

# 4 DETAILED DEFINITION OF LEVEL 2 ALTERNATIVES

Based on the conclusions of the Level 1 alternatives evaluation, two light rail alternatives and one BRT alternative, along with the TSM/Baseline and No Build Alternatives, were advanced to the next level of development and evaluation. The findings of the Level 1 evaluation also resulted in recommended refinements and modifications to all of the build alternatives. This chapter summarizes the detailed definitions of the No Build, TSM/Baseline, and three build alternatives carried forward for Level 2 evaluation. Additional information and more detailed alignment and station illustrations are provided in the *Level 2 Definition of Alternatives Technical Memorandum* (Sound Transit 2011f).

The assumptions and guiding principles for the development of the Level 2 alternatives remained the same as those described in Section 3.7.1 for the Level 1 alternatives.

## 4.1 NO BUILD ALTERNATIVE

The Level 2 No Build Alternative included only those improvements committed and funded for implementation by the transportation providers in the region. The Level 2 No Build Alternative was unchanged from that defined in Level 1.

### 4.1.1 Transportation Facilities

Only those physical improvements currently funded and committed as of fall 2010 are included in this alternative. Within the study area, these improvements include a number of minor lane additions and modifications to eliminate choke points along I-5, traffic management, and driver information improvements on I-5; and the completion of roadway, BRT, and intersection improvements to SR 99 in Shoreline. The most significant change from today in the study area included in the No Build Alternative is the assumption that light rail extends north to Northgate.



In addition, the balance of the 2008 voter-approved ST2 Plan, as shown in Figure 2-1, is assumed to be in place with light rail service running east to Overlake in Redmond and south to Redondo/Star Lake in Federal Way. By 2030 it is assumed that light rail service on the section between downtown Seattle and Northgate would operate at a combined 4-minute headway (the time between successive train or bus movements in a given direction) in each direction during peak periods and be served by two lines, one continuing east across Lake Washington and the other continuing south to Federal Way.

### 4.1.2 Bus Service Plan

Major changes in King County Metro bus service in the corridor will be made as a result of the extension of light rail to Northgate and the addition of the RapidRide E Line, a new BRT route serving SR 99 (Aurora Avenue) from Shoreline to downtown Seattle. No significant restructuring of Community Transit bus service between Snohomish County and the major destinations in King County was assumed.

The assumed changes to King County Metro routes at Northgate are based on routing developed in 2004 by King County Metro to respond to proposed light rail service reaching Northgate. Once light rail service extends to Northgate, the following King County Metro routes currently serving Northgate would be discontinued:

- Route 41 (Lake City/Northgate to Seattle): Replaced by Route 75 (Lake City to Northgate)
- Route 66 (Northgate to Seattle via Roosevelt/Eastlake)
- Route 68 (Northgate to the University District via 25th Avenue NE): Replaced by Routes 16/63

In addition to the changes related to Link light rail service to Northgate, the King County Metro RapidRide E Line will replace the existing Route 358 and run from the Aurora Village Transit Center at the county line along the length of SR 99 to downtown Seattle. Features of the E Line include enhanced stations, limited stops, BAT lanes, and transit signal priority—all of which will improve speed and reliability. The goal is for more frequent, fast, and reliable service than what is currently operated by King County Metro Route 358.

## 4.2 TSM/BASELINE ALTERNATIVE

The Level 2 TSM/Baseline Alternative is a modified version of the alternative evaluated during level 1 and described in Chapter 3. Based on the findings of the Level 1 evaluation of both the TSM/Baseline and the two BRT alternatives, a number of service changes and low-cost improvements appear promising and were added to the former. The primary elements of the Level 2 TSM/Baseline Alternative are three new express bus routes:

- A route via I-5 connecting the existing Lynnwood Transit Center with the Link light rail station at Northgate, with a stop at the existing Mountlake Terrace Transit Center freeway station.

- A route connecting the existing Edmonds Park-and-Ride with the Link light rail station at Northgate via SR 99, North 175th Street and I-5, serving a stop at 220th Street SW, an expanded Shoreline Park-and-Ride and Transit Center, a stop at North 175th Street/Meridian Avenue, and the existing NE 145th Street freeway flyer stop on I-5 along the way. This route would serve as an express service complementing the existing *Swift* and RapidRide Line E services. While sharing stations, facilities, and the BAT lanes, the latter two BRT services stop much more frequently than the new express line.
- A route connecting the existing Mountlake Terrace Park-and-Ride and Transit Center with Northgate via 236th Street SW, 56th Avenue West, 19th Avenue NE, 15th Avenue NE, NE 175th Street, and I-5, with stops at Ballinger Way, NE 175th Street/15th Avenue NE, and the NE 145th Street freeway flyer stop.

### 4.2.1 Facility Design

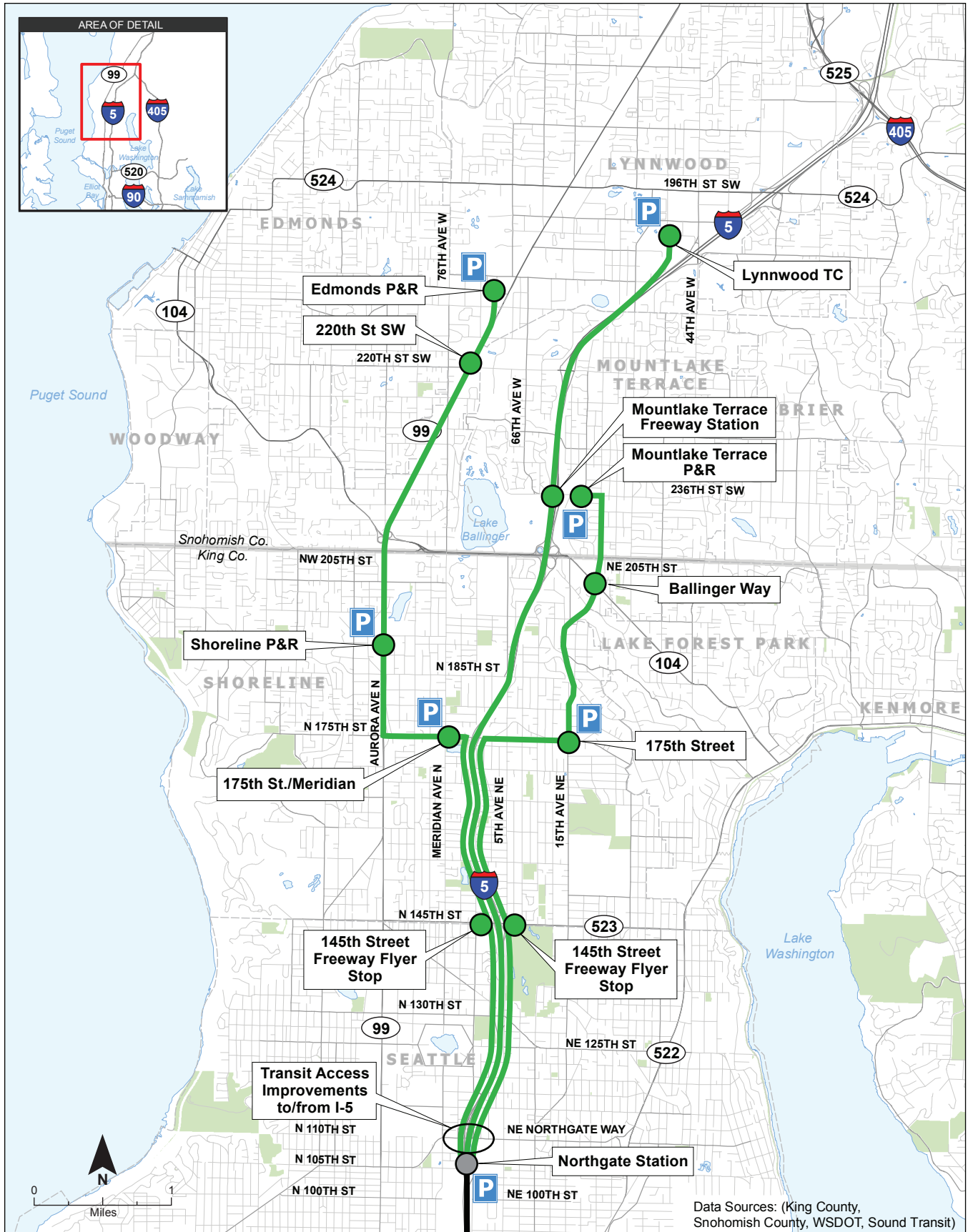
In addition to the new express bus routes, the TSM/Baseline Alternative includes a number of new park-and-ride facilities, improvements, and expansions at existing stations and park and ride facilities, as well as traffic engineering, roadway, and signalization improvements at a modest cost to enhance the service additions. These are shown in Figure 4-1 and described in the following sections.

#### NORTHGATE STATION

The three additional routes serving the Northgate Transit Center and light rail station will require nine additional bus layover spaces at Northgate. In-service bus bay needs can be met by the existing facility.

#### TRANSIT SPEED AND RELIABILITY IN NORTHGATE AREA

Currently, buses providing service southbound on I-5 to Northgate must weave across several lanes on I-5 from the left-side HOV lane to the right-side exit ramp to eastbound Northgate Way. Buses then must turn right onto eastbound Northgate Way and then right again onto southbound 1st Avenue NE, often experiencing significant delays while making these movements. This alternative includes the addition of a transit-only lane extending from the beginning of the southbound off-ramp to the intersection of Northgate Way, and then eastbound under the I-5 mainline in an added transit-only lane to the intersection of Northgate Way/1st Avenue NE, and then southbound for a short distance along 1st Avenue NE. The transit-only lane (Figure 4-2) would provide travel time savings and improved reliability for southbound bus service to Northgate. The bypass would be separated from the existing lanes with a center curb to prevent encroachment by general purpose traffic. Similarly, a new northbound transit-only left-turn lane to supplement the existing left-turn lane at the intersection of 1st Avenue NE and the I-5 northbound on ramp would provide travel time savings and improved reliability for northbound bus service accessing I-5. In addition to these improvements, transit signal priority strategies would be implemented at the traffic signals the buses pass through between the interchange and the transit center.



**Figure 4-1. Level 2 TSM/Baseline Alternative**



**Figure 4-2.** Northgate Area Transit Queue Bypass Improvement

### SHORELINE PARK-AND-RIDE

The TSM/Baseline Alternative assumes that the transit terminus functionality of the Aurora Village Transit Center would be re-located to the Shoreline Park-and-Ride (currently with a parking capacity of 400 stalls), along with the existing 200-stall park-and-ride capacity of the Aurora Village Transit Center. An additional 150 stalls of new parking capacity would be provided, for a combined total of 750 park-and-ride stalls. The re-located transit center would consist of 16 bays for in-service and layover operations. These changes allow the new express BRT line to interface with both the *Swift* BRT line from the north and the RapidRide Line E service from the south without time-consuming deviation from SR 99. *Swift* BRT would be extended south to terminate at the Shoreline Park-and-Ride.

### NORTH 175TH STREET/MERIDIAN AVENUE PARK-AND-RIDE

A new park-and-ride facility with 300 spaces would be constructed near the intersection of North 175th Street and Meridian Avenue. This would be served by the new express route from Edmonds Park-and-Ride to Northgate.

### **I-5/NE 145TH STREET PARK-AND-RIDE**

The existing park-and-ride facility at I-5 and NE 145th Street would be expanded from 68 stalls to a total of 150 spaces. This would be served by two new express routes: Edmonds Park-and-Ride to Northgate and Mountlake Terrace to Northgate.

### **NE 175TH STREET/15TH AVENUE NE PARK-AND-RIDE**

A new park-and-ride facility with 300 spaces would be constructed near the intersection of NE 175th Street and 15th Avenue NE. This would be served by the new Mountlake Terrace to Northgate express route.

### **EDMONDS PARK-AND-RIDE**

The Edmonds Park-and-Ride to Northgate express route would terminate at the existing Edmonds Park-and-Ride. In-service and layover bus bay requirements for this route would be met with existing on-street space. An additional 100 spaces of parking capacity would be added to the park-and-ride facility for a total of 350 spaces.

### **MOUNTLAKE TERRACE PARK-AND-RIDE**

The existing Mountlake Terrace Park-and-Ride facility would be served by the new Mountlake Terrace to Northgate express route. The existing 890-stall facility would provide in-service and layover bays for the new express route.

### **LYNNWOOD TRANSIT CENTER**

The Lynnwood to Northgate express route would terminate at the Lynnwood Transit Center. This route would require seven additional layover spaces. In-service bus bay needs would be met by the existing facility. An additional 500 stalls of parking capacity would be added, for a total of approximately 1,900 park-and-ride stalls.

## **4.2.2 Service Plan**

This alternative includes three new bus routes, as described earlier and shown in Figure 4-1, to connect the project area to the Link light rail station at Northgate. All three new routes would be subject to potential delays between the I-5 interchange and the Northgate Link Station, which can be substantial during morning and evening peak hours, as well as times of high shopping activity at the adjacent Northgate Mall regional shopping center complex. Priority treatments would help to mitigate these delays, but would not completely eliminate them. In addition, the new Edmonds to Northgate and Mountlake Terrace to Northgate routes would not be able to use the I-5 HOV lanes, because they would enter I-5 at 175th Street, stop at the existing 145th Street flyer stops, and exit at Northgate Way.

Express bus service on all three routes would be provided from 4:30 am to midnight (actual schedule would be timed for first inbound and last outbound trains at Northgate). Service frequencies were developed and refined to meet the projected ridership demand. Resulting headways were as follows:

- Lynnwood to Northgate route: 3.75 minutes during peak periods and every 15 minutes during off-peak periods
- Edmonds to Northgate route: 12 minutes during peak periods and every 15 minutes during off-peak periods
- Mountlake Terrace to Northgate route: 15 minutes during peak and off-peak periods

King County Metro Routes 301 and 303 would be replaced by the new Edmonds Park-and-Ride to Northgate Express route. Community Transit routes that now serve the Aurora Village Transit Center would be extended south on SR 99 to serve the new Shoreline Transit Center. Similarly, King County Metro routes that now serve the Aurora Transit Center would be truncated at the new Shoreline Transit Center.

### 4.3 L1: I-5 LIGHT RAIL ALTERNATIVE

The L1: I-5 Light Rail Alternative advanced to the Level 2 evaluation is similar to the L1: I-5 Light Rail Alternative assessed as part of the Level 1 evaluation. However, for Level 2 evaluation, the profile of this alignment was refined to take advantage of opportunities to place both the guideway and stations at ground level. In general, placing the rail line at the same level as I-5, where possible, based on available right-of-way, topography, and other conditions, has numerous advantages over placing the line on aerial structure. In addition to reducing costs, ground-level placement has the potential to minimize visual and noise impacts on adjacent land uses, and provides easier access for maintenance. The alignment refinement resulted in a combination of an elevated and at grade double-track rail line from Northgate to the Lynnwood Transit Center with intermediate stations at NE 145th Street, NE 185th Street, and the Mountlake Terrace Transit Center. Figure 4-3 provides an overview of the alternative, while Figures 4-4 through 4-7 provide more detail regarding alignment, profile, and station locations. Because of the topography along this section of I-5, much of the light rail ground level sections would be in retained cut-and-fill sections adjacent to the freeway. Much of the line can be located within the existing freeway right-of-way, but there are a number of locations where additional property would need to be acquired either for the guideway or station facilities and park-and-ride structures. These acquisitions may result in the displacement of some residences that are now located adjacent to I-5. The general scope of work includes:

- Capacity for new light rail fleet and O&M facility, as needed, to support the extension.
- Operation of up to four-car light rail trains between Northgate and Lynnwood in two directions, 20 hours per day, with peak headways of 4 minutes and off-peak headways of 10 minutes.

- New light rail stations at NE 145th Street, NE 185th Street, Mountlake Terrace Transit Center (I-5 at SW 236th Street), and Lynnwood Transit Center. All stations would be elevated, with the exception of the NE 185th Street Station, which would be at-grade.
- Five hundred new structured park-and-ride stalls at each of the North 145th Street, North 185th Street, and Lynnwood Transit Center Link stations, supplementing approximately 2,300 existing stalls along the alignment.
- Restructured bus services consistent with 2007 bus/light rail service integration work done by Sound Transit, Community Transit, and King County Metro for ST2 to address bus route changes compatible with light rail extended into south Snohomish County.
- Additional in-service and/or layover bus bays at new stations as needed to accommodate restructured bus services.

### 4.3.1 Facility Design

The proposed L1: I-5 Light Rail Alternative would be approximately 8.5 miles in length. The line starts at the Link light rail station at Northgate on the east side of I-5, which is now in final design and scheduled to open for service in 2021, and ends at the existing Lynnwood Transit Center on the west side of I-5. Because of the difficulties, impacts, and costs of crossing the freeway, the approach to alignment development at this stage was to minimize the number of times that the alignment crosses I-5. For the sections through Seattle and Shoreline, little if any space is available in the I-5 median, so the only alignments that avoid major roadway reconstruction are along the east or west side of the freeway. In Snohomish County, the I-5 median is wide enough to become a possible location for the light rail infrastructure without needing to rebuild the freeway.

Opportunities for locating stations are additional significant considerations in determining the alignment. An important station siting factor is to provide access to existing transit facilities such as transit centers and park-and-ride facilities to leverage investments where riders can connect to the regional system. The selection of station sites must also consider impacts on the alignment. If the location of stations frequently alternates from the east to the west side of I-5, this would require more structures to cross I-5, with more potential for impacts to I-5 and adjacent properties.

The North 145th Street Station is best located on the east side of I-5, where an existing park-and-ride lot and other available right-of-way provide more land to site the station, guideway alignment, and a parking area, although some private properties would still be needed. The topography in the area is also better for siting the station, park-and-ride facility, and aerial guideway alignment. In addition, 5th Avenue NE provides an additional buffer separating the light rail alignment, the station, park-and-ride facility, and adjacent properties. By comparison, a station and guideway alignment on the west side would have a higher potential to affect existing water resources. In addition, the topography rises above I-5 making the station development more difficult without affecting a greater number of properties. Lakeside School, located west of I-5, and private residences on the north side of NE 145th Street could be affected with a station and park-and-ride facility. Additionally, Thornton Creek crosses I-5 at



NE 145th Street, and then runs parallel to I-5. A west side alignment would likely affect the creek and would also remove vegetated and forested areas that provide a buffer between I-5 and adjacent properties.

