



Alternatives Evaluation Methodology

The Sellwood Bridge Evaluation Framework (see *Sellwood Bridge Project Evaluation Framework Technical Memorandum*, adopted on January 29, 2007) outlines the approach that is and will continue to be employed for screening all potential Sellwood Bridge Project alternatives down to a set that will be evaluated in the Draft Environmental Impact Statement (DEIS). There are two steps in this process.

The first step, conducted in winter 2007, screened preliminary concepts against a set of minimum requirements, called “threshold criteria.” These threshold criteria were developed to directly address the project purpose and need and represent a set of requirements which all feasible bridge concepts must meet. Preliminary concepts that met the minimum requirements were also compared against each other to allow elimination of clearly inferior concepts from further consideration. The Sellwood Bridge Project’s Community Task Force (CTF) recommended and the Policy Advisory Group (PAG) adopted a list of concepts to be advanced for further evaluation (see *Sellwood Bridge Project Range of Alternatives Technical Memorandum*, adopted on May 21, 2007). All concepts approved for further evaluation were fleshed out into project alternatives.

The second step of the evaluation process, conducted in spring 2007, compared the project alternatives against the evaluation criteria specified in the Evaluation Framework. These criteria were developed and adopted by the CTF and the PAG following discussion with a wide variety of stakeholders about what project features are most important and valuable. The 37 criteria are organized into the following categories:

- A. Aesthetics
- B. Bicycle and Pedestrian
- C. Community and Quality of Life
- D. Automobile, Freight, and Emergency Vehicles
- E. Construction
- F. Cost and Economic Impacts
- G. Natural Environment
- H. Material Use
- I. Mass Transit
- J. Seismic

A team of technical experts rated the performance of each project alternative against each evaluation criterion. Performance ratings were either qualitative or quantitative. For the qualitative criteria, the technical experts rated the alternatives on a 1 to 5 scale. For the quantitative criteria, actual performance data were normalized into a 1 to 5 scale. In both quantitative and qualitative ratings, the higher the rating, the more successfully the alternative matched the values for the project. A summary of evaluation results will be provided in the

Sellwood Bridge Project Screening of Alternatives Technical Memorandum (expected to be available in August 2007).

The following section documents the evaluation methodology for the 37 criteria, organized by evaluation criteria category. Attachment A includes the raw scores for all the criteria.

Evaluation Criteria Methodology

A. Aesthetics

Note: three criteria relating to project aesthetics are described below. Additional aesthetics criteria will be considered later in the project when bridge type information will be available (see *Sellwood Bridge Project Evaluation Framework Technical Memorandum*, adopted on January 29, 2007).

A.1. Flexibility in Bridge Design

Criterion

Maximize flexibility in bridge design types.

Measure

A qualitative scale considering whether the alternative maintains flexibility to use different bridge design types.

Method

The following assumptions were made for the evaluation process:

- Signature structure types, such as arches and cable-stayed bridges, are best suited to straight alignments; therefore straight alignments have the greatest flexibility for bridge types.
- Wider cross-sections are more challenging than narrower cross-sections because they limit the potential bridge structure types and aesthetics.
- The double deck sections (vehicular traffic on the upper deck; pedestrian and bicycle traffic on the lower deck) are limited to framing systems with main support along sides of the bridge, limiting the potential number of bridge types.
- The rehabilitation bridge alternatives are the most limited because the design is constrained to using the existing steel truss.

The following scoring scale was used in the analysis:

Score	Description
5	Maximum flexibility with both superstructure and substructure
4	Moderate flexibility with both superstructure and substructure
3	Adequate flexibility with either superstructure or substructure, but not both
2	Moderate flexibility with either superstructure or substructure, but not both
1	No flexibility with either superstructure or substructure

A.2 Views from Bridge

Criterion

Preserve, enhance, or create views from the bridge.

Measure

A qualitative scale considering quality of views provided from the bridge for bicyclists, pedestrians, and vehicle occupants.

Method

All alternatives were compared against views from the existing bridge. Viewsheds from the bridge were assumed to be the Willamette River, the West Hills, Sellwood Park, Downtown Portland, Marquam Hill, the Lloyd District, Ross Island, and the sky. The following scoring scale was used in the analysis:

Score	Description
5	View is enhanced from the bridge for all users, including pedestrians, bicyclists, and automobile occupants
4	View is preserved for all users, including pedestrians, bicyclists, and automobile occupants, and enhanced for a subset of these users
3	View is preserved for all users, including pedestrians, bicyclists, and automobile occupants
2	View is preserved for some users and decreased for some users
1	View is decreased for all users, including pedestrians, bicyclists, and automobile occupants

A.3 Views from Community

Criterion

Provide aesthetically pleasing intersection/interchange designs that instill a sense of community pride.

Measure

A qualitative scale considering views of the intersections/interchanges from the community.

Method

Alternatives were evaluated with primary emphasis on the east and west bridgeheads and compatibility with the existing built environment. For this evaluation, aesthetically pleasing was defined as elements of design that are pleasing to the eye, including landscaping, approach design, and the ability to incorporate further design treatments. Community pride was defined as involving a new or innovative approach to the bridge, a design that is architecturally striking yet compatible with the community and built environment, and approach that can serve as a gateway or landmark for the community, and/or can serve as a neighborhood identifier. On the west side, elevations of the signalized and roundabout interchanges were assumed to be the same. Alternatives with the roundabout interchange option were assumed to provide more opportunity for aesthetically pleasing landscaping than the signalized intersection alternatives. The following scoring scale was used in the analysis:

Score	Description
5	Westside interchange type is aesthetically pleasing and instills community pride (as seen from the Sellwood Park, the Willamette River, for users approaching from the bridge and those traveling along Highway 43). Eastside connection is aesthetically pleasing and compatible with the existing built environment.
4	Westside interchange type is moderately aesthetically pleasing and instills community pride, (as seen from a subset but not all of the following locations: the Sellwood Park, the Willamette River, users approaching from the bridge and those traveling along Highway 43). Eastside connection is moderately compatible with the existing built environment.
3	Westside interchange type is neither more nor less aesthetically pleasing as the existing interchange, as seen from the Sellwood Park, the Willamette River, users approaching from the bridge and Highway 43) and either preserves or does not detract from the existing community pride. Eastside connection is mostly compatible with the existing built environment and there is no change in the aesthetics compared to the No Build alternative.
2	Westside interchange type is less aesthetically pleasing and does not instill community pride, (as seen from the Sellwood Park, the Willamette River, for users approaching from the bridge and Highway 43). Eastside connection is less compatible with the existing built environment and is less aesthetically pleasing than the current bridge alignment.
1	Westside interchange type is not aesthetically pleasing and does not instill community pride, (as seen from the Sellwood Park, the Willamette River, for users approaching from the bridge and Highway 43). Eastside connection is not compatible with the existing built environment and is not aesthetically pleasing.

B. Bike and Pedestrian

B.1 Bike and Pedestrian Safety

Criterion

Maximize bicycle and pedestrian safety.

Measure

Bicycle/pedestrian facility width safety addresses conflicts with motor vehicles at intersections and interchange areas, and separation between various non-motorized users and motor vehicles.

Scoring was based on a qualitative scale considering: width of sidewalk; width of bike facility; width of travel lanes; separation to minimize conflicts between bikes and pedestrians; one-way versus two-way facilities; separation to minimize conflicts between low and high speed bicyclists; separation to minimize conflicts between motor vehicles and non-motorized users (including separation of bicycle and pedestrian facilities from travel lanes).

Method

The following sub-criteria were developed to evaluate this criterion:

Category	Subcriterion
Westside Interchange/Intersection	Riverview cemetery access: Number of direct conflict points for bicyclists/pedestrians with motor vehicles between bridge's west end and cemetery access road
Bridge Cross-Section	Sidewalk/shared use path width
Bridge Cross-Section	Bicycle lane width

Category	Subcriterion
Bridge Cross-Section	Number of vehicle travel lanes
Bridge Cross-Section	Outside vehicle travel lane type
Bridge Cross-Section	Degree of separation between differing bicycle/pedestrian users
Bridge Cross-Section	Physical separation from motor vehicle traffic
User Security	Visibility of bicyclists/pedestrians from other bridge users

The points were summed and compared with the total number of possible points, which varied by alternative. The total number of possible points represented the combined values of the highest possible score for each subcriterion. These totals also reflect subcriteria where individual scores were assigned to bicycle/pedestrian facilities on each side of the Sellwood Bridge (e.g., "sidewalk/shared use path width"). Some criteria do not apply to several concepts (e.g., "bicycle lane width" does not apply to bridge concepts where bicycle lanes are not provided). In these cases, these subcriteria received a score of "zero," and the total number of possible points was adjusted to reflect the omission of these subcriteria. The total numbers of possible points varied by alternative, so aggregate scores were each expressed as a percentage of the total number of possible points. The percentage scores were translated to scores of 1 through 5. Additional information on the scoring of this criterion is provided in Attachment B.

The following scoring scale was used in the analysis:

Score	Description
5	Alternative received maximum points possible, or within top 20% of possible points, based on evaluation of subcriteria.
4	Alternative received between 60-80% of possible points based on evaluation of subcriteria.
3	Alternative received between 40-60% of possible points based on evaluation of subcriteria.
2	Alternative received between 20-40% of possible points based on evaluation of subcriteria.
1	Alternative received minimum points possible, or within lowest 20% of possible points.

B.2 Bicycle and Pedestrian Connections

Criterion

Maximize convenient and direct connections for bicyclists and pedestrians.

Measure

Convenient and direct connections for bicyclists and pedestrians addresses the presence of non-motorized facilities on one or both sides of interchange/intersection areas, whether facilities accommodate one-way versus two-way bicycle traffic, and whether bicycle/pedestrian facilities follow relatively direct routes and provide logical connections.

Scoring was based on a qualitative scale considering: out of direction travel; grade; ease of crossing of OR 43 and SE Tacoma; and connections to OR 43, SE Tacoma, cemetery access road, the regional trail network, and the north side of Macadam Avenue.

Method

The following sub-criteria were developed to evaluate this criterion:

Category	Subcriterion
Westside Interchange/Intersection	Access provisions between bridge and Willamette Greenway Trail: Presence of ramps for bicyclists/pedestrians on the north and/or south sides of the bridge
Westside Interchange/Intersection	Bridge/Willamette Greenway Trail access ramp design elements: Number of 90-degree (or greater) turns on each ramp between bridge and streetcar/Willamette Greenway Trail)
Westside Interchange/Intersection	Connections for bicyclists/pedestrians between bridge and Riverview Cemetery access road: Presence of bicycle/pedestrian facilities on one or both sides of interchange/intersection area
Westside Interchange/Intersection	Connections between bridge and Riverview Cemetery access road: Directness of route of bicycle/pedestrian facilities through interchange/ intersection area
Bridge Alignment	Bridge length
Bridge Cross-Section	One-way vs. two-way bicycle facilities

The scoring methodology for this criterion is the same as the bike and pedestrian safety criterion, where points for each subcriterion were summed and compared with the total number of possible points, which varied by alternative. The percentage scores were translated to scores of 1 through 5.

Additional information on the scoring of this criterion is provided in Attachment B.

Score	Description
5	Alternative received maximum points possible, or within top 20% of possible points, based on evaluation of subcriteria.
4	Alternative received between 60-80% of possible points based on evaluation of subcriteria.
3	Alternative received between 40-60% of possible points based on evaluation of subcriteria.
2	Alternative received between 20-40% of possible points based on evaluation of subcriteria.
1	Alternative received minimum points possible, or within lowest 20% of possible points.

C. Community Quality of Life

C.1 Noise

Criterion

Minimize noise impacts caused by traffic on residents, businesses, bridge users, and visitors.

Measure

Qualitative scale considering the number of potential impacts.

Method

Sensitive noise receptors for this analysis include outdoor use areas (such as balconies at residences and parks), historic resources (such as Oaks Pioneer Church and Riverview Funeral Home), and trail facilities in the bridge area (such as the Willamette Greenway Trail and the Springwater Corridor Trail). Federal Highway Administration (FHWA) and Oregon Department of Transportation (ODOT) Noise Abatement Criteria methods were used for the analysis. These methods define a noise impact (an impacted receiver) for all land uses in the bridge area as: (1) a noise level of 65-decibel (dBA) or greater; or (2) an increase in noise levels greater than 3 dBA than the No Build alternative.

Noise impacts were measured using FHWA's Transportation Noise Model (TNM) software (version 2.5). Year 2030 p.m. peak hour traffic volumes from the Sellwood Bridge *Modal Considerations and Potential Bridge Cross-Sections Technical Memorandum* (February 2007) were used to input in the noise model. Noise levels were measured for both the top and bottom floors for multiple story buildings.

FHWA noise abatement criteria methods, the standard methodology for roadway noise analysis, were used to assign noise receivers (such as parks, recreational paths, and houses) different usage factors based on their relative number of hours of use. For example, the usage factor for a house is 1; a park usage factor was determined to be 0.17; and a path usage factor was determined to be 0.13.

The number of impacted receivers was calculated by multiplying the number of noise receivers whose noise levels would be 65-decibel (dBA) or greater, or would increase by more than 3 dBA over the No Build alternative levels, times the usage factor for that receiver. An improvement in noise levels of 4 dBA or greater was considered in calculations as a negative value and "cancelled out" an impacted receiver.

The total number of impacted receivers was determined for each alternative. The following scoring scale was used in the analysis:

Score	Description
5	Nine (9) or less impacted receivers
4	Ten (10) to nineteen (19) impacted receivers
3	Twenty (20) to twenty-nine (29) impacted receivers
2	Thirty (30) to forty (40) impacted receivers
1	Forty (40) or more impacted receivers

C.2 Neighborhood Cut-Through Traffic

Criteria

Minimize through traffic intrusion in Sellwood and other South Portland neighborhoods.

Measure

Comparison of average daily traffic volumes on neighborhood streets against future No Build alternative.

Method

The differentiator between alternatives for this criterion is the number of travel lanes on the Sellwood Bridge. Traffic volumes from the City of Portland Office of Transportation traffic analysis model were estimated for the two-lane, three-lane, and four-lane alternatives for Year 2035 a.m. and p.m. 2-hour peak-period traffic volumes entering and exiting Tacoma Street west of 17th Avenue and Taylor's Ferry Road west of Highway 43.

The traffic analysis model concluded traffic volumes were slightly higher (1 percent) for the three- and four-lane alternatives compared to the two-lane alternatives. Although the traffic volumes were similar, different scores were assigned between the two-lane and three-lane/four-lane alternatives to differentiate between alternatives. Because the differences in overall traffic volumes between the two-, three-, and four-lane alternatives were minor, only a subset of the original 1-5 scale was used (scores of 4 and 2 only). The following scoring scale was used in the analysis:

Score	Description
4	Alternative is a two-lane cross-section
2	Alternative is a three- or four-lane cross-section

C.3 Recreational Facilities

Criterion

Minimize impacts to recreational facilities.

Measure

A qualitative scale was used considering impact on recreational use, constructive use, and long-term construction impacts on recreation properties.

Method

The *Section 4(f) Resources Potentially Impacted by the Sellwood Bridge Project Technical Memorandum* (January, 2007) provides an overview of recreational resources in the project area (referred to as Section 4(f) recreational resources in the memorandum). Eight recreational properties are located in the bridge vicinity:

- Powers Marine Park
- Riverview Cemetery
- Willamette Greenway Trail (west side of Willamette River)
- Willamette Greenway Trail (east side of Willamette River)
- Springwater Trail
- Sellwood Riverfront Park
- Oaks Pioneer Park
- Spokane Street Trail Connection

The number of new recreational facility crossings was determined. Each alternative began with five points. Points were deducted for the following:

- A new recreational facility crossing (1 point deduction) – For the alternatives that replaced the existing bridge, one point was deducted if the alternative crossed a new recreational facility that the existing bridge does not already cross.
- Detour bridge (1 point deduction) – The teal alignment was assumed to be the detour bridge location. A detour bridge would temporarily cross eight recreational facilities (Powers Marine Park, Riverview Cemetery, and Willamette Greenway Trail on the west side, and the Springwater Trail, Willamette Greenway Trail, Sellwood Riverfront Park, Oaks Pioneer Park, and the Spokane Avenue trail connection to the Willamette Greenway Trail on the east side). Construction impacts are considered important impacts under the Section 4(f) requirements, but temporary impacts were not assumed to have the same severity of impact as permanent impacts. For that reason, a one point total deduction was assigned to alternatives with a detour bridge.
- Adjacent to recreational property (0.5 point deduction) – Alternatives adjacent to, but not crossing, a recreational facility were assigned a 0.5 point deduction (such as the Pink alignment adjacent to but not crossing Sellwood Riverfront Park)

The total number of points after the above deductions equaled the final score for the alternative.

