CHAPTER 7: TRANSPORTATION

7.1 Introduction

This chapter describes the potential effects of the Missing Link project on the transportation system in the study area. Topics addressed include the roadway network, traffic volumes and operations, motorized freight corridors, nonmotorized users (bicyclists and pedestrians), public transportation, freight rail, and safety.

The primary sources of information used to prepare this analysis include the following:

- **Roadway Characteristics**: Lane configuration, intersection control, and industrial and residential driveway information as collected during fieldwork; previous technical analyses in the study area; and data provided by SDOT.
- **General-Purpose Traffic:** Traffic counts and turning movement data provided by SDOT and collected in the field.
- **Freight Truck:** Freight truck volumes, turning movement data, and truck route information provided by SDOT and collected from field counts and previous technical analyses in the study area.
- **Nonmotorized Users:** Pedestrian and bicycle volumes and circulation data provided by SDOT and collected in the field within the study area, as well as BGT user volumes in other areas of the city.
- **Public Transportation**: Public transportation service operating in the study area and travel route information provided by King County Metro.
- **Freight Rail:** Train volumes and routes that traverse the study area, as reported by the Federal Railroad Administration and the BTR.
- **Safety:** Accident data and incident response data in the project vicinity provided by SDOT and the Seattle Fire Department.

The quantitative traffic analysis is based on traffic conditions during the PM peak hour—the hour during which traffic volumes are at their highest. For additional details on study methods, see the Transportation Discipline Report (Parametrix, 2016).

7.2 Affected Environment

7.2.1 Study Area

The transportation study area was defined as the area bounded by 32nd Ave NW to the west, NW 56th St/20th Ave NW/Leary Ave NW to the north, 11th Ave NW to the east, and Shilshole Ave NW/NW 45th St to the south (Figure 7-1). The study area boundaries encompass the areas where the function of transportation modes could be affected by project construction or operation. Analysts used estimated traffic volumes and construction phasing to identify potentially affected areas.

Figure 7-1. Transportation Discipline Study Area and Study Intersections and Driveways

Figure 7-1 also shows the 13 intersections and 10 driveways evaluated as part of the affected environment analysis. Seven of the intersections (Intersections 1, 2, and 4 through 8) have full signals and are referred to as signalized intersections. Intersection 3 has a pedestrian-activated signal, which remains green for traffic on the major street until activated by a pedestrian. This intersection is described as having a pedestrian half signal. The remaining intersections (Intersections 9 through 13) are controlled by stop signs and are referred to as unsignalized intersections.

Driveways (identified in Figure 7-1 as numbers 14 through 23) provide access to businesses in the study area and are unsignalized. The driveways chosen for this analysis are a sample of representative driveways in the study area with a range of traffic volumes and represent industrial and commercial driveways.

7.2.2 **Roadway Network**

The roadway network within the study area consists of principal, minor, and collector arterial streets, as well as local access streets (Figure 7-2). Most roads in the study area are classified as local access streets.

Principal arterial roadways are the foundation of the city's transportation network, designated as the major thoroughfares for trucks, motor vehicles, and transit vehicles. In the study area, NW Leary Way and 15th Ave NW are defined as principal arterials, meaning that they serve as primary routes for vehicle trips between urban centers and as connections to the regional transportation network.

Minor arterials distribute traffic from the principal arterials to collector arterials and local access streets, and provide connections to community destinations. In the study area, NW 46th St, Shilshole Ave NW, NW Market St, and 24th Ave NW are minor arterials.

Collector arterials collect and distribute traffic from principal and minor arterials to local access streets or directly to local destinations. Collector arterials are typically located within neighborhood boundaries and serve small groups of stores, schools, small apartment complexes, and residential land uses. In the study area, 14th Ave NW and 20th Ave NW are considered collector arterials.

All other streets are local residential or commercial access streets. SDOT does not consider local access streets as part of the arterial network. Local access streets provide direct access from the arterial network to local land uses.

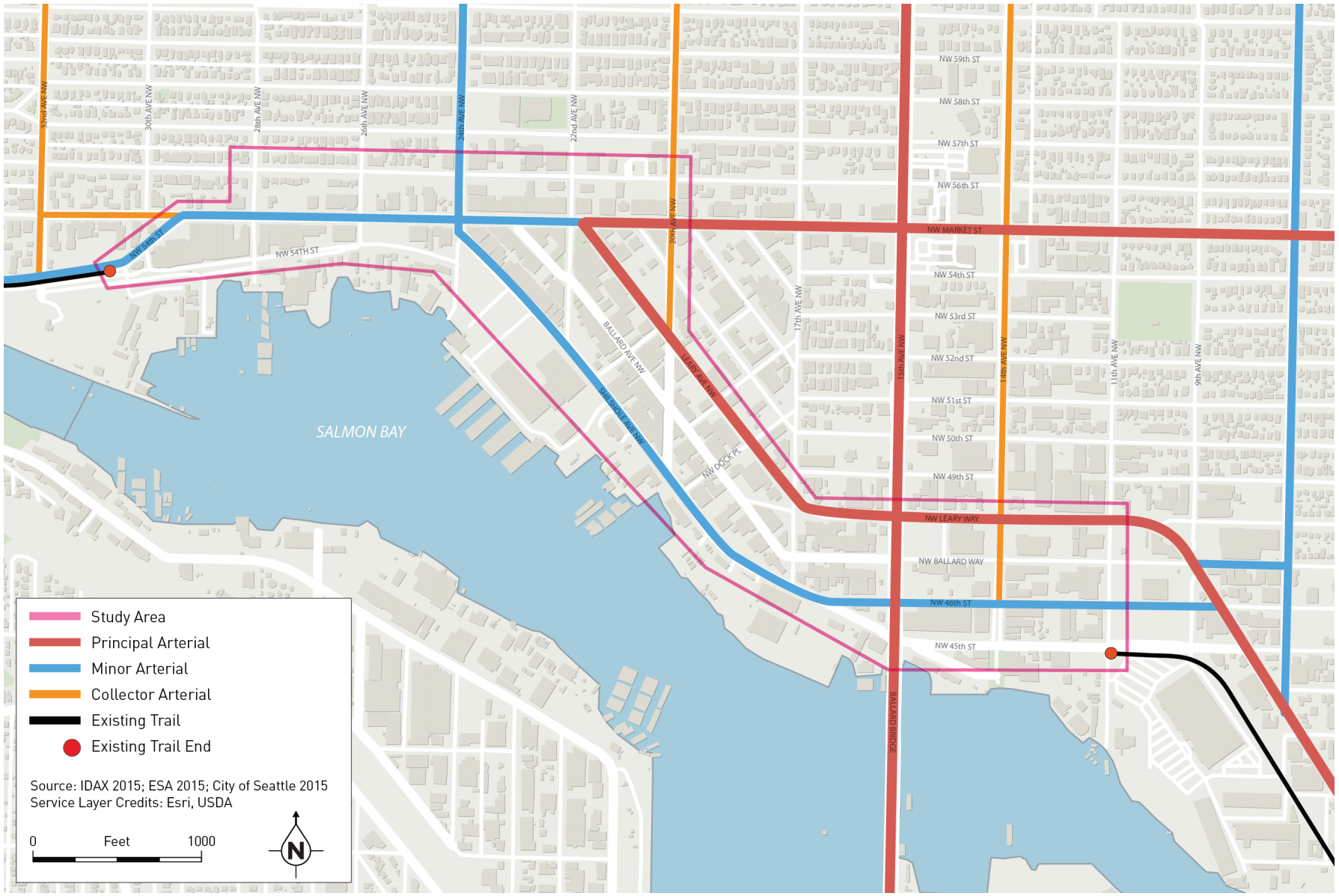

Figure 7-2. Transportation Discipline Study Area Roadway Hierarchy

7.2.3 Intersection Operations and Driveway Delay

Intersection operations were measured using the level of service (LOS) scale ranging from A to F, depending on the delay conditions at the intersection. LOS A represents the best conditions with minimal delay and LOS F represents the worst conditions with severe congestion. LOS ratings are based on the control delay of the intersection or roadway. Table 7-1 lists the intersection LOS delay thresholds for signalized and stop-controlled intersections. There are variations in the ranges of delay associated with the LOS ratings for signalized and unsignalized (stop-controlled) intersections.

Table 7-1. Level of Service Thresholds

Level of Service	*Average Control Delay per Vehicle (seconds)*	
	Signalized Intersections	*Stop-Controlled Intersections*
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Note: The LOS criteria are based on control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final deceleration delay.

For this analysis, intersections that operate at LOS E or F are considered unacceptable. As shown in Figure 7-3 and Table 7-2, the following four intersections currently operate at LOS E or F during the PM peak hour:

- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp;
- Intersection 11: Shilshole Ave NW/NW 17th St (southbound approach from NW 17th St);
- Intersection 12: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW); and
- Intersection 13: NW 56th St/24th Ave NW (westbound approach on NW 56th St).

All other intersections in the study area currently operate at LOS D or better.

The average delay in seconds at driveways during the PM peak hour is shown in Table 7-3. Existing delay at driveways in the study area ranges between approximately 10 and 25 seconds during the PM peak hour.

Figure 7-3. 2015 PM Peak Hour Study Intersection Level of Service

Table 7-2. 2015 PM Peak Hour Study Intersection Level of Service

*ID**	*Intersection*	*Traffic Control*	*2015 Existing Conditions PM Peak Hour*	
			LOS	*Delay (sec)*
1	NW Market St/28th Ave NW	Signal	A	6
2	NM Market St/24th Ave NW	Signal	D	42
3	NM Market St/Ballard Ave NW	Pedestrian Half Signal	A	8
4	NW Market St/22nd Ave NW/ Leary Ave NW	Signal	D	54
5a	15th Ave NW/NW Leary Way Southbound Off-Ramp	Signal	B	15
5b	15th Ave NW/NW Leary Way Northbound Off-Ramp	Signal	E	61
6	NW Leary Way/14th Ave NW	Signal	A	8
7	NW Leary Way/11th Ave NW	Signal	B	14
8	11th Ave NW/NW 46th St	Signal	B	18
9	11th Ave NW/NW 45th St	Unsignalized	A	10
10	NW 46th St/Shilshole Ave NW	Unsignalized	A	8
11	Shilshole Ave NW/NW 17th St	Unsignalized	E	42
12	Leary Ave NW/20th Ave NW	Unsignalized	F	269
13	NW 56th St/24th Ave NW	Unsignalized	E	39

*ID number matches ID number on Figures 7-1 and 7-3.

