RapidRide Prioritization Plan

Corridor 1012 Summary Report

May 2024

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CORRIDOR SUMMARY

Ridership

No Build

+23%

RapidRide Corridor 1012

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour **+27.0**

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour **75.7**

Weekday boardings per revenue hour with RapidRide investment in 2042.

Travel Time

Proposed Travel Time Savings **-21%**

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time **31**

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Equity Priority Area Score

2.6

Average area of need score within 1/2 mile of station locations.

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine the corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1012 (Route 44). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1012 is currently served by Route 44, which connects Ballard, Wallingford and the University District to the UW Medical Center and University of Washington Link station. The eastern and western ends of the corridor serve important dense, mixed-use centers. The University of Washington – on the eastern end of the corridor – is the corridor activity center and transit generator. The middle of the corridor is primarily residential, with neighborhood-scale retail.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would operate from Ballard through Wallingford and the University District to Seattle Children's Hospital, instead of serving the southern areas of the University of Washington and the UW Medical Center. This project conducted a high-level review of the Metro Connects 2050, Metro Connect interim, and existing Route 44 alignments to identify the alignment to carry forward into analysis.

The result of the alignment screening was an alignment matching the existing route, terminating at the University of Washington Link station, instead of at the Children's Hospital.

2.2 Representative Alignment

The representative alignment matches the output from the alignment screening, as no other alignment changes were identified. Figure 2 lists the only change and how it compares to each of the alignments considered. The representative alignment is shown in Figure 3.

Figure 2 Alignment Changes

	Change from…		
Alignment Change	**Route 44**	**Metro Connects**	**Recommended Alignment in Screening**
Eastern terminus at University of Washington Link Station, instead of at Seattle Children's Hospital.	⊗	✔	⊗

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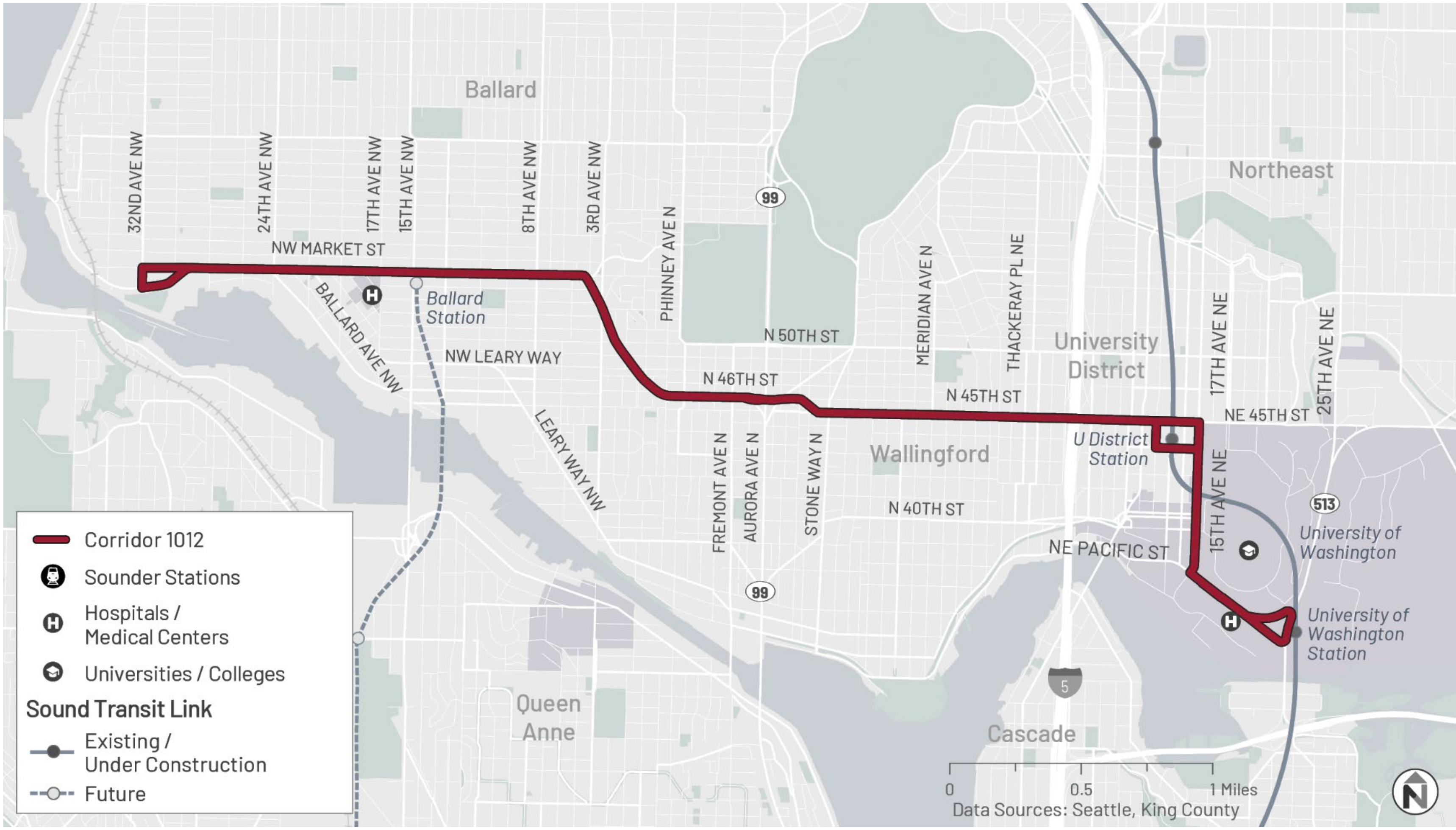
Figure 3 Corridor Overview



3.0 Transit Network

Route 44 currently provides frequent, east-west bus service between the Ballard and University District neighborhoods of Seattle. Route 44 connects to the RapidRide D Line in Ballard, the RapidRide E Line in Fremont, and Link light rail service at the University District and University of Washington Stations. Route 44 connects to regional bus service in the University District, while points of connection to local bus service are provided at many locations along its alignment.

3.1 Future Network Changes

The Metro Connects Interim Network assumes that Route 44 would connect to new RapidRide service in the Ballard and University District neighborhoods of Seattle and would connect to new Link light rail service in Ballard. Route 44 would continue to connect with additional local bus service at many points along its alignment.

Figure 4 Existing Transit Network

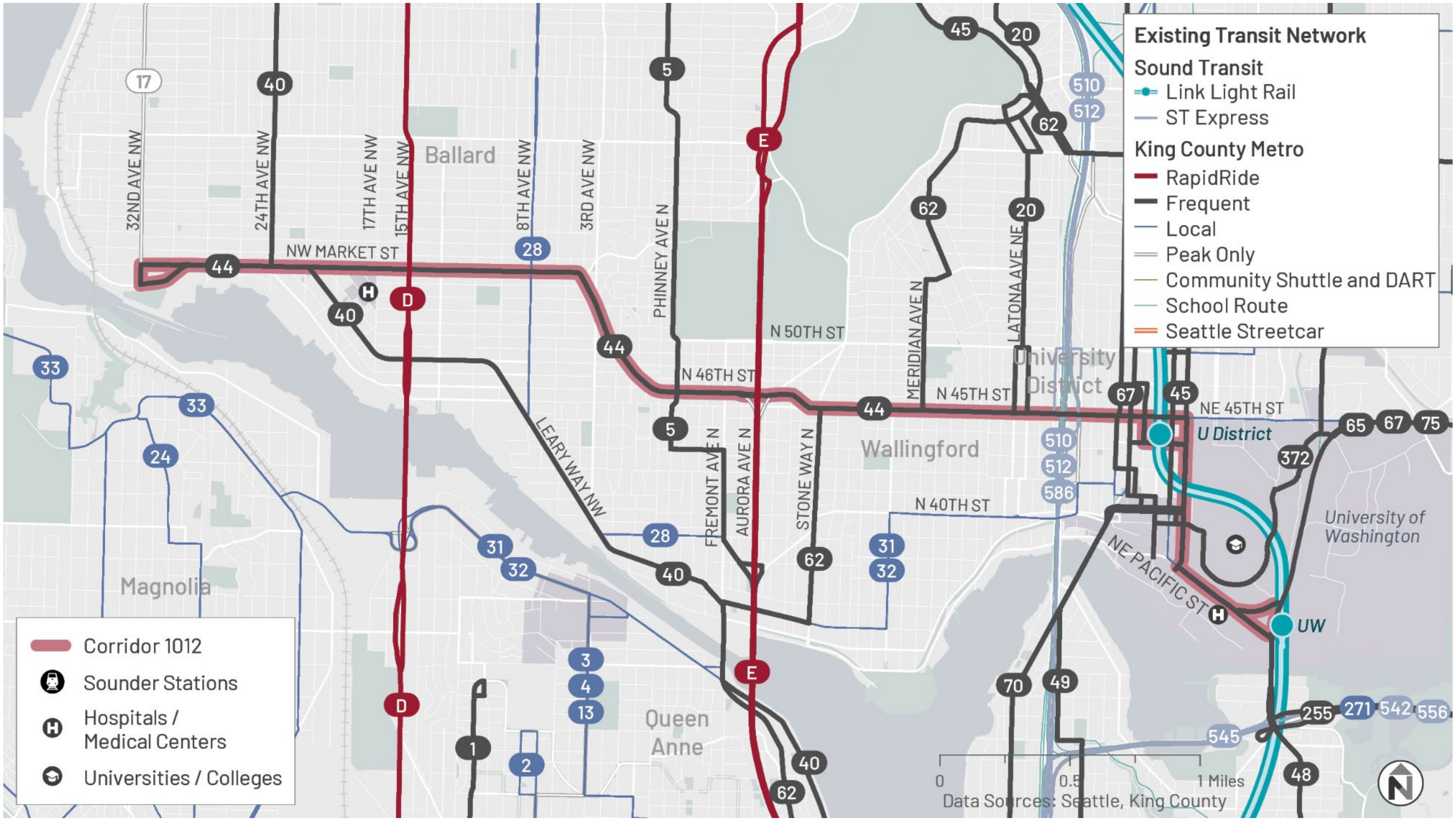


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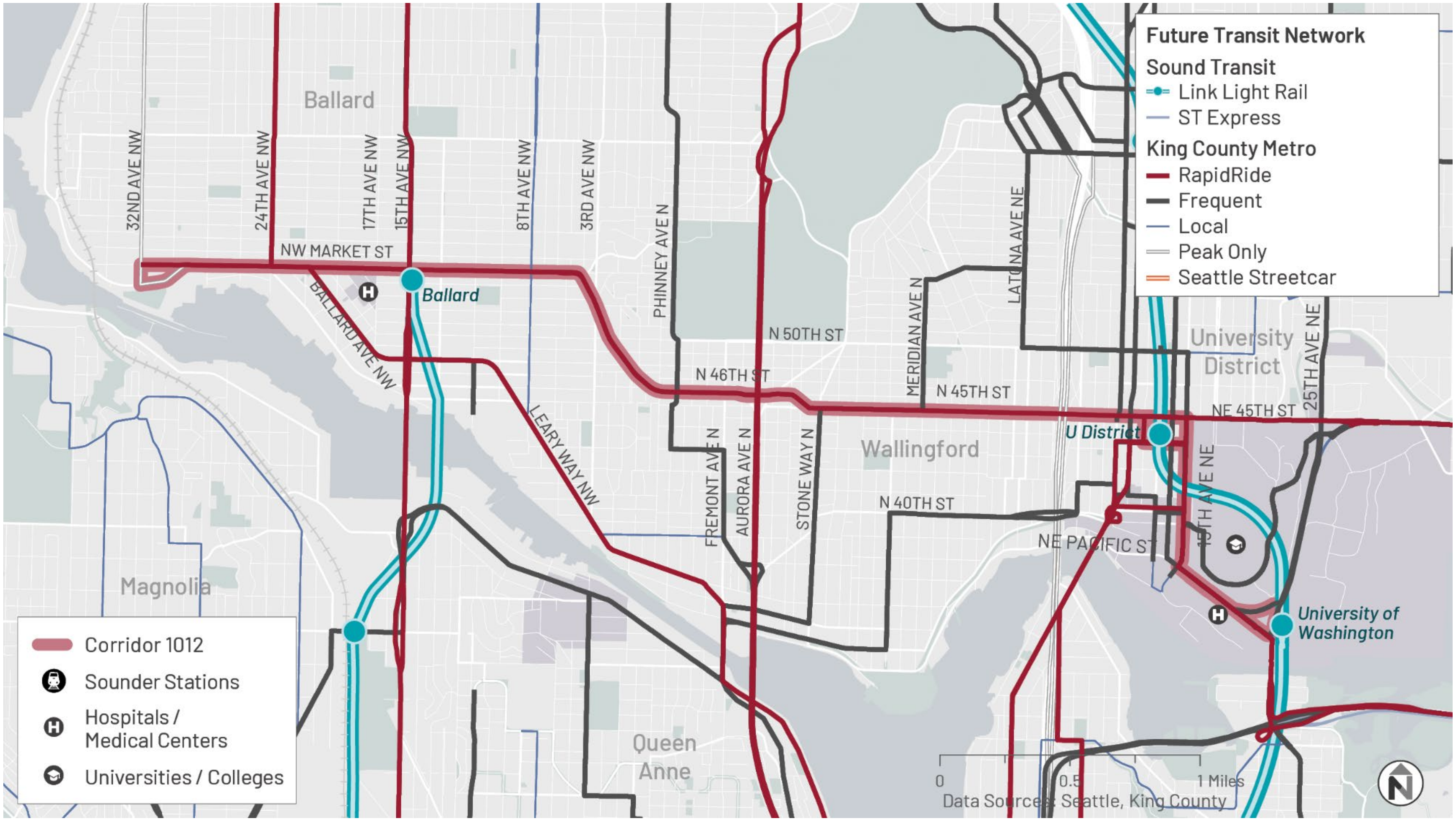
Figure 5 Metro Connects Interim Network



4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 44 currently operates frequent service for most of the day, every day. It operates every 12 minutes or better from 6 am to 9 pm on Weekdays, and 15 minutes or better from 8 am to 9 pm on Saturdays and Sundays. During Weekday peak hours, Route 44 runs every 10 minutes.

Figure 6 Existing Route 44 Frequency by Time of Day

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60	20	12	10			12					10					12	15	20			30	60	
Saturday	60		30	18	15	12			15									20			30	60		
Sunday	60		30	18	15	12			15									20			30	60		

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency and span on Weekdays, Metro would need to increase Route 44 frequency during the morning period. On Weekdays, Route 44 needs at least one additional trip between 6 am and 7 am to ensure 10-minute service for peak hours. On Saturdays and Sundays, Route 44 would need to add two additional trips per hour between 6 am and 7 am, and one additional trip per hour between 7 am and 8 am. This addition would ensure 15-minute service for Weekend standards.

Figure 7 shows the number of additional trips needed per direction hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60	20	10	10			12					10					12	15	20		30		60	
Saturday	60		15		15	12			15									20			30		60	
Sunday	60		15		15	12			15									20			30		60	

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a roundtrip will take approximately 62 minutes during the PM peak and 51 minutes during the off-peak hours. Although additional trips would be added, the service hours needed to operate Corridor 1012 would decrease because of the travel time savings. Metro could save approximately 36 service hours each weekday (21% savings), save 16 hours on Saturdays, and 16 hours on Sundays.

Figure 9 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would save four buses on weekdays (8 buses, relative to the existing 12 buses needed on weekdays). One fewer vehicle would be needed on Saturdays and Sundays (6 buses, relative to the existing 7 buses). These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	Percent
Daily Service Hours				
Weekday	172	136	-36	-21%
Saturday	119	103	-16	-14%
Sunday	119	103	-16	-13%
Daily One-Way Trips				
Weekday	212	210	-2	-1%
Saturday	156	158	+2	+1%
Sunday	156	158	+2	+1%
Fleet				
Weekday	12	8	-4	-33%
Saturday	7	6	-1	-14%
Sunday	7	6	-1	-14%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require at least one layover spaces at each end.[1] These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a UW Station / Montlake Triangle

The UW Station / Montlake Triangle area is a terminus for Routes 44 and 73. There is approximately 400 feet of curb layover space, but overhead trolley wire constrains how many buses can use this. During the busiest times of day, typically five buses lay over at once, three 60-foot trolley buses, and two 40-foot hybrids. Electrification would be provided by the existing overhead wires in this location. If a new terminus location is identified elsewhere, new trolley wire would need to be constructed.

4.5b Ballard

The western terminus of the corridor is on 32nd Ave NW between NW Market and NW 54th St. This is an on-street location and has capacity for two 60-foot coaches. In the PM, an extra 100 feet of layover is available on NW Market. The corridor is already electrified with overhead wires, so no additional charging facilities would be needed. If additional layover space is needed, one or more driveways would need to close, or the layover space would need to shift to a different location.

[1] A one-way travel time of approximately 30 minutes requires a layover of six minutes (20% layover). With buses every 10 minutes, there would typically be one bus laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

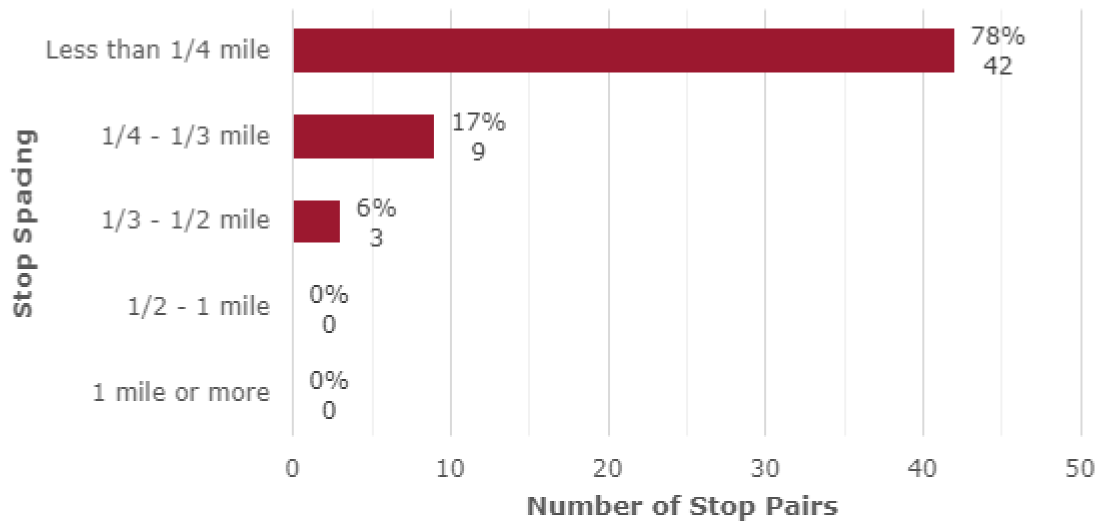
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,000 feet (or almost one-fifth mile).