C.4 Historic and Cultural Resources

Criteria

Preserve historic and archaeological resources along the project corridor.

Measure

A qualitative scale of potentially significant historic properties and archaeological resources affected by the alternative.

Method

Preliminary investigation has identified no known archaeological resources within any alternative properties. Therefore, this criterion only addresses historic properties.

Four historic properties are located within or adjacent the various bridge footprints:

- Sellwood Bridge
- Riverview Cemetery (including A. E. Doyle Columns)
- Riverview Cemetery Caretaker's Residence (funeral home)
- Oaks Park Pioneer Church (formerly St. Johns Episcopal)

Preliminary analysis suggests that each of these properties is eligible for listing on the National Register of Historic Places either individually, or as a contributing element of an Historic District.

Affects to historic properties can be direct physical impacts, resulting in the demolition, partial destruction, or modification of a property, and indirect impacts, which can be auditory, atmospheric, or visual.

Each historic property was assumed to have equal value. Each alternative began with 5 points. Points were deducted for each impact as follows:

- Complete demolition, or condemnation, as the most severe physical impact, resulted in a deduction of 1 point per historic property.
- Direct physical impacts resulted in deductions ranging between 0.5 to 1 points to account for the range of severity of those impacts.
- Physical impacts that result in significant physical alterations, but not demolition, resulted in a deduction of 0.5 points per historic property.
- Proximity impacts that resulted in the significant changes in the setting of an historical property resulted in the deduction of 0.5 points per historic property.

The total number of points after the above deductions was the final score for the alternative.

C.5 Residential Relocations

Criterion

Minimize residential relocations.

Measure

Number of residential units displaced by alternative.

Method

This criterion is quantitative. Residential units were identified using Geographic Information System (GIS) files, aerial photographs and maps, county tax records, and field verification. The right-of-way footprint for each alternative was overlain on a map and the number of displaced residential units was identified. It was assumed that if any portion of a residential structure were directly impacted, the entire structure (and all residential units within the structure) would be displaced.

The results are reported as the number of displaced residential units for each alternative, with a higher number indicating a greater potential impact.

C.6 Residential Impacts

Criterion

Minimize residential impacts.

Measure

Number of residences within 30 feet of the proposed alternative.

Method

This criterion is quantitative. It does not address residential relocations, which are addressed in the Residential Relocations criterion.

Residential units were identified using GIS files, aerial photographs and maps, county tax records, and field verification. The right-of-way footprint for each alternative was overlain on a map. Building footprint boundaries in GIS were used to identify the number of residential units

that would be in place following construction of the alternative located within a 30-foot buffer for each alternative alignment.

The results are reported as the number of residences within 30-feet of the alternative, with a higher number indicating a greater potential impact to residential land uses.

C.7 Business Relocations

Criterion

Minimize business relocations.

Measure

Number of businesses displaced by alternative.

Method

This criterion is quantitative. Businesses were identified using GIS files, aerial photographs and maps, county tax records, and field verification. The right-of-way footprint for each alternative was overlain on a map and the number of displaced businesses was identified. It was assumed that if any portion of a structure were directly impacted, the structure (and all businesses within that structure) would be displaced.

The results are reported as the number of displaced businesses for each alternative, with a higher number indicating a greater potential business impact.

C.8 Business Impacts

Criterion

Improve or avoid negatively impacting the viability of existing businesses within the bridge impact area.

Measure

A qualitative scale considering auto access, parking, visibility, and access for delivery trucks.

Method

The bridge impact area for this criterion is defined as businesses located near the easterly and westerly bridge connections (Macadam Avenue to the west and Tacoma Street to the east). The analysis considered access, circulation, visibility, parking, and ease of delivery vehicles. The following assumptions were made:

- Current conditions were considered viable for businesses within the study area, and that no changes to existing access, parking, visibility, and ease of delivery would be an acceptable solution.
- Ability of businesses to remain viable following displacement of any existing businesses by the alternative.

The following scoring scale was used in the analysis:

Score	Description
5	Alternative is expected to preserve viability of businesses along Macadam Avenue and Tacoma Street within the bridge impact area.

Score	Description
4	Alternative is expected to preserve viability of the majority of businesses along Macadam Avenue and Tacoma Street within the bridge impact area.
3	Alternative is expected to preserve the viability of many of the businesses along Macadam Avenue and Tacoma Street within the bridge impact area.
2	Viability of many of the businesses along Macadam Avenue and Tacoma Street within the bridge impact area could be jeopardized by the alternative.
1	Alternative is not expected to preserve the viability for the businesses along Macadam Avenue and Tacoma Street within the bridge impact area.

C.9 Plan Consistency

Criterion

Achieve consistency with adopted community plans.

Measure

Qualitative scale considering consistency with relevant regional and local plans on both sides of the bridge (including *Tacoma Main Street Plan*) in terms of: number of lanes; classification; presence of bicycle facilities and sidewalks; bicycle and pedestrian connections; accommodation of freight; and connection with the local street network.

Method

The *Preliminary Plan and Policy Review Technical Memorandum* (November, 2006) summarized relevant land use and transportation policies in adopted plans as they relate to the Sellwood Bridge project. Most of these policies:

- Do not differentiate between alternatives, such as the following policy in the *Sellwood-Moreland Neighborhood Plan*: “Use the public areas near the river’s edge to help unify and create an identity for the neighborhood.”
- Are considered in other criterion, such as these two policies in the *Sellwood-Moreland Neighborhood Plan*: “Preserve views from the Sellwood Bridge to the river, the hills to the west, and downtown Portland in any Sellwood Bridge renovation or replacement” (considered in the Aesthetics category); and “Improve access to and from the neighborhood across the Willamette Rive for transit, bicycle, and pedestrians” (considered in the Bicycle and Pedestrian category).

Elements in three adopted plans do differentiate between alternatives for plan consistency:

- *South Willamette River Crossing Study*: Recommended against replacing the Sellwood Bridge with a four-lane crossing and using the bridge for bikes and pedestrians only. The study recommended preserving or replacing the existing bridge with a two-lane bridge.
- The *Tacoma Main Street Plan* states providing adequate regional traffic capacity in the travel shed that Tacoma Street and the Sellwood Bridge serves is not the responsibility of Tacoma Street and states to “avoid increasing traffic capacity for a regional facility.” Because Tacoma Street currently has two travel lanes, alternatives with three and four lane cross sections are considered to conflict with this policy.

- The *Willamette River Plan*: Identifies a “View Corridor” westward on SE Spokane Street towards the Willamette River. The Plan states this view must be preserved.

The elements from the *South Willamette River Crossing Study* and *Tacoma Main Street Plan* are similar – to provide a two-lane bridge to avoid increasing capacity for a regional facility. The *Tacoma Main Street Plan* and *South Willamette River Crossing Study* were weighted higher than the *Willamette River Plan* because mitigation and/or a plan amendment to the *Willamette River Plan* are possible for the Spokane Street view corridor. Scores were assigned based on the above adopted plan elements that differentiate between alternatives. The following scoring scale was used in the analysis:

Score	Description
5	Alternative is consistent with all plans
3	Alternative is consistent with <i>South Willamette River Crossing Study</i> and <i>Tacoma Main Street Plan</i> , but inconsistent with the <i>Willamette River Plan</i>
1	Alternative is inconsistent with the <i>South Willamette River Crossing Study</i> and <i>Tacoma Main Street Plan</i>

D. Automobile, Freight, and Emergency Vehicles

D.1 Congestion Delay

Criterion

Minimize congestion delay in the bridge area.

Measure

Qualitative measure considering vehicle hours of delay (VHD) along the following corridors: OR 43 between Lake Oswego and Taylors Ferry; Tacoma Street between 6th and 17th; 99E to Taylor's Ferry; Highway 224 to 17th to Macadam and Taylor's Ferry; and Taylor's Ferry between Terwilliger and Highway 43.

Method

VHD is a means to measure traffic congestion, and is generally defined as the number of hours people are delayed in their vehicle to reach their destination.¹

VHD was estimated by the City of Portland Office of Transportation’s traffic analysis model for Year 2035 a.m. and p.m. peak 2-hour periods. The a.m. peak 2-hour period considered inbound (to Portland) traffic only. The p.m. 2-hour period VHD considered outbound (from Portland) traffic only.

Model results concluded no substantial difference in VHD amongst alternatives to differentiate between alternatives. Therefore, all alternatives scored the same (score of 3).

¹ Vehicle hours of delay is measured as the volume of traffic times the delay experienced. Delay is measured as the difference between vehicle hours traveled at free flow speed and the vehicle hours traveled at congested speed.

D.2 Accessibility

Criterion

Improve accessibility to residences and businesses.

Measure

Area within a 20-minute travel time contour from the center of the Sellwood Bridge.

Method

The City of Portland Office of Transportation's traffic analysis model for the Year 2035 a.m. and p.m. 2-hour peak periods was used to develop 20-minute travel time contours from the center of the bridge using the entire street network. The travel time area ranged between 5 and 9 percent larger than the No Build alternative 20-minute travel time area for the two-lane, three-lane, four-lane, and two general-purpose/two transit lane alternatives. Scores range between 1 and 3 because there was only a slight difference in travel time area (4 percent) between all alternatives.

The following scoring scale was used in the analysis:

Score	Description
3	Travel time area is 9 percent more than the No Build alternative
2.5	Travel time area is 8 percent more than the No Build alternative
2	Travel time area is 7 percent more than the No Build alternative
1.5	Travel time area is 6 percent more than the No Build alternative
1	Travel time area is 5 percent more than the No Build alternative

D.3 Incident Impact

Criterion

Minimize impact of incidents and allow the passing of emergency vehicles.

Measure

Combined width of travel lane and shoulders (curb-to-curb).

Method

Greater curb-to-curb bridge widths provide improved opportunity for emergency vehicles to safely bypass/access an area along the bridge in the event of an incident. Extra width also provides a designated vehicle breakdown area.

This is a quantitative criterion. The curb-to-curb widths (in feet) were determined for all alternatives. The widths were dependent upon the cross-section rather than the alignment or intersection type.

The results are reported as the curb-to-curb alternative width, with a higher number indicating a greater opportunity to minimize incidents and allow the passing of emergency vehicles.

D.4 Accommodate Trucks

Criterion

Accommodate truck traffic.

Measure

Combined width of travel lane and shoulders (curb-to-curb).

Method

Curb-to-curb widths affect the safety and comfort of truck drivers and other drivers sharing the bridge with trucks. Larger widths provide desirable clearances between commercial vehicles traveling in opposite direction.

This is a quantitative criterion. The curb-to-curb widths (in feet) were determined for all alternatives. The widths were dependent upon the cross-section rather than the alignment or intersection type.

The results are reported as the curb-to-curb alternative width, with a higher number indicating a greater opportunity to accommodate truck traffic.

D.5 Future Needs

Criterion

Retain flexibility to respond to future transportation needs along the corridor.

Measure

Qualitative score assessing the ability to add capacity on the bridge alternative cross section, or ability to add to the bridge alternative in the future.

Method

The ability to remain flexible to future transportation needs along the corridor is a direct function of the bridge cross-section or the ability to rechannelize/reconfigure the bridge deck in the future.

The following scoring scale was used in the analysis:

Score	Description
5	Alternative accommodates vehicular traffic and allows for future needs
4	Alternative has the potential to accommodate future vehicular traffic needs
3	Alternative has the potential to accommodate future vehicular traffic needs, but does so by impacting bicycle and pedestrian facilities
2	Alternative has the potential to accommodate future vehicular traffic needs, but does so by eliminating bicycle and pedestrian facilities
1	Alternative does not have the potential to accommodate future vehicular traffic needs

D.6 Open during Maintenance

Criterion

Remain open to traffic during periods of required maintenance.

Measure

Combined width of travel lane and shoulders (curb-to-curb).

Method

Greater curb-to-curb widths provide improved flexibility in staging traffic flow during periods of maintenance. Smaller curb-to-curb dimensions may require traffic detours.

This is a quantitative criterion. The curb-to-curb widths (in feet) were determined for all alternatives. The widths were dependent upon the cross-section type, rather than the bridge alignment or intersection type.

The results are reported as the curb-to-curb alternative width, with a higher number indicating a greater opportunity to remain open to traffic during periods of required maintenance.

E. Construction*E.1 Closure Time***Criterion**

Minimize closure time.

Measure

Qualitative scale of the estimated time of bridge closure during construction.

Method

The main differentiator between alternatives for closure time is the amount of tie-in work required for the new bridge to the existing east approach. The following assumptions were made:

- New alignments with the most overlap of the existing bridge alignment have the largest impact and therefore a longer construction time.
- Construction of the west interchange was not considered in the evaluation because construction would be staged and remain open to traffic during construction.

The following scoring scale was used in the analysis:

Score	Description
5	Detour bridge provided for rehabilitated bridge alternatives; for replacement bridge alternatives, bridge alignment is located away from existing bridge minimizing or eliminating bridge closure, and cross-section is narrow, minimizing the taper to the existing cross-section on Tacoma Street
4	Narrow bridge cross-section with least impact to existing bridge closure, or bridge alignment is located away from existing bridge, minimizing the taper to the existing cross-section on Tacoma Street
3	Wider cross-sections with moderate impact to existing bridge closure, or closure to traffic during shifting of traffic between construction stages and no detour bridge provided
2	Widest cross-sections with most impact to existing bridge closure
1	No detour bridge provided for rehabilitation bridge alternatives; bridge is closed for entire construction period

E.2 Construction Time

Criterion

Minimize construction time.

Measure

Estimated months of construction time, defined as starting with construction mobilization, and ending with the opening of the completed project.

Method

The following assumptions were made:

- Alignments located away from the existing bridge take less construction time, due to the potential for less interference with existing traffic.
- Staged construction areas and traffic flow modifications require more time to construct than alternatives not affecting existing bridge traffic.
- Narrow bridges require less time to build than wider sections.
- Due to foundation work, rehabilitated bridge alternatives with a Phase II seismic upgrade have longer construction times than Phase I only seismic upgrades.

The following scoring scale was used in the analysis:

Score	Description
5	Less than 24 months
4	24 to 30 months
3	31 to 38 months
2	39 to 44 months
1	More than 44 months

E.3 Travel Impacts

Criterion

Minimize travel impacts during construction.

Measure

Length of detour route during construction for all modes.

Method

The following assumptions were made:

- No travel impacts would occur (a bridge would remain open to traffic during construction) under all bridge replacement alternatives and for rehabilitation options with a detour bridge.
- Travel impacts would occur if the existing bridge were rehabilitated with no detour bridge provided.

The following scoring scale was used in the analysis:

Score	Description
5	Bridge is replaced, or a detour bridge is provided for a rehabilitated bridge
1	Bridge is rehabilitated with no detour bridge provided

F. Cost and Economic Impacts

F.1 Life Cycle Cost

Criterion

Minimize life cycle cost.

Measure

Cost of design, construction, right-of-way acquisition, and maintenance in year of construction dollars.

Method

This is a quantitative criterion. Cost estimates were separated by three distinguishing features: bridge alignment; cross-section width; and bridge construction type (rehabilitation or replacement). Cost estimates were developed based on June 2007 costs for conceptual level layout design. They include an escalation factor to report costs in year 2012 dollars. The cost model used for this analysis relies on quantity estimates for major construction items such as pavement, retaining walls, and structures. The replacement alternatives were assumed to be concrete segmental construction. This assumption reflects a moderate cost bridge type and does not represent costs of a signature (cable-stayed or arch) structure. Costs for other items are estimated as a percentage or lump sum value. Right of way acquisition costs were estimated based on market values established by the County Tax Assessor. Cost contingencies were added to reflect relocation expenses based on average reported costs for similar projects. Additional contingency costs were identified to reflect potential cure or damage items for partial acquisition properties.

The methodology to develop cost estimates for each alternative is documented in Attachment C.

G. Natural Environment

G.1 Floodplain Impacts

Criterion

Minimize impacts to the floodplain, and meet Oregon Transportation Investment Act (OTIA) III floodplain/fluviol standards to the greatest extent practical.