The NE 185th Street Station could be sited on either the east or west side of I-5, but the light rail guideway alignment would be more ideally located on the east side to serve the NE 145th Street and Mountlake Terrace stations that appear to be best located on the east side of the freeway. This configuration has resulted in a primary alignment with some station facilities to the west of I-5, but a light rail alignment and passenger platform to the east.

The Mountlake Terrace Station is best located either in the median of the freeway or the east side to take advantage of the existing transit infrastructure and minimize new transportation right-of-way requirements. A light rail guideway alignment and station located on the west side of I-5 would have greater right-of-way impacts and require long pedestrian bridges across I-5 to access the existing transit center and parking garage. Right-of-way on the west side of the freeway is more constrained than on the east side due to the existing SR 104 and 236th Street SW freeway ramps. Avoiding these ramps would require placing light rail on or adjacent to a golf course that has both public and private ownership, as well as potential wetlands. The west side of I-5 opposite the existing Mountlake Terrace Transit Center also has steeper forested slopes immediately adjacent to I-5 and 236th Street SW, with residential properties nearby.

For these reasons, a “primary” alignment was chosen for the purposes of the Level 2 evaluation that runs along the east side of I-5 from Northgate to Mountlake Terrace, crosses the I-5 northbound lanes north of Mountlake Terrace, then runs in the freeway median until finally crossing the southbound lanes to reach the Lynnwood Transit Center.

In developing the I-5 light rail alignment, ongoing coordination with WSDOT led to a determination that the light rail infrastructure should be located so as to not unduly constrain future modifications to the freeway. In partnership with WSDOT, it was determined that this need could be satisfied by preserving an 84-foot-wide envelope extending from the current freeway centerline to a future eastern edge of pavement along the northbound lanes of I-5 between interchanges. The conceptual alignment developed is based on preserving this 84-foot-wide envelope between interchanges and assumes an additional 40-foot envelope for light rail operation at freeway level (i.e., at-grade, in retained cut or retained fill), which is generous in comparison to typical width requirements for at-grade rail on level ground (e.g., 30 feet). The larger envelope assumed is primarily to account for additional width required for retained cut or fill. In most sections of the alignment, sufficient right-of-way exists to accommodate both the 84-foot freeway and 40-foot light rail envelopes. However, some sections would require partial acquisitions of multiple property parcels. It is possible that many of these could require full parcel acquisitions because they are either small parcels, or because access to them has been severed (which could occur if it is necessary to take part of a residential street next to the freeway). More details on potential right-of-way impacts will be evaluated in subsequent analyses. Figures 4-8, 4-9, and 4-10 show a typical cross-section of I-5 with light rail elevated and at-grade on the east side of the roadway, as well as in the median of the roadway, respectively.

The sections that follow describe the major components that form the light rail line along the I-5 alignment between Northgate Transit Center and Lynnwood Transit Center. Line segments and stations are included in these descriptions. Light rail vehicles and the O&M facility capacity to support the light rail line are not included in these descriptions and are the subject of a separate system-wide study that Sound Transit is now undertaking. As the design of the line is refined, requirements for passenger drop-off facilities, local bus transfers, and street and traffic signal improvements around the stations will be further investigated. Refinement of the pedestrian connectivity infrastructure will also need to be considered. For the purposes of developing conceptual cost estimates, it was also assumed there would be one track crossover in the vicinity of each station.

### **NORTHGATE TRANSIT CENTER TO NE 145TH STREET**

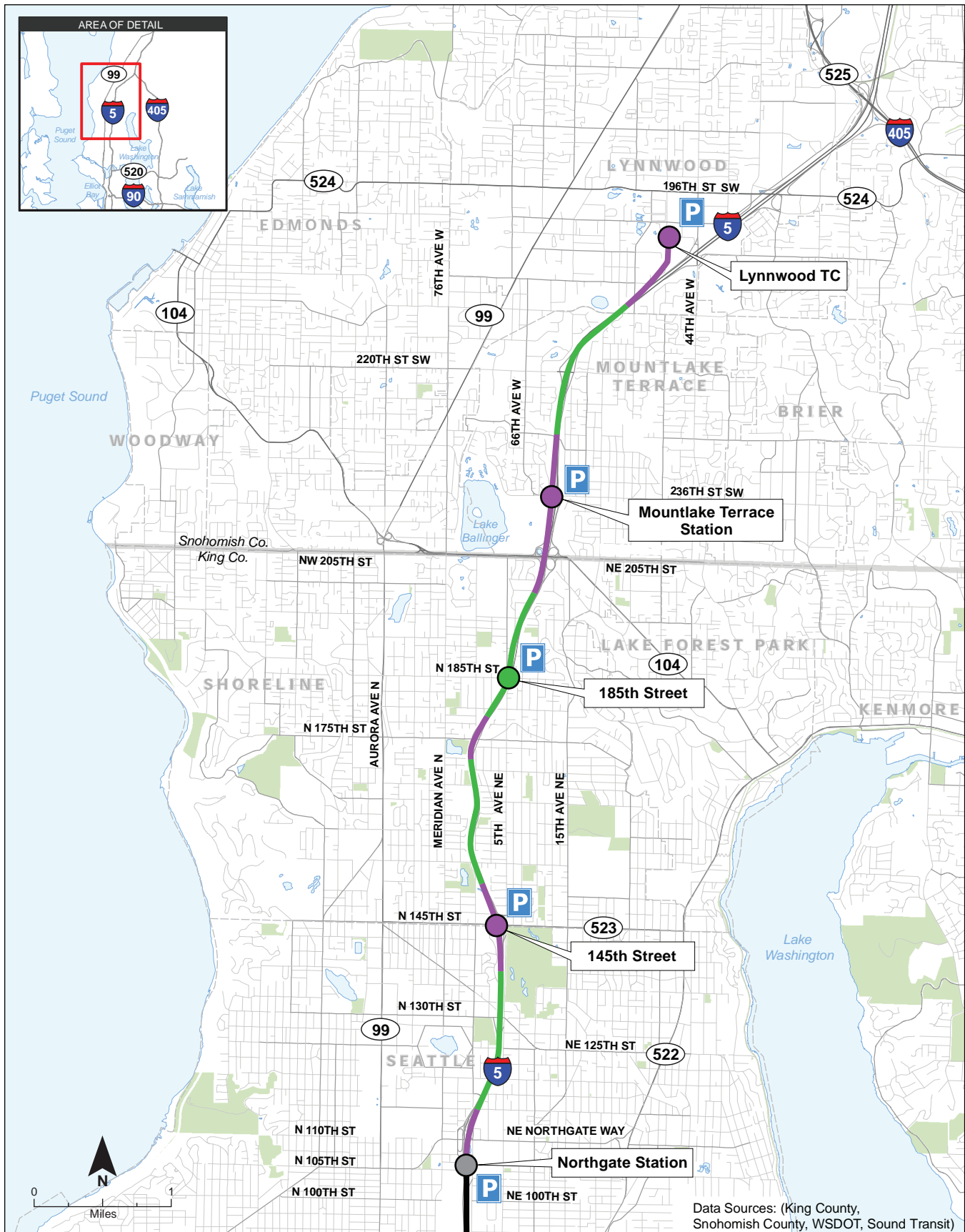
The alignment begins at the north end of the planned Northgate Link station tail tracks in the Northgate Mall parking lot east of 1st Avenue NE. It continues north in a mix of elevated and at-grade profiles on the east side of I-5 to NE 145th Street, where it would arrive at an elevated light rail station at NE 145th Street. A center platform aerial station with a ground level plaza would be located above NE 145th Street, with station entrances on the south and north sides of NE 145th Street. The NE 145th Street Station would include the following:

- Park-and-ride garage of 500 parking spaces, representing a 430 space expansion over the existing small open lot
- Elevated pedestrian walkway between the parking garage and the light rail station
- Provisions for both on-street and possibly off-street bus bays and layover stalls to be determined

### **NE 145TH STREET TO NE 185TH STREET**

The alignment for this segment begins north of the NE 145th Street Station. It would continue north in a predominantly at-grade profile on the east side of I-5 to the NE 185th Street Station, with short sections of elevated alignment over arterials crossing under I-5. An at-grade station would be located under a rebuilt NE 185th Street overpass. The NE 185th Street Station includes the following:

- Park-and-ride garage with 500 parking spaces located on the west side of I-5 across from the station
- Elevated pedestrian walkway across I-5 between the parking garage and the light rail station
- Two off-street in-service bus bays
- Two off-street layover bays



- Elevated Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail
- At-Grade Light Rail Station
- North Link Light Rail
- North Link Station
- P Parking Available at Station

**Figure 4-3. L1: Level 2 I-5 Light Rail Alternative**

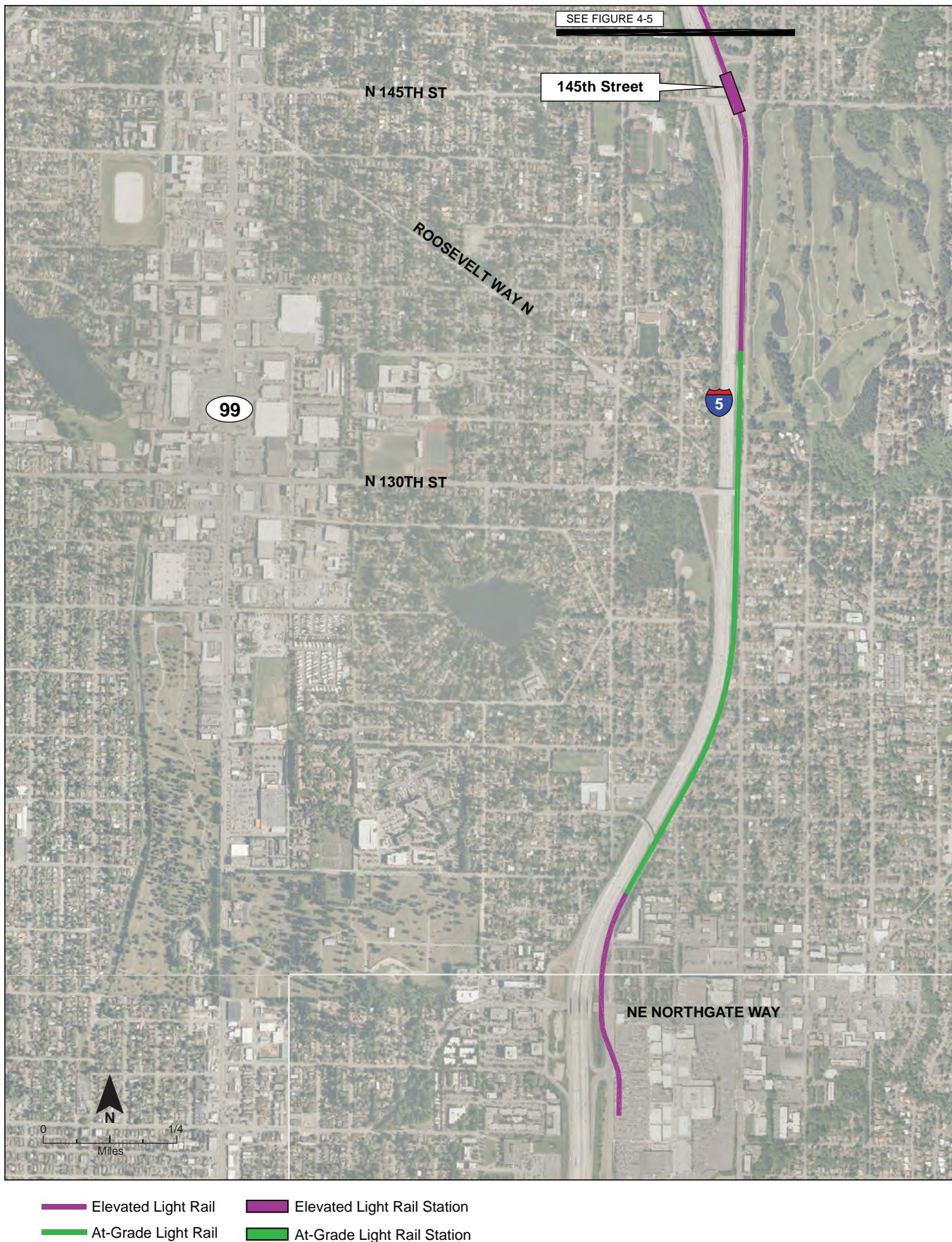


Figure 4-4. L1: Level 2 I-5 Light Rail Alternative Detail - 1 of 4

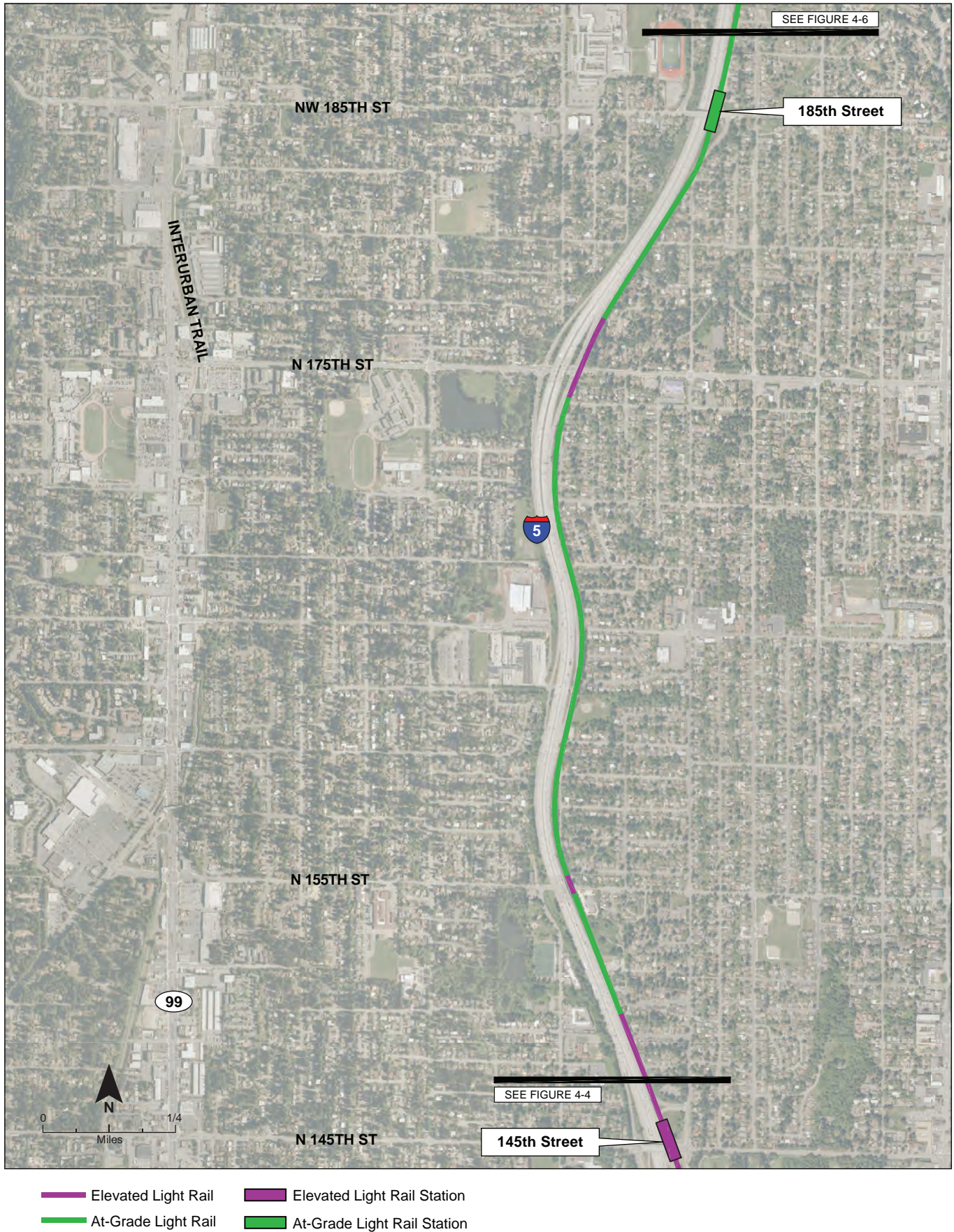
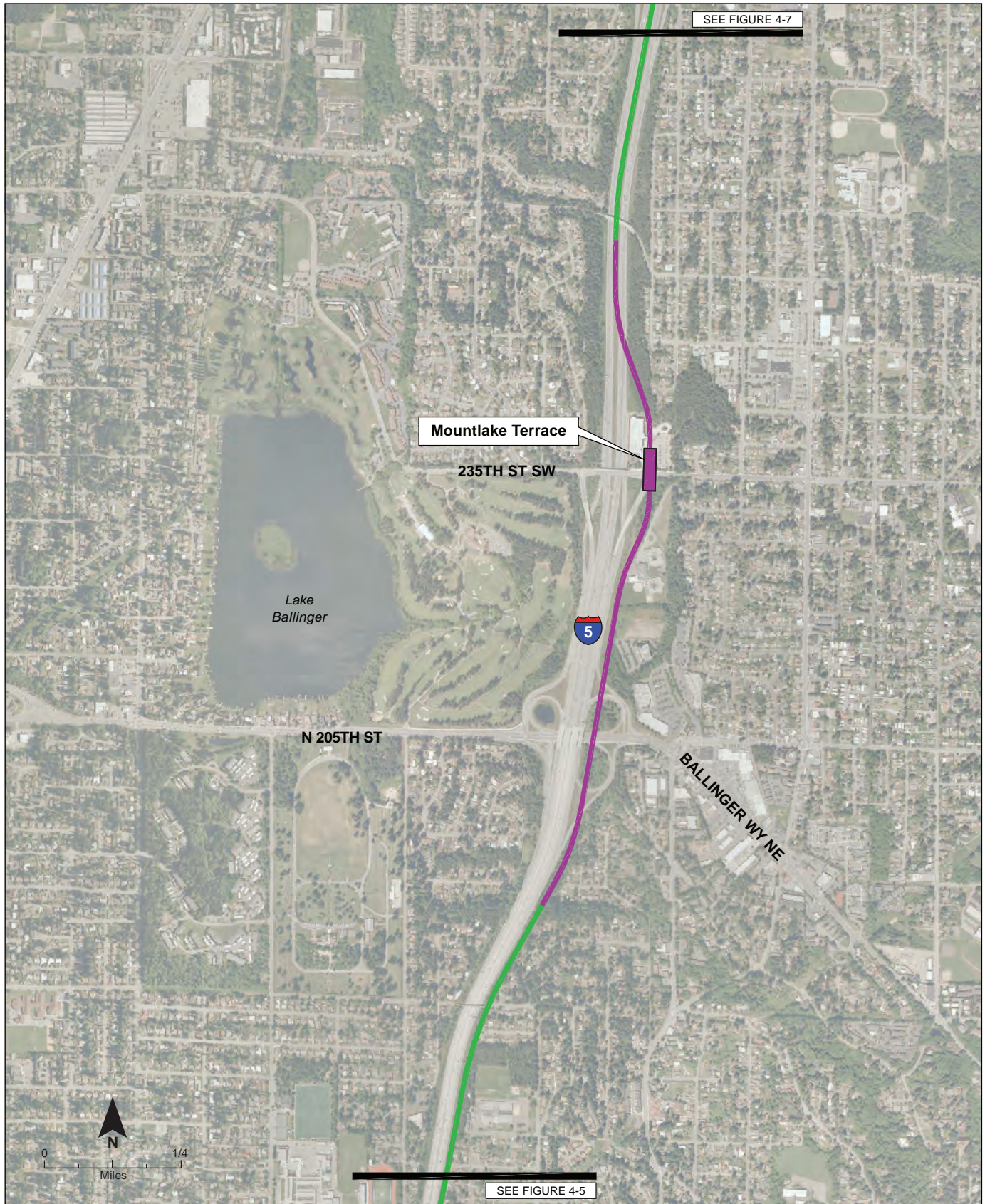
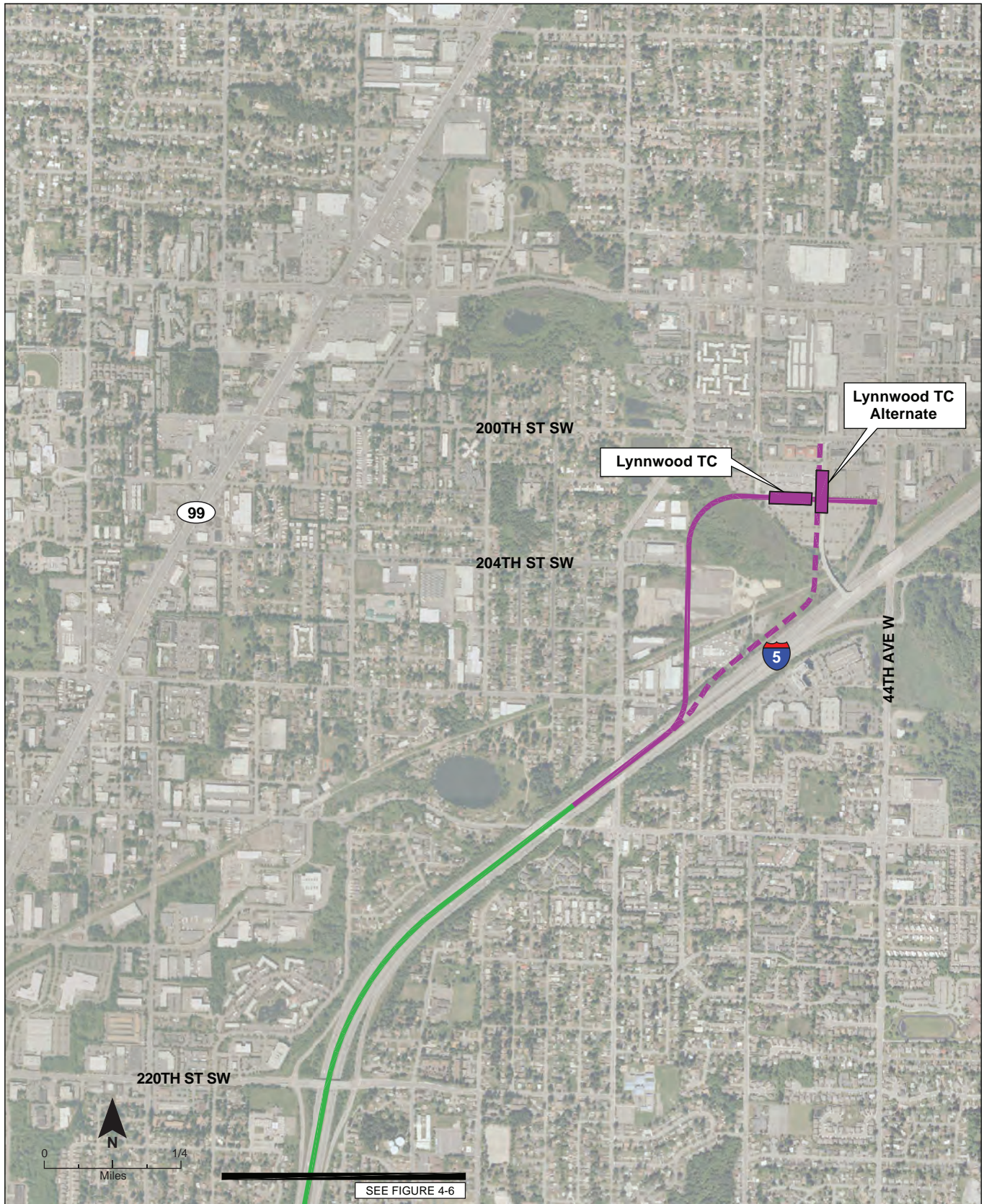


