Eastside Transit Alternatives Analysis

Evaluation Summary

May 2006

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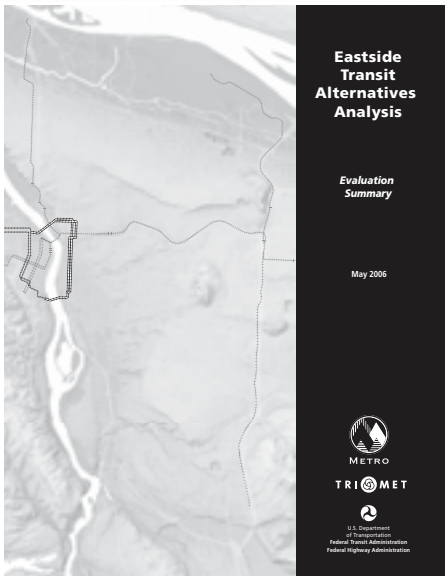
TRANSIT ALTERNATIVES ANALYSIS



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Executive Summary

Overview

This Evaluation Report contains the analysis of transit alternatives for a loop circulator in Portland's Central City. This Executive Summary section presents the results of the evaluation in an abbreviated summary form. The Summary section that follows provides more detail regarding the definition of the alternatives, goals and objectives, design considerations and evaluation measures. The individual report chapters that follow provide full detail and documentation regarding this alternatives analysis. This analysis was conducted in a manner intended to be consistent with the Federal Transit Administration's (FTA) newly created Small Starts program, current guidance for Alternatives Analysis and the National Environmental Policy Act.

Definition of Alternatives

All alternatives were based on the Regional Transportation Plan's 2025 Financially Constrained network and include:

The **No-Build Alternative** fulfills the role of a **Small Starts Baseline** as it includes incremental service increases in the corridor and serves the same downtown circulation travel market as the Streetcar Alternative.

The **Streetcar Alternative** is defined as the **Full Loop** alignment, and has three **Minimum Operable Segments (MOS); Oregon Street, Morrison Street,** and at the Oregon Museum of Science and Industry **,** referred to as **OMSI.** These are shown in Figure ES-1

The **Streetcar Alternative** was analyzed using the MLK/Grand couplet alignment through the Central Eastside. The **Two-way Grand Design Option** could also be used for the Central Eastside segment of the loop, and is presented as an alternative to the MLK/Grand couplet alignment. The alternatives are presented schematically in Figures ES-2 through ES-5, showing the operating plan for each alternative. For the MOS alternatives, a connecting bus completes the full loop.

The results of key evaluation measures is presented below. A more detailed accounting of all evaluation measures is presented in the Summary, and in Chapter 3 of this report.

Transit Ridership Results

Each alternative results in an increase in Streetcar and total transit ridership compared to the 2025 No-Build Alternative, with the Full Loop resulting in the largest increase. Figure ES-5 shows this breakdown.

All of the build alternatives have over 50 percent of their ridership and at least some portion of the trip occurring in the Central Eastside. The OMSI MOS and Full Loop alternatives would exhibit the highest percentage of streetcar ridership on the eastside at approximately 75 percent.

Compared to the No-Build alternative, the Full Loop and OMSI MOS alternatives would improve transit connectivity through the Central Eastside by providing a limited stop, one-seat ride through the eastside. Streetcar alternatives would provide greater transit capacity and would result in more riders per mile of operation.

Figure ES-1
Streetcar Alternative and the Minimum Operable Segments (MOS)

Figure ES-2
Streetcar Alternative Service Concept

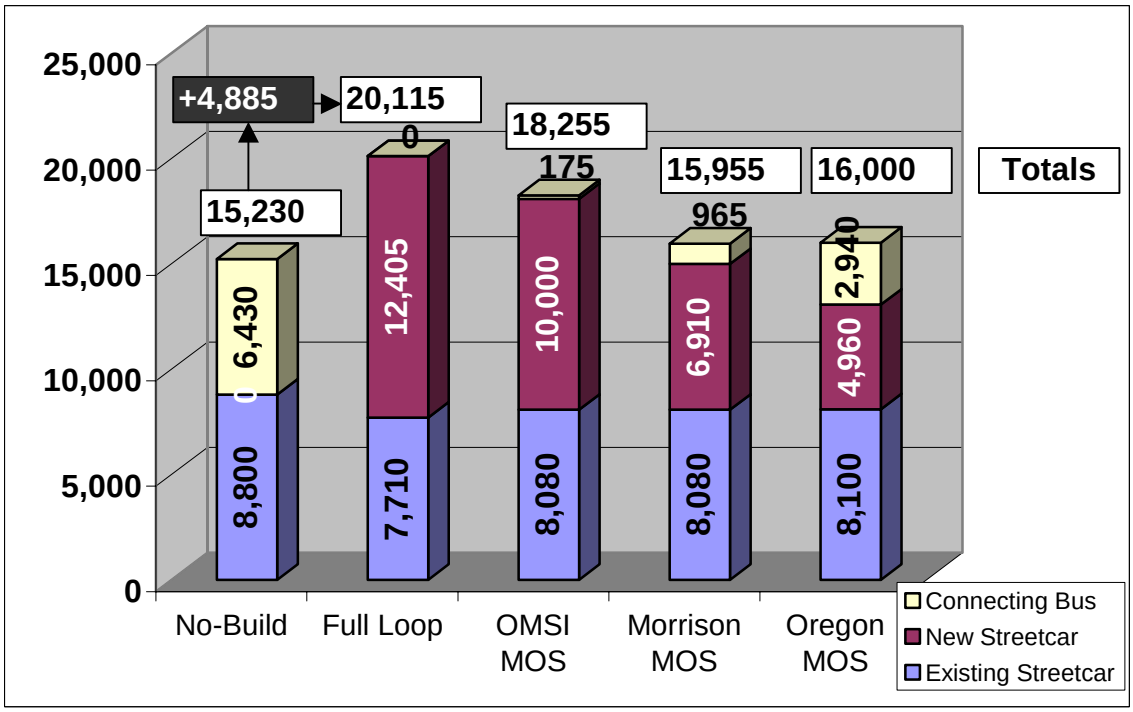
Figure ES-3
OMSI MOS Service Concept

Figure ES-4
Morrison MOS Service Concept

Figure ES-5
Oregon MOS Service Concept

The introduction of Streetcar service on the eastside would further complement the eastside grid system by dispersing trips across an array of destinations. The Full Loop alternative would have the best overall improvement in total transit travel times to/from and within the corridor compared to the No-Build alternative.

Figure ES-6
Streetcar and Bus Ridership Average Weekday – Year 2025



The full loop Streetcar Alternative, and to a lesser degree the MOSs, meet the project's goal of creating a Central City circulator transit project that distributes trips throughout the districts it serves.

All of the build alternatives provide improved connections between key visitor destinations in the Central City. The presence of streetcar stops, rails and catenary would make streetcar relatively more easily identifiable than standard fixed route bus service, which lacks permanent guideway improvements.

All of the build alternatives would result in reduced parking demand compared to the No-Build, because more internal transit trips within the corridor are accommodated on transit.

Land Use and Development Policy Results

All of the alternatives would be consistent with state, local and regional land use plans and policies in effect in the Central City. The Full Loop would go the farthest toward implementing specific policies regarding a Central City transit circulator and fostering transit supportive development.

The region's compact urban form, land use mix, short average trip lengths and the presence of viable alternatives to the single occupant vehicle are directly attributable to the region's land use

and transportation plans and policies. These have resulted in transit trips, including bus, streetcar and light rail, that have grown substantially more than vehicle miles traveled, a trend that is unusual compared to the rest of the country. Residents of the Central City, with it's high level of transit service and density and mix of uses, make fewer auto trips, own fewer cars, and use transit more than their counterparts in other parts of the region. Figure ES-6 summarizes this trend historically.

Economic Development Policy Results

The existing Portland Streetcar line demonstrates the impact of transit on development. This can be illustrated by the response of the private sector development community to announced plans to build a streetcar line in downtown Portland. In 1997, the City of Portland gave final approval to Portland Streetcar Inc., to proceed with construction and operation of streetcar service in downtown Portland. July 2001, streetcar operation commenced. Based on the experience of the Portland Streetcar, the private sector is willing to develop at a higher density along a streetcar line as evidenced by signed developer agreements to build to higher floor area ratios contingent on the presence of the streetcar. After 1997, those areas within one block of the streetcar experienced much greater development than areas two, three or more blocks from the alignment. Specifically, since the commitment to streetcar service was made, lands within one block of the streetcar were built to within 90 percent of allowed density (FAR), while lands within two blocks only built to a little over 70 percent and areas three blocks distant built to a little over 60 percent of allowed density.

Based on the experience of the Portland Streetcar and application of that experience to the Eastside project through analysis of existing zoning, floor area ratios, redevelopment potential and other factors, substantially more housing and mixed use development could occur on the eastside with the Full Loop Streetcar or MOSs than with the No-Build, commensurate with the length of the project. The percent of maximum floor area ratio (FAR) was used to assess what might occur on the Eastside. Given the existing zoning, an additional 3,432 housing units could be expected between 2005 and 2025 if a the OMSI MOS or Full Loop projects were built. The shorter MOSs would result in fewer additional housing units.

The Eastside has numerous proposed economic development projects that would benefit from transit and especially a streetcar because of the streetcars' demonstrated higher attraction of riders and greater passenger capacity. This larger public investment in a streetcar would likely result in greater private investments in the Eastside than would occur with the provision of bus service.

Traffic Impact Results

The proposed Eastside Streetcar route would operate in mixed traffic on existing streets within the corridor. During the PM Peak periods traffic congestion is relatively heavy along this corridor, which would in turn impact streetcar operations. The Streetcar operations are dependent on the general traffic flow of the roadway system the streetcar is operating in, and key locations where the streetcar requires signalization changes or other exclusive provisions to integrate with the general traffic flow.

Future 2009 (opening year) and 2025 PM peak hour traffic analyses were conducted at 51 intersections along the SE MLK Jr. Boulevard/SE Grand Avenue couplet and the NE Broadway/NE Weidler couplet. For the year 2009 PM peak hour traffic operations, four intersections along the proposed route are anticipated to operate at an intersection level of service (LOS) E to F, and/or a volume to capacity Ratio (V/C) greater than 1.00. For the year 2025 PM

peak hour traffic operations, 17 intersections along the proposed route are anticipated to operate at a LOS E to F, and/or a V/C greater than 1.00.

Future PM peak hour traffic conditions may have some impact on streetcar operations due to congestion along this corridor. Six of the intersections would be impacted by Streetcar operations, where general traffic is stopped for the streetcar to turn into mixed traffic through either a new traffic signal or the addition of a new phase to the existing traffic signal. These changes would not significantly alter the existing signal timing and progression of traffic along these roadways.

As part of the proposed Streetcar alignment, several signal and roadway changes are proposed to successfully integrate Streetcar into mixed traffic. Changes would include special signal phases, queue jumps, roadway widening, and striping and lane changes. These changes were incorporated into the traffic analysis for Streetcar to OMSI and are summarized in this section. Any of the MOS Alternatives would have the same improvements up to the respective terminus locations.

Design Considerations

Further investigation into potential improvements to move the streetcar through the corridor faster and more reliably as well as ways to improve the pedestrian environment should be conducted during the next phase of this study. Based on community support, engineering judgment, and the 2009 and 2025 traffic analysis, several design issues have been identified and will be evaluated further during the next phase of the project These design issues focus on streetcar operations and the pedestrian environment. Current plans in the corridor will help with the pedestrian environment and additional considerations could be made to improve on the pedestrian access and safety along the Broadway/Weidler and MLK Jr./Grand couplets.

Two Way Grand Design Option

The Two-Way Grand Design Option was developed as an alternative to the MLK Boulevard/Grand Avenue couplet to address transfer connection to radial bus lines and to improve the pedestrian environment. The Two-Way Grand Avenue Design Option has been designed so that it could be applied to any of the MOSs with the exception of the Oregon MOS which doesn't extend to the Central Eastside, and does not preclude either two-way Grand Avenue design option or the MLK/Grand couplet alignment extension to the Central Eastside.

With the Two-way Grand Avenue alignment, Grand Avenue would be converted to a two-way street. Streetcar would operate in both directions in the travel lanes with traffic. The proposed streetcar alignment would remain the same north of E Burnside Street. Southbound streetcar would turn northbound on E Burnside and southbound on SE Grand Avenue. Both northbound and southbound streetcar would operate on SE Grand Avenue. SE 7th Avenue would provide for the northbound general traffic function to replace SE Grand Avenue.

The Two-Way Grand Design Option would require extensive roadway improvements to SE 7th Avenue to carry northbound auto trips diverted from SE Grand Avenue. Transitions to and from SE Grand Avenue would be required at SE Stephens Street on the southern end and NE Couch Street on the northern end of the alignment. Additionally, roadway improvements would be needed to change NE Grand Avenue from one-way traffic operation to two-way traffic operation.