Measure

Cubic yards of fill encroachment in 100-year floodplain.

Method

Fill material within a floodplain reduces the amount of storage during flood events by increasing fill material within the 100-year floodplain, and negatively affects the 100-year floodplain elevation.

This is a quantitative criterion. Floodplain impacts were identified by determining the existing amount of fill and calculating the new amount of fill (in cubic yards) inside the 100-year floodplain boundary for each alternative. The net amount of new fill for each alternative was calculated as follows:

$$(\text{Proposed alternative's amount of fill in 100-year floodplain}) - (\text{existing amount of fill in 100-year floodplain}) = \text{net amount of new fill}$$

The 100-year floodplain boundary (34.5 feet) was determined using 2004 Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRM maps).

G.2 Fish Species and Habitat**Criterion**

Maximize benefits to threatened and endangered fish species and other fish habitat and minimize impacts.

Measure

Qualitative scale of pier encroachment in the floodway (ordinary high water level).

Method

The potential impacts to endangered fish species and other fish habitat vary by magnitude and duration, depending upon the alternative, and may be positive or negative.

Fish species and habitat impacts were determined for each alternative by calculating the cubic yards of bridge pier encroachment in the Willamette River floodway (at and below the ordinary high water level). Straight replacement bridge alternatives were assumed to have more design flexibility, and therefore the opportunity for clear spanning the river, reducing or eliminating the number of piers in the river.

The following scoring scale was used in the analysis:

Score	Description
5	Alternative will have no piers in the Willamette River
4	Opportunity to span the Willamette River with no piers
3	Limited opportunity to span the Willamette River with no piers
2	Modification to existing piers in the Willamette River (same number of piers as the existing bridge)
1	More piers in the Willamette River than the existing bridge

G.3 Terrestrial Species**Criterion**

Maximize benefits to threatened and endangered terrestrial species and minimize impacts.

Measure

Qualitative scale considering net change in amount of impervious surface.

Method

The total potential impacts to threatened and endangered terrestrial species are assumed to vary by type, magnitude, and duration of impact, depending upon the alternative, and may be positive or negative.

Terrestrial species impacts were determined for each alternative by calculating the existing amount of impervious surface area and calculating the new surface area for each alternative. The net amount of new impervious surface for each alternative was calculated as follows:

$$(\text{Proposed alternative's impervious surface area}) - (\text{existing amount of impervious surface area}) = \text{net amount of impervious surface}$$

A description of the scoring is as follows:

Score	Description
5	Net decrease of more than 5% in impervious surface area
4	Net decrease of zero – 5% in impervious surface area
3	Net increase of zero – 10% in impervious surface area
2	Net increase of 11 – 25% in impervious surface area
1	Net increase more than 25% in impervious surface area

G.4 Wildlife Habitat**Criterion**

Maximize benefits to wildlife habitat and minimize impacts.

Measure

Qualitative scale considering area of lost wildlife habitat.

Method

The potential impacts to wildlife habitat would vary by type, magnitude, and duration, depending upon the alternative, and may be positive or negative.

Wildlife habitat area was defined as vegetated and unvegetated terrestrial habitat. GIS, aerial photographs, and alternative footprint alignments were used to calculate the existing wildlife habitat area and the new wildlife habitat area for each alternative. The net amount of new wildlife habitat for each alternative was calculated as follows:

$$(\text{Proposed alternative's wildlife habitat area}) - (\text{existing amount of wildlife habitat}) = \text{net amount of wildlife habitat}$$

The following scoring scale was used in the analysis:

Score	Description
5	Net increase of more than 5% in terrestrial habitat acreage (potentially vegetated area)

Score	Description
4	Net increase of zero - 5% in terrestrial habitat acreage (potentially vegetated area)
3	Net decrease of zero - 10% in terrestrial habitat acreage (potentially vegetated area)
2	Net decrease of 11 – 25% in terrestrial habitat acreage (potentially vegetated area)
1	Net decrease of more than 25% in terrestrial habitat acreage (potentially vegetated area)

Potential short-term construction related impacts were not evaluated, except for alternatives where a detour bridge would be constructed. For these alternatives, the presence of the detour bridge was considered. See Attachment D.

G.5 Riparian and Trees

Criterion

Maximize benefits to riparian areas and minimize tree loss.

Measure

Qualitative scale of riparian habitat lost.

Method

The potential impacts to riparian habitat are expected to vary by type, magnitude, and duration of impact, depending upon the alternative. Impacts may be positive or negative.

Riparian habitat was defined as all areas at or below the elevation of 34.5 feet (100-year floodplain elevation). Riparian habitat impacts were determined for each alternative using GIS, aerial photographs, and the alternative footprint alignments to calculate the existing amount of riparian habitat and the new riparian habitat area for each alternative. The net amount of riparian habitat was calculated for each alternative:

$$(\text{Proposed alternative's riparian habitat area}) - (\text{existing amount of riparian habitat}) = \text{net amount of riparian habitat}$$

The following scoring scale was used in the analysis:

Score	Description
5	Net increase of more than 5% in riparian habitat
4	Net increase of zero - 5% in riparian habitat
3	Net decrease of zero - 10% in riparian habitat
2	Net decrease of 11 - 25% in riparian habitat
1	Net decrease of more than 25% in riparian habitat

Potential short-term construction related impacts were not evaluated, except for alternatives where a detour bridge would be constructed. For these alternatives, the presence of the detour bridge was considered. See Attachment D.

G.6 Air Quality

Criterion

Maximize benefits to air quality and minimize air quality impacts.

Measure

Number of intersections along major collectors or arterials within the study area where the primary approach exceeds a volume-to-capacity (v/c) ratio of 0.9 during the p.m. peak 2-hour period.

Method

Degradation in air quality often results when substantial traffic congestion occurs. Substantial traffic congestion can occur when the travel demand at an intersection exceeds 90 percent of the intersection's carrying capacity (volume-to-capacity ratio of 0.9).

Output from the City of Portland's Office of Transportation's traffic analysis model for Year 2035 was used to determine the number of intersections along Tacoma Street from Highway 43 to SE 17th Avenue, and the Highway 43/Taylor's Ferry intersection that have at least one major approach exceeding a v/c ratio of 0.9 during the p.m. peak 2-hour period.

The traffic analysis output concluded that all alternatives had the same number of intersections with at least one major approach exceeding a v/c of 0.9 during the p.m. peak 2-hour period. Therefore, all alternatives were assigned the same score (score of 3).

G.7 Recreational Fishing

Criterion

Preserve recreational fishing and maintain instream structure and cover.

Measure

Location and square feet of instream structure and cover loss.

Method

The potential impacts to riparian habitat would vary by type, magnitude, and duration, depending upon the alternative, and may be positive or negative. Instream structures can create localized change in channel morphology, provide habitat, prevent stream bank erosion by redirecting the force of the water, and create habitat in the form of pools and instream cover.

Recreational fishing impacts were determined for each alternative by calculating the existing location and amount of instream structure and cover and calculating the new instream structure and cover. The net amount of instream structure and cover for each alternative was determined as follows:

$$(\text{Proposed alternative's instream structure and cover}) - (\text{existing amount of instream structure and cover}) = \text{net amount of instream structure and cover}$$

The following scoring scale was used in the analysis:

Score	Description
5	Net increase more than 5% in instream structure and cover
4	Net increase of zero - 5% in instream structure and cover

Score	Description
3	Net decrease of zero - 10% in instream structure and cover
2	Net decrease of 11 - 25% in instream structure and cover
1	Net decrease of more than 25% in instream structure and cover

Potential short-term construction related impacts were not evaluated, except for alternatives where a detour bridge would be constructed. For these alternatives, the presence of the detour bridge was considered. See Attachment D.

H. Material Use

H.1 Material Use

Criterion

Maximize use of materials from the existing bridge.

Measure

Qualitative scale of obtaining materials from the existing bridge.

Method

Reuse of existing materials was determined based on the replacement or rehabilitation of the existing bridge. Reuse of material from the existing bridge would occur in the rehabilitated bridge alternatives, the double-truss replacement alternatives, or the alternatives that use existing bridge as a pedestrian and bicycle facility. Alternatives that would build a new bridge structure without using the existing bridge would not use existing material. A description of the scoring is as follows:

Score	Description
3	Some existing material can be reused in the new bridge
1	Existing material will not be incorporated in the new bridge

I. Mass Transit

I.1 Mass Transit Reliability

Criterion

Increase mass transit reliability.

Measure

A qualitative scale considering mass transit travel times, based on the ability to provide dedicated mass transit facilities or operational priority for mass transit, and/or the ability to reduce overall hours of delay.

Method

Mass transit reliability is a factor of the ability to provide dedicated transit facilities on the bridge (transit-only lanes) and/or overall levels of congestion (measured as VHD) for the

bridge and connecting major roadways, such as Highway 43, Tacoma Street, and Taylors Ferry Road. A congested roadway network was assumed to negatively affect transit reliability.

The City of Portland Office of Transportation's Year 2035 traffic analysis model concluded highly congestion conditions (VHD) for all two-lane, three-lane, and four-lane alternatives.

Because the traffic analysis model concluded that all alternatives (two-lane, three-lane, and four-lane) operate at highly congested conditions, the primary differentiator for transit reliability between alternatives is the presence of transit-only lanes for transit to bypass congested the conditions in the general-purpose lanes.

The following scoring scale was used in the analysis:

Score	Description
3	Alternative includes a transit only lane(s)
1	Alternative does not include a transit only lane(s)

1.2 Accommodate Future Transit

Criterion

Accommodate future streetcar or express transit alternatives.

Measure

Quantitative score considering number of lanes and interchange geometrics.

Method

The ability of each alternative to accommodate future streetcar or express transit was evaluated using two sub-criteria: the number of travel lanes (general purpose or transit dedicated), and the geometry of the alignment and the interchange at each bridgehead.

The following scoring scale was used in the analysis:

- *Number of Lanes* – Alternatives with more travel lanes were assumed to have more flexibility and better able to accommodate future transit than alternatives with fewer travel lanes. The scoring for this sub-criterion is as follows:

Score	Description
5	4-lane cross-section
3	3-lane cross-section
1	2-lane cross-section

- *Geometrics/Interchange* – A signalized intersection better accommodates future transit because signal prioritization for transit could be used and because a streetcar could not merge into a roundabout without signalization of the roundabout. The scoring for this sub-criterion is as follows:

Score	Description
5	Signalized intersection
1	Roundabout

The final score for the alternatives was the average of the two sub-criteria scores:

$$[(\text{Number of Lanes Score}) + (\text{Geometrics/Interchange Type Score})]/2 = \text{Final Score for Future Transit Accommodation}$$

1.3 Cohabitation of Modes

Criterion

Ensure efficient cohabitation of mass transit and auto/truck traffic.

Measure

Qualitative scale considering presence of dedicated bus pullouts, mass transit stops, and transfer points.

Method

The cohabitation of auto/truck and mass transit traffic is enhanced through the incorporation of elements that allow for bus pullouts, dedicated stops, and transfer points while still providing mobility of non-transit traffic.

The cohabitation of modes was evaluated using two sub-criteria: opportunity for dedicated bus pullouts/stops; and opportunity for transfer points. The following scoring scale was used in the analysis:

- Dedicated bus pullouts/stops – the ability of an alternative to incorporate bus pullouts and transit stops is greater with more travel lanes. The geometric design of a signalized intersection on the west end would provide more opportunity for pullouts at the intersection compared to the geometric design of a roundabout. For the roundabout alternatives, the presence of bus stops and pullouts would not be confined to the roundabout area. For the signalized intersection alternatives, the presence of bus stops and pullouts corresponds with pedestrian and vehicular movements at the intersection area.

Score	Description
5	Widest cross-section with the most potential for dedicated pullouts in the intersection area on the west end of the bridge
3	Wide cross-section with the most potential for dedicated pullouts in the intersection area on the west end of the bridge; or widest cross-section with limited potential for dedicated pullouts on the west end of the bridge
2	Narrow cross-section with the most potential for dedicated pullouts in the intersection area on the west end of the bridge
1	Narrow cross-section with limited potential for dedicated pullouts in the intersection area on the west end of the bridge

- Transfer Points – Transfer points would be maximized with all modes (mass transit, vehicular traffic, bicyclists, and pedestrians) on the same bridge deck because this

minimizes the travel time for bicyclists and pedestrians to access transit stops or stations. Bicycle and pedestrian facilities on a separate bridge deck increases this travel time, decreasing the ease of transfers. Bicycle and pedestrian facilities on a separate bridge structure provides the least opportunity for transfer points.

Score	Description
5	Greatest ease of transfers
3	Moderate ease of transfers
1	Least ease of transfers

The final score for the alternatives was the average of the two sub-criteria scores:

$$[(\text{Dedicated Bus Pullouts/Stops Score}) + (\text{Transfer Points Score})] / 2 = \text{Final Score for Cohabitation of Modes}$$

1.4 Transit Connectivity

Criterion

Ensure effective transit connectivity.

Measure

Qualitative scale considering connectivity of all transit modes.

Method

Transit connectivity relies on co-location of mass-transit facilities and the connection of those facilities with other modes.

Alternatives were evaluated based on their ability to ensure connectivity between mass transit and bicycle and pedestrian facilities. A roundabout was assumed to be less effective for transit connectivity than a signalized intersection due to the number of at-grade lane crossings required by bicyclists and pedestrians. A description of the scoring is as follows:

Score	Description
5	Bicycle/pedestrian ramps directly connect transit on the bridge with proposed streetcar route below bridge
4	Bicycle/pedestrian ramps connect transit on the bridge with proposed streetcar route below bridge
3	Bicycle/pedestrian ramps connect transit on the bridge with proposed streetcar route below bridge, but the bicycle and pedestrian connection is less desirable due to the roundabout
2	Transit on the bridge, and bicycle and pedestrian facilities are separated, which is not as desirable for transit connectivity
1	Transit on the bridge, and bicycle and pedestrian facilities are separated, which is not as desirable for transit connectivity, and the connection is less desirable due to the roundabout

J. Seismic

J.1 Earthquake Damage

Criterion

Minimize loss of life, loss of property, and damages from an earthquake.

Measure

Qualitative scale considering the ability of the bridge to resist a moderate earthquake.

Method

A rehabilitated bridge would receive either a Phase I² seismic retrofit or a Phase I and a more extensive Phase II³ seismic retrofit. However, a Phase I and Phase II seismic retrofit of the existing bridge provides less effective protection from an earthquake construction of a new bridge. A new bridge would be designed to current seismic code without the constraints of the existing bridge's design. For information on Seismic Design, including information on Phase I and Phase II retrofit design, see the *Sellwood Bridge Seismic Design Technical Memorandum* (February, 2007).

Alternatives were evaluated based on design constraints (the type of bridge construction – replacement or rehabilitation) and type of seismic upgrade (Phase I or Phase I/Phase II).

The following scoring scale was used in the analysis:

Score	Description
5	New bridge designed to current seismic code
4	New bridge designed to current seismic code with some constraints associated with the double truss design
3	Rehabilitated bridge with Phase I and II seismic retrofits
2	Rehabilitated bridge with Phase I seismic retrofit only

² Low cost retrofit option aimed at keeping beams remaining on supports.

³ A higher cost retrofit option aimed at preserving the bridge structure and protecting the investment.