Figure 4-5. L1: Level 2 I-5 Light Rail Alternative Detail - 2 of 4



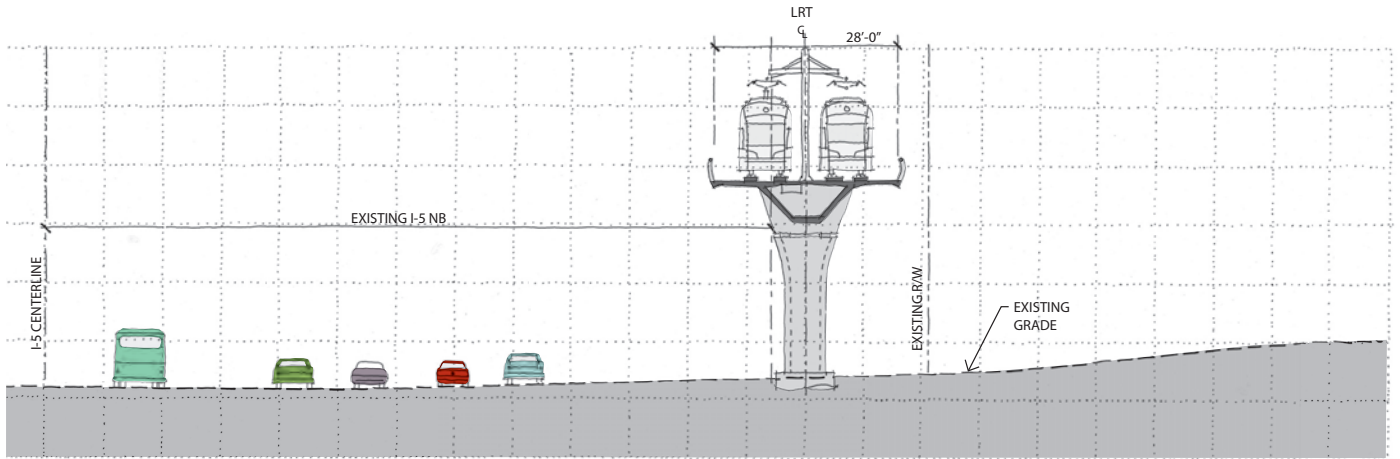
- Elevated Light Rail
- At-Grade Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail Station

**Figure 4-6. L1: Level 2 I-5 Light Rail Alternative Detail - 3 of 4**

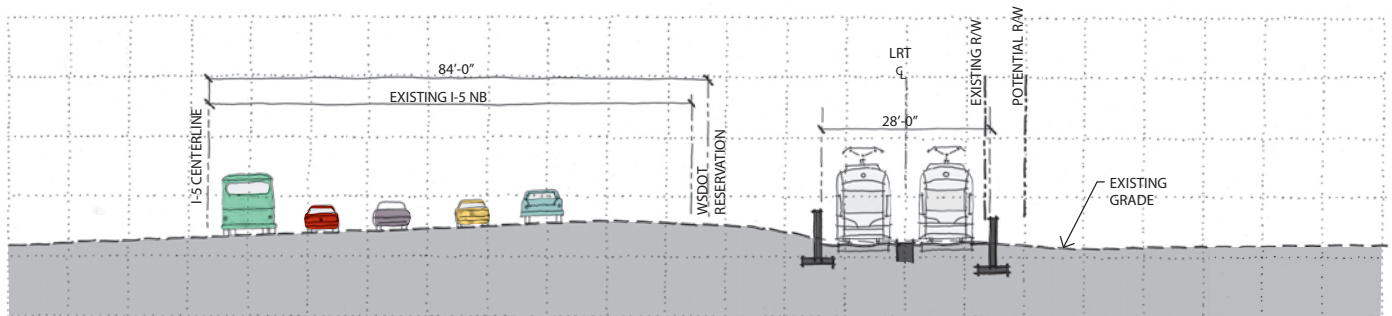


- Elevated Light Rail
- At-Grade Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail Station

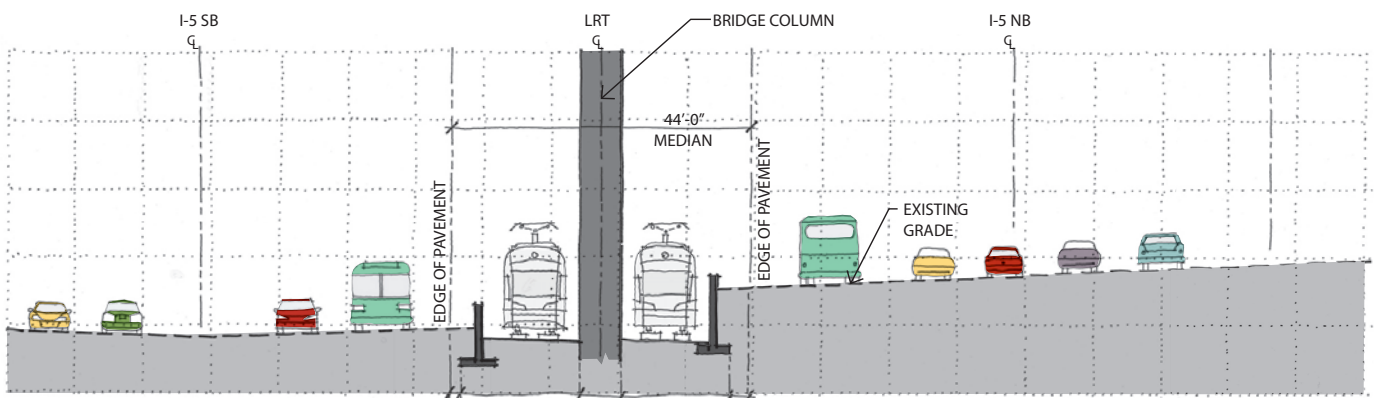
**Figure 4-7. L1: Level 2 I-5 Light Rail Alternative Detail - 4 of 4**



**Figure 4-8.** L1: I-5 Light Rail Alternative - Typical Cross-section of Elevated Rail on East Side of Roadway



**Figure 4-9.** L1: I-5 Light Rail Alternative - Typical Cross-section of At-grade Rail on East Side of Roadway



**Figure 4-10.** L1: I-5 Light Rail Alternative - Typical Cross-section of At-grade Rail in Median of Roadway



### NE 185TH STREET TO MOUNTLAKE TERRACE TRANSIT CENTER

The alignment for this segment begins north of the NE 185th Street station. It would continue in a mix of elevated and at-grade profiles to 236th Street SW, where it would arrive at the Mountlake Terrace Transit Center. An aerial station would be located over 236th Street SW, with station entrances on the south and north sides of 236th Street SW, and would serve the Mountlake Terrace Transit Center, park-and-ride garage, and freeway station. The aerial station is assumed to be center platform with a ground-level plaza. The Mountlake Terrace Station includes the following:

- Two off-street in-service bus bays and six off-street layover bus bays at the Mountlake Terrace Transit Center
- To maintain the existing parking supply a new parking garage with approximately 230 parking spaces to replace existing surface parking that would be displaced by the expanded and relocated off-street transit center

### MOUNTLAKE TERRACE TRANSIT CENTER TO LYNNWOOD TRANSIT CENTER

The alignment for this segment begins at the Mountlake Terrace Transit Center and continues north on an elevated structure, crossing over the northbound lanes of I-5, entering the freeway median, and dropping to grade. The alignment continues at-grade in the median of I-5 to just south of Lynnwood, where it transitions back to aerial structure and passes over the southbound freeway lanes to reach the existing Lynnwood Transit Center. An aerial station is located on the south side of the Lynnwood Transit Center oriented either east-west in the 202nd Street SW right-of-way or north-south in the 46th Avenue West right-of-way. This station is assumed to be center platform with a ground level plaza connecting to the Lynnwood Transit Center. The Lynnwood Transit Center Station includes the following:

- Additional park-and-ride garage of 500 spaces, for a total of approximately 1,900 spaces at the Lynnwood Transit Center
- Pedestrian bridge connection from the station to the east side of 44th Avenue West to access the city center area
- Two additional off-street layover bays
- A sufficient number of in-service bus bays

### 4.3.2 Service Plan

Light rail service includes operation of up to four-car trains serving stations at Northgate Transit Center, NE 145th Street, NE 185th Street, Mountlake Terrace Transit Center, and Lynnwood Transit Center. Service would be provided 20 hours per day, with peak headways of 4 minutes and off-peak headways of 10 minutes. Headways were determined based on service levels required to meet estimated ridership demand.

No changes are proposed for Community Transit local routes except for minor adjustments to Route 112 to serve the Mountlake Terrace Transit Center. Local King County Metro routes in north King County would be adjusted to serve light rail. Existing routes would either be truncated or extended to serve the new light rail stations at NE 145th Street, NE 185th Street, and the Mountlake Terrace Transit Center. All of Community Transit's south Snohomish County commuter routes to the University of Washington and downtown Seattle would be restructured to terminate at the Lynnwood, Mountlake Terrace, or 185th Street light rail stations. None of the existing 800 or 400 series routes from south Snohomish County would continue south of 185th Street in Shoreline. North Snohomish County commuter routes would continue to operate unchanged from today's operations.

Most Sound Transit and Community Transit routes from south Snohomish County that operate to Seattle would terminate in Lynnwood where passengers would transfer to light rail. The exceptions are routes that currently originate in Edmonds and provide service to downtown Seattle and the University District. These routes would terminate at the Mountlake Terrace and Shoreline Park-and-Ride Stations where passengers would transfer to light rail.

King County Metro commuter routes connecting north King County with downtown Seattle, Overlake, and the University District (e.g., 242, 301, and 304) would be modified or discontinued and replaced with modified routes that would provide connections to the light rail stations at Northgate, NE 145th Street, and NE 185th Street.

#### 4.4 L2: SR 99 MIXED PROFILE LIGHT RAIL ALTERNATIVE

The L2: SR 99 Mixed Profile Light Rail Alternative advanced to the Level 2 evaluation is similar in concept to the L2: SR 99 Light Rail Alternative assessed as part of the Level 1 evaluation. This alternative would include a combination of elevated and at-grade double-track rail line from Northgate to the Lynnwood Transit Center with four intermediate stations. The general scope of work includes:

- Capacity for new light rail fleet and O&M facility, as needed, to support the extension
- New at-grade light rail stations located at North 130th Street and North 160th Street, as well as new elevated light rail stations at the Shoreline Park-and-Ride (North 192nd Street), Mountlake Terrace Transit Center, and Lynnwood Transit Center
- Five hundred new structured park-and-ride stalls at both the Shoreline Park-and-Ride and Lynnwood Transit Center, supplementing approximately 2,600 existing stalls along the alignment
- Restructured bus services to integrate existing service with new light rail service and to avoid duplication of transit service on SR 99
- Relocation of the transit functionality of the Aurora Village Transit Center to the Shoreline Park-and-Ride, including 16 bays for in-service and layover operations

- Additional in-service and/or layover bus bays at the Mountlake Terrace Park-and-Ride and the Lynnwood Transit Center to accommodate restructured bus services

Early in the Level 2 alternatives development process, a major change was made to this alternative from the concept evaluated during Level 1. A decision was made to change from peak period operation of four-car trains at 4-minute headways to peak operation at 8-minute headways. This decision was based on analysis of traffic operations along SR 99 and the lessons learned to date as a result of at-grade median light rail operations along Martin Luther King Jr. Way in the city of Seattle.

The Level 1 evaluation had indicated some potential for traffic congestion along the at-grade sections of the SR 99 alignment, so work was undertaken early in the refinement of the Level 2 alternatives to better understand the possible impacts. At-grade light rail operating in the median of SR 99 would require trains to pass through a number of signalized intersections, exposing them to delays that would not occur with a completely grade-separated alignment. The affected SR 99 traffic signals can be timed to provide varying levels of priority for light rail, with the trade-off being the resulting delay to roadway traffic. Complete pre-emption of the signals for the train movements (i.e., the signals turn green to facilitate the train movement and stop all conflicting traffic) would result in significant impacts to conflicting traffic movements.

Sound Transit's experience on Martin Luther King Jr. Way in Seattle is that full signal pre-emption for median running light rail is not practical along a major arterial. Instead, at grade median running light rail typically operates with traffic signal *priority* as opposed to *pre-emption*, and trains would need to stop at some signals with some unpredictability. It is not known what the policies of the cities of Seattle and Shoreline and WSDOT will be toward the operation of SR 99, but given the high cross-street and left-turn traffic volumes, full pre-emption for light rail does not seem practical. Analysis of intersections along SR 99 indicates that many will be operating at LOS F (i.e., highly congested) by 2030. The traffic added as a result of the consolidation of left turns and other traffic relocations, along with the addition of a four-car train every 2 minutes, would further worsen these highly congested conditions. If trains are provided a high level of priority through these intersections severe traffic impacts would result, especially to cross-street and left-turn movements.