This design option would change both the function and classification of SE Grand Avenue and SE 7th Avenue. This would likely require an amendment to the City of Portland *Transportation System Plan* (TSP) and Metro's *Regional Transportation Plan* (RTP) street classification

designations. This design option would also likely result in traffic impacts, diversion of traffic into the adjacent neighborhoods, impacts to the Industrial Sanctuary, and private property impacts. During the next phase of study, if the Two-Way Grand design option were chosen as the preferred alternative, then further refinement of this design option would be needed. A full discussion of design considerations is included in Chapter 4 of the *Evaluation Report.*

Financial Feasibility

Assessing financial feasibility at the Alternatives Analysis phase of project development is a matter of comparing capital, operating and maintenance costs against proposed revenue sources. Funding sources generally solidify as a project moves through the project development process. In this section, proposed costs and revenues are presented and potential shortages and surpluses identified.

Capital cost estimates are provided in 2005 dollars and inflated to year of expenditure (YOE). The construction is assumed to be conducted from September 2007 to September 2009. Construction inflation has been assumed to be 5% per year through 2008. The cost estimates are based on a build-up of FTA cost categories and appropriate contingencies and are presented below.

Table ES-1
Capital Costs

Project Alternative	($2005 dollars)	($ YOE dollars)
Oregon MOS	$84,000,000	$100,506,000
Morrison MOS (MLK-Grand	$105,000,000	$125,632,000
Morrison MOS (Two Way Grand)	$119,000,000	$142,380,000
OMSI MOS (MLK-Grand)	$142,000,000	$169,905,000
OMSI (Two-Way Grand)	$156,000,000	$186,653,000
Full Loop	$153,000,000	$187,026,000
Full Loop (2-Way Grand)	$167,000,000	$203,774,000

Source: URS, Portland Streetcar Inc, April 2006

A preliminary inventory of funding sources indicate a potential of $100-125 million available for total project costs, which would not be sufficient to fund the entire Full Loop at this time. The Oregon MOS and Morrison MOS have listed sources (not fully committed) that could assure the completion of the project. The OMSI MOS and Full Loop require identification of $35-47 million in additional sources of funding in order to be constructed in a single project phase. Additional revenue would need to be identified if the entire project is to be constructed in one phase. Descriptions of proposed revenue sources are presented below.

- **Federal Small Starts** (60%): up to $75,000,000.
- **Committed Federal funding** (HUD, MTIP): $4,200,000.
- **Local Improvement District**: $6,000,000 to $10,000,000
- **Bridge Funds:** $9,000,000
- **Portland Development Commission Funding**: $25,000,000-$35,000,000.
- **City of Portland Funding**: $4,000,000

The Oregon MOS and Morrison MOS have listed sources (not fully committed) that could assure the completion of the project. The OMSI MOS and Full Loop require identification of $35-47 million in additional sources of funding in order to be constructed in a single project phase.

Operations and maintenance costs are presented in Table ES-2 below. These costs refer to the difference between the alternatives and the No-Build and include connecting bus and streetcar costs.

Table ES-2
Operating and Maintenance Costs ($ 2005)

Project Alternative	Operating Cost
Full Loop	$ 5,262,000
OMSI MOS	$ 5,325,100
Morrison MOS	$ 4,928,200
Oregon MOS	$ 4,642,200

Source: TriMet 2006

Operating revenue commitments have not been made for the Eastside Transit Project. However, funding mechanisms are in place that could potentially generate enough operating revenue to expand the streetcar system. More work will be required between TriMet and the City of Portland to develop a mutually agreeable funding plan, and to identify potential additional funding sources if necessary.

Cost-Effectiveness

Cost effectiveness provides a measure of how effectively the investment in capital, operating and maintenance funds that would be required for each alternative translates into ridership on the new streetcar line. The Full Loop is the most cost-effective alternative in terms of total annualized capital and operating cost per new streetcar rider, annualized federal cost per new streetcar rider and operating cost per streetcar rider. Cost-effectiveness decreases as the length of the project alternative decreases.

The Full Loop alternative, which has the highest cost, would also have the most riders, resulting in the lowest cost per streetcar rider of $4.25. The remaining MOS alternatives, with fewer additional new streetcar miles, and therefore lower cost and ridership, show a cost per rider figure commensurate with the length of the new streetcar line; the OMSI MOS cost per rider is $5.01, Morrison MOS is $5.80, and the Oregon MOS is $6.86.

The Full Loop alternative results in the lowest federal cost per streetcar rider at $1.77 per rider. The remaining MOS alternative's, show an increasing federal cost per streetcar rider commensurate with the length and ridership of the new streetcar line. Specifically, the OMSI MOS federal cost per rider is $2.03, Morrison MOS is $2.17, and the Oregon MOS is $2.39.

The Full Loop alternative would have the lowest operating cost per streetcar rider at $1.30 per rider. The remaining MOS alternatives show increasing operating cost per rider as ridership declines with each successive shorter streetcar alternative.

Project Decision Making

The outcome of the Eastside Transit Alternatives Analysis will be the adoption of a locally preferred alternative. The LPA will specify the mode, alignment, and termini of the transit project and may also set forth a phasing strategy for the project if a minimum operable segment (MOS) is chosen.

Public involvement and comment has taken place since 2005 and will continue through the LPA process. The LPA recommendation will be generated by jurisdiction senior staff that serve on the Project Management Group (PMG). The citizen committee for the project, the Eastside Project Advisory Committee (EPAC) will also generate a recommendation. The Steering Committee,

which is composed of elected officials and executive staff of Metro, TriMet, the Oregon Department of Transportation (ODOT), the Cities of Portland and Lake Oswego, and Multnomah and Clackamas Counties will review the PMG and EPAC recommendations as well as public comment and will issue a LPA recommendation. The Portland City Council, Multnomah County Commission, TriMet Board and Portland Streetcar Board will make recommendations to the Metro Council either supporting or amending the Steering Committee Recommendation. The region's MPO body, the Joint Policy Advisory Committee on Transportation will make a LPA decision recommendation to the Metro Council. The Metro Council will then make the final LPA decision. It should be noted that the Steering Committee oversees both the Eastside Transit Alternatives Analysis and the Portland to Lake Oswego Transit and Trail Alternatives Analysis.

Evaluation Summary

Overview

This Evaluation Report summarizes the analysis of transit alternatives for a loop circulator in Portland's Central City (see Figure S-1). The purpose of the Eastside Transit Alternatives Analysis is to develop, evaluate and select a transit alternative that is responsive to community needs and the travel demand in the Central City and which serves as a catalyst for economic development and supports and focuses land use. This analysis was conducted in a manner intended to be consistent with the Federal Transit Administration's (FTA) newly created Small Starts program, current guidance for Alternatives Analysis and the National Environmental Policy Act.

This report provides analysis and information for decision-makers and the public to undertake selection of a Locally Preferred Alternative (LPA). This report does not recommend a LPA for adoption, but presents consistent information on each alternative that allows the reader to determine how well each alternative meets the project's purpose and need and evaluation criteria. Information is presented specific to each evaluation measure and is designed to serve as the basis for selection of a LPA. The report provides information regarding transportation analysis, transit ridership, land use, economic development, capital and operating costs, traffic impacts, conceptual design, and cost effectiveness.

Goals and Objectives

The following goals and objectives have been developed with the Eastside Policy Advisory Committee and Steering Committee and have received public review. The goals may be summarized as a project that will:

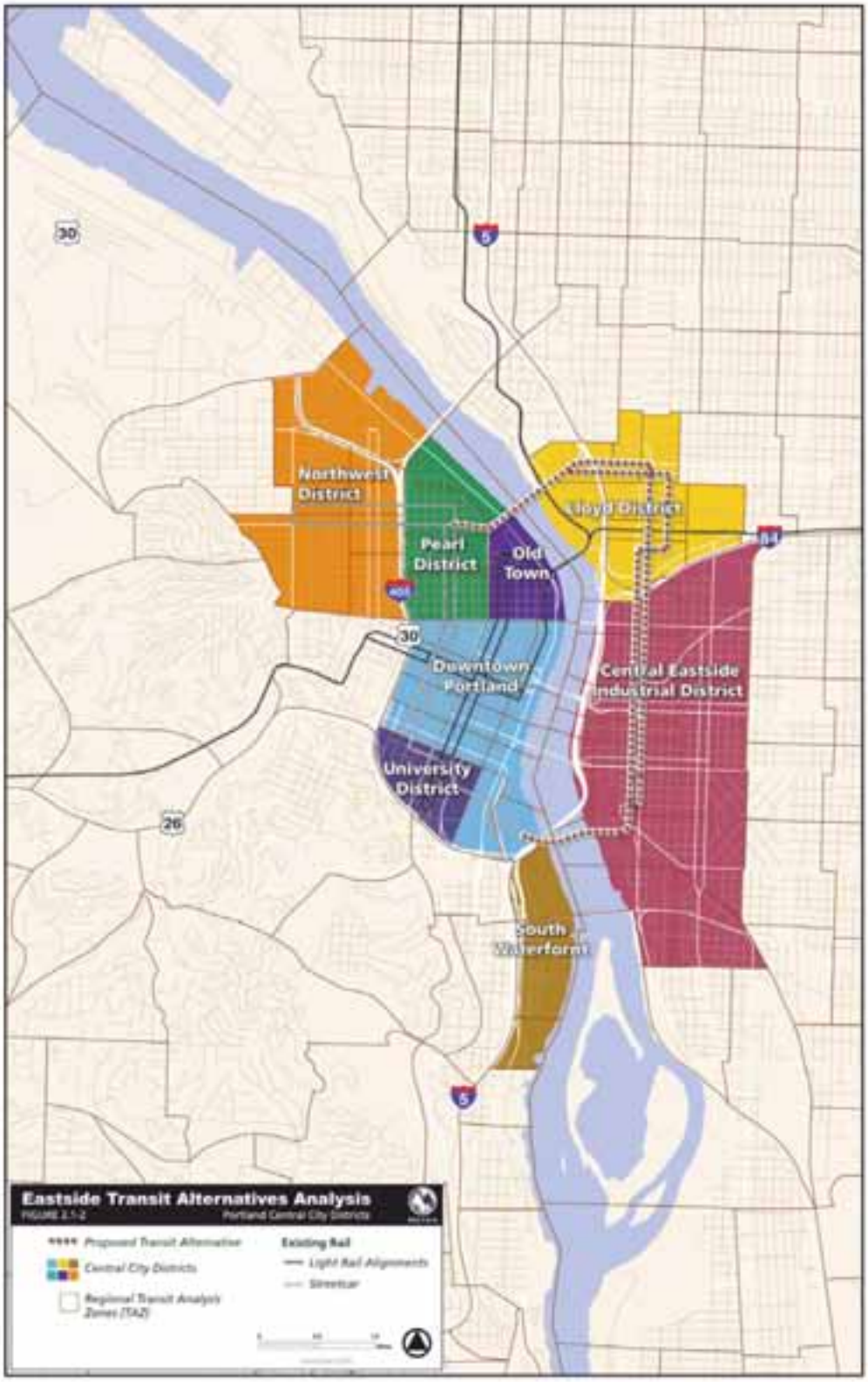
- Reduce reliance on the auto for trips to, from and within the Central City.
- Improve Central City transit circulation, capacity, connectivity and local access that facilitates economic development and promotes the vitality of the Central City, and
- Support existing and future streetcar and light rail investments in the region by expanding the system and increasing ridership in a cost-effective manner.
- Support economic development.
- Support community goals and has strong public acceptance.

For a full discussion of the project's purpose and need, goals and objectives and evaluation measures, please see Chapter 1 of this report.

Central City Development Context

Together, Portland's Central City - Eastside and Westside - is the region's premier mixed use center, serving as a cultural, employment, high density housing center upon which the transit system is centered. Between 1980 and 2000, office space in the Central City increased from about 5.2 million square feet to over 14 million - up 174 percent. During this period Central City employment increased from about 89,000 to 121,000. From 1995 to 2005, there were 6,379 new homes built in the Pearl and Old Town districts - 97 per cent of the City's 2020 target for these districts. The number of households in the Central City is expected to increase by 55 percent between 2005 and 2025. Employment is forecast to increase by 35 percent. The location of new growth is important as households in the Central City generate fewer auto trips, fewer vehicle miles traveled, and more transit and walk trips compared to locations without transit friendly conditions. Many believe that the locally funded streetcar approved in 1997 and opened in 2001

Figure S-1
Central City Districts and Study Area



has been a catalyst for private development - much more than rubber-tired transit. For example, from 1997 to 2005, over $2.28 billion has been invested within two blocks of the streetcar line, representing over 7,200 new residential units and 4.6 million square feet of additional commercial space. Further, over half (55 percent) of all new development within the City's core has been constructed within one block of the streetcar line. In comparison, prior to 1997, land located within one block of the streetcar alignment totaled 19 percent of all development. Central City districts, in addition to providing jobs and housing, also include cultural, entertainment, higher educational institutions and are important destinations. Many in the local business, civic, higher education and government sectors believe that a loop streetcar will tie together the Central City districts into a cohesive core and spark substantial additional growth in housing and jobs beyond the current forecast.