Table 7-3. 2015 PM Peak Hour Study Driveway Delay

*ID**	*Driveway*	*2015 Existing Conditions PM Peak Hour Delay (sec)*
14	NW 54th St/Ballard Locks	21
15	Shilshole Ave NW/Stimson Marina	17
16	Shilshole Ave NW/Salmon Bay Center	18
17	Shilshole Ave NW/Salmon Bay Sand and Gravel (north side)	11
18	Shilshole Ave NW/Salmon Bay Sand and Gravel (south side)	22
19	Shilshole Ave NW/Covich-Williams Chevron	15
20	Shilshole Ave NW/Salmon Bay Café	15

*ID**	*Driveway*	*2015 Existing Conditions PM Peak Hour Delay (sec)*
21	Shilshole Ave NW/Ballard Industrial	20
22	Ballard Ave NW/Ballard Industrial	8
23	Shilshole Ave NW/Ballard Mill Marina	20

*ID number matches ID number on Figure 7-1.

7.2.4 **Freight**

As documented in the Freight Master Plan, SDOT has proposed several streets in the study area as Major and Minor Truck Streets. Major Truck Streets are arterial streets that provide connections between and through industrial land uses (Manufacturing Industrial Centers and intermodal terminals), commercial districts, and urban centers (SDOT, 2016). Minor Truck Streets provide connections to and from urban villages and commercial districts, and secondary connections to major truck streets (SDOT, 2016). Major Truck Streets in the study area include:

- Shilshole Ave NW;
- NW Leary Way;
- 15th Ave NW; and
- NW Market St between 24th Ave NW and the eastern boundary of the study area.

Minor Truck Streets in the study area include 24th Ave NW between Shilshole Ave NW and the northern boundary of the study area.

The Industrial Areas Freight Access Project (SDOT and Port of Seattle, 2015) describes all arterial streets in the city as freight routes, although arterials are not subject to the same criteria for street design, traffic management, and pavement design and repair as Major Truck Streets. In addition to Shilshole Ave NW, NW Market St, 24th Ave NW, NW Leary Way, and 15th Ave NW, the following streets are considered arterial streets and are expected to accommodate some freight traffic:

- NW 46th St;
- 14th Ave NW; and
- 20th Ave NW.

Daily truck volumes (medium and heavy trucks) are highest on NW Leary Way/Leary Ave NW, NW Market St, NW 54th St, and Ballard Ave NW based on daily volume counts. During the PM peak hour, freight truck volumes in the study area are also highest on NW Leary Way/Leary Ave NW, Ballard Ave near 22nd Ave NW, and NW Market St.

7.2.5 **Nonmotorized Users**

The existing BGT ends just east and west of the study area. The eastern end of the BGT is at 11th Ave NW and NW 45th St. The western end is located 300 feet east of 32nd Ave NW and NW 54th St.

The BGT is a multi-use trail that provides local and regional access connecting Seattle, Lake Forest Park, and Kenmore. Near the study area, the BGT provides connections to destinations such as Golden Gardens

Park and the Ballard Locks to the west, and Gas Works Park and the University of Washington to the east. Near the study area, the trail has a width of between 12 and 15 feet. Currently, the BGT is used by a variety of nonmotorized users, including walkers, runners, bicyclists, skaters, and commuters.

In addition to the BGT, other bicycle facilities within and near the study area are shown on Figure 7-4. Most streets in the study area have paved sidewalks on both sides of the street with widths varying between 6 and 20 feet (Figure 7-5).

Table 7-4 shows daily nonmotorized counts recorded during 2015 on the BGT at two locations: 9th Ave NW and at Seaview Ave NW. Table 7-5 provides nonmotorized volumes during the PM peak hour on the BGT at 9th Ave NW.