Micro-simulation traffic modeling of SR 99 indicates that, while light rail operations could be fine-tuned to work with 4-minute headways, highly congested and unstable traffic conditions would result. These conditions would lead to a high probability of unpredictable train delays. When combined with the short train headways, schedule recovery from these delays would be difficult. Another factor in determining the train headways that can be reliably maintained is how this segment fits within the regional rail network. Figure 4-11 illustrates the planned light rail system configuration once extensions are completed east to Overlake in Redmond, south to South 200th Street in SeaTac, and north to Lynnwood. As can be seen, the system would operate with two lines—one from Lynnwood to South 200th Street and one from Lynnwood to Overlake. Both lines would operate at 8-minute peak period headways resulting in 4-minute peak headways between the junction at the south end of the Seattle CBD and Lynnwood, which requires every train operating in the system to traverse the segment between Northgate and

Lynnwood. Ridership forecasting completed as part of the system plan development indicates that this level of service, at least south of Lynnwood, is needed to accommodate forecasted demand. As a result, any delays incurred in the segment between Northgate and Lynnwood would affect the operation of the entire light rail system. This problem becomes worse when the system is eventually built north to Everett, south to Tacoma, and east to downtown Redmond.

As a result, it was determined that 4-minute headway operation through signalized intersections along this portion of SR 99 was neither prudent nor practical. Instead, a decision was made to turn back the Overlake trains at Northgate and only continue the South 200th Street trains on to Lynnwood. This configuration increases the headways along SR 99 to a more comfortable 8-minute operation.

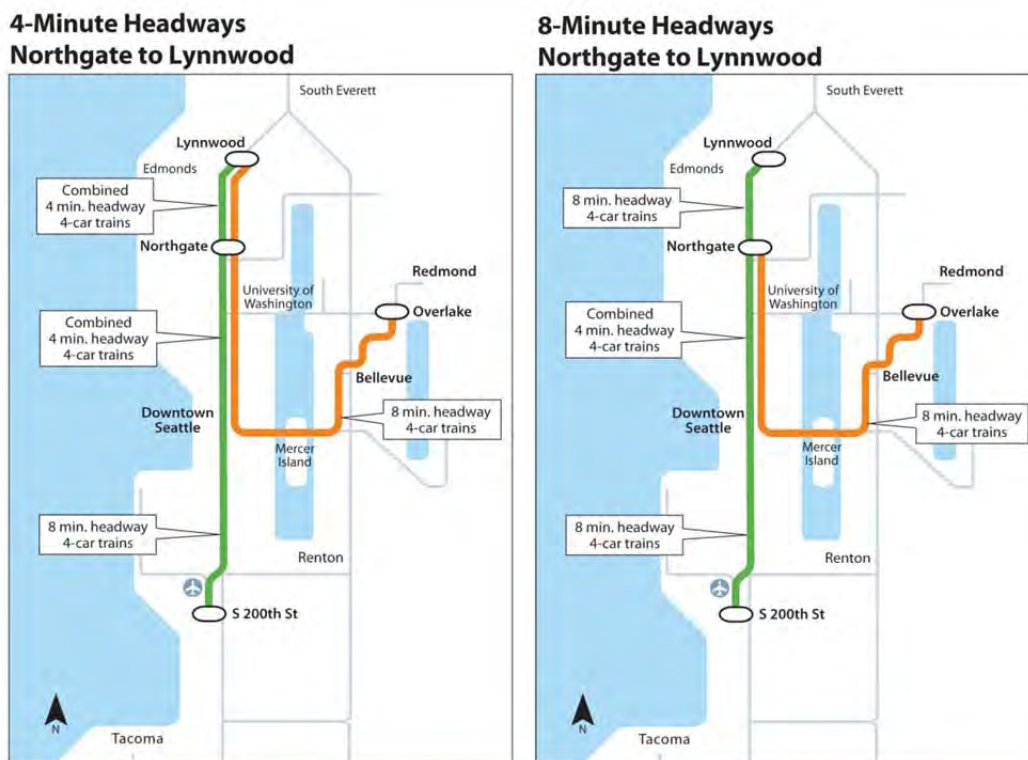


Figure 4-11. 4- and 8-Minute System Operating Plans

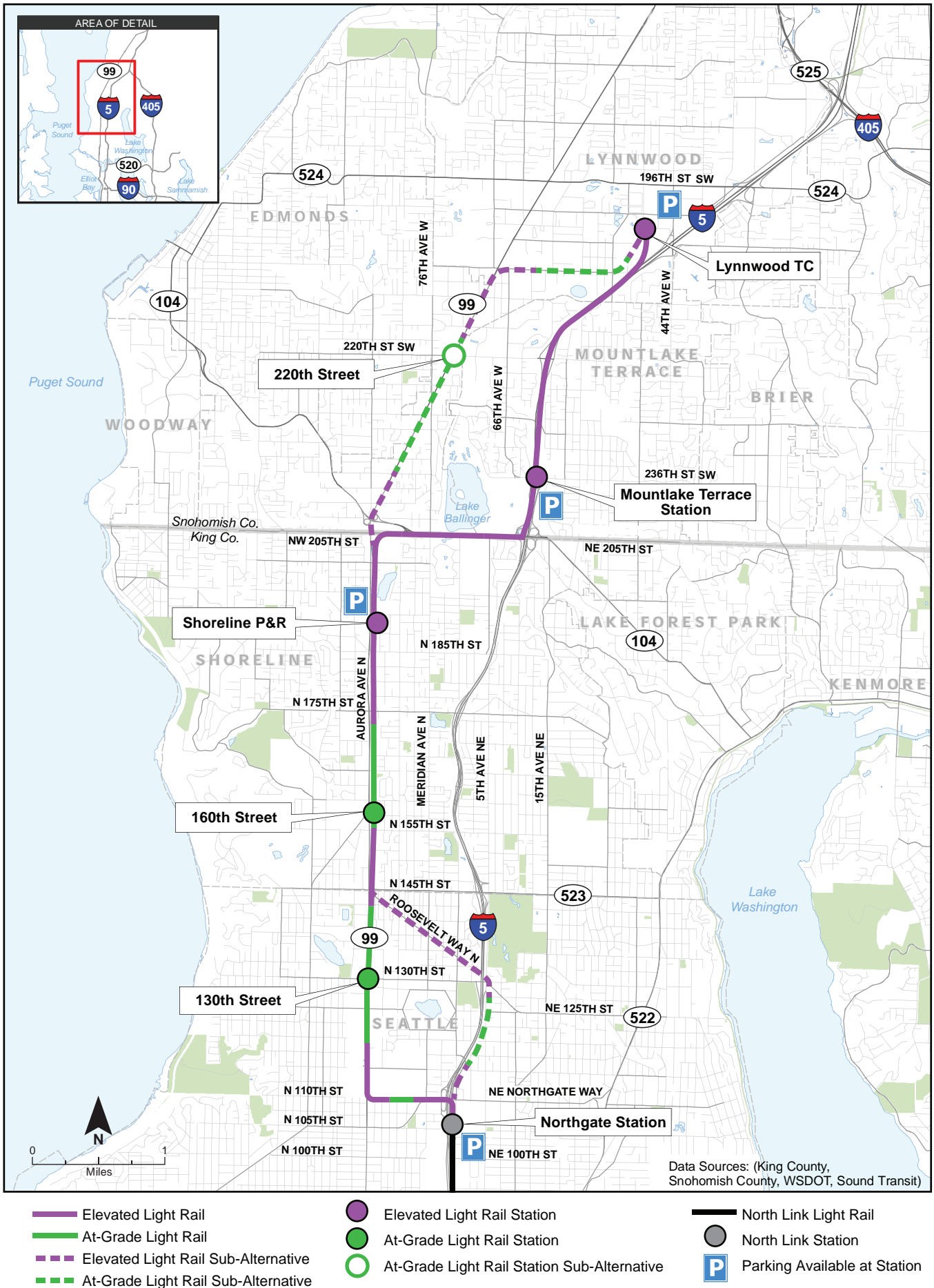
### 4.4.1 Facility Design

Figure 4-12 provides an overview of the alternative showing the primary alignment and two possible variations—one at the south and one at the north end. Figures 4-13 through 4-16 provide more detail regarding the alignment, profile, and station locations. The proposed L2: SR 99 Mixed Profile Light Rail Alternative is approximately 10.2 miles in length from the Northgate Transit Center to the Lynnwood Transit Center. Potential right-of-way acquisitions would be required along the majority of the alignment, and would be quite large for the at-grade sections and stations (50 to 90 feet of new right-of-way would be required). Because the at-grade alignment passes through intersections along SR 99, the conceptual design approach was to maintain traffic functionality and level of service existing in baseline conditions. This would require maintaining the existing through lanes and BAT lanes, as well as adding new left-turn lanes to accommodate consolidated left-turn volumes. This would result in dual left-turn lanes at many intersections. At station locations, the left-turn lanes are placed outside of the station platforms, resulting in a relatively extensive total roadway and trackway width (up to 190 feet). Figure 4-16 shows a typical cross-section of the existing SR 99 between North 110th Street and North 145th Street. Figures 4-17 and 4-18 illustrate typical examples of the resulting cross-sections for a mid-block at-grade rail guideway location and an at-grade rail station location, respectively. As the design of the line is refined, details for roadway improvements, as well as passenger drop-off facilities, local bus transfers, and street and traffic signal improvements around the stations will be further investigated. Refinement of the pedestrian connectivity infrastructure will also need to be considered. For the purposes of developing conceptual cost estimates, it was also assumed there would be one track crossover in the vicinity of each station.

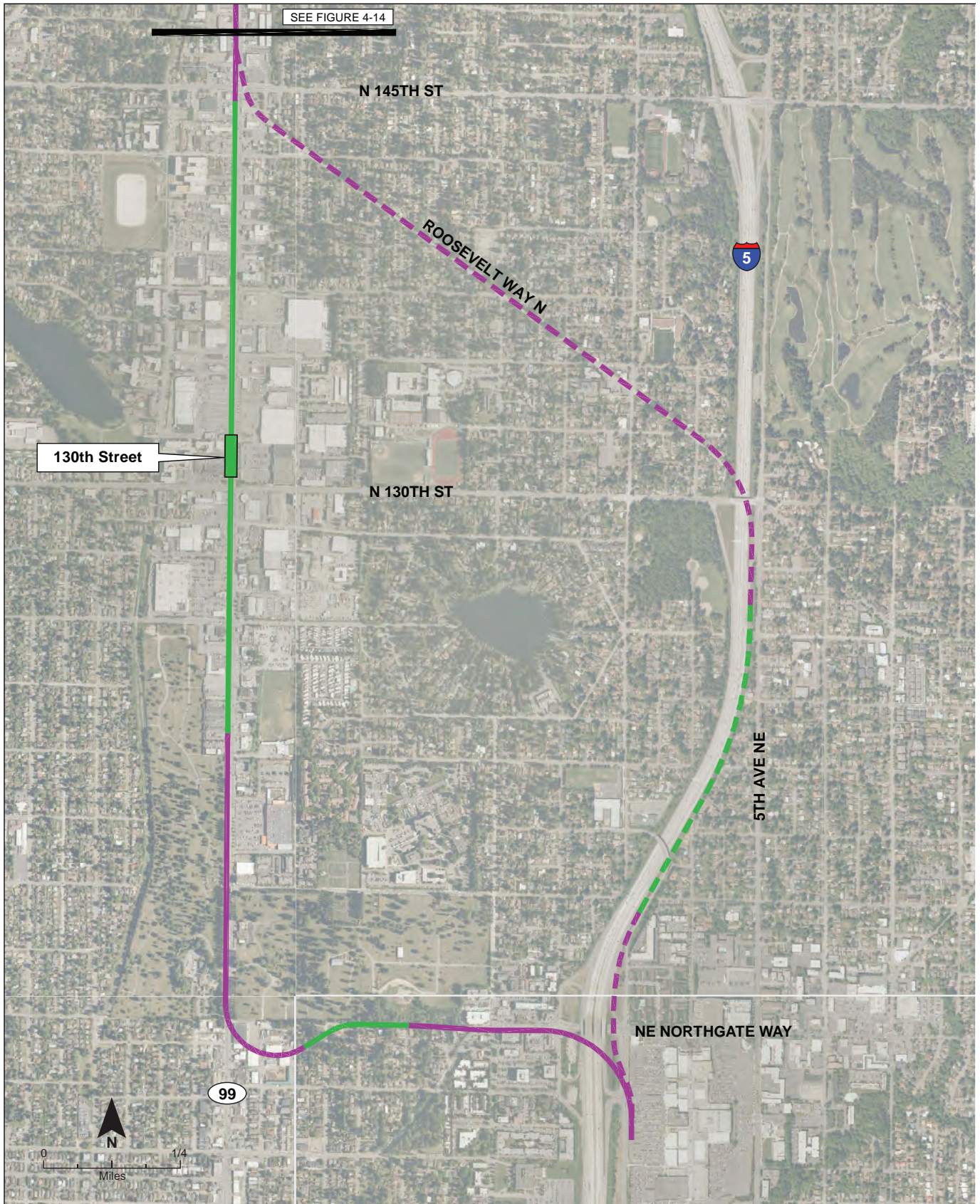
#### NORTHGATE TRANSIT CENTER TO NORTH 130TH STREET

The alignment begins at the north end of the planned Northgate Link station tail tracks in the Northgate Mall parking lot east of 1st Avenue NE. The aerial alignment continues north and then turns west, crossing over I-5, and continuing on aerial structure along the south side of Northgate Way. As Northgate Way turns southwest, the alignment would cross over the street and continue west generally along North 110th Street on the south edge of the Evergreen Washelli Cemetery. A section of this alignment may be at-grade, but most of it would be aerial. North 110th Street would be reconstructed to reconnect the local streets through this segment.

Near SR 99, the aerial alignment would curve to the south and then north to cross the northbound lanes and enter the median of SR 99. The aerial alignment would continue north in the median of SR 99 to about North 120th Street to minimize impacts to the adjacent cemetery. Throughout this section, the existing SR 99 roadway lane configuration would be maintained, with the exception of the center two-way left-turn lane that would be used for the column supports and to provide left-turn pockets for business access. North of North 120th Street, the alignment would transition to at-grade and SR 99 would be widened to the east to provide space for the guideway in the median.

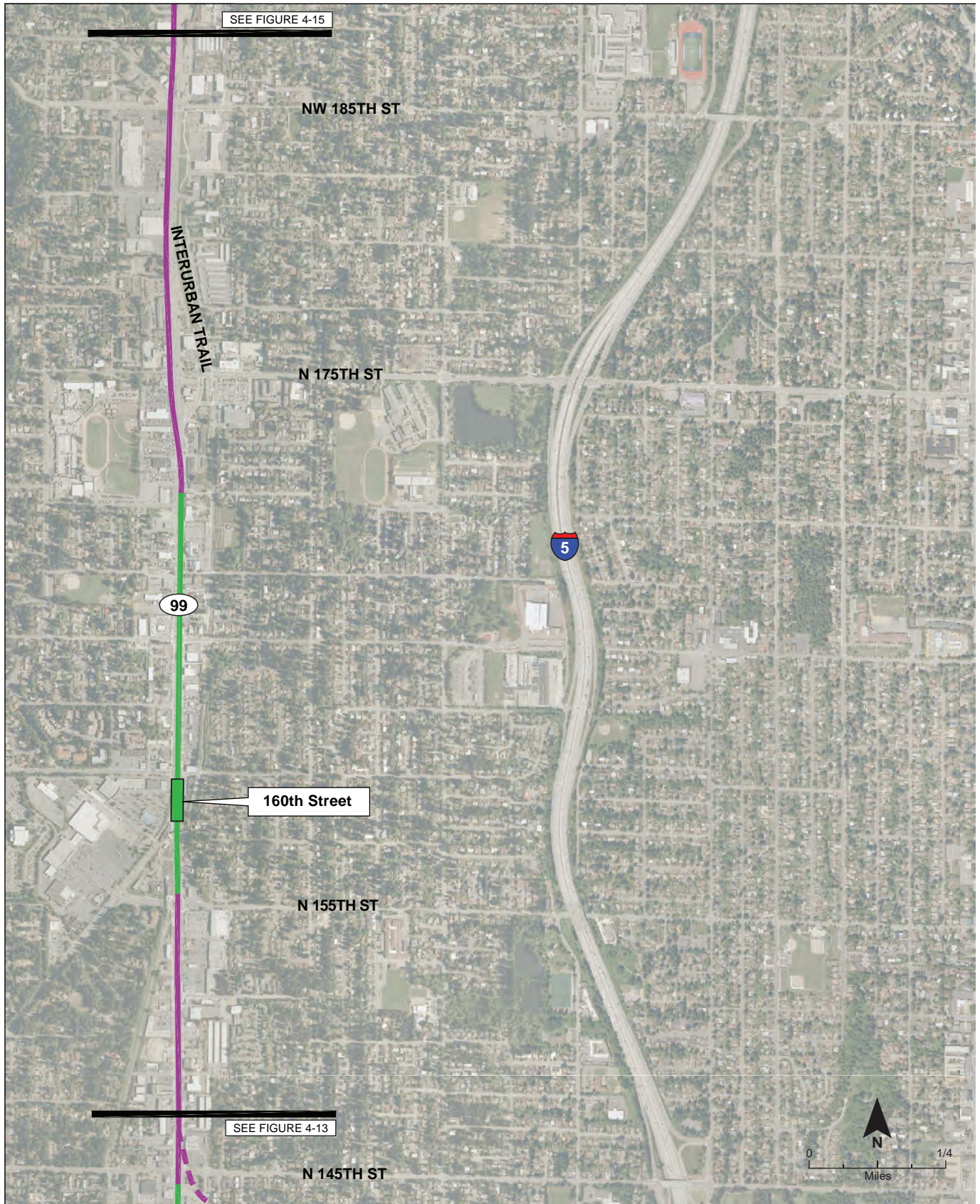


**Figure 4-12.** Level 2 L2: SR 99 Mixed Profile Light Rail Alternative



- |  |                     |  |                               |  |                             |
|--|---------------------|--|-------------------------------|--|-----------------------------|
|  | Elevated Light Rail |  | Alternate Elevated Light Rail |  | Elevated Light Rail Station |
|  | At-Grade Light Rail |  | Alternate At-Grade Light Rail |  | At-Grade Light Rail Station |