Approximately 80% of stop pairs along the corridor are less than a quarter mile, and with an additional 17% between a quarter and third of a mile (Figure 10).

Figure 10 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

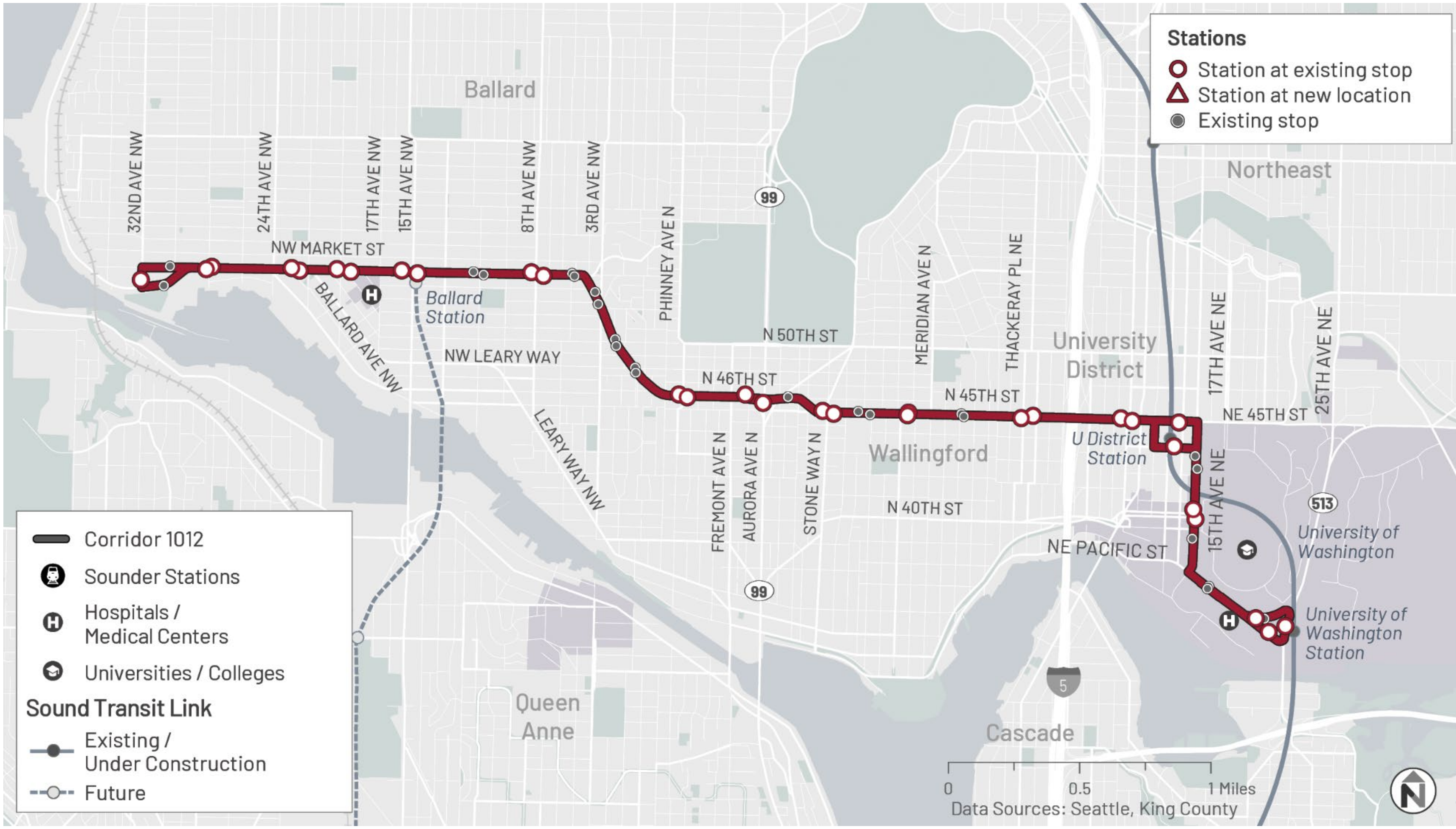
The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the

locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 11. The average spacing would be 1,940 feet, or approximately one-third of a mile, which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 11 Proposed Station Locations



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5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 12, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 55.

Figure 12 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 32), each station is categorized into one of the four potential station typologies. The typologies are listed in Figure 13 and summarized in Figure 14.

Figure 13 Station Boardings and Typology

#	Station	Forecast Boardings		Typology	
		EB	WB	EB	WB
1	32nd Ave NW & NW Market St	140	-	Medium	-
2	NW Market St & 28th Ave NW	160	-	Large	Small
3	NW Market St & Ballard Ave NW	160	40	Large	Small
4	NW Market St & 20th Ave NW	130	10	Medium	Small
5	NW Market St & 15th Ave NW	2,060	190	Large Raised	Large
6	NW Market St & 8th Ave NW	330	70	Large	Medium
7	N 46th St & Phinney Ave N	450	660	Large Raised	Large Raised
8	N 46th St & Linden Ave	510	520	Large Raised	Large Raised
9	N 45th St & Stone Way N	790	200	Large Raised	Large
10	N 45th St & Wallingford Ave N	350	240	Large Raised	Large
11	NE 45th St & Latona/Thackeray	60	290	Medium	Large
12	NE 45th St & Roosevelt Way NE	60	340	Medium	Large
13	U District Station	40	970	Small	Large Raised
14	15th Ave NE & NE Campus Pkwy	10	1,220	Small	Large Raised
15	NE Pacific Pl & NE Pacific St	-	-	Small	-
16	Montlake Blvd NE & NE Pacific Pl	-	130	-	Small
17	NE Pacific St & Montlake Blvd NE	-	40	-	Medium

Figure 14 Route 44 Station Typology Summary

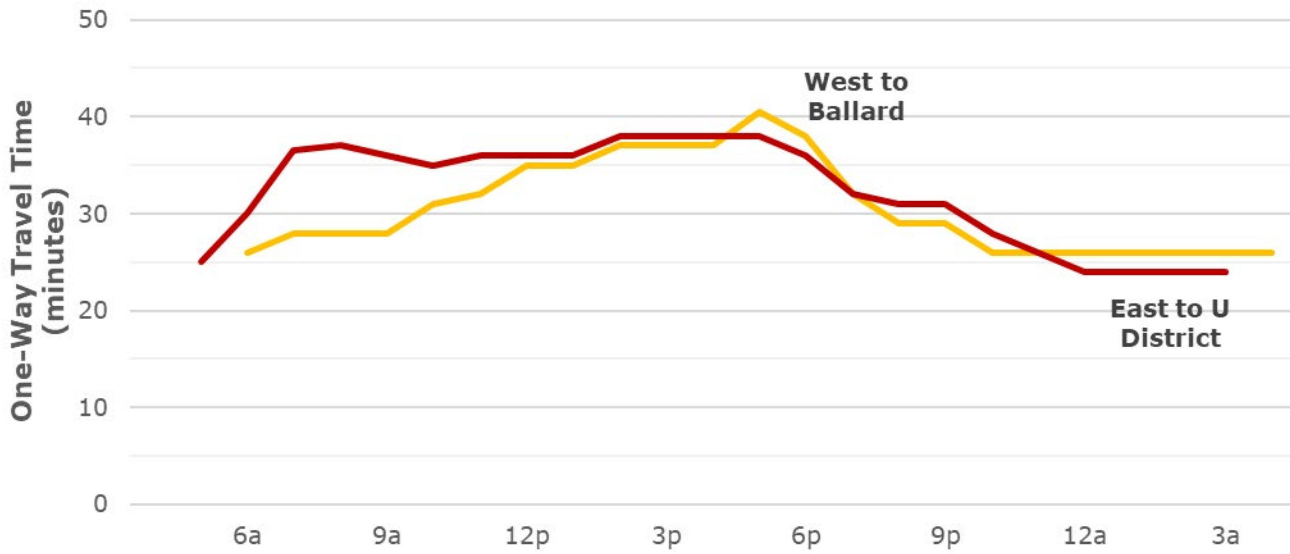
Station Type	Count	Percent
Large Raised Station	9	30%
Large Station	8	27%
Medium Station	6	20%
Small Station	7	23%
Total	**30**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 44 in May 2023 ranged between 24 minutes (late in the evening) to 41 minutes (during the PM peak). On average a one-way trip took 31 minutes.

Figure 15 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

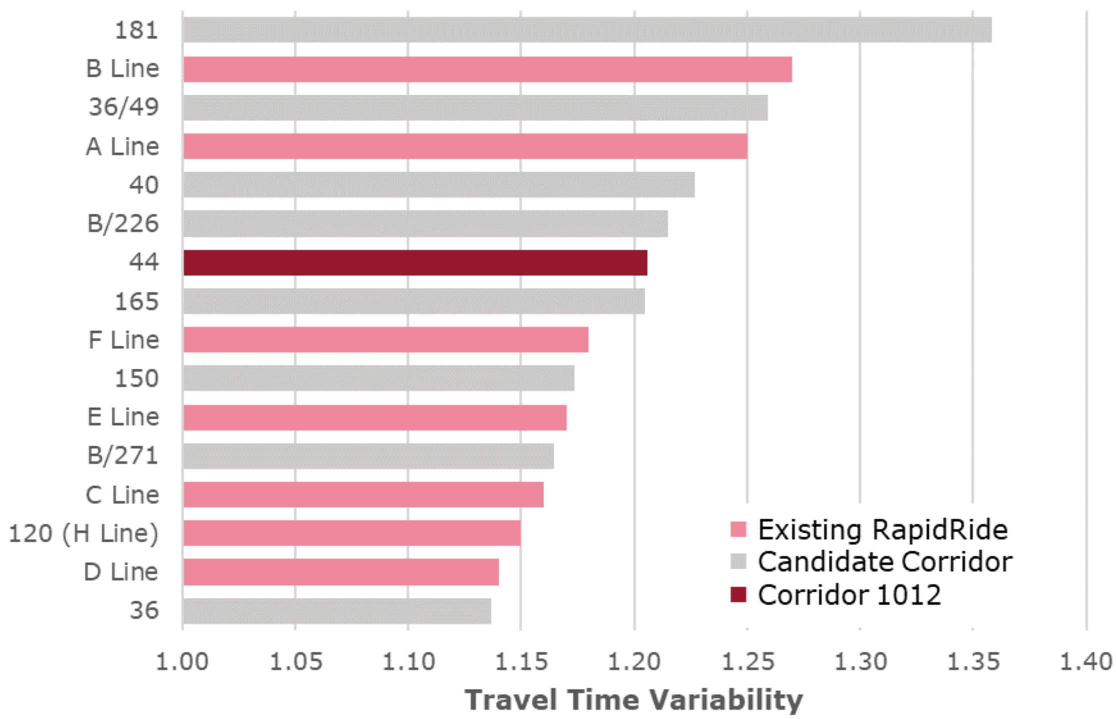
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 1012 experiences delay of almost 30 minutes between the 20th and 80th percentile travel time. This is approximately 2.78 minutes (167 seconds) of trip delay per mile on an average trip. This is the highest delay of all nine corridors, and more than twice as high as the second-most delayed corridor.

Eastbound trips between 2-5 PM and westbound trips at 5 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.15 to 1.21. This indicates the longest travel times (slowest trips) take 15-21% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1012's performance is typical. This comparison is shown in Figure 16.

Figure 16 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 17.

Figure 17 Speed & Reliability Summary

Metric	Value
On-time performance[A]	73%
Average speed	12.5 mph
Average trip delay[B]	29.7 min
Average trip delay per mile	167 sec
Lowest median hourly travel time (Reference) [C]	24 min
Highest median hourly travel time	29 min[D]
Travel time variability[E]	1.21

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 4 PM for westbound trips, from Fall 2021.

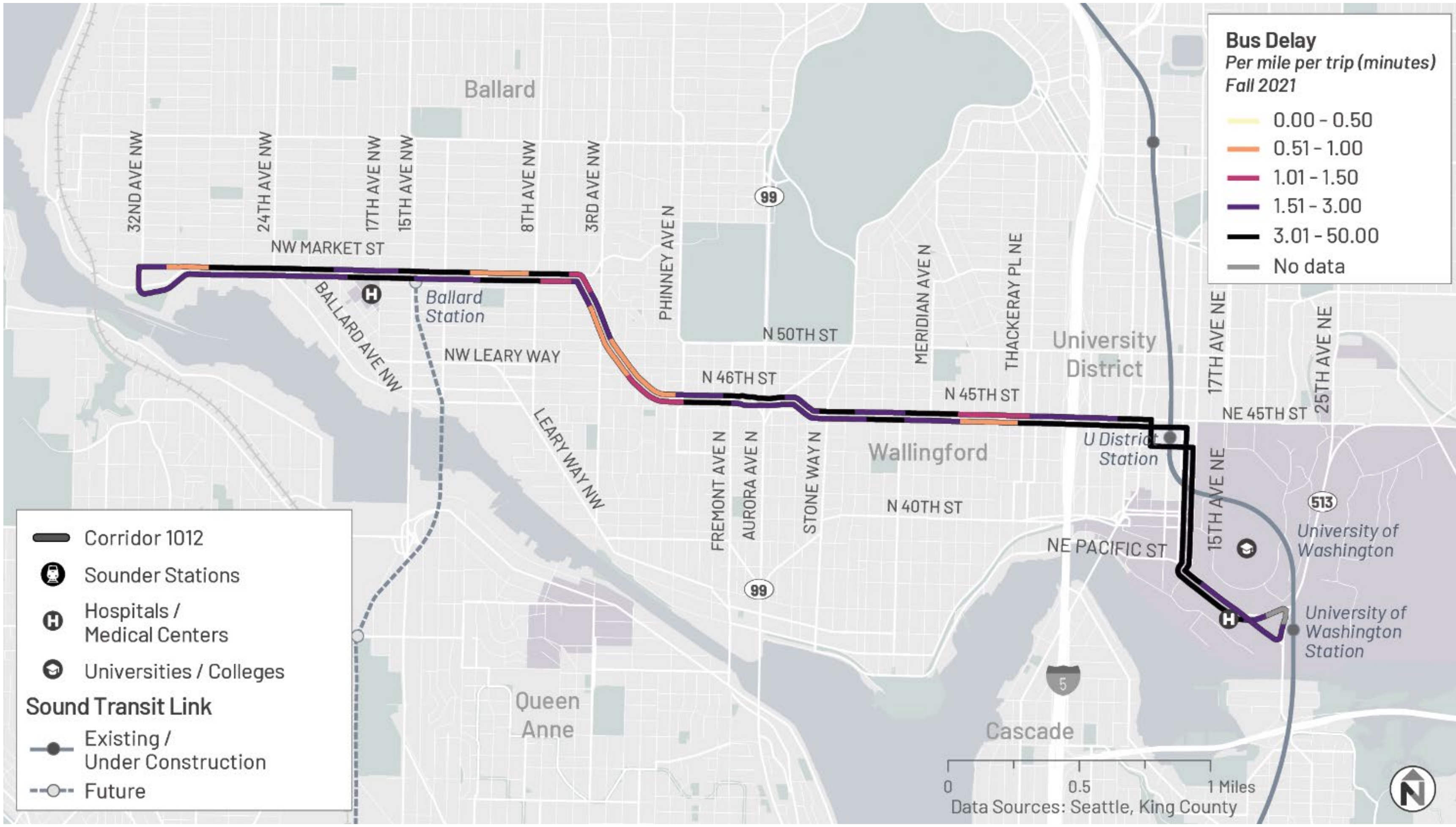
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 18 shows the delay along the Route 44 corridor based on King County Metro's AVL data from Fall 2021.[2] The segments shown are stop pairs along Route 44. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Many portions along the Route 44 corridor experience high delay in both directions, including NW Market St, N 46th St, and all segments in U District. All segments near Ballard Station, U District Station, and University of Washington Station experience high delay.

[2] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 18 Corridor 1012 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 19 and Figure 20 show the delay for each individual stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

In U District, delays are present at all portions of the corridor. Stop pairs along NW Market St experience moderate to high delay throughout the day, with high delay particularly concentrated at NW Market St & Ballard Ave NW. Stop pairs in Wallingford also experience high delay. Throughout the corridor, higher levels of delay occur between 9 am and 9 pm for many stop pairs, including at lower delay locations.

