*Chapter 6*

# Alternatives Evaluation

This chapter evaluates how East Link would meet the project purpose and need, and it analyzes the benefits, environmental impacts, and cost-effectiveness of the project as well as each segment alternative.

The purpose and need for the East Link Project, as discussed in Chapter 1, is to expand the Sound Transit Link light rail system from Seattle to Mercer Island, Bellevue, and Redmond via Interstate 90 (I-90) in order to provide a reliable and efficient alternative for moving people to the Eastside of Lake Washington and throughout the region. To meet this purpose and need, the East Link Project would be a composite of one alternative from each of the five geographic segments connecting Seattle with Mercer Island, Bellevue, Overlake, and Redmond.

In addition, the East Link Project is one of several proposed light rail expansions to Central Link, the north-south light rail project under construction in Seattle. Collectively, the system would have benefits greater than the individual projects. Several of these benefits are also described in this section.

## 6.1 Performance in Meeting Project Goals and Objectives

The goals and objectives for the East Link Project are described in Chapter 1 and form the basis for the evaluation of alternatives presented in this chapter. These goals and objectives include the following:

1. Transportation goal: Improve transit mobility in the East Link corridor
    a. Improve the quality of transit service
    b. Increase transit accessibility
    c. Maximize East Link ridership
2. Environmental goal: Preserve environmental quality in the corridor
    a. Minimize potential adverse operating impacts on the natural and built environments
    b. Minimize potential adverse construction impacts on the natural and built environments
3. Land use goal: Support regional and local land use goals and objectives
    a. Support adopted land use and transportation plans
4. Implementation goal: Minimize risk in the corridor
    a. Enhance stakeholder and community support
    b. Design system to reduce construction risk
5. Financial Goal: Provide a financially feasible solution
    a. Build a system within project budget
    b. Build a system that can be operated and maintained within available revenue
    c. Build a system that is cost-effective

This chapter evaluates the entire project and the individual alternatives related to each goal. The data used to assess how the East Link Project and the segment alternatives meet these goals are taken from earlier chapters of this Draft Environmental Impact Statement (EIS), namely Chapter 2 for project cost information, Chapter 3 for transportation-related topics, and Chapter 4 for environmental and land use goals. The risk assessment discussed in this chapter is based on both cost and construction risks. The data are used in the following subsections to compare the various alternatives.

### 6.1.1 Transportation Goal: Improving Mobility

The East Link Project would improve mobility into and out of many of the urban centers with the highest populations and highest levels of employment in the Puget Sound region (Seattle, Bellevue, Overlake, and Redmond). East Link would provide easy access throughout the project area and other key regional urban centers through seamless extension of Central Link, which is under construction in the greater Seattle area. This subsection describes how the project would accomplish the following:

- Improve the quality of transit service
- Increase transit accessibility
- Maximizes East Link ridership

Table 6-1 summarizes the transportation characteristics of the project alternatives.

TABLE 6-1
Summary of East Link Alternatives

| Segment | Alternative | No. of Stations | Segment Daily Boardings (2030)[a] | East Link Daily Ridership Totals (2030)[a] | Segment Travel Time (minutes) |
|---|---|---|---|---|---|
| A, Interstate 90 | A1, I-90 Alternative | 2 | 5,500 | 45,500 | 11 |
| B, South Bellevue | B1, Bellevue Way | 1 | 4,000 | 46,000 | 5 |
| | B2A, 112th SE At-Grade | 2 | 4,500 | 44,500 | 5 |
| | B2E, 112th SE Elevated | 2 | 4,500 | 45,500 | 5 |
| | B3, 112th SE Bypass | 1 | 4,000 | 45,500 | 5 |
| | B7, BNSF | 1 | 1,000 | 43,500 | 5 |
| C, Downtown Bellevue | C1T, Bellevue Way Tunnel | 3 | 8,000 | 46,000 | 5 |
| | C2T, 106th NE Tunnel | 2 to 3 | 7,500 | 46,500 | 5 |
| | C3T, 108th NE Tunnel | 2 to 3 | 8,000 | 48,000 | 4 |
| | C4A, Couplet | 2 to 3 | 6,500 | 44,000 | 7 |
| | C7E, 112th NE Elevated | 2 to 3 | 5,500 | 44,000 | 4 |
| | C8E, 110th NE Elevated | 2 to 3 | 6,500 | 45,500 | 4 |
| D, Bel-Red/ Overlake | D2A, NE 16th At-Grade | 3 to 4 | 6,500 | 46,000 | 10 |
| | D2E, NE 16th Elevated | 3 to 4 | 6,500 | 46,000 | 9 |
| | D3, NE 20th | 3 to 4 | 6,000 | 45,000 | 10 |
| | D5, SR 520 | 2 | 6,000 | 46,000 | 7 |
| E, Downtown Redmond | E1, Redmond Way | 2 | 3,000 | 45,500 | 6 |
| | E2, Marymoor[b] | 2 to 3 | 3,000 | 45,500 to 46,000 | 6 to 8 |
| | E4, Leary Way | 2 | 3,000 | 45,500 | 6 |

[a] Based on approved Puget Sound Regional Council forecasts. Higher ridership is likely with proposed land use plans in the Bel-Red and Overlake areas.

[b] Range for the Marymoor Alternative (E2) is dependent on whether the alternative terminates at Redmond Town Center (low end of the range) or continues to the Redmond Transit Center (high end of the range).

#### 6.1.1.1 Transit Quality

The East Link Project would provide a comfortable, high-capacity service that would increase reliability of the regional transit system, resulting in substantial time savings for all travel modes. Current bus service reliability is poor and is projected to remain poor into the future in spite of infrastructure investments to improve high vehicle-occupancy travel. This is because congestion on the arterial and highway systems will continue to influence transit service dependability.

The East Link Project would improve transit quality in the region by providing frequent and reliable high-capacity transit (HCT) service 20 hours each day in the Seattle, Mercer Island, and Bellevue to Redmond corridors. Passengers of East Link would receive a comfortable ride, high-person capacity, efficient loading of multiple-car trains resulting in short in-station loading time and dependable, on-time departures and arrival.

The project would use dedicated right-of-way, allowing East Link to operate reliably, independent of congested roadway conditions. The project is planned to operate between major growth centers with a train-arrival frequency (i.e., headway) of every 9 minutes by 2030 during peak periods. The project has the capacity to comfortably carry 600 persons per 4-car train and 800 persons with crowded conditions. During the peak period, East Link could carry 9,000 to 12,000 people per hour in each direction, or the equivalent of about 6 to 10 freeway lanes of traffic total (automobiles in the Puget Sound region currently average 1.17 persons per

vehicle during commute hours, or 2,300 persons per lane per hour).

This capacity would provide a robust backbone service feeding a network of bus distribution and feeder routes. As a dedicated right-of-way system, East Link would provide reliable, frequent service through highly congested roadways to feed multiple bus lines, thereby collectively reaching a broad range of destinations in a more timely manner than the No Build Alternative. The East Link Project analysis estimates that light rail travel between Seattle and Downtown Bellevue would take less than 20 minutes, and between Seattle and Downtown Redmond, about 35 minutes, regardless of time of day or level of traffic congestion, a savings of up to 30 minutes compared to an automobile traveling between these locations in the afternoon peak period. It can currently take up to 47 minutes to travel between Seattle and Bellevue (via I-90) and up to 63 minutes to travel between Seattle and Redmond (via SR 520) (http://www.wsdot.wa.gov/Traffic/Seattle/TravelTimes/reliability/). In the future these automobile times are expected to continue to worsen, and therefore light rail would provide an even greater travel-time savings. Without the East Link Project, it is expected that bus reliability in the future would reach a failing level. East Link Project reliability would provide the highest transit service level.

The Sound Transit Ridership Model was used to calculate the travel-time savings with transit trips in the afternoon (PM) travel period. Average transit travel time is the time it takes to travel from door to door (i.e., from the front door of their home to the front door of their work) by a composite of modes (i.e., auto, bus, bicycle, pedestrian, and light rail). Compared to the No Build Alternative, the average door-to-door peak-period transit travel time using light rail would be between 5 and 20 minutes faster to a given East Link destination. The results of the transit travel-time savings analysis for people who reside in the East Link study area are summarized in Table 6-2, which provides a range of minute savings by station.

TABLE 6-2
Average 2030 Door-to-Door Peak-Period Transit Travel Time Savings with East Link Compared to No Build Alternative

| Segment | Station | Average Minutes Saved |
|---|---|---|
| A, Interstate 90 | Rainier | 7 |
| | Mercer Island | 7 |
| B, South Bellevue | South Bellevue | 5 |
| | 118th | 11 |
| | SE 8th | 7 to 9 |
| C, Downtown Bellevue | East Main | 10 |
| | Old Bellevue | 9 |
| | Bellevue Transit Center | 7 to 9 |
| | Hospital | 8 |
| | Ashwood/Hospital | 6 to 9 |
| D, Bel-Red/ Overlake | 124th | 6 to 13 |
| | 130th | 6 to 15 |
| | Overlake Village | 8 to 15 |
| | Overlake Transit Center | 6 to 13 |
| E, Downtown Redmond | SE Redmond | 15 to 19 |
| | Redmond Town Center | 16 to 20 |
| | Redmond Transit Center | 12 |

### 6.1.1.2 Transit Accessibility

The East Link Project would enhance accessibility and integration of transportation modes by creating between 10 and 13 stations with connections to local bus systems and park-and-ride options. While the population in the project vicinity has increased substantially since the 2000 U.S. Census, 2000 Census data show that the project would enhance access for more than 5,000 low-income and more than 9,000 minority residents who live within one-half mile of proposed stations. The low-floor cars that would be used for East Link provide convenient loading for Americans with disabilities.