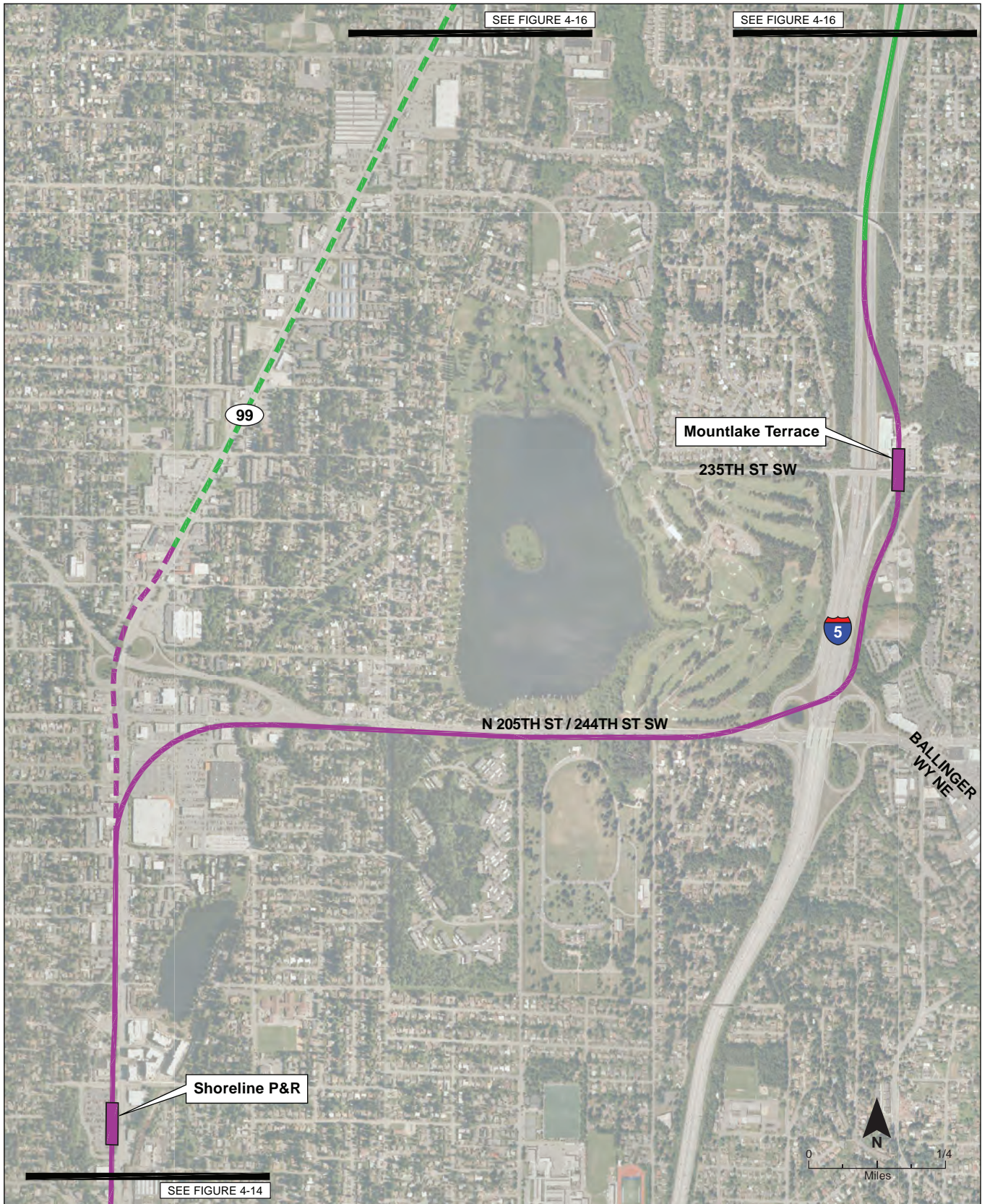
**Figure 4-13.** Level 2 L2: SR 99 Mixed Profile Light Rail Alternative Detail - 1 of 4



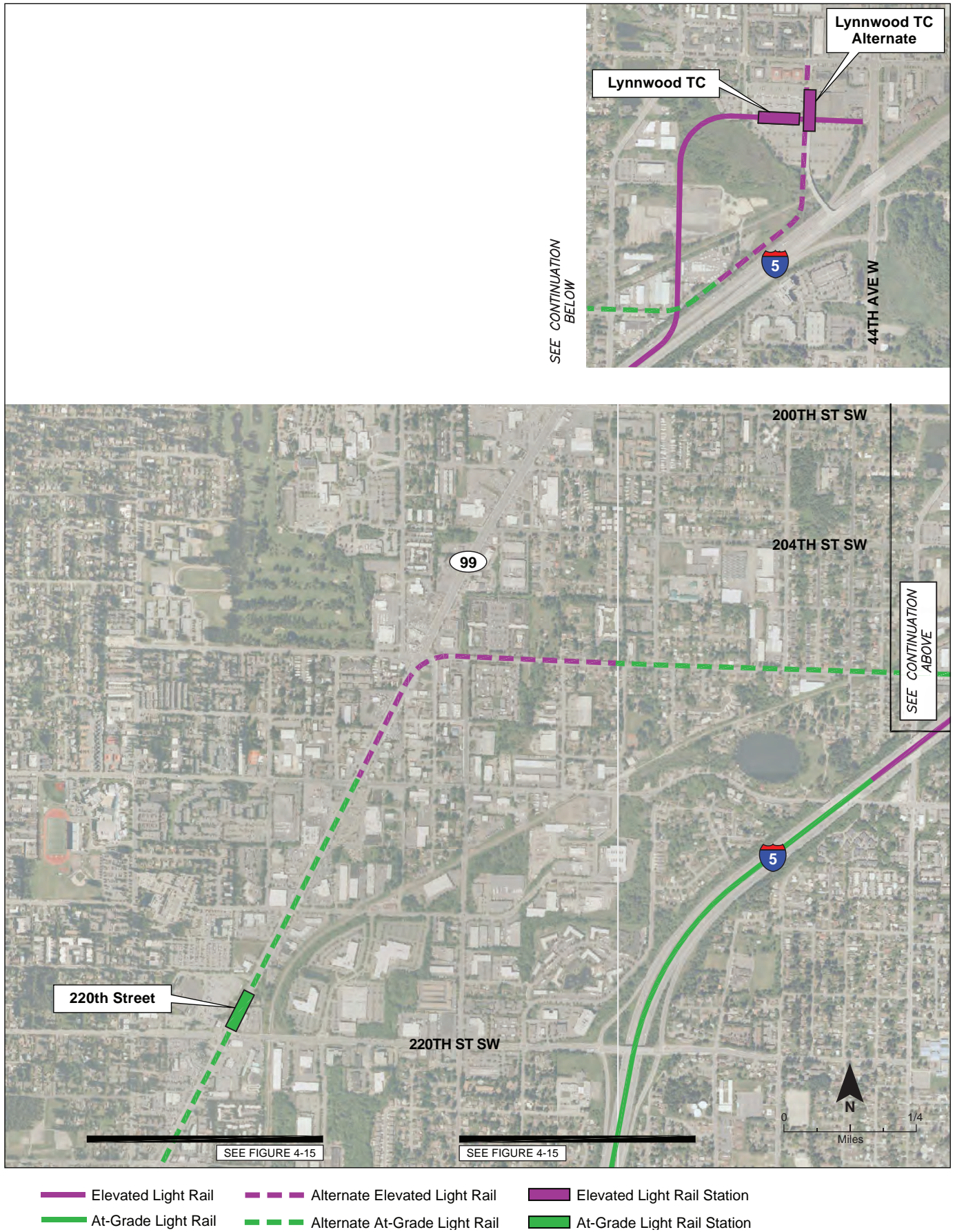
- Elevated Light Rail
- At-Grade Light Rail
- - - Alternate Elevated Light Rail
- - - Alternate At-Grade Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail Station

**Figure 4-14.** Level 2 L2: SR 99 Mixed Profile Light Rail Alternative Detail - 2 of 4  
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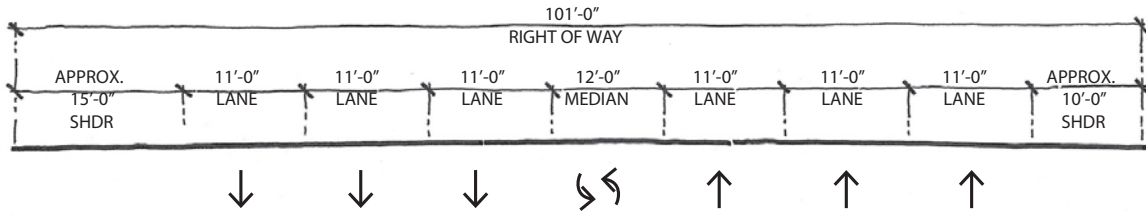




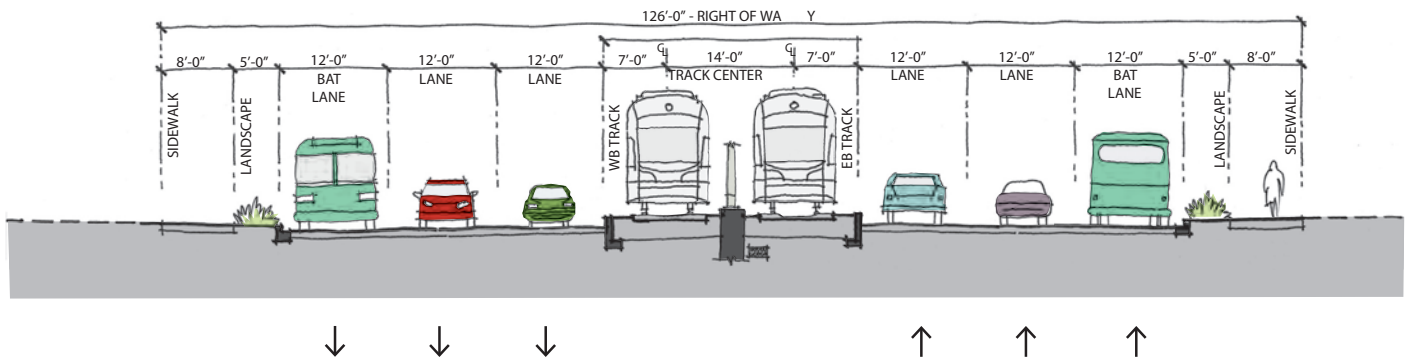
**Figure 4-15.** Level 2 L2: SR 99 Mixed Profile Light Rail Alternative Detail - 3 of 4



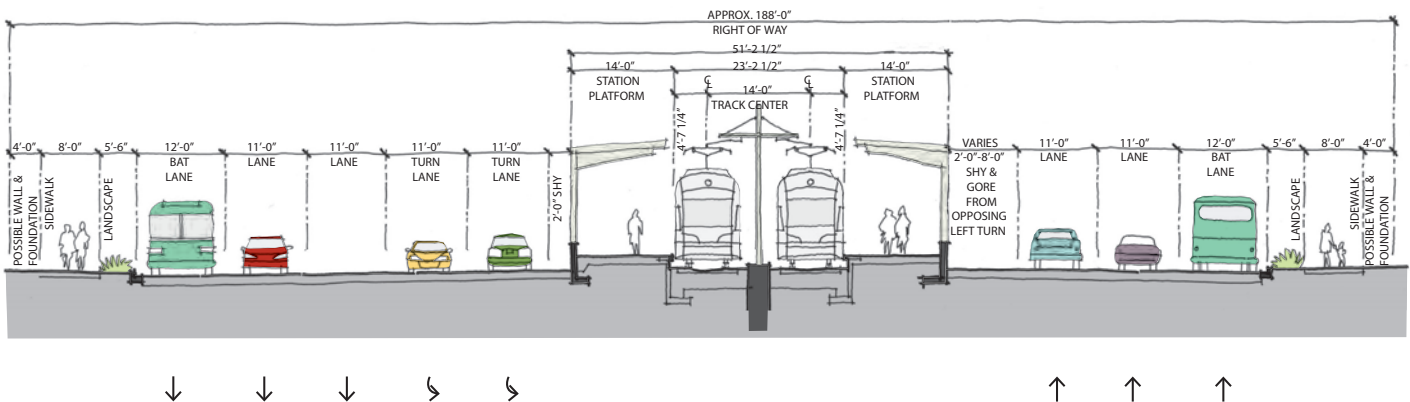
**Figure 4-16.** Level 2 L2: SR 99 Mixed Profile Light Rail Alternative Detail - 4 of 4



**Figure 4-17.** Existing SR 99 Typical Cross-section



**Figure 4-18.** L2: SR 99 Mixed Profile Light Rail Alternative Typical At-grade Mid-block Cross-section



**Figure 4-19.** L2: SR 99 Mixed Profile Light Rail Alternative At-grade Cross-section at Intersection with Station

An at-grade station would be located just north of North 130th Street. The station would be located in the median of SR 99 with side platforms, and have a total width of approximately 60 feet and length of approximately 380 feet.

### **NORTH 130TH STREET TO NORTH 160TH STREET**

North of the 130th Street Station, the at-grade alignment continues in the center of SR 99 to approximately North 143rd Street, where it would transition to an elevated guideway to cross over the heaviest traffic intersections at North 145th Street and North 155th Street. The alignment would then shift back to at-grade just north of North 155th Street, where a station would be located at North 160th Street. Portions of the Interurban Trail, including the pedestrian bridge over SR 99, would require reconstruction.

The at-grade station at North 160th Street would be located in the median of SR 99 with side platforms, and have a total width of approximately 60 feet and length of approximately 380 feet.

### **NORTH 160TH STREET TO SHORELINE PARK-AND-RIDE**

North of the 160th Street Station, the alignment continues at-grade in the SR 99 median to approximately North 173rd Street, where it transitions to an elevated structure. The elevated guideway crosses from the median to the west side of SR 99, passing over the high-volume intersections of North 175th Street and North 185th Street. The elevated guideway continues on the west side of SR 99 to an elevated station at the Shoreline Park-and-Ride (North 192nd Street). The light rail station at the existing Shoreline Park-and-Ride would include all of the functions now provided by the Aurora Village Transit Center. The latter would be re-located to the light rail station and the existing site of the Aurora Village Transit Center could be redeveloped. The Shoreline Park-and-Ride Station includes the following:

- Elevated pedestrian walkway between the existing Shoreline Park-and-Ride and the light rail station
- Sixteen bays for in-service and layover operations to replace the existing Aurora Village Transit Center
- An 1,100-stall parking garage to replace the existing 400 parking spaces at the Shoreline Park and Ride and the 200 existing spaces at the Aurora Village Transit Center, plus an additional 500 parking spaces

### **SHORELINE PARK-AND-RIDE TO MOUNTLAKE TERRACE TRANSIT CENTER**

North of the Shoreline Park-and-Ride Station, the elevated alignment continues along the west side of SR 99. Near the King/Snohomish County line, the aerial structure turns east, and then crosses over SR 99 and the parking lots and commercial properties near the intersection of SR 99 and North 205th Street (SR 104). The alignment continues eastward along the south side of SR 104, crossing over Meridian Avenue, 1st Avenue NE, 5th Avenue NE, SR 104, and I-5. This route would cross I-5 in a straight alignment to simplify structural requirements, and then curve north through office and school properties south of 236th Street SW. An aerial station would be located

over 236th Street SW, with station entrances on the south and north sides of 236th Street SW. This aerial station would serve the Mountlake Terrace Transit Center, park-and-ride garage, and freeway station. The aerial station is assumed to be center platform with a ground-level plaza. The Mountlake Terrace Station includes the following:

- Two off-street in-service bus bays and six off-street layover bus bays at Mountlake Terrace Transit Center
- A new parking garage with approximately 230 parking spaces to replace existing surface parking that would be displaced by the expanded and relocated off-street transit center

### **MOUNTLAKE TERRACE TRANSIT CENTER TO LYNNWOOD TRANSIT CENTER**

The alignment in this segment is identical to that described in Section 4.3.1 for the L1: I-5 Light Rail Alternative.

#### **4.4.2 Alignment Variations**

As shown in Figure 4-8, two alignment variations are under consideration for this alternative. The first provides an alternative connection between Northgate and SR 99. Instead of following Northgate Way and North 110th Street, the alternative alignment would continue along the east side of I-5 to approximately NE 130th Street, where it would cross over I-5 on an elevated structure and continue elevated along Roosevelt Way North to SR 99. This alignment alternative would preclude a station at North 130th Street. While a tunnel configuration also was given initial consideration for this section, the tunnel option was dropped following the Level 1 evaluation. As discussed in Chapter 3, with other non-tunnel alignments appearing to perform equal or better, further consideration of very costly tunnel alignments was dropped.

The second alignment variation would continue north of the King County/Snohomish County line at NW 205th Street/244th Street SW rather than turning east to follow SR 104 to I-5. From the station at the Shoreline Park-and-Ride, the alignment would continue elevated on the west side of SR 99, crossing over 244th Street SW and SR 104 before transitioning to at-grade in the median of SR 99 at approximately 240th Street SW. The alignment would then follow SR 99 at-grade to an at-grade station at 220th Street SW. At 208th Street SW, the alignment would transition to an elevated structure to cross over the northbound lanes of SR 99 and turn east onto 208th Street SW. On 208th Street SW, the alignment would transition from aerial back to at-grade in the median of the street and follow 208th Street SW to I-5. It would then transition back to aerial just prior to I-5 and turn northeast and continue along the west side of the I-5 right-of-way to Lynnwood Transit Center. Because of the constrained existing right of-way, this alignment would require substantial property acquisitions along the north side of 208th Street SW. In order to provide circulation and access to residents along the road, it is assumed that four signalized intersections allowing crossings of the rail guideway would be provided as well.

Finally, short sections of the former Interurban right-of-way that parallels SR 99 in King and Snohomish Counties might be crossed or used for the light rail alignment. While an alignment that requires continuous use of large segments of the Interurban right-of-way was dropped from consideration based on the findings from the initial screening (discussed in Chapter 3), it is

possible that using smaller portions of the right-of-way could be reconsidered if sections of a SR 99 route prove more difficult, but not as a major route alignment option.

### 4.4.3 Service Plan

Light rail service includes four-car trains serving stations at the Northgate Transit Center, North 130th Street, North 160th Street, Shoreline Park-and-Ride, Mountlake Terrace Transit Center, and Lynnwood Transit Center. Service would be provided 20 hours per day, with peak headways of 8 minutes and off-peak headways of 10 minutes.