**Attachment A:
Raw Scores for All Criteria**

Preliminary Screening of Alternatives

Concept Number	Concept	Description	Criteria Category																			Constructor		
			Aesthetics			Bike and Pedestrian		Community Quality of Life										Automobile, Freight, and Emergency Services					Minimize Closure Time	Minimize Construction Time
			Flexibility - Bridge Design	Views from Bridge	Views from Community	Bike/Ped Safety	Convenient Direct Connections	Noise Impacts	Through Traffic Intrusion	Recreational Impacts	Historic / Archaeological Resources	Residential Relocations	Residential Impacts	Business Relocations	Business Impacts	Plan Consistency	Minimize Delay	Improve Accessibility	Minimize Incidents Impacts	Accommodate Trucks	Future Needs	Open During Maintenance		
BLUE SIGNALIZED																								
1	A'	2-lane 53-foot wide	5	4	4	2.5	3.5	4	4	5	3	50	1	9	3	5	3	1	28	28	1	28	4	3
2	C	2-lane 64-foot wide	4	4	4	4	4.5	4	4	5	3	50	1	10	3	5	3	1	37	37	2	37	3	3
3	C'	2-lane 68-foot wide	4	4	4	4.5	4	4	4	5	3	50	1	10	3	5	3	1	37	37	3	37	3	3
4	D	2-lane/2-lane transit 75-foot wide	3	4	3	3	4	4	4	5	3	51	1	10	2	3	3	1.5	48	48	4	48	2	2
5	E	4-lane 77-foot wide	3	4	3	1	3.5	4	2	5	3	51	1	10	2	1	3	3	58	58	4	58	2	2
6	F	3-lane 88-foot wide	3	4	3	4.5	4	4	2	5	3	51	1	10	2	1	3	2	49	49	5	49	2	2
7	K	4-lane 57-foot wide; bike/ped below	2	2	3	3	4.5	5	2	5	3	50	1	10	3	1	3	3	54	54	4	54	2	2
PURPLE SIGNALIZED																								
8	A'	2-lane 53-foot wide	5	4	4	2.5	4	3	4	5	3	12	0	8	4	5	3	1	28	28	1	28	4	3
9	C	2-lane 64-foot wide	4	4	4	4	5	3	4	5	3	12	0	8	4	5	3	1	37	37	2	37	3	3
10	C'	2-lane 68-foot wide	4	4	4	4.5	4.5	3	4	5	3	12	0	8	4	5	3	1	37	37	3	37	3	3
11	D	2-lane/2-lane transit 75-foot wide	3	4	3	3	4.5	3	4	5	3	12	0	8	3	3	3	1.5	48	48	4	48	2	2
12	E	4-lane 77-foot wide	3	4	3	1	4	3	2	5	3	12	0	8	3	1	3	3	58	58	4	58	2	2
13	F	3-lane 88-foot wide	3	4	3	4.5	4.5	3	2	5	3	12	0	8	3	1	3	2	49	49	5	49	2	2
14	K	4-lane 57-foot wide; bike/ped below	2	2	3	3	5	3	2	5	3	12	0	8	4	1	3	3	54	54	4	54	2	2
YELLOW SIGNALIZED, CENTER REHABILITATION																								
15	A	2-lane 53-foot wide	1	4	4	3	3.5	1	4	5	3.5	1	54	7	4	5	3	1	28	28	1	28	1	4
16	A with detour bridge	2-lane 53-foot wide	1	4	4	3	3.5	1	4	4	3.5	7	54	10	4	5	3	1	28	28	1	28	5	4
17	A with Phase 2 seismic	2-lane 53-foot wide	1	4	4	3	3.5	1	4	5	3.5	1	54	7	4	5	3	1	28	28	1	28	1	3
18	A with detour bridge and Phase 2 seismic	2-lane 53-foot wide	1	4	4	3	3.5	1	4	4	3.5	7	54	10	4	5	3	1	28	28	1	28	5	3
19	I	2-lane 31-foot wide; bike/ped below	1	2	3	1.5	4.5	1	4	5	3.5	1	44	7	4	5	3	1	28	28	1	28	1	4
20	I with detour bridge	2-lane 31-foot wide; bike/ped below	1	2	3	1.5	4.5	1	4	4	3.5	7	44	10	4	5	3	1	28	28	1	28	5	4
21	I with Phase 2 seismic	2-lane 31-foot wide; bike/ped below	1	2	3	1.5	4.5	1	4	5	3.5	1	44	7	4	5	3	1	28	28	1	28	1	3
22	I with detour bridge and Phase 2 seismic	2-lane 31-foot wide; bike/ped below	1	2	3	1.5	4.5	1	4	4	3.5	7	44	10	4	5	3	1	28	28	1	28	5	3
117	L	2-lane 57-foot wide	1	4	4	3	3.5	1	4	5	3.5	1	55	7	4	5	3	1	32	32	1	32	1	4
118	L with detour bridge	2-lane 57-foot wide	1	4	4	3	3.5	1	4	4	3.5	7	55	10	4	5	3	1	32	32	1	32	5	4
119	L with Phase 2 seismic	2-lane 57-foot wide	1	4	4	3	3.5	1	4	5	3.5	1	55	7	4	5	3	1	32	32	1	32	1	3
120	L with detour bridge and Phase 2 seismic	2-lane 57-foot wide	1	4	4	3	3.5	1	4	4	3.5	7	55	10	4	5	3	1	32	32	1	32	5	3
YELLOW SIGNALIZED, WIDEN SOUTH TRUSS, REPLACE																								
23	A'	2-lane 53-foot wide	1	4	4	3	3.5	1	4	5	3.5	12	42	7	4	5	3	1	28	28	1	28	4	3
24	C	2-lane 64-foot wide	1	4	4	4.5	4.5	1	4	5	3.5	12	42	8	4	5	3	1	37	37	2	37	3	3
25	C'	2-lane 68-foot wide	1	4	4	5	4	1	4	5	3.5	12	42	8	4	5	3	1	37	37	3	37	3	2
26	D	2-lane/2-lane transit 75-foot wide	1	4	3	3.5	4	1	4	5	3.5	12	42	8	3	3	3	1.5	48	48	4	48	3	2
27	E	4-lane 77-foot wide	1	4	3	1	3.5	1	2	5	3.5	12	42	8	3	1	3	3	58	58	4	58	3	2
28	F	3-lane 88-foot wide	1	4	3	4.5	4	1	2	5	3.5	12	42	8	3	1	3	2	49	49	5	49	3	2
29	K	4-lane 57-foot wide; bike/ped below	1	2	3	3.5	4.5	1	2	5	3.5	12	42	7	4	1	3	3	54	54	4	54	3	2
YELLOW SIGNALIZED WIDEN SOUTH REPLACEMENT																								
103	A'	2-lane 53-foot wide	5	4	4	3	4	1	4	5	3	12	42	7	4	5	3	1	28	28	1	28	4	4
104	C	2-lane 64-foot wide	4	4	4	4.5	5	1	4	5	3	12	42	8	4	5	3	1	37	37	2	37	3	3
105	C'	2-lane 68-foot wide	4	4	4	5	4.5	1	4	5	3	12	42	8	4	5	3	1	37	37	3	37	3	3
106	D	2-lane/2-lane transit 75-foot wide	3	4	3	3.5	4.5	1	4	5	3	12	42	8	3	3	3	1.5	48	48	4	48	3	2
107	E	4-lane 77-foot wide	3	4	3	1	4	1	2	5	3	12	42	8	3	1	3	3	58	58	4	58	3	2
108	F	3-lane 88-foot wide	3	4	3	4.5	4.5	1	2	5	3	12	42	8	3	1	3	2	49	49	5	49	3	2
109	K	4-lane 57-foot wide; bike/ped below	2	2	3	3.5	3.5	1	2	5	3	12	42	7	4	1	3	3	54	54	4	54	3	2
PINK SIGNALIZED																								
30	A'	2-lane 53-foot wide	3	5	4	2.5	1.5	5	4	2.5	2.5	6	0	56	2	3	3	1	28	28	1	28	5	4
31	C	2-lane 64-foot wide	3	5	4	4	2.5	5	4	2.5	2.5	6	0	56	2	3	3	1	37	37	2	37	4	4
32	C'	2-lane 68-foot wide	3	5	4	4.5	2	5	4	2.5	2.5	6	0	56	2	3	3	1	37	37	3	37	4	4
33	D	2-lane/2-lane transit 75-foot wide	2	5	3	3	2	5	4	2.5	2.5	6	0	56	2	3	3	1.5	48	48	4	48	4	3
34	E	4-lane 77-foot wide	2	5	3	1	1.5	5	2	2.5	2.5	6	0	56	2	1	3	3	58	58	4	58	4	3
35	F	3-lane 88-foot wide	2	5	3	4.5	2	5	2	2.5	2.5	6	0	56	2	1	3	2	49	49	5	49	4	3
36	K	4-lane 57-foot wide; bike/ped below	1	3	3	3	2.5	5	2	2.5	2.5	6	0	56	2	1	3	3	54	54	4	54	4	3
TEAL SIGNALIZED																								
37	A'	2-lane 53-foot wide	4	5	4	2.5	2	5	4	2	2.5	6	0	3	4	3	3	1	28	28	1	28	5	4
38	C	2-lane 64-foot wide	3	5	4	4	3	5	4	2	2.5	6	0	3	4	3	3	1	37	37	2	37	4	4
39	C'	2-lane 68-foot wide	3	5	4	4.5	2.5	5	4	2	2.5	6	0	3	4	3	3	1	37	37	3	37	4	4
40	D	2-lane/2-lane transit 75-foot wide	2	5	3	3	2.5	5	4	2	2.5	6	0	3	3	3	3	1.5	48	48	4	48	4	3
41	E	4-lane 77-foot wide	2	5	3	1	2	5	2	2	2.5	6	0	3	3	1	3	3	58	58	4	58	4	3
42	F	3-lane 88-foot wide	2	5	3	4.5	2.5	5	2	2	2.5	6	0	3	3	1	3	2	49	49	5	49	4	3
43	K	4-lane 57-foot wide; bike/ped below	1	3	3	3	4.5	5	2	2	2.5	6	0	3	4	1	3	3	54	54	4	54	4	3
BLUE ROUNDABOUT																								
44	A'	2-lane 53-foot wide	5	4	5	2.5	2.5	4	4	5	3	50	1	9	3	5	3	1	28	28	1	28	4	3
45	C	2-lane 64-foot wide	4	4	5	4	3.5	4	4	5	3	50	1	10	3	5	3	1	37	37	2	37	3	3
46	C'	2-lane 68-foot wide	4	4	5	4.5	3	4	4	5	3	50	1	10	3	5	3	1	37	37	3	37	3	3
47	D	2-lane/2-lane transit 75-foot wide	3	4	4	3	3	4	4	5	3	51	1	10	2	3	3	1.5	48	48	4	48	2	2
48	E	4-lane 77-foot wide	3	4	4	1	2.5	4	2	5														

Preliminary Screening of Alternatives

Concept Number	Concept	Description	Criteria Category																			Construction			
			Aesthetics			Bike and Pedestrian		Community Quality of Life										Automobile, Freight, and Emergency Services							
			Flexibility - Bridge Design	Views from Bridge	Views from Community	Bike/Ped Safety	Convenient Direct Connections	Noise Impacts	Through Traffic Intrusion	Recreational Impacts	Historic / Archaeological Resources	Residential Relocations	Residential Impacts	Business Relocations	Business Impacts	Plan Consistency	Minimize Delay	Improve Accessibility	Minimize Incidents Impacts	Accommodate Trucks	Future Needs	Open During Maintenance	Minimize Closure Time	Minimize Construction Time	
62	I	2-lane 31-foot wide; bike/ped below	1	2	4	1	3.5	1	4	5	3.5	1	44	7	4	5	3	1	28	28	1	28	1	4	
63	I with detour bridge	2-lane 31-foot wide; bike/ped below	1	2	4	1	3.5	1	4	4	3.5	7	44	10	4	5	3	1	28	28	1	28	5	4	
64	I with Phase 2 seismic	2-lane 31-foot wide; bike/ped below	1	2	4	1	3.5	1	4	5	3.5	1	44	7	4	5	3	1	28	28	1	28	1	3	
65	I with detour bridge and Phase 2 seismic	2-lane 31-foot wide; bike/ped below	1	2	4	1	3.5	1	4	4	3.5	7	44	10	4	5	3	1	28	28	1	28	5	3	
121	L	2-lane 57-foot wide	1	4	5	2.5	2.5	1	4	5	3.5	1	55	7	4	5	3	1	32	32	1	32	1	4	
122	L with detour bridge	2-lane 57-foot wide	1	4	5	2.5	2.5	1	4	4	3.5	7	55	10	4	5	3	1	32	32	1	32	5	4	
123	L with Phase 2 seismic	2-lane 57-foot wide	1	4	5	2.5	2.5	1	4	5	3.5	1	55	7	4	5	3	1	32	32	1	32	1	3	
124	L with detour bridge and Phase 2 seismic	2-lane 57-foot wide	1	4	5	2.5	2.5	1	4	4	3.5	7	55	10	4	5	3	1	32	32	1	32	5	3	
YELLOW ROUNDABOUT, WIDEN SOUTH TRUSS, REPLACE																									
66	A'	2-lane 53-foot wide	1	4	5	2.5	2.5	1	4	5	3.5	12	42	7	4	5	3	1	28	28	1	28	4	3	
67	C	2-lane 64-foot wide	1	4	5	4	3.5	1	4	5	3.5	12	42	8	4	5	3	1	37	37	2	37	3	3	
68	C'	2-lane 68-foot wide	1	4	5	4.5	3	1	4	5	3.5	12	42	8	4	5	3	1	37	37	3	37	3	2	
69	D	2-lane/2-lane transit 75-foot wide	1	4	4	3	3	1	4	5	3.5	12	42	8	3	3	3	1.5	48	48	4	48	3	2	
70	E	4-lane 77-foot wide	1	4	4	1	2.5	1	2	5	3	12	42	8	3	1	3	3	58	58	4	58	3	2	
71	F	3-lane 88-foot wide	1	4	4	4.5	3	1	2	5	3.5	12	42	8	3	1	3	2	49	49	5	49	3	2	
72	K	4-lane 57-foot wide; bike/ped below	1	2	4	3	3.5	1	2	5	3.5	12	42	7	4	1	3	3	54	54	4	54	3	2	
YELLOW, ROUNDABOUT WIDEN SOUTH REPLACEMENT																									
110	A'	2-lane 53-foot wide	5	4	5	2.5	2.5	1	4	5	3	12	42	7	4	5	3	1	28	28	1	28	4	4	
111	C	2-lane 64-foot wide	4	4	5	4	3.5	1	4	5	3	12	42	8	4	5	3	1	37	37	2	37	3	3	
112	C'	2-lane 68-foot wide	4	4	5	4.5	3	1	4	5	3	12	42	8	4	5	3	1	37	37	3	37	3	3	
113	D	2-lane/2-lane transit 75-foot wide	3	4	4	3	3	1	4	5	3	12	42	8	3	3	3	1.5	48	48	4	48	3	2	
114	E	4-lane 77-foot wide	3	4	4	1	2.5	1	2	5	3	12	42	8	3	1	3	3	58	58	4	58	3	2	
115	F	3-lane 88-foot wide	3	4	4	4.5	3	1	2	5	3	12	42	8	3	1	3	2	49	49	5	49	3	2	
116	K	4-lane 57-foot wide; bike/ped below	2	2	4	3	3.5	1	2	5	3	12	42	7	4	1	3	3	54	54	4	54	3	2	
PINK ROUNDABOUT																									
73	A'	2-lane 53-foot wide	3	5	5	3	1.5	5	4	2.5	2.5	6	0	56	2	3	3	1	28	28	1	28	5	4	
74	C	2-lane 64-foot wide	2	5	5	4	2.5	5	4	2.5	2.5	6	0	56	2	3	3	1	37	37	2	37	4	4	
75	C'	2-lane 68-foot wide	2	5	5	4.5	2	5	4	2.5	2.5	6	0	56	2	3	3	1	37	37	3	37	4	4	
76	D	2-lane/2-lane transit 75-foot wide	2	5	4	3.5	2	5	4	2.5	2.5	6	0	56	2	3	3	1.5	48	48	4	48	4	3	
77	E	4-lane 77-foot wide	2	5	4	1	1.5	5	2	2.5	2.5	6	0	56	2	1	3	3	58	58	4	58	4	3	
78	F	3-lane 88-foot wide	2	5	4	4.5	2	5	2	2.5	2.5	6	0	56	2	1	3	2	49	49	5	49	4	3	
79	K	4-lane 57-foot wide; bike/ped below	1	3	4	3	2.5	5	2	2.5	2.5	6	0	56	2	1	3	3	54	54	4	54	4	3	
TEAL ROUNDABOUT																									
80	A'	2-lane 53-foot wide	4	5	5	2.5	1	5	4	2	2.5	6	0	3	3	3	3	1	28	28	1	28	5	4	
81	C	2-lane 64-foot wide	3	5	5	4	2	5	4	2	2.5	6	0	3	3	3	3	1	37	37	2	37	4	4	
82	C'	2-lane 68-foot wide	3	5	5	4.5	1.5	5	4	2	2.5	6	0	3	3	3	3	1	37	37	3	37	4	4	
83	D	2-lane/2-lane transit 75-foot wide	2	5	4	3.5	1.5	5	4	2	2.5	6	0	3	2	3	3	1.5	48	48	4	48	4	3	
84	E	4-lane 77-foot wide	2	5	4	1	1	5	2	2	2.5	6	0	3	2	1	3	3	58	58	4	58	4	3	
85	F	3-lane 88-foot wide	2	5	4	4.5	1.5	5	2	2	2.5	6	0	3	2	1	3	2	49	49	5	49	4	3	
86	K	4-lane 57-foot wide; bike/ped below	1	3	4	2.5	3	5	2	2	2.5	6	0	3	3	1	3	3	54	54	4	54	4	3	
EXISTING BRIDGE BIKE/PED WITH BLUE SIGNAL																									
87	Top of K	4-lane 57-foot wide	1	2	3	3.5	3.5	1	2	1	3.5	50	1	10	3	1	3	3	54	54	4	54	2	1	
88	Top of J	2-lane 39-foot wide	1	2	3	3.5	3.5	1	4	1	3.5	50	1	9	3	1	3	1	36	36	1	36	2	1	
EXISTING BRIDGE BIKE/PED WITH PURPLE SIGNAL																									
89	Top of K	4-lane 57-foot wide	1	3	3	3.5	3.5	1	2	1	3.5	12	0	8	4	1	3	3	54	54	4	54	2	1	
90	Top of J	2-lane 39-foot wide	1	3	3	3.5	3.5	1	4	1	3.5	12	0	8	4	1	3	1	36	36	1	36	2	1	
EXISTING BRIDGE BIKE/PED WITH PINK SIGNAL																									
91	Top of K	4-lane 57-foot wide	1	3	3	3.5	2.5	1	2	1	3	6	0	56	2	1	3	3	54	54	4	54	4	1	
92	Top of J	2-lane 39-foot wide	1	3	3	3.5	2.5	1	4	1	3	6	0	56	2	1	3	1	36	36	1	36	4	1	
EXISTING BRIDGE BIKE/PED WITH TEAL SIGNAL																									
93	Top of K	4-lane 57-foot wide	1	3	3	3.5	3.5	1	2	1	3	6	0	3	4	1	3	3	54	54	4	54	4	1	
94	Top of J	2-lane 39-foot wide	1	3	3	3.5	3.5	1	4	1	3	6	0	3	4	1	3	1	36	36	1	36	4	1	
EXISTING BRIDGE BIKE/PED WITH BLUE ROUNDABOUT																									
95	Top of K	4-lane 57-foot wide	1	2	4	3.5	3.5	1	2	1	3.5	50	1	10	3	1	3	3	54	54	4	54	2	1	
96	Top of J	2-lane 39-foot wide	1	2	4	3.5	3.5	1	4	1	3.5	50	1	9	3	1	3	1	36	36	1	36	2	1	
EXISTING BRIDGE BIKE/PED WITH PURPLE ROUNDABOUT																									
97	Top of K	4-lane 57-foot wide	1	3	4	3.5	3.5	1	2	1	3.5	12	0	8	4	1	3	3	54	54	4	54	2	1	
98	Top of J	2-lane 39-foot wide	1	3	4	3.5	3.5	1	4	1	3.5	12	0	8	4	1	3	1	36	36	1	36	2	1	
EXISTING BRIDGE BIKE/PED WITH PINK ROUNDABOUT																									
99	Top of K	4-lane 57-foot wide	1	3	4	3.5	2.5	1	2	1	3	6	0	56	2	1	3	3	54	54	4	54	4	1	
100	Top of J	2-lane 39-foot wide	1	3	4	3.5	2.5	1	4	1	3	6	0	56	2	1	3	1	36	36	1	36	4	1	
EXISTING BRIDGE BIKE/PED WITH TEAL ROUNDABOUT																									
101	Top of K	4-lane 57-foot wide	1	3	4	3.5	3.5	1	2	1	3	6	0	3	4	1	3	3	54	54	4	54	4	1	
102	Top of J	2-lane 39-foot wide	1	3	4	3.5	3.5	1	4	1	3	6	0	3	4	1	3	1	36	36	1	36	4	1	