HOW TO READ DELAY CHARTS

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

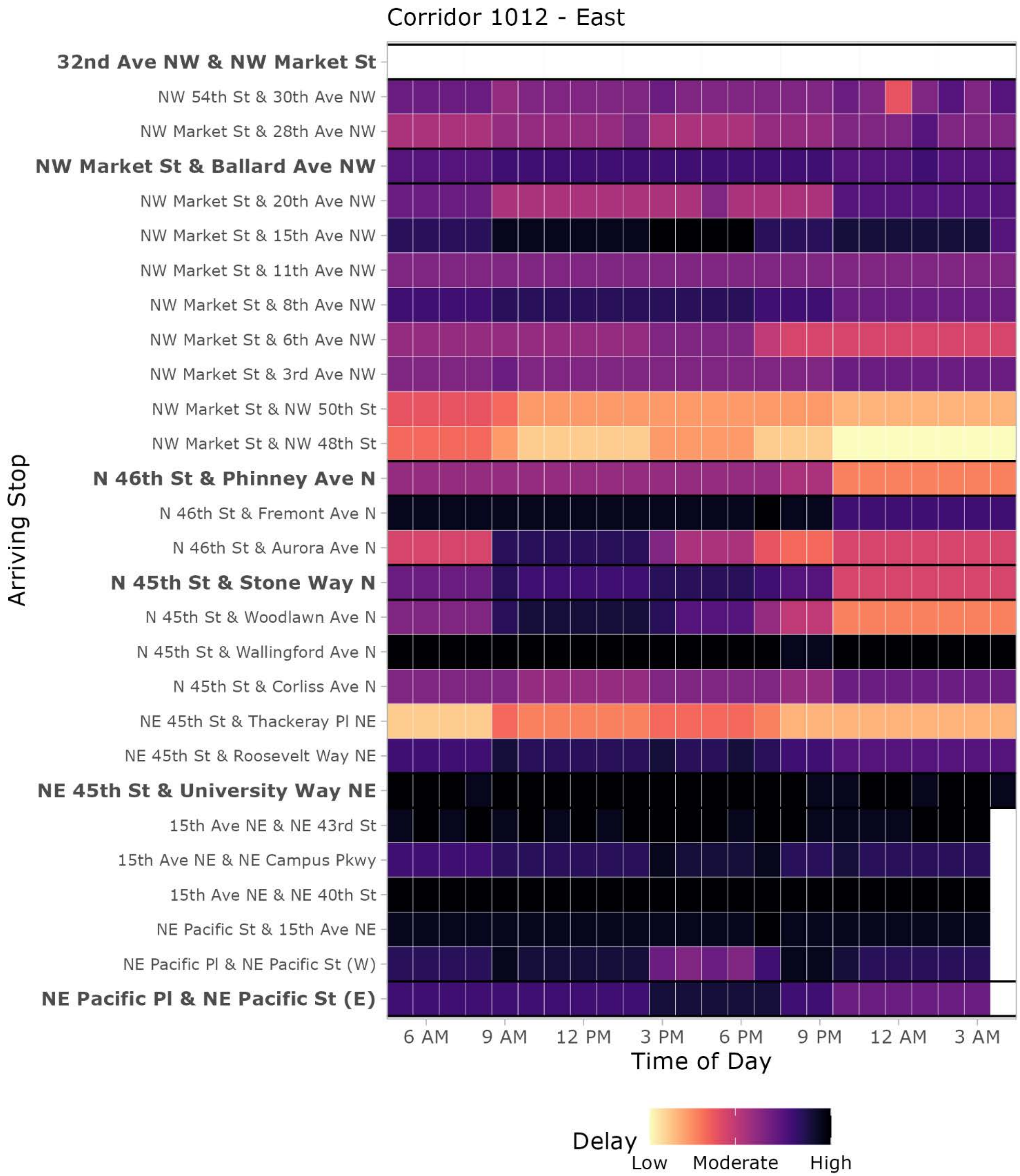
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

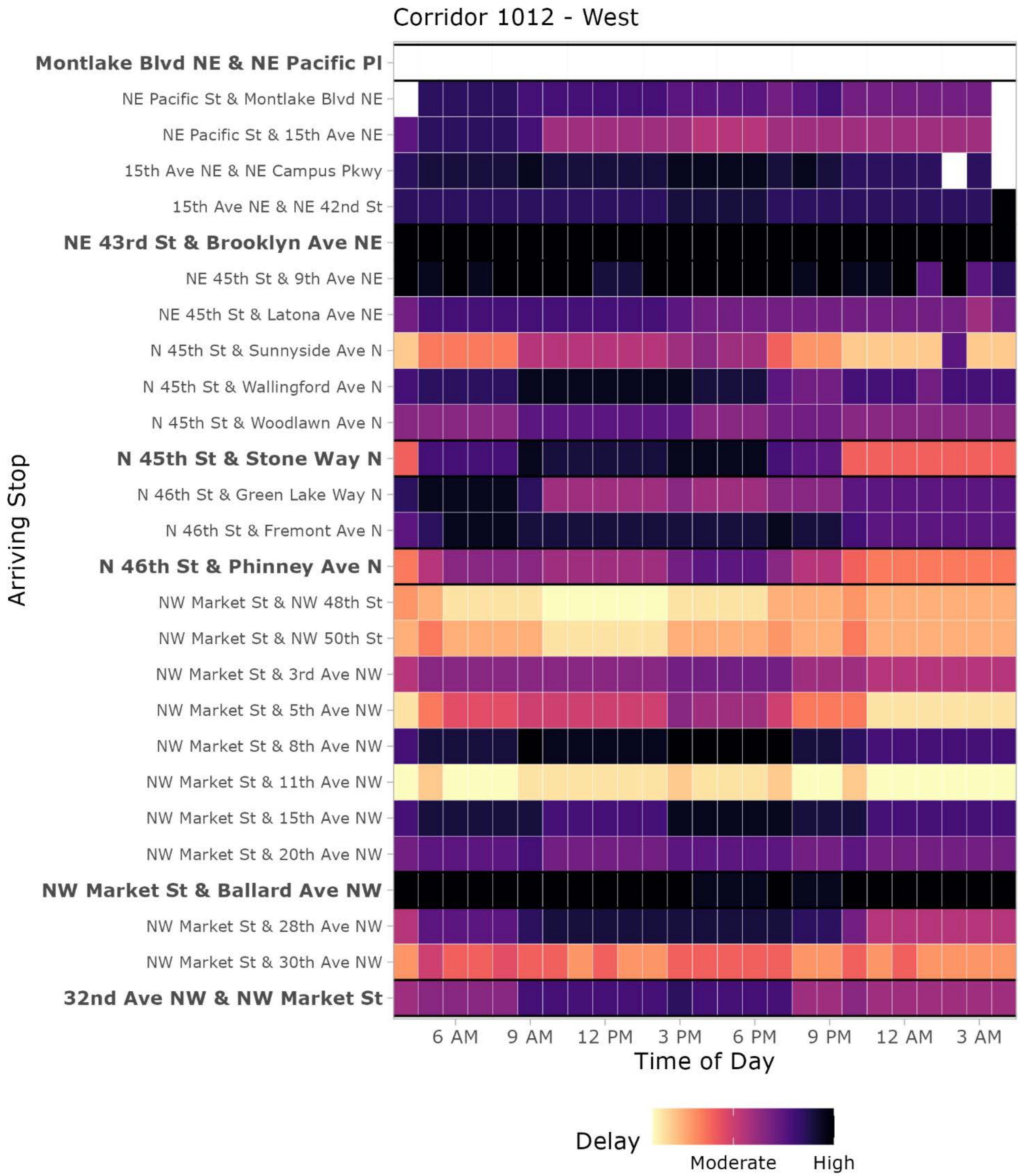
Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 19 Corridor 1012 Eastbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 20 Corridor 1012 Westbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

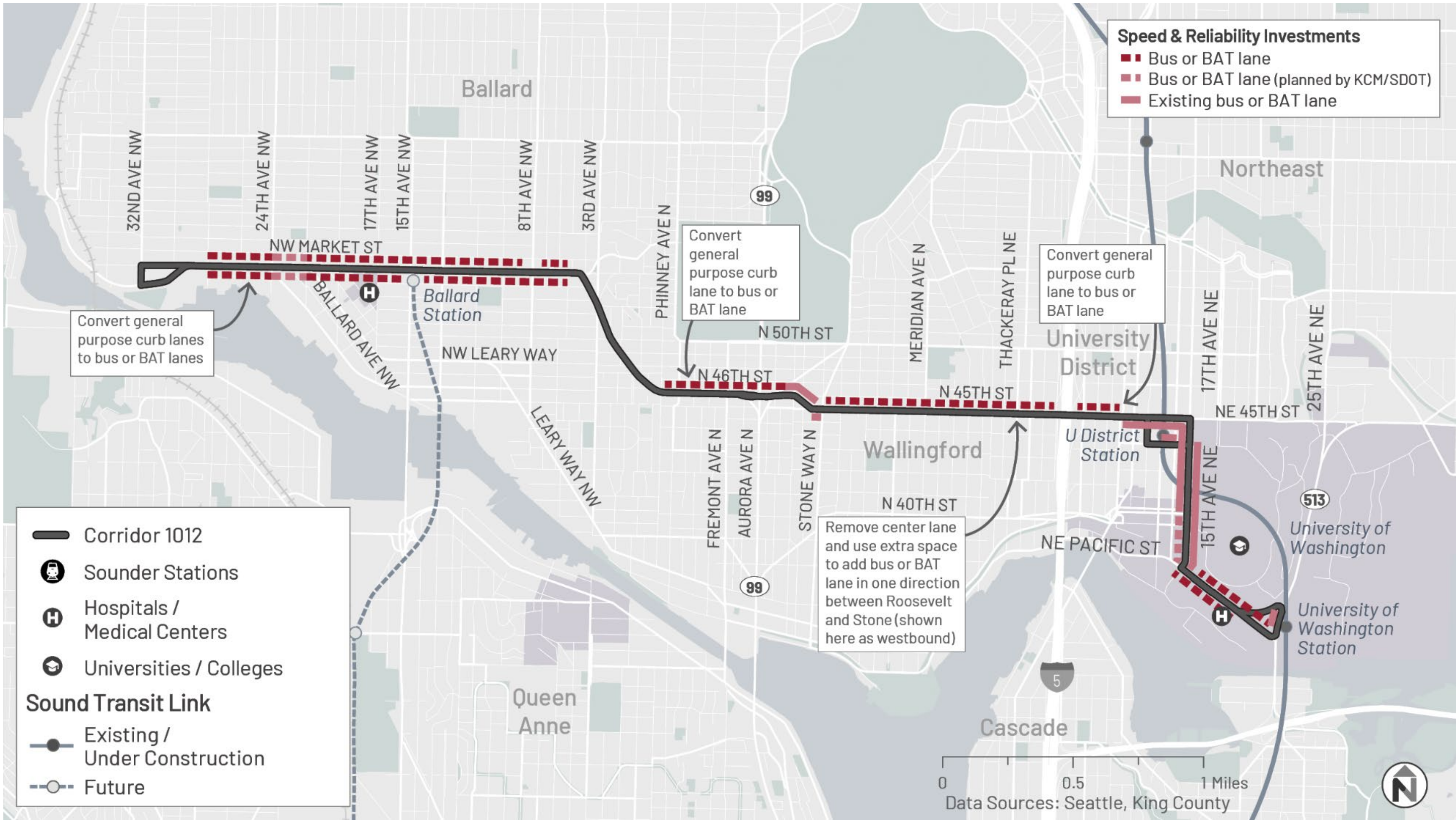
6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 1012 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 21, and they are shown geographically in a map in Figure 22.The corridor currently achieves transit priority for 21% of its centerline miles, which is below the RapidRide *minimum* standard of 40%. The additional projects proposed here would increase the coverage to 77%, which would exceed the *desired* standard of 50%.

Figure 21 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
NW Market St (28th Ave NW to 5th Ave NW)	Bus/BAT lane	Add eastbound bus/BAT lane from 28th Ave NW to 17th Ave NW, 15th Ave NW to 5th Ave NW. Add westbound bus/BAT lane from 5th Ave NW to 7th Ave NW, and 8th Ave NW to 28th Ave NW.
N 46th St (Midvale Ave N to Stone Way N)	Bus/BAT lane	Add eastbound bus/BAT lane for approximately 200 feet approaching Stone Way N intersection, as planned by KCM.
N 46th St (Phinney Ave N to Green Lake Way N)	Bus/BAT lane	Repurpose second general purpose lane in westbound direction to add a bus/BAT lane between Green Lake Way N and Phinney Ave N.
N 45th Ave (Stone Ave N to Roosevelt Way NE)	Bus/BAT lane	Remove center turn lane and repurpose roadway to add a bus/BAT lane in one direction between Stone Ave N and Roosevelt Way NE. If eastbound, between Stone Ave N and Roosevelt Way NE. If westbound, between Roosevelt Way and 8th Ave, and between 5th Ave and Stone Ave N.
15th Ave NE/NE Pacific St (NE Campus Pkwy to Montlake Blvd NE)	Bus/BAT lane	Repurpose second general purpose lane on 15th Ave NE and on NE Pacific St into a bus/BAT lane southbound and eastbound between NE Campus Pkwy and NE Pacific Pl, and westbound between Montlake Blvd NW and east of 15th Ave NE.

Figure 22 Proposed Transit Priority Treatments



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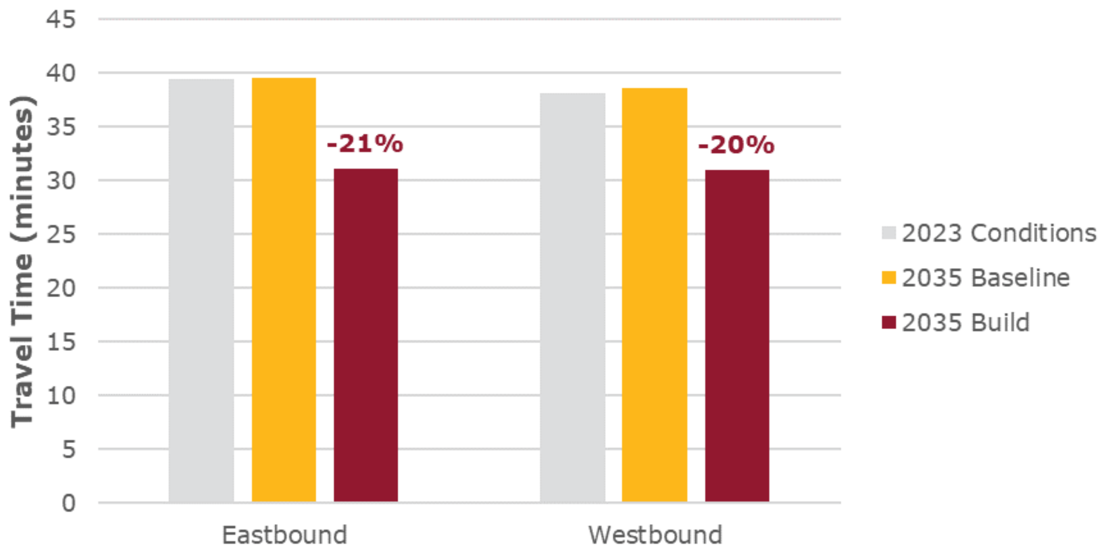
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1012 alignment are forecast to reduce PM peak Future Build condition travel times 20-21% from Future Baseline conditions. Average bus travel speed is expected to increase to 10-11 mph in the Future Build conditions. Eastbound and westbound trips will experience a similar reduction in travel times.

Figure 23 shows transit travel times for the overall route.

Figure 23 Route 44 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 44 carried approximately 5,800 people per day in Spring 2023, and as much as 8,900 people in Fall 2019. The route has now recovered approximately 65% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[3], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 24 Route 44 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	8,883	-	100%
Fall 2020	2,624	-70%	30%
Fall 2021	4,801	+83%	54%
Spring 2023	5,769	+20%	65%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 25 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 44.

The busiest stop locations are near NW Market St and 15th Ave NW, and along N 45th St between I-5 and 15th Ave NE near the U-District Link Station. Moderate to high ridership occurs at most stops along the corridor except from 32nd Ave NW to 24th Ave NW and from 15th Ave NW and Phinney Ave N.

[3] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 25 Boarding and Alighting Activity by Stop (Spring 2023)

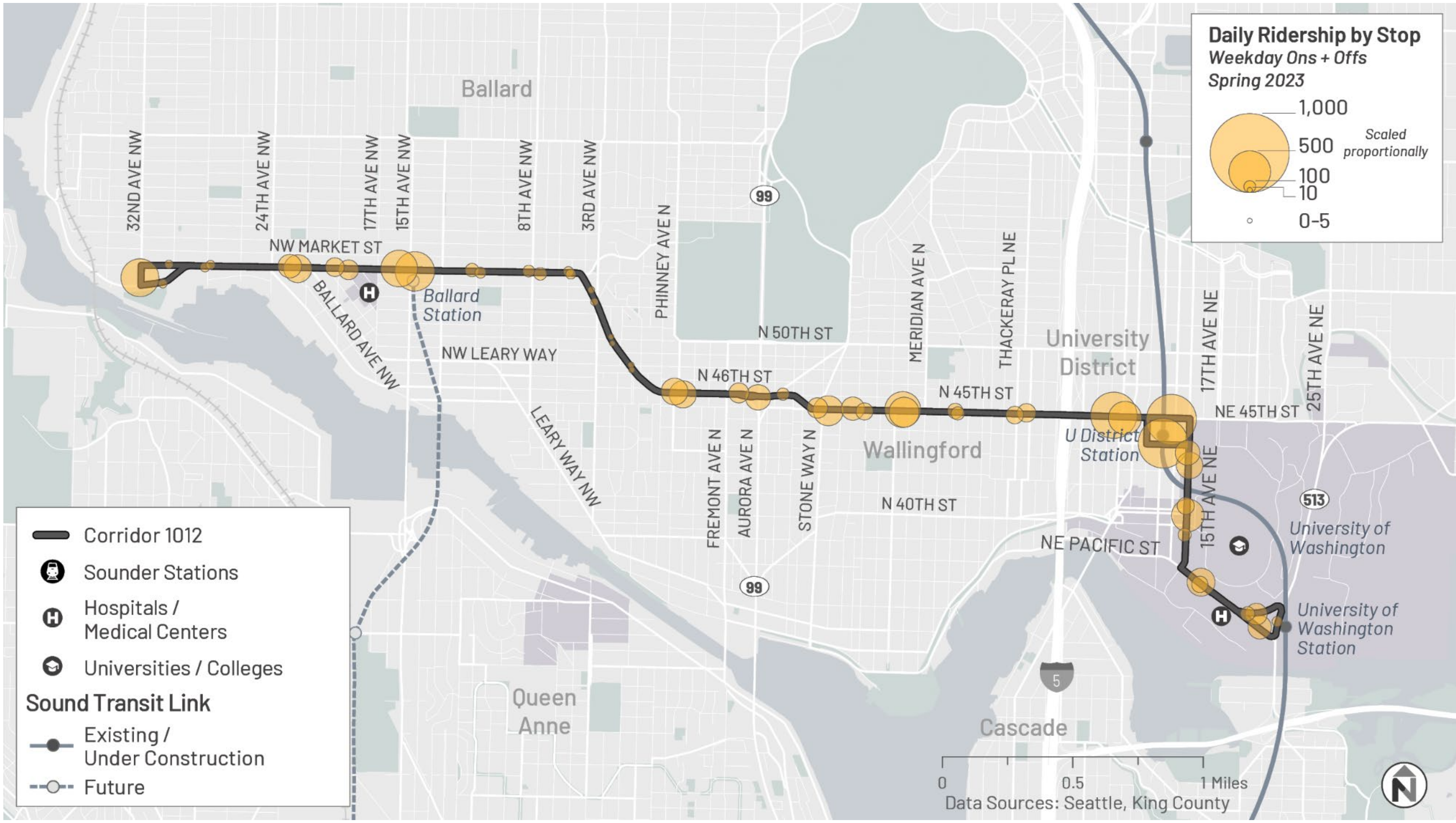


Figure 26 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Eastbound	Westbound	Total
32nd Ave & Market St	227	222	449
Market St & 30th Ave / 54th St & 30th Ave	59	51	110
Market St & 28th Ave	67	62	129
Market St & Ballard Ave	315	256	571
Market St & 20th Ave	207	193	399
Market St & 15th Ave	468	433	901
Market St & 11th Ave	87	121	208
Market St & 8th Ave	111	98	209
Market St & 5th/6th Ave	76	76	151
Market St & 3rd Ave	40	31	71
Market St & 50th St	15	14	29
Market St & 48th St	19	23	43
46th St & Phinney Ave	306	300	606
46th St & Aurora Ave/Linden Ave	282	210	492
46th St & Green Lake Way	-	105	105
45th St & Stone Way	343	215	558
45th St & Woodlawn Ave	170	253	424
45th St & Wallingford Ave	344	422	766
45th St & Corliss Ave/Sunnyside Ave	117	147	264
45th St & Latona Ave/Thackeray Pl	175	189	364
45th St & Roosevelt Way	385	562	947
U District Station	612	608	1,219
15th Ave & 42nd/43rd St	273	296	569
15th Ave & Campus Pkwy	170	377	547
15th Ave & 40th St	118	-	118
Pacific St & 15th Ave	160	315	475
Montlake Triangle	132	78	209

Source: King County Metro Spring 2023

Note: Ridership values represent average weekday boardings plus alightings by stop.