Community Transit routes that now serve the Aurora Village Transit Center would be extended south on SR 99 to serve the new Shoreline Transit Center and light rail station. Similarly, King County Metro routes that now serve the Aurora Transit Center would be truncated at the new Shoreline Transit Center and light rail station.

Local King County Metro routes in north King County would be adjusted to serve light rail. Existing routes would either be truncated or extended to serve the new light rail stations at North 130th Street, North 160th Street, Shoreline Park-and-Ride, and Mountlake Terrace Transit Center.

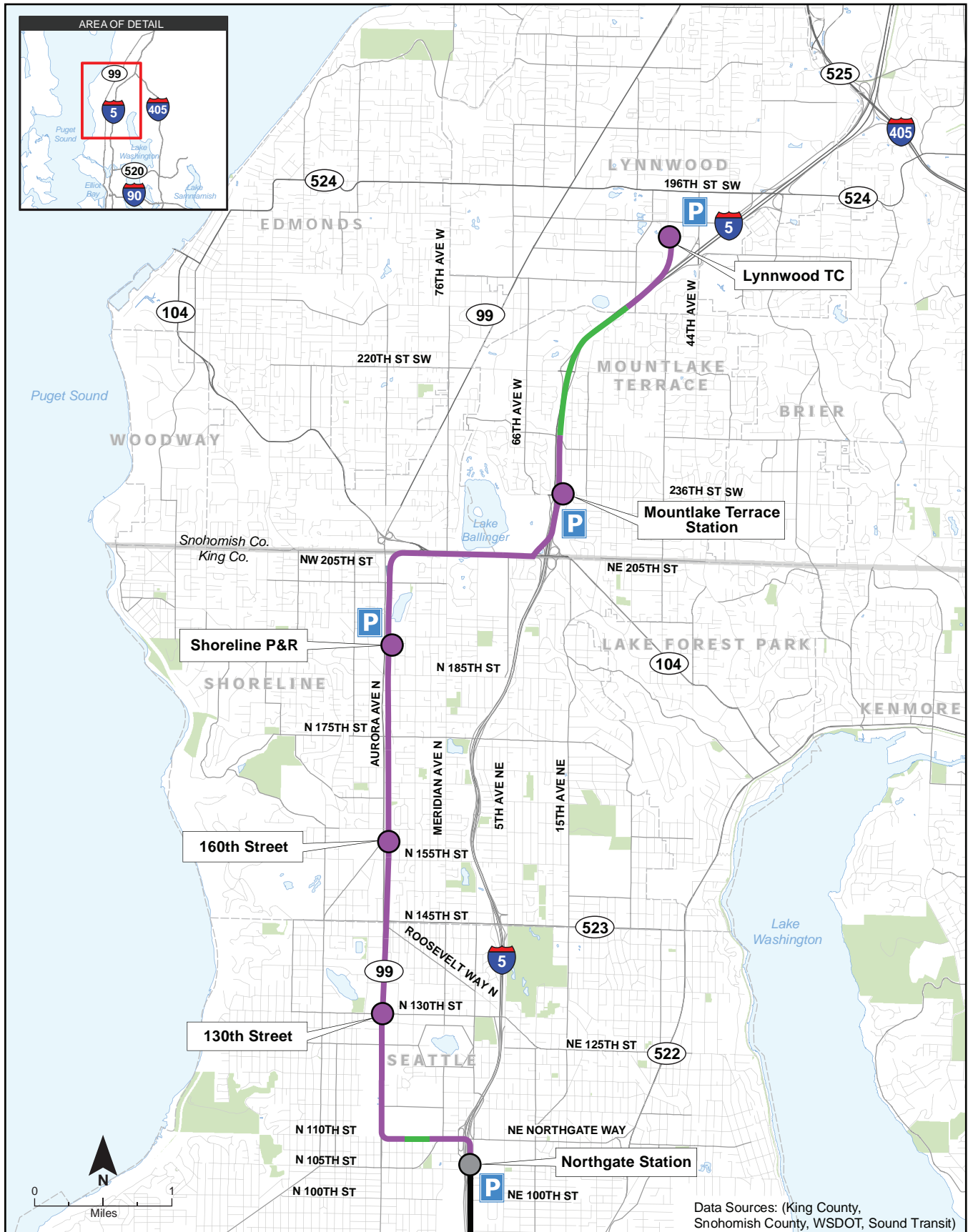
All Sound Transit routes from Snohomish County that operate to Seattle would terminate in Lynnwood, where passengers would transfer to light rail. Community Transit I-5 commuter routes connecting south Snohomish County to downtown Seattle and to the University of Washington would continue to operate as they do today, with the exception of routes currently connecting Edmonds with Seattle. These routes would terminate at the Mountlake Terrace and Shoreline Park-and-Ride stations where passengers would transfer to light rail. North Snohomish County commuter routes would continue to operate unchanged from today's configuration. King County Metro Route 301 would be discontinued and Route 304 would be truncated at the North 160th Street Station.

King County Metro RapidRide E Line BRT would interface with Community Transit's *Swift* BRT service at the Shoreline Park-and-Ride Station, which would be the terminus for both BRT services.

## 4.5 L3: SR 99 ELEVATED LIGHT RAIL ALTERNATIVE

The L3: SR 99 Elevated Light Rail Alternative has a similar alignment to the L2: SR 99 Mixed Profile Light Rail Alternative with the exception that the entire section of the alignment along SR 99 would be elevated. The difference between the L2 and L3 alignments occurs in the section between approximately North 120th Street and North 175th Street. Also, in contrast with the L2: SR 99 Mixed Profile Light Rail Alternative, the elevated alignment along SR 99 would allow for operations at 4-minute headways during peak periods. This alternative overall would include a combination of elevated and at-grade double-track rail line from Northgate to the Lynnwood Transit Center with four intermediate stations. Figure 4-20 provides an overview of the alternative showing the primary alignment and two possible variations—one at the south and one at the north end. Figures 4-21 through 4-24 provide more detail regarding the alignment, profile, and station locations. The general scope of work includes:

- Capacity for new light rail fleet and O&M facility, as needed, to support the extension
- New elevated light rail stations located at North 130th Street, North 160th Street, Shoreline Park-and-Ride (North 192nd Street), Mountlake Terrace Transit Center, and Lynnwood Transit Center
- Five hundred new structured park-and-ride stalls at both the Shoreline Park-and-Ride and Lynnwood Transit Center, supplementing approximately 2,600 existing stalls along the alignment
- Restructured bus services to integrate existing service with new light rail service and to avoid duplication of transit service on SR 99
- Relocation of the transit functionality of the Aurora Village Transit Center to the Shoreline Park-and-Ride, including 16 bays for in-service layover operations
- Additional in-service and/or layover bus bays at Mountlake Terrace Park-and-Ride and Lynnwood Transit Center to accommodate restructured bus services



- Elevated Light Rail
- At-Grade Light Rail
- Elevated Light Rail Station
- North Link Light Rail
- North Link Station
- P Parking Available at Station

**Figure 4-20. L3: Level 2 SR 99 Elevated Light Rail Alternative**

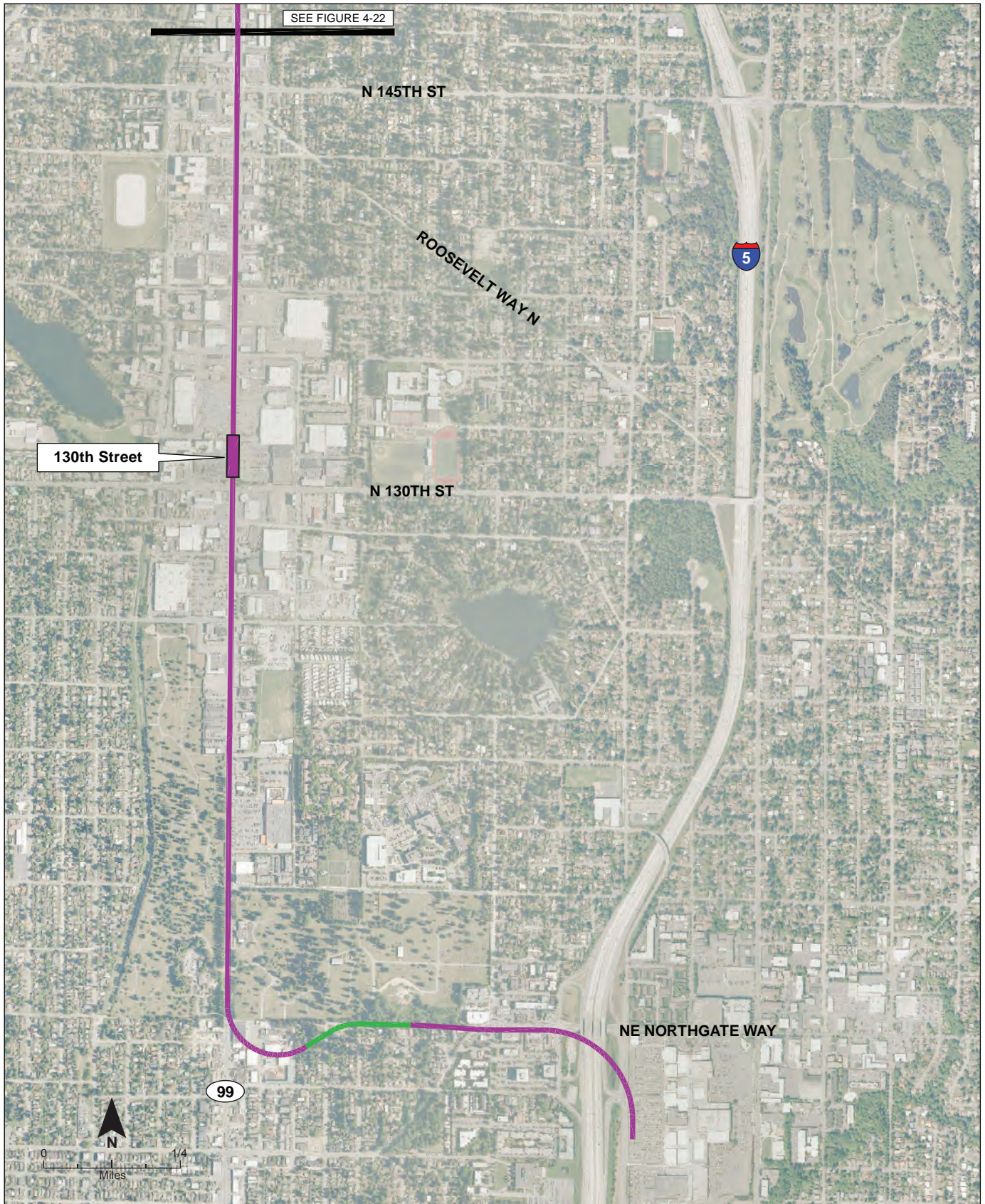


### 4.5.1 Facility Design

The L3: SR 99 Elevated Light Rail Alternative is approximately 10.2 miles (Northgate Transit Center to the Lynnwood Transit Center) in length. The following subsections describe the major components that form a potential light rail line along the SR 99 alignment between the Northgate Transit Center and the Lynnwood Transit Center. Line segments and stations are included in these descriptions. Light rail vehicles and the O&M facility capacity to support the light rail line are not included in these descriptions and are the subjects of a separate system wide study that Sound Transit is now undertaking. As the design of the line is refined, requirements for these types of improvements, as well as passenger drop-off facilities, local bus transfers, and street and traffic signal improvements around the stations will be further investigated. Figure 4-25 shows a typical cross-section of the existing SR 99 between North 110th Street and North 145th Street. Figures 4-25 and 4-26 illustrate typical examples of the resulting cross-sections for a mid-block elevated rail guideway location and an elevated rail station location, respectively. Refinement of the pedestrian connectivity infrastructure will also need to be considered. Other design features assumed in the capital cost estimates include one track crossover in the vicinity of each station.

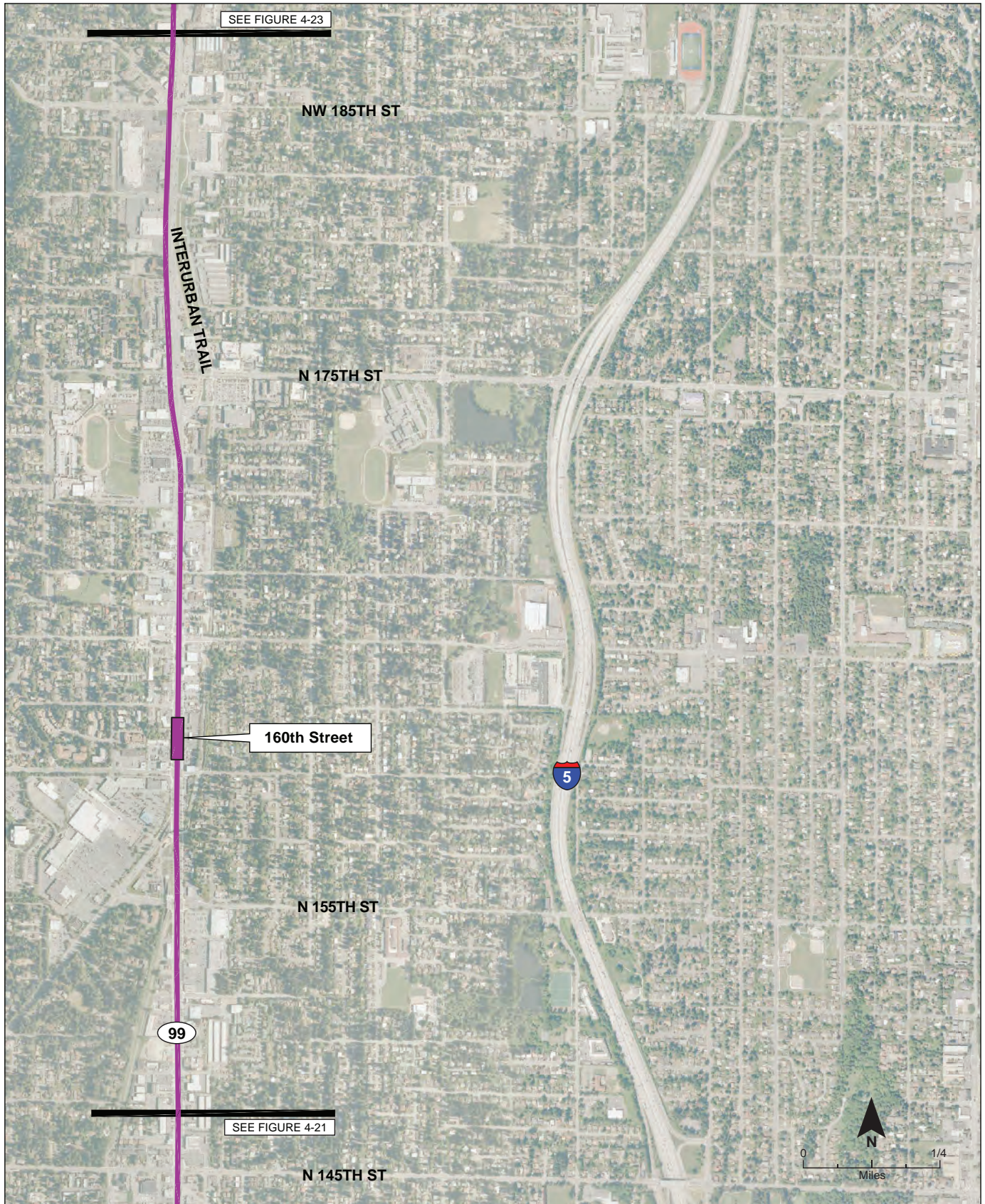
The L3: SR 99 Elevated Light Rail Alternative alignment assumes the elevated guideway is located on the west side of SR 99 north of North 120th Street. Alternatively, the alignment could be located either in the median or on the east side of SR 99, though either one would have consequences. An elevated guideway in the median of SR 99 would require significant roadway reconstruction and widening to accommodate left-turn demand at each signalized intersection. Median placement would result in traffic impacts because the current two-way left-turn lane would be removed to make space available for column placement. All left turns and U-turns would be consolidated at the signalized intersections, adding to the amount of roadway reconstruction. The cost and complexity of stations would also increase because either a mezzanine level or street level plaza would be required in the median below the passenger platform. For these reasons, a median elevated guideway was not used in this analysis.

A cursory evaluation suggests that there are not significant differences in the guideway impacts if it is located on the east side instead of the west side. However, both the 160th Street and Shoreline Park-and-Ride stations appear to be better situated on the west side of SR 99. At 160th Street, existing commercial and high-density residential land uses are located on the west side. The existing Shoreline Park-and-Ride provides a location on the west side that can be redeveloped with an expanded transit center. For these reasons, a "primary" alignment was chosen for the purposes of the Level 2 evaluation that runs along the west side of SR 99. However, analysis of this specific alignment for the Level 2 evaluation does not preclude future assessment of alignment variations.