Additionally, the East Link Project would extend transit connections for riders to and from Central Link destinations. Central Link will connect Downtown Seattle to the Sea-Tac International Airport by 2009, with extensions to the University of Washington by 2016. East Link Operation Plans include direct service north to the University of Washington and Northgate without requiring a change of trains.

### 6.1.1.3 Ridership

Ridership projections vary among the segment alternatives. As a project, providing service from Seattle to Redmond, East Link is projected to contribute between 43,500 and 48,000 rider trips per day to the Sound Transit light rail system by 2030. Chapter 3, Section 3.4.3.3, describes differences among alternatives. The following subsections summarize the relative variations in ridership among the alternatives.

#### Segment A

There are 5,500 daily boardings forecast for the I-90 Alternative (A1). These boardings would be for Rainier

and Mercer Island stations only. The International District/Chinatown Station boardings are not included.

### Segment B

All Segment B alternatives would attract a similar number of daily segment and overall project ridership (4,000 to 4,500 segment and 44,500 to 46,000 overall), except for the BNSF Alternative (B7), which would attract a substantially lower number of segment boardings (1,000) and 43,500 overall.

### Segment C

There would be a wider spread of influence on daily boardings among alternatives within Segment C than the alternatives in Segment B. The 108th Tunnel Alternative (C3T) would attract the most daily boardings both within the segment and overall, while the 112th Elevated Alternative (C7E) would attract the least for both. After C3T, the following Segment C alternatives would attract daily boardings both within Segment C and for East Link overall in descending order: Bellevue Way Tunnel and 106th Tunnel alternatives (C1T and C2T), 110th Elevated and Couplet alternatives (C8E and C4A).

### Segment D

All Segment D alternatives would attract similar ridership (approximately 6,000 to 6,500 segment boardings), including the SR 520 Alternative (D5), which has two fewer station stops. This shows that the Overlake Transit Center Station has a large ridership potential even without the other proposed stations at 124th and 130th avenues. The ridership model demonstrates that D5, with faster travel time than other Segment D alternatives, would result in higher boardings at nearby stations in adjacent segments, and therefore would have similar influence in overall project-wide ridership as the other Segment D alternatives.

Both Bellevue and Redmond will adopt or already have adopted land use plans in Bellevue for the Bel-Red area and Redmond for the Overlake Village area. The projected land uses would consist of high-density residential and commercial mixed land uses concentrated around the proposed station locations (i.e., Hospital/Ashwood, 124th, 130th and Overlake Village stations). The transportation model included only some of the increased land uses. The cities of Bellevue and Redmond included all of these changes in land use in their modeled ridership expectations in the four station areas. Their results show an increase of almost triple the Sound Transit-projected ridership for 2030. The exception is the SR 520 Alternative (D5), which would not experience the same increase in ridership from the 124th and 130th Stations.

### Segment E

Segment E does not reveal a strong difference in daily boardings among the alternatives. The Marymoor Alternative (E2), which would extend to the Redmond Transit Center, would provide one more station than the other alternatives and therefore more access. Without the Redmond Transit Center Station, E2 Alternative ridership would be similar to the other Segment E alternatives.

## 6.1.2 Environmental Goal: Preserve Environmental Quality

The environmental goal is to preserve environmental quality in the project corridor. This goal would be met in the following ways:

- Minimize potential adverse operating impacts on the natural and built environments
- Minimize potential adverse construction impacts on the natural and built environments

### 6.1.2.1 Range of Impacts

All project alternatives would incorporate impact avoidance and minimization measures. Because of the highly urbanized nature of the project vicinity, most impacts would relate to the built environment. Impacts generally would concern transportation, property acquisition, visual and parks resources, and noise and vibration. Fewer impacts would affect natural resources, as demonstrated by the range of impacts summarized in Table 6-3. Most of the adverse impacts could be mitigated.

The East Link Project would also offer environmental improvements over the No Build Alternative. The project would result in net benefit to aquatic habitats and would remove contaminated soil along the project route. The construction process would bring economic benefit to the area by adding jobs and money spent in the region. After construction, the area surrounding several of the stations would be likely to attract transit-oriented development where additional capacity in land-use density is permitted. East Link would benefit the region by decreasing vehicle miles traveled (VMT) and vehicle hours traveled (VHT) by 0.2 percent, which would result in lower energy usage and would help reduce the overall volume of carbon dioxide emission into the region and, therefore, reduce greenhouse gas effects. Thus, the East Link Project is expected to preserve overall environmental quality.

TABLE 6-3
Project-Wide Range of Impacts by Impact Category-

| Impact Category | | | Low Potential Impact Range | High Potential Impact Range |
|---|---|---|---|---|
| Transportation | Number of intersections improved | | 0 | 2 |
| | Number of intersections worsened (after mitigation) | | 10 (0) | 15 (0-2) |
| | Number of parking spaces removed (on-street/off-street) | | 14/325 | 60/1,312 |
| Acquisitions, Relocations, and Displacements | Full property acquisitions | | 17 | 95 |
| | Partial property acquisitions | | 88 | 257 |
| | Total acres to be acquired | | 55.5 | 125.5 |
| | Businesses displaced | | 56 | 161 |
| | Residences displaced | | 3 | 232 |
| Land Use | Consistent with relevant policies | | Consistent | Consistent |
| | Potential to facilitate transit-oriented development | | Low to moderate | Moderate to high |
| Economics | Employment displacements (estimated number of employees) | | 760 | 2,820 |
| | Initial property tax impact (% of city property tax revenue) | | 0.12 | 0.51 |
| Visual | Number of incidences where project may result in a decrease in visual quality | | 0 | 3 |
| Air Quality and Greenhouse Gases | Savings in tons of carbon monoxide per year compared to the No Build Alternative (tons carbon monoxide/year) | | 3 | 2 |
| | Hot spot analysis exceedances | | 0 | 0 |
| | Greenhouse gas emissions annual decrease (carbon dioxide equivalent in metric tons) | | 31,684 | 35,244 |
| | Greenhouse gas emissions during construction (carbon dioxide equivalent in metric tons) | | 94,893 | 173,197 |
| Noise/Vibration | Traffic noise impacts (after mitigation) | | 0(0) | 101(0) |
| | Transit noise impacts (after mitigation) | | 0(0) | 217(0) |
| | Vibration (after mitigation) | | 3(0) | 12(5) |
| | Ground-borne noise (after mitigation) | | 25(0) | 37(1) |
| Ecosystems | Long-term impact on Wetlands (acres) | | 0.1 | 2.2 |
| | Impact on high-value (priority) nonwetland habitat (acres) | | 1.5 | 6.5 |
| | Impact on threatened/ endangered species | | 0 | 0 |
| | Fish passage/habitat | | No impact | Minor adverse impact |
| Water | Increase in impervious surface (acres) | | 13.6 | 30.09 |
| | Floodplain impact | | None | Minor |
| Energy | Savings in million British thermal units (Btu)/year | | 8,753 | 8,837 |
| Geology | Risk of causing a geologic hazard | | Low risk | Medium risk |
| Hazardous Materials | Potential impacts on high-risk sites (number of sites) | | 6 | 28 |
| Electromagnetic Field | Electromagnetic field interference | | 0 | 0 |
| Utilities | Relocation | | Low to moderate | High |
| Historic Resources | Length of archaeological sensitive areas (miles of corridor) | | 3.67 | 6.34 |
| | Potential to affect historical resources (number) | | 0 | 1 |
| Parklands | Potential permanent parkland impact (acres) | **Surface** | 0.5 | 3.6 |
| | | **Elevated** | 0.2 | 1.2 |
| Construction Impacts | Noise, transportation delays & detours, economic impacts to businesses | | Medium | High |

Where applicable, Table 6-3 gives the range of the lowest and highest impacts for each impact category before mitigation measures are applied. As shown, many project-wide impacts before mitigation concern property acquisition, which is also reflected in business and employee relocation, removal of parklands, and some losses in wetlands. East Link operation may also degrade traffic intersections. After mitigation, only a few resources would be adversely affected by the project. Depending on the combination of alternatives, there may be some residual vibration impacts, visual quality reductions, and impacts on McCormick Park.

Civil construction of the East Link Project would be about a 2- to 5-year process on a given portion of the route. During construction, traffic may be adversely affected, which can affect adjacent businesses. Construction also results in dust, noise, and vibration, as well as lower visual quality around the construction site. There may be temporary impacts on wetlands and other habitats. Sound Transit is committed to replacing park lands, but during construction, park use would be limited in some construction areas. Construction of any of the alternatives could also result in increased employment and spending in the project vicinity during construction.