7.3 Forecast Ridership

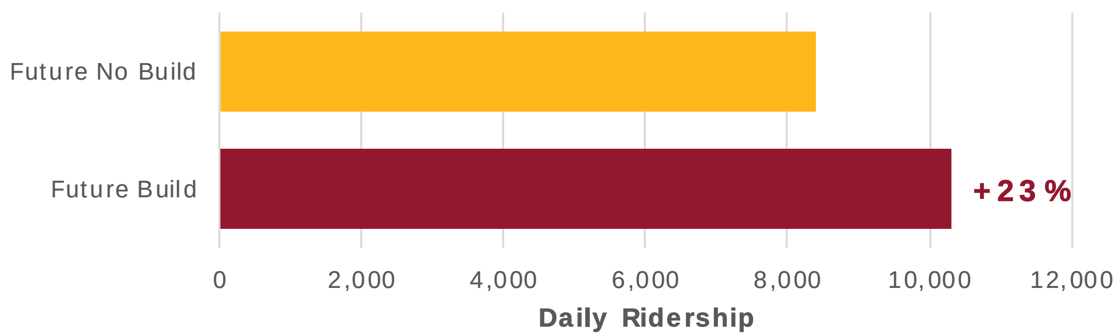
Future ridership for Corridor 1012 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1012 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 970 boardings in the PM peak hour and 10,300 daily boardings. Key ridership hubs include 15th Avenue NW, N 46th Street between Phinney Avenue and Stone Way, and in the University District. Future ridership for each candidate RapidRide station is shown in Figure 28.

7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 1,900 riders per weekday (or 23% increase) is forecast for Corridor 1012 compared to a "baseline" scenario with today's service levels for Route 44.

Figure 27 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1012 is forecast at 76 riders per revenue hour. This would result in an improvement of 55 percent in productivity compared to a future "baseline" 49 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 49 and 32 riders per revenue hour, respectively. At 76 riders per revenue hour, Corridor 1012 would rank as the highest of the nine candidate RapidRide corridors.

Figure 28 Future Corridor Ridership

King County METRO

8.0 Equity and Sustainability

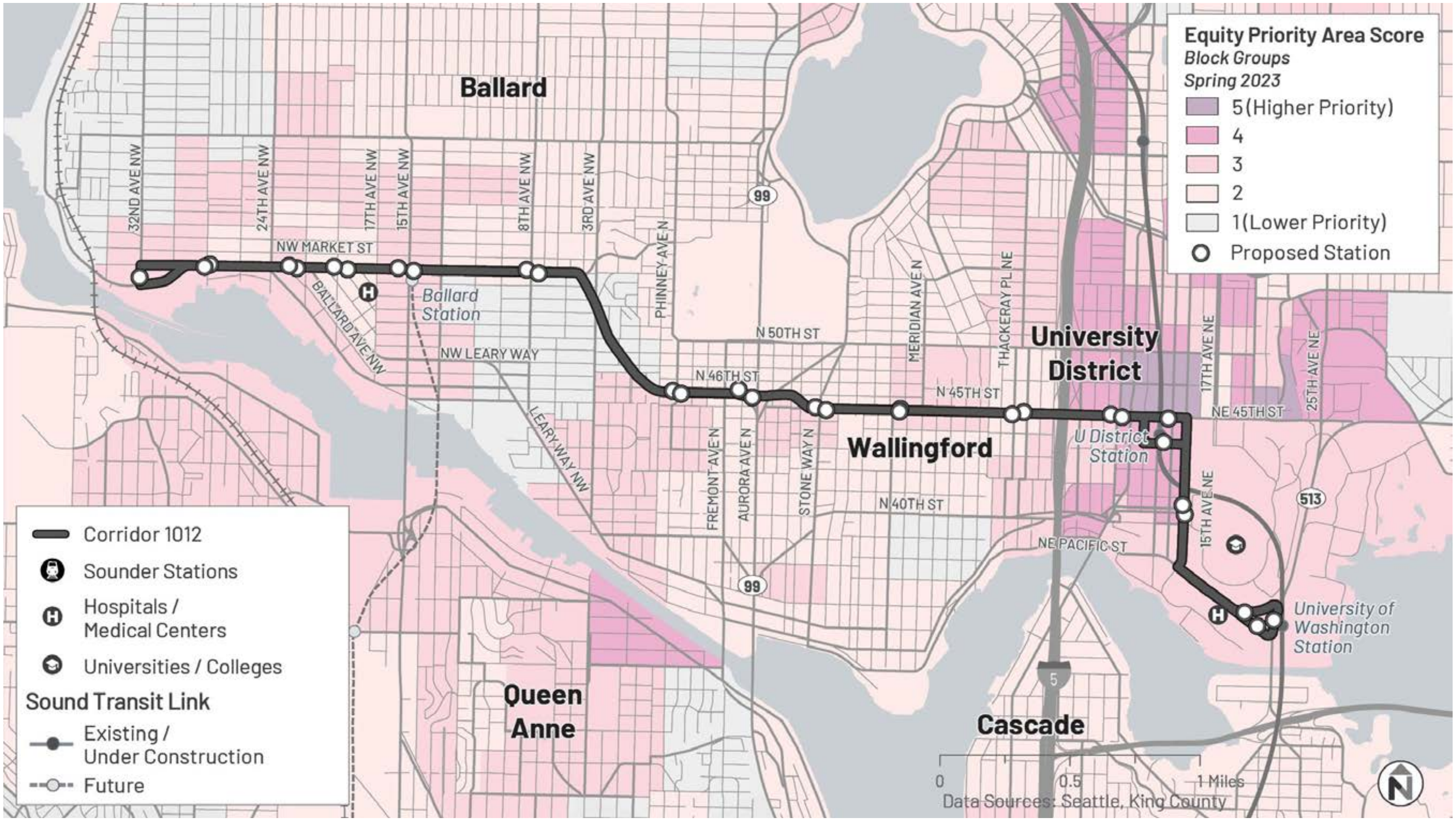
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[4] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 29 displays equity priority area scores for block groups located along the Corridor 1012. In the eastern portion of the alignment, the route serves high equity priority areas in the University District neighborhood of Seattle along NE 45th Street between Roosevelt Way NE and 15th Avenue NE.

[4] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 29 King County Metro Equity Priority Areas



King County METRO

8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 30 and Figure 31 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[5] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Route 44 in Fall 2020, ridership retention was consistent with the regional average. By Spring 2023, however, change in ridership near N 45th St at Meridian Ave N and the U-District Link station was 10-20 points higher than the region, while change in ridership near NW Market St at Ballard Ave NW, NE 45th St at Thackeray Pl NE, and the University of Washington Link Station was generally 10 to 63 points lower.

[5] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 30 Ridership Retention (Fall 2020)

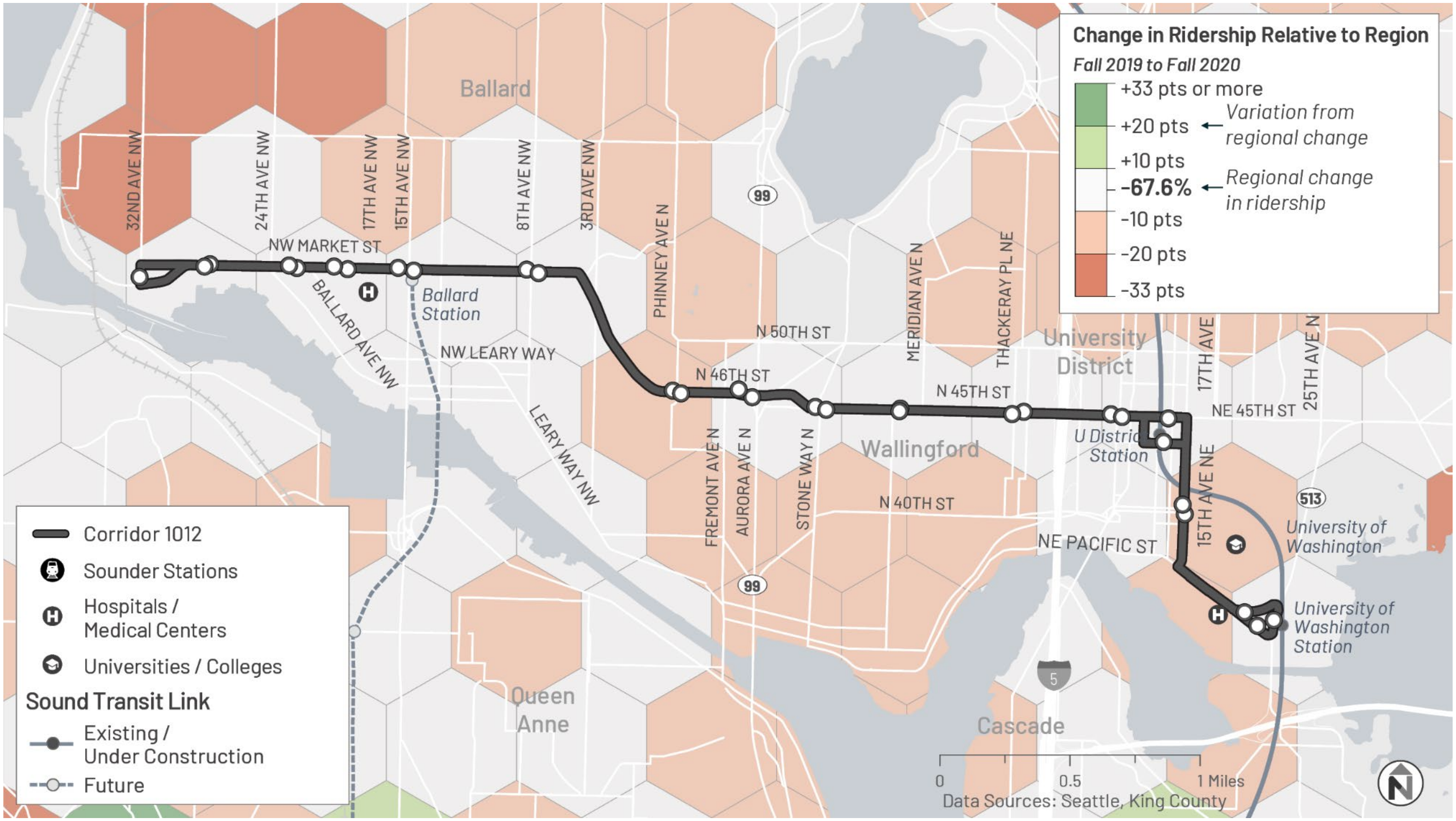


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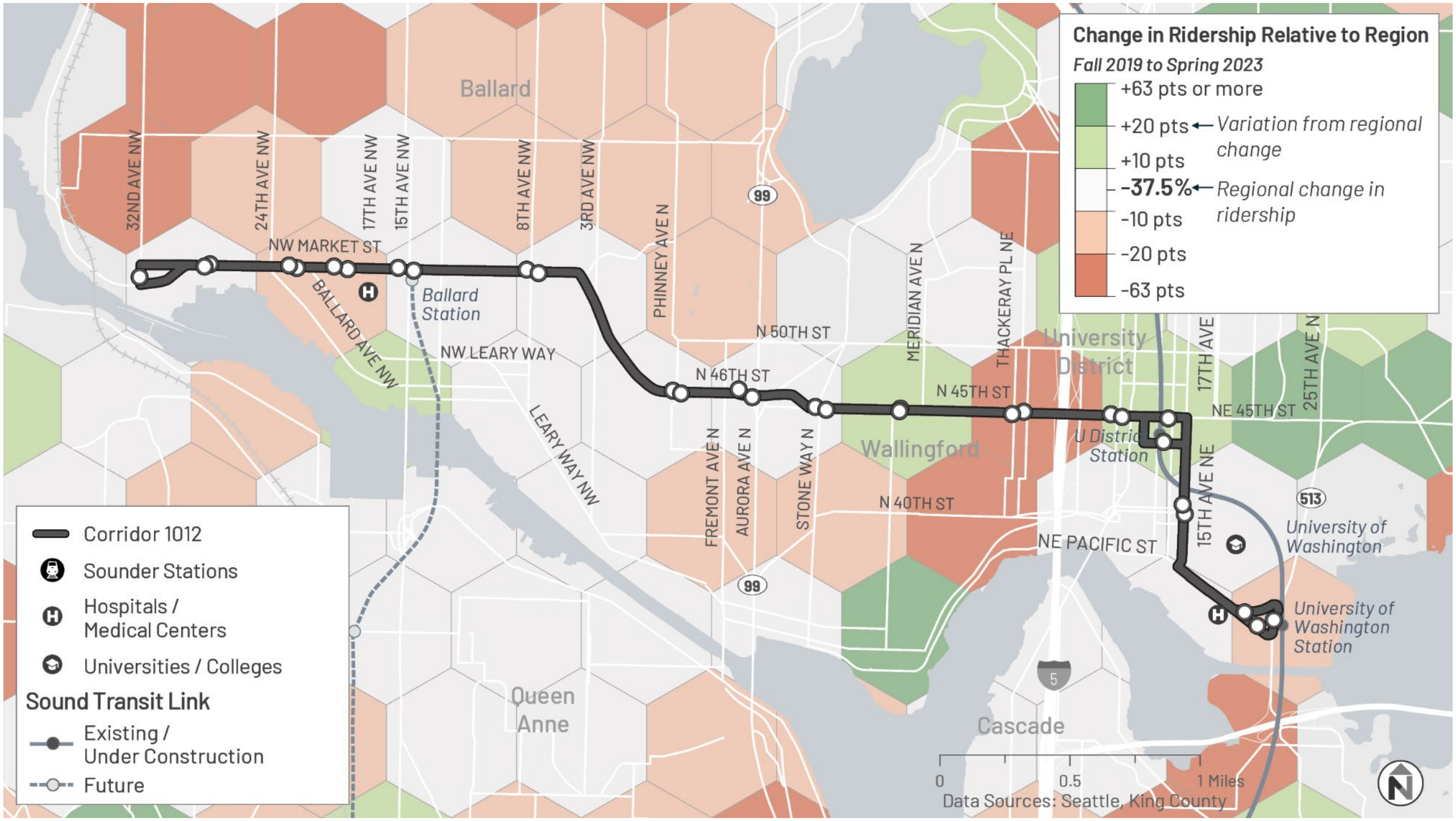
Figure 31 Ridership Retention (Spring 2023)



King County METRO

8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Route 44 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[6] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 24% for priority populations along the corridor. Compared with other candidate RapidRide corridors, this is the third lowest increase in job access.

8.4 GHG emissions

Ridership gains – and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 44 – will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[7] Approximately 0.68 metric tons of CO_2 would be reduced daily due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the fourth smallest reduction.