Description of Alternatives

Alternatives include the No Build/Baseline alternative (referred to henceforth as the No-Build Alternative) and a streetcar alternative including a full loop, and minimum operable segments - Oregon Street, Morrison Street and Oregon Museum of Science and Industry (OMSI). In addition, a Two-Way Grand Avenue alignment is included as a design option to the MLK/Grand alignment. All alternatives are analyzed as they would be constructed and operated in 2025. For a detailed discussion of the definition of alternatives, please see Chapter 2 of this report.

The **No-Build** fulfills the role of a Small Starts baseline as it includes incremental service increases in the corridor and serves the same downtown circulation travel market as the Streetcar Alternative. The No-Build provides bus service between RiverPlace, OMSI (via the Hawthorne Bridge), the Central Eastside and Lloyd Districts, connecting to downtown via frequent light rail and bus service at the Rose Quarter Transit Center, as shown in Figure S-2.

The **Streetcar Alternative** consists of the "full loop" alignment, as shown in Figure S-3. The Streetcar Alternative would operate from RiverPlace to PSU to 10^{th} /11^{th} Avenues on the existing Portland Streetcar alignment. It would divert from the existing alignment to cross the Broadway Bridge at 10^{th}/11^{th} and NW Lovejoy. A new alignment would be constructed to connect to the Lloyd District on NE Broadway/Weidler and NE Grand/7^{th} Avenues and would continue south into the Central Eastside via the MLK/Grand couplet and would cross back to RiverPlace via the proposed Milwaukie Light Rail bridge, also known as the Caruthers Bridge. The **Streetcar Alternative** is analyzed using the MLK/Grand couplet alignment. The **Two-way Grand Design Option** could also be used for the Central Eastside segment of the loop, and is presented as an alternative to the MLK/Grand couplet alignment.

The Streetcar Alternative includes three **Minimum Operable Segments**, shown in Figure S-4. Each MOS is a potential terminus for the first phase of streetcar construction. In order to maintain full loop connectivity for purposes of comparison, connecting bus service would link each MOS to OMSI and RiverPlace, connecting with the existing Portland Streetcar via the Hawthorne Bridge. Service concepts for the Streetcar Alternative and the MOSs are presented in Figures S-5 through S-8. The **Oregon MOS** would terminate in the Lloyd District at the Oregon Convention Center and would be compatible with either the MLK/Grand Couplet or the Two-way Grand Design Option. **The Morrison MOS** would terminate at SE Morrison Street and would be feasible with either the MLK/Grand couplet or the Two-way Grand Design Option. **The OMSI MOS** would terminate immediately south of OMSI. A flyover would be constructed over the Union Pacific railroad right of way, and would be feasible with either the MLK/Grand couplet or the Two-way Grand Design Option. Table S-1 summarizes the characteristics of each alternative.

Figure S-2
No-Build Transit Network

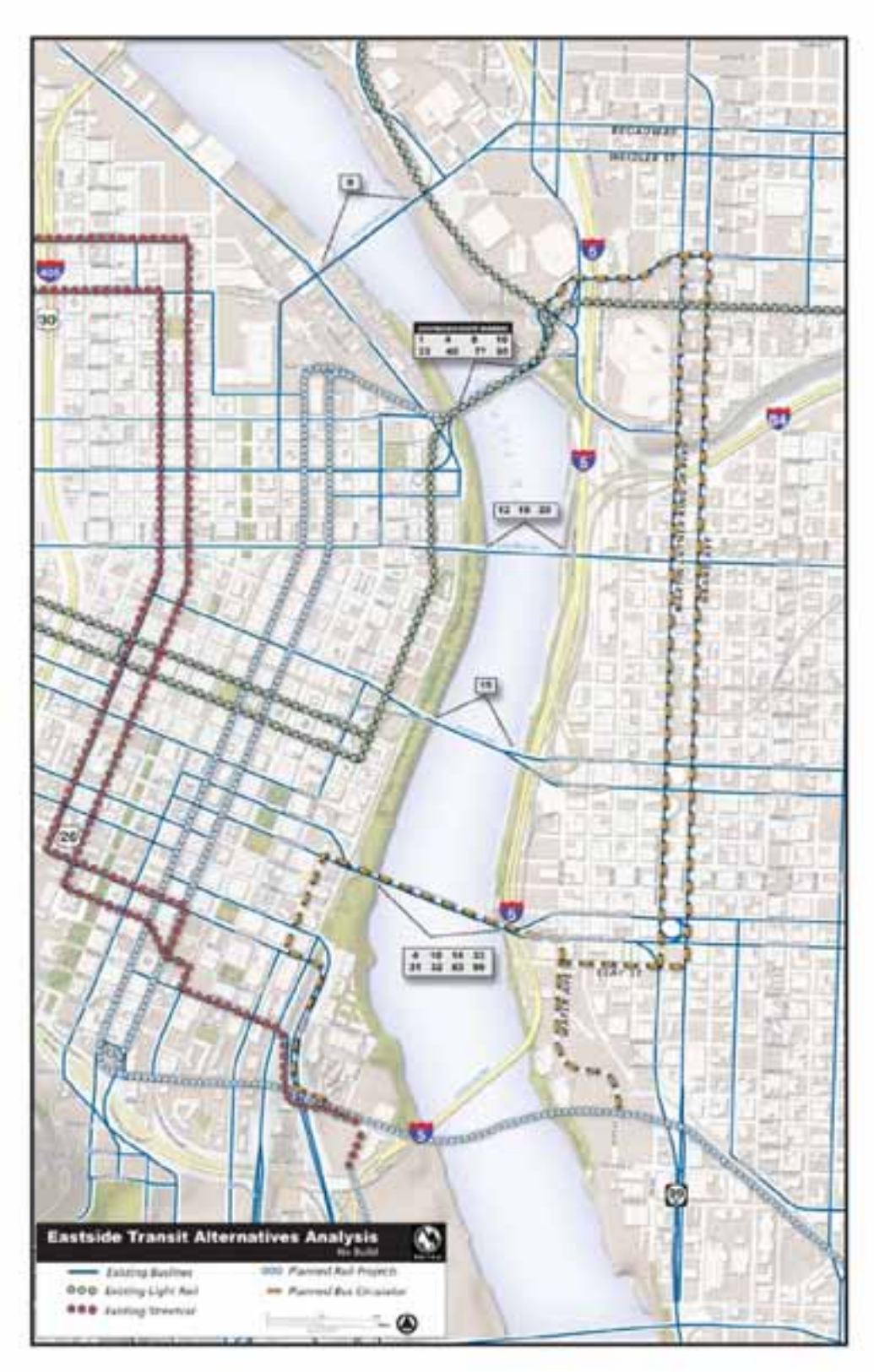


Figure S-3
Streetcar Alternative "Full Loop"

Figure S-4
Streetcar Alternative and MOS

Figure S-5
Streetcar Alternative Service Concept

Figure S-6
OMSI MOS Service Concept

Figure S-7
Morrison MOS Service Concept

Figure S-8
Oregon MOS Service Concept

Table S-1
Summary of Transit Characteristics by Alignment

	No-Build Bus (Line 83)	Full Loop	OMSI MOS	Morrison MOS	Oregon MOS
Streetcar Length (in miles)					
Total One-Way Length[1]		6.0	5.7	4.8	4.0
Existing/Shared Streetcar Length	2.4	2.4	2.4	2.4	2.4
New Streetcar Length	NA	3.6	3.3	2.4	1.6
Bus Connector Length[2]	3.5	NA	1.4	2.3	3.2
Headways (in minutes)					
Shared Streetcar Headways	10-min peak/15-min off peak	5-min peak/7.5 min off-peak	5-min peak/7.5 min off-peak	5-min peak/7.5 min off-peak	5-min peak/7.5 min off-peak
New Streetcar Headways	NA	10-min peak/15-min off-peak	10-min peak/15-min off-peak	10-min peak/15- min off-peak	10-min peak/15- min off-peak
Peak Bus Connector Headways	10-min peak/15-min off-peak	10-min peak/15-min off-peak	10-min peak/15-min off-peak	10-min peak/15- min off-peak	10-min peak/15- min off-peak
Peak Streetcar Vehicle Requirements[3]	NA	12	10	7	6
Bus Connector Transfer Locations	NA	NA	At OMSI and RiverPlace	At SE Morrison St and RiverPlace	At NE Oregon St and RiverPlace
Compatible with the Two-Way Grand Design Option	NA	Yes	Yes	Yes	NA[4]

[1] Estimated one-way length
[2] With the Minimum Operable Segments (MOS), transfer to a bus is required to complete the loop.
[3] This includes the total number of vehicles needed to provide the streetcar service to the Central Eastside as well as additional spare vehicles for maintenance, emergencies, and breakdowns.
[4] The Two-Way Grand Avenue Design Option has been designed so that it could be applied to any of the MOSs with the exception of the Oregon MOS which doesn't extend to the Central Eastside, but does not preclude either two-way Grand Avenue design option or the MLK/Grand couplet alignment extension to the Central Eastside.

Evaluation of Alternatives

The alternatives were evaluated based on how well they performed relative to the project's evaluation measures. The measures and the results of the analysis are summarized below. Detailed discussion of these analyses and results can be found in Chapter 3.

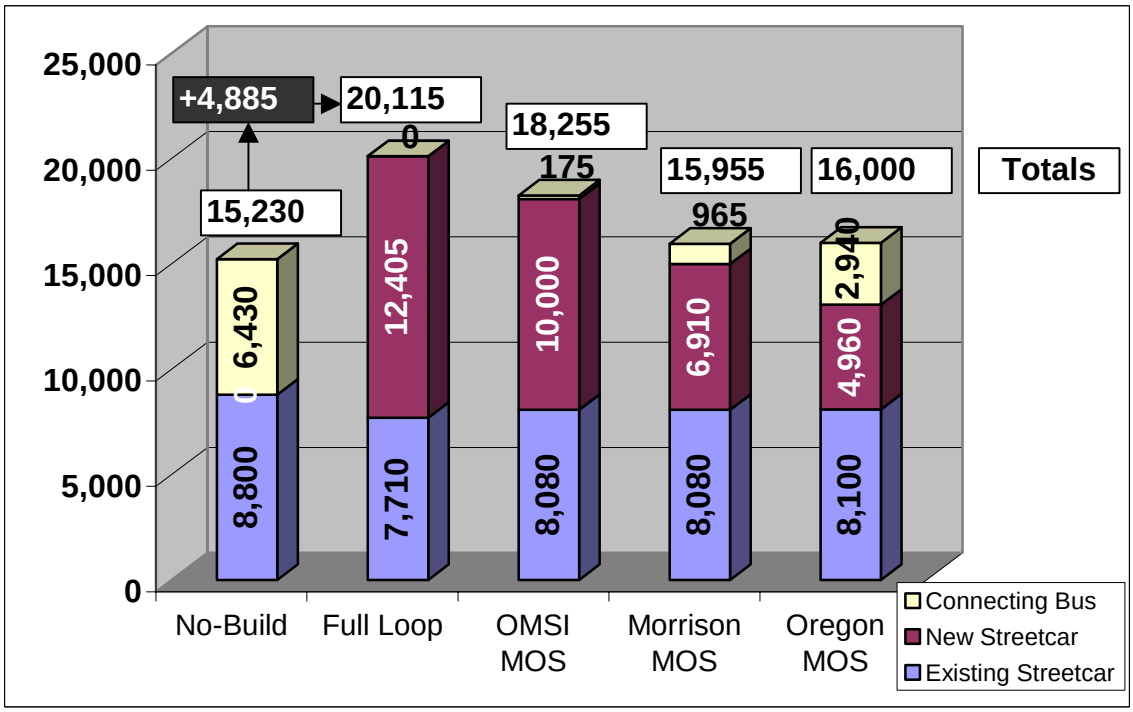
The transportation analysis of the alternatives was done using Metro's travel demand forecasting models. Model results are based on the MLK/Grand couplet alignment through the Central Eastside. Given the constraints of a regional model, travel demand forecasts were not prepared for the Two-way Grand Design Option. Travel times would be similar to the MLK/Grand couplet and the zonal detail, even in downtown and on the eastside, is not fine enough to discern differences between the two alignments. However, traffic assignments were prepared for use in the traffic analysis.

Measure:	**Improve Central City Transit Ridership**
Result:	***Each alternative results in an increase in Streetcar and total transit ridership compared to the 2025 No-Build Alternative, with the Full Loop resulting in the largest increase.***

Each alternative was analyzed with the same underlying transit network. There are no significant differences among the alternatives with regards to which portions of the corridor have walk accessibility to the transit system. Each 2025 alternative has the same transit coverage in terms of households (33,700) and employment (275,000), creating a "level playing field" for the analysis.