#### 6.1.2.2 Environmental Impacts by Alternative

Table 6-4 summarizes the environmental impacts for each segment, focusing on the issues that differentiate alternatives within each segment. The categories may differ between segments because of the types of impacts occurring in each segment. A comparative description among alternatives within each segment follows for notable environmental impacts.

##### Segment A

Because the I-90 Alternative (A1) is mostly located within the existing I-90 freeway, there would be few environmental impacts. A summary of these impacts is provided in Table 6-4. The primary impacts would be transportation related. In comparison to the No Build Alternative (even with the implementation of the I-90 Two-Way High-Occupancy Vehicle (HOV) Transit and Operations Project), light rail would increase the total numbers of persons crossing I-90 during peak traffic hours. If the D2 Roadway (transit/ HOV access ramp from Seattle to I-90 center roadway) does not permit joint use of light rail and bus transit usage, then bus transit trips may lengthen by as much as 8 minutes. The project would result in increased congestion at two Mercer Island freeway ramps and worsen the operations at five arterial intersections, although these can be mitigated. Other environmental impacts include ground-borne noise impacts on adjacent residential properties and the removal of landscaping where Sound Transit station entrances would be placed along Benvenuto Park in Seattle and in the Park-on-the-Lid in Mercer Island; both impacts could be mitigated. There is a moderate potential for the Rainier and Mercer Island stations to attract additional transit-oriented development in the nearby vicinity.

##### Segment B

A summary of Segment B impacts is provided in Table 6-4. All Segment B alternatives would cause impacts on the Mercer Slough Nature Park. The BNSF Alternative (B7) would create a new crossing over the Mercer Slough Nature Park. The 112th At-Grade (B2A) and 112th SE Bypass (B3) alternatives would require the most property acquisition in this park, specifically along its west edge. Only B3 and B7 would result in long-term impacts on wetlands. The 112th SE Elevated Alternative (B2E) would result in only one residential displacement. The Bellevue Way Alternative (B1) would result in the highest number of residential displacements, whereas B7 would displace the highest number of employees. All Segment B alternatives traveling along Bellevue Way would lower the visual quality of the area due to long-term changes to the west hill side.

The Bellevue Way (B1), 112th SE At-Grade (B2A), and 112th SE Bypass (B3) alternatives would affect traffic operations at the 112th Avenue SE and Bellevue Way intersection, but the affects can be mitigated. All noise and vibration impacts can be mitigated in Segment B. There is little to no transit-oriented development potential in Segment B due to land use zoning and existing development patterns.

All Segment B alternatives would likely involve the use of a temporary construction easement in the Mercer Slough Nature Park. Except for the BNSF Alternative (B7), these are limited to the western border, which may require trail and other access detours during construction. Construction of the at-grade alternatives (B1, B2A, and B3) would require widening Bellevue Way. Constructing elevated profiles may result in closing or narrowing travel lanes and the use of temporary easements. For B7, a raised platform would be built across the Mercer Slough to reach the construction site within the marshy areas.

Elevated portions of the guideway may require pile driving, and, therefore, there would be noise impacts during daytime construction hours. This may have temporary adverse effect on wildlife in the vicinity.

TABLE 6-4
Differentiating Environmental Impacts for East Link Alternatives

| Segment A | | | |
|---|---|---|---|
| **Differentiating Environmental Impacts** | | | **A1** |
| Transportation Impacts | | | Improved person throughput and capacity. Similar or improved vehicle and truck travel time. Traffic intersection impacts and increased bus travel times with light-rail-only option on D2 Roadway. |
| I-90 Total Person Throughput Across Lake Washington | AM | Increase over No Build[a] | 4,200 |
| | | Increase over No Build[b] | 2,300 |
| | PM | Increase over No Build[a] | 1,900 |
| | | Increase over No Build[b] | 350 |
| Public Services | | | May increase emergency service response times |
| Permanent Impacts to Park –acres before mitigation | | | 0.2 to 0.3 acre |
| No. of Buildings with Ground Borne Noise Impacts (after mitigation) | | | 25 (0) |
| Other construction impacts | | | I-90 access changes |

| Segment B | | | | | | |
|---|---|---|---|---|---|---|
| **Differentiating Environmental Impacts** | | **B1** | **B2A** | **B2E** | **B3** | **B7** |
| Residential Displacements – No. of housing units | | 13 | 3 | 1 | 3 | 0 |
| Business Displacements (No. of employees) | | 2 (20) | 0 (0) | 0 (0) | 0 (0) | 4 (130) |
| Wetland Impact in acres | | 0 | 0 | < 0.1 | 0.4 | 1.8 |
| High-Value Nonwetland Habitat Loss in acres | | 1.7 | 0.7 | 0.4 | 0.7 | 3.1 |
| Decrease in Visual Quality? | | Yes | Yes | Yes | Yes | No |
| Noise-Impacted Receptors – No. of living units (No. after mitigation) | Traffic Related | 80 (0) | 20 (0) | 0 | 20 (0) | 0 |
| | Light Rail Related | 3 (0) | 0 | 0 | 0 | 98 (0) |
| Vibration-Impacted Buildings with Vibration Impacts (No. after mitigation) | | 1 (0) | 0 | 0 | 0 | 0 |
| Permanent Park Impacts (area in acres before mitigation) | Surface | 0.4 | 1.4 | 0.3 | 1.2 | 0.1 |
| | Elevated | 0 | 0.3 | 0.4 | 0.4 | 0.9 |
| Intersections Not Meeting Local Standard and Operating Worse than No Build Alternative (No. after mitigation) | | 1 (0) | 1 (0) | 0 (0) | 1 (0) | 1 (0) |

| Segment C | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Differentiating Environmental Impacts** | | **C1T** | **C2T** | **C3T** | **C4A** | **C7E** | **C8E** |
| Residential Displacements (No. of housing units) | | 93 | 0-12 | 7-19 | 8 | 0 | 2 |
| Business Displacements (No. of Employees) | | 18 (300) | 8 to 16 (210 to 290) | 50 to 57 (680 to 770) | 59 to 61 (670 to 830) | 44 to 45 (530 to 570) | 48 (590) |
| Decrease in Visual Quality? | | No | No | Yes | Yes | No | Yes |
| Hazardous Material Sites | | 6 | 2 | 3 | 0 | 0 | 0 |
| Light Rail Noise Impacted Receptors – No. of living units (No. after mitigation) | | 12 (0) | 12 to 36 (0) | 0 to 24 (0) | 4 to 12 (0) | 4 to 12 (0) | 87 (0) |
| Traffic Noise Impacted Receptors – No. of living units (No. after mitigation) | | 21 (0) | 0 | 0 | 0 | 0 | 0 |
| Vibration Impacted Receptors – No. of buildings (No. after mitigation) | | 3 (0) | 1 to 2 (0 to 1) | 0 to 1 (0 to 1) | 7 to 8 (3 to 4) | 0 to 1 (0 to 1) | 7 (3) |
| Ground-Borne Noise Impacted Receptors – No. of buildings (No. after mitigation) | | 2 (0) | 1 to 2 (0 to 1) | 3 to 12 (0) | 0 | 0 | 0 |
| Permanent Park Impacts – area in acres before mitigation | Surface | 0 | < 0.1 | 0.6 | 1.0 | 0.4 | 0 |
| | Elevated | 0 | 0 | 0 | 0.3 | 0 | 0.2 |
| Utility Relocation | | High | High | Medium | High | Low | Low |
| Intersections Not Meeting Local Standard and Operating Worse than No Build Alternative (No. after mitigation) | | 0 | 0 | 0 | 0 | 0 | 1 (1) |

TABLE 6-4
Differentiating Environmental Impacts for East Link Alternatives

| Segment D | | | | |
|---|---|---|---|---|
| **Differentiating Environmental Impacts** | **D2A** | **D2E** | **D3** | **D5** |
| Business Displacements (No. of employees) | 41 to 49 (1,270 to 1,480) | 43 to 46 (960 to1,180) | 64 to 72 (1,260 to 1,480) | 43 to 52 (430 to 570) |
| Wetland Impact in acres | 0.4 | 0.3 | 0.1 | 0.5 |
| High-Value Nonwetland Habitat Loss in acres | 0.7 | 0.6 | 0.1 | 1.27 |
| Hazardous Material Sites | 3 | 3 | 5 | 2 |
| Noise Impacted Receptors - No. of living units (No. after mitigation) | 0 | 0 | 0 | 10 (0) |
| Stream Crossings | 4 | 4 | 4 | 3 |
| Intersections Not Meeting Local Standard and Operating Worse Than No Build Alternative (No. after mitigation) | 2 (0) | 2 (0) | 1 (0) | 0 (0) |