[6] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[7] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 41 intersections along Route 44 to evaluate transit travel time benefits of the proposed improvements. Out of the 41 intersections, 27 signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 14 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 32 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 32 Modeled Delay from Synchro

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
Eastbound								
101	NW Market St & Barnes Ave NW	Signal	1.6	1.7	1.3	1.6	1.7	2.7
102	17th Ave NW & NW Market St	Signal	7.7	7.3	2.2	7.7	7.3	10.6
103	15th Ave NW & NW Market St	Signal	54.7	57.1	57.1	54.7	57.1	57.1
104	14th Ave NW & NW Market St	Signal	9.0	20.7	15.7	9.0	20.7	39.8
105	8th Ave NW & NW Market St	Signal	27.4	48.2	20.7	27.4	48.2	78.6
106	3rd Ave NW & NW Market St	Signal	10.8	10.9	10.9	10.8	10.9	10.9
107	Phinney Ave N & N 46th St	Signal	8.8	10.8	11.4	8.8	10.8	11.4
108	Fremont Ave N & N 46th St	Signal	64.8	4.2	3.9	64.8	4.2	3.9
109	Greenlake Way N & N 46th St	Signal	21.1	24.4	21.1	21.1	24.4	21.1
110	Stone Way N & N 45th St	Signal	29.2	29.4	121.9	38.8	29.4	56.0
111	Densmore Ave N & N 45th St	Signal	2.2	2.7	2.5	2.2	2.7	2.5
112	Wallingford Ave N & N 45th St	Signal	17.2	20.0	22.0	17.2	20.0	22.0
113	Meridian Ave N & N 45th St	Signal	7.2	7.4	9.9	7.2	7.4	9.9
114	Thackeray Pl NE & NE 45th St	Signal	6.8	6.2	5.6	6.8	6.2	5.6
115	Latona Ave NE & NE 45th St	Signal	7.1	8.2	8.2	7.1	8.2	8.2
116	I-5 SB Ramp & NE 45th St	Signal	28.1	28.9	28.9	28.1	28.9	28.9
117	I-5 NB Ramp & NE 45th St	Signal	15.6	17.8	17.8	15.6	17.8	17.8
118	Roosevelt Way NE & NE 45th St	Signal	18.3	11.7	11.7	18.3	23.8	23.8
119	11th Ave NE & NE 45th St	Signal	13.7	14.4	17.8	17.4	19.2	16.9
120	12th Ave NE & NE 45th St	Signal	9.9	11.0	11.7	9.9	13.0	12.7
121	University Way NE & NE 43rd St	Signal	-	-	-	-	-	-
122	15th Ave NE & NE 43rd St	Signal	5.4	5.2	5.2	6.5	6.3	6.3

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	2035 Baseline	2035 Build	Traffic Delay (seconds) Existing	2035 Baseline	2035 Build
123	15th Ave NE & NE 42nd St	Signal	9.7	12.7	12.7	12.7	19.1	19.1
124	15th Ave NE & NE 41st St	Signal	8.0	3.9	3.9	8.8	8.3	8.3
125	15th Ave NE & NE Campus Pkwy	Signal	9.2	7.6	7.7	12.4	6.9	6.9
126	15th Ave NE & NE 40th St	Signal	27.6	18.0	18.1	50.2	29.7	29.7
127	15th Ave NE & NE Pacific St	Signal	35.8	42.7	38.9	35.8	42.7	38.9
Westbound								
127	15th Ave NE & NE Pacific St	Signal	32.6	37.8	37.8	40.9	51.0	51.0
126	15th Ave NE & NE 40th St	Signal	27.6	27.0	27.0	27.6	27.0	27.0
125	15th Ave NE & NE Campus Pkwy	Signal	8.6	10.8	10.8	8.6	10.8	10.8
124	15th Ave NE & NE 41st St	Signal	1.0	1.4	1.4	1.0	1.4	1.4
123	15th Ave NE & NE 42nd St	Signal	3.3	4.2	0.2	3.3	4.2	6.4
122	15th Ave NE & NE 43rd St	Signal	1.6	9.9	9.9	1.6	9.9	9.9
121	University Way NE & NE 43rd St	Signal	20.1	22.7	22.7	20.1	22.7	22.7
120	12th Ave NE & NE 45th St	Signal	33.4	33.4	10.0	33.4	33.4	89.6
119	11th Ave NE & NE 45th St	Signal	10.1	10.6	10.6	10.1	10.6	10.6
118	Roosevelt Way NE & NE 45th St	Signal	5.9	6.3	6.3	5.9	6.3	6.3
117	I-5 NB Ramp & NE 45th St	Signal	23.3	31.9	31.9	23.3	31.9	31.9
116	I-5 SB Ramp & NE 45th St	Signal	4.0	4.3	4.3	4.0	4.3	4.3
115	Latona Ave NE & NE 45th St	Signal	4.3	4.5	3.3	4.3	4.5	10.2
114	Thackeray Pl NE & NE 45th St	Signal	9.1	11.3	2.8	9.1	11.3	11.1
113	Meridian Ave N & N 45th St	Signal	9.6	6.7	3.1	9.6	6.7	5.9
112	Wallingford Ave N & N 45th St	Signal	38.7	18.2	18.2	38.7	18.2	45.7
111	Densmore Ave N & N 45th St	Signal	1.9	2.4	0.3	1.9	2.4	2.7
110	Stone Way N & N 45th St	Signal	45.1	47.6	75.1	45.1	47.6	39.3

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
109	Greenlake Way N & N 46th St	Signal	33.0	28.7	15.2	33.0	28.7	43.7
108	Fremont Ave N & N 46th St	Signal	35.2	15.3	2.1	35.2	15.3	8.5
107	Phinney Ave N & N 46th St	Signal	1.7	22.8	10.1	1.7	22.8	26.6
106	3rd Ave NW & NW Market St	Signal	45.2	34.0	34.0	45.2	34.0	34.0
105	8th Ave NW & NW Market St	Signal	36.8	45.2	45.2	36.8	45.2	45.2
104	14th Ave NW & NW Market St	Signal	9.0	19.0	13.1	9.0	19.0	57.1
103	15th Ave NW & NW Market St	Signal	51.3	47.0	44.5	51.3	47.0	93.5
102	17th Ave NW & NW Market St	Signal	11.6	11.4	8.2	11.6	11.4	19.9
101	NW Market St & Barnes Ave NW	Signal	1.4	1.7	1.8	1.4	1.7	2.9

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 33 summarizes the number of crashes along the corridor by severity level and mode. There were 283 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 30% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 5% resulted in a fatality or serious injury.

Figure 33 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	1	1%	0	0%	0	0%	**1**	**<1%**
Serious Injury	3	2%	11	20%	1	3%	**15**	**5%**
Minor Injury	57	29%	26	48%	21	66%	**104**	**37%**
Possible Injury	136	69%	17	31%	10	31%	**163**	**58%**
Total	**197**	**100%**	**54**	**100%**	**32**	**100%**	**283**	**100%**

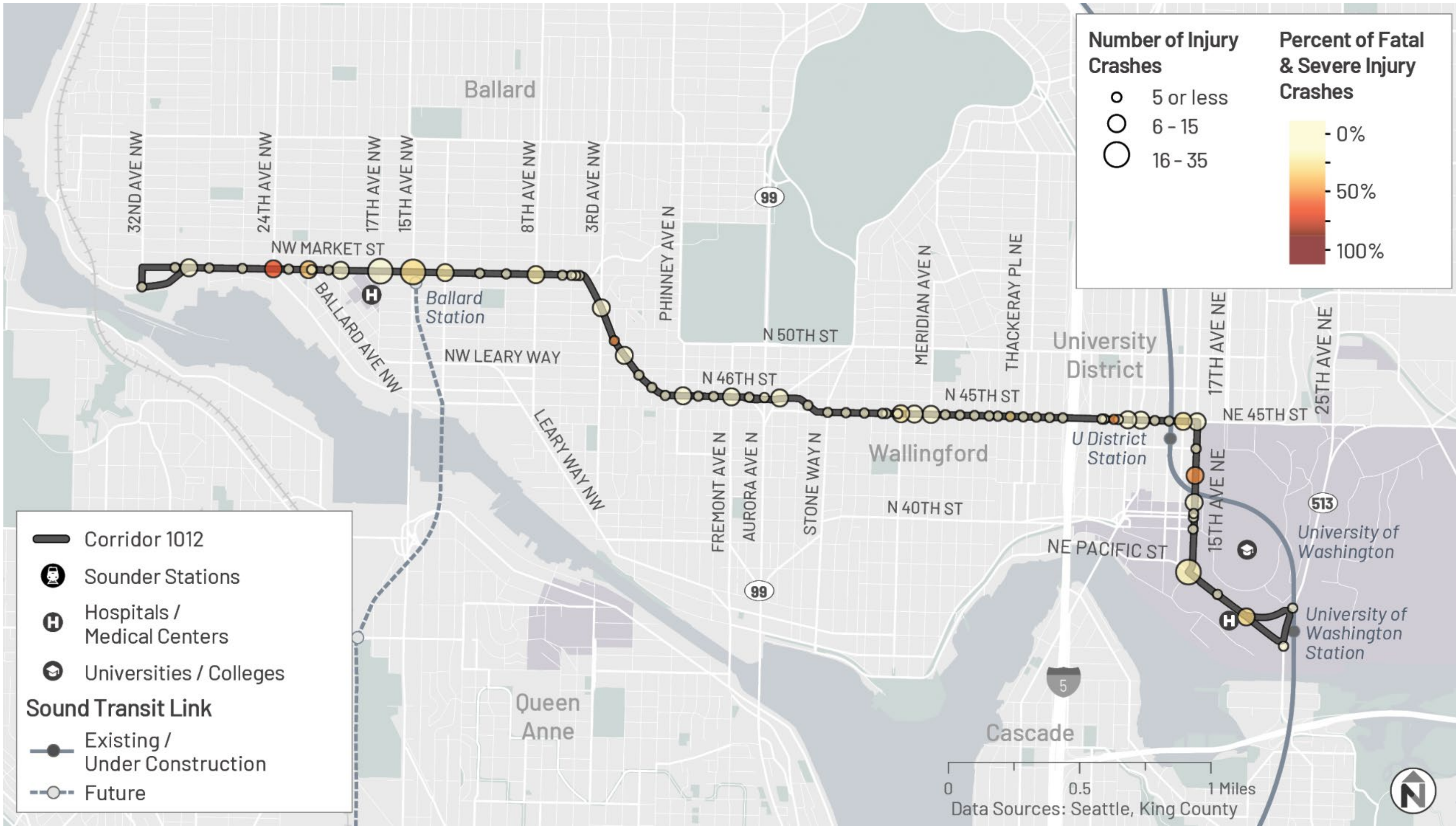
Source: WSDOT (2018-2022)

Figure 34 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along NW Market St between 24th Ave NW and 15th Ave NW and between 8th Ave NW and Phinney Ave N
- Along N 46th St and N/NE 45th St between Phinney Ave N and 15th Ave NE
- Along 15th Ave NE between NE 45th St and the University of Washington Hospital

Figure 34 Crash Locations



11.0 Planned Improvements

Route 44 serves Seattle. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36.

Major projects include transit improvements that restrict motor vehicle turn movements, a curb island installation between Phinney Ave N and Linden Ave N, and bicycle facilities in U District.

Figure 35 Planned Jurisdictional Investments

King County METRO

Figure 36 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	In-street facility with minor separation	In-street facility with minor separation	32nd Ave NW (NW Market St – NW 54th St)	Recommended Bicycle Network Map
2	Neighborhood greenway	Neighborhood greenway	28th Ave NW at NW Market St	Recommended Bicycle Network Map
3	NGW Connection to Missing Link 1 (26th Ave NW)	NGW Connection to Missing Link 1 (26th Ave NW)	26th Ave NW at NW Market St	2021-2024 BMP Implementation Plan
4	In-street facility with minor separation	In-street facility with minor separation	24th Ave NW at NW Market St	Recommended Bicycle Network Map
5	Burke Gilman Trail Missing Link	New trail	Shilshole Ave NW at NW Market St	SDOT Bicycle Master Plan, 2021-2024 Implementation Plan
6	Missing Link Bike Route Study on NW Market St – Leary Ave NW – 17th Ave NW	Missing Link Bike Route Study on NW Market St – Leary Ave NW – 17th Ave NW	NW Market St (24th Ave NW – 22nd Ave NW)	Current Projects
7	NW Market St / Leary Way NW / N 36th St Improvements	Reconstruct and make operational/ITS improvements to Leary Way NW corridor to facilitate freight movement. This project would coordinate specific truck operational improvements with the BINMIC Truck Route Improvements.	NW Market St (24th Ave NW – 22nd Ave NW)	Freight Master Plan
8	NW Market St Paving Project	Full concrete reconstruction of NW Market St between 24th Ave NW and 15th Ave NW (excluding intersections at 24th Ave NW and 15th Ave NW); Curb ramp upgrades and replacements; Sidewalk repair; Tree pit expansion; Water main upgrades; Stormwater drainage improvements	NW Market St (24th Ave NW – 15th Ave NW)	Current Projects
9	Bike Lanes	Add bike lanes on 20th Ave NW between Market and Leary by converting the parking to parallel paid parking all along route. Maintain 11 ft travel lanes and 5 ft bike lanes and 7 ft parking along the curbside.	20th Ave NW at NW Market St	dotMaps, Recommended Bicycle Network Map
10	Road Upgrade	Paving, curb ramps, drainage improvements, electrical	15th Ave NW at NW Market St	dotMaps

ID	Improvement	Description	Extent	Source
11	Seattle – 15th Ave W/NW and Ballard Bridge	Scope includes resurfacing and restriping 15th Ave W/NW from W Nickerson St to NW 58th St including the approach decks of Ballard Bridge. Concrete panels to be replaced on off ramps and upgrades made to bus stop pads. Curb repairs and curb ramps to be ad	NW Market St at 15th Ave NW	2023-2026 PSRC Regional TIP
12	15th Ave NW / NW Market St Intersection Improvement	Improve southeast corner curb radius, which would impact existing signal equipment.	15th Ave NW / NW Market St	Freight Master Plan
13	Cycle track	Cycle track	14th Ave NW at NW Market St	Recommended Bicycle Network Map
14	In-street facility with minor separation	In-street facility with minor separation	14th Ave NW at NW Market St	Recommended Bicycle Network Map
15	TPMC Proposed Investment Area	14th: left turn signal head added for protected left turn 11th: new pedestrian-activated traffic signal	NW Market St (14th NW Ave – 11th Ave NW)	Route 44 TPMC
16	Neighborhood greenway	Neighborhood greenway	11th Ave NW at NW Market St	Recommended Bicycle Network Map
17	Mobility improvements along NW Market St between 8th Ave NW and Stone Way N	Restrict left turns at non-critical intersections to improve east/ west mobility for freight.	NW Market St (8th Ave NW – Stone Way N)	Freight Master Plan
18	Neighborhood greenway	Neighborhood greenway	6th Ave NW and 5th Ave NW at NW Market St	Recommended Bicycle Network Map, dotMaps
19	Cycle track	Cycle track	NW Market St (6th Ave NW – 5th Ave NW)	Recommended Bicycle Network Map, dotMaps
20	Neighborhood greenway	Neighborhood greenway	Greenwood Ave N at N 46th St	Recommended Bicycle Network Map
21	TPMC Proposed Investment Area	Curb island installation	N 46th St (Phinney Ave N – Linden Ave N)	Route 44 TPMC

ID	Improvement	Description	Extent	Source
22	Priority Bus Corridor (Route 5)	•Proposed Transit Improvements include – TSP, Bus Bulbs, Stop consolidation, Station Upgrades • Investigate multiple termination options on north end • Identify funding to complete improvements outside of Seattle city limits • Consider queue jump options to provide transit priority on Fremont Bridge • Coordinate design of transit priority treatments with ongoing Bicycle Master Plan facility planning on Phinney Ave N	Phinney Ave N at N 46th St	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
23	Sidewalk Safety Repair Program	Sidewalk Safety Repair Program	Fremont Ave N at N 46th St	dotMaps, SDOT Sidewalk Safety Repair Program
24	Cycle track	Cycle track	Fremont Ave N at N 46th St	Recommended Bicycle Network Map
25	Neighborhood greenway	Neighborhood greenway	Linden Ave N at N 46th St	Recommended Bicycle Network Map
26	Neighborhood greenway	Neighborhood greenway	Woodland Park Ave NE at NE 46th St	Recommended Bicycle Network Map
27	Neighborhood greenway	Neighborhood greenway	N 46th St at N Midvale Pl	Recommended Bicycle Network Map
28	Neighborhood greenway	Neighborhood greenway	Interlake Ave N at N 45th St	Recommended Bicycle Network Map
29	In-street facility with minor separation	In-street facility with minor separation	Wallingford Ave N at N 45th St	Recommended Bicycle Network Map
30	Neighborhood greenway	Neighborhood greenway	Wallingford Ave N at N 45th St	Recommended Bicycle Network Map
31	Neighborhood greenway	Neighborhood greenway	Sunnyside Ave N at N 45th St	Recommended Bicycle Network Map
32	Neighborhood greenway	Neighborhood greenway	1st Ave NE at NE 45th St	Recommended Bicycle Network Map
33	Seattle – Pedestrian Refuge Islands	Improve pedestrian safety at unsignalized intersections through installation of 8 pedestrian refuge islands. One location will require a new ADA compliant ramp.	NE 45th St at 2nd Ave NE	2023-2026 PSRC Regional TIP

ID	Improvement	Description	Extent	Source
34	In-street facility with minor separation	In-street facility with minor separation	Thackeray Pl NE at NE 45th St	Recommended Bicycle Network Map
35	Neighborhood greenway	Neighborhood greenway	5th Ave NE at NE 45th St	Recommended Bicycle Network Map
36	TPMC Proposed Investment Area	Roadway striping	NE 45th St (Brooklyn Ave NE – University Way NE)	Route 44 TPMC
37	NE 45th St between 8th Ave NE and Latona Ave	Protected bike lane	NE 45th St (8th Ave NE – Latona Ave NE)	2021-2024 BMP Implementation Plan
38	TPMC Proposed Investment Area	• Add pedestrian crosswalk • Add traffic signal • Add concrete island to restrict turns • NW corner reconstruction • Curb ramp construction	NE 45th St at 8th Ave NE	Route 44 TPMC
39	AAC-11th/12th Ave NE	Protected bike lane	11th Ave NE at NE 45th St	2021-2024 BMP Implementation Plan, 2023-2026 PSRC Regional TIP
40	Neighborhood greenway	Neighborhood greenway	12th Ave NE at NE 45th St	Recommended Bicycle Network Map
41	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	NE 45th St (12th Ave NE – 15th Ave NE) / 15th Ave NE (NE 45th St – NE 43rd St)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
42	Loyal Heights to U District via Green Lake	Construct a new RapidRide line connecting Loyal Heights and the University District via Green Lake. This project would improve the attractiveness of transit for a regional growth center and include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops. This project will connect to one Regional Growth Center, University District. It will expand transit access to existing and planned Light Rail, Commuter Rail and Sound Transit BRT services.	15th Ave NE (N E 45th St – NE Campus Pkwy) / NE 45th St (University Way NE – 15th Ave NE)	Regional Transportation Plan 2022-2050
43	Priority Bus Corridor (Route 36/49)	• Proposed Transit Improvements include – TSP, Electrification on 12th Ave, Bus Bulbs, Station Upgrades • Evaluate turnaround and layover options at north and south ends of the corridor • Creation of new transit street on 12th Ave including electrification, TSP, and bus bulbs • Electrification needed on NE 11th/Roosevelt N. of Campus Parkway • Work with Sound Transit to ensure safe, attractive, and convenient connections at the 4 Link stations served by this corridor	15th Ave NE (N E 45th St – NE Campus Pkwy) / NE 45th St (University Way NE – 15th Ave NE)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
44	Priority Bus Corridor (Crown Hill – Green Lake – U District)	• Proposed Transit Improvements include – TSP, Bus Bulbs, Electrification • Evaluate electrification cost/benefit north of 50th Street • Evaluate turnaround and layover options at east and west ends of the corridor • Conduct traffic analysis east of I-5 to determine key congested intersections and priority bus treatment options • Conduct study of routing options through Greenlake east of Aurora Ave • Coordinate with existing planned improvements south of 50th Street	15th Ave NE (N E 45th St – NE Campus Pkwy) / NE 45th St (University Way NE – 15th Ave NE)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
45	Priority Bus Corridor (Lake City – Northgate – U District)	• Proposed Transit Improvements include – TSP, Bus Bulbs, Stop consolidation • Conduct further analysis of alignment options along Lake City Way/80th Street/Roosevelt Way • Integrate route design/transit priority treatments with ongoing Bicycle Master Plan facility planning on Roosevelt Way between NE 40th Street and NE 65th Street • Create high quality connections between the route and U-District Link Station on Brooklyn Ave	15th Ave NE (N E 45th St – NE Campus Pkwy)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
46	Cycle track	Cycle track	15th Ave NE (N E 45th St – NE Pacific St)	Recommended Bicycle Network Map
47	In-street facility with minor separation	In-street facility with minor separation	NE Campus Pkwy at 15th Ave NE	Recommended Bicycle Network Map
48	Bus lane	Red Paint Treatment for buses along this section of roadway, between NE Pacific Pl & Montlake Blvd NE.	EB slip lane from NE Pacific Pl to Montlake Blvd NE	dotMaps

12.0 Capital Costs

This chapter summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Route 44 corridor. Costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Charging infrastructure[8] (not included in Route 44)
- Trolley infrastructure

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 14. For transit speed and reliability improvements, refer to Figure 21. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 37.