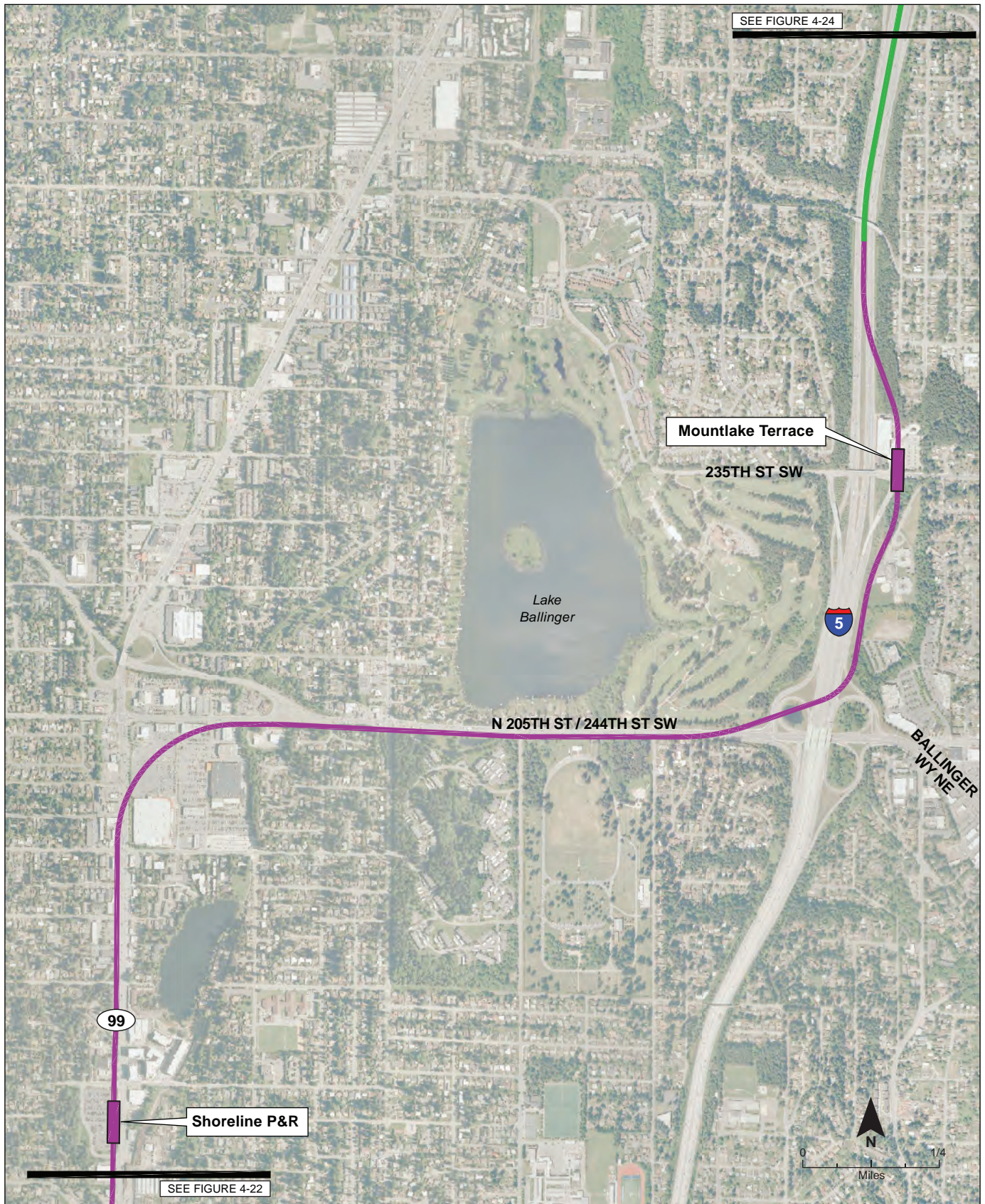
- Elevated Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail
- At-Grade Light Rail Station

**Figure 4-21.** L3: Level 2 SR 99 Elevated Light Rail Alternative Detail - 1 of 4



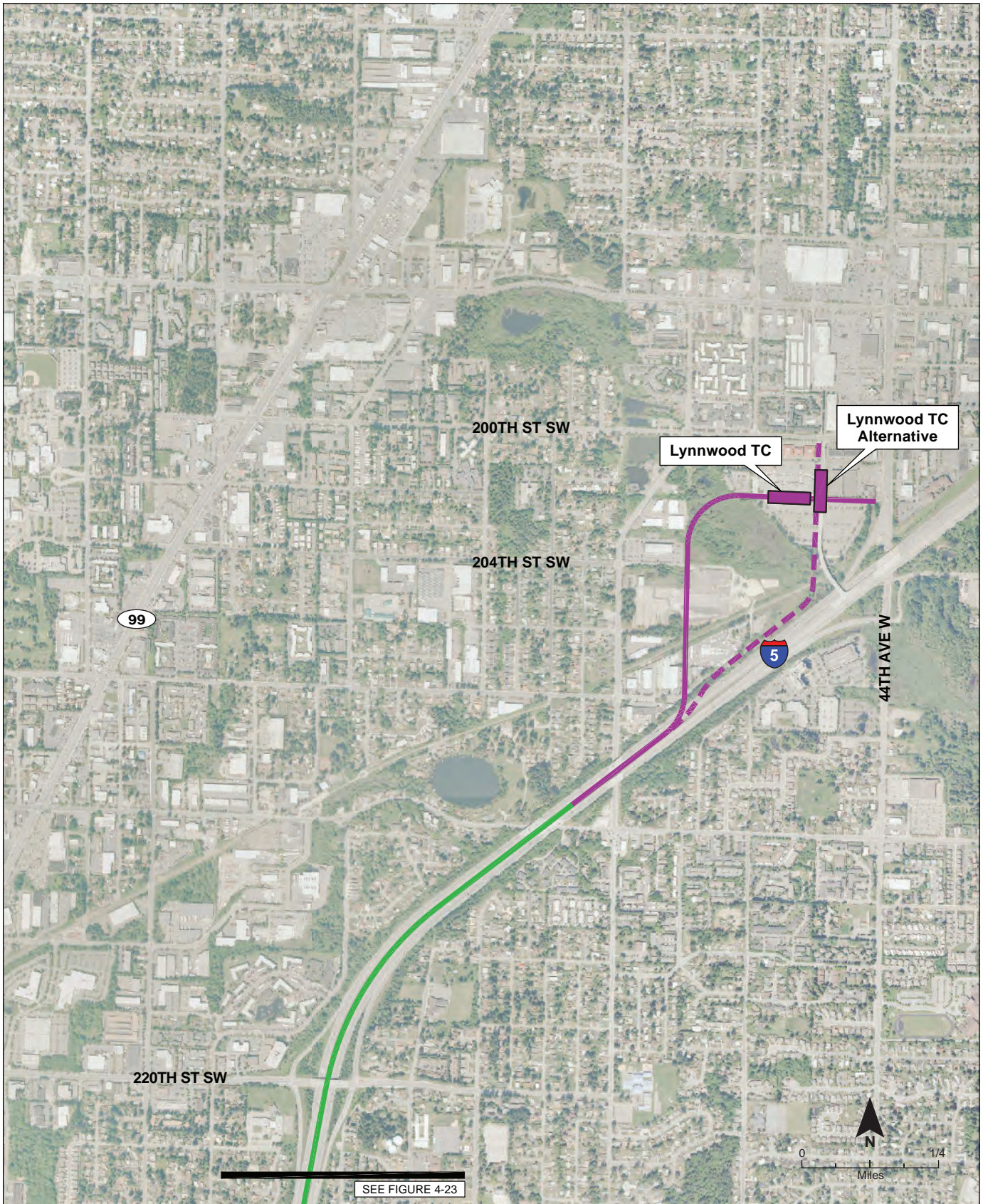
- Elevated Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail
- At-Grade Light Rail Station

**Figure 4-22.** L3: Level 2 SR 99 Elevated Light Rail Alternative Detail - 2 of 4



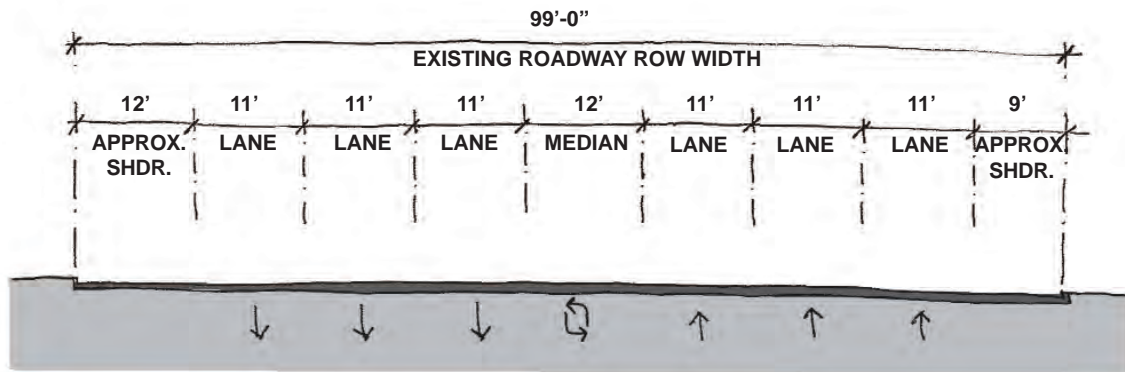
- Elevated Light Rail
- At-Grade Light Rail
- Elevated Light Rail Station
- At-Grade Light Rail Station

**Figure 4-23.** L3: Level 2 SR 99 Elevated Light Rail Alternative Detail - 3 of 4

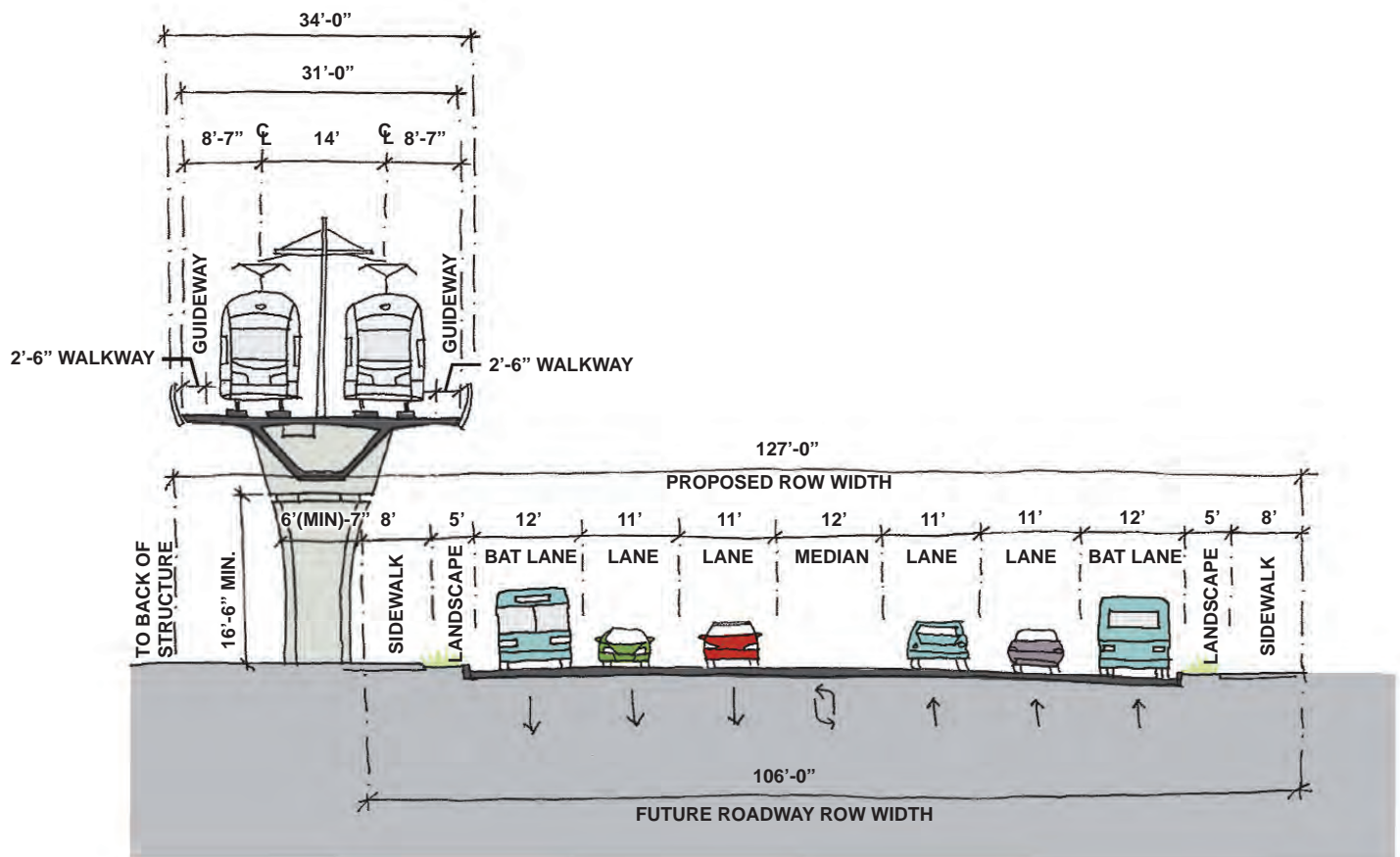


- Elevated Light Rail
- Elevated Light Rail Station
- Alternate Elevated Light Rail
- At-Grade Light Rail
- At-Grade Light Rail Station

**Figure 4-24.** L3: Level 2 SR 99 Elevated Light Rail Alternative Detail - 4 of 4



**Figure 4-25.** Existing SR 99 Typical Cross-section



**Figure 4-26.** L3: SR 99 Elevated Light Rail Alternative Typical Cross-section

### **NORTHGATE TRANSIT CENTER TO NORTH 130TH STREET**

The alignment would begin at the north end of the planned Link station tail tracks at Northgate Mall between 1st Avenue NE and the existing Northgate Transit Center. This alternative would have the same alignment as the L2: SR 99 Mixed Profile Light Rail Alternative between Northgate and approximately North 120th Street. The aerial alignment would continue north out of the station and then turn west, crossing over I-5, and continue along the south side of Northgate Way as an aerial guideway. An additional 15 to 20 feet of right-of-way would be required along Northgate Way.

As Northgate Way turns southwest, the alignment would continue west generally along the North 110th Street alignment. A section of this alignment may be at-grade, but most of it would be aerial. North 110th Street would be reconstructed to reconnect the local streets through this segment.

Near SR 99, the aerial alignment would curve to the south and then north to cross the northbound lanes and enter the median of SR 99. This long curve would require acquisition of new right-of-way to the south of North 110th Street in order to avoid affecting the adjacent cemetery. The aerial alignment would continue north in the median of SR 99 with a design that minimizes right-of-way impacts on the cemetery. At approximately North 120th Street, the alignment would cross over to the west side of SR 99 where 15 to 20 feet of additional right-of-way may be required for the elevated guideway. The aerial alignment would continue north along the west side of SR 99 to an aerial station located on the north side of North 130th Street. The station would feature a center platform and a ground-level plaza, requiring at least 60 feet of additional right-of-way.

### **NORTH 130TH STREET TO NORTH 160TH STREET**

Continuing north of the 130th Street Station, the aerial alignment would continue along the west side of SR 99 to an aerial station located at North 160th Street. The station would feature a center platform and a ground-level plaza. The alignment would require modifications to the Interurban Trail where the pedestrian bridges cross North 155th Street and SR 99. Fifteen to 20 feet of additional right-of-way may be required for the elevated guideway and at least 60 feet required at the station location.

### **NORTH 160TH STREET TO SHORELINE PARK-AND-RIDE**

North of the 160th Street Station, the alignment would continue on the west side of SR 99 in an aerial alignment to an elevated station at the Shoreline Park-and-Ride (North 192nd Street). The alignment matches back with the L2: SR 99 Mixed Profile Light Rail Alternative alignment at approximately North 175th Street. North of this point both alignments are the same. Fifteen to 20 feet of additional right-of-way may be required for the elevated guideway. The station would be located within the existing park-and-ride facility.

An elevated center platform station with a mezzanine would be located at the Shoreline Park-and-Ride. The station would have the following characteristics:

- Elevated pedestrian walkway between the existing Shoreline Park-and-Ride and the light rail station
- Sixteen bays for in-service and layover operations to replace the existing Aurora Village Transit Center
- A parking garage to replace the existing 600 parking spaces at the Shoreline Park and Ride (approximately 400 spaces) and the Aurora Village Transit Center (approximately 200 spaces), plus an additional 500 parking spaces for a total of 1,100 parking spaces

### **SHORELINE PARK-AND-RIDE TO MOUNTLAKE TERRACE TRANSIT CENTER**

North of the Shoreline Park-and-Ride Station, the elevated alignment would continue along the west side of SR 99. Near the King/Snohomish County line, the aerial structure would turn east, crossing over SR 99 and the parking lots and commercial properties near the intersection of SR 99 and North 205th Street. The alignment would continue eastward along the south side of SR 104, crossing over Meridian Avenue, 1st Avenue NE, 5th Avenue NE, then across SR 104, and I-5. This route would cross over to the east side of I-5 and curve north toward the east side of the existing Mountlake Terrace parking garage.

The assumed station at Mountlake Terrace would be the same as the one defined for the L1: I-5 Light Rail Alternative. An aerial station would be located over 236th Street SW, with station entrances on the south and north sides of 236th Street SW, and would serve the Mountlake Terrace Transit Center, park-and-ride garage, and freeway station. The aerial station is assumed to be center platform with a ground-level plaza.

The Mountlake Terrace Station also would have the following characteristics:

- Two off-street in-service bus bays and six off-street layover bus bays at Mountlake Terrace Transit Center
- A new parking garage with approximately 230 parking spaces to replace existing surface parking that would be displaced by the expanded and relocated off-street bus layover bays

### **MOUNTLAKE TERRACE TRANSIT CENTER TO LYNNWOOD TRANSIT CENTER**

The alignment in this segment is identical to that described in Section 4.3.1 for the L1: I-5 Light Rail Alternative.

## **4.5.2 Service Plan**

Light rail service includes four-car trains serving stations at the Northgate Transit Center, North 130th Street, North 160th Street, Shoreline Park-and-Ride, Mountlake Terrace Transit



Center, and the Lynnwood Transit Center. Service would be provided 20 hours per day, with peak headways of 4 minutes and off-peak headways of 10 minutes.

Community Transit routes that now serve the Aurora Village Transit Center would be extended south on SR 99 to serve the new Shoreline Transit Center and light rail station. Similarly, King County Metro routes that now serve the Aurora Transit Center would be truncated at the new Shoreline Transit Center and light rail station.

Local King County Metro routes in north King County would be adjusted to serve light rail. Existing routes would either be truncated or extended to serve the new light rail stations at North 130th Street, North 160th Street, Shoreline Park-and-Ride, and the Mountlake Terrace Transit Center.

Most Sound Transit and Community Transit routes from south Snohomish County that operate to Seattle would terminate in Lynnwood where passengers would transfer to light rail. The exceptions are routes that currently originate in Edmonds and provide service to downtown Seattle and the University District. These routes would terminate at the Mountlake Terrace and Shoreline Park-and-Ride Stations where passengers would transfer to light rail. North Snohomish County commuter routes would continue to operate unchanged from today's operations. King County Metro Route 301 would be discontinued and Route 304 would be truncated at the North 160th Street Station.

King County Metro RapidRide E Line BRT would interface with Community Transit's *Swift* BRT service at the Shoreline Park-and-Ride Station, which would be the terminus for both BRT services.

