

## Southwest Corridor Plan Key Issues: South Portland

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# **Key Issues: South Portland**

## Contents

Southwest Corridor Plan overview	1
How to use this Key Issues memo	2
South Portland Key Issues summary	3
HCT alignment option descriptions	8
South Portland analysis and findings	11
Transit performance	11
Community development	15
Mobility	18
Cost estimates	20
Engineering complexity and risk	22
Community impacts	23
Next steps	25
Appendix A: Anticipated major project documents and estimated dates of completion	A1
Appendix B: Shared Investment Strategy roadway and active transportation projects	B1
Appendix C: Corridor-wide mode considerations	C1
Appendix D: Demographic maps	D1

## South Portland Key Issues: introduction and summary

## Southwest Corridor Plan overview

The Southwest Corridor Plan is a comprehensive approach to achieving community visions through integrated land use and transportation planning. The Southwest Corridor Plan incorporates high capacity transit (HCT) alternatives, roadway, bicycle and pedestrian projects, and adopted local land use visions, including the Barbur Concept Plan, the Tigard High Capacity Transit Land Use Plan, Linking Tualatin, and the Sherwood Town Center Plan. The Plan is exploring Bus Rapid Transit (BRT) and Light Rail Transit (LRT) alternatives for several alignments that connect the Portland Central City, Southwest Portland, Tigard, and Tualatin.

In July 2013, the Southwest Corridor Plan Steering Committee recommended a Shared Investment Strategy (SIS) that includes key investments in transit, roadways, active transportation, parks, trails and natural areas. A refinement study was initiated in August 2013 to narrow HCT options, identify a preferred alternative and create a subset of roadway and active transportation projects. In June 2014, the Steering Committee accepted the recommendation of a narrowed set of HCT design options and requested additional refinement work from staff.

In December 2014, the Steering Committee directed project staff to use these findings and further community input to develop a Preferred Package of transportation investments to support community land use goals. The Preferred Package is anticipated to be defined in spring 2016.

After the Steering Committee approves the Preferred Package, then the identified HCT mode, alignment options, roadway, bicycle and pedestrian projects will receive full environmental review in a Draft Environmental Impact Statement (DEIS) under the National Environmental Policy Act (NEPA). It is anticipated that additional roadway, transit, bicycle and pedestrian projects will be studied, funded and implemented through other collective federal, state, regional and local efforts.

### **Desired outcome: Preferred Package**

Project partners will work together to develop a Preferred Package by spring 2016 that addresses the needs and aspirations of Southwest Corridor residents and businesses. The Preferred Package will include the following components:

- *HCT Preferred Alternative:* Preferred HCT alignments to study further in a DEIS, including mode, alignments, terminus, and associated roadway, bicycle and pedestrian projects
- **Corridor Connections:** Potential funding source and timeframe for each of the roadway, bicycle and pedestrian projects identified in the Shared Investment Strategy
- Land use and development strategy: Partnership agreements and other pre-development work to activate land use and place-making strategies identified in local land use visions

## **Identifying the Preferred Package: 2015-2016 timeline overview**

To reach a Preferred Package by spring 2016, two key Steering Committee decision-making points have been identified in 2015: July and December. Technical analysis, place-based public outreach and partner conversations will precede each Steering Committee decision. A draft recommendation report will be presented at community forums before each decision-making point, including public comment gathered during the place-based outreach period and any additional technical analysis compiled.

The July Steering Committee decision will focus on direct versus indirect access to key destinations in the corridor including Marquam Hill, Hillsdale and the Portland Community College (PCC) Sylvania Campus, as well as technical modifications to HCT alignments. The December Steering Committee decision will focus on the remaining HCT alignments and terminus options as well as an HCT mode decision between LRT and BRT. In January 2016, the Steering Committee will identify a Draft Preferred Package, including HCT mode, alignment options, terminus options, and associated roadway and active transportation projects for further study in a DEIS, a funding strategy for additional priority roadway, bicycle, and pedestrian projects throughout the corridor, and integrated land use and development strategies.



## How to use this Key Issues memo

The Southwest Corridor project partners are taking a place-based approach to understanding the key issues related to potential HCT and transportation investments as they relate to local concerns and community aspirations. The place-based key issues will be reviewed by the public and the Steering Committee in the context of their implications for achieving the multifaceted goals for the corridor as a whole. Decision makers and the public will have several months to discuss this report through public meetings and online engagement.

This document fits into a broader array of technical information that supports Steering Committee decision making during this phase of the Southwest Corridor Plan. **Appendix A** lists the anticipated major project documents and their estimated dates of completion.

In addition to this report and other Key Issues memos, a draft Evaluation Report expected in May 2015 will provide technical evaluation of the options in the South Portland, Hillsdale and PCC-Sylvania areas. A staff recommendation report focusing on HCT options in these areas will be available prior to the July 2015 Steering Committee meeting and will include a summary of stakeholder feedback. The remaining place-based evaluation and recommendation reports will be available before the December 2015 Steering Committee decision.

This document includes an overview of the decision making process as it relates to the key issues in South Portland, a description of the three proposed high capacity transit alignments to serve South Portland, a summary of technical information and a description of key issues for decision makers and the public to consider. Appendices contain supplemental information including maps and project lists of Shared Investment Strategy road, bicycle and pedestrian projects being considered for the South Portland area, a discussion of general transit mode considerations, and maps highlighting demographic factors in the study area.

## South Portland Key Issues summary

The South Portland area encompasses the project area between the Portland Transit Mall and SW Hamilton Street, but also includes a tunnel HCT alignment option that extends to the Hillsdale and Burlingame areas. This memo focuses on the following three HCT options under consideration for the South Portland area:

- A Marquam Hill-Hillsdale deep-bored tunnel between downtown Portland and SW Bertha Boulevard (LRT only)
- A surface alignment on SW Barbur Boulevard (BRT or LRT) between downtown Portland and SW Hamilton Street, including a new pedestrian and bike connection between Marquam Hill and Barbur Boulevard
- 3. A surface alignment on SW Naito Parkway from downtown Portland to the merge point with Barbur Boulevard and continuing to SW Hamilton Street, including a new pedestrian and bike connection between Marquam Hill and Barbur Boulevard, and including implementation of at least some portions of the Ross Island bridgehead project

Additional HCT options in the vicinity of Hillsdale overlap this geographic area but are addressed separately in the Hillsdale Key Issues memo. The



Marquam Hill-Hillsdale Tunnel alignment is addressed in both the South Portland and Hillsdale Key Issues memos.



## **Major decisions in South Portland**

In July 2015 the Southwest Corridor Plan Steering Committee will be asked to make a decision on which of the proposed HCT alignment choices serving the South Portland area will advance to further environmental review through a DEIS that could begin in late 2016.

While some distinctions between the Barbur and Naito options are described in this document, a decision to advance one over the other will require further detailed analysis that will be performed as part of the DEIS. As a result, both the Naito Parkway and Barbur Boulevard alignments, as well as local circulation options in the Ross Island bridgehead area, will continue to be studied beyond July 2015. The Steering Committee will decide in July 2015 whether the Marquam Hill-Hillsdale Tunnel alignment will also proceed for further environmental review. This document focuses on the substantial tradeoffs between a tunnel option and the two surface options so that the public and decision makers can be confident that all options that will enter the DEIS are viable and aligned with project goals.

### Timeline of Major Decisions in South Portland

July 2015:

• Should the Marquam Hill-Hillsdale Tunnel be continue to be studied?

December 2015:

- Is BRT or LRT the preferred mode to study in the DEIS?
- What is the best implementation approach for roadway, bike, and pedestrian projects that are not included as part of the HCT project but are defined in the Shared Investment Strategy in South Portland?

DEIS (anticipated 2016/2017):

- Should a surface alignment use Naito Parkway or Barbur Boulevard in South Portland?
- If the Marquam Hill-Hillsdale Tunnel is studied in the DEIS: will the tunnel or the surface alignment be selected for the LPA?

#### **Evaluation factors**

Deliberation and decision making will be driven by how well each element of the proposed project meets the Southwest Corridor Plan's overarching Purpose and Need, including improved mobility and safety for all users and modes of transportation, efficient and reliable transportation choices, wise use of public resources, improved access to key places, and equitable distribution of the benefits and burdens of transportation and land use development.

This South Portland Key Issues memo outlines data collected through technical analysis, community knowledge and discussions with partners that will influence this decision, including:

- Transit performance
- Community development
- Mobility
- Capital cost estimates
- Engineering complexity and risk
- Community impacts

## **South Portland summary**

The following table summarizes evaluation factors, key considerations, and analysis results for consideration in the South Portland area.