| Segment E | | | | | |
|---|---|---|---|---|---|
| **Differentiating Environmental Impacts** | | **E1** | **E2** | | **E4** |
| | | | **To Redmond Transit Center** | **To Redmond Town Center** | |
| Residential Displacements – No. of housing units | | 2 | 126 | 2 | 2 |
| Business Displacements (No. of employees) | | 7 (210) | 24 (380) | 8 (200) | 7 (120) |
| Decrease in Visual Quality? | | No | No | No | Yes |
| High-Value Nonwetland Loss in acres | | 2.1 | 1.0 | 1.0 | 1.3 |
| Stream Crossings | | 2 | 2 | 2 | 2 |
| Noise Impacted Receptors – No. of living units (No. after mitigation) | | 26 (0) | 0 (0) | 0 (0) | 0 (0) |
| Vibration Impacted Receptors – No. of buildings (No. after mitigation) | | 3 (1) | 3 (1) | 3 (1) | 3 (0) |
| Historic Property Impact | | No | No | No | Yes |
| Permanent Park Impacts (area in acres before mitigation) | Surface | < 0.1 | 2.0 | 2.0 | 0.7 |
| | Elevated | 0.3 | 0.2 | 0.2 | 0.2 |
| Intersections Not Meeting Local Standard and Operating Worse than No Build Alternative (No. after mitigation) | | 2 (0) | 4 (0) | 2 (0) | 3 (0) |

| Maintenance Facilities | | | | |
|---|---|---|---|---|
| **Differentiating Environmental Impacts** | **MF1** | **MF2** | **MF3** | **MF5** |
| Business Displacements (No. of employees) | 86 to 93 (750 to 940) | 3 to 6 (470 to 880) | 93 to 96 (890 to 940) | 20 to 50 (320 to 600) |
| Acres Converted to Transportation Use | 21.9 to 24.1 | 26 to 26.9 | 19.3 to 27.6 | 16.5 to 19.6 |
| Wetland Impact in acres | 0.1 | 0.2 | 0 | 0 |
| High-Value Nonwetland Loss in acres | 0 | 0 to 0.4 | 0 | 0 |
| Stream Crossings | 0 | 0 | 1 | 0 |
| Change in Impervious Surface in acres | +2.5 to +3.7 | –0.4 to –3.7 | –1 to –1.7 | +1.8 to +2.3 |
| Construction Risk | Low | Low | Low | Low |

[a] Without HOV lanes in the outer roadways between Mercer Island and Rainier Avenue S (Stages 1 and 2 only).
[b] With HOV lanes in the outer roadways (HOV lanes Stages 1 – 3 completed)

### Segment C

A summary of Segment C impacts is provided in Table 6-4. There is a low potential for Segment C alternatives to attract additional transit-oriented development because the Bellevue Transit Center station area is highly developed and the Hospital and East Main station areas are already developing up to zoning capacity without light rail service. Tunnel alternatives would result in the fewest transportation impacts during operation. The Couplet Alternative (C4A) would require permanent removal of one travel lane on 108th and 110th avenues NE and the conversion of these streets to one-way operation. While C4A would affect some north-south vehicle operations, intersection operations are expected to experience little to no change compared to the 2020 and 2030 No Build Alternative. The 110th NE Elevated Alternative (C8E) is the only alternative in Segment C where one intersection would be impacted and would not meet local standards and would operate worse than the No Build Alternative following mitigation. Noise and vibration impacts of tunnels can be substantially mitigated, except for few instances of residual vibration impacts where the tunnel would be shallow and less than 10 feet from an adjacent building. The Couplet Alternative (C4A) may result in noise and vibration impacts that can mostly be mitigated. C8E has the potential to result in noise impacts on a number of high-density residential complexes, but these impacts can be mitigated to avoid operational impacts on the interior areas.

Many of the Segment C impacts would be caused during construction due to lane closures, dislocating buses from the Bellevue Transit Center, utility relocation, noise, vibration, dust, truck traffic, and associated effects on businesses. Tunnel construction would require longer construction periods than elevated and at-grade portions. Cut-and-cover construction may have more severe impacts to nearby businesses due to reduced access and extended construction disturbances.

Bellevue Way (C1T) and 108th NE Tunnel (C2T) alternatives would interface with hazardous material sites and have a high degree of utilities relocation. C1T would have the highest number of potential residential relocations of alternatives in Segment C and is the only corridor that has a relatively high risk of soil settlement that may be avoided through engineering and construction methods. Because of primarily bored tunnel construction, the 108th NE Tunnel Alternative (C3T) would result in less conflict with utilities and less disruption of traffic and businesses than C1T and C2T. C1T and C2T would involve large portions of cut-and-cover construction in high-rise areas to avoid conflicts with the underground structural supports of the adjacent building foundations and underground parking structures. Like the cut-and-cover alternatives, C4A would require relocation of utilities directly under and parallel to the route. Elevated alternatives—112th NE (C7E) and 110th NE (C8E)—would generally result in the fewest residential displacements and utilities impacts.

Alternatives C1T and C7E would cause no impact on parks, whereas alternatives C3T, C4A, and C8E would occupy a large portion of McCormick Park during construction. This park would be replaced to pre-construction size or larger, and the light rail would be located between the park and NE 12th Street, which would reduce the visual quality of the park for adjacent residents and park users.

Most of the staging areas would be available for redevelopment consistent with applicable zoning following construction. Construction of tunnels may require some periods of night work and have a longer construction duration and number of truck trips than surface alternatives.

Alternatives C4A, C7E and C8E staging area and construction activities would be disruptive to a number of businesses and to high-density residential complexes. However, the construction of these alternatives would involve the fewer number of truck trips over tunnel alternatives.

With the exception of the Bellevue Way Tunnel Alternative (C1T), there would be a range of impacts in Segment C alternatives due to the variation in connections from Segment B. Different connectors result in different areas needed as construction staging areas. Because of the high-density urban environment in Downtown Bellevue, staging areas that would be needed during construction have been identified. Variations in property acquisition, numbers of displaced employees, and realignment of Sturtevant Creek would be due to the connections from Segment B. Connections from the 112th NE alternatives (B2E and B2A) would result in higher residential impacts except when B2A connects with tunnel alternatives or the 112th NE Elevated Alternative (C7E), which would result in no residential displacements. The connector between B2A and the C2T and C3T tunnels would occupy the District Courthouse, which is part of the Surrey Downs Park and planned to be relocated in the development of Surrey Downs Park. Connections from B3 and B7 would result in ecosystem impacts and more employee displacement than other connectors.

### Segment D

The Segment D alternatives would not vary greatly in their impacts, as shown in Table 6-4. The primary difference would be that the SR 520 Alternative (D5) could have up to two fewer stations in the Bel-Red subarea, which may influence redevelopment in this area and would provide fewer points of access to East Link. Because of this difference, D5 would require the fewest property displacements, lowest employee displacements, and least utility relocations. All alternatives except D5 would have station locations that would support transit-oriented development for both the Bel-Red subarea in Bellevue and the Overlake Village subarea in Redmond. The NE 20th Alternative (D3) would involve building a retained cut in the median of NE 20th Street. This alternative could result in the highest employee displacement and would be likely to have the highest impact on access to adjacent businesses. D3 and D5 could result in minor adverse impacts on fish-bearing streams, but this impact can be mitigated to a net benefit. Only D5 would result in a noise impact during operation, which can be mitigated.

Construction impacts for the Segment D alternatives would involve traffic detour routes, extensive truck trips, and possible pile-driving noise for elevated and retained-cut portions of the alternatives. D3 would result in the most truck trips and would potentially affect the largest number of businesses due to retained-cut construction along a major commercial corridor, NE 20th Avenue. The NE 16th At-Grade (D2A) and SR 520 (D5) alternatives would have slightly fewer construction impacts than the NE 20th (D3) and NE 16th Elevated (D2E) alternatives.

### Segment E

The main environmental impact differences among alternatives in Segment E would involve park, historic resource, and visual impacts, as shown in Table 6-4. The Redmond Way Alternative (E1) would generally have fewer environmental impacts than the other two alternatives. The Marymoor Alternative (E2), due to its route along Marymoor Park, would have the greatest park impacts. It also would require the most residential displacements although most of these can be avoided if E2 terminates at the Redmond Town Center Station. The Leary Way Alternative (E4) also would affect park property to a lesser degree, but it would change the visual quality along the Leary Way gateway to the Redmond city center. Transportation impacts would be generally similar among the Segment E alternatives, although E2 may worsen the operation of a few additional intersections. There is a moderate potential for Segment E alternatives to attract additional transit-oriented development in the nearby vicinity of station locations because mixed-use zoning capacity has not been filled.

Construction for the Segment E alternatives would require the temporary detour of the Sammamish River Trail, Bear Creek Trail, and the East Lake Sammamish Trail and possible pile driving along SR 520 and Lake Sammamish Parkway. E2 would also require the full closure of 161st Avenue NE during construction.

### Maintenance Facilities

A summary of maintenance facility impacts is provided in Table 6-4. All the maintenance facility alternatives are located in predominantly commercial/industrial areas that are compatible land use. The 116th Maintenance Facility (MF1) and the SR 520 Maintenance Facility (MF3) would displace substantially more businesses (up to 93 and 95, respectively) than the other potential maintenance facility locations. MF3 would have the most potential employee displacements, nearly 1,300 employees. The SE Redmond Maintenance Facility (MF5) would have the fewest employee displacements, 560 or fewer people. The fewest business displacements would occur under the BNSF Maintenance Facility (MF2), which would only displace six to seven businesses, depending on the alternative connection. MF1 and MF2 would require wetlands and wetland buffers to be filled. In addition, MF3 would result in the loss of 230 linear feet of channel where Goff Creek would be placed in culverts under the facility. This impact could be avoided by realigning the stream.