SELLWOOD BRIDGE
Project
MULTNOMAH COUNTY

Concept Number	Concept	Criteria Category														
		Cost and Economic Impacts	Natural Environment							Material Use	Mass Transit				Seismic	
			Minimize Travel Impacts During Construction	Minimize Life Cycle Costs	Impacts to Floodplain	Fish Species and Habitat	Terrestrial Species	Wildlife Habitat	Riparian Areas and Tree Loss		Air Quality	Recreational Fishing	Maximize Use of Existing Materials	Increase Transit Reliability		Accommodate Future Streetcar/Express Transit
BLUE SIGNALIZED																
1	A'	5	313,810,257	0	4	2	2	3	3	3	1	1	3	3.5	4	5
2	C	5	337,537,809	0	4	2	2	3	3	3	1	1	3	3.5	4	5
3	C'	5	344,635,543	0	4	2	2	3	3	3	1	1	3	3.5	4	5
4	D	5	340,209,074	0	4	2	2	3	3	3	1	3	5	5	5	5
5	E	5	345,051,045	0	4	2	2	3	3	3	1	1	5	5	4	5
6	F	5	358,345,514	0	4	1	1	3	3	3	1	1	4	4	4	5
7	K	5	348,772,422	0	4	3	3	3	3	3	1	1	5	4	2	5
PURPLE SIGNALIZED																
8	A'	5	279,953,121	0	4	3	3	2	3	3	1	1	3	3.5	4	5
9	C	5	304,939,817	0	4	2	2	2	3	3	1	1	3	3.5	4	5
10	C'	5	312,484,313	0	4	2	2	2	3	3	1	1	3	3.5	4	5
11	D	5	308,877,016	0	4	2	2	2	3	3	1	3	5	5	5	5
12	E	5	313,976,316	0	4	2	2	2	3	3	1	1	5	5	4	5
13	F	5	327,575,302	0	4	1	1	2	3	3	1	1	4	4	4	5
14	K	5	318,091,537	0	4	3	3	2	3	3	1	1	5	4	2	5
YELLOW SIGNALIZED, CENTER REHABILITATION																
15	A	1	266,960,308	0	3	3	2	3	3	3	1	1	3	3.5	4	2
16	A with detour bridge	5	339,546,343	0	3	3	2	3	3	3	1	1	3	3.5	4	2
17	A with Phase 2 seismic	1	323,266,558	0	2	3	2	3	3	3	1	1	3	3.5	4	3
18	A with detour bridge and Phase 2 seismic	5	395,852,593	0	2	3	2	3	3	3	1	1	3	3.5	4	3
19	I	1	260,246,428	0	3	3	3	3	3	3	1	1	3	3.5	2	2
20	I with detour bridge	5	332,832,463	0	3	3	3	3	3	3	1	1	3	3.5	2	2
21	I with Phase 2 seismic	1	316,552,678	0	2	3	3	3	3	3	1	1	3	3.5	2	3
22	I with detour bridge and Phase 2 seismic	5	389,138,713	0	2	3	3	3	3	3	1	1	3	3.5	2	3
117	L	1	270,785,614	0	3	3	2	3	3	3	1	1	3	3.5	4	2
118	L with detour bridge	5	343,371,649	0	3	3	2	3	3	3	1	1	3	3.5	4	2
119	L with Phase 2 seismic	1	327,091,864	0	2	3	2	3	3	3	1	1	3	3.5	4	3
120	L with detour bridge and Phase 2 seismic	5	399,677,899	0	2	3	2	3	3	3	1	1	3	3.5	4	3
YELLOW SIGNALIZED, WIDEN SOUTH TRUSS, REPLACE																
23	A'	5	421,492,881	0	1	2	2	3	3	3	1	1	3	3.5	4	3
24	C	5	390,028,401	0	1	2	2	3	3	3	1	1	3	3.5	4	3
25	C'	5	396,366,387	0	1	2	2	3	3	3	1	1	3	3.5	4	3
26	D	5	392,696,288	0	1	2	2	3	3	3	1	1	5	5	5	3
27	E	5	397,158,384	0	1	2	2	3	3	3	1	1	5	5	4	3
28	F	5	408,840,079	0	1	1	1	3	3	3	1	1	4	4	4	3
29	K	5	393,945,943	0	1	3	3	3	3	3	1	1	5	4	2	3
YELLOW SIGNALIZED WIDEN SOUTH REPLACEMENT																
103	A'	5	348,291,005	0	4	3	3	3	3	3	1	1	3	3.5	4	5
104	C	5	302,473,179	0	4	2	2	3	3	3	1	1	3	3.5	4	5
105	C'	5	309,598,605	0	4	2	2	3	3	3	1	1	3	3.5	4	5
106	D	5	305,220,597	0	4	2	2	3	3	3	1	3	5	5	5	5
107	E	5	310,076,414	0	4	2	2	3	3	3	1	1	5	5	4	5
108	F	5	323,391,654	0	4	2	2	3	3	3	1	1	4	4	4	5
109	K	5	313,659,328	0	4	2	2	3	3	3	1	1	5	4	2	5
PINK SIGNALIZED																
30	A'	5	278,384,010	500	2	2	2	3	3	3	1	1	3	3.5	4	5
31	C	5	303,126,971	500	2	1	1	3	3	3	1	1	3	3.5	4	5
32	C'	5	310,680,223	500	2	1	1	3	3	3	1	1	3	3.5	4	5
33	D	5	309,276,875	500	2	1	1	3	3	3	1	3	5	5	5	5
34	E	5	314,470,052	500	2	1	1	3	3	3	1	1	5	5	4	5
35	F	5	326,949,959	500	2	1	1	3	3	3	1	1	4	4	4	5
36	K	5	316,654,113	500	2	2	2	3	3	3	1	1	5	4	2	5
TEAL SIGNALIZED																
37	A'	5	284,758,573	5277	3	2	2	1	3	3	1	1	3	3.5	4	5
38	C	5	309,422,237	5277	3	1	1	1	3	3	1	1	3	3.5	4	5
39	C'	5	316,909,428	5277	3	1	1	1	3	3	1	1	3	3.5	4	5
40	D	5	315,438,271	5277	3	1	1	1	3	3	1	3	5	5	5	5
41	E	5	320,700,263	5277	3	1	1	1	3	3	1	1	5	5	4	5
42	F	5	333,071,091	5277	3	1	1	1	3	3	1	1	4	4	4	5
43	K	5	325,134,379	5277	3	2	2	1	3	3	1	1	5	4	2	5
BLUE ROUNDABOUT																
44	A'	5	328,782,679	0	4	3	3	3	3	3	1	1	1	3	3	5
45	C	5	349,545,611	0	4	2	2	3	3	3	1	1	1	3	3	5
46	C'	5	355,933,020	0	4	2	2	3	3	3	1	1	1	3	3	5
47	D	5	359,310,488	0	4	2	2	3	3	3	1	3	3	4	4	5
48	E	5	363,565,834	0	4	2	2	3	3	3	1	1	3	4	3	5
49	F	5	369,642,991	0	4	2	2	3	3	3	1	1	2	3	3	5
50	K	5	366,847,052	0	4	2	2	3	3	3	1	1	3	3	1	5
PURPLE ROUNDABOUT																
51	A'	5	295,893,497	0	4	3	3	2	3	3	1	1	1	3	3	5
52	C	5	318,289,253	0	4	2	2	2	3	3	1	1	1	3	3	5
53	C'	5	325,123,424	0	4	2	2	2	3	3	1	1	1	3	3	5
54	D	5	327,077,987	0	4	2	2	2	3	3	1	3	3	4	4	5
55	E	5	331,590,662	0	4	2	2	2	3	3	1	1	3	4	3	5
56	F	5	339,093,374	0	4	2	2	2	3	3	1	1	2	3	3	5
57	K	5	335,265,724	0	4	3	3	2	3	3	1	1	3	3	1	5
YELLOW ROUNDABOUT, CENTER REHABILITATION																
58	A	1	283,498,293	0	3	3	3	3	3	3	1	1	1	3	3	2
59	A with detour bridge	5	356,084,328	0	3	3	3	3	3	3	1	1	1	3	3	2
60	A with Phase 2 seismic	1	339,804,543	0	2	3	3	3	3	3	1	1	1	3	3	3
61	A with detour bridge and Phase 2 seismic	5	412,390,578	0	2	3	3	3	3	3	1	1	1	3	3	3

SELLWOOD BRIDGE
Project
MULTNOMAH COUNTY

Concept Number	Concept	Criteria Category															
		Cost and Economic Impacts	Natural Environment							Material Use	Mass Transit			Seismic			
			Minimize Travel Impacts During Construction	Minimize Life Cycle Costs	Impacts to Floodplain	Fish Species and Habitat	Terrestrial Species	Wildlife Habitat	Riparian Areas and Tree Loss		Air Quality	Recreational Fishing	Maximize Use of Existing Materials		Increase Transit Reliability	Accommodate Future Streetcar/Express Transit	Efficient Auto/Transit Cohabitation
62	I	1	277,610,238	0	3	3	3	3	3	3	3	3	1	1	3	1	2
63	I with detour bridge	5	350,196,273	0	3	3	3	3	3	3	3	3	1	1	3	1	2
64	I with Phase 2 seismic	1	333,916,488	0	2	3	3	3	3	3	3	3	1	1	3	1	3
65	I with detour bridge and Phase 2 seismic	5	406,502,523	0	2	3	3	3	3	3	3	3	1	1	3	1	3
121	L	1	287,323,599	0	3	3	3	3	3	3	3	3	1	1	3	3	2
122	L with detour bridge	5	336,782,796	0	3	3	3	3	3	3	3	3	1	1	3	3	2
123	L with Phase 2 seismic	1	343,629,849	0	2	3	3	3	3	3	3	3	1	1	3	3	3
124	L with detour bridge and Phase 2 seismic	5	416,215,884	0	2	3	3	3	3	3	3	3	1	1	3	3	3
YELLOW ROUNDABOUT, WIDEN SOUTH TRUSS, REPLACE																	
66	A'	5	449,368,454	0	1	3	3	3	3	3	3	3	1	1	3	3	3
67	C	5	403,657,686	0	1	2	2	3	3	3	3	3	1	1	3	3	3
68	C'	5	409,262,247	0	1	2	2	3	3	3	3	3	1	1	3	3	3
69	D	5	412,752,750	0	1	2	2	3	3	3	3	3	3	3	4	4	3
70	E	5	416,616,673	0	1	2	2	3	3	3	3	3	1	3	4	3	3
71	F	5	421,735,941	0	1	2	2	3	3	3	3	3	1	2	3	3	3
72	K	5	413,078,763	0	1	2	2	3	3	3	3	3	1	3	3	1	3
YELLOW, ROUNDABOUT WIDEN SOUTH REPLACEMENT																	
110	A'	5	363,263,427	0	4	3	3	3	3	3	1	1	1	3	3	5	
111	C	5	314,480,980	0	4	2	2	3	3	3	1	1	1	3	3	5	
112	C'	5	320,896,082	0	4	2	2	3	3	3	1	1	1	3	3	5	
113	D	5	324,322,010	0	4	2	2	3	3	3	1	3	3	4	4	5	
114	E	5	328,591,203	0	4	2	2	3	3	3	1	1	3	4	3	5	
115	F	5	334,689,131	0	4	2	2	3	3	3	1	1	2	3	3	5	
116	K	5	331,733,958	0	4	2	2	3	3	3	1	1	3	3	1	5	
PINK ROUNDABOUT																	
73	A'	5	294,035,572	500	3	2	2	3	3	3	1	1	1	3	3	5	
74	C	5	315,758,757	500	3	1	1	3	3	3	1	1	1	3	3	5	
75	C'	5	322,469,089	500	3	1	1	3	3	3	1	1	1	3	3	5	
76	D	5	326,499,935	500	2	1	1	3	3	3	1	3	3	4	4	5	
77	E	5	330,996,983	500	2	1	1	3	3	3	1	1	3	4	3	5	
78	F	5	337,244,106	500	2	1	1	3	3	3	1	1	2	3	3	5	
79	K	5	332,658,722	500	3	2	2	3	3	3	1	1	3	3	1	5	
TEAL ROUNDABOUT																	
80	A'	5	303,324,334	5277	3	2	2	1	3	3	1	1	1	3	3	5	
81	C	5	324,928,693	5277	3	2	2	1	3	3	1	1	1	3	3	5	
82	C'	5	331,563,495	5277	3	1	1	1	3	3	1	1	1	3	3	5	
83	D	5	335,570,795	5277	3	1	1	1	3	3	1	3	3	4	4	5	
84	E	5	340,128,836	5277	3	1	1	1	3	3	1	1	3	4	3	5	
85	F	5	346,230,439	5277	3	1	1	1	3	3	1	1	2	3	3	5	
86	K	5	344,034,762	5277	3	2	2	1	3	3	1	1	3	3	1	5	
EXISTING BRIDGE BIKE/PED WITH BLUE SIGNAL																	
87	Top of K	5	426,108,049	0	2	2	2	3	3	3	3	1	5	4	2	3	
88	Top of J	5	405,608,050	0	2	3	3	3	3	3	3	1	3	3	2	3	
EXISTING BRIDGE BIKE/PED WITH PURPLE SIGNAL																	
89	Top of K	5	387,913,342	0	2	3	3	2	3	3	3	1	5	3.5	2	3	
90	Top of J	5	365,230,552	0	2	3	3	2	3	3	3	1	3	2.5	2	3	
EXISTING BRIDGE BIKE/PED WITH PINK SIGNAL																	
91	Top of K	5	388,282,228	500	2	2	2	3	3	3	3	1	5	4	2	3	
92	Top of J	5	364,986,228	500	2	3	3	3	3	3	3	1	3	3	2	3	
EXISTING BRIDGE BIKE/PED WITH TEAL SIGNAL																	
93	Top of K	5	395,248,080	5277	2	2	2	1	3	3	3	1	5	3	1	3	
94	Top of J	5	370,641,141	5277	2	3	3	1	3	3	3	1	3	2	1	3	
EXISTING BRIDGE BIKE/PED WITH BLUE ROUNDABOUT																	
95	Top of K	5	448,885,992	0	2	2	2	3	3	3	3	1	5	4	1	3	
96	Top of J	5	423,763,239	0	2	3	3	3	3	3	3	1	3	3	1	3	
EXISTING BRIDGE BIKE/PED WITH PURPLE ROUNDABOUT																	
97	Top of K	5	409,771,273	0	2	3	3	2	3	3	3	1	3	3.5	1	3	
98	Top of J	5	384,199,261	0	2	3	3	2	3	3	3	1	1	2.5	1	3	
EXISTING BRIDGE BIKE/PED WITH PINK ROUNDABOUT																	
99	Top of K	5	409,717,569	500	2	2	2	3	3	3	3	1	3	4	1	3	
100	Top of J	5	384,110,193	500	2	3	3	3	3	3	3	1	1	3	1	3	
EXISTING BRIDGE BIKE/PED WITH TEAL ROUNDABOUT																	
101	Top of K	5	419,724,417	5277	2	2	2	1	3	3	3	1	3	3	1	3	
102	Top of J	5	392,806,100	5277	2	3	3	1	3	3	3	1	1	2	1	3	