Key considerations	Evaluation	Marquam Hill-Hillsdale Tunnel (LRT)	Surface Alignments			
	factors		Barbur	Naito		
<ul> <li>Transit Performance</li> <li>How would a Marquam Hill-Hillsdale tunnel alignment perform relative to a</li> </ul>	2035 new transit trips	New Transit Trips: 16,900	New Transit Trips: • 15,700 (LRT) • 8,400 (BRT-estimated)	New Transit Trips: • 15,700 (LRT) • 8,400 (BRT)		
<ul> <li>surface alignment?</li> <li>Do the performance differences justify the higher capital costs, complexity, and risk associated with a tunnel?</li> </ul>	2035 line riders	Line riders: 52,400 (High number of bus transfers to LRT in Hillsdale results in high line ridership relative to new transit trips)	Line riders: • 44,100 (LRT) • 31,200 (BRT-estimated)	Line riders: • 43,500 (LRT) • 30,800 (BRT)		
<ul> <li>How would an HCT project affect Marquam Hill transit and auto usage?</li> </ul>	Travel time (PSU to Tualatin)	Travel Time: 29 minutes	Travel Time: • 30 minutes (LRT) • 33 minutes (BRT-estimated)	Travel Time: • 31 minutes (LRT) • 34 minutes (BRT)		
	2035 Marquam Hill station usage and auto volume impacts	<ul> <li>Increases Marquam Hill transit ons &amp; offs by 28%</li> <li>Daily auto volumes on streets providing access to Marquam Hill would decline by 3%</li> </ul>	<ul> <li>Increases Marquam Hill transit ons &amp; offs by 14% (with LRT)</li> <li>Daily auto volumes on streets providing access to Marquam Hill would decline by 2% (with LRT)</li> </ul>	<ul> <li>Increases Marquam Hill transit ons &amp; offs by 14% (with LRT)</li> <li>Daily auto volumes on streets providing access to Marquam Hill expected to decline similar to Barbur alignment</li> </ul>		
<ul> <li>Community Development</li> <li>Do surface or tunnel alignments offer the most desirable redevelopment opportunities for communities in South Portland?</li> <li>Can effective bicycle and pedestrian connections be developed so that a surface alignment can provide a good connection for transit riders to Marquam Hill?</li> </ul>	Access	<ul> <li>Direct access to Marquam Hill</li> <li>No connection between Lair Hill and Marquam Hill</li> <li>No direct station access to South Waterfront (access via tram)</li> <li>Includes sidewalk/bike improvements to access station</li> </ul>	<ul> <li>Indirect access to Marquam Hill (via new pedestrian connection)</li> <li>Potential stations at Hamilton and Gibbs in Lair Hill/South Portland</li> <li>Walk access to South Waterfront via Gibbs St ped bridge</li> <li>Includes sidewalk/bike improvements along Barbur and to access stations</li> </ul>	<ul> <li>Indirect access to Marquam Hill (via new pedestrian connection)</li> <li>Potential stations at Hamilton and Gibbs in Lair Hill/South Portland</li> <li>Walk access to South Waterfront via Gibbs St ped bridge</li> <li>Transforms the remnant expressway on this stretch of Naito into an urban boulevard with multimodal access to the HCT station</li> </ul>		
	Redevelopment potential	Redevelopment potential near stations	Some redevelopment potential along Barbur	Most redevelopment potential, including on land that could become available with Ross Island Bridgehead reconfiguration		
	Support of local land use plans			Supports Barbur Concept Plan		

Key considerations	Evaluation	Marquam Hill-Hillsdale Tunnel (LRT)	Surface Alignments			
	factors		Barbur	Naito		
MobilityAccessibilityIncludes side access static• Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?Includes side access static• Do surface or tunnel alignments offer		Includes sidewalk/bike improvements to access station	Includes sidewalk/bike improvements along alignment and to access stations	<ul> <li>Includes sidewalk/bike improvements along alignment and to access stations</li> <li>Could include projects that improve auto access to Ross Island Bridge and reconnect street grid</li> </ul>		
<ul> <li>more opportunities to improve safety for all users?</li> <li>Can surface alignments on Naito or Barbur be designed to avoid creating a barrier effect for cars, bikes and pedestrians?</li> </ul>	Mode considerations	<ul> <li>23 BRT vehicles per hour in the peak in South Portland</li> <li>10 LRT vehicles per hour in the peak</li> </ul>	Same as Barbur alignment			
<ul> <li>Capital Costs</li> <li>What are the cost differences between a tunnel and a surface option?</li> <li>Does overall cost impact the length of the final high capacity transit project?</li> </ul>	Cost estimates in 2014 dollars	<ul> <li>Adds \$732M - \$900M compared to Barbur or Naito alignment</li> <li>Depending on regional funding capacity, could impact the length of the alignment</li> </ul>	\$1.9B - \$2.4B (LRT) line cost \$680M - \$1.2B (BRT) line cost	Adds \$167M to Barbur line cost (LRT) Adds \$192M to Barbur line cost (BRT)		
<ul> <li>Engineering complexity/risk</li> <li>Are the benefits and risks associated with construction of a deep-bored tunnel clear?</li> <li>What aspects of each alignment option present noteworthy risk?</li> </ul>	Risk	<ul> <li>Large area needed for tunnel mining/access for heavy equipment and trucks at each portal</li> <li>Risk of complications with tunnel boring resulting in cost overruns</li> <li>Traffic and physical roadway impacts from hauling excavated materials</li> <li>Potential 4(f) impacts to Duniway Park with tunnel construction</li> </ul>	<ul> <li>Right-of-way impacts</li> <li>Potential 4(f) impacts to Duniway Park</li> </ul>	<ul> <li>Complexity of Ross Island bridgehead modification construction</li> <li>Potential right-of-way impacts if maintaining all travel lanes on Naito</li> <li>Modification of existing structures along Naito</li> </ul>		
<ul> <li>Community impacts</li> <li>Can the benefits and burdens of an HCT alignment be equally distributed among all population groups in the corridor?</li> <li>Do surface or tunnel alignments offer greater access to key places such as education, employment, health care and retail centers?</li> </ul>	Distribution of impacts	<ul> <li>Most direct access to education, employment and health care services on Marquam Hill</li> <li>Limited access to education, health care, employment and retail services on Naito Parkway, South Waterfront, and local retail centers</li> <li>Portal may be a visual or potential 4(f) concern if impacting parks/open space</li> </ul>	<ul> <li>Potential right of way impacts</li> <li>Provides more direct access to education, employment, health care and retail services not located on Marquam Hill</li> </ul>	<ul> <li>Potential right of way impacts</li> <li>Most improved access to education and health care services along Naito Parkway via HCT station areas and road, bicycle and pedestrian improvements</li> </ul>		

## **South Portland Key Issues**

## **HCT alignment option descriptions**

There are three HCT alignments in South Portland: two surface and one tunnel. A number of other HCT alignment options were removed from further consideration by the Steering Committee in April and June 2014. More information on these options may be found on the Southwest Corridor Plan website: <a href="http://www.oregonmetro.gov/public-projects/southwest-corridor-plan/project-library">http://www.oregonmetro.gov/public-projects/southwest-corridor-plan/project-library</a>



## Surface

The two surface alignment options in South Portland would both include a pedestrian connection from Barbur Boulevard to Marquam Hill near Gibbs Street for both BRT and LRT. The Naito Parkway alignment option could potentially include modifications to the current Ross Island bridgehead access, regardless of HCT travel mode.

#### Naito Parkway surface alignment

This option would connect to downtown Portland via Lincoln Street at Naito Parkway, with LRT tying into the Portland-Milwaukie light rail (PMLR) tracks on Lincoln and BRT using the new bus-only lanes between Naito and 1<sup>st</sup> Avenue on Lincoln. LRT would utilize the PMLR station on Lincoln while the BRT would stop adjacent to the station at curb side stops near the Lincoln LRT station to facilitate transfers.

Continuing south, the Naito alignment would likely locate a station north of Gibbs Street in the vicinity of the existing Ross Island Bridge ramps. This location minimizes impacts to adjacent properties due to the necessary width of the station area and also allows the station to better serve the National College of Natural Medicine (NCNM) while still providing a connection to the Gibbs corridor with the Hooley pedestrian bridge connection to South Waterfront. This alignment could convert travel lanes on Naito Parkway to transit-only and remove existing grade-separated intersections along the corridor. This alignment would include the Marquam Hill pedestrian/bike access project and could require inclusion of the Ross Island bridgehead access project, both described later in this section.

#### Barbur Boulevard surface alignment

This option would tie into downtown, via a new bridge at 4<sup>th</sup> Avenue connecting to the PMLR tracks at Lincoln for LRT or would utilize existing bridges on 5<sup>th</sup> and 6<sup>th</sup> for BRT in a combination of dedicated guideway and mixed traffic, making connections directly to the Transit Mall. LRT would utilize the existing Jackson Street station and would locate a second station on Barbur in the vicinity of Gibbs Street to the south. BRT would utilize the existing station on the Transit Mall near Mill Street and PSU Plaza and would likely locate another station near Sheridan Street to the south as well as a third station in the vicinity of Gibbs Street. This alignment could convert travel lanes on Barbur Boulevard to transit-only and remove the existing grade-separated intersection at Naito Parkway. This alignment would include the Marquam Hill pedestrian/bike access project described below.