Each alternative results in an increase in Streetcar and total transit ridership compared to the 2025 No-Build Alternative. As shown in Figure S-9, all of alternatives result in an increase in bus and streetcar ridership on the key routes in the corridor. Existing streetcar totals refer to ridership on the existing streetcar line between RiverPlace and NW Portland. New streetcar ridership refers to the second line that would operate as the full loop, or which would connect RiverPlace to any of the three MOSs. The bus ridership totals refer to the connecting bus service that would complete the loop for each of the MOSs. The shorter MOS's, Oregon and Morrison, show a slight increase over the No-Build of approximately 700 riders each. The OMSI MOS shows an overall increase of approximately 3,000 bus and streetcar trips and the Full Loop alternative shows the highest increase at 4,885 trips.

Figure S-9
Streetcar and Bus Ridership Average Weekday – Year 2025

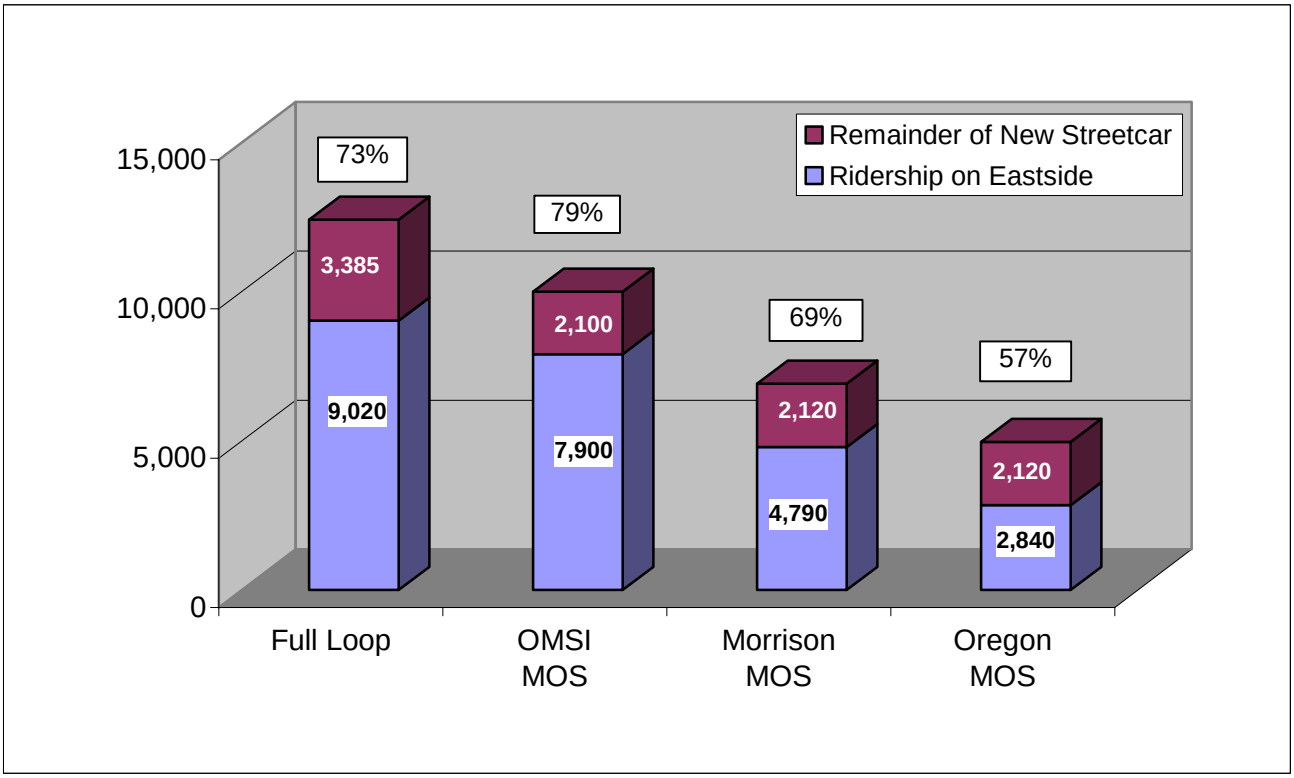


Source: Metro, 2006

Measure:	**Improve Eastside transit ridership**
Results:	***All of the build alternatives have over 50 percent of their ridership and at least some portion of the trip occurring in the Central Eastside.***

Another measure of comparison for alternatives is to assess new ridership within the Eastside. Figure __ below, shows the percentage of ridership on the new streetcar line where some portion of the trip occurs in the Central Eastside (See Figure S-10 for district map).All of the build alternatives have over 50 percent of their ridership and at least some portion of the trip occurring in the Central Eastside. The OMSI MOS and Full Loop alternatives would exhibit the highest percentage of streetcar ridership on the eastside at approximately 75 percent, in part because in both of these alternatives streetcar traverses the entire eastside.

Figure S-10
Percentage of New Streetcar Ridership with Some Portion of Trip in the Central Eastside - Average Weekday, Year 2025



Source: Metro 2006

Measure:	**Improve north/south transit connectivity and capacity through the Central Eastside.**
Result:	***Compared to the No-Build alternative, the Full Loop and OMSI MOS alternatives would improve transit connectivity through the Central Eastside by providing a limited stop, one-seat ride through the eastside. Streetcar alternatives would provide greater transit capacity and would result in more riders per mile of operation.***

This measure focuses on how well each alternative improves transit connectivity and capacity through the Central Eastside. As compared to the No-Build alternative, the Full Loop and OMSI MOS alternatives would improve transit connectivity through the Central Eastside by providing a limited stop, one-seat ride through the eastside. The Morrison MOS and Oregon MOS alternatives perform comparable to the No-Build because, for a majority of trips, a transfer would be required to travel through the Central Eastside.

The streetcar alternatives, because of the greater carrying capacity of the vehicle, would provide more carrying capacity through the Central Eastside at equivalent headways compared to bus transit.

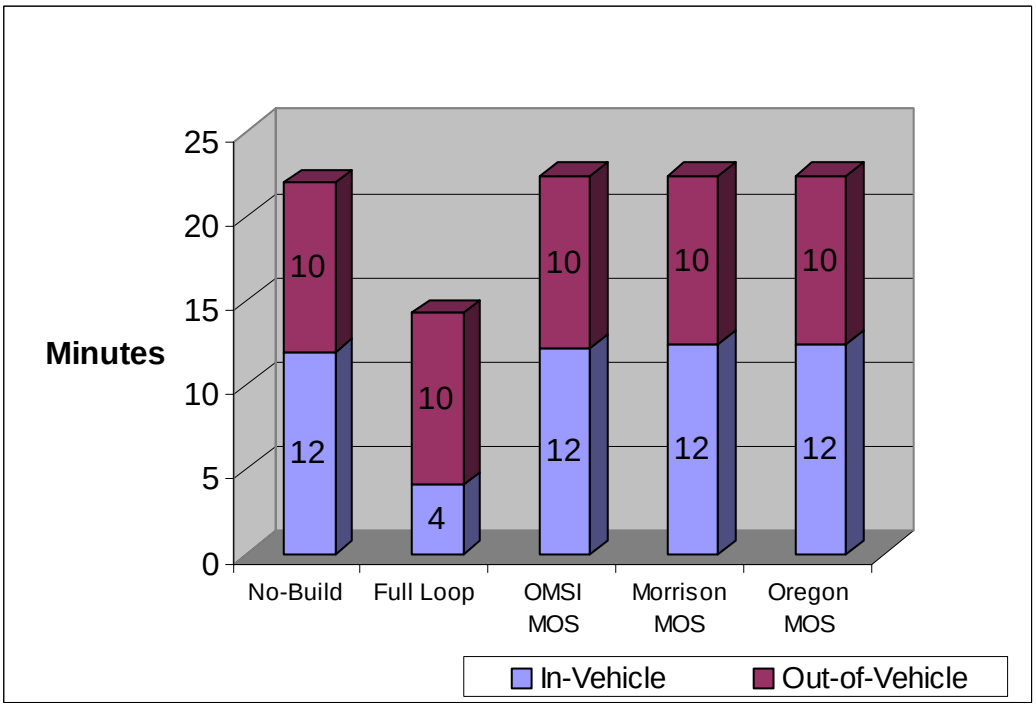
Another example of improved transit circulation and connectivity is an increase in the number of streetcar riders per mile of operation. The Full Loop would result in 2,068 riders per mile,

followed by the OMSI MOS at 1,754, the Morrison MOS at 1,440 and the Oregon MOS at 1,240 riders per mile. The increase in riders per mile indicates that more trips are possible when the streetcar is extended to connect to more destinations.

Measure:	**Serve as a "cross-town" transit line that complements the eastside transit grid.**
Results:	***The introduction of Streetcar service on the eastside would further complement the eastside grid system by dispersing trips across an array of destinations. The Full Loop alternative would have the best overall improvement in total transit travel times to/from and within the corridor compared to the No-Build alternative.***

The Full Loop alternative would have the best overall improvement in total transit travel times to/from and within the corridor compared to the No-Build alternative. The MOS alternatives would have somewhat less improvement, in part because of required transfers along the central eastside for some origin and destination pairs. Figure S-11 shows the advantage of the Caruthers Bridge alignment to make the connection between OMSI and RiverPlace.

Figure S-11
Total Transit Travel Time between OMSI and RiverPlace PM Peak, Year 2025



Source: Metro 2006

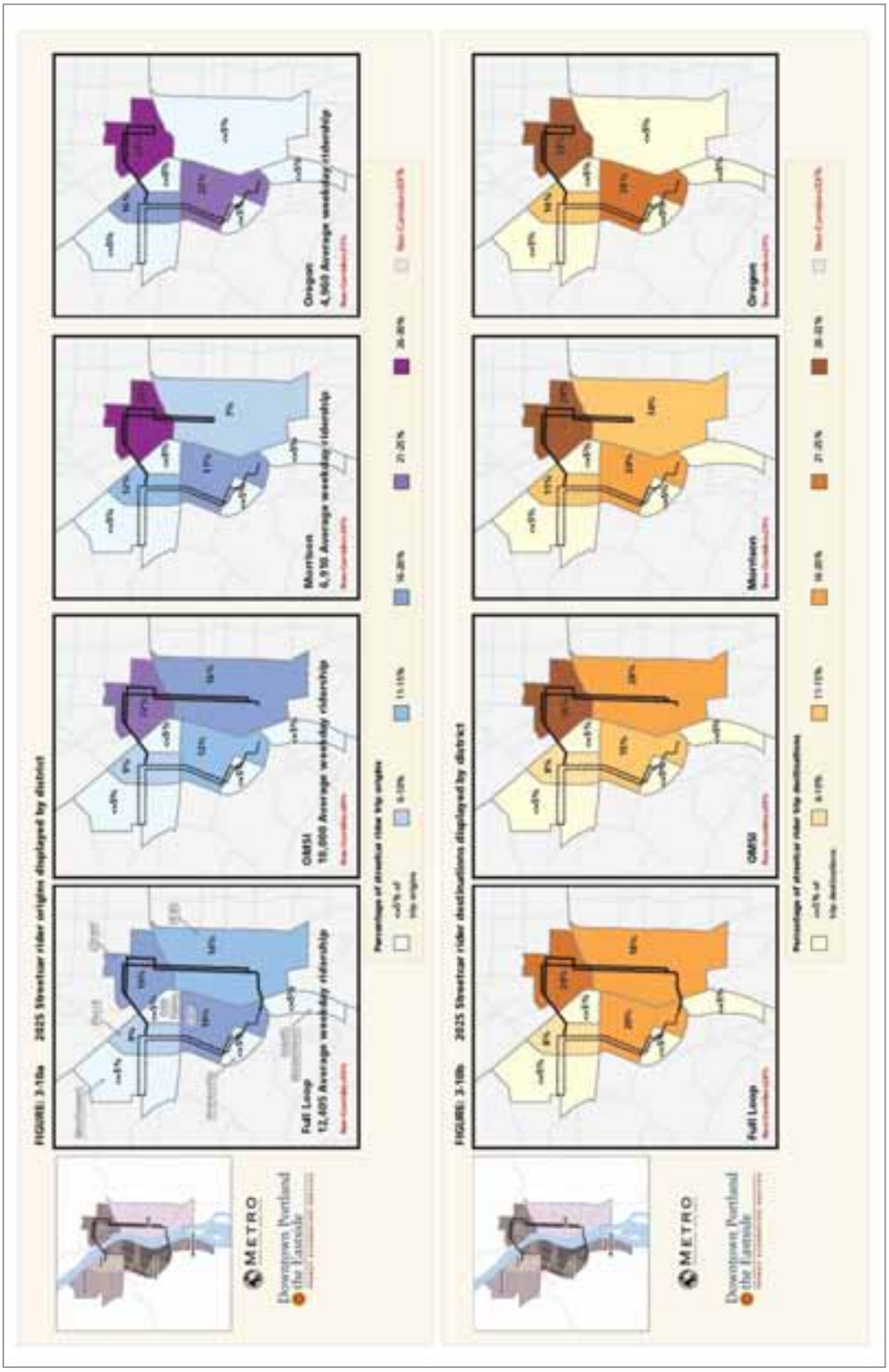
Measure:	**Improve Central City transit circulation**
Result:	***The full loop Streetcar Alternative, and to a lesser degree the MOSs, meet the project's goal of creating a Central City circulator transit project that distributes trips throughout the districts it serves.***

A key measure of the success of the proposed alternatives is whether they improve transit circulation within the Central City by connecting destinations such as Portland's Central Business District (CBD), RiverPlace, the Central Eastside, the Lloyd, University, and Pearl Districts, and to non-corridor locations. Analysis shows that all alternatives meet the project's goal of creating a Central City circulator transit project that distributes trips throughout the districts it serves.