[8] For non-trolley routes only.

Figure 37 Order-of-Magnitude Project Costs

	Category	% of Total	Costs
	Stops and Stations	44%	$ 6,570,000
	Transit Speed and Reliability Improvements	51%	$ 7,640,000
	Layover and Terminus Facilities	2%	$ 300,000
	Charging Infrastructure	-	-
	Trolley Infrastructure	3%	$ 450,000
	Construction Base Subtotal		***$ 14,960,000***
2%	Stormwater Upgrades		$ 300,000
3%	Traffic Control		$ 450,000
10%	Mobilization		$ 1,500,000
2%	TESC		$ 300,000
	Subtotal Construction Cost		***$ 17,510,000***
10.1%	Sales Tax		$ 1,770,000
10%	Construction Contingency		$ 1,930,000
40%	Contingency (Design Allowance and Risk)		$ 8,490,000
	Total Construction Cost		***$ 29,700,000***
10%	Project Management		$ 2,970,000
5%	Planning		$ 1,490,000
15%	Engineering/Design		$ 4,460,000
10%	Construction Management		$ 2,970,000
3%	Environmental Review		$ 900,000
2%	Permitting		$ 600,000
	Total Project Cost		***$ 43,090,000***

13.0 Environmental Screening

13.1 Introduction

This chapter summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Route 44 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – The project is expected to remain consistent with the existing visual character of the project area and would not affect any designated view corridors.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Route 44 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – Route 44 does not traverse or alter any navigable waterways.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Acquisitions and Displacements – At present, there are no identified requirements for permanent easements or property acquisitions along Route 44.
- Floodplains - Improvements associated with the project are not anticipated to occur within any floodplains.
- Air Quality - The project is expected to contribute to long-term improvements in air quality.
- Wetlands – The Union Bay Natural Area is approximately .25 miles from the proposed corridor. The project is not anticipated to have any adverse effects to these wetlands due to distance.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources.

13.a Cultural Resources

In order to identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted. The Route 44 corridor passes through the Ballard Avenue Historic District. Adjacent to the corridor are properties listed in both the National Register of Historic Places and the Washington National Heritage Register, including significant sites such as Seattle Carnegie Library - Ballard Branch, Ballard Fire Station No. 18, Wallingford Fire and Police Station, Interlake Public School, and University National Bank Building.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located on Market Street and in the University District.

A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the Ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 44 corridor including in the Greenwood neighborhood and Downtown Seattle. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

A traffic operational analysis was conducted to evaluate the transit travel time benefits of proposed improvements at 41 intersections along Route 44. The analysis revealed that at 19 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 11 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

The removal of parking for conversion to a bus or BAT lane along the corridor would have a potential adverse effect. This effect would be most pronounced in the Ballard neighborhood along Market Street due to the current parking supply. The removal of parking spaces will need to be evaluated in a transportation technical report, including a parking study.

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the project's aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 44, can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The FTA Transit Noise and Vibration Impact Assessment Manual (FTA 2018) notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads.

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The eastern most portion of the Route 44 alignment, which curves around the Triangle Parking Garage at the University of Washington, is adjacent to a mapped breeding area for Great blue heron. Any construction work at this site would have the potential to impact the species. Construction or noise generating activities in this area will need to be undertaken outside of breeding windows (April - August) unless a permit is obtained. WDFW buffers for Great Blue Herons are 197 feet year-round and range from 656 to 1,320 feet (depending upon type of activity) from February to September.

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 44 corridor include known critical areas for landslides and peat settlement. The areas will be considered for their potential impact to the project during design. A small potential landslide area is present at 3rd Ave NW and NW Market Street, which is adjacent to the corridor. However, Route 44 does not pass through it directly. The University of Washington portion of the corridor is all a peat settlement prone area.

The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces, and it is situated within two different stormwater basins. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the City of Seattle Stormwater Code and Manual, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures may encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control (if applicable, as per the City of Seattle requirements), and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP), a TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.4 Cumulative and Indirect Impacts

Route 44 serves the city of Seattle. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of "facility modernization" that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

However, if the loss of parking is substantial enough that it causes public controversy or possible significant adverse impacts, FTA may require an Environmental Assessment to be prepared. This would be unusual but not without precedent in Seattle—the former Roosevelt RapidRide (now J Line) BRT went through an EA process at least in part because of the amount of potential parking loss.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification

- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit

RapidRide Prioritization Plan

Corridor 1049 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

King County METRO

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King County METRO

Corridor Summary

Corridor 1049 | Route 150

CORRIDOR SUMMARY

Ridership

No Build

+60%

RapidRide Corridor 1049

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour **+12.4**

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour **50.7**

Weekday boardings per revenue hour with RapidRide investment in 2042.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Travel Time

Proposed Travel Time Savings **-22%**

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

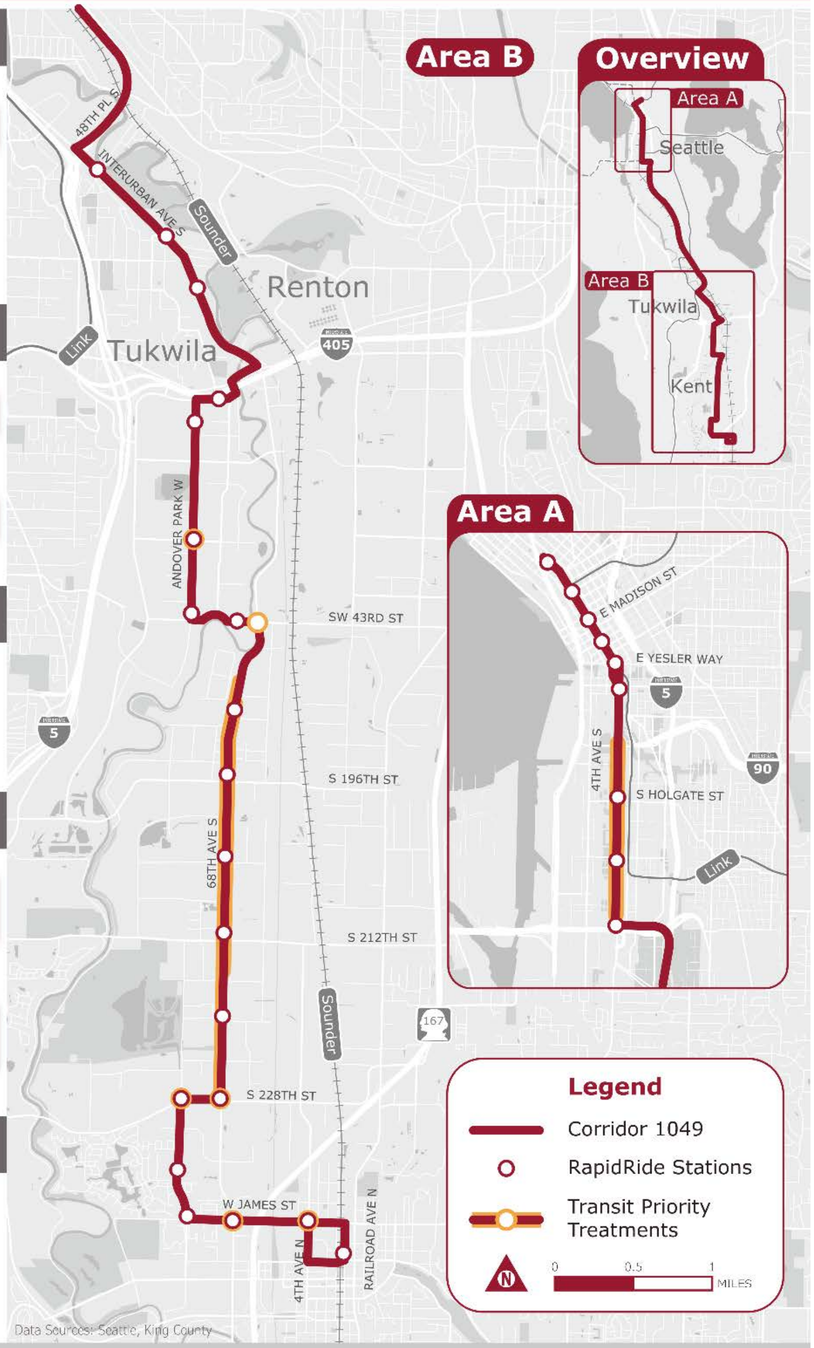
2035 Corridor End-To-End Travel Time **63**

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Equity Priority Area Score

3.7

Average area of need score within 1/2 mile of station locations.



RAPIDRIDE

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1049 (Route 150). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1049 is currently served by Route 150, which connects Downtown Seattle to the South King County communities of Tukwila and Kent via I-5. The route serves major employment and commercial activity in Downtown Seattle, and industrial areas in SODO, Southcenter, and the industrial corridor between Tukwila and Kent.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would operate truncated service between Kent and Rainier Beach. This project conducted a high-level review of that alignment compared to the existing and Metro Connects Interim routes. However, given potential impacts to current riders, as well as the potential opportunity to deploy operating cost savings for additional service on the corridor (or elsewhere), additional analysis will be needed in the future to understand the merits of the Metro Connects alignment.

The result of the alignment screening was a recommendation for the Metro Connects interim alignment, which follows Route 150’s existing alignment but uses 4th Avenue S instead of the SODO busway and excludes the 194th St/196th St deviation that’s served during peak periods.

2.2 Representative Alignment

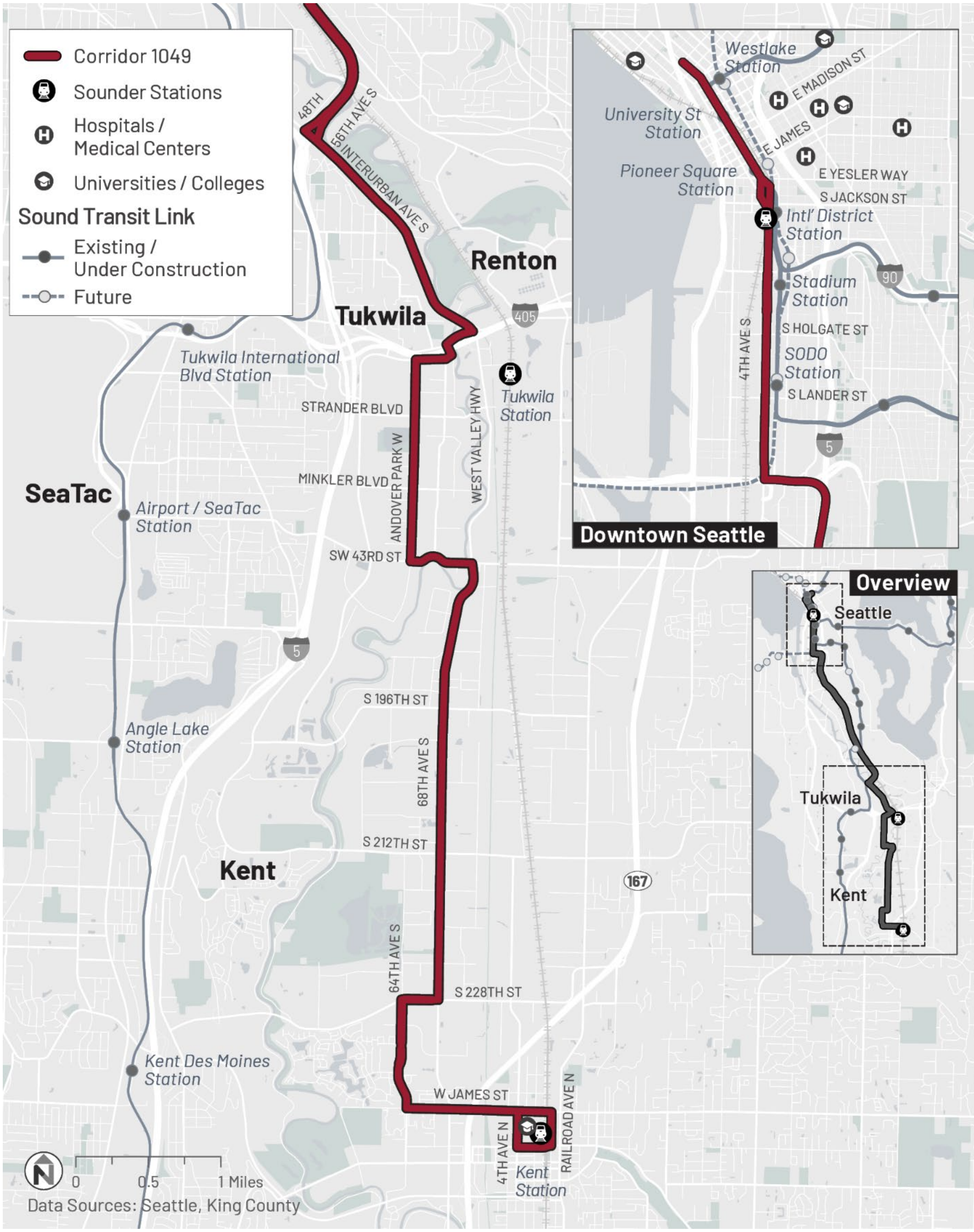
The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. These changes include realigning service in downtown Seattle to match other RapidRide corridors, and adjustments to routing in the Southcenter area.

Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 150, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Final Alignment Changes

Alignment Change	Change from… Route 150	Metro Connects	Recommended Alignment in Screening
Realign service from SODO busway onto 4th Ave S due to future closure of busway for Link	✓	✓	✗
Adjust downtown service from 2nd and 4th Ave onto 3rd Ave to match existing RapidRide service	✓	✓	✓
Change northern terminus from Seattle Convention Center (using Pine and Union Streets) to 3rd Avenue & Virigina Street	✓	✓	✓
Realign service from 61st Ave S to 66th Ave S in Tukwila to reduce out-of-direction travel	✓	✓	✓

Figure 3 Corridor Overview



King County METRO

3.0 Transit Network

Route 150 connects with many other routes in Downtown Seattle and SODO, often overlapping with other services. Iin Tukwila and Kent, Route 150 serves as a primary, north-south frequent-service line with limited parallel or overlapping service. RapidRide A line operates about two miles west, and Route 160 (future RapidRide I Line) operates about two-and-a-half miles east. Both operate frequent service throughout the day. Route 153 is the other only north-south line operating nearby (one mile to the east), but it operates every 30 minutes throughout the day on weekdays only.

Route 150 connects to several local and regional transit lines in Downtown Kent (including Sounder and Route 160) and in Tukwila at the Westfield Southcenter Mall/Tukwila Transit Center (including RapidRide F Line). The route connects with Link, Sounder, and multiple other RapidRide lines and other bus routes in SODO and Downtown Seattle.

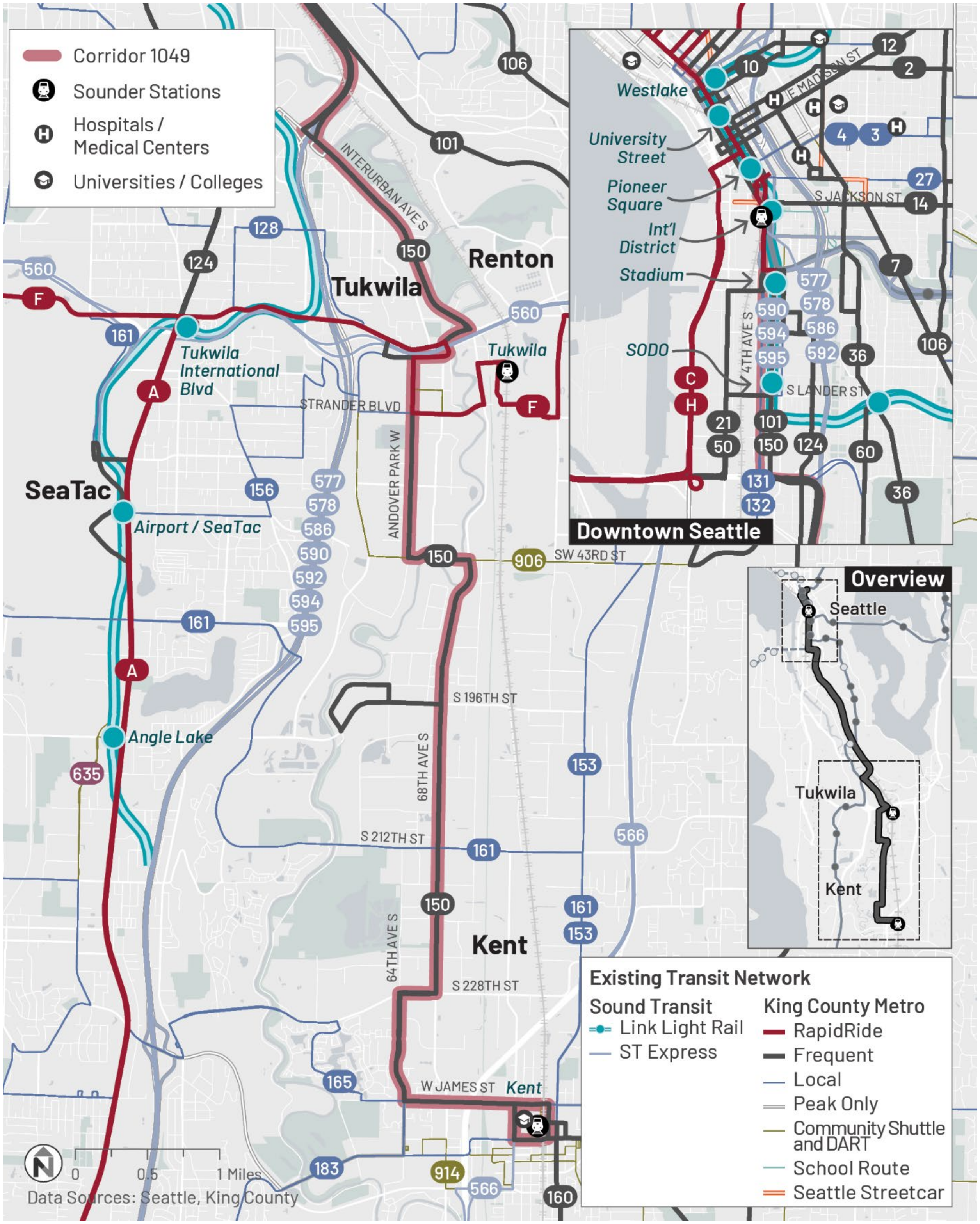
3.1 Future Network Changes

The Metro Connects Interim Network assumes an increase of frequent service in Tukwila and Kent. New RapidRide services would operate along Routes 160 and 165, [1] and frequent service would operate along alignments like 161, 168, 183, and 906.