#### Tunnel

The LRT tunnel option would run between the downtown Portland Transit Mall and Burlingame, including direct access to Marquam Hill and Hillsdale.

#### Marquam Hill-Hillsdale Tunnel

This option would tie into the downtown Transit Mall via a new bridge at 4<sup>th</sup> Avenue connecting to the PMLR tracks at Lincoln Street. Access to the tunnel portal would be in the vicinity of Hooker Street. The tunnel would extend under Marquam Hill with a deep station to directly access Oregon Health & Science University (OHSU) and indirectly connect to the VA Medical Center and Casey Eye Institute through the OHSU campus. A second deep station would be located under the Hillsdale town center, near the intersection of Capitol Highway and Sunset Boulevard. The tunnel would exit the hillside in the vicinity of Bertha Boulevard where it meets Barbur Boulevard.

With this alignment option there would be no surface connections to inner southwest Portland except those north of I-405 described above. The Marquam Hill-Hillsdale Tunnel alignment would not assume a direct pedestrian and bicycle connection between Marquam Hill and Barbur Boulevard since the area would be served by an underground station with an elevator.

## Roadway, pedestrian and bicycle projects

All options include a range of roadway, pedestrian and bicycle improvements to better connect the corridor to the surrounding neighborhoods near stations and along surface portions of alignments. The specific improvements vary depending on the alignment and multimodal needs. Maps and lists of potential roadway, pedestrian and bicycle projects that would accompany HCT alignments in South Portland are included in Appendix B. Two major projects, Marquam Hill pedestrian/bike access and the Ross Island bridgehead project, are described in more detail below.

#### Marquam Hill pedestrian/bike access

This connection has been studied at a conceptual level through the Marquam Hill Design Challenge. Two firms were hired to conceptually render new connections from a Barbur or Naito transit stop up to Marquam Hill. Options studied included a sky bridge, several escalator options and a pedestrian tunnel. Connections on the hill were proposed at Terwilliger and/or within the OHSU campus. The project engaged the surrounding neighborhood groups, adjoining property owners and several health care providers. Those engaged included the Veterans Medical Center, NCNM, and OHSU. It is clear that a well-designed connection from Barbur to the OHSU campus and beyond to the VA Medical Center is feasible, and it is assumed this connection would be constructed as part of a Barbur or Naito surface alignment.

#### Ross Island bridgehead project

The set of projects referred to collectively as the Ross Island bridgehead project is a set of modifications to the roadway system at the west end of the Ross Island Bridge, in the South Portland/Lair Hill neighborhood. The modifications are based on previous planning work, including the South Portland Circulation Study, the Portland City Council-adopted Barbur Concept Plan, and the I-405 Design Workshop, and include changes to roadways and ramps intended to improve street connectivity, reduce the barrier effect of Naito Parkway for the neighborhood, improve pedestrian and bicycle connections, and modify motor vehicle connections to the Ross Island Bridge. The project involves converting Naito Parkway from an arterial to a collector, converting the complex networks of ramps, frontage roads, and disconnected streets to a more typical grid street pattern, and providing accommodations for through vehicles and vehicles accessing the bridge. At a minimum, it would be necessary to implement portions of the bridgehead project in order for a Naito surface alignment to function safely and effectively.

## South Portland analysis and findings

## **Transit performance**

Key considerations:

- How would a Marquam Hill-Hillsdale tunnel alignment between downtown Portland and Burlingame perform relative to a surface alignment in the same area?
- Do the performance differences justify the higher capital costs, complexity and risk associated with a tunnel?
- How would an HCT project affect Marquam Hill transit and auto usage?
- How would the lack of a surface connection to inner SW neighborhoods (including South Waterfront) affect the long-term goals and visions for these areas?

Key findings:

- Marquam Hill-Hillsdale Tunnel alignment travel time would be about two minutes faster than the Naito surface LRT option and two minutes faster than a surface Barbur LRT option between downtown and Burlingame.
- A Marquam Hill-Hillsdale tunnel would result in 8,300 additional line riders but only 1,200 more new transit trips in 2035 when compared to the LRT surface alignment on Barbur (line riders and system trips are defined in the following section). The difference occurs because many of the additional line riders would transfer to LRT from local buses and ride one stop to a Marquam Hill station.
- All three alignment options would increase daily on and off transit boardings at Marquam Hill by 14 to 28 percent in 2035 compared to a no-build option. Daily auto volumes on streets providing access to Marquam Hill would decline by a projected two to three percent.

The South Portland transit analysis focuses on differences between LRT operating through a tunnel under Marquam Hill and LRT routed on the surface on Barbur Boulevard or Naito Parkway and utilizes three travel demand model runs to reflect these alternatives. Model runs used LRT as the mode for comparison because the tunnel option is not under consideration for BRT. **All model results at this time should be considered preliminary as developments in HCT options and local bus service assumptions will necessitate updated model runs throughout the DEIS process.** 

#### Travel time and reliability

The Marquam Hill-Hillsdale Tunnel alignment would be slightly shorter than the Barbur surface alignment and could travel at a higher speed because it would be completely separated from cars, pedestrians and bikes. Therefore it would provide the fastest and most reliable LRT travel times of the options in South Portland, saving 1.2 minutes over LRT on Barbur Boulevard and 2 minutes over LRT on Naito Parkway, or about four to six percent of the total travel time projected between the Transit Mall and a Tualatin terminus. The Naito alignment would be slightly slower than the Barbur option due to its longer distance and an additional station at Lincoln Street.

#### Line and system ridership

Future transit ridership forecasts are largely determined by the speed of the service relative to competing modes and by the numbers of households and jobs the line serves. Ridership is expressed in two ways: **line ridership** measures the number of daily riders on the specific HCT line (between the Tualatin terminus and downtown Portland)—this includes both new transit riders and those who rode buses in a no-build scenario (without the HCT project). **Change in system transit trips** measures the growth of total system ridership with implementation of the proposed project compared to a no-build alternative—this isolates new transit riders only. While shifts from buses to HCT in the model reflect riders who mostly benefit from improved accessibility with a project, new riders represent shifts in mode, usually from autos to transit, which are more likely to benefit the transit system as a whole. All measures are for forecast year 2035.

The Marquam Hill-Hillsdale Tunnel option would result in 8,300 more line riders compared to LRT on Barbur Boulevard, a 19 percent increase, but only 1,200 more new transit riders (system transit trips), a 8 percent increase. This discrepancy occurs because of the difference in access to Marquam Hill between the tunnel alternative and the surface alternatives. With HCT on either Barbur or Naito, a surface pedestrian and bicycle connection between Barbur Boulevard and Marquam Hill is assumed to be built as part of the HCT project regardless of the mode selected. This connection, whether it is an elevator, escalator, walkway, or other design, would be accessible to HCT and local bus riders at Barbur Boulevard near Gibbs Street. Approximately half of the projected users of the pedestrian/bicycle connection would be local bus riders. For the Marquam Hill-Hillsdale Tunnel alternative, without the direct connection between Barbur and Marquam Hill, local bus riders instead would transfer to LRT in either Hillsdale or downtown Portland and travel one stop to the tunnel station under Marquam Hill. These transfers result in higher line ridership for LRT in a tunnel, but a much smaller difference in net new transit riders compared to the surface alternatives.

#### Marquam Hill transit ridership impact to auto volumes and local transit service

Both the surface and tunnel HCT alternatives would attract higher transit ridership to Marquam Hill compared to a no-build alternative (without an HCT project), with an increase of 1,850 average weekday station ons and offs (13 percent) and 3,350 station ons and offs (23 percent) respectively (see figure below). The tunnel option would result in 1,500 more daily ons and offs at Marquam Hill compared to the Barbur option, a nine percent increase.



#### Transit Trips Accessing Marquam Hill by Mode

		LRT on Naito	
Mode of Access	No Build	and Barbur	LRT in Tunnel
Direct Bus	11,200	5,250	3,000
Tram	3,350	1,500	1,300
Bus to Ped/Bike Connection		4,450	
Light Rail		5,150	14,300
Transit Riders	14,550	16,300	18,600
Line Ridership		43,500	52,400
System Ridership Change		15,700	16,900

Roads accessing Marquam Hill would experience some reductions in auto volumes with the introduction of HCT, with projected daily auto volumes reduced by approximately two percent with LRT on Barbur and by approximately three percent with the LRT in a tunnel. With or without HCT, vehicle trips to the hilltop are constrained by parking capacity limits, resulting in latent demand for auto travel on the three road access points (Terwilliger Boulevard to the north and south, and Marquam Hill Road to the west).