**Attachment B:
Bicycle and Pedestrian Methodology**



Attachment B: Bicycle and Pedestrian Methodology

Introduction

This memorandum discusses the methodology used for evaluating the bicycle/pedestrian concepts proposed for the Sellwood Bridge Planning Project. The text begins with a description of the evaluation criteria and how they were measured with respect to the walking and bicycling environment. The 96 “concepts” were evaluated from a bicycle/pedestrian *safety* standpoint, and again evaluated separately from a *convenience* standpoint. The concepts each received a range of “points” based on the degree to which they fulfilled the respective safety and convenience criteria. The memo concludes with a description of the methodology used for translating the initial concept scores into an overall scoring system used to evaluate the concepts from other standpoints (e.g. environmental, cost, property impacts, etc.).

Evaluation Criteria and Scores

This section describes criteria that were used for evaluating the bicycle/pedestrian concepts. The criteria were divided into two broad categories, focusing on bicycle/pedestrian *safety*, and *convenient/direct connections* to, from and across the bridge. Within these categories, the criteria were further split into sub-categories reflecting various bridge location and design aspects (e.g., alignment, cross-section, westside interchange, etc.).

A scoring point range was assigned to each criterion (identified in Tables 1 and 2), enabling the Project Team to numerically evaluate the various concepts. Whereas some criteria are easily quantifiable (e.g., bicycle lane width), the Project Team exercised professional judgment in quantifying other criteria (e.g., directness of route). It should be noted that while most criteria include similar point ranges, some criteria were assigned higher point ranges reflecting either a more diverse spectrum of alternatives, or their relatively high importance from a bicycling/walking standpoint.

Safety Criteria

This section discusses evaluation criteria used to measure bicycle and pedestrian safety. The criteria address issues such as bicycle/pedestrian facility width, conflicts with motor vehicles at intersections and interchange areas, and separation between various non-motorized users as well as from motor vehicles. Table 1 identifies the evaluative scores associated with these criteria.

Riverview cemetery access: This criterion measures the number of direct conflict points with motor vehicles as bicyclists and pedestrians pass through the westside interchange/intersection area. The measurement was based on the assumption that non-motorized users would remain on the same side of the interchange/intersection area (e.g., north or south side) as they travel between the bridge and Riverview Cemetery access road (unless a lack of pedestrian/bicycle facilities on one side of the interchange/intersection forces users to divert to the other side to complete the crossing).

Concepts minimizing the number of bicycle/pedestrian/motor vehicle conflict points received higher evaluative scores.

Sidewalk/shared use path width: Some concepts include sidewalks serving pedestrians while others include shared use paths for both pedestrians and bicyclists. Wider facilities provide greater opportunities for accommodating bi-directional traffic, and allocating space for different users (e.g., through pedestrians versus those stopping on the bridge to enjoy views). Generally, wider facilities received higher scores.

Bicycle lane width: Wider bicycle lanes provide additional “shy distance” between bicyclists and adjacent motor vehicles, as well as the adjacent curb. Wider bicycle lanes also enable bicyclists to safely maneuver around drainage grates, glass, and other debris that may be present in the lane. Because relatively small width differences can substantially affect user comfort and safety, greater weight was assigned to this criterion. Overall, wider bicycle lane widths received higher scores.

Number of vehicle travel lanes: This criterion measures the number of vehicle travel lanes provided on the bridge structure. Higher evaluative scores were assigned to concepts with fewer vehicle travel lanes, as a fewer number of lanes tends to correspond with a greater sense of safety and comfort from a non-motorized user’s standpoint.

Outside vehicle travel lane type: This criterion evaluates use of the travel lane adjacent to the bridge’s bicycle/pedestrian facilities. While most concepts include general-purpose lanes, some concepts provide transit-only lanes exclusively for buses, streetcars or other transit vehicles. Compared with general-purpose lanes, transit-only lanes would likely serve lower traffic volumes thereby increasing bicyclist/pedestrian comfort (and potentially increasing safety by decreasing the number of vehicle conflicts with bicyclists/pedestrians). For this reason, concepts with outside transit-only lanes received higher scores.

Degree of separation between differing bicycle/pedestrian users: Because bicyclists and pedestrians generally travel at different speeds, higher evaluative scores were given to concepts providing greater separation between these users. For instance, wide shared use paths supplemented by adjacent bicycle lanes enable recreational bicyclists (who generally travel at slower speeds) to use the shared use facility, and commuter cyclists (who generally travel at higher speeds) to use the bicycle lanes.

Physical separation from motor vehicle traffic: This criterion measures the degree of separation between motorized and non-motorized users. Some concepts include minimal separation in the form of striped bicycle lanes adjacent to vehicle travel lanes. Other concepts include sidewalks/shared use paths physically separated from motorists via vertical setbacks or separate bicycle/pedestrian structures. Concepts providing physical separation between motorized and non-motorized users received higher scores. It should be noted that other criteria (e.g., “sidewalk/shared use path width”) also serve as indicators of physical separation. As a result, this specific criterion includes a shorter point range.

Visibility of bicyclists/pedestrians from other bridge users: This criterion addresses user safety and security concerns, specifically visibility of bicyclists and pedestrians from motorists and other bridge users. This criterion addresses the “eyes on the street” component which is highly valued by non-motorized users. This criterion also addresses whether bicyclists and pedestrians could seek

immediate help from passers-by during emergencies. Correspondingly, concepts providing bicycle/pedestrian facilities adjacent to motor vehicle traffic received higher evaluative scores.

Convenient/Direct Connections Criteria

This section discusses evaluation criteria used to gauge the relative convenience of bicycle/pedestrian facilities in the various concepts. Bicyclists and pedestrians strongly prefer the shortest and most direct routes between their origins and destinations. These criteria address issues such as the presence of non-motorized facilities on one or both sides of interchange/intersection areas, whether facilities accommodate one-way versus two-way bicycle traffic, and whether bicycle/pedestrian facilities follow relatively direct routes and provide logical connections. Table 2 highlights the evaluative scores associated with these criteria.

Access provisions between bridge and Willamette Greenway Trail: This criterion addresses whether access ramps connect the Sellwood Bridge’s west end with the Willamette Greenway Trail and a potential future streetcar alignment (currently in the planning phase by Metro). Most concepts provide access ramps on the north and south sides of the bridge, facilitating easier bridge/trail connections for users on either side of the bridge. Some concepts provide access ramps on one side of the bridge only, which could create convenience issues if bicyclists/pedestrians are forced to follow a circuitous route to reach their desired side of the bridge (safety issues also arise if bicyclists/pedestrians chose to cross at-grade, especially where crossing treatments do not exist). As a result, concepts with access ramps on both sides received higher scores.

Bridge/Willamette Greenway Trail ramp design elements: This criterion evaluates the relative level of convenience provided by the bridge/trail access ramps. This includes estimating the number of tight turns (90-degrees or greater) included on the access ramps. Tight turns, such as 180-degree “switchback” turns, can create difficult maneuvers for bicyclists, pedestrians with strollers, and other users requiring additional space to maneuver through turn areas. Higher evaluative scores were assigned to concepts with fewer numbers of tight access ramp turns.

Bridge/cemetery access road connections (presence of bicycle/pedestrian facilities in westside interchange/intersection area): This criterion addresses the presence of bicycle/pedestrian facilities in the westside interchange/intersection area. Some concepts provide bicycle/pedestrian facilities on the north and south sides of the interchange area, thereby facilitating easy connections between the cemetery and bridge’s north and south sides. As a result, these concepts received higher evaluative scores. Concepts receiving lower scores include those providing bicycle/pedestrian facilities on one side of the interchange/intersection area only, which could lengthen travel distances for users (and create safety issues if bicyclists/pedestrians chose to cross at-grade where crossing treatments do not exist).

Bridge/cemetery access road connections (directness of bicycle/pedestrian facilities through westside interchange/intersection area): This criterion evaluates the directness of bicycle/pedestrian facilities in the westside interchange/intersection area. Specifically, this criterion measures the directness of route for bicyclists/pedestrians traveling between the Riverview Cemetery access road and the Sellwood Bridge’s west end. While the signalized interchange concepts offer a relatively “straight line” travel path between the bridge and cemetery access road, the roundabout concepts require more circuitous travel through the area. Concepts providing more direct access between the bridge and cemetery access road received higher evaluative scores.

Bridge length: This criterion compares the relative bridge lengths for each of the five structure alignment concepts. Bridge alignments for most concepts provide a relatively direct route between the east and west sides of the Willamette River, which correspondingly provide the most direct bicycle/pedestrian routes. Other concepts include more circuitous bridge alignments which would increase user travel distances. Higher scores corresponded with shorter, more direct bridge alignments.

One-way versus two-way bicycle traffic: This criterion addresses whether bicycle facilities on each side of the bridge (north and south sides) accommodate one-way versus two-way bicycle traffic. Facilities accommodating two-way bicycle traffic enable bicyclists to use the most convenient side of the bridge based on their overall desired travel route. Correspondingly, two-way facilities received higher evaluative scores.

Criteria Considered but Not Evaluated

Eastside Connections: The Sellwood Bridge should provide convenient and safe bicycle/pedestrian connections with key eastside routes and destinations, including SE Tacoma Street, the Spokane/Umatilla bicycle boulevards, and the Springwater Corridor Trail. At the time of this evaluation, specific information regarding these connections was not available. As eastside connection concepts are developed, they should be evaluated with respect to bicycle/pedestrian convenience and safety.

Highway 43/Macadam Avenue bus stop access: This criterion would have evaluated the location of TriMet bus stops on Highway 43/Macadam Avenue with respect to safe and convenient bicycle/pedestrian access to and from the Sellwood Bridge. At the time of this evaluation, specific information regarding bus stop locations (e.g., on the Highway 43 mainline versus interchange ramps) was not available. As westside interchange/intersection concepts are further refined, potential bus stop locations should be evaluated with respect to bicycle/pedestrian convenience and safety.

Through bicycle travel on Highway 43/Macadam Avenue: This criterion would have measured the number of direct conflict points with motor vehicles as bicyclists travel through the interchange area on Highway 43/Macadam Avenue. Conflict points include areas where through bicyclists must cross vehicle traffic (at-grade) transitioning between Highway 43/Macadam Avenue and the Sellwood Bridge via interchange on- and off-ramps. All concepts include the same number of conflict points, and would have received the same evaluative scores.

Table 1: Safety Criteria and Scoring System

Category	Criterion	Indicator	Points
Westside Interchange/ Intersection	Riverview cemetery access: Number of direct conflict points with motor vehicles between bridge's west end and cemetery access road (assumes pedestrians/bicyclists would remain on the same side of the street as they pass through the interchange/intersection area unless they are required to divert to the other side due to a lack of ped/bike facilities) ^{1, 2}	3 conflict points	0
		2 conflict points	5
Bridge Cross-Section	Sidewalk/shared use path width ^{3, 4}	8'	5
		10'	10
		12'	15
		14'	20
		16'	25
		20'	35
Bridge Cross-Section	Bicycle lane width ³	5'	5
		6.5'	20
Bridge Cross-Section	Number of vehicle travel lanes	4 lanes	0
		3 lanes	5
		2 lanes	10
		0 lanes ⁵	15
Bridge Cross-Section	Outside vehicle travel lane type	General-purpose lane	0
		Transit-only lane	5
Bridge Cross-Section	Degree of separation between differing bicycle/pedestrian users ³	No separation	0
		Physical separation: Pedestrians/slower-speed bicyclists use sidewalk/shared use path; higher speed bicyclists use bicycle lanes	15
Bridge Cross-Section	Physical separation from motor vehicle traffic	Partial separation (bicycle lanes on bridge)	5
		Full separation	10
User Security	Visibility of bicyclists/pedestrians from other bridge users	Lower visibility: Bicyclists/pedestrians located on separate bridge deck from motorists (e.g., on lower deck or on separate structure)	0
		Higher visibility: Bicyclists/pedestrians adjacent to motorists	20

¹ For concepts where the number of conflict points differs between the north and south sides of the interchange/intersection area, the evaluation was based on the higher number.

² For concepts where the existing Sellwood Bridge is converted to a bicycle/pedestrian bridge, it was assumed that bicyclists/pedestrians would connect with the Willamette Greenway Trail, then pass through the interchange/intersection area associated with the new structure.

³ For concepts with facilities on both sides of the bridge (e.g., sidewalks/shared use paths), points were assigned for the facility on each side, and the respective scores were then added to arrive at a single score. A single score was assigned to concepts with one bicycle/pedestrian facility (e.g., shared use path below the vehicle structure).

⁴ For concepts where the existing Sellwood Bridge is converted to a bicycle/pedestrian bridge, the structure was evaluated as a 27' wide shared use path (23' existing roadway, plus 4' existing sidewalk).

⁵ "Zero" lanes were assumed for concepts serving bicyclists/pedestrians on a separate bridge deck below vehicle traffic, or on an exclusive bicycle/pedestrian bridge.