Figure S-12 displays an array of graphics that represent the distribution (calculated as a percentage) of new streetcar trip origins and destinations by district for each alternative. The Full Loop alternative has a more balanced distribution pattern of origins and destinations across the study area districts. Although each district is generating a slightly lower percentage of origins and destinations, as compared to the MOS alternatives, the Full Loop alternative is serving more districts. Specifically, downtown Portland, the Lloyd, Central Eastside, and Pearl Districts show up as major origin and destinations in the Full Loop alternative, indicating a relatively equal distributions of trips in the study area. In contrast, the Oregon MOS alternative, which provides streetcar only as far as the Lloyd District, has the opposite pattern of origins and destinations. The spatial pattern reflects a more concentrated distribution of origins and destinations, with a slightly higher percentage of origins

Non-corridor districts, or districts outside the study area, account for a large percentage of both origins and destinations in all of the alternatives, showing that the streetcar would integrate with a variety of transit trips and perform as an element of the total transit system to provide central city circulation. Approximately 1/3 of the non-corridor origins and destinations involve a district (SE Portland) just outside and adjacent to the corridor. In fact, over 2/3 of the non-corridor origins and destinations involve Multnomah County.

Figure S-12
2025 Streetcar Rider Origins and Destinations by District



Source: Metro 2006

Measure: **Serve important visitor destinations including Downtown, Rose Garden, Coliseum, Oregon Convention Center, Lloyd Mall and OMSI with a clearly identifiable fixed route transit service.**

Results: ***All of the build alternatives provide improved connections between visitor destinations.***

Linking visitor attractions and hotels with an easily identifiable fixed-route transit service would attract both local and out-of-state visitors increasing transit ridership, and increasing Portland's overall attractiveness. However, Metro's regional model does not currently account for such visitor trips. Consequently, a potentially substantial market is unaccounted for in the current analysis. To address the visitor market, a special-purpose non-resident model would need to be developed based on locally obtained survey data.

Measure: **Appraisal of identifiability of transit alternatives.**

Results: ***The presence of streetcar stops, rails and catenary would make streetcar relatively more easily identifiable than standard fixed route bus service, which lacks permanent guideway improvements.***

The presence of streetcar stops, rails and catenary would make streetcar relatively more easily identifiable than standard fixed route bus service, which lacks permanent guideway improvements. The longer the MOS, the more identifiable an alternative was determined to be.

Measure: **Reduce demand for parking.**

Results: ***All of the build alternatives would result in reduced parking demand compared to the No-Build, because more internal transit trips within the corridor are accommodated on transit.***

All of the build alternatives would result in reduced parking demand because more internal transit trips within the corridor are accommodated on transit, ranging from 700 to 300 more transit trips, as compared to the No-Build alternative.

Land Use and Development Policy and Results

The land use policy framework for the Eastside Transit Alternatives Analysis is focused on the Central City, and includes state, regional and local plans and policies. The evaluation of land use and development policies includes a determination of the project's consistency with plans and policies and also evaluates the effect that these plans and policies have had in creating a transit supportive environment in the Central City.

The state, regional and local levels of government work together to create the land use and policy framework for this project and the Central City. Regional and local plans must be prepared consistent with Oregon's Statewide Planning Goals. Both the *Central City Plan* and the *2040 Growth Concept*, as part of the *Regional Framework Plan*, have been acknowledged by the Oregon Land Conservation and Development Commission as consistent with the Statewide Planning Goals.

Measure:	**Consistency with state, regional and local land use plans and policies.**
Results:	***All of the alternatives would be consistent with state, local and regional land use plans and policies in effect in the Central City. The Full Loop would go the farthest toward implementing specific policies regarding a Central City transit circulator and fostering transit supportive development.***

The regional plan, the 2040 Growth Concept supports and encourages the growth and development of the Central City, including the Eastside, as "the largest market area, the region's employment and cultural hub." As shown in Table S-2, the Eastside Transit Project (bus or streetcar), by providing a transit circulator that helps connect the districts of the Central City, is consistent with the 2040 Growth Concept and the Central City Plan.

Table S-2
Land Use Plans and Policies Summary

	Statewide Planning Goals	Region 2040 and Regional Framework Plan	Central City Plan and CCTMP*
Transit Friendly Policies	Yes	Yes	Yes
Demonstrated Results	Compact urban form	Transit ridership greater than population or VMT growth	Greater mode share in Central City with its use of mixes, density and available transit
Project Consistent with Plans/Policies			
Bus	Yes	Yes	Yes
Streetcar	Yes, but likely to foster more development	Yes, but likely to foster more development	Yes, but likely to foster more development

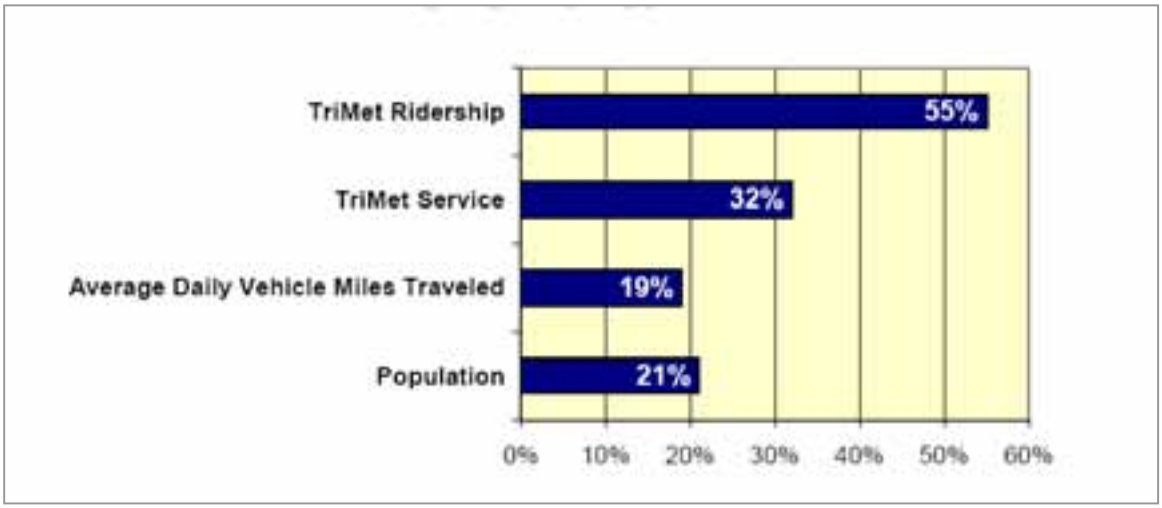
**Central City Transportation Management Plan, City of Portland*

Measure:	**Land use plans and policies have demonstrated results that create a transit friendly environment for the project.**
Results:	***The region's compact urban form, land use mix, short average trip lengths and the presence of viable alternatives to the single occupant vehicle are directly attributable to the region's land use and transportation plans and policies. These have resulted in transit trips, including bus, streetcar and light rail, that have grown substantially more than vehicle miles traveled, a trend that is unusual compared to the rest of the country. Residents of the Central City, with it's high level of transit service and density and mix of uses, make fewer auto trips, own fewer cars, and use transit more than their counterparts in other parts of the region.***

Based on the Portland region's growth in transit ridership, relatively low rate of vehicle miles traveled per capita and despite only moderate density, it can be concluded that the Portland region has been successful in providing transit that is well used and providing urban form and land use conducive to transit use. The tools that have been used include longstanding land use plans and policies, which have many, if not most of the elements considered necessary for transit friendliness. Further, as the Central City, including the Eastside Corridor is planned for the most dense and intense land uses and activities in the region, with corresponding policies, regulations and incentives, the Eastside corridor is also concluded to be transit friendly. Land use plans and policies that apply to the region, the central city, and the Eastside have a good track record of transit friendliness. Either a bus or streetcar would benefit from and reinforce these transit friendly plans and policies.

Transit trips, including bus, streetcar and light rail, have grown substantially more than vehicle miles traveled in the region (see Figure S-13). This trend is largely attributable to the region's compact urban form, land use mix and form, short average trip lengths and the presence of viable alternatives to the single occupant vehicle.

Figure S-13
Comparison of Population, Vehicle Miles Traveled and Transit Service and Ridership 1993 - 2003



Source: TriMet., 2006

Table S-3 below shows that a transit supportive land use pattern and good levels of transit service result in higher transit mode split, fewer vehicle miles traveled per capita and reduced auto ownership when compared to areas of the region that lack such attributes. The Central City as a whole has the region's highest levels of transit service, and greatest residential and employment densities due to the implementation of state, regional, and local land use policies. These policies and their resulting development pattern result in auto trips "not taken" by residents of the Central City compared to other parts of the region.

Table S-3
Transportation Mode Share by Transit and Land Use Characteristics

	Mode Share					Vehicle Miles per capita	Auto ownership per household
Land Use Type	**% Auto**	**% Walk**	**% Transit**	**% Bike**	**% Other**		
Good Transit/Mixed Use	58.1%	27.0%	11. 5%	1.9%	1.5%	9.80	0.93
Good Transit Only	74.4%	15.2%	7.9%	1.4%	1.1%	13.28	1.50
Remainder of Multnomah County	81.5%	9.7%	3.5%	1.6%	3.7%	17.34	1.74
Remainder of Region	87.3%	6.1%	1.2%	0.8%	4.6%	21.79	1.93

Source: Metro 1994 Travel Survey

Looking at the Portland region and comparing its density and vehicle miles per capita, we find that in a comparison with metropolitan areas from throughout the country, the Portland region has medium density, but much lower daily vehicle miles traveled per capita. In fact, the Portland region has comparable daily vehicle miles traveled per capita to such transit intensive cities as San Francisco and Chicago. Further, when looking at the Portland region's transit mode share, it meets or exceeds that of many much larger cities. In addition, Portland has been ranked as on the five best cities for walking - which again reinforces the notion that a pedestrian and transit friendly environment has been established relative to other parts of the country.

Economic Development Policy and Results

The existing Portland Streetcar line demonstrates the impact of transit on development. This can be illustrated by the response of the private sector development community to announced plans to build a streetcar line in downtown Portland. In 1997, the City of Portland gave final approval to Portland Streetcar Inc., to proceed with construction and operation of streetcar service in downtown Portland. July 2001, streetcar operation commenced.

Measure:	**Economic development policies and the private sector support the proposed transit investment.**
Results:	***Based on the experience of the Portland Streetcar, the private sector is willing to develop at a higher density along a streetcar line as evidenced by signed developer agreements to build to higher floor area ratios contingent on the presence of the streetcar. After 1997, those areas within one block of the streetcar experienced much greater development than areas two, three or more blocks from the alignment.***

A significant part of the economic development framework of the initial Portland Streetcar segments involved development agreements. These agreements were contracts between the public and private sector stipulating that if the public sector provided certain investments, particularly streetcar construction and operation, the private sector would agree to higher development densities and intensity. In addition, a local improvement district was formed to contribute to the construction of the streetcar.