HCT service could reduce the number of local buses traveling directly to Marquam Hill as riders shift to LRT or BRT. Both LRT on the surface and using a tunnel would reduce the daily direct local bus ons and offs at Marquam Hill by more than half – a drop of 5,950 (53 percent) and 8,200 (73 percent), respectively, while increasing the total transit ridership to Marquam Hill based on the 2035 Regional Transportation Plan's assumed local bus network.

#### Naito compared to Barbur

Model results for the Naito option compared to the Barbur option are very similar. An alignment on Barbur Boulevard would be nearly one minute faster than a Naito alignment because of a slightly more direct route and one less station in downtown Portland. Therefore, the Barbur option would attract slightly higher ridership along most of the route. A Naito alignment, however, would serve an additional station at Lincoln Street and 3<sup>rd</sup> Avenue, currently under construction as part of TriMet's new Portland-Milwaukie light rail. This additional stop for BRT or LRT would attract additional ridership destined to and from the southern portion of the Portland central business district. The combined effects result in LRT on Barbur having slightly higher line ridership (44,100 compared to 43,500) and identical change in system trips or new riders (15,700). A model run for BRT on Barbur has not yet been completed.

#### South Portland mode considerations

Appendix C includes a general discussion of differences between BRT and LRT modes and their corridorwide impacts; this section addresses issues particular to the South Portland area.

Consideration should be made for the number of transit vehicles traveling through South Portland, with a project on either Barbur or Naito. Today four bus routes and up to 20 buses travel along Barbur Boulevard in South Portland in the peak hour on weekdays, and six bus lines and up to 14 buses travel along Naito Parkway, and bus service will likely increase as future demand grows. Introduction of HCT, regardless of mode, would reduce the number of local buses traveling through South Portland as riders shift to either LRT or BRT. However, because of differences in carrying capacities, more BRT vehicles than LRT vehicles would be needed to carry an equivalent passenger load (see Appendix C). The projected 2035 demand would require 23 BRT vehicles per hour in the peak in South Portland, while LRT would require 10 vehicles per hour in the peak.

HCT service operates faster than local buses because of exclusive right of way but also because of signal pre-emption or signal priority at intersections. The high number of hourly vehicles required for BRT can be expected to diminish some of this travel time benefit. The more frequently that HCT vehicles pass through an intersection, it is less likely that signal priority could be given to the transit vehicles over cars. When the frequency of signal priority requests interferes with auto movement, priority for HCT vehicles is limited. Detailed traffic analysis performed in the DEIS will help estimate the effects of transit pre-emption on traffic and transit performance. The frequency required for BRT and the limitations of existing transit priority infrastructure would make it less likely than LRT to be granted signal pre-emption or signal priority.

Today six bus routes and up to 23 buses serve Marquam Hill in the peak hour on weekdays, and service will likely increase with future demand growth. Since HCT options are either in a tunnel (LRT) or on Barbur or Naito (LRT or BRT) with a direct connection to the hilltop, the number of buses serving Marquam Hill would likely be reduced as demand shifts to HCT, regardless of mode or alignment.

### **Community development**

Key considerations:

- Does a surface or a tunnel alignment offer the most desirable redevelopment opportunities for communities in South Portland?
- Can effective bicycle and pedestrian connections be developed so that a surface HCT alignment can directly connect transit riders to Marquam Hill?

Key findings:

- The Marquam Hill-Hillsdale Tunnel alignment would provide the most direct access to OHSU and the VA Hospital via an underground station with elevator access above ground within the OHSU campus. This alignment would not provide access to Naito Parkway, Barbur Boulevard or South Waterfront
- A Barbur or Naito alignment would require multimodal investments to provide pedestrian and bicycle access from Barbur or Naito to Marquam Hill.
- A Barbur or Naito alignment would provide opportunities for enhanced transit travel between inner SW Portland destinations south of the city limits.
- A Barbur or Naito alignment would provide connections between educational campuses at PSU, OSHU in South Waterfront and Marquam Hill, NCNM and PCC.
- A Naito alignment would offer the most redevelopment potential of the each of the proposed alignments, including parcels of land that could become available through the reconfiguration of the Ross Island Bridgehead.
- A Naito alignment would fulfill the goals and visions contained in the Portland City Counciladopted Barbur Concept Plan, including reconnecting the adjacent neighborhood that was separated by the Ross Island Bridge connection to I-405 and Barbur.
- A Naito alignment would provide additional transit service in the south end of downtown Portland via Lincoln.

The key Community Development considerations of each alignment option in South Portland are access, redevelopment potential, and support of local land use plans. Access relates to the ability of surrounding land uses to access the proposed transit alignment. Redevelopment potential is the availability of vacant and underutilized properties to redevelop based on impacts of the implementation of the Shared Investment Strategy. Support of local land use plans is a reference to how the proposed investment options fit in the scheme of adopted local land use plans.

The specific Community Development issues surrounding the South Portland area are tied directly to the three alignment choices in this area. There are different considerations around how each of the remaining alignments would support local land use goals and regional employers. An important point to consider is the existing ridership that travels to and from this area on a daily basis on current transit lines. The area contains a mix of large employers (OHSU, PSU, VA hospital), educational institutions (PSU, NCNM, OHSU), established residential areas in Lair Hill and Homestead and a growing residential population in South Waterfront. Combined with ongoing investment by the City of Portland in the

Education and North Macadam Urban Renewal Areas, these generate strong transit ridership demands today that will continue into the future.

The choice of HCT alignment will have a direct impact on existing jobs and residents, impacts to the existing residential neighborhoods and what kind of future growth may occur. The singular point of convergence for the existing employers, education institutions and future residents is the South Portland/Lair Hill neighborhood. Bisected by large-scale infrastructure projects over the last 60 years, the area exists as a "pass-through" neighborhood since it provides the only city street connection of the northern and southern limits of downtown Portland. It has been a long-held goal of the city to knit the neighborhood back together. Future investment of a high capacity transit project in the corridor could profoundly impact the built environment in South Portland for many decades to come.

#### Marquam Hill-Hillsdale Tunnel

<u>Access</u>: An elevator connection from a tunnel station would offer the most direct connection to Marquam Hill, which currently employs more than 20,000 people between OHSU and the VA Medical Center and provides services daily to patients and families. It would not provide direct connections to South Waterfront or other South Portland neighborhoods. With the projected growth of South Waterfront from an existing 3,200 residential units today to 11,600 units in 2035, some investment in a stronger surface connection for pedestrians and bikes for the east/west connection would need to supplement any tunnel construction. Without a direct HCT connection, the South Portland neighborhood and other transit riders seeking access to the neighborhood and to South Waterfront would need a safe and efficient east/west connection that does not currently exist.

<u>Redevelopment potential</u>: The Tunnel alignment would not offer redevelopment potential to existing properties along Barbur and Naito. Although some natural, market-driven increases in land value based on proximity to Downtown may occur along the northern portion of Barbur Boulevard, the remaining neighborhood would likely see little to no impact to property values from the construction of a tunnel alignment since no station would serve the neighborhood. This would potentially limit the ability of some underutilized and undervalued properties to redevelop in the short and medium term.

<u>Support of local land use plans</u>: The tunnel alignment would not support the existing Barbur Concept Plan, which calls for some form of High Capacity Transit investment along Naito Parkway. A key element of the Barbur Concept Plan is to realign the existing Ross Island Bridge ramps that weave through the South Portland neighborhood, which would not be addressed with this alignment choice.

#### Barbur

<u>Access</u>: Although the Barbur alignment would provide enhanced transit options to a portion of the South Portland neighborhood, there are significant grade differences between Barbur and Naito that make full access to areas east of Barbur Boulevard a challenge. The significant grade drop to the east of Barbur poses a challenge to the movement of pedestrians and cyclists from the east up to any proposed transit station. It is likely that a station along Barbur would necessitate investment in a stronger pedestrian/bicycle connection to the east. This alignment would also not offer a direct connection to Marquam Hill, which would necessitate some form of multimodal investment that would allow pedestrians and cyclists to get from an HCT station along Barbur Boulevard up to the Hill.

<u>Redevelopment potential</u>: The redevelopment potential of this alignment is primarily focused on properties along the northern end of Barbur Boulevard. Although some redevelopment would likely occur in this area, the fact that very little developable acreage exists along Barbur Boulevard south of Hooker Street means that expectations should be tempered regarding redevelopment returns.

<u>Support of local land use plans</u>: The Barbur alignment was not the selected alignment in the Barbur Concept Plan. It is unclear, at this time, how placing HCT service on Barbur Boulevard may affect the preferred land use scenario envisioned in the Barbur Concept Plan.

#### Naito

<u>Access</u>: A significant access benefit from this alignment choice is the re-design of Naito Parkway, which would offer more pedestrian crossings. The current design of Naito Parkway is that of a limited access highway, with very few crossing opportunities. The proposed redesign that would occur with the HCT investment would increase opportunities for controlled crossings. This would have the effect of increasing mobility in the neighborhood and opening up new opportunities for direct east/west connections from South Waterfront to Marquam Hill. This alignment option would also require a direct connection to be built to Marquam Hill, but as discussed in the Barbur alignment this connection has been studied at a conceptual level, appears feasible, and is assumed to be constructed as part of the Naito alignment. Another access benefit is the ability to serve a station on Lincoln Street.