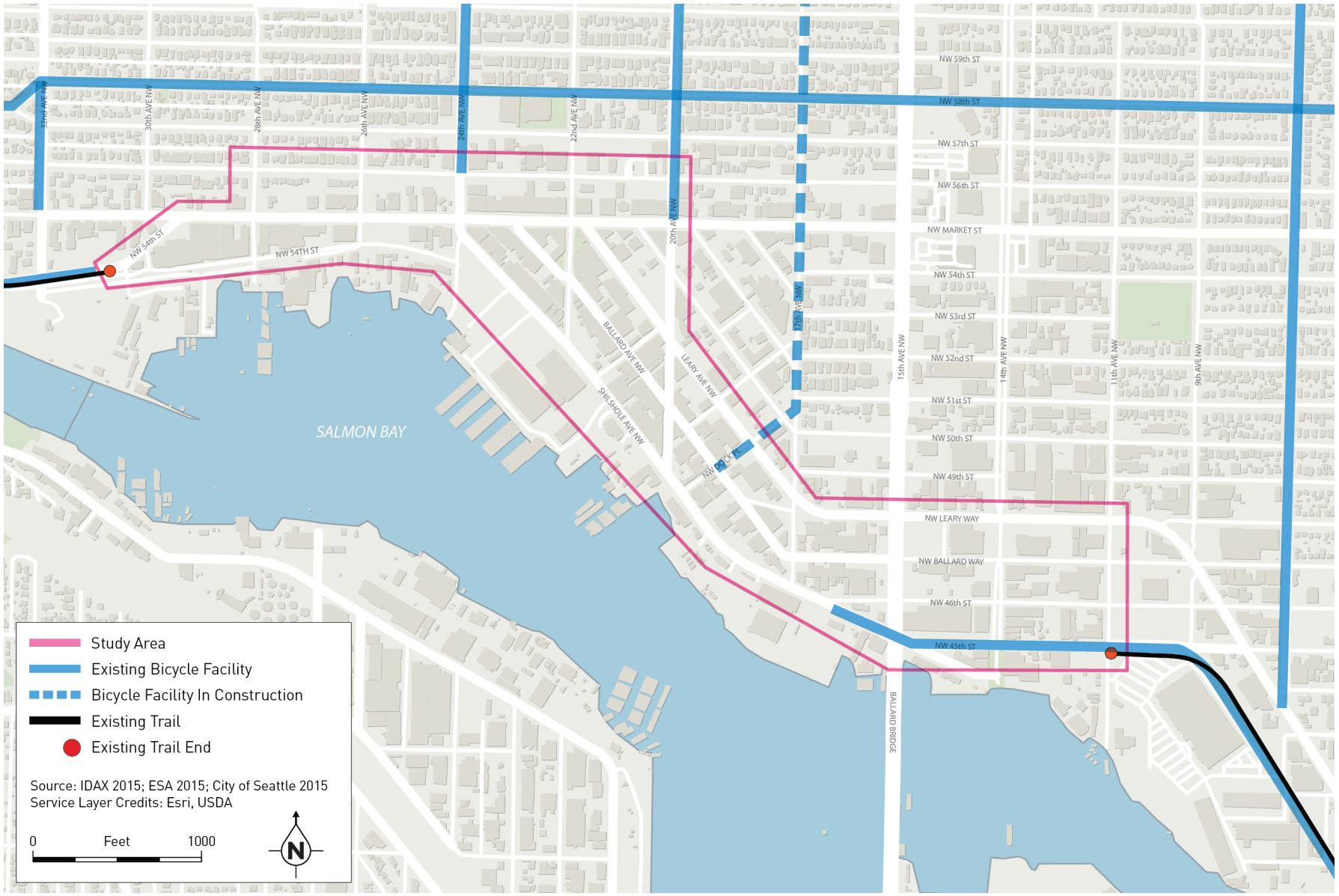

Figure 7-4. 2015 Study Area Bicycle Facilities

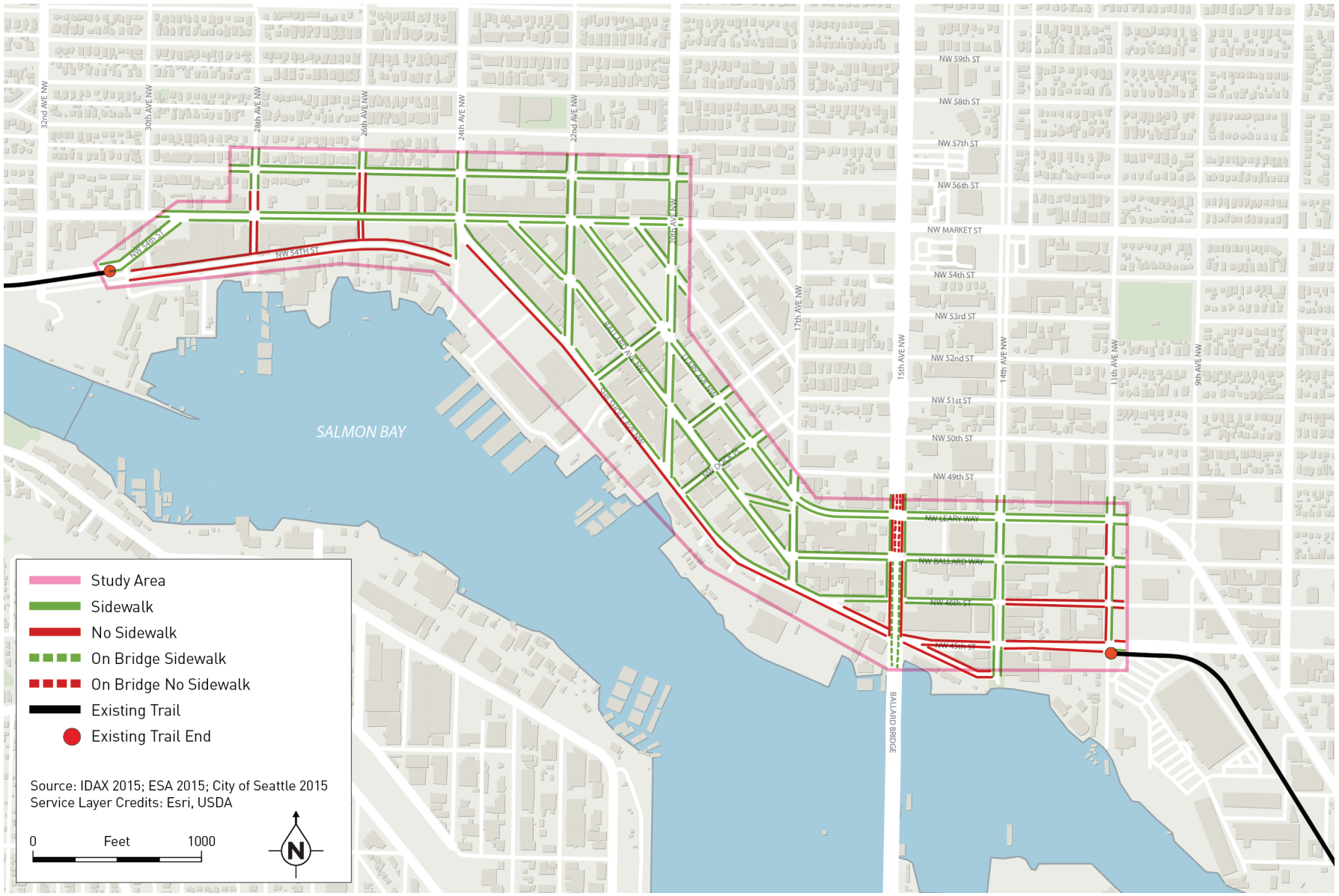

Figure 7-5. 2015 Study Area Sidewalks

Table 7-4. 2015 Daily Bicycle Counts and Estimated Pedestrian Volumes on the BGT

Date	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Estimated Total Pedestrians*[1]	*Estimated Westbound Pedestrians*[1]	*Estimated Eastbound Pedestrians*[1]
BGT at 9th Ave NW						
Fri 7/17/15	1,080	670	410	360	230	130
Sat 7/18/15	1,530	760	770	505	260	245
Sun 7/19/15	1,420	715	705	470	245	225
Mon 7/20/15	1,665	845	820	545	285	260
Tues 7/21/15	1,640	815	825	540	275	265
Wed 7/22/15	1,720	850	870	565	290	275
BGT at Seaview Ave NW						
Fri 7/17/15	400	180	220	135	60	75
Sat 7/18/15	635	325	310	210	105	105
Sun 7/19/15	200	80	120	65	25	40
Mon 7/20/15	55	45	10	20	15	5
Tues 7/21/15	75	65	10	25	20	5
Wed 7/22/15	130	75	55	45	25	20
Thurs 7/23/15	95	70	25	30	20	10

[1] Pedestrian volumes estimated based on the bicycle-to-pedestrian ratio developed using counts taken in September 2015.

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

Table 7-5. 2015 PM Peak Hour Nonmotorized Counts on the BGT at 9th Ave NW

PM Peak Hour	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Total Pedestrians*	*Westbound Pedestrians*	*Eastbound Pedestrians*
5:00–6:00 PM	190	145	45	50	35	15

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

Bicycle volumes are higher than pedestrian volumes on the BGT. Counts recorded during 2015 indicated that pedestrian volumes are approximately 30% of bicycle volumes on the trail. The counts at 9th Ave NW, the closest location to the study area, also indicate that bicycle volumes are typically higher on weekdays than on weekends (Table 7-4). This is likely because of the high number of commuters who use the BGT compared to recreational users. Nonmotorized volumes on the BGT are substantially higher on the east side of the study area compared to the west side. It is likely that a large number of users are starting and ending their trips in the higher density residential areas north of the study area.

Turning movement counts collected in April 2014 and September 2015 at study area intersections also recorded pedestrian and bicycle movements during the PM peak hour. During the PM peak hour, bicycle volumes were highest at:

- NW 45th St near the eastern end of the BGT;
- Shilshole Ave NW and NW 46th St;
- 22nd Ave NW and NW Market St;
- NW Market St and NW 24th St; and
- NW Market St and NW 28th St.

The bicycle counts indicate that during the PM peak hour, bicyclists are traveling westbound from the eastern end of the BGT along Shilshole Ave NW. Bicyclists likely use various northbound streets, such as 22nd Ave NW and 24th Ave NW, to connect to residential areas. This also likely indicates that some of the bicycle trips begin and end in the residential areas north of the study area.

During the PM peak hour, pedestrian volumes are highest at:

- NW Market St;
- Leary Ave NW near 20th Ave NW; and
- NW 56th St near 24th Ave NW.

Pedestrian volumes in these locations are likely highest due to the adjacent land uses and proximity of transit stops.

7.2.6 Public Transportation

Major transit corridors in the study area include NW Market St, NW Leary Way, 24th Ave NW, and 15th Ave NW. King County Metro operates six transit routes in the study area (Figure 7-6).

Figure 7-6. 2015 Transit Stops and Corridors

7.2.7 **Freight Rail**

The Ballard Terminal Railroad Co. (BTR) rail line is a shortline railroad that provides freight goods movement in the study area, primarily to the Salmon Bay Sand and Gravel Company. In the study area, the BTR rail line is located on the south side of NW 54th St and Shilshole Ave NW and continues onto the north side of NW 45th St. There is also a rail spur line that travels north from NW 45th St to NW 46th St directly east of 14th Ave NW. There are nine public at-grade crossings in the study area located at:

- 30th Ave NW and NW 54th St;
- 28th Ave NW and NW 54th St;
- 26th Ave NW and NW 54th St;
- 24th Ave NW and NW 54th St;
- Shilshole Ave NW at 15th Ave NW;
- NW 45th St and 11th Ave NW;
- NW 45th St and 14th Ave NW;
- NW 46th St and 14th Ave NW; and
- NW 46th St near 11th Ave NW.

The rail line also crosses several driveways on the south side of Shilshole Ave NW, including the driveways at the Stimson Marina, Salmon Bay Center, Salmon Bay Sand and Gravel, Covich-Williams Chevron, Salmon Bay Café, and Ballard Mill Marina.

Trains do not regularly travel across all of the crossings. Currently, shipments destined for Salmon Bay Sand and Gravel are transferred from BNSF to BTR near the Seaview Boatyard. From this location, trains travel south and east along the BTR rail line to deliver shipments to Salmon Bay Sand and Gravel. The shipment is unloaded from the train cars, and then empty cars are moved back to the transfer location between BTR and BNSF near the Seaview Boatyard. The train engine used by BTR is stored between NW 45th St and NW 46th St just east of 14th Ave NW. Currently, shipments to Salmon Bay Sand and Gravel occur approximately three times per week (Cole, 2016). Although train movements typically occur when traffic and nonmotorized volumes are lower, such as during the night, BTR can operate trains at any time of the day.

Trains typically travel at speeds of 5 to 10 miles per hour (mph) in the study area. Half of the crossings in the study area do not currently have safety enhancements, such as gates, advance warning signs, pavement markings, or crossbucks (signs in a letter "X" formation that indicate grade crossings). At a minimum, federal law requires all public at-grade crossings to have passive warning signs, such as crossbucks (FHWA, 2007). The following five crossings do not provide crossbucks:

- 30th Ave NW and NW 54th St (U.S. Department of Transportation [USDOT] Crossing Number 101212H);
- Shilshole Ave NW at 15th Ave NW (USDOT Crossing Number 101226R);
- NW 46th St and 14th Ave NW (USDOT Crossing Number 101246C);
- NW 46th St near 11th Ave NW (USDOT Crossing Number 101258W); and
- NW 45th St and 11th Ave NW (USDOT Crossing Number 101264A).

7.2.8 **Safety**

Between January 2012 and December 2014, there were 338 vehicular collisions in the study area. The single block segment of Ballard Ave NW between NW Market St and 22nd Ave NW had the highest number of collisions compared to other single block segments in the study area, with 13 collisions over the 3-year period (Figure 7-7). The majority of collisions in the study area were property damage-only collisions with parked vehicles. None of the collisions were fatal.

The intersections with the highest concentrations of collisions—five or more collisions over the 3-year period—included the following (Figure 7-8):

- NW 46th St and 14th Ave NW;
- 15th Ave NW northbound and NW Leary Way;
- NW Market St and Leary Ave NW;
- NW Leary Way and 14th Ave NW; and
- NW Leary Way and 11th Ave NW.

Collisions involving nonmotorized users are shown on Figure 7-9. Collisions involving pedestrians or bicyclists were distributed throughout the study area, with just over half occurring between intersections (on block segments). The majority of the nine collisions with pedestrians occurred when a turning or forward-moving vehicle struck a pedestrian who was crossing the street. The cause of collisions between bicyclists and vehicles in the study area varies, although the majority of collisions occurred when both the vehicle and the bicyclist were moving. For example, many collisions occurred when a vehicle was traveling in an opposite direction to the bicyclist, such as a right-turning vehicle colliding with a forward-moving bicyclist or a turning bicyclist colliding with a forward-moving vehicle. There were no dedicated bicycle facilities in the locations where a collision between a vehicle and a bicyclist occurred, with the exception of one collision that occurred on NW 45th St between 9th Ave NW and 11th Ave NW. The existing BGT runs parallel to this location.

Nonmotorized safety in the study area is also affected by roadway conditions, including the presence of railroad tracks and other obstacles. Incident response data provided by the Seattle Fire Department indicate locations in the study area where roadway conditions could create unsafe passage for bicyclists and pedestrians (Seattle Fire Department, 2015). As shown on Figure 7-10, incident responses have been concentrated along NW 45th St and Shilshole Ave NW, and at the intersections of NW 45th St/14th Ave NW and under the Ballard Bridge. The presence of railroad tracks in these locations could influence safety conditions for nonmotorized users, particularly bicyclists. Incidents near railroad tracks typically occur when bicycle tires become trapped between the railroad tracks and the street. Between January 2012 and December 2014, there were 45 incidents in the study area. However, it is likely that additional incidents caused by roadway conditions occurred but were not recorded.