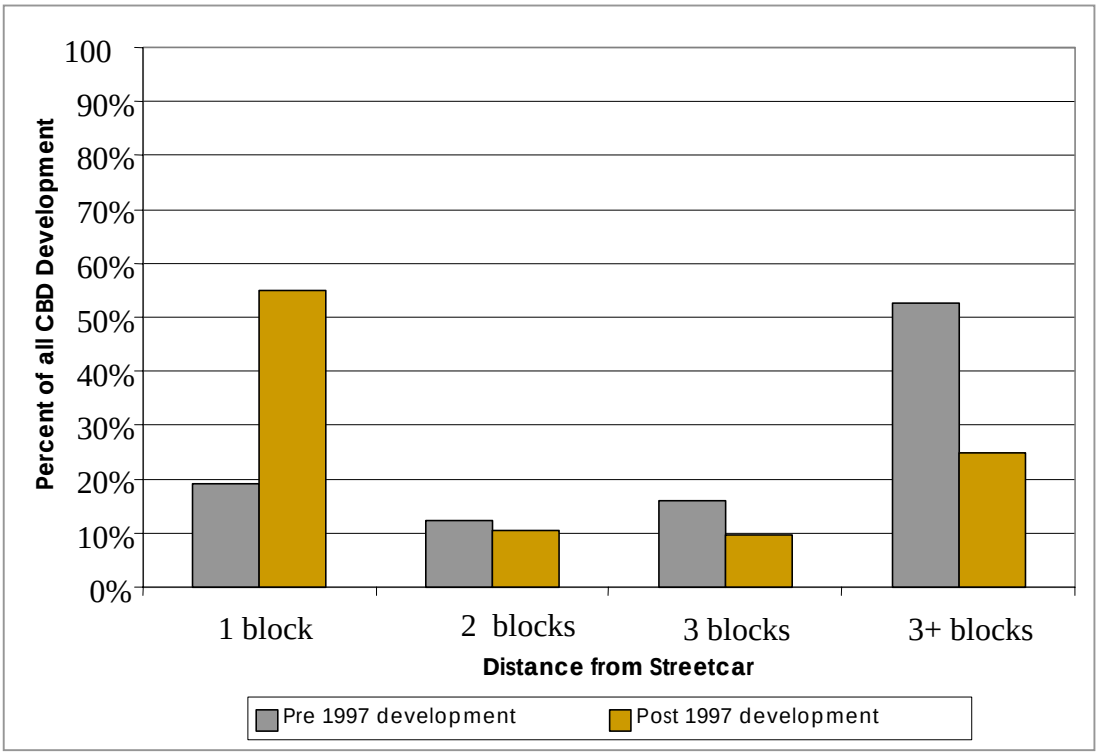
In a study by E. D. Hovee Inc, it was found that the development occurring after 1997 in close proximity to the streetcar line was at a higher density than prior to 1997. Actual floor area ratio (FAR) built since 1997 was compared with potential FAR (one measure of the maximum allowed density or intensity of development). Hovee found that those areas within one block of the streetcar experienced much greater development than areas two, three and three and more blocks from the streetcar. Specifically, since the commitment to streetcar service was made, lands within one block of the streetcar were built to within 90 percent of allowed density (FAR), while lands within two blocks only built to a little over 70 percent and areas three blocks distant built to a little over 60 percent of allowed density, as shown in Figure S-14.

Figure S-14
Development Potential Achieved - Block by Block
(Before 1997 Streetcar Decision and 1997-2004)

Source: Portland Streetcar Development Impacts, E.D. Hovee, 2005

Streetcar influence is also demonstrated when the amount of development within one block of the streetcar as a percent of total central business district (CBD) development is compared with the percent of total CBD development in blocks two, three and more distant, as shown in Figure S-15 below.

Figure S-15
Development Potential Achieved
Percent of All Central Business District Development
(Before 1997 Streetcar Decision and 1997-2004)



Source: Portland Streetcar Development Impacts, E.D. Hovee, 2005

In addition to the economic policies and plans in place in the Central City that have resulted in today's healthy economy, it is important to look to the future to assess what trends will be shaping the Central City and the districts served by the Eastside project. A recent study has shown that the Portland region has experienced growth in the 25 to 34 year-old population in excess of the region's overall population growth trend. Further, the type of 25 to 34 year-old moving to the Portland region tends to be those that are college educated. In addition, the locations that this 25 to 34 year-old population tends to locate is closer to the Portland central business district (defined as within three miles of the city center.) This study argues that successful economic development must address the 25 to 34 college educated population and that this population is attracted to close-in neighborhoods. It further demonstrates that close-in neighborhoods in Portland have been successful in attracting this population compared with most other cities in the US. Based on this assessment, Portland is well positioned to attract this key demographic to the Central City in the future.

Measure:	**Economic development potential in the Lloyd District and Central Eastside**
Results:	***Based on the experience of the Portland Streetcar and application of that experience to the Eastside project through analysis of existing zoning, floor area ratios, redevelopment potential and other factors, substantially more housing and mixed use development could occur on the eastside with the Full Loop Streetcar or MOSs than with the No-Build, commensurate with the length of the project.***

The demonstrated response of the development community to the streetcar in Downtown and the Pearl District can be used to draw some conclusions regarding the Eastside project. E.D. Hovee developed projections for development that could occur in the Lloyd District and Central Eastside if a streetcar project were built. The percent of maximum floor area ratio (FAR) was used to assess what might occur on the Eastside. Given the existing zoning, an additional 3,432 housing units could be expected between 2005 and 2025 if a the OMSI MOS or Full Loop projects were built. The shorter MOSs would result in fewer additional housing units.

Employment is more difficult to project using this method and there were no significant differences found in the existing projections from the maximum FAR method. It should be noted that in discussions with the City of Portland Planning Bureau, it appears as though some adjustments to the 2025 South Corridor projections of housing should occur. However, the basic point of strong streetcar influence will still be shown and further work to revise and adjust this comparison will be completed soon.

There is a great deal of information that has been presented about transit and its value to economic development as well as the economic development climate in the Eastside. It can be concluded that when comparing the economic development benefits of bus service (No-Build) with a streetcar, that:

- The Eastside has relatively high value land, though it also has a significant amount of undervalued properties with buildings not reflecting the underlying land value;
- The Eastside has proposed numerous economic development projects which would benefit from transit and especially a streetcar because of the streetcars' demonstrated higher attraction of riders and greater passenger capacity.
- A streetcar is likely to spark substantially more economic development - perhaps on the order of 4 times, or 3,400 more housing units than a bus (No-Build).
- This larger public investment in a streetcar would likely result in greater private investments in the Eastside than would occur with the provision of bus service.
- The larger private investment in development in the Eastside consistent with a streetcar would likely result in a larger tax base than would result with the provision of bus service.

2009 and 2025 PM Peak Hour Traffic and Streetcar Operations

The traffic analysis used the Financially Constrained 2025 RTP network for future demand and to determine future traffic volumes for the 2009 and 2025 PM peak hour traffic analysis. The traffic analysis focused on the traffic conditions and how they would affect streetcar operations, and how streetcar operations would impact traffic.

For the purpose of this analysis, the OMSI MOS streetcar alignment was chosen as a representative alignment to assess traffic impacts for the streetcar alternative. The Full Loop and OMSI MOS traffic impacts would be identical, as no additional mixed traffic operations would be required to complete the loop over the Caruthers Bridge. The analysis evaluated streetcar operations through the Lloyd District and the Central Eastside districts.

The proposed Eastside Streetcar route would operate in mixed traffic on existing streets within the corridor. During the PM Peak periods traffic congestion is relatively heavy along this corridor, which would in turn impact streetcar operations. The Streetcar operations are dependent on the following conditions:

- General traffic flow of the roadway system the streetcar is operating in, and
- Key locations where the streetcar requires signalization changes or other exclusive provisions to integrate with the general traffic flow.

Future 2009 (opening year) and 2025 PM peak hour traffic analyses were conducted at 51 intersections along the SE MLK Jr. Boulevard/SE Grand Avenue couplet and the NE Broadway/NE Weidler couplet. For the year 2009 PM peak hour traffic operations, four intersections along the proposed route are anticipated to operate at an intersection level of service (LOS) E to F, and/or a volume to capacity Ratio (V/C) greater than 1.00. For the year 2025 PM peak hour traffic operations, 17 intersections along the proposed route are anticipated to operate at a LOS E to F, and/or a V/C greater than 1.00.

Future PM peak hour traffic conditions may have some impact on streetcar operations due to congestion along this corridor. Six of the intersections would be impacted by Streetcar operations, where general traffic is stopped for the streetcar to turn into mixed traffic through either a new traffic signal or the addition of a new phase to the existing traffic signal. These changes would not significantly alter the existing signal timing and progression of traffic along these roadways.

The streetcar operations would impact the following intersections:

- NW 11th Avenue/NW Lovejoy Street
- NW Lovejoy Street/NW Broadway Bridge
- NE Weidler Street/NE 7th Avenue
- NE Grand Avenue/NE Broadway Street
- SE MLK Jr. Boulevard/SE Harrison Street
- SE Grand Avenue/SE Harrison Street

Changes to the Transportation Network for the Proposed Streetcar Alignment

As part of the proposed Streetcar alignment, several signal and roadway changes are proposed to successfully integrate Streetcar into mixed traffic. Changes would include special signal phases, queue jumps, roadway widening, and striping and lane changes. These changes were incorporated into the traffic analysis for Streetcar to OMSI and are summarized in this section. Any of the MOS Alternatives would have the same improvements up to the respective terminus locations.

Table S-4 summarizes the changes to the transportation system for the proposed Streetcar alignment.

Table S-4
Summary of Proposed Signal and Roadway Improvements

Location	Traffic Signal Improvements			Roadway Improvements	
	Transit Phase	Queue Jump	New Signal[1]	New Striping	Widen/New Roadway
NW 11th Avenue at NW Lovejoy Street	X		X		
NW Lovejoy Street at the NW Broadway Bridge	X				
NW Lovejoy Street at the NW Broadway Bridge	X				
NE Broadway Street				X	X
NE Broadway Street at N Williams Street			X		
NE Weidler Street					X
NE Weidler Street at N Williams Street			X		
NE Weidler Street at NE Wheeler Street			X[2]		
NE Broadway Street at NE 2nd Avenue			X[2]		
NE Weidler Street at NE 2nd Avenue			X[2]		
NE Weidler Street at NE 7th Avenue	X				
NE 7th Avenue and NE Halsey Street			X		
NE Grand Avenue and NE Broadway Street	X				
NE MLK Jr. Boulevard				X	
NE MLK Jr. Boulevard at NE Couch Street		X			
NE MLK Jr. Boulevard				X	
NE MLK Jr. Boulevard and NE Davis Street			X		
SE MLK Jr. Boulevard at SE Morrison Street			X[2]		
SE MLK Jr. Boulevard at SE Belmont Street			X[2]		
SE MLK Jr. Boulevard at SE Pine Street			X[2]		
SE Grand Avenue at SE Pine Street			X[2]		
SE MLK Jr. Boulevard under the Hawthorne overpass			X[2]		
SE MLK Jr. Boulevard and SE Clay Street		X			
SE MLK Jr. Boulevard and Streetcar flyover			X		
New Streetcar Flyover					X
SE MLK Jr. Boulevard and SE Harrison Street	X		X		
SE Grand Avenue and SE Harrison Street	X		X		

Note: this table does not include physical modifications to existing traffic signals.
[1] Identifies locations where a traffic signal does not exist today or in the future. This does not include locations where there is a traffic signal but needs to be replaced due to modifications to operations.
[2] New Pedestrian Traffic Signal

Design Considerations

Further investigation into potential improvements to move the streetcar through the corridor faster and more reliably as well as ways to improve the pedestrian environment should be conducted during the next phase of this study. Based on community support, engineering judgment, and the 2009 and 2025 traffic analysis, the following design considerations to study further during the next phase include, but are not limited to streetcar operations and pedestrian access, as described below.

Streetcar Operations:

Heavy traffic volumes, queues and delays along the corridor could potentially impact the operations of the streetcar. Table S-5 identifies potential areas of concern or issues to be considered further.

Pedestrian Access

The proposed streetcar includes various pedestrian improvements to make the pedestrian access to the streetcar stations safer and more comfortable. However, there are still other pedestrian improvements that could be implemented to improve the pedestrian environment in the corridor. Current plans in the corridor will help with the pedestrian environment and additional considerations could be made to improve on the pedestrian access and safety along the Broadway/Weidler and MLK Jr./Grand couplets. Some potential solutions to be considered include:

- Adding curb extensions to reduce the crossing distance across the wide arterial streets.
- Plant additional street trees.
- Consolidate or reduce the width of excessive driveways, to minimize the number of disruptions to the through zone of the sidewalk.
- Construct ADA-compliant curb ramps, especially where none currently exist.
- Improve the conditions of the sidewalk along MLK beneath the Morrison and Hawthorne bridges. Currently, the area behind the sidewalk is fenced off and used as storage, leaving a narrow space between the fence and the bridge structure. The sidewalk could potentially be widened by moving the fence four feet and adding lighting could improve the pedestrian environment.
- Consider installing additional traffic signals to allow for more pedestrian crossing opportunities and potentially slowing traffic down.
- Create a plan for improvements along SE MLK Jr. Boulevard and SE Grand Avenue that integrates streetscape, street design, transit access, and redevelopment opportunities.