<u>Redevelopment potential</u>: Based on work done by the City of Portland on the Barbur Concept Plan, the Naito alignment produces the most potential for redevelopment of existing vacant and underutilized parcels within the Kelly Focus Area. Barbur Concept plan work included an assessment of redevelopable parcels that identified significant opportunity on existing parcels, and on parcels that would be created through the reconfiguration of the Ross Island Bridge ramps. Either BRT or LRT on Naito Parkway would have a positive effect on property values along the route through the design of a more pedestrian and bicycle friendly streetscape and the direct access to HCT. The existing Lair Hill historic overlay would serve to guide the form and intensity of redevelopment in certain portions of the area, which may address some local concerns regarding the impacts of future redevelopment sites on the character of the neighborhood. Additionally, redevelopment opportunities would become available in downtown Portland, as the alignment would move off of the Transit Mall and head east before joining with Naito Parkway. This would activate a portion of downtown currently characterized by lower intensity uses.

<u>Support of local land use plans</u>: The Naito alignment would be the most supportive of local land use plans, specifically the Barbur Concept Plan. The South Portland neighborhood falls into the Kelly Focus area of that plan, which identifies Naito Parkway as the spine for HCT, and a potential reconfiguration of the Ross Island Bridge ramps, allowing reconnection of the historic street grid in the Lair Hill neighborhood. These changes would bring new activity and increased housing options to portions of the neighborhood, while maintaining its unique character.

### **Mobility**

Key considerations:

- Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?
- Do surface or tunnel alignments offer more opportunities to improve safety for all travel modes?
- Can surface alignments on Naito or Barbur be designed to avoid creating additional barrier effects for cars, bikes and pedestrians?

Key findings:

- None of the alignment options overlap with regional or statewide freight routes in South Portland.
- The Naito and Barbur alignments utilize the most heavily-trafficked segment of Barbur Boulevard in Portland; the Marquam Hill-Hillsdale Tunnel avoids this segment.
- Design treatments for a Barbur or Naito alignment could include addressing observed crash types and improve pedestrian and bicycle facilities.
- A Naito alignment would remove the barrier within the neighborhood created by the regional roadway system.

#### Motor vehicle and freight mobility

The Barbur and Naito alignment options would utilize the most heavily-trafficked segment of Barbur Boulevard in Portland, between Hamilton Street and Capitol Highway, while the tunnel would avoid this segment. All of Barbur Boulevard and a portion of Naito Parkway (north of the Ross Island Bridge) are designated Major Truck Streets by the city, but are not regional or statewide (Oregon Highway Plan) freight routes. Freight stakeholders have expressed interested in avoiding overlap between highcapacity transit and freight routes; none of the alignment options in South Portland overlap with regional or state designations, but care will need to be taken to ensure continued freight mobility on locally designated Major Truck Streets. Transit designs would be required to accommodate freight trucks including vertical and horizontal clearances along all alignment options.

Initial traffic analysis considered traffic operations on the South Portland alignments. The following table summarizes the intersections analyzed and the initial findings.

	Meets motor vehicle performance target?*				
	2035 No-Build	2035 Build			
Broadway Ave & I-405 SB Exit Ramp	Yes	Yes			
6th Ave & Broadway	No	No			
5th Ave & Broadway	Yes	Yes			
4th Ave & Lincoln St	Yes	Yes			
4th Ave & Caruthers/Broadway	Yes	Yes			
Barbur Blvd/4th Ave & Sheridan St	Yes	Yes			
1st Ave & Arthur St	Yes	Yes			
Hood Ave & Kelly Ave/Ross Island Bridge	No	Yes			
Naito Pkwy & Hooker St	Yes	Yes			
Naito Pkwy & Ross Island Bridge	No	Yes			
Naito Pkwy & Gibbs St	Yes	Yes			
Naito Pkwy & Whitaker St	Yes	Yes			
Barbur Blvd & Naito Pkwy	Yes	No			
Barbur Blvd & Bancroft St	Yes	No			
Barbur Blvd & Hamilton St	No	No			

\* Within permitted margin of accuracy

Source: Final SW Corridor Traffic Analysis and Operations Memorandum, DKS, July 29, 2014

During the DEIS phase, more detailed analysis will be performed, and mitigation would be developed for intersections not expected to meet the 2035 motor vehicle performance target. This could include changes in lane configurations, traffic signals, or other mitigation options. This level of analysis will likely be required in a decision between surface options Barbur and Naito.

The west end of the Ross Island Bridge provides a major connection point for multiple arterials and freeways. The project may modify how traffic accesses the Ross Island Bridge. More detailed traffic analysis will be performed in the DEIS to determine the effects on mobility, throughput, and safety in this area.

#### Pedestrians and bicycles

Use of a Naito or Barbur alignment would bring opportunities to improve the roadway for pedestrians and bicyclists. Barbur Boulevard between Hamilton Street and Burlingame largely lacks sidewalks, and the bike lanes have gaps and are not wide enough to comfortably serve most people when accounting for the speed and volume of vehicle traffic. A transit alignment following Barbur Boulevard could address these pedestrian and bicycle gaps and deficiencies. The Marquam Hill-Hillsdale Tunnel alignment would not preclude these improvements in the future, but would not implement them.

#### Safety

Use of a Naito or Barbur alignment could bring opportunities to improve the roadway for safety of all modes of travel. Barbur Boulevard is a high-crash corridor, and has been the location of high-severity

crashes between South Portland and Burlingame. Design treatments to address observed crash types and improve pedestrian and bicycle facilities could improve the roadway's safety. The Marquam Hill-Hillsdale Tunnel alignment would not preclude such improvements in the future, but would not implement them as part of an HCT project.

#### **Access**

Presuming use of center-running transit for the in-street segments, the Naito or Barbur alignment options would all result in minor changes to motor vehicle access along Barbur Boulevard south of Hamilton Street, where there are few destination and access points. North of Hamilton Street, the Barbur alignment would result in significant changes in access to the local streets and driveways along the segment, and the likely elimination of some left-turn access. Access control already exists along the Naito alignment. Selection of the Naito alignment could modify traffic circulation patterns to and from the Ross Island Bridge.

#### Lane conversions

The only places in the corridor that are being considered for lane conversion are sections of roadways that currently appear to have excess capacity based on early traffic analysis. One of these locations is on Barbur Boulevard between Hooker Street and Naito Parkway. This segment of Barbur Boulevard currently has two northbound travel lanes, one southbound travel lane, and a two-way center turn lane. The project team is looking at the potential to convert one northbound travel lane and portions of the middle turn lane in order to minimize impacts to adjacent properties. The project team is also looking at running BRT vehicles in mixed traffic in this segment. If decisions are made to exclude lane conversions, designs can be modified to maintain existing lane configurations, with the tradeoff of more property impacts. On Naito Parkway the project team is looking at a range of potential lane configurations, including a scenario that incorporates the Ross Island bridgehead access project into the alignment for LRT or BRT.

As the project progresses, further traffic analysis will look in detail at traffic flows at intersections as well as in the broader network to assess whether lane conversions could work and whether additional mitigations might be needed to allow conversion, such as new turn lanes or signals. Additionally, more detailed consideration of the property impacts of different lane configurations will allow for a discussion about the trade-offs between minimizing impacts and maintaining existing auto capacity.

#### **Cost estimates**

Key considerations:

- What are the cost differences for the entire project between a tunnel and a surface option?
- What are the trade-offs between cost of a project and other factors such as reliability, safety, access and community development opportunities?
- How does cost impact the length of the final high capacity transit alignment?

Key findings:

- BRT estimates range from \$680M to \$1.2B. The range reflects options for direct service to Hillsdale and dedicated transit lanes.
- LRT estimates range from \$1.9B to \$2.4B. The range includes direct access to Hillsdale and PCC Sylvania but does not include the cost of a Marquam Hill-Hillsdale bored tunnel.
- A Marquam Hill-Hillsdale bored tunnel would add an estimated \$750M to \$900M to the cost of an LRT project.

Current cost estimates for corridor HCT alignments are based on conceptual design. Estimates will continue to be refined as options are narrowed and designs are developed, but current estimates are useful in demonstrating the relative differences between current options. All figures are in year 2014 dollars, and exclude escalation and finance costs. Cost estimates are not yet complete for all modes, options, and segments; estimates will be updated and reported as the project progresses.

#### Corridor-wide costs

Current estimates for a BRT alignment from downtown Portland to Tualatin range from \$680M to \$1.2B. The range reflects options for cut-and-cover tunneling and for infrastructure improvements to allow BRT to operate in dedicated transit lanes.