## 6.1.3 Land Use Goal: Support Regional and Local Land Use Goals and Objectives

### 6.1.3.1 Project-Wide Support of Land Use Goals and Objectives

The East Link Project would support regional and local land use goals and objectives. East Link is a critical element in the region's long-term plan to manage growth. It would support the continued planned development of urban centers along the East Link corridor, including Downtown Bellevue and Overlake. As the Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) for the region, The Puget Sound Regional Council (PSRC) has adopted growth management plans to direct much of the expected growth in population and employment into the urban centers in the Puget Sound region, in large part to help reduce low-density development from expanding the urban edge and the related impacts of growth on the environment. This growth management plan needs

transportation options that support such targeted growth.

East Link is consistent with the PSRC growth management strategy, *VISION 2040* (PSRC, 2008), which promotes the development of a coordinated transportation system that is integrated with and builds upon local, county-wide, regional, and state planning efforts. *VISION 2040's* focus is to contain growth, concentrate new employment into urban centers, and link urban centers with a high-quality multimodal transportation system.

The *VISION 2040* growth strategy is also designed to foster a greater mix of land uses and a more complete and efficient network of streets and other public rights-of-way, and to support an urban environment that is more amenable to walking, biking, and using transit. As the Regional Transit Authority (under Chapter 81.104 and 81.112 the Revised Code of Washington [RCW]), Sound Transit is responsible for regional HCT system planning in the context of *Destination 2030*.

Sound Transit's *Regional Transit Long-Range Plan*, adopted in 2005, represents Sound Transit's goals, policies, and strategies for the long-term development of an HCT system within the central Puget Sound region. This long-range plan is the basis for the next phase of investments, known as Sound Transit 2: a Mass Transit Guide, the Regional Transit System Plan for Central Puget Sound (ST2) and also known as the Mass Transit Expansion proposal. The East Link Rail Transit Project is included in ST2, which was approved by the voters in November 2008.

The East Link Project would support jurisdictional efforts to implement regional policies related to HCT to fulfill plans and policies in those jurisdictions, especially those related to transit-oriented developed. The success of such development depends to a considerable degree on supportive policies designed to make areas around transit stations more attractive for development than other areas.

East Link would promote this development by connecting four of the urban growth centers identified in *VISION 2040*, including Seattle, Bellevue, Overlake, and Redmond. East Link would provide direct transit access between these centers and other regional and local destinations. East Link would allow jurisdictions to better implement transit and pedestrian-oriented land use patterns where current zoning allows. Many of the local jurisdictions have also identified new opportunities for mixed-use development in addition to those that are classified as urban centers by the *VISION 2040* plan, such as Mercer Island's city center, the City of Bellevue's Bel-Red area, and Redmond's Overlake Village.

*Destination 2030* is the transportation element of *VISION 2040* and is the long-range plan for transportation in the central Puget Sound region through the year 2030 (PSRC, 2001). *Destination 2030* supports a balanced, multimodal transportation system that provides options for users; the plan identifies more than 1,100 specific projects to improve roads, transit, and ferry service. The East Link Project is one of the key components in *Destination 2030* to develop a regional HCT system linking urban centers.

#### 6.1.3.2 Segment-Specific Support of Land Use Goals and Objectives

##### Segment A

Segment A of the East Link Project would specifically meet the City of Seattle's goals to promote urban villages, link urban centers, and facilitate access to employment centers for Central Area residents with expanded access to the Eastside via the International District/Chinatown Station and new access via the Rainier Station. The City of Mercer Island also has goals to promote mixed-use development at regional transit facilities and to provide adequate transit opportunities, especially serving its city center of mixed-use development adjacent to the planned Mercer Island Station. The Rainier Station and Mercer Island Station would promote localized, mixed-use urban village development.

##### Segment B

In order to connect Seattle and Bellevue urban centers, light rail must travel through South Bellevue to and from the I-90 Lake Washington crossing. This area is primarily residential and low-density, and it has not been designated for higher-density development by the City of Bellevue. All the Segment B alternatives would serve either an expanded South Bellevue Park-and-Ride Lot or a new park-and-ride lot near 118th Avenue SE and SE 8th Street. The 112th At-Grade and Elevated alternatives (B2A and B2E) would include another station at 112th Avenue SE and SE 8th Street. East Link would increase park-and-ride capacity and travel options for residents in South Bellevue neighborhoods and for employees in business parks located east of 112th Avenue SE, consistent with City of Bellevue transportation goals.

##### Segment C

Segment C is located within Downtown Bellevue, which has been designated an urban center by PSRC and is the focus of Bellevue's efforts to increase residential and employment density. The *City of Bellevue Downtown Implementation Plan* also identifies

HCT as an important element of the downtown transportation plan (City of Bellevue, 2003). The City of Bellevue has adopted a goal of a non-single-occupant-vehicle commute of 40 percent as part of its Growth Efficiency Transportation Center Policy. Segment C alternatives feature up to three stations serving Downtown Bellevue. The Segment C alternatives would all access the Bellevue Transit Center and Overlake/Group Heath Hospital Medical Center. For the 112th NE Elevated Alternative (C7E), the Bellevue Transit Center Station would be located on an elevated platform approximately 700 feet away from the transit center. The alternative includes a level pedestrian bridge to connect riders to the transit center. The Bellevue Way Tunnel Alternative (C1T) would provide an additional station at Main Street in Old Town Bellevue, an established residential and retail district that has ongoing projects to increase density. The remaining Segment C alternatives, when connected to Segment B via the 112th SE Bypass (B3) or BNSF (B7) alternatives, would have an additional station at 112th Avenue SE and Main Street.

### Segment D

Segment D is located within the Bel-Red/Overlake sub-areas, which are planned for substantial redevelopment in coming years. The *Bel-Red Corridor Plan*, which is expected to be approved by the City of Bellevue in early 2009, promotes transitioning this corridor from primarily light industrial land uses to denser mixed-use land uses, with retail, office, residential, and open space developed around transportation nodes. The transportation nodes would be at the proposed stations. The *Bel-Red Corridor Plan* calls for an additional 4.5 million square feet of commercial and office space and an additional 5,000 residential units. The NE 16th At-Grade (D2A) and Elevated (D2E) alternatives and the NE 20th Alternative (D3) would best facilitate this plan through the placement of stations at approximately 124th Avenue NE and/or 130th Avenue NE, as well as a station at 152nd Avenue NE. The SR 520 Alternative (D5) would bypass these first two station sites, limiting the ability of the East Link Project to facilitate transit-oriented development and increased density in this corridor.

The far eastern portion of Segment D is referred to as Overlake, which is also identified by PSRC as a growth center. Redmond's Overlake Neighborhood, has been designated as an urban center. Redmond's *Overlake Neighborhood Plan* supports transit-oriented development in the area around 152nd Street and NE 24th streets through its land use and transportation goals and policies. This subarea in the Overlake Neighborhood is referred to as Overlake Village and is planned to accommodate an additional 5,800 residential units by 2030. The entire Overlake Neighborhood is planned to accommodate an additional 4.5 million square feet of commercial development by 2030. The Overlake Village stations in the NE 16th At-Grade (D2A), NE 16th Elevated (D2E), and NE 20th (D3) alternatives would best meet Redmond transit-oriented development planning objectives. The SR 520 Alternative (D5) would provide a station in the Overlake Village area, but it would not be as centrally located with respect to the planned high-density, mixed-use center. All alternatives would serve the Overlake Transit Center.

### Segment E

The Segment E alternatives would serve the Downtown Redmond urban center and SE Redmond, two areas the City of Redmond seeks to connect using rapid transit to support continued mixed-use redevelopment goals. The land uses in Downtown Redmond are generally mixed with multifamily residential, commercial retail shopping, and mid-rise office complexes. Redevelopment is occurring within the northwest portion of Downtown Redmond around the Redmond City Hall and the Redmond Transit Center. Southeast of Downtown Redmond, the land uses change considerably. South of the SR 202 and SR 520 interchange, land uses include light industrial/manufacturing.

All Segment E alternatives would equally serve Downtown Redmond, thus equally meeting the plan and policy goals to support redevelopment; however, if extended beyond Redmond Town Center, the Marymoor Alternative (E2) would provide additional access adjacent to the Redmond Transit Center, which is across NE 83rd Street from the site of a relocated park-and-ride lot currently being redeveloped with transit-oriented development.

### Maintenance Facilities

As stated above under Segment D and E, the land uses around all the proposed maintenance facilities are generally light industrial or commercial, which are compatible with maintenance facility operations. The only exception is MF1, which borders office and medical facilities to the south and west but otherwise is surrounded by light industrial uses and the BNSF corridor. A proposal for a new Children's Hospital Ambulatory Surgery Center near the MF1 site is under review by the City of Bellevue. MF1 would be cut into the hillside and therefore would be nearly 30 feet lower than the hospital site and uses to the west.