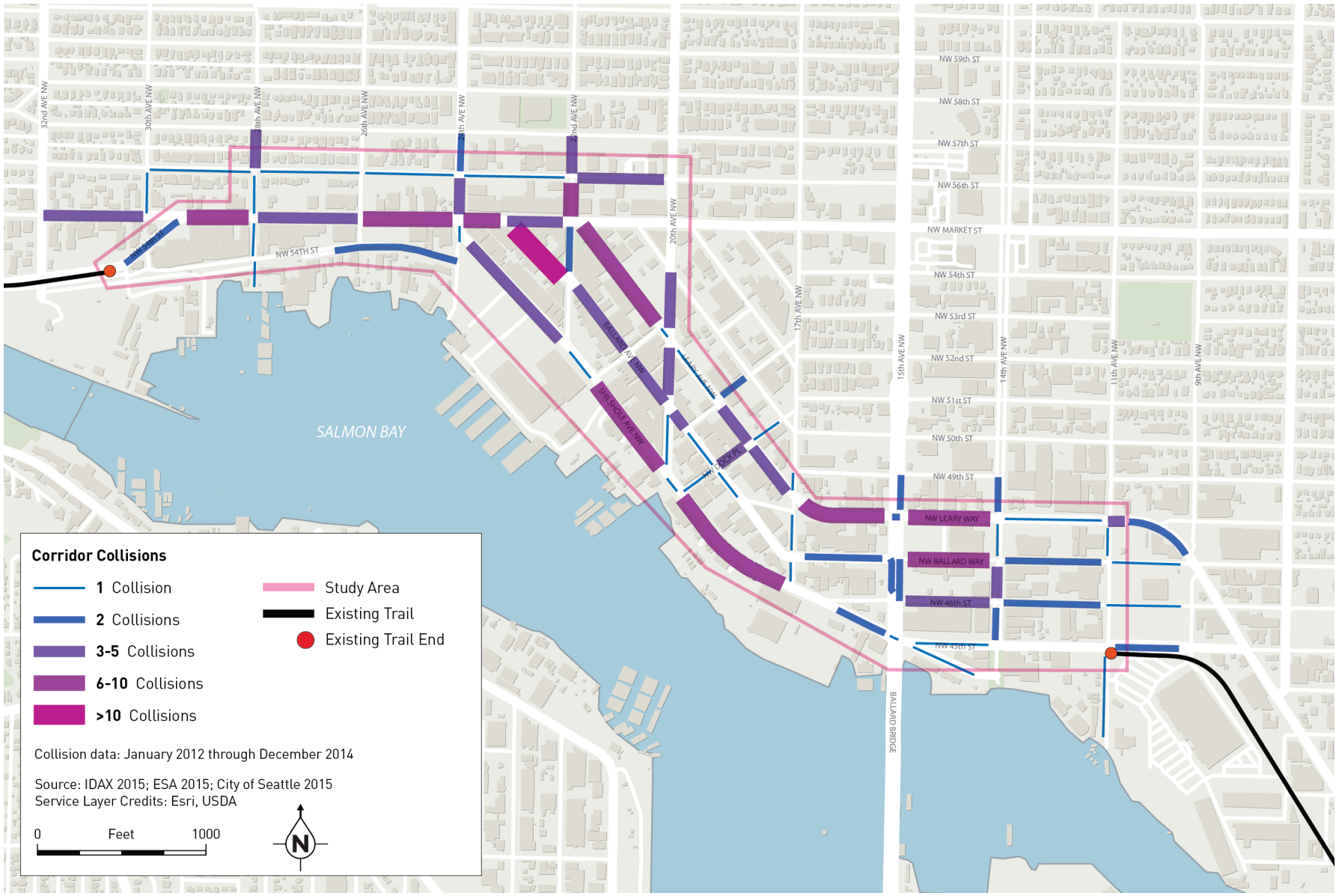

Figure 7-7. Study Area Corridor Collisions

Figure 7-8. Study Area Intersection Collisions

Figure 7-9. Study Area Collisions Involving Nonmotorized Users

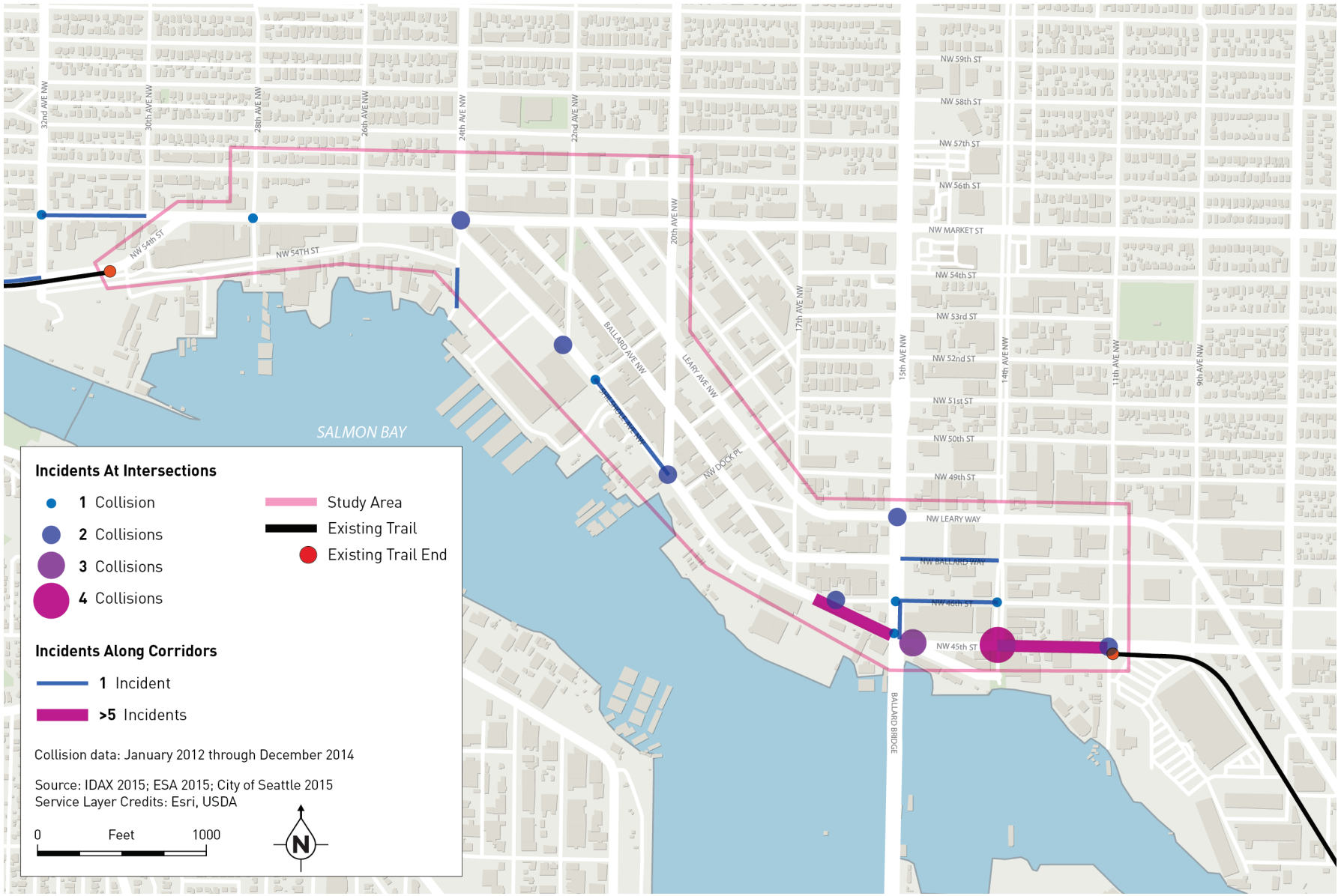

Figure 7-10. Study Area Nonmotorized Incident Responses

7.3 Potential Impacts

7.3.1 No Build Alternative

Construction

No construction activities would occur under the No Build Alternative for the Missing Link project; therefore, there would be no construction impacts associated with the No Build Alternative.

Operation

Roadway Network

The roadway configuration and the 23 study area intersections and driveways for the No Build Alternative would be the same as the 2015 existing conditions.

Traffic Volumes and Operations

The year 2040 was used as the timeline to analyze the impacts of the project. The project team estimated the 2040 passenger vehicle volumes for the study area intersections under No Build conditions (i.e., without the project) by applying an annual background growth rate of 0.6% to existing traffic counts in the study area (IDAX, 2015; SDOT, 2015a, 2015b). The 0.6% growth rate is consistent with the two previous transportation studies completed in 2008 and 2011 for the Missing Link (Parsons Brinckerhoff, 2008, 2011).

The projected growth in traffic volumes would result in more congestion and delay under the No Build Alternative compared to 2015 existing conditions. The following intersections are expected to operate at LOS E or F, or would have increased delay, in 2040 under the No Build Alternative:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5b: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 11: Shilshole Ave NW/NW 17th St (southbound approach);
- Intersection 12: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW); and
- Intersection 13: NW 56th St/24th Ave NW (westbound approach).

All other intersections in the study area would operate at LOS D or better (Figure 7-11).

During the PM peak hour, delay at study area driveways could increase by up to 12 seconds compared to existing conditions.

Freight

The primary freight corridors would be the same under the No Build Alternative compared to the 2015 existing conditions. However, increased traffic congestion from background population and employment growth would likely adversely affect freight movement in the study area. Freight vehicles would experience the same delay at study area intersections as general-purpose vehicles. Intersection 11 (Shilshole Ave NW/NW 17th St) would operate at LOS F in 2040 and is located on a primary freight corridor as designated by SDOT.

Figure 7-11. 2040 No Build Alternative PM Peak Hour Study Intersection Level of Service

Nonmotorized Users

Bicycle volumes in the study area are projected to increase by 5% each year between 2015 and 2040 based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from SDOT (SDOT, 2015c, 2015d; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Pedestrian volumes are projected to increase by 1% each year between 2015 and 2040 (Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015).

Pedestrian and bicycle facilities in and near the study area under the No Build Alternative would be the same as under the 2015 existing conditions. There would continue to be a gap in the BGT within the study area (between 11th Ave NW and NW 45th St and approximately 300 feet east of 32nd Ave NW and NW 54th St). Similar to existing conditions, bicyclists are anticipated to primarily use Shilshole Ave NW to travel through the study area.