Current estimates for an LRT alignment from downtown Portland to Tualatin range from \$1.9B to \$2.4B. The range reflects options for cut-and-cover tunnel and surface options in Hillsdale and at PCC but excludes the deep-bored Tunnel option under Marquam Hill. The region's funding capacity will impact the final inclusion of expensive HCT alignment choices that provide direct service to important destinations versus serving more communities to the south.

#### South Portland area costs

#### Marquam Hill-Hillsdale Tunnel

The approximately 2.5-mile long Marquam Hill-Hillsdale Tunnel, considered only for LRT, would cost an estimated \$1.34B. The Marquam Hill-Hillsdale Tunnel would increase project costs by \$732M to \$900M over a surface-only alignment.

#### Barbur and Naito

For LRT, a Naito alignment would cost approximately \$167M more than a Barbur alignment. For BRT, a Naito alignment would cost about \$192M more than a Barbur alignment. Both alignment options would include one new station in the vicinity of Gibbs Street. For BRT, an additional station could be included near Sheridan Street, since the next closest station on the Transit Mall would be further north than the Jackson Station, the next closest LRT station. While the Barbur alignment for LRT would include a new transit bridge over I-405 near 4<sup>th</sup> Avenue, costs for the Naito alignment would be higher for both modes due to the reconstruction of Naito Parkway necessary for HCT operations and access, and due to the potential reconstruction of the Ross Island bridgehead.

## **Engineering complexity and risk**

Key considerations:

- Are the benefits and risks associated with construction of a deep-bored tunnel clear?
- What aspects of each alignment option present noteworthy risk?

Key findings:

- A Marquam Hill-Hillsdale bored Tunnel has the highest level of complexity and risk of the proposed alignments.
- The primary engineering risk of an alignment on Barbur would be balancing traffic operations with right-of-way impacts to adjacent properties.
- Construction phasing, traffic control and maintaining access to homes and businesses would be complex during the construction of a Naito or Barbur alignment

Complexity and risk analysis in the South Portland area focuses on differences between LRT operating through a tunnel under Marquam Hill, LRT or BRT routed on the surface of Barbur Boulevard, and LRT or BRT routed on the surface of Naito Parkway. Complexity and risk analysis comparisons of these options are at this time a mix of quantitative and qualitative assessments. Additional analysis will be developed in the coming months to further define geotechnical/structural complexity and risk as well as to identify the potential for impacts to major utilities.

#### Marquam Hill-Hillsdale Tunnel

Of the options under consideration the deep-bored tunnel under Marquam Hill has the highest level of complexity and risk. Tunnels are inherently risky given the unexpected subsurface conditions to be encountered and overcome. The West Hills, formed by basalt flows, are geologically complex including numerous faults, resulting in a high degree of risk. Many tunnels constructed for transportation worldwide exceed their estimated costs by substantial amounts. For example, the Robertson Tunnel, which provides transit access to the Oregon Zoo, ultimately cost 80 percent more than the original construction bid due to unforeseen complications and related schedule delays.

In the case of a bored tunnel particular consideration must be given to the impacts to the portal areas near Hooker Street and near the intersection of Barbur and Bertha Boulevards. These include the large footprint required for the mining operation staging areas, access to these locations for heavy equipment and trucks, complex sequencing of work and materials delivery, as well as materials to be hauled off site. A considerable amount of construction traffic would be generated by hauling off excavated soil and rock. This would add complexity to the transportation system surrounding the site and the need to mitigate impacts along the haul route, which would likely include phasing reconstruction of roadways damaged by very heavy trucks continually travelling through. In addition, the northern portal's proximity to Duniway Park could have Section 4(f) implications and the southern portal's proximity to a busy commercial area in Burlingame would be likely to impact businesses. Section 4(f) is a federal provision that prevents the use of land from publicly owned areas such as parks unless specific conditions are met, including there being no prudent alternative.

A technical tunneling memo expected in May 2015 will more fully describe the geotechnical issues associated with tunnel construction.

#### Inner Barbur Boulevard, Tie-in to Naito

The primary engineering risk with an alignment on Barbur Boulevard would be balancing traffic operations with right-of-way impacts to adjacent properties, including the adjacent Lair Hill Park. Detailed traffic analysis will be performed in the DEIS to identify or verify feasible configurations. Traffic control and maintaining access during construction are key short term risks.

#### Naito Parkway with Ross Island Bridgehead Project, Tie-in to Barbur

The Naito alignment has a number of risks worth mentioning. Initial traffic analysis has been promising; however, as with the Barbur alignment, a more detailed traffic study will be necessary for evaluating the project and defining the extent of necessary improvements. It is possible that the extent of improvements could expand beyond the current scope of the defined project, increasing the cost and complexity. Complexity would likely be greater for the Naito alignment relative to the Barbur alignment because of the Ross Island bridgehead modifications. Phasing, traffic control and maintaining access to homes and businesses will complicate construction, given the existing congestion already experienced in the area, and many of the connections around the bridgehead would likely be under construction simultaneously.

#### **Community impacts**

Key considerations:

- Can benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?
- Do surface or tunnel alignments offer the greatest access to key places such as education, employment, health care and retail centers?

Key findings:

- Based on spatial analysis of demographic maps, there is no significant difference in how each alignment option runs through areas of non-white or non-English speaking populations.
- Based on spatial analysis of demographic maps, there are slight differences in how each alignment option runs through areas of low-income and senior populations.
- Subsequent analysis and conversations with residents, employees and visitors to the corridor will further detail the potential for unequal distribution of benefits and burdens of high capacity transit construction and service.

Demographic maps for non-white, non-English speaking, low-income and senior populations were overlaid with maps of the proposed HCT alignments (see Appendix D). Subsequent discussions with residents, employees and visitors to these areas will help us to further understand how different racial, ethnic and language groups may be impacted by the proposed alignments.

#### Non-white and non-English speaking populations

Based on spatial analysis of the maps, none of the alignment options would run through areas with more than average non-white populations; however, disaggregation by ethnicity shows that a Marquam Hill-Hillsdale Tunnel alignment would pass under one area of higher than average concentration of Asian population south of Marquam Hill. Each alignment would run primarily through areas with very low percentages of non-English-speaking populations, with one exception of a higher than average parcel of non-English speaking population west of Marquam Hill.

#### Low-income and senior populations

Based on spatial analysis of the maps, the Barbur Boulevard and Naito Parkway alignments would run primarily through areas with higher than average low-income populations; the Marquam Hill alignment would run under a portion of higher than average low-income population and also under below average areas. Each of the three alignments would run through areas with significantly higher than average populations of seniors 65 years and older. The Hillsdale Loop option would run through areas with somewhat higher than average populations of seniors.

#### Access to services

Investments in the transportation systems throughout the Southwest Corridor aim to improve access to important community services such as education, health care, retail and employment centers for all residents.

Education centers identified in South Portland include National College of Natural Medicine, OHSU Marquam Hill campus, Portland State University, Wilson High School, and Rieke and Hayhurst Elementary schools. Portland State University would be served by any of the three alignments since all stop on the Transit Mall. Access to the planned southern expansion of the PSU campus at Lincoln would be served by a Naito alignment. Access to PSU's life science program in South Waterfront would be served by either surface alignment. A Marquam Hill-Hillsdale Tunnel would provide the most direct service to Oregon Health Sciences University Marquam Hill campus via an underground elevator, but would not provide access to NCNM because it would not include significant roadway, pedestrian and bicycle improvements to Naito Boulevard or a surface connection from the hill to Barbur. A Naito alignment would provide the most direct access and improvements to NCNM.

Health care services identified in South Portland include NCNM, the OHSU Marquam Hill and South Waterfront campuses, and VA Hospital. A Marquam Hill-Hillsdale Tunnel would provide the most direct service to the OHSU Marquam Hill campus via an underground elevator, but would provide limited access improvements to NCNM because it would not include significant roadway, pedestrian and bicycle improvements to Naito. A Naito alignment would provide the most direct access and improvements to NCNM. The Naito and Barbur surface alignments both provide access to the OHSU South Waterfront campus via the Hooley pedestrian bridge.

Key retail and employment centers in South Portland include the OHSU Marquam Hill campus, VA Hospital, South Waterfront, and retail centers along Corbett and in the Lair Hill district. A Marquam Hill-Hillsdale Tunnel would provide the most direct service to the OHSU Marquam Hill campus via elevator and indirectly to the VA Hospital from Terwilliger Boulevard. The Naito and Barbur alignments would provide the most direct access to South Waterfront and other retail centers in South Portland.

#### **Property impacts**

The options under consideration all have varying levels of impact to adjacent private properties. In many cases, property impacts are limited to only a narrow strip of area needed to widen the roadway and sidewalks. In other cases, temporary construction easements may be all that is needed to allow for construction of new roadway and sidewalks. In extreme cases, large or complete acquisitions may be necessary when impacts to buildings or other major infrastructure are unavoidable. The project team is currently quantifying the areas of potential impact on each of the options and will be presenting the level of impact of the various options relative to one another once the data is assembled. In areas where converting an auto travel lane to a transit lane is under consideration, property impacts will be evaluated for scenarios both with and without the lane conversion in order to facilitate discussion about the trade-offs of minimizing impacts and maintaining auto capacity.