## 6.1.4 Implementation Goal: Minimize Risks

Sound Transit has a goal to minimize risks in the corridor by enhancing stakeholder and community support and through recognizing and managing construction risks.

### 6.1.4.1 Enhance Stakeholder and Community Support

The objective of the community support goal is to involve the community in the project development and design process. The development of the East Link project has continued Sound Transit's commitment to involving the community at every step of the project. As described in Appendix B, Public Involvement and Agency Correspondence, the outreach effort in the East Link area began with the original project planning, design, environmental scoping, and development. In September 2006, the environmental scoping began for the East Link Draft EIS. Outreach activities have included hosting public open houses and workshops, offering information at local public meetings, making door-to-door visits, and ongoing agency coordination. In addition, Sound Transit's outreach staff has attended community events, posted regular project updates on the Sound Transit web site and mailed fact sheet and project announcement throughout the project corridor.

Following the public scoping process, the Sound Transit Board identified the alternatives to be evaluated in the Draft EIS at its December 14, 2006, meeting. In early 2007, Sound Transit hosted five community-focused workshops to engage community members in refining the route and station alternatives being evaluated in the Draft EIS. At these workshops, community members were asked about important neighborhood features, known resources, and other elements for consideration, such as walking routes, traffic, and important views. The input received was used in the refining and development of the alternatives evaluated in the Draft EIS. This process of considering community input will continue throughout the development of the East Link Project.

Additionally, Sound Transit has made it a priority to engage diverse populations early in the planning and development process by providing outreach information packets and making them available in multiple formats. Before scoping, Sound Transit identified minority and low-income populations based on U.S. Census data. Sound Transit literature has included a language block (i.e., text box on the literature) translated into Russian, Chinese, Spanish, Vietnamese, Farsi, and Tagalog regarding contacting and speaking with Sound Transit staff in those languages about the East Link Project. Also, Sound Transit identified and conducted targeted outreach to organizations that serve minority, non-English-speaking, and low-income populations within the East Link Project vicinity. These organizations were sent the scoping notification postcard and received follow-up phone calls to find out whether the organizations needed additional information about the East Link Project, and they were reminded how they could submit public comments. Organizations were also asked if they would like project staff to sit down with members of their organization to review the scoping information.

### 6.1.4.2 Reduce Construction Risks

Sound Transit has evaluated possible construction risk issues for each alternative. At this early stage of design, the construction risk analysis found that risks are highest with tunnel construction, retained cuts, and at-grade construction in dense environments. Table 6-5 summarizes the results of the analysis by alternative and identifies which alternatives are higher or lower than other alternative risks.

#### Tunnel Construction

Sound Transit concluded that the greatest construction risk would be associated with the Segment C tunnel alternatives (C1T, C2T, and C3T). The Bellevue Way Tunnel (C1T) and 106th NE Tunnel (C2T) alternatives are primarily cut-and cover tunnel excavation. Most of the 108th NE Tunnel Alternative (C3T) is bored and portions of C2T are proposed to be bored, but cut-and-cover is necessary to avoid impacting soil nails that can affect adjacent property foundations.

Generally, more tunnel construction results in increased risk reflected in costs and safety issues. Tunnel construction would generate a large amount of excavated material that would need to be moved to a staging area and ultimately to a disposal site. Limitations on haul truck movements and location of actual disposal sites would have cost impacts on the construction. However, there are some differences in risk depending on whether the tunnel is created by boring, using a cut-and-cover method, or by sequential excavation mining construction methods.

**Bored Tunnels** (portions of the 106th NE Tunnel Alternative [C2T] and most of the 108th NE Tunnel Alternative [C3T]) would pass through glacial till in Downtown Bellevue and may encounter boulders and building tie-backs. Bored tunnels have a high degree of risk as a result of the uncertainty associated with below-grade soils.

TABLE 6-5
Level of Construction Risk by Alternative

| Segment | Alternative | Risk |
|---|---|---|
| A, Interstate 90 | A1, I-90 Alternative | Lower |
| B, South Bellevue | B1, Bellevue Way | Lower |
| | B2A, 112th SE At-Grade | Lower |
| | B2E, 112th SE Elevated | Lower |
| | B3, 112th SE Bypass | Lower |
| | B7, BNSF | Lower |
| C, Downtown Bellevue | C1T, Bellevue Way Tunnel | Higher |
| | C2T, 106th NE Tunnel | Higher |
| | C3T, 108th NE Tunnel | Higher |
| | C4A, Couplet | Moderate |
| | C7E, 112th NE Elevated | Lower |
| | C8E, 110th NE Elevated | Lower |
| D, Bel-Red/Overlake | D2A, NE 16th At-Grade | Lower |
| | D2E, NE 16th Elevated | Lower |
| | D3, NE 20th | Moderate |
| | D5, SR 520 | Lower |
| E, Downtown Redmond | E1, Redmond Way | Lower |
| | E2, Marymoor | Lower |
| | E4, Leary Way | Lower |
| Maintenance Facilities | MF1, 116th | Lower |
| | MF2, BNSF | Lower |
| | MF3, SR 520 | Lower |
| | MF5, SE Redmond | Lower |

**Cut-and-Cover Tunnels** (Bellevue Way Tunnel and 106th NE Tunnel alternatives [C1T and C2T]) would require larger amounts of soil excavation and replacement than the bored tunnels. Because construction access is from the surface, cut-and-cover may involve permanent relocation of existing utilities in otherwise dense utility corridors. Sometimes utilities can be held in place, but maneuvering around utilities is a risk. Also, cut-and-cover tunnel construction results in considerable traffic management issues caused by lane closures, detours, and signal modification. Therefore C1T and C2T would have a higher risk than the 108th NE Tunnel Alternative (C3T), which is best suited for the bored tunnel method. In addition, all tunnel alternatives would include cut-and-cover station construction; C1T would have two cut-and-cover stations, whereas C2T and C3T have only one, the Bellevue Transit Center Station.

**Sequential Excavation Mining** is the most risky form of tunnel construction. The process is slower and more expensive and may involve higher safety risks over other tunnel construction methods. This method is only employed when neither bored nor cut-and-cover is practical. This method would only occur under the Bellevue Arts Museum for the Bellevue Way Tunnel Alternative (C1T).

#### Retained-Cut Construction

Like cut-and-cover, a retain-cut construction requires large amounts of soil excavation and utility relocation. Retained-cut construction would occur in portions of the Bellevue Way Tunnel (C1T), NE 20th (D3), and SR 520 (D5) alternatives and in all Segment E alternatives adjacent to SR 520. The risk occurs most strongly in urban corridors (C1T and D3), where there is limited area to relocate utilities and high conflicts with traffic during construction.

#### At-Grade in Dense Urban Environment

Constructing at-grade alternatives in dense, urban environments can result in high to moderate risks. A constrained right-of-way makes construction more difficult and more costly. For long-term reliability in service, all utilities parallel to and located underneath an at-grade route would need to be relocated and crossings would need to be encased such that utility access can be obtained without affecting light rail operations. This would increase the risk on the construction of the Couplet Alternative (C4A) and would present a risk due to the number of potential utility conflicts located along 108th Avenue NE and 110th Avenue NE. The design of this alternative would account for utility relocation, and accurate utility surveying and pothole data would be paramount in reducing risk.

### 6.1.5 Financial Goal: Achieve Financial Feasibility

Sound Transit is committed to implementing a light rail system that not only meets regional transportation needs but also meets the following financial goals:

- Build a system within project budget
- Build a system that can be operated and maintained within available revenue
- Build a system that is cost-effective

#### 6.1.5.1 Building the Project within Budget

The ST2 Plan approved by the voters in November 2008 would fund the construction portion of the East Link Project from Seattle to Overlake Transit Center Station. ST2 provides funding for an at-grade or elevated alternative through downtown Bellevue. If the Sound Transit Board selects a tunnel alternative in this segment, additional funding sources would be

required. Environmental review and preliminary engineering are funded by ST2 for the segment from Overlake Transit Center Station to downtown Redmond. However, the overall project cost will vary depending on which alternatives are selected and which stations and other elements are included in the project.

The cost of the East Link Project from Seattle to the Overlake Transit Center is estimated to range between $2.3 and $3.7 billion. If the project were only built to the Hospital Station (east end of Segment C), the high-cost project would be just under $3 billion, whereas the low-cost project would be just under $2 billion. Many factors weigh into the difference in cost beyond just the length of the project, such as number of stations, profile of the route and varying costs for property acquisition. The high project cost estimate includes a tunnel alternative in Segment C, Downtown Bellevue, and the low-cost includes an elevated alternative in Downtown Bellevue. The overall project cost range to complete the East Link Project to its terminus in Downtown Redmond is currently estimated to fall between $2.7 and $4.5 billion. Table 6-6 summarizes the estimated cost for each alternative by segment. The range in costs is due to design options or variations in the connectors between segments.