In the Seattle Center City, new Link connections would be available to West Seattle, Ballard, and Bellevue, among other transit connections to additional RapidRide corridors and other frequent services.

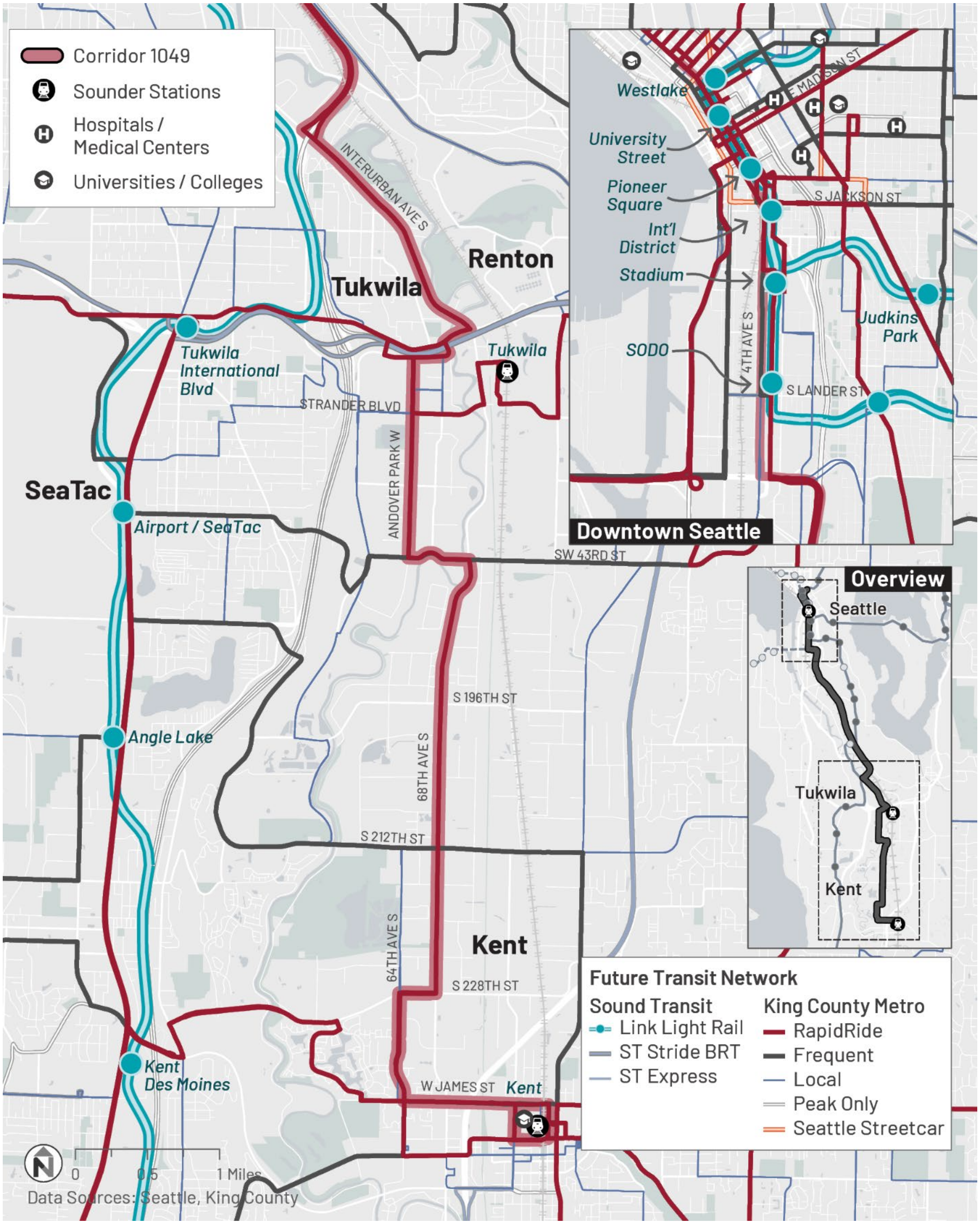
[1] Route 165 is a candidate RapidRide corridor.

Figure 4 Existing Transit Network



King County METRO

Figure 5 Metro Connects Interim Network



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4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 150 currently operates with frequent service for most of the day, every day. Service operates every 15 minutes on weekdays from 6 am through 6 pm. On Saturdays and Sundays, Route 150 runs every 15 minutes from 8 am through 7 pm. Service operates hourly through the night, seven days a week.

Figure 6 Existing Route 150 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>60</td><td>30</td><td colspan="12">15</td><td>20</td><td colspan="4">30</td><td colspan="5">60</td></tr>
<tr><td>Saturday</td><td></td><td>60</td><td colspan="2">30</td><td colspan="11">15</td><td>20</td><td colspan="3">30</td><td colspan="5">60</td></tr>
<tr><td>Sunday</td><td></td><td>60</td><td colspan="2">30</td><td>20</td><td colspan="10">15</td><td colspan="2">30</td><td colspan="7">60</td></tr>
</table>

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency and span on weekdays, Metro would need to increase Route 150 frequency during the morning and afternoon peak periods and overnight. Peak service today operates every 15 minutes, but the minimum standard is every 10 minutes. This would require at least two additional trips per hour for seven hours on weekdays. One additional trip per hour would be needed during the 11 pm hour to maintain 30-minute service until midnight.

On Saturdays and Sundays, one to two additional trips per hour would be needed in the morning or late at night to ensure 15-minute service from 6 am to 7 pm, and 30-minute service from 7 pm to midnight.

Figure 7 shows the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	2	2	2	-	-	-	-	-	-	2	2	2	3	-	-	-	-	1	-	-	-	-
Saturday	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Sunday	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60	30	10			15						10				30				30	60			
Saturday		60	15		15											20		30		30	60			
Sunday		60	15			15											30	30			60			

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings) a roundtrip will take 127 minutes during the PM peak and 106 minutes during off-peak hours. Assuming the number of trips identified above needed to achieve the minimum RapidRide standard, Metro would need to add approximately 36 service hours each weekday (or a 21% increase), but save 2 hours on Saturdays and add 14 hours on Sundays, to meet the RapidRide minimum standard.[2]

Figure 9 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would also need 4 additional buses on weekdays to meet this increased level of service (16 buses, relative to the existing 12 buses needed on weekdays).

[2] Note: In Fall 2024 layovers in Downtown Seattle on Route 150 are planned to move from Convention Place to a new layover location in Eastlake. This will increase existing service hours and will impact the amount of additional service needed to meet the RapidRide standard.

Two fewer vehicles would be needed on Saturday or Sunday (9 buses, relative to the existing 11 buses). These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	% Change
Daily Service Hours				
Weekday	175	211	+36	+21%
Saturday	161	159	-2	-1%
Sunday	143	157	+14	+10%
Daily One-Way Trips				
Weekday	133	166	+33	+25%
Saturday	119	136	+17	+14%
Sunday	110	134	+24	+22%
Fleet				
Weekday	12	16	+4	+33%
Saturday	11	9	-2	-18%
Sunday	11	9	-2	-18%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require at least two layover spaces at each end.[3] However, with the large amount of freeway running, there may be greater layover needs due to the increased charging time that may be necessary on this route.

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a Downtown Seattle

On-street options for a layover location in Downtown Seattle are limited. King County Metro will likely need to work with the City of Seattle to identify one or two new layover spaces to accommodate RapidRide service for this corridor.

The terminus would be on surface streets and shared with other King County Metro routes. Today, Route 150 has a layover near the Seattle Convention Center. In Fall 2024, the layover

[3] A one-way travel time of approximately 62-66 minutes requires a layover of 15 minutes (20% layover). With buses every 10 minutes, there would typically be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

will move to the new Eastlake Layover Facility (ELF). The ELF will have capacity for 11 60-foot coaches for all routes that will be using it.

However, if converted to RapidRide service, the route's terminus could be shifted to a current or future RapidRide terminus to share amenities with other routes.

Although no charging infrastructure for battery electric buses exists today in Downtown Seattle, King County Metro is exploring this. ELF will likely be a priority location for charging infrastructure. This, combined with the layover capacity there, means the ELF location may be the best solution for a terminus.

If the ELF is identified as the terminus for this corridor, it could marginally increase service hours and the projected operating cost above what is described elsewhere in this report.

4.5b Kent Station

Kent Station has nine bays. Six bays are used for bus boarding, two bays are used for layover, and one bay is used by Access Transportation. Five routes currently use the station as a terminus, including Route 150), and four other routes serve the station as an intermediary stop. Route 150 uses Bay 7 unless occupied, then Bay 6 as an alternate overflow location. Both bays are 80 feet in length.

The station provides restrooms for operators. Although no charging infrastructure exists today, this transit center is an off-street facility that could be retrofitted to include bus charging. The station is on property owned by Sound Transit, which could be a factor in adding new charging infrastructure.

King County Metro and Sound Transit are working together on planning a new off-street layover facility for Kent Station. Final design for this off-street facility is anticipated to be completed by the end of 2024. The proposal has 12 layover spaces, with a minimum of 9, and will include charging infrastructure.

Kent Station is expected to experience capacity constraints within 10 years due to service growth. These capacity limitations may impact the location, design, and cost of RapidRide stations. Additional analysis will be needed to identify alternate station locations or other service changes to ensure sufficient capacity for Route 150 RapidRide service.

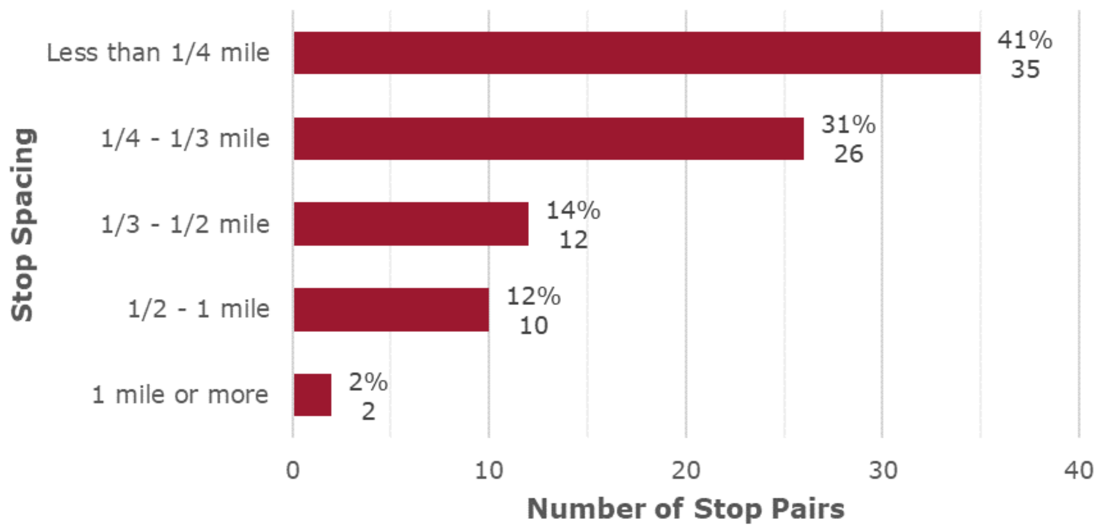
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,600 feet (or approximately one-third mile), excluding the alignment along I-5 between Tukwila and SODO.

Approximately 40% of stop pairs along the corridor are less than a quarter mile apart, and with an additional 31% between a quarter and third of a mile (Figure 10).

Figure 10 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

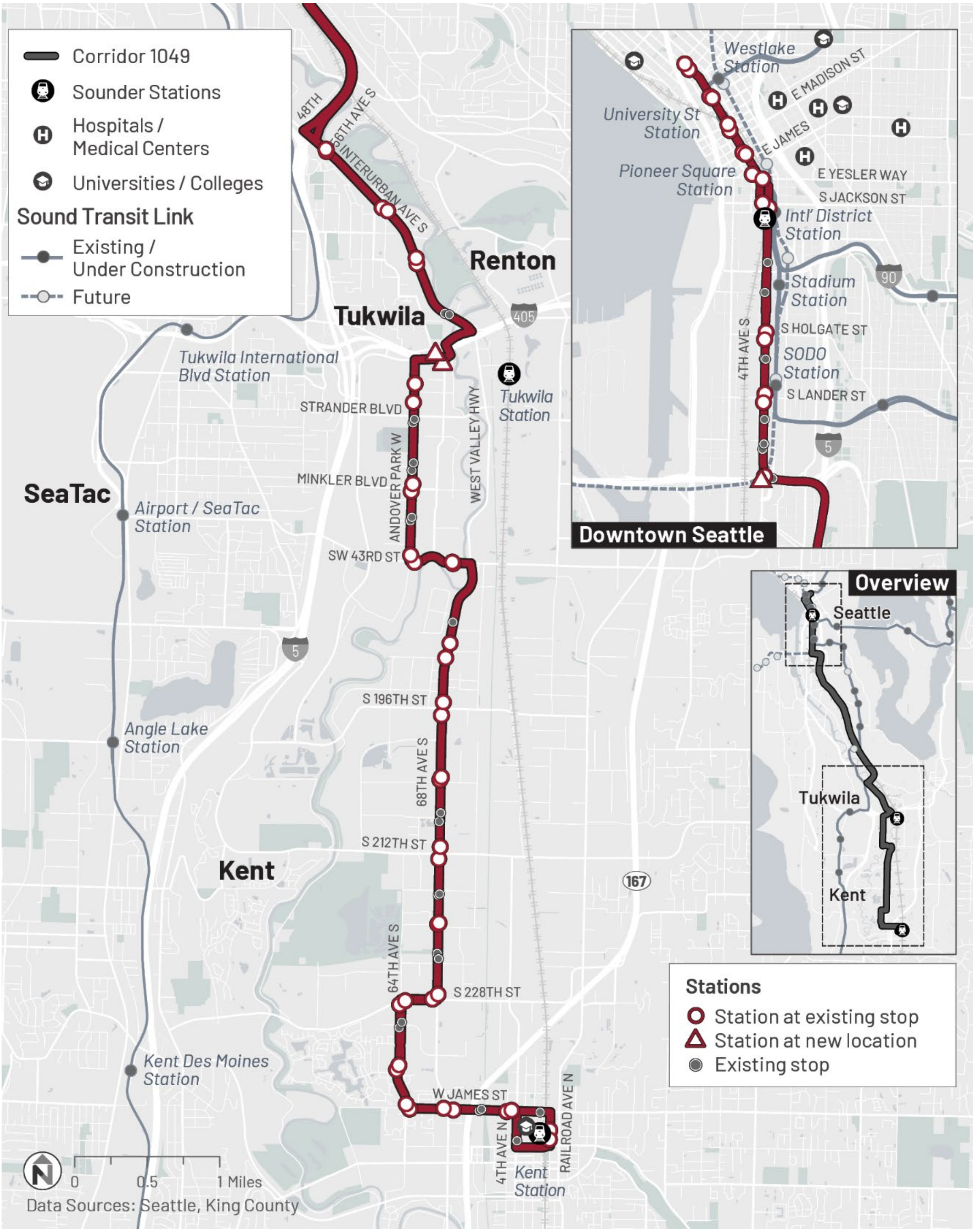
The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 11. Excluding the portion along I-5 between SODO and Tukwila, the average spacing would be 2,400 feet (or approximately a half mile), which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.[4]

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

[4] Compared to existing RapidRide lines, the proposed station spacing for this corridor is roughly equivalent to A Line (2,410 feet) but wider than F Line (2,180 feet).

Figure 11 Proposed Station Locations



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5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 12, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in the Section 12.0 Capital Costs on page 57.

Figure 12 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 35), each station is categorized into one of the four potential station typologies. Station locations with existing RapidRide stations are assumed to not require any new amenities. The typologies are listed in Figure 13 and summarized in Figure 14.