## **Next steps**

This Key Issues memo formally introduces to decision-makers and the public information relevant to a decision on high capacity transit alignments in South Portland. Between March and July 2015, project staff will present information on South Portland and other Southwest Corridor Plan issues and invite public comment at numerous public meetings, including a Community Planning Forum and a Community Technical Workshop. An updated calendar can be found on our website:

#### http://www.oregonmetro.gov/public-projects/southwest-corridor-plan

**May 2015:** Staff will produce a technical evaluation report that will include assessments of options accessing South Portland, Hillsdale and Portland Community College, followed by staff recommendations to the Steering Committee in June.

**July 13, 2015:** The Steering Committee will be asked to consider making decisions on what options in these three areas should continue to be studied in a Draft Environmental Impact Study.

**December 2015:** the Steering Committee will be asked to consider making a recommendation on the mode, terminus and remaining HCT alignments to be studied further in a DEIS, along with an implementation strategy for the corridor connection projects defined in the Shared Investment Strategy.

## **Appendices**

Appendix A: Anticipated major project documents and estimated dates of completion

- Appendix B: Shared Investment Strategy roadway and active transportation projects
- Appendix C: Corridor-wide mode considerations
- Appendix D: Demographic maps

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# Appendix A: Anticipated major project documents and estimated dates of completion

July Steering Committee decision: direct vs. indirect service to Marquam Hill, Hillsdale and PCC Sylvania

- Key Issue Memos:
  - South Portland March
  - Hillsdale March
  - PCC Sylvania May
- Draft Evaluation Report May
- Evaluation Report and Recommendation June
- Supplementary documents:
  - Tunnel fact sheet March
  - Tunnel technical memo May

**December Steering Committee decision:** remaining HCT alignments, mode, and terminus and SIS funding strategy

- Key Issue Memos:
  - Tigard June
  - Tigard to Bridgeport Village September
  - Bridgeport Village to Tualatin September
  - Barbur / Adjacent to I-5 October
  - HCT mode October
  - HCT terminus October
- Evaluation Report October
- Evaluation Report and Recommendation November
- Supplementary documents:
  - Modeling report October
  - Cost estimate report October
  - Traffic report October
- Funding strategy for Shared Investment Strategy roadway, bike and pedestrian projects December

# Appendix B: Shared Investment Strategy roadway and active transportation projects

The information in this appendix will be further developed and presented as a stand-alone document.

The Shared Investment Strategy (SIS) Roadway and Active Transportation Project List includes projects that improve access to both key places in the corridor and to the high capacity transit (HCT) alignments currently under consideration:

- *HCT-aligned projects* are roadway, bikeway and pedestrian projects that were initially identified in the SIS in July 2013, and then were further refined in July 2014 as the HCT alignments were narrowed. These projects either run along the HCT alignment (and would be incorporated into HCT designs and cost estimates) or improve access to station areas.
- **Corridor Connections** are roadway, bikeway and pedestrian projects that improve connectivity and mobility across the corridor, beyond the immediate geographic area of a potential HCT line. These were identified in the SIS in July 2013 as critical for the support of land use goals in essential and priority places.

Some of the projects identified as HCT-supportive are also critical land use supportive projects, and will remain on the SIS Roadway and Active Transportation Project List as Corridor Connections projects if their associated HCT station or alignments are removed from consideration. Other HCT-supportive projects that do not support key land uses will be removed from the SIS project list as their associated HCT alignments or stations are removed from consideration.

For all projects on the SIS Roadway and Active Transportation Project List, potential funding sources will be identified. For HCT-supportive projects, one potential funding approach will be as part of the HCT package, but other potential funding sources will be identified for each project to support their implementation whether as part of a transit project or as a standalone project. Some projects will need to undergo traffic analysis and other evaluation to assess impacts prior to project partner agreement on implementation.

The following map and list show both the HCT-supportive and corridor connections projects in the South Portland and Hillsdale areas.



<b>Project #</b> Location/ Ownership	<b>Title</b> Description	Cost	Primary Mode	Primary Project Type	Time- frame	Potential Funding Sources	Notes
<b>1019</b> Portland ODOT	Barbur Lane Diet - Capitol to Hamilton (reduce northbound lanes from three to two with multimodal improvements) Reduce number of northbound lanes from three to two from Capitol Hwy (north) to 1/4 mile south of Hamilton to reduce speeds and improve safety, improve ped/bike crossing safety and add protected bike lanes	¢	Bicycle	Corridor Connections			
<b>1044</b> Portland ODOT	South Portland Circulation and Connectivity (Ross Island Bridge ramp connections) Adds a new ramp connection between I- 405 and the Ross Island Bridge from Kelly Avenue. Restore at-grade intersections along Naito Parkway, with new signalized intersections at Ross Island Bridge access and at Hooker Street. Removes several existing roadways and ramp connections.	\$\$\$\$	Multimodal	HCT Supportive		HCT Package	With HCT on Naito Parkway: Include
<b>2999</b> Portland	Pedestrian connection from Barbur to Terwilliger at Gibbs Construct a new pedestrian walkway under the tram within the Gibbs right-of- way through the Terwilliger Parkway. The steep grade and forested area will require lighting and stairs.	\$	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur/Naito & Gibbs: Include
<b>3028</b> Portland	Inner Hamilton bikeway -from SW Terwilliger Blvd to SW Corbett Ave. Enhanced shared roadway. Includes connection to Terwilliger on SW Hamilton Terrace	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Hamilton: Include

Cost: ¢ - up to \$500,000; \$ - up to \$5 M; \$\$ - up to \$10 M; \$\$\$ - up to \$20 M; \$\$\$\$ - More than \$20 M

<b>Project #</b> Location/ Ownership	<b>Title</b> Description	Cost	Primary Mode	Primary Project Type	Time- frame	Potential Funding Sources	Notes
<b>3038</b> Portland	Lower SW 1st bikeway -from SW Barbur Blvd to SW Arthur St. Multiple bicycle facility types: separated in- roadway (Corbett: Gibbs - Grover); bicycle boulevard (all other segments). Includes connection to SW Kelly Ave on SW Grover St and SW Corbett Ave	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur/Naito & Gibbs: Include
<b>3044</b> Portland ODOT	Middle Barbur bikeway -from SW 23rd Ave to SW Capitol Hwy-Barbur Blvd Ramp. Separated bicycle route in-roadway. Listed as a Regional Bicycle Parkway in the Regional Active Transportation Plan (5/9/13).	\$	Bicycle	HCT Supportive		HCT Package	With HCT adjacent to I-5: Include within 1/2 mile of stations With HCT on Barbur: Include
<b>3093A</b> Portland	<b>Terwilliger bikeway gaps</b> Separated bicycle route in-roadway. Eliminate key gaps in the Terwilliger Blvd bikeway	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Terwilliger: Include lower section near Barbur (50%)
<b>3101</b> Portland	Vermont-Chestnut bikeway -from SW Capitol Hwy to SW Terwilliger Blvd. Bicycle boulevard	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Terwilliger: Include Include with HCT station at 13th instead of Terwilliger?
<b>4002</b> Portland ODOT	Barbur Blvd, SW (3rd - Terwilliger): Multimodal Improvements Construct Improvements for transit, bikes and pedestrians. Transit improvements include preferential signals, pullouts, shelters, left turn lanes, sidewalks, and crossing improvements.	\$\$	Multimodal	HCT Supportive		HCT Package	With HCT on Barbur Boulevard: Include

<b>Project #</b> Location/ Ownership	<b>Title</b> Description	Cost	Primary Mode	Primary Project Type	Time- frame	Potential Funding Sources	Notes
<b>5005</b> Portland ODOT	Barbur Blvd, SW (Terwilliger - City Limits): Multimodal Improvements Complete boulevard design improvements including sidewalks and street trees, safe pedestrian crossings, enhance transit access and stop locations, and bike lanes (Terwilliger - SW 64th or Portland City Limits).	\$\$\$\$	Multimodal	HCT Supportive		HCT Package	With HCT adjacent to I-5: Include within 1/2 mile of stations (20%) With HCT on Barbur Boulevard: Include
<b>5006</b> Portland ODOT	<b>Barbur Lane Diet: Miles to Capitol</b> Reduce number of northbound travel lanes on Barbur from Miles to Capitol Highway (north) from two to one to reduce speed and improve safety. Adds bike lanes over Newberry and Vermont bridges.	¢	Bicycle	Corridor Connections			
<b>5013</b> Portland ODOT	Naito/South Portland Improvements (left turn pockets with bike/ped and remove tunnel, ramps and viaduct) Reconstruct Naito Pkwy as two-lane road w/bike lanes, sidewalks, left turn pockets, & on-street parking. Remove grade separation along Naito at Barbur Blvd. (tunnel), the Ross Island Bridge, Arthur/Kelly (viaduct), and the Grover pedestrian bridge.	\$\$\$\$	Multimodal	HCT Supportive		HCT Package	With HCT station at Barbur & Gibbs: Include signalized pedestrian crossing(s) of Naito near station (1%) With Naito alignment: Include
6004 Portland ODOT	Newbury viaduct bicycle and pedestrian facilities Construct new bicycle and pedestrian facilities at/parallel to Newbury St. viaduct	\$	Bike/Ped	Corridor Connections			