There is only slightly higher cost consideration for A1 for the potential accommodation of joint bus and light rail use of the D2 Roadway. In Segment B, however, the range of costs varies by the length of elevated profile versus at-grade and the amount of property acquisition required for each alternative, with the Bellevue Way (B1) and 112th SE At-Grade (B2A) alternatives being lower cost and the 112th SE Elevated (B2E) and Bypass (B3) alternatives higher cost. However, the cost savings in Segment B are not fully realized when reviewing the cost of combining Segment B alternatives with Segment C alternatives. For instance, B1 combined with the Bellevue Way Tunnel Alternative (C1T) results in the highest cost combination. Otherwise, the tunnel alternatives in Segment C are the most costly, and the at-grade or elevated profiles result in lower, but comparable, costs. The Couplet Alternative (C4A) is comparable with the elevated alternatives due to higher utility relocations and more property acquisition. The SR 520 Alternative (D5) is the least costly among Segment D alternatives, because it has fewer stations and fewer large-business displacements. Otherwise, as in Segment B, the Segment D alternative costs vary by the profile and the right-of-way costs, with the NE 20th Alternative (D3) being the highest cost because it has both elevated and retained-cut profiles. Finally, in Segment E, the shortest alternative, the Leary Way Alternative (E4) is the least costly, while the Marymoor Alternative (E2) is the longest and highest-cost alternative. A shortened version of E2 that eliminates the Redmond Transit Center Station would be comparable with the Leary Way Alternative (E4) cost.

TABLE 6-6
Estimated Cost by Alternative

| Segment | Alternative | **Estimated Cost** in millions, 2007$ |
|---|---|---|
| A, Interstate 90 | A1, I-90 Alternative | $730-750 |
| B, South Bellevue | B1, Bellevue Way | $420 |
| | B2A, 112th SE At-Grade | $500 |
| | B2E, 112th SE Elevated | $550 |
| | B3, 112th SE Bypass | $520 |
| | B7, BNSF | $510 |
| C, Downtown Bellevue | C1T, Bellevue Way Tunnel | $1,610 |
| | C2T, 106th NE Tunnel | $1,280-1,360 |
| | C3T, 108th NE Tunnel | $1.120-1,260 |
| | C4A, Couplet | $610-700 |
| | C7E, 112th NE Elevated | $500-600 |
| | C8E, 110th NE Elevated | $700 |
| D, Bel-Red/Overlake | D2A, NE 16th At-Grade | $690-710 |
| | D2E, NE 16th Elevated | $800-840 |
| | D3, NE 20th | $840-870 |
| | D5, SR 520 | $530-580 |
| E, Downtown Redmond | E1, Redmond Way | $680 |
| | E2, Marymoor | $570-790 |
| | E4, Leary Way | $580 |
| Maintenance Facilities | MF1, 116th | $430-460 |
| | MF2, BNSF | $310 |
| | MF3, SR 520 | $360-380 |
| | MF5, SE Redmond | $240-280 |

### 6.1.5.2 Build a System That Can Be Operated and Maintained Within Available Revenue

Annual operating costs for the East Link project would vary by profile type and number of stations. The ST2 Plan funds operation of the portion of the East Link Project from Seattle to Overlake Transit Center Station. The major determinants of operating costs for the project are service levels, running time, and trackway profile. The more frequent the service and the longer the line, the more vehicles it takes to maintain equivalent headways. Shorter alternatives with fewer stations have lower operating costs. In terms of line

and station maintenance, at-grade is the lowest cost, elevated the next highest, and tunnel the highest. The primary difference in cost lies in whether the project includes a tunnel through Downtown Bellevue. Operations for tunnels are more costly to maintain because of additional infrastructure components, such as stairwells, escalators, elevators, vent shafts, and station walls. In addition, tunnel stations require unique security and lighting considerations.

### 6.1.5.3 Cost-Effectiveness of Project and Alternatives

Cost-effectiveness was measured as the project's annualized cost divided by the projected number of riders that the project would attract each year, for a cost-per-rider estimate. Annualized costs are the project's construction costs averaged over the years of operation. Costs are presented and discussed in detail in Chapter 2, Section 2.6 of this Draft EIS. These cost-effectiveness estimates offer decision-makers a point of comparison among the alternatives.

Within the estimated cost range for the East Link Project, from the low-cost ($2,843 million) project that combines the I-90 (A1), 112th SE At-Grade (B2A), 112th NE Elevated (C7E), SR 520 (D5), and Leary Way (E4) alternatives to high-cost ($4,452 million) for the combination of the I-90 (A1), Bellevue Way (B1), Bellevue Way Tunnel (C1T), SR 520 (D3), and Marymoor (E2) alternatives, there is a range in cost-effectiveness depending on which segment alternatives are combined (Exhibit 6-1). The low-cost project would be the most cost-effective. The high-cost project would be the least cost-effective but would offer roughly 7 percent greater ridership than the low-cost project.

The total project cost-effectiveness would be affected by the cost-effectiveness of each segment; therefore, cost-effectiveness (cost per rider) was calculated for each alternative. However, because this cost per rider does not include the effect of travel time on riders not originating in or destined for stations within a segment, it understates the benefit faster alternatives offer to through riders. For this reason, the project appears to be more cost-effective than the individual alternatives. Exhibit 6-2 shows the range of cost-effectiveness for each alternative. In general, comparisons should only be drawn between alternatives within the same segment. Segments A, C and D have a cost-effectiveness range for each alternative (in Exhibit 6-2, dark blue shows low range and green shows high range) due the variation in connections from the alternatives in the adjacent segments or various design options within the alternative.

#### Segment A

There is only one alternative within Segment A, the I-90 Alternative, which has two options on the D2 Roadway, light rail only or joint operation with bus traffic. The cost-effectiveness is estimated to be $11.50 per rider for light rail only and $11.90 with joint operations. The additional cost of the D2 joint operation design option would slightly reduce the cost-effectiveness of A1. There would be no additional light rail riders due to this design option; however, it would offer substantial bus travel-time savings.

#### Segment B

In Segment B, the BNSF Alternative (B7) is the least cost-effective. At $51.15 per rider, B7 is about 5 times higher than the other alternatives in this segment. This is primarily a result of the lower segment ridership as compared to the other alternatives. B7 would have roughly one-quarter of the segment riders than the other alternatives within Segment B. The other Segment B alternatives are reasonably comparable to one another in cost-effectiveness.

#### Segment C

In Segment C, the 112th NE Elevated (C7E), 110th Elevated (C8E), and the at-grade Couplet (C4A) alternatives are very close in cost-effectiveness and are the most cost-effective per rider. These alternatives are almost one-half the cost of the highest-cost alternative—the Bellevue Way Tunnel Alternative (C1T). Among the tunnel alternatives, the 108th NE Tunnel Alternative (C3T) is the most cost-effective. The 106th NE Tunnel Alternative (C2T) is somewhat less