Table S-5
Summary of the Design Considerations for Streetcar Operations

Location	Design Considerations to Study Further
Streetcar Operations	
Northwest Connection	Improve the connection between the Broadway Bridge and Northwest Portland
NW Lovejoy Street	Identify the feasibility of re-striping NW Lovejoy Street as two eastbound lanes east of 10th Avenue to improve streetcar operations
NW Lovejoy Street Ramp and the Broadway Bridge	Identify ways to improve the operations at this intersection, such as: ▪ Compare a Lead or Lag signal phase for the streetcar ▪ Identify the cost and feasibility of operating the streetcar in the left lanes on the NW Lovejoy Ramp ▪ Identify the feasibility of an alternative that would use NW Hoyt Street to NW Broadway Street to access the Broadway Bridge
NE Broadway/Weidler Streets Couplet	Identify the feasibility of operating streetcar in the right lanes on NE Broadway Street and NE Weidler Street
NE Broadway Street at N Williams Avenue	Identify potential right of way impacts at NE Williams Street may occur by shifting lanes to add a left turn lane at N Vancouver Avenue to reduce traffic conflicts with the streetcar
NE Broadway Street at N Vancouver Avenue	Identify ways to reduce traffic conflicts with streetcar, such as: ▪ Shifting the four travel lanes on NE Broadway Street to the north to add a left turn lane to N Vancouver Avenue, as designed in this Alternatives Analysis ▪ Shifting the existing lanes to the north to provide a left turn only lane from NE Broadway Street to N Vancouver Avenue and restripe the left/through lane to a left turn only lane. Streetcar would shift from the left lane to the third lane
NE Grand Avenue at NE Broadway Street	Consider special detection and signal timing plans for the streetcar to clear out the westbound queues on NE Broadway east of NE MLK Jr. Boulevard to improve streetcar operations
NE Grand Avenue between NE Multnomah/NE Holladay Street and NE Broadway Street	Identify the feasibility of restriping the right lane to a right turn/streetcar only lane on NE Grand Avenue between NE Multnomah Street (or NE Holladay Street) and NE Weidler Street to improve streetcar operations
NE Broadway Street at NE MLK Jr. Boulevard	Identify ways to reduce traffic conflicts with streetcar, such as: ▪ Remove on-street parking on NE Broadway between NE Grand Avenue and NE MLK Jr. Boulevard to provide a new auto left turn lane, as designed in this Alternatives Analysis ▪ Restripe the existing left/through lane to provide a left turn only lane on NE Broadway Street to NE MLK Jr. Boulevard and streetcar would operate in the second lane with through traffic on NE Broadway Street
NE 7th Avenue Transit Station Platforms	Consider locating the streetcar station platforms near side/center of the street to reduce conflicts with bikes

Table S-5
Summary of the Design Considerations for Streetcar Operations (Continued)

Location	Design Considerations to Study Further
NE MLK Jr. Boulevard between NE Couch Street and NE Oregon Street	Identify ways to improve streetcar speed and reliability due to increase in congestion, such as: ▪ Restripe to create a streetcar only lane between NE Lloyd Boulevard and NE Couch ▪ Extend the streetcar only lane north of NE Lloyd Boulevard to NE Oregon Street adjacent to the Oregon Convention Center ▪ Consider potential special timing plans for NE MLK Jr. Boulevard that extend the green time at NE Lloyd Boulevard to clear the queues from the intersection, and reduce the southbound green time at NE Oregon Street when traffic is queued on NE MLK Jr. Boulevard
NE Grand Avenue at NE Everett Street/I-84 eastbound on-ramp	Consider constructing a right turn lane on NE Grand Avenue to the I-84 on-ramp to reduce the traffic conflict between the streetcar and access to I-84
SE Grand Avenue at E Burnside Street	Consider providing a right turn only lane on SE Grand Avenue to E Burnside Street to reduce the traffic conflict between the streetcar and right turns to E Burnside Street
MLK Jr. Boulevard at E Burnside Street	Consider providing one westbound lane on E Burnside and providing a right turn only lane on MLK Jr. Boulevard to E Burnside Street to allow two options for vehicles to turn for the Burnside Bridge and reduce congestion along MLK Jr. Boulevard
SE MLK Jr. Boulevard at SE Clay and Hawthorne Streets	Evaluate the traffic and streetcar operations of the pedestrian signal and queue jump at this location
SE MLK Jr. Boulevard and SE Grand Avenue at SE Harrison Street	Identify ways to improve the streetcar connection across SE MLK Jr. Boulevard and SE Grand Avenue to OMSI, such as: ▪ Add new traffic signals at SE Harrison Street and SE MLK Jr. Boulevard and SE Grand Avenue, as included in the design in this Alternatives Analysis ▪ Due to lane configurations on SE MLK Jr. Boulevard at this location, consider other locations to cross SE MLK Jr. Boulevard such as using SE Division Street to SE Market Street
Streetcar Only Bridge/Connection at the NE Grand/MLK Viaduct	Confirm the grades/alignment needed for the connection of the streetcar bridge over the railroad tracks to OMSI and coordinated with the ongoing SE MLK/Grand Viaduct Project
MLK Jr. Boulevard/Grand Avenue Couplet	Identify the feasibility of operating streetcar in the left lanes on NE Broadway Street and NE Weidler Street to reduce the cost and conflict with moving the existing water pipe
Traffic Signals	In addition to providing a separate phase, consider special traffic signal timing plans and detection to clear the traffic queues for streetcar operations

Two Way Grand Design Option

The Two-Way Grand Design Option was developed as an alternative to the MLK Boulevard/Grand Avenue couplet to address transfer connection to radial bus lines and to improve the pedestrian environment. With the Two-way Grand Avenue alignment, Grand Avenue would be converted to a two-way street. Streetcar would operate in both directions in the travel lanes with traffic. The proposed streetcar alignment would remain the same north of E Burnside Street. Southbound streetcar would turn northbound on E Burnside and southbound on SE Grand Avenue. Both northbound and southbound streetcar would operate on SE Grand Avenue. SE 7th Avenue would provide for the northbound function to replace SE Grand Avenue.

This design option would require that the lane configuration and signals be modified. A southbound lane would be introduced to Grand Ave. The number of lanes northbound on Grand would be reduced. This would require re-routing vehicle traffic from the Grand Ave Viaduct to SE 7th Avenue through the Central Eastside to one-way northbound to accommodate increased traffic volumes and serve as the couplet to MLK Blvd. Traffic would be re-routed from the Grand Ave Viaduct at SE Mill Street and back to Grand somewhere between NE Couch and NE Everett before the I-84 overpass. This conversion would require removal and relocation of one or both bike lanes on SE 7th Ave.

The Two-Way Grand Design Option would require more extensive roadway improvements to SE 7th Avenue to carry northbound auto trips diverted from SE Grand Avenue. Transitions to and from SE Grand Avenue would be required at SE Stephens Street on the southern end and NE Couch Street on the northern end of the alignment. Additionally, roadway improvements would be needed to change NE Grand Avenue from one-way traffic operation to two-way traffic operation.

The Two-Way Grand Avenue Design Option has been designed so that it could be applied to any of the MOSs with the exception of the Oregon MOS which doesn't extend to the Central Eastside, and does not preclude either two-way Grand Avenue design option or the MLK/Grand couplet alignment extension to the Central Eastside.

This design option would change both the function and classification of SE Grand Avenue and SE 7th Avenue. This would likely require an amendment to the City of Portland *Transportation System Plan* (TSP) and Metro's *Regional Transportation Plan* (RTP) street classification designations. This design option would also likely result in traffic impacts, diversion of traffic into the adjacent neighborhoods, impacts to the Industrial Sanctuary, and private property impacts.

<u>2025 Travel Patterns Under the Two-Way Grand Design Option</u>

Metro's travel demand model, which is based on the Financially Constrained 2025 RTP network was used to identify the future 2025 travel patterns for both the MLK/Grand couplet and the Two-Way Grand design option. The 2025 PM 2-hour peak volumes were used to identify potential travel patterns and major destinations and origins using Grand Avenue and 7th Avenue.

The following summarizes some changes in travel patterns between the two scenarios (MLK/Grand couplet and Two-Way Grand design option):

- Under the couplet scenario trips to I-84 were taken via Grand Avenue. Under the Two-Way Grand design option, trips wanting to access I-84 did not use SE 7th Avenue through the corridor, instead they stayed on Grand Avenue to I-84.
- From 7th Avenue, many of the trips turned onto NE Couch Street instead of using NE Everett Street to get back to NE Grand Avenue.
- With the Two-Way Grand Avenue design option, some neighborhood traffic diversion is anticipated. The most prominent diversion of traffic occurs south of the SE Madison Street.
    - Volumes would increase on I-5 northbound and access the highway via the new McLoughlin/I-5 on- and off-ramps.
    - Volumes would increase on SE 11th and 12th Avenue between SE Division Street and SE Hawthorne Boulevard.
    - Volumes would increase on SE Water Avenue between SE Division Street and SE Clay Street.
    - Volumes would increase on SE Hawthorne and SE Madison Street between the Hawthorne Bridge and SE 11th Avenue.

Two-Way Grand Avenue Design Option Considerations

During the next phase of study, if the Two-Way Grand design option were chosen as the preferred alternatives than further refinement of this design option would be needed. Table S-6 summarizes design considerations to study further during the next phase of this study.

Table S-6
Summary of Two-Way Grand Avenue Design Option Design Considerations

Location	Design Considerations to Study Further
Transitions at the North End	Transition at NE Everett and the traffic impacts and access to I-84
Streetcar Transition at E Burnside Street	Traffic impacts and operations at the intersections with E Burnside at MLK Jr. Boulevard and Grand Avenue.
Morrison MOS Terminus	Traffic operations and impacts at the streetcar terminus at the SE Morrison Street and SE Grand Avenue intersection
Bike Lanes	Identifying the best location for the bike lanes that would be relocated from SE 7th Avenue
SE Grand Avenue	Identify the best cross section for two-way Grand Avenue in regards to pedestrians, bicycles, traffic and streetcar
Transitions at the South End	Identify if Stephens Street could carry the potential traffic demand that is destined through the corridor and traffic impacts on SE MLK Jr. Boulevard were the streetcar crosses to access OMSI
Traffic Analysis	Traffic impacts are unknown at this time and further traffic analysis would need to be conducted

Financial Feasibility

Assessing financial feasibility at the Alternatives Analysis phase of project development is a matter of comparing capital, operating and maintenance costs against proposed revenue sources. Funding sources generally solidify as a project moves through the project development process. In this section, proposed costs and revenues are presented and potential shortages and surpluses identified.

Capital cost estimates are provided in 2005 dollars and inflated to year of expenditure (YOE) in Table S-7. The construction is assumed to be conducted from September 2007 to September 2009. Construction inflation has been assumed to be 5% per year through 2008. The cost estimates are based on a build-up of FTA cost categories and appropriate contingencies and are presented below.

Table S-7
Capital Costs

Project Alternative	($2005 dollars)	($ YOE dollars)
Oregon MOS	$84,000,000	$100,506,000
Morrison MOS (MLK-Grand	$105,000,000	$125,632,000
Morrison MOS (Two Way Grand)	$119,000,000	$142,380,000
OMSI MOS (MLK-Grand)	$142,000,000	$169,905,000
OMSI (Two-Way Grand)	$156,000,000	$186,653,000
Full Loop	$153,000,000	$187,026,000
Full Loop (2-Way Grand)	$167,000,000	$203,774,000

Source: URS, Portland Streetcar Inc, April 2006

Capital Funding Sources

Potential federal and local sources for capital funding have been identified. At this phase of project development the funding sources are general strategies to be pursued with actual funding commitments anticipated prior to a request for FTA funding. There are variations in the amount available by funding source and these assumptions are outlined below. The FTA Small Starts share controls a considerable part of the proposed funding as it is assumed that the project can receive a 60% federal share up to the maximum of $75 million allowed under the program. The total project cost cannot exceed $250 million under the FTA Small Starts program, which is not an issue for this project. Table S-8 present the complete capital funding plan.

Table S-8
Proposed Capital Funding Plan

	Oregon MOS	Morrison MOS MLK-Grand	Morrison MOS 2 Way Grand	OMSI MOS MLK-Grand	OMSI MOS 2 Way Grand	LOOP MLK-Grand	LOOP 2 Way Grand
Construction Costs							
Streetcar to NE Oregon	100,506,000	100,506,000	100,506,000	100,506,000	100,506,000	100,506,000	100,506,000
Oregon to Morrison		25,126,000	25,126,000	25,126,000	25,126,000	25,126,000	25,126,000
Two-Way Grand Cost			16,748,000		16,748,000		16,748,000
Morrison to OMSI				44,273,000	44,273,000	44,273,000	44,273,000
Loop Completion						17,121,000	17,121,000
TOTAL	**100,506,000**	**125,632,000**	**142,380,000**	**169,905,000**	**186,653,000**	**187,026,000**	**203,774,000**
Total Without Inflation ($ FY 05)	84,000,000	105,000,000	119,000,000	142,000,000	156,000,000	153,000,000	167,000,000
Funding Sources							
FTA 60% Grant	60,303,600	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000
LID	6,000,000	8,000,000	8,000,000	10,000,000	10,000,000	10,000,000	10,000,000
PDC TIF - multiple districts	20,000,000	25,000,000	25,000,000	30,000,000	30,000,000	35,000,000	35,000,000
Bridge Funds	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000
HUD (committed)	613,590	613,590	613,590	613,590	613,590	613,590	613,590
MTIP (committed)	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
MTIP (SAFETEA-LU)	1,650,000	1,650,000	1,650,000	1,650,000	1,650,000	1,650,000	1,650,000
MTIP (City Request	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
City Funding (TBD)	593,155	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
TOTAL REVENUE	**100,160,345**	**125,263,590**	**125,263,590**	**132,263,590**	**132,263,590**	**137,263,590**	**137,263,590**
SURPLUS/(DEFICIT*)	**(345,655)**	**(368,410)**	**(17,116,410)**	**(37,641,410)**	**(54,389,410)**	**(49,762,410)**	**(66,510,410)**

Source: Portland Streetcar Inc, and URS, May 2006

Note: PDC TIF funds to be determined.