<b>Project #</b> Location/ Ownership	<b>Title</b> Description	Cost	Primary Mode	Primary Project Type	Time- frame	Potential Funding Sources	Notes
6005 Portland ODOT	Vermont viaduct bicycle and pedestrian facilities Construct new bicycle and pedestrian facilities at/parallel to Vermont St. viaduct	\$\$	Bike/Ped	Corridor Connections			
6022 Portland ODOT	I-405 Bike/Ped Crossing Improvements Improve opportunities for bicycles and pedestrians to cross over/under I-405 on Harbor Drive, Naito Parkway, 1st, 4th, 5th, 6th and Broadway.	\$	Bike/Ped	HCT Supportive		HCT Package	Consider opportunity to address with HCT crossing of I-405
9005A Portland	Red Electric Trail: Fanno Creek Trail to Willamette Park - Hillsdale to Shattuk Provide east-west route for pedestrians and cyclists in SW Portland that connects and extends the existing Fanno Creek Greenway Trail to Willamette Park. Listed as a Regional Bicycle Parkway and Regional Pedestrian Parkway in the Regional Active Transportation Plan (5/9/13).	\$	Bike/Ped	HCT Supportive		HCT Package	With HCT station in Hillsdale: Include
9005B Portland	Red Electric Trail: Fanno Creek Trail to Willamette Park - to Hillsdale Provide east-west route for pedestrians and cyclists in SW Portland that connects and extends the existing Fanno Creek Greenway Trail to Willamette Park. Listed as a Regional Bicycle Parkway and Regional Pedestrian Parkway in the Regional Active Transportation Plan (5/9/13).	\$\$\$	Bike/Ped	Corridor Connections			

<b>Project #</b> Location/ Ownership	<b>Title</b> Description	Cost	Primary Mode	Primary Project Type	Time- frame	Potential Funding Sources	Notes	
<b>9007</b> Portland	Slavin Road to Red Electric Trail: Barbur to Corbett Build Multi use trail on Slavin Road from Barbur to Corbett. The Red Electric Trail is listed as a Regional Bicycle Parkway and Regional Pedestrian Parkway in the Regional Active Transportation Plan (5/9/13).	\$	Bike/Ped	Corridor Connections				

#### HCT-supportive projects in South Portland

Most of the HCT-supportive projects in South Portland focus on improving bike and pedestrian connectivity in South Portland and across I-405 into downtown Portland.

The Naito and Barbur alignments would both include a pedestrian and bike connection between Marquam Hill and an HCT station near Gibbs and either Barbur or Naito. This connection, paired with the Hooley Pedestrian Bridge, would provide a pedestrian and bike connection between Marquam Hill and the South Waterfront.

The Naito alignment would also include two interconnected projects that modify auto access to the Ross Island Bridge (1044) and reconnect the street grid across Naito Parkway (5013). The Ross Island bridgehead modifications would shift bridge traffic from local streets and open up land currently occupied by bridge ramps. New signals would be added along Naito Parkway, providing crossing opportunities for cars, bikes, and pedestrians. The west end of the Ross Island Bridge provides a major connection hub of multiple arterials and freeways. Traffic analysis will be needed to determine the effects on mobility and safety to the west end of the Ross Island Bridge from these projects.

		% of project included with each HCT alignment option						
#	Title	Naito LRT	Naito BRT	Barbur LRT	Barbur BRT	Marquam Hill- Hillsdale tunnel LRT		
1044	South Portland Circulation and Connectivity	100	100	0	0	0		
2999	Pedestrian connection from Barbur to Terwilliger	100	100	100	100	0		
3028	Inner Hamilton bikeway	100	100	100	100	0		
3038	Lower SW 1st bikeway	100	100	100	100	0		
4002	Barbur Blvd Multimodal Improvements	100	100	100	100	0		
5013	Naito/South Portland Improvements	100	100	1	1	0		
6022	I-405 Bike/Ped Crossing Improvements	20	20	20	40	20		

not included with HCT alignment1 to 33% of project included with HCT alignment

%

- % 34 to 66% of project included with HCT alignment
  - 67 to 100% of project included with HCT alignment

#### Corridor connections projects in South Portland

The only corridor connections project within South Portland is the Slavin Road to Red Electric multi-use trail between Barbur and Corbett (9007). Paired with the Red Electric Trail (9005A and 9005B), the Slavin Road trail would provide a new bike and pedestrian connection between Hillsdale and South Portland.

Other corridor connections projects on the South Portland and Hillsdale SIS Projects map and list are addressed in the Hillsdale Key Issues Memo.

## **Appendix C: Corridor-wide mode considerations**

The information in this appendix will be further developed and presented as a stand-alone document.

Two high capacity transit (HCT) modes are under consideration for the corridor:

- Light rail transit (LRT)
- Bus rapid transit (BRT)

#### Bus Rapid Transit description

There are currently four operating LRT (or MAX) lines and one under construction in the Portland area. In 2014, BRT was selected as the preferred mode for the under-development Powell-Division Transit Development Project, but to date BRT does not operate in the region. Typically, BRT is differentiated from standard bus service by several characteristics:

- Fifty percent or more of the alignment operate in dedicated transitway lanes to increase speed and reliability.
- Portions of the alignment may have queue bypass lanes, signal priority, or other design elements to speed travel.
- Vehicles are larger capacity and have multiple doors for entry and exit.
- Fare payment is made off-board to reduce dwell time
- Stations are similar to LRT or streetcar stations, and are spaced further apart than local service bus stops for faster service.

#### **Capital costs**

Depending on the percentage of dedicated transitway for a BRT alternative, capital costs to construct physical infrastructure are more expensive for LRT, which operates in fully dedicated transitway, in large part due to right-of-way acquisition of property required for construction. It is important that BRT planning consider the risks of "watering down" a project by deciding to operate BRT in congested roadways to avoid high capital costs or engineering complexity. This can diminish the effectiveness of BRT service as the most difficult places to attain exclusive right of way are often the places it is most needed.

Capital costs are a one-time cost shared by many partners including the federal government, which usually contributes 50% of a project's capital cost, as well as state and local governments, municipal planning organizations, transit agencies, and other private partners.

#### **Operating and maintenance costs**

The vehicle operator accounts for the largest share of operating costs regardless of mode. Since an LRT vehicle has greater capacity compared to a BRT vehicle (266 versus approximately 86), fewer LRT vehicles are required to carry an equivalent passenger load, making LRT less expensive to operate than BRT. SW Corridor model runs indicate that in the year 2035 the 7.5 minutes assumed peak headway (number of minutes between vehicle arrivals) for LRT is sufficient to accommodate peak-hour, peak-direction demand. For BRT, however, the peak frequencies would need to be increased to 3 minute

headways to accommodate demand. This would result in higher operating costs for BRT for the lifetime of the service. On-going operating and maintenance costs are largely locally funded.

#### Speed, service and ridership

LRT attracts more riders than BRT. Because LRT always operates in exclusive transit lanes and because it is more likely to be granted signal priority at intersections, light rail is faster and more reliable than BRT. Stated preference surveys also show that LRT attracts more discretionary riders than BRT, due to speed advantages but also to better perceived ride quality compared to BRT.

Models indicate that in 2035 the demand for HCT in the Southwest Corridor would require 20 BRT vehicles per hour in the peak, while LRT is assumed to operate with eight vehicles per hour in the peak with enough capacity still available to accommodate ridership growth beyond 2035. For BRT, growth above the projected 2035 demand would require yet more increases in service.

HCT service provides travel time advantages over local buses because of exclusive right of way but also because of longer distances between stations and signal priority at intersections. The high number of hourly vehicles required for BRT can be expected to diminish some of the travel time benefit from signal priority. The more frequently HCT vehicles pass through an intersection, the less likely signal priority can be given to the transit vehicles over autos. When the frequency of signal priority requests interferes with auto movement, priority for HCT vehicles is limited. It's expected that traffic would be largely unaffected by the eight LRT vehicles per hour assumed in the peak in 2035; however, the frequency required for BRT would likely prohibit full priority.

#### Development

Both BRT and LRT would leverage private development investment at station areas. Available research assessing the difference in scale of development by mode is inconsistent and contradictory. Staff will address development by mode over the course of the next year.



## **Appendix D: Demographic maps**