Table 2: Convenient/Direct Connections Criteria and Scoring System

Category	Criterion	Indicator	Points
Westside interchange/ intersection	Access provisions between bridge and Willamette Greenway Trail: Presence of ramps on the north and/or south sides of the bridge	Access ramp provided on north or south side of bridge only	0
		One access ramp provided for bicycle/pedestrian-only structure ¹	10
		Access ramps provided on north and south sides of bridge	10
Westside interchange/ intersection	Bridge/Willamette Greenway Trail access ramp design elements: Number of 90-degree (or greater) turns on each ramp between bridge and streetcar/Willamette Greenway Trail) ²	5 or more turns	0
		3-4 turns	5
		0-2 turns	10
Westside interchange/ intersection	Connections between bridge and Riverview Cemetery access road: Presence of bicycle/pedestrian facilities on one or both sides of interchange/intersection area ³	Access to cemetery road provided on north or south side of interchange/intersection area only: Some bicyclists/pedestrians must cross traffic at-grade or divert under bridge to reach facilities on other side of interchange/intersection area	0
		Access to cemetery road provided on north and south sides of interchange/intersection area	10
Westside interchange/ intersection	Connections between bridge and Riverview Cemetery access road: Directness of route of bicycle/pedestrian facilities through interchange/intersection area	Circuitous route	0
		Direct route (follows a relatively straight line)	10
Bridge Alignment	Bridge length	Less-direct route between east and west sides of river	0
		Moderately-direct route between east and west sides of river	5
		Direct route between east and west sides of river	10
Bridge Cross-Section	One-way vs. two-way bicycle facilities ^{4, 5, 6}	One-way	0
		Two-way	5

¹ This applies to concepts with a separate bicycle/pedestrian structure either below the vehicle structure, or utilizing the existing Sellwood Bridge as a bicycle/pedestrian-only bridge.

² For concepts where the number of turns differs between the north and south ramps, the evaluation was based on the ramp with the higher number of turns. For concepts including a separate lower-level bicycle/pedestrian structure, the number of turns was reduced by "1" to account for the reduced elevation difference between the bicycle/pedestrian structure and the ground.

³ For concepts with a separate bicycle/pedestrian structure below the vehicle deck, it was assumed that the lower deck would meet the interchange area at the bridge's west end at the same elevation as the upper deck, and connect with bicycle/pedestrian facilities on one or both sides (depending on whether they are provided within the interchange area).

⁴ For concepts with facilities on both sides of the bridge (e.g., sidewalks/shared use paths), points were assigned for the facility on each side, and the respective scores were then added to arrive at a single score.

⁵ Bicycle/pedestrian facilities 10' wide or less were assumed to accommodate one-way bicycle traffic only.

⁶ For concepts accommodating bicyclists/pedestrians on a single separate bridge deck (e.g., located below vehicle traffic, or on a bicycle/pedestrian-only structure), the score was doubled to normalize with other concepts that received two separate scores corresponding with bicycle/pedestrian facilities on each side of the bridge.

Aggregate Scoring System

Discussed earlier, evaluative “scores” were assigned to each criterion based on the type of pedestrian/bicycle facilities provided in each bridge concept. In each of the two main categories (*safety* and *convenience*), individual criterion scores were summed and compared with the total number of possible points.

The total number of possible points represents the combined values of the highest possible score for each criterion. These totals also reflect criteria where individual scores were assigned to bicycle/pedestrian facilities on each side of the Sellwood Bridge (e.g., “sidewalk/shared use path width”).

It should be noted that some criteria do not apply to several concepts (e.g., “bicycle lane width” does not apply to bridge concepts where bicycle lanes are not provided). In these cases, these criteria received a score of “zero”, and the total number of possible points was adjusted to reflect the omission of these criteria. Because the total number of possible points varied by concept, aggregate scores were each expressed as a percentage of the total number of possible points.

The final step in the scoring process involved translating the percentage scores into a “1” through “5” point range reflecting the scoring system used for evaluating other aspects of this project (with “1” reflecting least-desirable concepts and “5” representing most-desirable concepts). For the bicycle/pedestrian evaluation, this point scale was subdivided into 0.5-point increments to account for variations among the numerous concepts. The following process was used to develop final scores for the safety and convenience categories:

- The minimum and maximum percentage scores were identified, and served as the endpoints for the new 1-to-5 point scoring range.
- The original percentage score range was divided into nine equal increments, reflecting the number of possible scores within the new 0.5-point increment scoring range. “1” represented the lowest possible score, and “5” represented the highest possible score.

Evaluation Results

The attached matrix summarizes evaluation results and identifies the 1-to-5 score for each bridge concept with respect to bicycle/pedestrian safety and convenience. From a safety standpoint, the concept receiving the highest score incorporates the following elements:

- The “C-Prime” bridge cross-section, consisting of two vehicle travel lanes, two 6.5-foot wide bicycle lanes, a 20-foot wide shared use path on one side, and an 8-foot wide sidewalk on the other side. The wide shared use path provided in this concept would facilitate easier bi-directional pedestrian/bicycle traffic, and could reduce conflicts between multiple users. A bicycle lane would accommodate all cyclists on one side of the bridge (adjacent to the sidewalk), while cyclists could either use a bicycle lane or the shared use path on the other side. This cross-section provides some separation between motorized and non-motorized bridge traffic, and provides visibility of bicyclists and pedestrians from other bridge users.
- A signalized intersection with the Highway 43/Macadam Avenue ramps at the bridge’s west end. The signalized intersection minimizes the number of direct vehicle-bicycle/pedestrian conflict points.
- The “Yellow” bridge alignment, located roughly on the existing Sellwood Bridge alignment.

Other concepts receiving relatively high evaluative scores from a safety standpoint also integrate the “C-Prime” bridge cross-section; alignments relatively close to the existing bridge; and a signalized intersection at the bridge’s west end.

From a convenience standpoint, the concept receiving the highest evaluative score incorporates the following elements:

- The “C” and “K” bridge cross-sections. The “C” cross-section provides two vehicle travel lanes, two 6.5-foot wide bicycle lanes, and two 12-foot wide shared use paths. The relatively wide shared use paths in this concept could each accommodate two-way bicycle traffic, enabling cyclists to use the most convenient side of the bridge based on their desired travel path. Cyclists could also use bicycle lanes or shared use paths, depending on their level of experience, comfort or other factors informing their decision. The “K” cross-section serves bicyclists and pedestrians on a separate structure below the vehicle deck. This concept provides a 20-foot wide shared use path below four vehicle travel lanes.
- A signalized intersection with the Highway 43/Macadam Avenue ramps at the bridge’s west end. The signalized intersection concept provides the most direct route for users traveling between the Sellwood Bridge and the Riverview Cemetery access road.
- The “Purple” bridge alignment, located immediately south of the existing Sellwood Bridge. This alignment would provide a relatively direct path between the east and west sides of the Willamette River. This concept also provides access ramps to the Willamette Greenway Trail/future streetcar from both sides of the bridge, with the fewest number of tight-turns on the ramps. This alignment also provides bicycle/pedestrian facilities on both sides of the street through the westside intersection area, eliminating out-of-direction travel for foot and bicycle traffic.

Other concepts receiving relatively high evaluative scores from a convenience standpoint integrate the “C”, “C-Prime”, “D”, and “I” bridge cross-sections; alignments relatively close to the existing bridge; and a signalized intersection at the bridge’s west end.

Preliminary Screening of Alternatives



	Concept	Cost and Economic Impacts			
		Minimize Life Cycle Costs			
		Construction Cost (In 2007 Dollars)	75 Year Maintenance Cost (In 2007 Dollars)	TOTAL LIFE CYCLE COST (In 2007 Dollars)	TOTAL LIFE CYCLE COST (In 2012 Dollars)
Blue Signalized					
1	A'	\$234,849,000	\$4,095,000	\$238,944,000	\$313,810,000
2	C	\$252,644,000	\$5,248,000	\$257,892,000	\$337,538,000
3	C'	\$258,288,000	\$5,248,000	\$263,536,000	\$344,636,000
4	D	\$254,528,000	\$5,416,000	\$259,944,000	\$340,209,000
5	E	\$257,350,000	\$6,506,000	\$263,856,000	\$345,051,000
6	F	\$268,403,000	\$6,040,000	\$274,443,000	\$358,346,000
7	K	\$260,910,000	\$6,070,000	\$266,980,000	\$348,772,000
Purple Signalized					
8	A'	\$214,132,000	\$4,176,000	\$218,307,000	\$279,953,000
9	C	\$232,916,000	\$5,353,000	\$238,269,000	\$304,940,000
10	C'	\$238,920,000	\$5,353,000	\$244,274,000	\$312,484,000
11	D	\$235,789,000	\$5,554,000	\$241,343,000	\$308,877,000
12	E	\$238,791,000	\$6,672,000	\$245,463,000	\$313,976,000
13	F	\$250,113,000	\$6,180,000	\$256,294,000	\$327,575,000
14	K	\$242,666,000	\$6,224,000	\$248,890,000	\$318,092,000
Yellow Signalized, Center					
15	A	\$192,178,000	\$19,419,000	\$211,598,000	\$266,960,000
16	A with detour bridge	\$247,111,000	\$19,419,000	\$266,531,000	\$339,546,000
17	A with Phase 2 seismic	\$237,223,000	\$19,419,000	\$256,643,000	\$323,267,000
18	A with detour bridge and Phase 2 seismic	\$292,156,000	\$19,419,000	\$311,576,000	\$395,853,000
19	I	\$187,292,000	\$19,419,000	\$206,711,000	\$260,246,000
20	I with detour bridge	\$242,224,000	\$19,419,000	\$261,644,000	\$332,832,000
21	I with Phase 2 seismic	\$232,337,000	\$19,419,000	\$251,756,000	\$316,553,000
22	I with detour bridge and Phase 2 seismic	\$287,269,000	\$19,419,000	\$306,689,000	\$389,139,000
23	L	\$195,151,000	\$19,419,000	\$214,570,000	\$270,786,000
24	L with detour bridge	\$250,083,000	\$19,419,000	\$269,503,000	\$343,372,000
25	L with Phase 2 seismic	\$240,196,000	\$19,419,000	\$259,615,000	\$327,092,000
26	L with detour bridge and Phase 2 seismic	\$295,128,000	\$19,419,000	\$314,548,000	\$399,678,000
Yellow Signalized, Widen South Rehab					
27	A'	\$290,601,000	\$39,531,000	\$330,132,000	\$421,493,000
28	C	\$267,365,000	\$40,683,000	\$308,048,000	\$390,028,000
29	C'	\$272,397,000	\$40,683,000	\$313,079,000	\$396,366,000
30	D	\$269,232,000	\$40,852,000	\$310,084,000	\$392,696,000
31	E	\$271,748,000	\$41,941,000	\$313,689,000	\$397,158,000
32	F	\$281,507,000	\$41,475,000	\$322,982,000	\$408,840,000
33	K	\$269,786,000	\$41,505,000	\$311,291,000	\$393,946,000
Yellow Signalized, Widen South Replacement					
34	A'	\$265,689,000	\$4,095,000	\$269,784,000	\$348,291,000
35	C	\$230,970,000	\$5,248,000	\$236,218,000	\$302,473,000
36	C'	\$236,632,000	\$5,248,000	\$241,879,000	\$309,599,000
37	D	\$232,901,000	\$5,416,000	\$238,318,000	\$305,221,000
38	E	\$235,732,000	\$6,506,000	\$242,238,000	\$310,076,000
39	F	\$246,798,000	\$6,040,000	\$252,838,000	\$323,392,000
40	K	\$239,206,000	\$6,070,000	\$245,276,000	\$313,659,000
Pink Signalized					
41	A'	\$212,529,000	\$4,354,000	\$216,883,000	\$278,384,000
42	C	\$230,897,000	\$5,593,000	\$236,491,000	\$303,127,000
43	C'	\$236,849,000	\$5,593,000	\$242,443,000	\$310,680,000
44	D	\$235,264,000	\$5,914,000	\$241,178,000	\$309,277,000
45	E	\$238,240,000	\$7,107,000	\$245,347,000	\$314,470,000
46	F	\$248,704,000	\$6,529,000	\$255,234,000	\$326,950,000
47	K	\$240,893,000	\$6,630,000	\$247,523,000	\$316,654,000
Teal Signalized					
48	A'	\$218,708,000	\$4,601,000	\$223,309,000	\$284,759,000
49	C	\$237,138,000	\$5,919,000	\$243,057,000	\$309,422,000
50	C'	\$243,110,000	\$5,919,000	\$249,029,000	\$316,909,000
51	D	\$241,514,000	\$6,327,000	\$247,841,000	\$315,438,000
52	E	\$244,500,000	\$7,606,000	\$252,106,000	\$320,700,000
53	F	\$255,002,000	\$6,954,000	\$261,957,000	\$333,071,000
54	K	\$248,622,000	\$7,095,000	\$255,717,000	\$325,134,000
Blue Roundabout					
55	A'	\$244,392,000	\$6,659,000	\$251,051,000	\$328,783,000
56	C	\$260,056,000	\$7,558,000	\$267,614,000	\$349,546,000
57	C'	\$265,133,000	\$7,558,000	\$272,690,000	\$355,933,000
58	D	\$267,197,000	\$8,167,000	\$275,364,000	\$359,310,000
59	E	\$269,735,000	\$9,062,000	\$278,796,000	\$363,566,000
60	F	\$275,247,000	\$8,350,000	\$283,597,000	\$369,643,000
61	K	\$272,868,000	\$8,704,000	\$281,572,000	\$366,847,000
Purple Roundabout					
62	A'	\$224,614,000	\$6,566,000	\$231,180,000	\$295,893,000
63	C	\$241,552,000	\$7,506,000	\$249,058,000	\$318,289,000
64	C'	\$246,988,000	\$7,506,000	\$254,493,000	\$325,123,000
65	D	\$247,977,000	\$8,053,000	\$256,029,000	\$327,078,000
66	E	\$250,695,000	\$8,976,000	\$259,670,000	\$331,591,000
67	F	\$257,329,000	\$8,286,000	\$265,614,000	\$339,093,000
68	K	\$254,143,000	\$8,607,000	\$262,749,000	\$335,266,000
Yellow Roundabout, Center					
69	A	\$204,049,000	\$20,852,000	\$224,900,000	\$283,498,000
70	A with detour bridge	\$258,982,000	\$20,852,000	\$279,833,000	\$356,084,000
71	A with Phase 2 seismic	\$249,094,000	\$20,852,000	\$269,945,000	\$339,805,000
72	A with detour bridge and Phase 2 seismic	\$304,027,000	\$20,852,000	\$324,878,000	\$412,391,000
73	I	\$199,823,000	\$20,852,000	\$220,674,000	\$277,610,000
74	I with detour bridge	\$254,755,000	\$20,852,000	\$275,607,000	\$350,196,000
75	I with Phase 2 seismic	\$244,868,000	\$20,852,000	\$265,719,000	\$333,916,000
76	I with detour bridge and Phase 2 seismic	\$299,800,000	\$20,852,000	\$320,652,000	\$406,503,000
77	L	\$207,021,000	\$20,852,000	\$227,873,000	\$287,324,000
78	L with detour bridge	\$261,954,000	\$20,852,000	\$282,805,000	\$359,910,000
79	L with Phase 2 seismic	\$252,066,000	\$20,852,000	\$272,918,000	\$343,630,000
80	L with detour bridge and Phase 2 seismic	\$306,999,000	\$20,852,000	\$327,850,000	\$416,216,000
Yellow Roundabout, Widen South Rehab					
81	A'	\$310,467,000	\$42,095,000	\$352,561,000	\$449,368,000
82	C	\$276,074,000	\$42,993,000	\$319,068,000	\$403,658,000
83	C'	\$280,519,000	\$42,993,000	\$323,513,000	\$409,262,000
84	D	\$282,665,000	\$43,603,000	\$326,268,000	\$412,753,000
85	E	\$284,888,000	\$44,497,000	\$329,385,000	\$416,617,000
86	F	\$289,630,000	\$43,786,000	\$333,415,000	\$421,736,000
87	K	\$282,591,000	\$44,139,000	\$326,730,000	\$413,079,000
Yellow Roundabout, Widen South Replacement					
88	A'	\$275,232,000	\$6,659,000	\$281,891,000	\$363,263,000
89	C	\$238,383,000	\$7,558,000	\$245,940,000	\$314,481,000
90	C'	\$243,476,000	\$7,558,000	\$251,034,000	\$320,896,000
91	D	\$245,570,000	\$8,167,000	\$253,737,000	\$324,322,000
92	E	\$248,117,000	\$9,062,000	\$257,179,000	\$328,591,000
93	F	\$253,642,000	\$8,350,000	\$261,992,000	\$334,689,000
94	K	\$251,164,000	\$8,704,000	\$259,868,000	\$331,734,000
Pink Roundabout					
95	A'	\$222,682,000	\$6,848,000	\$229,530,000	\$294,036,000
96	C	\$238,900,000	\$7,808,000	\$246,708,000	\$315,759,000
97	C'	\$244,178,000	\$7,808,000	\$251,985,000	\$322,469,000
98	D	\$246,594,000	\$8,492,000	\$255,086,000	\$326,500,000
99	E	\$249,233,000	\$9,454,000	\$258,687,000	\$330,997,000
100	F	\$254,896,000	\$8,681,000	\$263,577,000	\$337,244,000
101	K	\$251,381,000	\$9,069,000	\$260,450,000	\$332,659,000
Teal Roundabout					
102	A'	\$231,063,000	\$7,231,000	\$238,294,000	\$303,324,000
103	C	\$247,315,000	\$8,265,000	\$255,580,000	\$324,929,000
104	C'	\$252,605,000	\$8,265,000	\$260,870,000	\$331,563,000
105	D	\$255,043,000	\$9,041,000	\$264,084,000	\$335,571,000
106	E	\$257,688,000	\$10,086,000	\$267,774,000	\$340,129,000
107	F	\$263,361,000	\$9,239,000	\$272,599,000	\$346,230,000
108	K	\$261,299,000	\$9,668,000	\$270,967,000	\$344,035,000