Under the No Build Alternative, increased pedestrian and bicycle volumes in the study area could result in increased conflicts between nonmotorized users and vehicular traffic, particularly for bicyclists. Bicyclists currently travel on study area roadways without designated bicycle facilities, particularly on Shilshole Ave NW. When there are more bicyclists on study area streets in the future, the lack of dedicated facilities could result in more collisions between motor vehicles and bicyclists because of increased volumes.

Public Transportation

Public transportation services under the No Build Alternative would be similar to the 2015 existing conditions. With increased population and employment growth, demand for public transit would likely increase, which could result in the need for service expansion in the study area.

None of the intersections along transit corridors are expected to operate at LOS F under the No Build Alternative. The intersection at NW 56th St and 24th Ave NW would operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the westbound approach. Similarly, the intersection at Leary Ave NW, 20th Ave NW, and NW Vernon Pl would also operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the northeast-bound approach on NW Vernon Pl and the southbound approach on 20th Ave NW.

Freight Rail

Rail operations in the study area under the No Build Alternative are expected to be similar to the 2015 existing conditions. No impacts are anticipated under the No Build Alternative.

Safety

Traffic and nonmotorized volumes in the study area are expected to increase between 2015 and 2040. This could increase collision frequencies for both motor vehicle and nonmotorized users in the study area. Bicycle volumes are expected to grow at a higher rate than vehicles and pedestrians; therefore, the frequency of motor vehicle-bicycle collisions could increase at a greater rate under the No Build Alternative. No new dedicated bicycle facilities would be provided under the No Build Alternative. The majority of collisions between bicyclists and motor vehicles to date have occurred when both the bicyclist and the motor vehicle were moving in areas lacking dedicated bicycle facilities. If this condition persists, there could be an increased likelihood for collisions between motor vehicles and bicyclists because of increased volumes.

Other roadway conditions that influence nonmotorized safety would also remain the same under the No Build Alternative, such as the presence of railroad tracks and other obstacles. If dedicated bicycle facilities are not provided to allow bicyclists to avoid or safely traverse areas with obstacles such as railroad tracks, the number of nonmotorized incidents is expected to increase as nonmotorized volumes increase in the study area.

7.3.2 Impacts Common to All Build Alternatives

Construction

Traffic Volumes and Operations

Construction activities could affect traffic operations in the vicinity of each Build Alternative during the 12- to 18-month construction period. Construction would occur in small segments that could range between three and four street blocks; therefore, isolated portions of the roadway would be affected.

During construction, traffic delay and congestion impacts are anticipated, particularly in areas where the roadway is reduced to one lane. There could also be traffic diversions to other study area streets during construction, which could increase delay and congestion on other roadways. However, traffic delay from diversions is expected to be minimal because it is likely that vehicles would be distributed along multiple adjacent roadways under each alternative.

Additional sources of potential traffic delay during construction could include the following:

- Visual distraction from construction activities; and
- Construction trucks entering and exiting the work zone and staging areas.

In general, delays resulting from these sources are likely to be minor.

Driveway access to properties would likely be maintained during construction. It is possible that driveways could be narrowed during construction, or could be temporarily surfaced with ADA-compliant materials in place of asphalt or concrete. If properties have more than one access point, it is also possible that one driveway could be closed while the other remains open during construction. Impacts are expected to be minor for driveway access and for traffic accessing individual properties.

Freight

Freight traffic could experience temporary, minor delays and congestion. Access to businesses in the study area would be maintained throughout construction. Because freight traffic peaks during the midday, roadway closures during the day could cause additional delay for freight vehicles. However, this impact is not anticipated to be significant because construction closures would only occur for several hours.

Nonmotorized Users

Pedestrian and bicyclist access would be maintained within the construction areas in accordance with City policies for construction. Commercial businesses would remain open, and residential and industrial properties would remain accessible. Sidewalks could be temporarily replaced by ADA-compliant facilities within the construction area and to access other properties. Temporary pedestrian facilities could include asphalt sidewalks, steel plates over unfinished areas, wood sidewalks with railings, or cordoned-off areas of parking lanes. When necessary during construction, nonmotorized users could be rerouted

around active construction zones, which could lengthen nonmotorized trips and travel times. However, the impact would be minor in any one location because construction is expected to occur in segments of three to four street blocks.

Public Transportation

Traffic diversion to other study area streets could increase delay and congestion for transit in the study area. However, this impact would not be significant because diverted vehicles would likely be distributed along multiple adjacent roadways under each of the alternatives.

Specific construction impacts on public transportation that would only occur for the Ballard Avenue Alternative and Leary Alternative are described in Section 7.3.6 and Section 7.3.7, respectively.

Freight Rail

Construction impacts on rail service would only occur on the Shilshole South Alternative (Section 7.3.4). Construction activities for all other Build Alternatives are not expected to affect rail operations in the study area.

Safety

Construction activities for the Build Alternatives could temporarily affect safety in the study area. Temporary changes in roadside characteristics and surfacing could increase accident frequencies in isolated locations in the study area during construction. Changes in roadside characteristics could include the presence of construction equipment and activities or loss of shoulders, among other alterations, which have the potential to create distractions for drivers. Changes in roadway surfacing could affect traffic speeds and braking.

Operation

Roadway Network

All alternatives would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 8 to 12 feet wide with varying buffers on the side of the trail between the adjacent roadways and properties.

Traffic Volumes and Operations

The same projected increases in traffic, bicycle, and pedestrian volumes for the year 2040 used in the No Build Alternative analysis were also applied to each Build Alternative described below.

Freight

All alternatives would cross driveways used for freight movement. Freight vehicles would be required to stop before the trail to check for pedestrians and bicyclists before advancing to the roadway. For driveways that were studied, this could result in zero to 25 seconds of additional delay, on average, above the No Build Alternative during the PM peak hour. Similar delays are expected for other driveways in the study area. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and all day.

Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do and may have to reorient their business operations to accommodate freight by relocating loading docks or driveways.

Nonmotorized Users

The project would provide a dedicated 8- to 12-foot multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. The trail would cross driveways and loading docks. These crossings would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections.

Safety

The Missing Link would improve safety for nonmotorized users and motor vehicles in the study area. A dedicated bicycle facility would improve the predictability of conflict points between motor vehicles and cyclists and reduce the likelihood of collisions because potential conflict points would be clearly identifiable by both motor vehicle drivers and trail users. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The Missing Link would be designed to clearly delineate trail user space from the roadway, and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

7.3.3 Shilshole South Alternative

Construction

Under the Shilshole South Alternative, there could be additional traffic and freight delays on Shilshole Ave NW during construction. If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to other routes within the construction zone. This impact could occur for several hours during the midday but only for short segments of roadway (between three and four street blocks).

Under the Shilshole South Alternative, pavement would be added to portions of the BTR rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. These construction activities would be coordinated with BTR operations and would occur during times when BTR trains are not operating; construction equipment would be cleared from the tracks each day. Because construction activities near the rail line would be coordinated with BTR train movements, construction activities are not expected to affect rail operations. Any construction activities near the BTR rail line would be coordinated with the BTR and would adhere to Federal Railroad Administration requirements for construction near rail facilities.

Operation

Roadway Network

The Shilshole South Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 8 to 12 feet wide with a 1- to 6-foot buffer on each side of the trail between the roadway and adjacent properties.

Under the Shilshole South Alternative, NW 54th St between the Ballard Locks driveway and Shilshole Ave NW would have one lane of travel in each direction. In various locations, driveways would cross the trail to allow access to businesses. The roadway channelization on Shilshole Ave NW would be similar to the No Build Alternative, with one travel lane in each direction for vehicles. There are approximately 41 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with SDOT and property owners. On Shilshole Ave NW at 17th Ave NW, a left-turn pocket in the eastbound direction and new signal would be provided.

One travel lane in each direction would be provided on NW 45th St between Shilshole Ave NW and 11th Ave NW under the Shilshole South Alternative. At the intersection of 14th Ave NW and NW 45th St, a left-turn pocket would be provided in both the eastbound and westbound directions. At the intersection of 11th Ave NW and NW 45th St, a left-turn pocket would be provided in the eastbound direction. A 5- to 17-foot clear zone would be provided between the Ballard Bridge overpass and 11th Ave NW on NW 45th St. The 17-foot-wide clear zone would be centered on the railroad tracks for clearance and safety.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 11 seconds of increased delay compared to the No Build Alternative.

The Shilshole South Alternative would not cause any intersections to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. However, the following five intersections (described below) would operate at a different LOS or have a change in delay when compared to the No Build Alternative (Figure 7-12).

1. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall intersection delay.

2. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C because traffic would shift from NW 46th St to NW 45th St as NW 45th St is restored to a two-way street. Under the No Build Alternative, NW 45th St remains an eastbound one-way street for vehicles.

Figure 7-12. Shilshole South Alternative PM Peak Hour Study Intersection Level of Service

3. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Shilshole South Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS decreases under the Shilshole South Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have a significant adverse impact on traffic operations because only a small number of vehicles would experience additional delay, and the intersection would still operate at LOS E or better.

4. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would be signalized under the Shilshole South Alternative. This would improve intersection operations (LOS A compared to LOS F under the No Build Alternative).

5. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Freight

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole South Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole South Alternative because a signal would be provided, improving intersection operations from LOS F to LOS A compared to the No Build Alternative.

Approximately 41 driveways and loading docks are located along the alignment of the Shilshole South Alternative. At driveways, freight vehicles could be delayed from zero to 11 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and all day. Although some driveways could experience additional delay compared to the No Build Alternative, this delay would not be considered a significant impact.

Up to 10 freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the north side of NW 54th St and the south side of Shilshole Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do, and they may have to reorient their business operations to accommodate freight by relocating loading docks or driveways. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole South Alternative. Properties with multiple driveways or access points may need to consolidate these where possible to improve safety and operations.

Nonmotorized Users

The project would provide a dedicated 8- to 12-foot multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements under the Shilshole South Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting.

The trail would cross approximately 41 driveways and loading docks under the Shilshole South Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 to 25 seconds for a vehicle to clear the trail.

Signal timing for both vehicles and nonmotorized users would be included at study area intersections. Signal timing would be optimized for all movements, so delay would not be increased to unacceptable levels for nonmotorized users and vehicles.