*Any deficits identified would have to be eliminated prior to submittal to FTA by a combination of value engineering and/or identification of additional revenues

Measure:	**Assessment of capital funding sources**
Results:	***A preliminary inventory of funding sources indicate a potential of $100-125 million available for total project costs, which would not be sufficient to fund the entire Full Loop at this time. The Oregon MOS and Morrison MOS have listed sources (not fully committed) that could assure the completion of the project. The OMSI MOS and Full Loop require identification of $35-47 million in additional sources of funding in order to be constructed in a single project phase. Additional revenue would need to be identified if the entire project is to be constructed in one phase.***

Descriptions of proposed revenue sources are presented below.

- **Federal Small Starts: $75,000,000.** The proposed project anticipates a 60% federal share.

- **Committed Federal: $4,200,000.** Streetcar has received a $1 million MTIP commitment of Surface Transportation Program (STP) funds, $613,000 Housing and Urban Development commitment, and $2.6 million from SAFETEA-LU.

- **Local Improvement District: $6,000,000 to $10,000,000.** A local improvement district similar to the one used for the initial streetcar is proposed with similar rates. LID revenue varies with the length of the project.

- **Bridge Funds: $9,000,000.** The Broadway Bridge will require a major improvement estimated to cost $17 million to extend its life. It is proposed that bridge funds be sought to support $9 million of the construction from other bridge funds available to the region.

- **Portland Development Commission Funding: $25,000,000-$35,000,000**. A total contribution ranging between $25-$35 million, depending on the alternative, is proposed from the various urban renewal districts benefiting from the project.

- **City of Portland Funding: $4,000,000 maximum** The balance of the project cost is anticipated to be provided by the City of Portland from various sources including system development charges, one-time-only funding, New Market Tax Credits, and others. A maximum amount is set at $4 million which represents the limit on ability to secure additional funds to complete the project.

The Oregon MOS and Morrison MOS have listed sources (not fully committed) that could assure the completion of the project. The OMSI MOS and Full Loop require identification of $35-47 million in additional sources of funding in order to be constructed in a single project phase.

Measure:	**Assessment of operating revenue sources**
Results:	***Operating revenue commitments have not been made for the Eastside Transit Project. However, funding mechanisms are in place that could potentially generate enough operating revenue to expand the streetcar system. More work will be required between TriMet and the City of Portland to develop a mutually agreeable funding plan, and to identify potential additional funding sources if necessary.***

Table S-9
Operating and Maintenance Costs ($ 2005)

Project Alternative	Operating Cost
Full Loop	$ 5,262,000
OMSI MOS	$ 5,325,100
Morrison MOS	$ 4,928,200
Oregon MOS	$ 4,642,200

Source: TriMet 2006

The operating and maintenance costs represent a blended cost of streetcar and bus (See Table S-8). This helps to explain the seemingly counter-intuitive result that the OMSI MOS would cost more to operate than the Full Loop. In the OMSI MOS, the piece of the loop connecting OMSI to RiverPlace is provided by a short segment of connecting bus service over the Hawthorne Bridge. In the Full Loop, the streetcar route is more direct over the Caruthers Bridge. In this instance, the difference in cost between the Full Loop and OMSI MOS streetcar segments is offset by the required bus connector in the OMSI MOS.

Operating revenue commitments have not been made for the Eastside Transit Project. City of Portland and TriMet revenue has been used to date for streetcar operations and each is discussed below. Some combination of these sources, and possibly additional sources, will ultimately be used to fund operations for the project. Currently, TriMet provides two-thirds of the streetcar operating revenue with the remaining third provided by the City of Portland. TriMet has proposed a review of the benefits of added streetcar service, potential savings that could be derived and development of a formula for operating cost participation. TriMet is unable to commit to service expansion beyond its current commitments due to the economic situation in the region and the projected payroll tax revenues. The City of Portland has developed a policy of supporting streetcar operations with parking meter revenues generated from the area served. The City is prepared to explore the feasibility of expanding the parking meters to include the area selected for streetcar service in the first construction segment. Contributions to operations from the City of Portland are based upon the increase of parking meters in the Central City.

Cost-Effectiveness

Cost effectiveness provides a measure of how effectively the investment in capital, operating and maintenance funds that would be required for each alternative translates into ridership on the new streetcar line. Table S-10 shows the cost per streetcar rider, new streetcar line only, for each alternative. The cost includes the annualized capital cost of the alternative and the annual operating and maintenance cost. The annual cost, as compared to the No-Build alternative, is compared to the annualized streetcar riders to arrive at cost per streetcar rider.

Measure:	**Assessment of cost-effectiveness, comparing ridership and costs**
Results:	***The Full Loop is the most cost-effective alternative in terms of total annualized capital and operating cost per new streetcar rider, annualized federal cost per new streetcar rider and operating cost per streetcar rider. Cost-effectiveness decreases as the length of the project alternative decreases.***

The Full Loop alternative, which has the highest cost, would also have the most riders, resulting in the lowest cost per streetcar rider of $4.25. The remaining MOS alternatives, with fewer additional new streetcar miles, and therefore lower cost and ridership, show a cost per rider figure commensurate with the length of the new streetcar line; the OMSI MOS cost per rider is $5.01, Morrison MOS is $5.80, and the Oregon MOS is $6.86.

Table S-10
Cost per Streetcar Rider
Year 2025

	Full Loop	OMSI MOS	Morrison MOS	Oregon MOS
Annual Capital + O&M Cost[1]	$17,177,000	$16,331,100	$13,062,200	$11,095,200
Annual New Streetcar Riders[2]	4,044,030	3,260,000	2,252,660	1,616,960
Cost/Streetcar Rider	$4.25	$5.01	$5.80	$6.86

[1]Costs are in 2005 dollars.
[2]Annualized Streetcar Riders on new streetcar line only.

Table S-11 is similar to the previous table except cost is shown as the federal share (assuming 60% federal share) of the annualized capital cost of each alternative. Operating and maintenance cost are excluded because the federal government does not pay any portion of the operating or maintenance cost.

The Full Loop alternative results in the lowest federal cost per streetcar rider at $1.77 per rider. The remaining MOS alternative's, show an increasing federal cost per streetcar rider commensurate with the length and ridership of the new streetcar line. Specifically, the OMSI MOS federal cost per rider is $2.03, Morrison MOS is $2.17, and the Oregon MOS is $2.39.

Table S-11
Federal Cost per Streetcar Rider
Year 2025

Federal Share (60%) CEI

	Full Loop	OMSI MOS	Morrison MOS	Oregon MOS
Annualized Capital Cost (60% share)[1]	$7,149,000	$6,603,000	$4,880,400	$3,871,800
Annual New Streetcar Riders[2]	4,044,030	3,260,000	2,252,660	1,616,960
Federal Cost/Streetcar Rider	$1.77	$2.03	$2.17	$2.39

[1]Federal Costs are in 2005 dollars and assume 60% maximum federal share.
[2]Annualized Streetcar Riders on new streetcar line only.

Table S-12
Operating Cost per Streetcar Rider
Year 2025

Operating Cost/New Streetcar Rider

	Full Loop	OMSI MOS	Morrison MOS	Oregon MOS
Annual O&M Cost[1]	$5,262,000	$5,325,100	$4,928,200	$4,642,200
Annual New Streetcar Riders[2]	4,044,030	3,260,000	2,252,660	1,616,960
O&M Cost/New Streetcar Rider	$1.30	$1.63	$2.19	$2.87

[1]Costs are in 2005 dollars.
[2]Annualized Streetcar Riders on new streetcar line only.

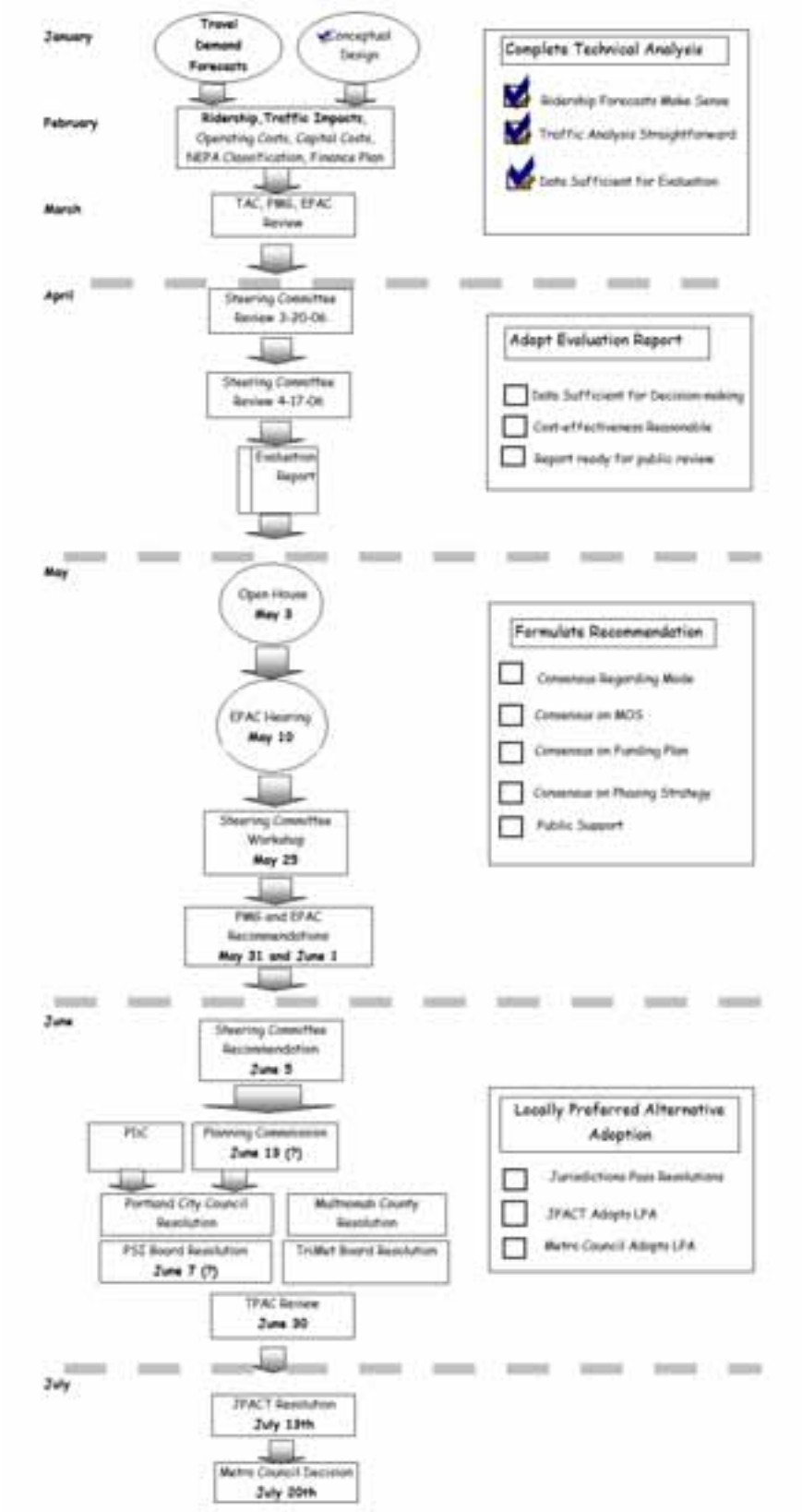
Table S-12 shows operating cost per streetcar rider, new streetcar line only, for each alternative. The Full Loop alternative would have the lowest operating cost per streetcar rider at $1.30 per rider. The remaining MOS alternatives show increasing operating cost per rider as ridership declines with each successive shorter streetcar alternative.

Decision Making

The outcome of the Eastside Transit Alternatives Analysis will be the adoption of a locally preferred alternative. The LPA will specify the mode, alignment, and termini of the transit project and may also set forth a phasing strategy for the project if a minimum operable segment (MOS) is chosen. The project's decision-making structure is shown in Figure S-16.

Public involvement and comment has taken place since 2005 and will continue through the LPA process. The LPA recommendation will be generated by jurisdiction senior staff that serve on the Project Management Group (PMG). The citizen committee for the project, the Eastside Project Advisory Committee (EPAC) will also generate a recommendation. The Steering Committee, which is composed of elected officials and executive staff of Metro, TriMet, the Oregon Department of Transportation (ODOT), the Cities of Portland and Lake Oswego, and Multnomah and Clackamas Counties will review the PMG and EPAC recommendations as well as public comment and will issue a LPA recommendation. The Portland City Council, Multnomah County Commission, TriMet Board and Portland Streetcar Board will make recommendations to the Metro Council either supporting or amending the Steering Committee Recommendation. The region's MPO body, the Joint Policy Advisory Committee on Transportation will make a LPA decision recommendation to the Metro Council. The Metro Council will then make the final LPA decision. It should be noted that the Steering Committee oversees both the Eastside Transit Alternatives Analysis and the Portland to Lake Oswego Transit and Trail Alternatives Analysis.

Figure S-16
Eastside Transit Alternatives Analysis Decision Process



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