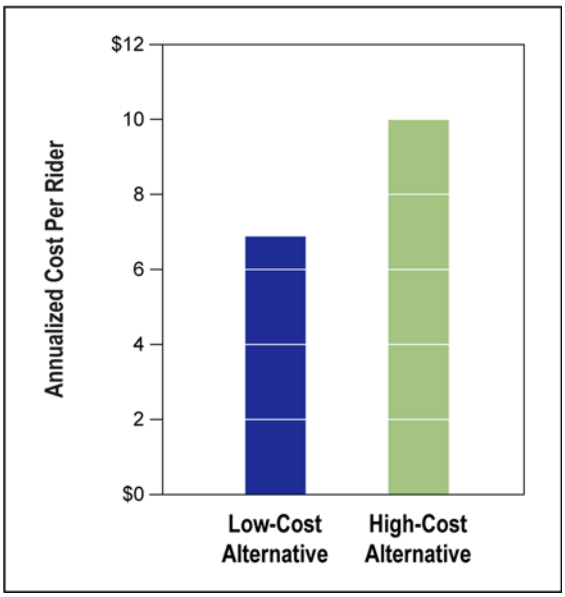


EXHIBIT 6-1
Cost-Effectiveness of Low-Cost and High-Cost Projects

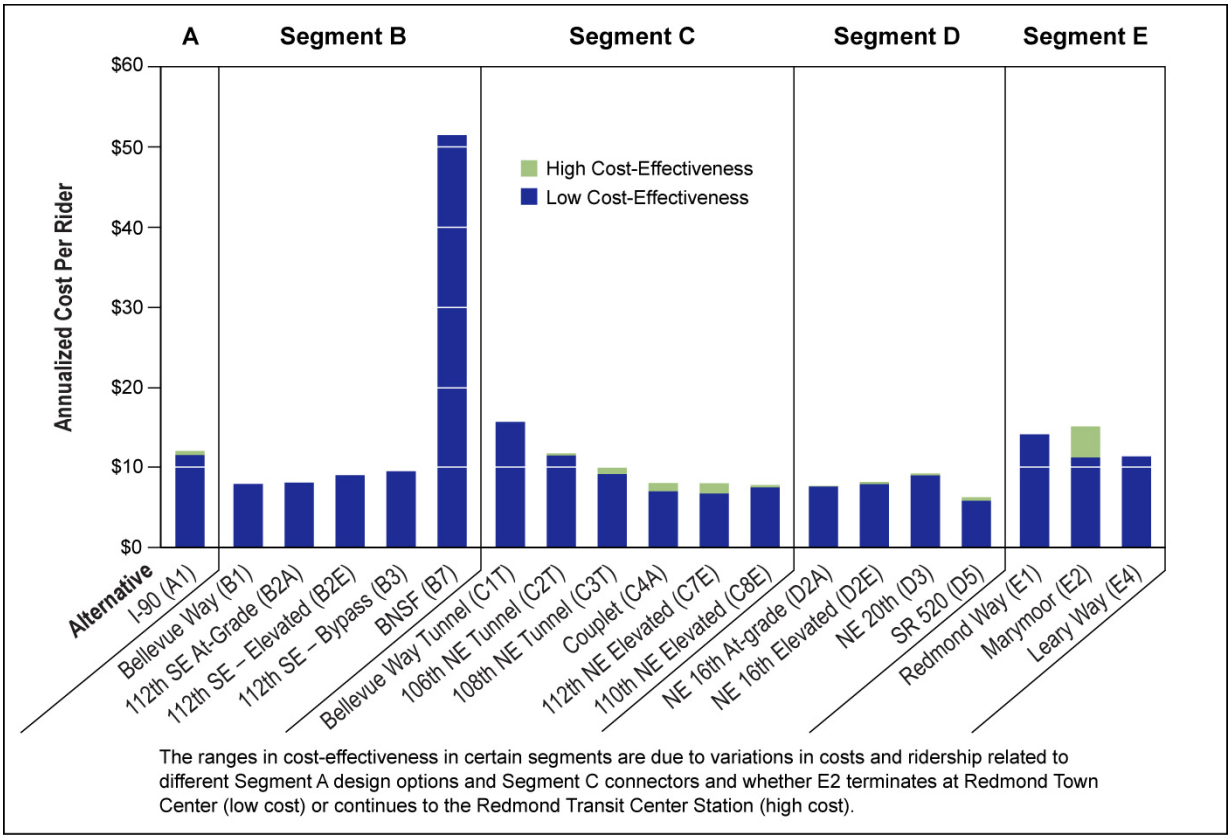


EXHIBIT 6-2
Cost-Effectiveness by Alternative

cost-effective than C3T but much more cost-effective than C1T.

Except for the Bellevue Way Tunnel Alternative (C1T), the cost-effectiveness of Segment C alternatives varies depending on the connection from Segment B alternatives. In Exhibit 6-2, the green extension shows the higher cost per rider attributed to highest cost connector. Remaining tunnel alternatives, C2T and C3T, have a higher cost per rider for connections from B2A and B7, as represented in Exhibit 6-2 by the higher end of the green bar. For the Couplet (C4A) and 112th Elevated (C7E) alternatives, the connection from B2E provides the best cost-effectiveness per rider as shown by the top of the blue bar, and B2A proves to be the least cost-effective. There is barely a discernable difference among the two connections (B3 and B7) for the 110th Elevated Alternative (C8E).

### Segment D

The Segment D alternatives have similar cost-effectiveness because each has similar ridership and costs, except for the SR 520 Alternative (D5), which is the most cost-effective. The NE 16th At-Grade Alternative (D2A) is the next most cost-effective, while the NE 16th Elevated and NE 20th alternatives (D2E and D3) are slightly less cost-effective.

There is a small range in cost-effectiveness for Segment D alternatives attributed to the connection from Segment C alternatives, either passing via NE 12th Street or from the BNSF corridor. The most cost-effective connector is represented in Exhibit 6-2 as the blue bar and the cost-per-rider range extends to the top of the green bar cost level. The NE 12th Street connection is more cost-effective for all Segment D alternatives (as illustrated by the top of the blue bar), except for D5, where the BNSF and the 152nd Station options are the most cost-effective.

The cost-effectiveness as illustrated in Exhibit 6-2 does not reflect the potential for increased ridership in Segment D attributed to newly or soon-to-be adopted land use plans by the cities of Bellevue and Redmond. (The potential for upwards of triple the ridership would greatly reduce the annualized cost per rider.) This would have the greatest benefit to D2A, D2E, and D3.

### Segment E

Ridership in this segment would be similar for all alternatives, so cost-effectiveness is directly correlated

to cost. The Leary Way Alternative (E4) is the most cost-effective, because it is the lowest cost alternative, and the Marymoor Alternative (E2) is the least cost-effective because it is the highest cost alternative. However, as shown in Exhibit 6-2, E2 cost-effectiveness is comparable with the other Segment E alternatives if it terminates at the Redmond Town Center Station.

## 6.2 Comparison of Benefits and Environmental Impacts

The East Link Project as a whole would improve transit quality in the region by providing frequent and reliable HCT service 20 hours each day in the Seattle, Mercer Island, and Bellevue to Redmond corridors. Passengers of East Link would receive a comfortable ride, high-person capacity, efficient loading of multiple-car trains resulting in short in-station loading time and dependable, on-time departures and arrival. This increase in reliability between major transit centers would enhance the network of bus distribution and feeder routes, thereby enhancing the ability of transit riders to reach a broader range of destinations in a shorter period of time. The East Link Project would be made up of a selection of one alternative from each segment. This section describes the trade-offs among the benefits, impacts, and cost-effectiveness of the alternatives.

Segment A does not have multiple alternatives, but the design option of shared use of the D2 roadway has higher cost trade-offs against worse bus transit performance if shared use in not accommodated. In Segment B, the 112th SE alternatives (B2A and B2E) offer the highest ridership levels and cost-effectiveness with relatively low environmental impacts and construction risk. The Bellevue Way Alternative (B1) would have the most residential property acquisitions, whereas the BNSF Alternative (B7) is the longest alternative, avoiding the South Bellevue neighborhoods, and would result in the highest level of wetland impacts. All Segment B alternatives that follow Bellevue Way from Segment A would result in traffic and visual impacts, noise impact, as well as a loss in some high-value habitat. However, except visual impacts, these impacts can be mitigated.

In Segment C, the tunnel alternatives would provide the highest ridership but also have a higher construction risk and worse cost-effectiveness than the at-grade couplet and elevated alternatives. Because they are underground, tunnel alternatives avoid interactions with traffic and decrease noise that the at-grade couplet and elevated alternatives may have during operation. However, tunnel alternatives result in considerably longer construction periods and extensive soil excavation and removal. Both the couplet and the cut-and-cover tunnel alternatives would have a high degree of utility relocation within constrained right-of-way, but the cut-and-cover tunnel alternatives would require a construction period at least 1 year longer and associated transportation impacts. While the Couplet (C4A), 112th NE Elevated (C7E), and 110th NE Elevated (C8E) alternatives are the most cost-effective, the 108th NE Tunnel Alternative (C3T) would have higher ridership. The 106th NE Tunnel Alternative (C2T) would have similar ridership to C3T at a higher cost and may result in more environmental impacts than the other Segment C alternatives.

The primary impacts of the Segment D alternatives would be on businesses and land uses. Although all alternatives in Segment D would cross several streams, impacts on habitat would be minimal and in some cases beneficial with mitigation. The NE 20th Alternative (D3) would displace the most businesses and employees and has the greatest estimated cost. It would also have slightly lower ridership than the NE 16th alternatives (D2A and D2E). The SR 520 Alternative (D5) has the lowest estimated cost but because of its location adjacent to SR 520, it would have the fewest stations and the least influence on transit-oriented development opportunities in the Bel-Red Subarea.

The Segment E alternatives would not differ in ridership, so the shortest alternative, Leary Way (E4), is most cost-effective but would result in visual impacts on the entry to Redmond Town Center. The Marymoor Alternative (E2) would provide more access but when extended to the Redmond Transit Center, it would also have the greatest impact in many categories: the highest estimated capital cost, the most business and employee displacements, and the highest impact on parks. Sound Transit is considering an option to terminate the Marymoor Alternative (E2) at the Redmond Town Center Station, which would make the E2 costs and business and employee displacements the same as the other Segment E alternatives. The Redmond Way Alternative (E1) would have the highest habitat impacts but the lowest impact on parks. The Leary Way Alternative (E4) is the only alternative that would require relocation of a historic structure, and it also would be the only alternative that would result in a change of visual quality along Leary Way.

The SE Redmond Maintenance Facility (MF5) would be the maintenance facility most compatible with

adjacent land uses, because it is located in an area planned to remain industrial in the future. The areas of the 116th Maintenance Facility (MF1), the BNSF Maintenance Facility (MF2), and the SR 520 Maintenance Facility (MF3), the land uses will eventually shift away from industrial uses to more mixed residential and commercial uses. MF1 and MF3 would also be more expensive to construct and would displace substantially more businesses than the other potential maintenance facility locations. In addition, MF1 would be located adjacent to medical offices and the new Children's Hospital ASC, which are more sensitive to noise and vibration than industrial uses. The greater cost for MF1 and MF2 would be related to greater amounts of excavation and grading required to make these sites level. MF1 and MF3 have the most potential employee displacements, with over 900, while MF5 would be the least costly maintenance facility and could have the fewest employee displacements, with as few as 320. The fewest business displacements would occur under MF2, which would displace three to six businesses, depending on which alternative it connects from.