Pedestrian and Bicycle Volumes

Between 2015 and 2040, bicycle volumes are anticipated to grow by 5% annually, and pedestrian volumes are expected to grow by 1% annually in the study area. These growth rates are based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from SDOT (SDOT, 2015c; 2015d; Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Anticipated nonmotorized volumes on the Missing Link in 2040 are summarized in Table 7-6. All nonmotorized counts were rounded to the nearest five users to account for daily fluctuations. For locations where the recorded volumes were between one and four, the count was rounded up to provide a conservative estimate of impacts. In the analysis, it is assumed that bicycle traffic would shift to the trail corridor proposed under each Build Alternative. This assumption provides the most conservative estimate of impacts under each of the Build Alternatives. Pedestrians and bicyclists who have destinations in other parts of the study area may use the trail on Shilshole Ave NW through the study area for only a short distance. This would result in nonmotorized users continuing to use other roadways in the study area as well, but the majority of users would shift to the trail. For additional details on the analysis, see the Transportation Discipline Report (Parametrix, 2016).

Table 7-6. 2040 PM Peak Hour Nonmotorized Volumes on the BGT

PM Peak Hour	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Total Pedestrians*	*Westbound Pedestrians*	*Eastbound Pedestrians*
BGT at the eastern end						
5:00–6:00 PM	430	325	105	65	45	20
BGT at the western end						
5:00–6:00 PM	160	90	70	125	85	40

The Missing Link project would be designed to accommodate a high volume of nonmotorized users; therefore, Missing Link users are not expected to be affected by diversion. Signal timing for both vehicles and nonmotorized users would be included in the design at study area intersections; as a result, no impacts on delay would occur from the addition of nonmotorized movements through intersections under the Shilshole South Alternative. Signal timing would be optimized for all movements, so delay would not be increased to unacceptable levels for nonmotorized users and vehicles.

Public Transportation

No impacts on transit under the Shilshole South Alternative are anticipated because transit service is not available on streets along this alignment.

Freight Rail

Under the Shilshole South Alternative, the BTR tracks could be relocated in various isolated locations along NW 54th St, Shilshole Ave NW, and NW 45th St. This could include removing pieces of passing rail that are no longer used or relocating track to allow additional right-of-way space for the trail. All track relocation would be coordinated with BTR so that rail operations would not be adversely affected.

The Shilshole South Alternative would improve separation between nonmotorized users and the rail line, which would improve safety. The Missing Link would cross the rail line near the Ballard Mill Marina. Signage and other design elements would be provided to warn nonmotorized users of train activity.

Safety

The Shilshole South Alternative would improve safety for nonmotorized users and motor vehicles in the study area. Under this alternative, a dedicated bicycle facility would improve predictability of conflict points between motor vehicles and bicyclists and reduce the likelihood of collisions. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The Missing Link would be designed to clearly delineate trail user space from the roadway and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

Under the Shilshole South Alternative, there would be sight distance concerns for exiting vehicles at up to eight driveways on the south side of Shilshole Ave NW between 20th Ave NW and 11th Ave NW where buildings are constructed up to the property lines. Buildings and structures adjacent to the trail could reduce visibility for both vehicles and trail users. However, the final trail design would include safety features to reduce conflicts between trail users and vehicles. The placement of the trail could also be moved to locations farther from the property lines, but this would require additional relocation of the BTR tracks. The final placement of the trail would be decided during final design. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify trail users and vehicle drivers of the trail crossing. Although a buffer would not be provided between the property line and the trail, these driveways would still operate safely under SMC 11.58.230, which states:

> "Except as directed otherwise by official traffic-control devices, the driver of a vehicle emerging from any alley, driveway, private property, or building shall stop such vehicle immediately prior to driving onto a sidewalk or onto the sidewalk area extending across any alley or driveway, or onto a public path, and shall yield the right-of-way to any pedestrian or bicyclist as may be necessary to avoid collision, and upon entering the roadway of a street shall yield the right-of-way to all vehicles approaching on the roadway."

Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

7.3.4 Shilshole North Alternative

Construction

Under the Shilshole North Alternative, there could be additional traffic and freight delay during construction on Shilshole Ave NW because the roadway is a two-lane street (one lane of traffic in each direction). If construction activities would require the closure of one lane of the roadway, traffic on Shilshole Ave NW would have to be controlled by a flagger to direct travel through the construction zone. Traffic could be affected for several hours during midday.

Under the Shilshole North Alternative, construction would occur on NW Market St, a transit corridor, which could have temporary impacts on public transportation. It is possible that delay and congestion could increase as a result of traffic diversion and road closures during construction. However, these impacts would be minimal because construction would occur in segments of three or four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation on NW Market St would be coordinated with King County Metro.

Operation

Roadway Network

The Shilshole North Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 12 feet wide with a 3- to 11-foot buffer between the roadway and the trail. A sidewalk between 5 and 12 feet wide would be provided between the trail and adjacent properties. There are approximately 58 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with SDOT and property owners.

Under the Shilshole North Alternative, NW 54th St between NW Market St and 32nd Ave NW would be a two-lane roadway with one lane in each direction. A left-turn pocket would be provided at 32nd Ave NW in the westbound direction. NW Market St between 30th Ave NW and 24th Ave NW would be a three-lane roadway with one travel lane in each direction and a two-way center-turn lane. At the intersection of NW Market St and 24th Ave NW, right- and left-turn pockets would be provided in the eastbound direction. On Shilshole Ave NW and NW 46th St, one travel lane in each direction would be provided. A signal at 17th Ave NW and Shilshole Ave NW would be provided.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 25 seconds of additional delay compared to the No Build Alternative.

The Shilshole North Alternative would not cause any intersections to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. However, seven intersections (described below) would operate at a different LOS or have changes in delay when compared to the No Build Alternative (Figure 7-13).

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would operate at LOS C under the Shilshole North Alternative compared to LOS A under the No Build Alternative. Under the Shilshole North Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at LOS E or better.

2. Intersection 2: NW Market St/24th Ave NW

The intersection at NW Market St and 24th Ave NW (Intersection 2) would have approximately 2 additional seconds of delay because the trail would cross the south leg of the intersection before it continues onto the north side of Shilshole Ave NW. This would create additional minor delay at the intersection but would not reduce overall LOS.

3. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate better under the Shilshole North Alternative (LOS B) compared to the No Build Alternative (LOS C). This is because traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Shilshole North Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay is for the worst-operating approach. Although the LOS decreases under the Shilshole North Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This delay is not anticipated to have an adverse impact on traffic operations because only a small number of vehicles would experience additional delay and the intersection would still operate at LOS E or better.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would be signalized under the Shilshole North Alternative. This would improve intersection operations (LOS B compared to LOS F under the No Build Alternative).

Figure 7-13. Shilshole North Alternative PM Peak Hour Study Intersection Level of Service

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Freight

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole North Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole North Alternative because a signal would be provided, improving intersection operations from LOS F to LOS B compared to the No Build Alternative.

Approximately 58 driveways and loading docks are located along the alignment of the Shilshole North Alternative. At driveways, freight vehicles could be delayed from zero to 25 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour. Although some driveways could experience additional delay compared to the No Build Alternative, this would not be considered an adverse impact.

Up to six freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/Market St NW, the north side of Shilshole Ave NW, and the north side of NW 46th St. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Approximately four loading docks could be affected between 24th Ave NW and 17th Ave NW on Shilshole Ave NW, and two driveways on NW Market St between NW 54th St and 26th Ave NW.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way by preventing some businesses from accessing their properties as they currently do. This may require some property owners to reorient their business operations to accommodate freight by moving driveways or loading docks. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole North Alternative. Properties with multiple driveways or access points, such as properties along NW Market St with two access points to a single parking lot, may need to consolidate these to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The project would provide a dedicated 12-foot multi-use trail for nonmotorized users for the entire study area. A 3- to 11-foot buffer would be provided between the roadway and the trail. A sidewalk between 5 and 12 feet wide would also be provided between the trail and adjacent properties. Additional nonmotorized improvements under the Shilshole North Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 58 driveways and loading docks under the Shilshole North Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Pedestrian and bicycle volumes would be similar to those described under the Shilshole South Alternative.

Public Transportation

There would be minimal impacts on transit from the Shilshole North Alternative. At the intersection of NW Market St and 28th Ave NW, which is located along a transit corridor, there could be additional delay compared to the No Build Alternative. This intersection would operate at LOS C under the Shilshole North Alternative compared to LOS A under the No Build Alternative. This could affect transit delay and speeds near this intersection. However, this intersection would operate above LOS E, and mitigation would not be required.

Freight Rail

No impacts on rail from the Shilshole North Alternative are anticipated because rail facilities and operations would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those resulting from the Shilshole South Alternative (see Section 7.3.4).

Under the Shilshole North Alternative, there would be sight distance concerns for exiting vehicles at approximately eight driveways on NW Market St, approximately 16 driveways on Shilshole Ave NW, and approximately four driveways on NW 46th St where buildings are constructed up to the property lines. Under the Shilshole North Alternative, sidewalks would be provided between the properties and the trail, which would improve safety. Trail users would have a buffer of 5 to 12 feet from the property frontage.

The final trail design would reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicle drivers of the trail crossing. Under SMC 11.58.230, driveways along the Shilshole North Alternative alignment would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because the trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

7.3.5 Ballard Avenue Alternative

Construction

Under the Ballard Avenue Alternative, there could be additional traffic and freight delay during construction on 28th Ave NW, NW 56th St, 22nd Ave NW, and Ballard Ave NW because these streets are two-lane streets (one lane of traffic in each direction). If construction activities would require the closure of one lane of the roadway, a flagger could be required to direct travel via alternative routes within the construction zone, which could be three to four street blocks in length. It is anticipated that this impact would be minimal because roadway closures would occur temporarily during the midday for several hours.

Operation

Roadway Network

The Ballard Avenue Alternative would alter the roadway network on NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW, 15th Ave NW, NW 46th St, and 11th Ave NW. The Ballard Avenue Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be12 feet wide with a 4- to 5-foot buffer between the roadway and the trail. A block-long section of trail between NW Ballard Way and NW 46th St would be 20 feet wide. A sidewalk 6 to 10 feet wide would be provided between the trail and adjacent properties.