## 4.6 B2: MULTI-CORRIDOR BUS RAPID TRANSIT ALTERNATIVE

The B2: Multi-Corridor BRT Alternative consists of three BRT lines serving each of the major north-south roadways between the existing Northgate and Lynnwood Transit Centers. Direct access ramps to and from the north would provide direct connections for transit between the Northgate Transit Center and the I-5 HOV lanes. Additionally, direct access ramps to and from the south connecting into the I-5 HOV lanes would be provided at NE 130th Street for transit and HOVs. As with the TSM/Baseline Alternative, existing bus services in the project area focused on the University District and downtown Seattle would remain in place. The three proposed routes comprising this alternative are shown in Figure 4-27 and would run along SR 99, I-5, and 15th Avenue NE. BRT vehicles and supporting maintenance facility capacity would be included. Physical improvements to facilitate the BRT service would include the following:

**Transit Signal Priority:** Transit signal priority improvements would be required at all signals along 15th Avenue NE, 200th Street SW, and North 130th Street. Also, because the existing transit signal priority systems on SR 99 in King and Snohomish counties use different technologies, BRT vehicles would be equipped with both types of technology in order to use them.

**Stations:** The BRT service would use existing Community Transit *Swift* and King County Metro RapidRide stations along SR 99 and the existing Lynnwood Transit Center and Mountlake Terrace Freeway Station. Five new BRT stations would be required. Four of these stations are in the 15th Avenue NE corridor, with one in the SR 99 corridor, as follows:

- Ballinger Way NE/19th Avenue NE
- NE 175th Street/15th Avenue NE
- NE 145th Street/15th Avenue NE
- NE 125th Street/15th Avenue NE
- SR 99/North 160th Street

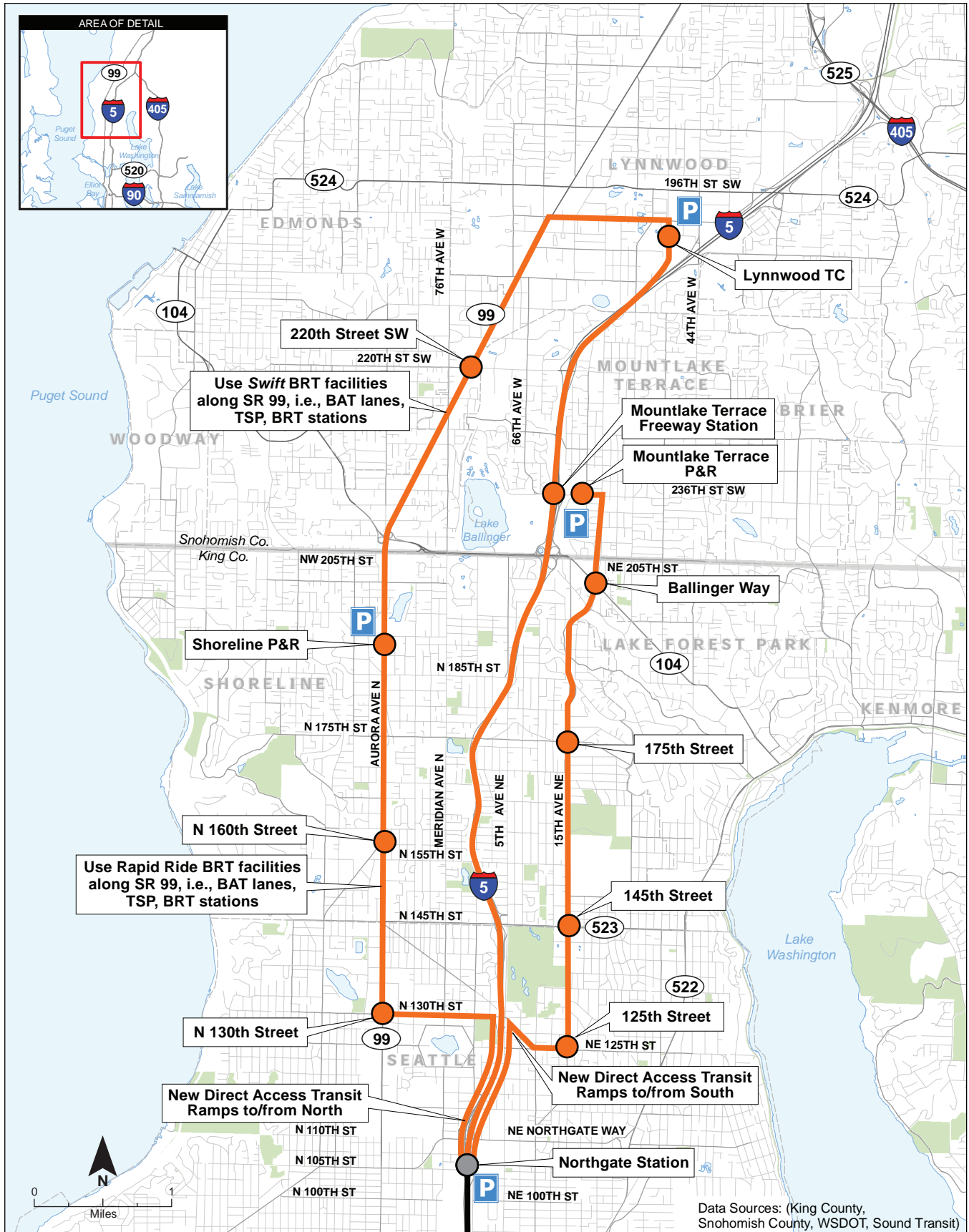
**Rider Amenities:** Real-time operating information, closed-circuit television, and off-board fare collection would be incorporated at BRT stations.

### 4.6.1 Facility Design

The proposed I-5 BRT route would use the existing HOV direct access ramps at Lynnwood, the HOV lanes on I-5, and the Mountlake Terrace Freeway Station. New HOV direct access ramps would be constructed to and from the south at North 130th and new transit-only ramps to and from the north at Northgate Transit Center to serve all three BRT routes. The Northgate ramps would connect directly into the transit center adjacent to the Link light rail station. The existing HOV lanes would be used with no modifications except as needed for the new direct access ramps. The existing configuration of I-5 has very little to no median space between Northgate and North 130th Street. In addition, most of the HOV lanes along this segment of I-5 do not have shoulders that meet current WSDOT standards. Any modifications to the HOV lanes and ramps to the HOV lanes would require widening of I-5 to accommodate the proposed ramps and possibly standard shoulder widths.

The layout of the BRT system includes the following assumptions:

- The Northgate direct access ramp would be bus only; HOVs would be prohibited since the only access would be to the transit center, where private vehicles are prohibited.
- The North 130th Street direct access ramp would accommodate transit and HOVs. WSDOT has indicated that with the potential future development of managed lanes in this section of I-5, a new access here would need to provide for HOV and possibly toll paying vehicles as well as buses.
- Transit-only ramps would be approximately 35 feet wide, providing two-way bus operations with no median barrier. HOV ramps would be designed to meet full interstate freeway standards.
- I-5 would be widened to WSDOT standards within the areas affected by the direct access ramps. This work could include repaving and upgrading drainage and utilities for the existing portions of those sections of freeway.



**Figure 4-27. B2: Level 2 Multi-Corridor BRT Alternative**

## NORTHGATE STATION

Northgate would be the southern terminus of the three new BRT lines where riders transfer to the light rail system. The existing transit center would be reconstructed as a two-level station—the bottom level serving local buses and the top level serving the BRT vehicles. Center passenger platforms would be built with stairs and elevators connecting the two levels. A pedestrian connection between the bus station and the light rail station would accommodate transfers between the two systems. This preliminary concept may evolve with more detailed design work.

Bus bay and layover requirements at the Northgate Transit Center include the following:

- The I-5 BRT service would require one bay for drop-off and one bay for pick-up, sized for articulated buses, and layover space for at least three articulated buses. Route 510/513 would require one in-service bay and one layover bay designed for articulated buses. The total bay requirements for the package of changes associated with the I-5 BRT service are three in-service bays and four layover bays.
- The 15th Avenue NE BRT service would require one bay for drop-off and one bay for pick-up for one articulated bus, and layover space for up to two articulated buses.
- The SR 99 BRT service would require one bay for drop-off and one bay for pick-up for one articulated bus, and layover space for up to two articulated buses.
- The total new bay requirements at Northgate Transit Center are seven in-service bays and eight layover bays. These would be located in the new second level of the Northgate Transit Center.

Bus-only direct access ramps to and from the north would connect the HOV lanes to the top level of the transit center as shown in Figure 4-28. These ramps would connect into the median of I-5 north of the express lanes terminus and have an S-curve layout between I-5 and the transit center. A 30-mph design speed is proposed. The ramps would pass over I-5, 1st Avenue NE, and NE 103rd Street, and pass under the light rail station tail tracks. The facility would connect to the local arterial street network to provide access for buses via a driveway and surface improvements adjacent to NE 103rd Street within the Northgate Mall parking lot.

To accommodate the bus ramps in the I-5 median, the southbound lanes of the freeway would be moved approximately 30 feet to the west and some reconstruction of the existing ramps would be required. This widening would extend approximately 0.3 mile to the north to accommodate the vertical profile of the ramps and the acceleration and deceleration lengths required for connections into the HOV lanes. Additional widening of northbound I-5 would be required, including the widening of the structure over Northgate Way, to provide the merge gap acceptance length required by WSDOT standards. This widening cannot be provided within the current median space. The northbound mainline must be widened to the east, which would affect the on-ramps from the Northgate Mall and NE Northgate Way. The widening associated with these ramps then would affect the frontage road and 117th Street flyover bridge. The total length of I-5 modifications would be approximately 0.9 mile and would extend

to meet the mainline widening that would be required to accommodate the proposed BRT improvements for the 130th Street direct access ramp. The proposed BRT station and ramps are shown in Figure 4-28. Additional right-of-way beyond the existing I-5 right-of-way would be required for some portions of this improvement.

### **NE 130TH STREET**

Direct access HOV ramps from the I-5 median HOV lanes to and from the south would rise to the grade of NE 130th Street where a new intersection would be created. I-5 would require widening for approximately 0.6 mile to the south and 0.5 mile to the north. The NE 130th Street Bridge would require reconstruction to allow the widened I-5 cross-section to pass under the structure and to provide the intersection improvements proposed. The proposed direct access ramp is shown in Figure 4-29.

### **SHORELINE PARK-AND-RIDE**

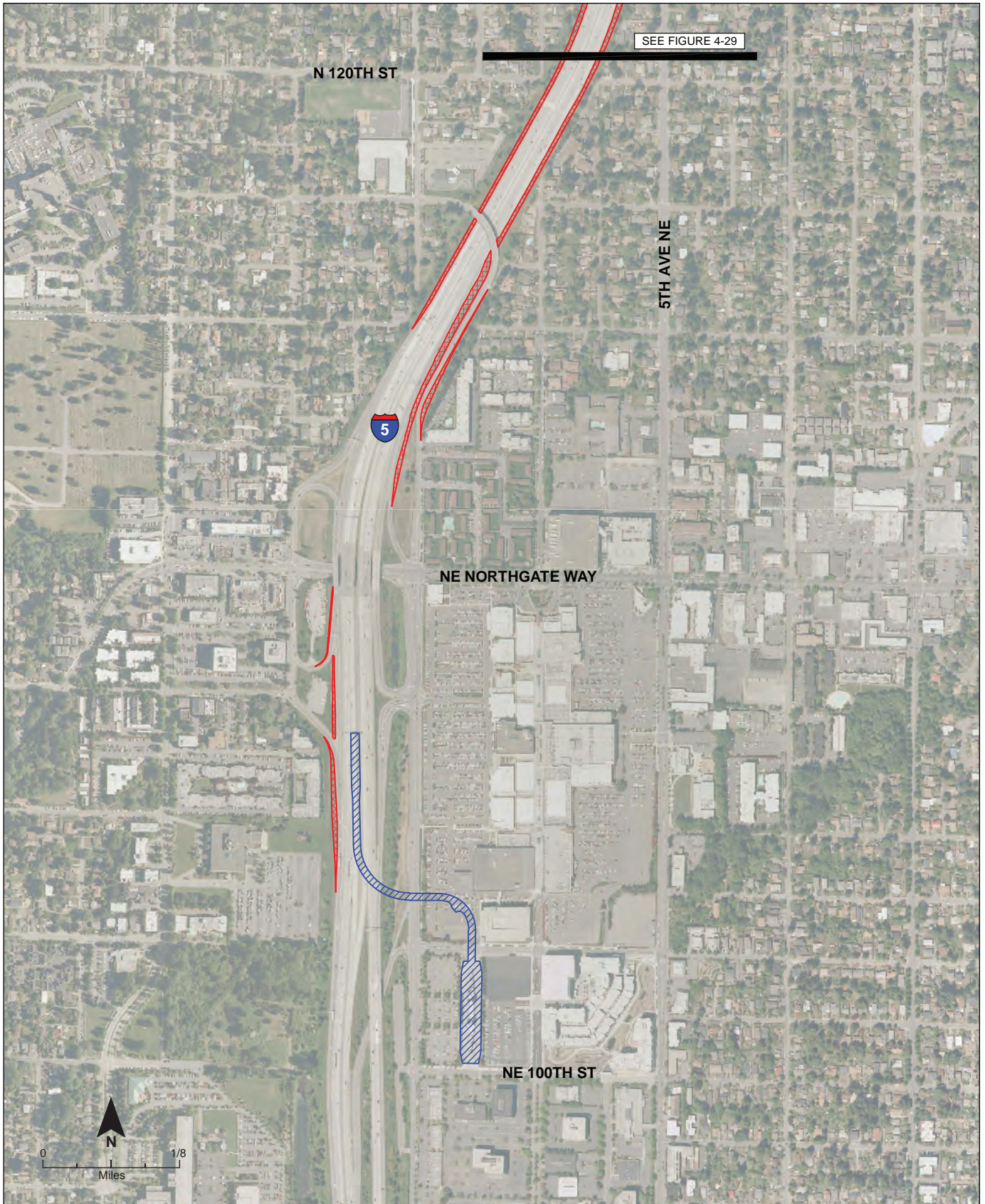
The B2: Multi-Corridor BRT Alternative assumes that the transit terminus functionality of the Aurora Village Transit Center would be re-located to the Shoreline Park-and-Ride, along with the existing 200-space park-and-ride capacity of the Aurora Village Transit Center. An additional 500 stalls of parking capacity would be provided, for a total of 1,100 park-and-ride stalls. The re-located transit center would consist of nine in-service bays and seven layover bays.



### **MOUNTLAKE TERRACE TRANSIT CENTER (236TH STREET SW)**

The I-5 BRT line would use the existing Mountlake Terrace Freeway Station. No additional improvements are anticipated at this location. This station is an at-grade median transit stop with stairs, elevators, and a pedestrian bridge connecting the station to the existing park-and-ride garage. No additional terminating routes are expected at the Mountlake Terrace Transit Center; thus, no additional layover spaces or bus bays would be required as a result of this alternative.

### **LYNNWOOD TRANSIT CENTER**



This location would use the existing HOV direct access ramps. These ramps connect both north and south along I-5 to the Lynnwood Transit Center. Similar to the light rail alternatives, 500 new structured park-and-ride stalls are assumed at the Lynnwood Transit Center bringing the total to 1,900 spaces. Three additional layover bays would be required at the Lynnwood Transit Center to accommodate the proposed BRT services.



-  BRT Improvement Area
-  Freeway Widening

**Figure 4-28.** Direct Access Improvements and Northgate BRT Station - 1 of 2



-  BRT Improvement Area
-  Freeway Widening

**Figure 4-29.** Direct Access Improvements and Northgate BRT Station - 2 of 2

## 4.6.2 Service Plan

Service for this alternative consists of three new high-frequency bus routes serving the North Corridor area between the Lynnwood Transit Center and the Northgate Transit Center where service would tie into Link light rail. Specific operating details of these three BRT routes are as follows:

- **SR 99 Route:** Lynnwood Transit Center, 200th Street SW, SR 99/Aurora Avenue North, NE 130th Street, NE 130th Street direct access ramp, I-5, Northgate direct access ramp, Northgate Link Station
- **15th Avenue NE Route:** Mountlake Terrace Transit Center, 236th Street SW, 56th Avenue West/19th Avenue NE, NE 196th Street, 15th Avenue NE, NE 125th Street, Roosevelt Way, NE 130th Street, NE 130th Street direct access ramp, I-5, Northgate direct access ramp, Northgate Link Station
- **I-5 BRT Route:** Lynnwood Transit Center, I-5, Mountlake Terrace Freeway Station, I-5, Northgate Link Station

BRT service on all three routes would be provided from 4:30 am to 1:30 am on Monday to Saturday and from 5:30 am to 1:00 am on Sunday. (The actual schedule would be timed for first southbound and last northbound trains at Northgate.)

Service frequencies were developed and refined to meet the projected ridership demand. On the SR 99 BRT route, frequencies would be every 10 minutes during peak periods and every 15 minutes during off-peak periods. On the I-5 BRT route, frequencies would be every 2 minutes during peak periods and every 10 minutes during off-peak periods. The 15th Avenue NE BRT route frequency would be every 15 minutes during both peak and off-peak periods.

Sound Transit Express and Community Transit commuter and local bus routes would not change, other than a minor re-route of Route 112 to serve the Mountlake Terrace Transit Center. King County Metro Routes 301 and 303 would be replaced by the new SR 99 to Northgate Express route. Community Transit routes that now serve the Aurora Village Transit Center would be extended south on SR 99 to serve the new Shoreline Transit Center. Similarly, King County Metro routes that now serve the Aurora Transit Center would be truncated at the new Shoreline Transit Center. Existing arterial BRT services would not be affected, but would rather be complemented by the new service.



## 4.7 OPERATION AND MAINTENANCE FACILITIES

All of the build alternatives require vehicle fleet expansions and associated additional operations & maintenance (O&M) base capacity to support them. The ST 2 finance plan includes funds for additional rail and bus O&M facilities to support the expanded system. While the new O&M capacity was determined in the plan and will be developed at the systems level, costs for these additions have been allocated to each corridor expansion on a per vehicle basis. Thus, the costs for O&M facility expansion are included in the estimates for all North Corridor build alternatives. The system-level process of identifying and analyzing alternatives for O&M facility expansion was recently initiated by Sound Transit through a separate effort designed to develop base capacity sufficient to support all corridor needs.