Preliminary Screening of Alternatives



	Concept	Cost and Economic Impacts			
		Minimize Life Cycle Costs			
		Construction Cost (In 2007 Dollars)	75 Year Maintenance Cost (In 2007 Dollars)	TOTAL LIFE CYCLE COST (In 2007 Dollars)	TOTAL LIFE CYCLE COST (In 2012 Dollars)
	Existing Bridge as Bike/Ped with Blue Signalized				
109	Top of K	\$306,145,000	\$21,514,000	\$327,658,000	\$426,108,000
110	Top of J	\$290,907,000	\$20,325,000	\$311,232,000	\$405,608,000
	Existing Bridge as Bike/Ped with Purple Signalized				
111	Top of K	\$282,776,000	\$21,668,000	\$304,444,000	\$387,913,000
112	Top of J	\$265,839,000	\$20,428,000	\$286,267,000	\$365,231,000
	Existing Bridge as Bike/Ped with Pink Signalized				
113	Top of K	\$282,449,000	\$22,074,000	\$304,522,000	\$388,282,000
114	Top of J	\$265,236,000	\$20,670,000	\$285,906,000	\$364,986,000
	Existing Bridge as Bike/Ped with Teal Signalized				
115	Top of K	\$288,966,000	\$22,539,000	\$311,505,000	\$395,248,000
116	Top of J	\$270,774,000	\$20,985,000	\$291,759,000	\$370,641,000
	Existing Bridge as Bike/Ped with Blue Roundabout				
117	Top of K	\$321,866,000	\$24,148,000	\$346,014,000	\$448,886,000
118	Top of J	\$303,108,000	\$22,772,000	\$325,880,000	\$423,763,000
	Existing Bridge as Bike/Ped with Purple Roundabout				
119	Top of K	\$298,000,000	\$24,051,000	\$322,050,000	\$409,771,000
120	Top of J	\$278,862,000	\$22,693,000	\$301,556,000	\$384,199,000
	Existing Bridge as Bike/Ped with Pink Roundabout				
121	Top of K	\$297,281,000	\$24,513,000	\$321,794,000	\$409,718,000
122	Top of J	\$278,308,000	\$23,015,000	\$301,323,000	\$384,110,000
	Existing Bridge as Bike/Ped with Teal Roundabout				
123	Top of K	\$306,104,000	\$25,112,000	\$331,216,000	\$419,724,000
124	Top of J	\$286,151,000	\$23,465,000	\$309,616,000	\$392,806,000

**Attachment C:
Cost Estimate Methodology**



Attachment C: Cost Estimate Methodology

A. Introduction

This memorandum details the cost model, design assumptions, and cost estimates for the Sellwood Bridge project alternative screening analysis. Costs are separated by three distinguishing features including the alignment, the cross-section width, and whether the river bridge is a replacement or rehabilitation. The costs have been developed based on in-progress conceptual level layout design and include a 40% contingency on the cost estimating items.

B. Cost Model and Assumptions

1. Cost Model Description

The cost model used for this analysis relies on estimates of quantities for major construction items such as pavement, structures (by assuming a concrete segmental bridge type for the new bridges and special features associated with the rehab alternates), and retaining walls. Costs for other items are estimated as percentages or lump sum values based on experience with similar facilities.

A brief description of cost items and their use in the cost model follows:

❑ **Pavement Removal**

The area of pavement removal is estimated from the existing planimetric files, and as-builts. The cost analysis assumes removal of all pavement (mainline and shoulders) within the project area. Pavement removal quantities are calculated within the proposed roadway improvement limits (mainline, ramps, arterials, local roads), and at locations where existing roadways will be abandoned.

❑ **New Pavement**

The area of new pavement is estimated from in-progress Design Alternatives (horizontal geometry). The unit cost of new pavement includes the cost of base and subbase materials. A thicker pavement structure is assumed for the mainline and ramps, as compared to the pavement thickness for arterials and local roads. Thus, different unit costs are used for each. In addition, the assumed unit cost for paved shoulders is conservatively assumed and identical to the assumed pavement unit cost.

❑ **Earthwork**

As estimated earthwork quantities are not available at this point, earthwork costs are based on a percentage of roadway pavement costs.

❑ **Supplemental Earthwork**

The above earthwork quantity is based on total pavement construction; however that quantity does not include the bridge structures in the potential slide area. This additional

earthwork cost is provided to account for the excess removal of existing fill affecting the slide near the west interchange.

❑ **Slope Stabilization**

\$10,000,000 slope stabilization is included to further protect the new interchange and river bridge against future slides. This slope stabilization cost is applied to all alignments equally as a lump sum.

❑ **Drainage**

Drainage costs are based on a percentage of pavement and earthwork costs. This item covers all roadway catch basins, inlets, box culverts, and storm sewers.

❑ **Erosion Control**

The cost of erosion control during construction is based on a percentage of pavement and earthwork costs.

❑ **Maintenance of Traffic**

Maintenance of traffic during construction is based on a percentage of roadway costs. This item is intended to include all typical costs of traffic control including temporary ramps, detours, temporary bridges (near the west interchange), barricades, crossovers, and signing. Supplemental maintenance of traffic cost is included to provide for the difficulty associated with building in a topographically constrained area. This cost is provided as a lump sum.

❑ **Lighting**

The cost of roadway lighting is based on a percentage of pavement and earthwork costs.

❑ **Signing and Pavement Marking**

The cost of highway signing and pavement marking is based on a percentage of pavement and earthwork costs.

❑ **Utilities**

The cost of typical utilities is based on a percentage of pavement and earthwork construction costs. Typical utilities are defined as electric service, cable, water and sanitary sewer, telephone, and standard gas line.

❑ **Railroad relocation**

Railroad relocation cost does not include street car improvements such as double track and pedestrian path construction. It only represents the raw cost of realigning the existing system near the west approach due to proposed improvements.

❑ **Hazardous Waste Removal**

This item accounts for the removal and disposal of any hazardous material from the Willamette River bottom or elsewhere in the project limits possibly including the area near the Staff Jennings fuel tanks.

❑ **Incidental Items**

Incidental costs are estimated as a percentage of paving and earthwork costs. Incidental items include items such as guardrail, median barrier, curb and gutter, landscaping, mobilization, clearing and grubbing, fencing, and field labs.

❑ **Traffic Signals**

Traffic signals required for intersection improvements are based on an individual tabulation of locations.

❑ **Structures**

Bridge removal and new bridge costs are calculated based on the proposed bridge width (travel lanes plus shoulders, bike/ped facilities, and parapets). Structure limits are estimated from preliminary information.

Unit costs for the river crossing structures were extracted from Appendix A of the *Comparison of Bridge Rehabilitation Versus Bridge Replacement Concepts* technical memorandum prepared by CH2M HILL and TY Lin International in September, 2006. Because the unit cost range is about \$300/SF to \$1200/SF depending on structure type assumed, a cast-in-place segmental concrete bridge alternate at \$500/SF was used to provide relative cost comparison between alternates. Unit costs for the rehabilitation and widening river bridge options were also extracted from Appendix A of the same memorandum cited above. \$385/SF was assumed for the “over water” portion of the 31 ft rehab option with bike/ped paths below. \$335/SF was assumed for the over water portion of the 53’ and 57’ rehab options. For the South widening alignment, \$400/SF was assumed to widen with a second truss. For the rehab and replacement options with ped/bike accommodations on the existing bridge, \$300/SF was assumed for the “over water” cost. Truss strengthening costs were not included for the ped/bike rehab bridge.

Rehabilitating the existing bridge, as in the Yellow center alignment, will require a detour bridge in order to maintain traffic across the river into and from the Sellwood neighborhood within the existing corridor. The cost of this detour bridge is assumed to be the same as building a 35’ replacement structure in the Teal alignment and includes ROW acquisition.

With the exception of the 53 ft. cross-section, widening to the south of the existing bridge and subsequent rehabilitation of the existing superstructure can accommodate movement of traffic during construction without a detour bridge. The 53 ft. cross-section is too narrow for staged construction and a detour bridge is provided as an option.

An additional percentage is added to structural costs to account for incidental costs associated with the structures for mobilization.

Phase I seismic retrofit Phase I is included in all rehabilitation alternatives, however Phase II seismic retrofit is an optional procedure. Costs for Phase II seismic retrofit are provided only in a subset of alternatives as identified in the alternative description. .

❑ **Retaining Walls**

Retaining wall costs are estimated based on a unit cost per square area exposed above ground.

❑ **Engineering**

Engineering costs are estimated for Preliminary Design, Final Design, and Construction Engineering and Inspection. The engineering costs are estimated as a variable percentage of the total roadway and structure construction costs. Engineering cost is assumed to be greater with the rehab alternatives because of the increased complexity in designing around the existing structure.

□ Right-of-Way Acquisition

The projected costs have been developed based on 2006/2007 market value as estimated by the Multnomah County Assessor. Exceptions are Tax Parcels R500026 and R268198, which are the land underlying the Sellwood Harbor and Riverpark Condominiums. As the Assessor has not identified a specific land value, an allowance of \$40 per square foot has been estimated based on comparable east side high density land. It is noted that Tax Parcel R268065 is under construction and has no current value per the Assessor. The value used in the cost estimate is based on the stated value noted in a March 30, 2007 article in the Oregonian. No attempt has been made to verify the Assessor's value estimates and they are assumed to be uniformly accurate relative to all properties in the study. As such, the analysis may be helpful in identifying comparative differences, but should not be given further reliance.

Additional cost contingencies have been identified for relocation expenses based on average reported costs for similar projects by a local relocation firm. Additional contingency costs have been identified relative to potential cure or damage items for partial acquisition properties. The costs valuation must be considered general in nature as additional project detail must be developed before further refinement is possible. The analysis is based on the premise that structures located within the proposed right-of-way will be removed in their entirety. While additional demolition costs will result, they have not been included within the analysis.

Due to absence of adequate land value data, properties located west of Highway 43 have not been included in the cost estimate. Acquisition of cemetery property will be similar for all of the alternatives, so this omission is not expected to alter the relationship of right of way costs among alternatives.

The right of way costs are not intended to constitute an appraisal of the various properties, and may only be used to identify relative cost differences for the various alignments.

□ Contingency

A contingency is applied to the cost estimate to account for the many unknowns at this stage of project development. Note that the contingency is not intended to cover future inflation or cost increases in right-of-way acquisition.

2. Unit Cost Assumptions

The assumed unit prices for roadway pavement and structures are shown in Tables 1 and 2, respectively. Note that the unit prices for structures vary for different structure types and configurations. As described previously, retaining wall unit costs are assumed to be a function of retaining wall height.

The assumed percentage of roadway costs for all other construction items, contingency, and engineering costs are listed in Table 3.

TABLE 1
Roadway Pavement Unit Costs Used in Cost Model

Item	Unit Price	Unit
Pavement Removal	\$20	yd ²
OR 43 and Ramp Pavement (including shoulders)	\$130	yd ²
Local Roadway Pavement (including shoulders)	\$100	yd ²
Railroad Relocation	\$500	Lin. Ft.
Sidewalk	\$25	yd ²

TABLE 2
Structure Unit Costs Used in Cost Model

Item	Unit Price	Unit
Land Bridge Removal	\$50	ft ²
River Bridge Removal	\$70 / \$35 (rehab)	ft ²
New Bridges (Land Based)	\$175	ft ²
New Bridges (River Crossing)		
Over River	Varies (see section B, Structures)	ft ²
Approaches	\$200	ft ²
Pedestrian Bridges	\$100	ft ²
Retaining Wall	\$85	ft ²

TABLE 3
Construction Cost Percentages Used in Cost Model

Item	Percent of Roadway Costs	Cost Basis
Earthwork	30%	Pavement Cost
Drainage	14%	Pavement Cost
Erosion Control	3%	Pavement and Earthwork Costs
Maintenance of Traffic During Construction	10%	Pavement and Earthwork Costs
Lighting	4%	Pavement and Earthwork Costs
Signage and Pavement Marking	4%	Pavement and Earthwork Costs
Typical Utilities	20%	Pavement and Earthwork Costs
Incidental Items	20%	Pavement and Earthwork Costs
Engineering (design, construction & inspection)	23-30%	Total Construction Cost
Contingency	40%	Total Construction Costs / Right of Way Costs / Engineering Costs

C. Maintenance Cost Assumptions

All alternative costs include maintenance costs which include pavement overlays every 20 years for the life of the bridge, 75 years. The maintenance costs for the rehabilitation alternatives also include bridge painting costs every 30 years for the life and a one time cost to jacket each pier.

**Attachment D:
Natural Environment Methodology**

Sellwood Bridge Screening Evaluation: Aquatic and Wildlife Resources Methodology

PREPARED FOR: Sellwood Bridge Project Management Team
PREPARED BY: CH2M HILL
DATE: June 22, 2007

Assumptions

- Teal alternative will include relocation/removal of the marina as well as the boat ramp. The other alternatives will not impact the marina.
- The east and west approach areas will not contain retaining walls providing a laterally continuous open area between the piers similar to the existing bridge.
- Replacement alternatives that are 57 feet wide or wider will utilize a side by side pier design and will have 4 sets of piers (8 piers total) below the ordinary high water elevation.
- Replacement alternatives that are less than 57 feet wide will utilize a single pier design and will have 4 sets of piers (4 piers total) below the ordinary high water elevation.
- Rehabilitation alternatives will maintain the existing number and size of piers below the ordinary high water elevation.
- In rehabilitation alternatives with a detour bridge, the detour bridge will only have 4 piers below the ordinary high water elevation for a total of 10 piers below the ordinary high water elevation. The detour bridge will be 31 feet wide.
- Approach pier placement will be similar to existing bridge approach pier placement (i.e., the last approach pier will be constructed between the ordinary high and low water elevations).
- Pier size (single or side by side piers) is the same as the existing bridge pier size:
 - Mid channel pier size: 35 ft x 14 ft
 - Approach pier size: 32 ft x 10.5 ft
- Replacement alternatives will consist of equal length bridge spans.
- Critical near shore habitat width is 10 percent of the channel width based on Friesen, 2005.
- Critical habitat area affected = (Critical habitat width X bridge width) X 2. Multiply by 2 to obtain total area for both sides of river.

- Terrestrial habitat includes any area that could potentially be vegetated (including existing impervious surface areas where a structure would be relocated/removed).
- The clearance from the bottom of the deck to the ordinary high water elevation at the east and west approaches are:
 - East approach: 62 feet
 - West approach: 65 feet
- Riparian impacts are based on 100-year flood elevation (34.5 NAVD) near the Sellwood Bridge from FEMA, 2004. The riparian area is encompassed in the 100-year floodplain.
- Impact ratings for threatened and endangered terrestrial species, wildlife habitat, and riparian habitat impacts were based on the range between lowest and highest impacts; there were no overall beneficial impacts. This impact range was divided into low, moderate, and high ratings based on the difference between low and high impacts.

Evaluation Results

The rating scores range from 1 (high adverse impact) to 5 (more than a slight benefit) for each aquatic and wildlife habitat parameter. The overall impacts to aquatic and terrestrial resources using this rating evaluation method range from 1.4 (moderate to high adverse impacts) to 2.4 (low to moderate adverse impacts) depending on the project alternative.

Literature Cited

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