Under the Ballard Avenue Alternative, all streets along the trail alignment would have one lane in each direction (two-lane roadway), with the exception of the western right-of-way adjacent to 15th Ave NW, which would be converted to trail-only use. There are approximately 42 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with the City and property owners.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 3 seconds of additional delay compared to the No Build Alternative.

The Ballard Avenue Alternative would not cause any intersection to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative. However, seven intersections (described below) would operate at a different LOS or change in delay when compared to the No Build Alternative (Figure 7-14).

Figure 7-14. Ballard Avenue Alternative PM Peak Hour Study Intersection Level of Service

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would have approximately 2 additional seconds of delay under the Ballard Avenue Alternative when compared to the No Build Alternative. This is because the trail would cross the east leg of the intersection, which would result in a minor increase in overall intersection delay.

2. Intersection 2: NW Market St/24th Ave NW

There would be approximately 4 additional seconds of delay at the intersection of NW Market St and 24th Ave NW (Intersection 2). This is because a signal would be installed at the nearby intersection of NW 56th St and 24th Ave NW (Intersection 13 – described below), which would alter traffic flow and coordination between the two intersections. Although there could be an additional 4 seconds of delay, Intersection 2 would operate at the same LOS under both the No Build Alternative and Ballard Avenue Alternative.

3. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Ballard Avenue Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS would decrease under the Ballard Avenue Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have an adverse impact on traffic operations.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would operate at LOS E under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Nonmotorized users would shift to the trail on NW Ballard Way/Ballard Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would operate at LOS B under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Under the Ballard

Avenue Alternative, this intersection would be signalized to improve safety for nonmotorized users, which would also improve operations for vehicles compared to the No Build Alternative.

Freight

Freight mobility at the intersection of 11th Ave NW and NW 46th St would be improved under the Ballard Avenue Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area.

Approximately 42 driveways and loading docks are located along the alignment of the Ballard Avenue Alternative. At driveways, freight vehicles could be delayed from zero to 3 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour.

Under the Ballard Avenue Alternative, up to eight freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the north side of NW 54th St, the east side of 28th Ave NW, the south side of NW 56th St, the west side of 22nd Ave NW, the southwest side of Ballard Ave NW/NW Ballard Way, the south side of NW 46th St, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Up to three loading docks could be affected between NW 54th St and NW Market St on 28th Ave NW.

The change in access could potentially alter how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do and may have to reorient their business operations to accommodate freight by moving driveways or loading docks. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Ballard Avenue Alternative. Properties with multiple driveways or access points, such as properties along NW 56th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The Ballard Avenue Alternative would provide a dedicated, 12- to 20-foot multi-use trail for nonmotorized users for the entire study area. A 4- to 5-foot buffer would be provided between the roadway and the trail. A sidewalk 6 to 10 feet wide would also be provided between the trail and properties along NW 54th St, NW Market St, Shilshole Ave NW, and NW 46th St. Additional nonmotorized improvements under the Ballard Avenue Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. Curb bulbs would be provided at most intersections along the alignment.

The trail would cross approximately 42 driveways and loading docks under the Ballard Avenue Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 to 25 seconds for a vehicle to clear the trail.

Pedestrian and bicycle volumes would be similar to those described under the Shilshole South Alternative.

Public Transportation

No impacts on transit under the Ballard Avenue Alternative are anticipated because there would be no additional delay on transit corridors compared to the No Build Alternative.

Freight Rail

No impacts on rail from the Ballard Avenue Alternative are anticipated because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those from the Shilshole South Alternative (see Section 7.3.4).

Under the Ballard Avenue Alternative, there could be sight distance concerns for exiting vehicles at up to 16 driveways on the southwest/south side of Ballard Ave NW/NW Ballard Way and up to two driveways on the south side of NW 46th St where buildings are constructed up to the property lines. Under the Ballard Avenue Alternative, sidewalks would be provided between the adjacent properties and the trail, which would improve safety. Trail users would have a buffer of 7 to 10 feet from the property frontage.

The final trail design would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicles of the trail crossing. Under SMC 11.58.230, driveways along the Ballard Avenue Alternative would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate commercial traffic.

There could be potential safety impacts associated with the Ballard Farmers Market under the Ballard Avenue Alternative. The market occurs every Sunday, year-round, and is located on Ballard Ave NW between Vernon Pl and 22nd Ave NW. When the market is open, Ballard Ave NW between Vernon Pl and 22nd Ave NW is closed to vehicle traffic to accommodate market stalls, which are set up in the right-of-way. The market attracts a large number of pedestrians to the area when open, which could conflict with trail use. The potential for collisions between trail users and visitors to the market could be a safety concern under the Ballard Avenue Alternative. Additional information on the Farmers Market is presented in Chapter 5, Recreation.

7.3.6 **Leary Alternative**

Construction

Under the Leary Alternative, there could be additional traffic and freight delay during construction on 11th Ave NW, a two-lane street (one lane of traffic in each direction). If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to alternative routes through the construction zone. This impact would likely be minimal.

Under the Leary Alternative, construction would occur on a transit corridor, which could have temporary impacts on public transportation similar to those described for general-purpose traffic. Increases in delay and congestion from traffic diversion and road closures could be possible during construction. However, these impacts are expected to be minimal because construction would occur in segments of three to four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation would be coordinated with King County Metro.

Operation

Roadway Network

The Leary Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 12 feet wide with a 3- to 13-foot buffer between the roadway and the trail. A sidewalk 6 to 10 feet wide would be provided between the trail and adjacent properties.

Under the Leary Alternative, NW Market St and Leary Ave NW/NW Leary Way would no longer be two lanes in each direction (four-lane roadway) along the trail alignment; these streets would have one travel lane in each direction and a center two-way left-turn lane (three-lane roadway). NW 54th St would have one travel lane in each direction (two-lane roadway), similar to existing conditions.

At the intersection of NW Market St and 24th Ave NW, right- and left-turn lanes would be provided in the eastbound and westbound directions. At the NW Leary Way and 15th Ave NW intersection, left-turn lanes would be provided in the eastbound and westbound directions.

There are approximately 33 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple access points could have their driveways consolidated into a single access point in coordination with the City and property owners.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 1 second of additional delay compared to the No Build Alternative.

The Leary Alternative would cause two intersections (Intersections 5a and 7) to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative. In addition, this alternative would cause delay to increase by 5 seconds or more at two intersections that operate at LOS E or worse under both alternatives. An additional seven intersections would operate at a different LOS or experience a change in delay when compared to the No Build Alternative. These intersections are described below and shown on Figure 7-15.

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would operate at LOS C under the Leary Alternative compared to LOS A under the No Build Alternative. Under the Leary Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at LOS D or better.

2. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection of NW Market St, 22nd Ave NW, and Leary Ave NW (Intersection 4) would have approximately 16 seconds of additional delay under the Leary Alternative compared to the No Build Alternative because the trail would travel through the intersection. This would create additional delay for vehicles because drivers would be required to stop for trail users.

3. Intersection 5a: 15th Ave NW/NW Leary Way (southbound off-ramp); Intersection 5b: 15th Ave NW/NW Leary Way (northbound off-ramp); Intersection 6: NW Leary Way/14th Ave NW; and Intersection 7: NW Leary Way/11th Ave NW

The study intersections on NW Leary Way/Leary Ave NW (Intersections 5a, 5b, 6, and 7) would operate at a worse LOS under the Leary Alternative compared to the No Build Alternative because NW Leary Way/Leary Ave NW would be reduced from four lanes to three lanes to accommodate the trail. Intersection 6 would be reduced to LOS C from LOS A under the Leary Alternative. Intersections 5a and 7 on NW Leary Way/Leary Ave NW would operate at LOS C or better under the No Build Alternative and LOS E or F under the Leary Alternative. The delay at Intersection 5b would increase by an estimated 13 seconds under the Leary Alternative compared to the No Build Alternative even though the intersection would operate at LOS E or F under both alternatives.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Leary Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS would decrease under the Leary Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have an adverse impact on traffic operations.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would operate at LOS E under the Leary Alternative compared to LOS F under the No Build Alternative because trail users would shift to the trail on NW Leary Way/Leary Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Figure 7-15. Leary Alternative PM Peak Hour Study Intersection Level of Service

Freight

As described earlier, intersection operations at the following intersections would be similar to or improve under the Leary Alternative when compared to the No Build Alternative:

- Intersection 2: NW Market St/24th Ave NW;
- Intersection 3: NW Market St/Ballard Ave NW;
- Intersection 8: 11th Ave NW/NW 46th St;
- Intersection 9: 11th Ave NW/NW 45th St;
- Intersection 11: Shilshole Ave NW/NW 17th St;
- Intersection 12: Leary Ave NW/20th Ave NW; and
- Intersection 13: NW 56th St/24th Ave NW.

At the intersection of 11th Ave NW and NW 46th St (Intersection 8), freight mobility would be improved because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. At the intersection of Shilshole Ave NW and NW 17th St, freight mobility would be improved because trail users would shift to the trail on NW Leary Way/Leary Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

The following four intersections would operate at a lower LOS under the Leary Alternative when compared to the No Build Alternative:

- Intersection 1: NW Market St/28th Ave NW;
- Intersection 6: NW Leary Way/14th Ave NW; and
- Intersection 10: NW 46th St/Shilshole Ave NW.

However, this would not be considered a significant impact because the intersections would still operate at LOS D or better.

Freight would be delayed at the following four intersections under the Leary Alternative when compared to the No Build Alternative:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5a: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp; and
- Intersection 7: NW Leary Way/11th Ave NW.

Freight mobility could be affected on NW Leary Way between 15th Ave NW and the eastern edge of the study area because NW Leary Way would be reduced by one lane in each direction. The decline in LOS experienced on these corridors is described in the previous section.

There are approximately 33 driveways and loading docks along the alignment of the Leary Alternative. At driveways, freight vehicles could be delayed an additional 1 second (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour.

Up to three freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/NW Market St, the southwest side of Leary Ave NW/NW Leary Way, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks so as not to block the trail. Two driveways on NW Market St and one driveway on NW Leary Way/Leary Ave NW might need to be moved.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do, and may have to reorient their business operations to accommodate freight by relocating access. Properties with multiple driveways or access points, such as properties along NW 56th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The Leary Alternative would provide a dedicated 12-foot multi-use trail for nonmotorized users for the entire study area. A 3- to 13-foot buffer would be provided between the roadway and the trail. A sidewalk 6 to 10 feet wide would also be provided between the trail and adjacent properties. Curb bulbs would be provided at most study area intersections. Additional nonmotorized improvements under the Leary Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 33 driveways and loading docks under the Leary Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 and 25 seconds for a vehicle to clear the trail.

Public Transportation

Under the Leary Alternative, impacts on public transportation would be similar to those described for general-purpose traffic on NW Leary Way/Leary Ave NW and NW Market St, which are both transit corridors. Additional congestion and delay at intersections on these streets could affect public transportation service on King County Metro Routes 17, 18, 29, 40, 44, and Rapid Ride D.

Freight Rail

No impacts on rail are anticipated from the Leary Alternative because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those from the Shilshole South Alternative (see Section 7.3.4).

Under the Leary Alternative, there could be sight distance concerns for exiting vehicles at up to nine driveways on the southwest/south side of Leary Ave NW/NW Leary Way and up to eight driveways on the south side of NW Market St, where buildings are constructed up to the property lines. Under the Leary Alternative, sidewalks would be provided between the properties and the trail, which would improve safety. Trail users would have a buffer of 8 to 10 feet from the property frontage. The final design of the trail would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicles of the trail crossing. Under SMC 11.58.230, driveways along the Leary Alternative would operate safely. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

The Leary Alternative would reduce the existing sidewalk on NW Market St between 24th Ave NW and 22nd Ave NW by up to 12 feet to accommodate the Missing Link. This location is a heavy-use pedestrian corridor, and the potential for conflicts between pedestrians and trail users could increase if the sidewalk were narrowed to accommodate the trail. Safety improvements, such as pavement variations and signage, could be used to slow trail user traffic through this portion of the Leary Alternative.

7.3.7 Connector Segments

Construction

Construction impacts on traffic volumes and operations, freight, nonmotorized users, public transportation, rail, and safety would be similar among all of the connector segments to those described for the Build Alternatives.

Operation

The specific design and impacts of the connector segments would depend on which alignments were being connected. Potential impacts associated with any connector segment could include the following:

- Increased intersection delay for general-purpose vehicles, freight, and public transportation;
- Altered loading dock and driveway access for businesses;
- Pedestrian congestion if sidewalks are reduced; and
- Potential sight distance concerns at driveways.

However, improvements on any of the connector segments would improve safety and comfort for nonmotorized users and vehicles.

7.4 Avoidance, Minimization, and Mitigation Measures

7.4.1 Measures Common to All Alternatives

Construction

To mitigate impacts from construction, SDOT would require the contractor to develop a Traffic Control Plan to reduce impacts on traffic operations and to protect and control motor vehicle, pedestrian, and

bicycle traffic during all phases of construction. The plan would be developed in accordance with City construction specifications and would be updated as appropriate for each construction phase. The plan could outline specific impact-reducing measures, including the following:

- Clearly marked detours for motor vehicles, developed in coordination with other agencies and adjacent construction projects, to provide alternative routes for access through the study area and to avoid active construction areas;
- Accommodations for vehicles that require loading zone access to properties for services such as business deliveries, taxi and bus service, and garbage pickup;
- Use of flaggers, uniformed police officers, barricades, signing, or other traffic control devices;
- Designated construction haul routes to minimize construction traffic impacts on other roadways;
- Accommodations for oversized freight vehicles to travel through construction zones, if necessary, during road closures;
- Clearly marked pedestrian and bicycle access routes as well as proposed locations of detour signage and other wayfinding elements; accessible routes would be within a reasonable distance of temporarily closed trails and other pathways;
- Transit stop closures, alternative transit stop locations, and interim transit routes developed and publicized in coordination with King County Metro;
- Arrangements for emergency access to and travel through construction areas to minimize impacts on emergency response times, developed in coordination with emergency response providers; and
- Maintenance of rail facilities and operations to minimize impacts on freight rail service, developed in coordination with BTR in accordance with Federal Railroad Administration specifications.

The City would maintain access to private property to the maximum extent feasible, and could notify property owners in advance of activities that might temporarily limit access. In addition, SDOT could coordinate with businesses affected by construction to provide wayfinding information for customers and support other outreach activities to minimize the potential adverse impacts of construction.

Operation

Avoidance, minimization, and mitigation measures for potential impacts on operations under each alternative are described below.

7.4.2 Measures Specific to Each Alternative

Shilshole South Alternative

Traffic Operations

No additional intersections are anticipated to operate at LOS E or worse under the Shilshole South Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures other than those that are part of the project would be required.

Freight

Mitigation measures for freight would not be required because the Shilshole South Alternative would not reduce operations to LOS E or worse at study area intersections that operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to 10 access points to businesses along NW 54th St, Shilshole Ave NW, and NW 45th St could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would be maintained.

Nonmotorized Users

Under the Shilshole South Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required. Nonmotorized traffic is also not expected to reduce intersection operations in the study area to LOS E or F when an intersection operates at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Shilshole South Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Shilshole South Alternative could require the relocation of BTR tracks in various isolated locations along NW 54th St, Shilshole Ave NW, and NW 45th St. All track relocations would be coordinated with BTR so that rail operations would not be adversely affected. BTR could complete the removal and reconstruction of any track segments prior to construction of the Missing Link.

Safety

The Shilshole South Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely.

In locations with sight distance concerns, design elements such as pavement markings, signage, or bubble mirrors could be used to further improve safety. Variations in the use of asphalt and concrete, different paint or thermoplastic striping and symbols, and elevations at driveway entrances could be used to clearly identify where the trail intersects driveways. Driveway notification signage could be used to maintain trail usage at safe speeds and to notify trail users and vehicles that a trail intersection exists.

Other improvements, such as intersection signalization or advanced warning systems with vehicle detection that activates elevated flashing beacons, could also be used to improve safety at key intersections or driveways. In coordination with businesses, driveways could also be combined into fewer access points to reduce the number of conflict locations. However, the final design of the trail would include safety features to reduce conflicts between trail users and vehicles.

Shilshole North Alternative

Traffic Operations

No additional intersections are anticipated to operate at a LOS E or worse under the Shilshole North Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures would be required.

Freight

Mitigation measures for freight would not be required because the Shilshole North Alternative would not reduce operations to LOS E or worse at study area intersections when they operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to six access points to businesses along NW 54th St/Market St NW, Shilshole Ave NW, and NW 46th St could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to the access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided. If access to businesses could not be relocated, SDOT could provide relocation assistance to affected property owners.

Nonmotorized Users

Under the Shilshole North Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Nonmotorized traffic is also not expected to affect intersection LOS or driveway delay in the study area. Therefore, no mitigation measures would be required. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Shilshole North Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Shilshole North Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Shilshole North Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely. Therefore, no mitigation would be required. Measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.

Ballard Avenue Alternative

Traffic Operations

No additional intersections are anticipated to operate at LOS E or F under the Ballard Avenue Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures would be required.

Freight

Mitigation measures for freight would not be required because the Ballard Avenue Alternative would not worsen operations to LOS E or F at study area intersections, compared to intersections that operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to eight access points to businesses along NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW/NW Ballard Way, NW 46th St, and 11th Ave NW could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided.

Nonmotorized Users

Under the Ballard Avenue Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Nonmotorized traffic is also not expected to affect intersection LOS or driveway delay in the study area. Therefore, no mitigation measures would be required. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Ballard Avenue Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Ballard Avenue Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Ballard Avenue Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. No mitigation would be required. However, measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.

Leary Alternative

Traffic Operations

The Leary Alternative would cause two intersections to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative (Intersections 5a and 7). The Leary Alternative

would cause delay to increase by 5 seconds or more at two intersections that operate at LOS E or worse under both alternatives (Intersection 4 and 7). These include the following intersections:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5a: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp; and
- Intersection 7: NW Leary Way/11th Ave NW.

The Leary Alternative would increase delay by more than 5 seconds at the intersection of NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4). Under the No Build Alternative, this intersection would operate at LOS E but would have less delay when compared to the Leary Alternative.

Because the right-of-way at on NW Market St and Leary Ave NW/Leary Way NW is constrained, additional right-of-way would be required if SDOT were to mitigate additional delay at Intersections 4, 5a, 5b, and 7. It is likely that this would result in additional impacts on properties and businesses near the intersections. The additional delay that would be experienced at Intersections 4, 5a, 5b, and 7 would likely occur only during the PM peak hour when traffic volumes are highest.

Freight

Mitigation measures for freight would be similar to those mentioned above for general-purpose vehicles. SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to three access points to businesses along NW 54th St/NW Market St, Leary Ave NW/NW Leary Way, and 11th Ave NW could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to the access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided.

Nonmotorized Users

Under the Leary Alternative, the sidewalk width on NW Market St between 24th Ave NW and 22nd Ave NW would be reduced to accommodate the Missing Link. This could create some pedestrian congestion on the sidewalk; however, the multi-use trail would alleviate some pedestrian congestion. Design elements such as landscaping, pavement variations and markings, and signage could be used to mitigate impacts. Elsewhere in the study area, nonmotorized facilities and comfort would be improved compared to the No Build Alternative.

Public Transportation

The Leary Alternative could affect public transportation on Leary Ave NW/NW Leary Way. SDOT could evaluate mitigation measures such as queue jumps to mitigate transit impacts under the Leary Alternative. Queue jumps are additional travel lanes provided for transit vehicles only that give transit priority over general-purpose vehicles at intersections. Queue jumps are often accompanied by a signal with an early green light for transit vehicles only.

Freight Rail

The Leary Alternative would not adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Leary Alternative could affect pedestrian safety on NW Market St between 24th Ave NW and 22nd Ave NW where the sidewalk would be reduced by up to 12 feet to accommodate the Missing Link. Design elements such as landscaping, pavement variations and markings, and signage could be used to mitigate impacts. Elsewhere in the study area, the Leary Alternative would improve safety compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely. Therefore, no mitigation would be required. However, measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.