Figure 13 Station Boardings and Typology

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
1	3rd Ave & Virginia St	130	NA*	Existing	Existing
2	3rd Ave & Pike St	110	NA*	Existing	Existing
3	3rd Ave & Seneca St	280	NA*	Existing	Existing
4	3rd Ave & Columbia St	360	NA*	Existing	Existing
5	3rd Ave & James St	220	-	Large	-
6	Prefontaine Pl & Yesler St	-	NA*	-	Existing
7	2nd Ave Ext/4th Ave S & Jackson St	870	NA*	Large Raised	Small
8	4th Ave S & Holgate St	450	410	Large Raised	Large Raised

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#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
9	4th Ave S & Lander St	1,110	100	Large Raised	Medium
10	4th Ave S & Spokane St	50	220	Medium	Large
11	Interurban Ave & 52nd Ave (Tukwila P&R)	50	190	Medium	Large
12	Interurban Ave & 58th Ave	30	120	Small	Medium
13	Interurban Ave & 147th St	10	30	Small	Small
14	Tukwila Parkway & Andover Park E	10	60	Small	Medium
15	Andover Park W & Baker Blvd	250	600	Existing	Existing
16	Andover Park W & Minkler Blvd	160	240	Large	Large
17	Andover Park W & 180th St	70	160	Medium	Large
18	180th St & Sperry Dr	150	210	Large	Large
19	West Valley Hwy & 190th St	130	40	Medium	Small
20	68th Ave & 196th St	80	40	Medium	Small
21	68th Ave & 204th St	40	20	Small	Small
22	68th Ave & 212th St	120	90	Medium	Medium
23	68th Ave & 220th St	70	20	Medium	Small
24	68th Ave & 228th St	30	30	Small	Small
25	64th Ave & 228th St	50	40	Medium	Small
26	64th Ave & 236th St	70	60	Medium	Medium
27	64th Ave & James St	160	290	Large	Large
28	James St & Washington Ave	110	160	Medium	Large
29	James St & 4th Ave	20	170	Small	Large
30	Kent Station	-	1,370	-	Large Raised

* Note: Northbound boardings in Downtown Seattle were undetermined

Figure 14 Station Typology Summary

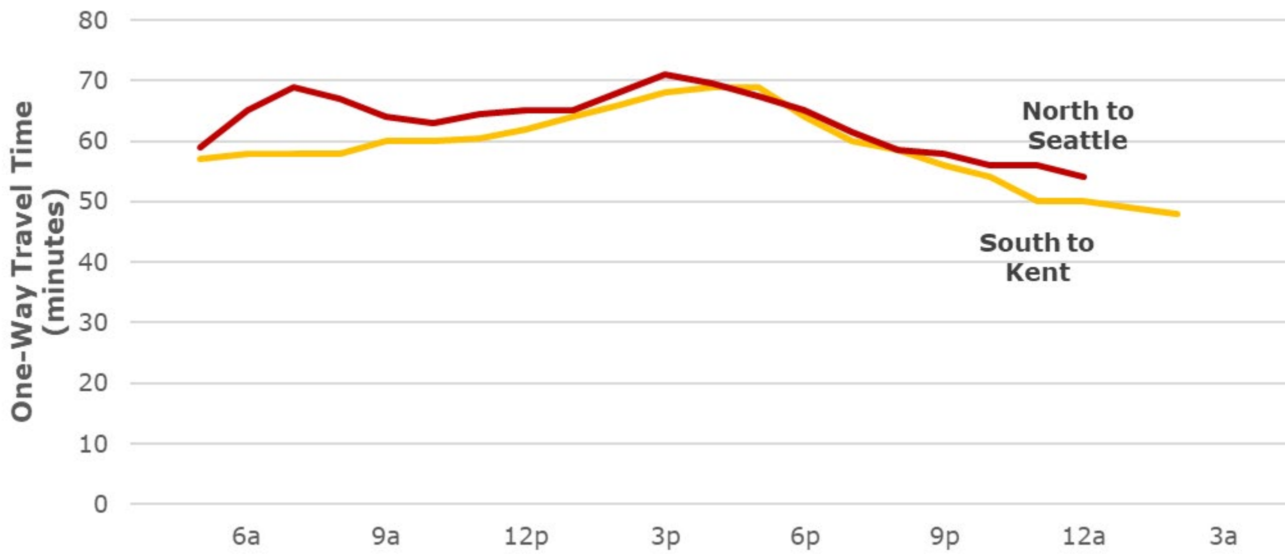
Station Type	Count	Percent
Large Raised Station	5	11%
Large Station	12	26%
Medium Station	15	33%
Small Station	14	30%
Total	**46**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 150 in May 2023 ranged between 48 minutes (late in the evening) to 71 minutes (during the PM peak). On average a one-way trip took 61 minutes.

Figure 15 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip for along Corridor 1049 experiences delay of almost 24 minutes between the 20th and 80th percentile travel time. This is approximately 0.59 minutes (35

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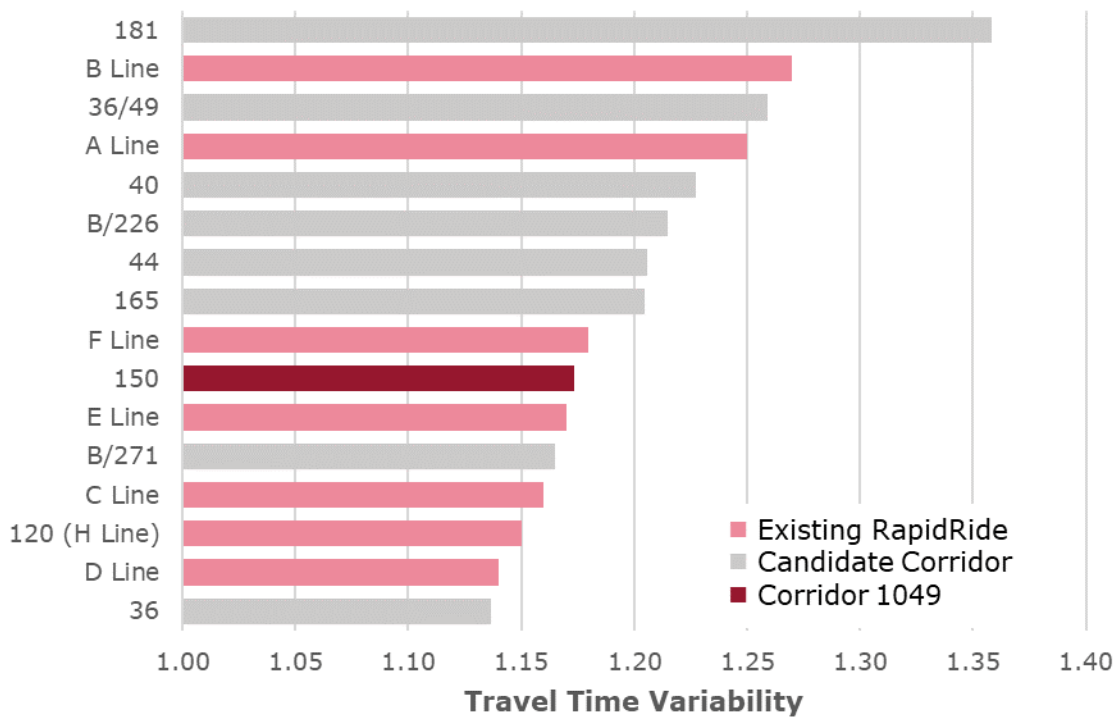
seconds) of trip delay per mile on an average trip. This is the lowest trip delay of all nine candidate corridors.

Northbound trips at 8 AM and southbound trips at 4 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.15 to 1.17. This indicates the longest travel times (slowest trips) take 15-17% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1049 is performing relatively well. This comparison is shown in Figure 16.

Figure 16 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 17.

Figure 17 Speed & Reliability Summary

Metric	Value
On-time performance[A]	72%
Average speed	24.1 mph
Average trip delay[B]	23.6 min
Average trip delay per mile	35 sec
Lowest median hourly travel time (Reference) [C]	45 min
Highest median hourly travel time	53 min[D]
Travel time variability[E]	1.17

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 8 AM for northbound trips, from Fall 2021.

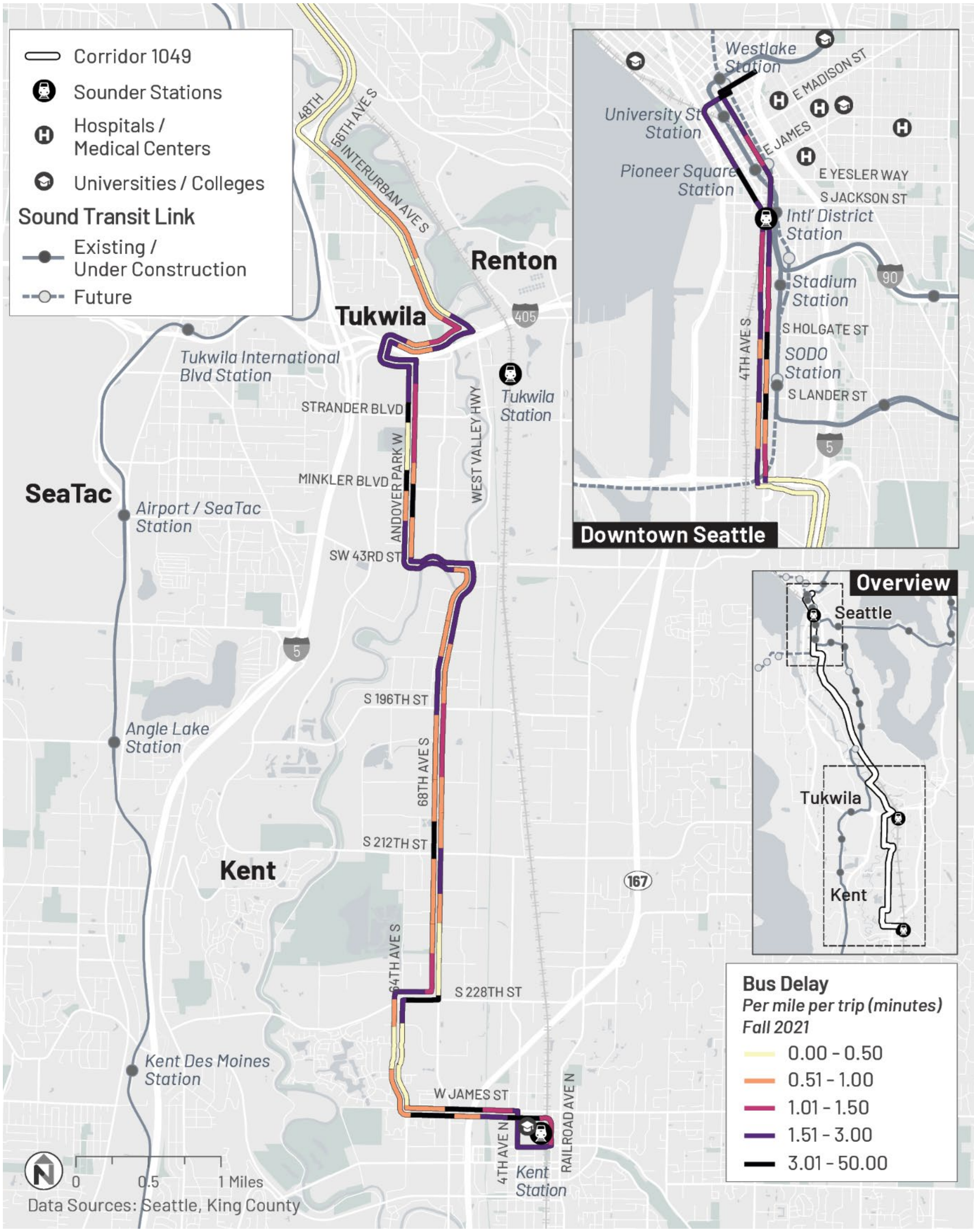
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 18 shows the delay along Corridor 1049 based on King County Metro's AVL data from Fall 2021.[5] The segments shown are existing stop pairs along the representative alignment, not just the Route 150 stop pairs. The data for the stop pairs along 4th Ave S are based on Routes 131 and 132. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Downtown and SODO are areas with high levels of delay, as do the portions of the corridor near the Westfield Southcenter Mall in Tukwila, and in Downtown Kent. Other high delay locations occur at major intersections including Minkler Boulevard, 196th Street, 212th Street and 228th Street.

[5] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 18 Corridor 1049 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

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Figure 19 and Figure 20 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

In Downtown Seattle and SODO, delays are present at all portions of the corridor. Along the alignment in Tukwila and Kent, delay is largely concentrated at a few locations. Along I-5, delay is relatively low on a per mile basis, but is primarily concentrated northbound in the morning and southbound in the late afternoon and evening.[6]

Overall, high delay locations tend to experience delay throughout the day. Higher levels of delay occur between 5 and 9 am and between 3 and 7 pm for many stop pairs, including at lower delay locations.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

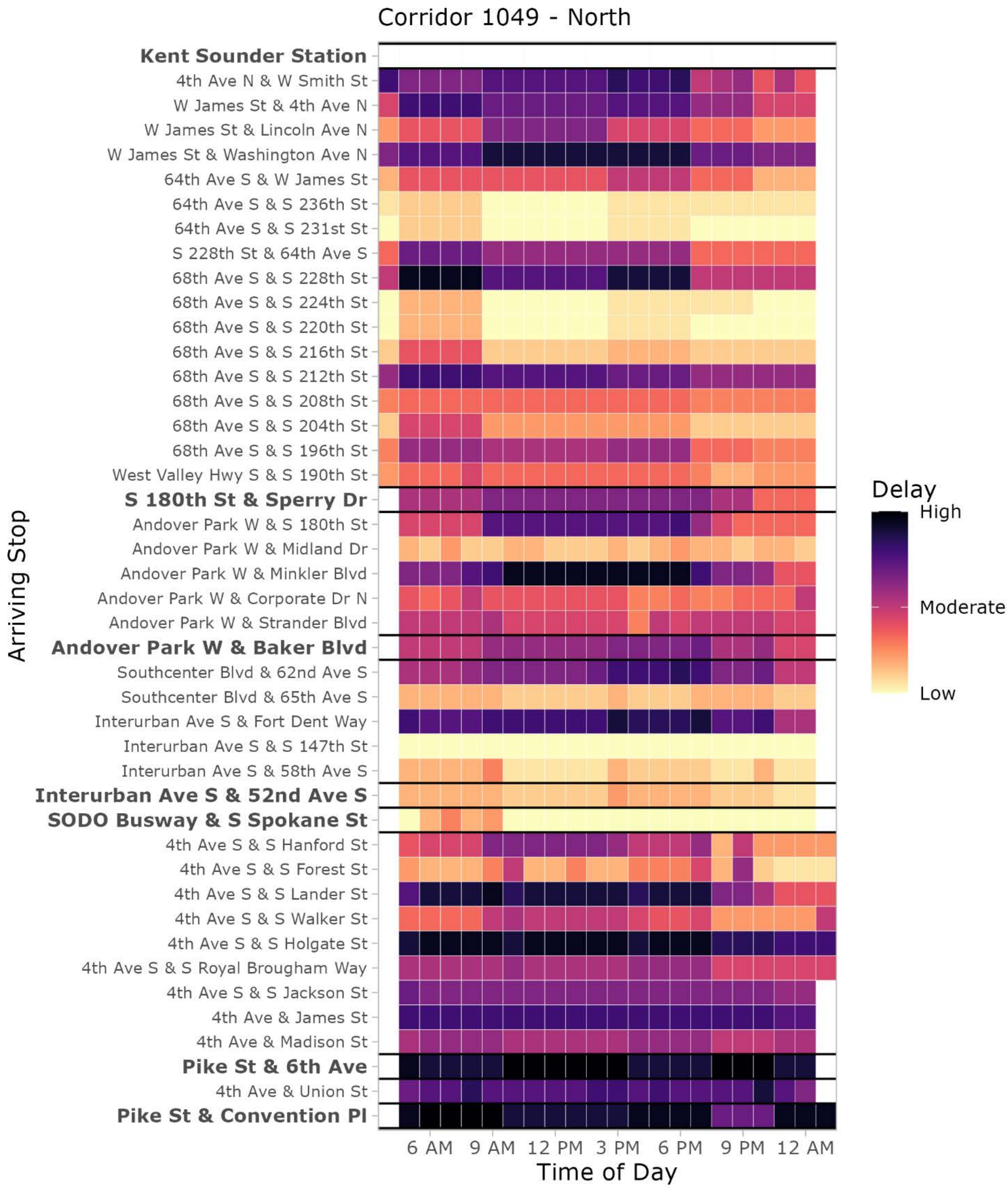
Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

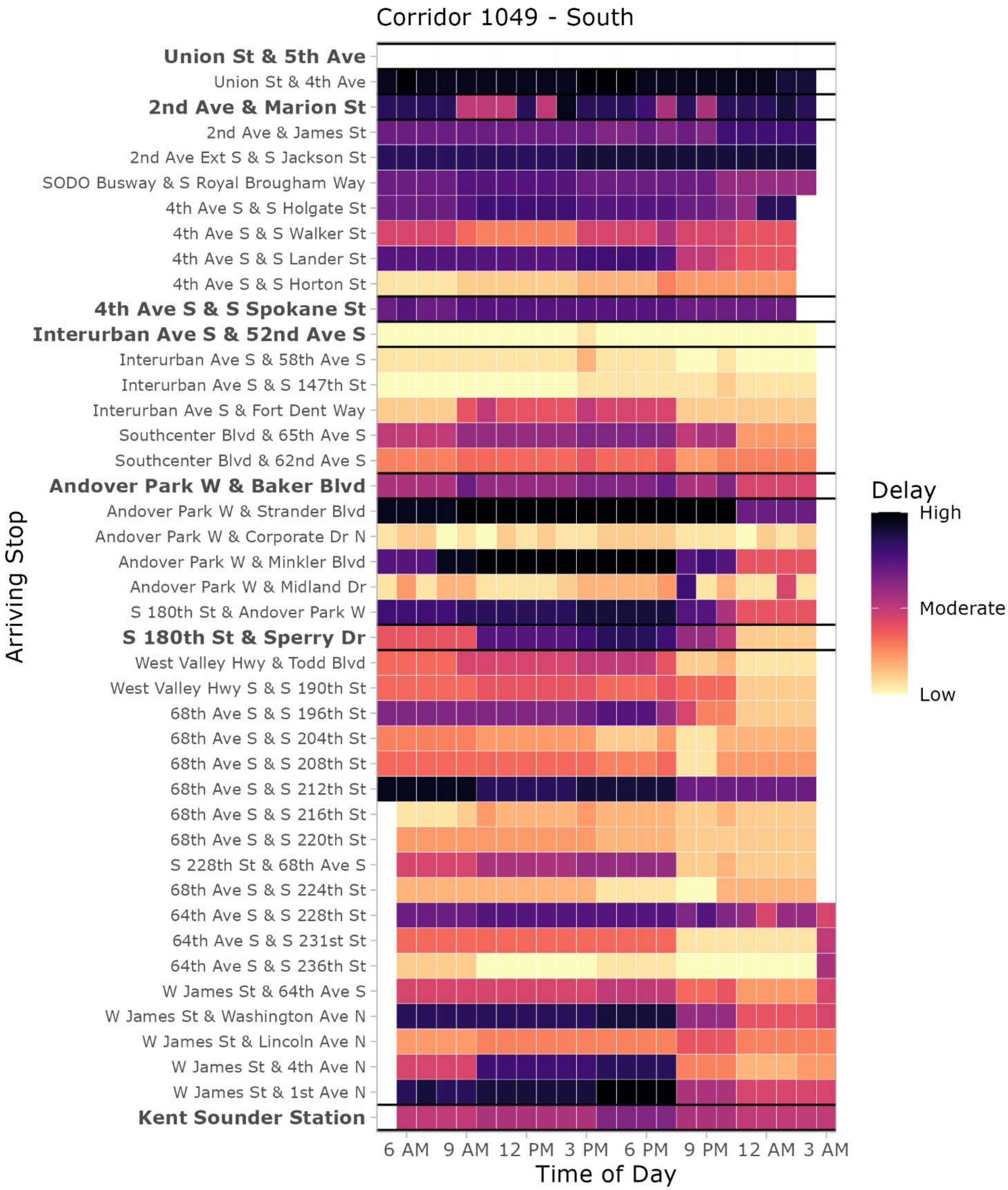
[6] The unit of analysis for the delay was the stop pair. As there are no stops along I-5, the delay is calculated between Interurban Avenue at 56th Ave and the SODO Busway at Spokane Street, a distance of more than 7 miles.

Figure 19 Corridor 1049 Northbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 20 Corridor 1049 Southbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 1049 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 21, and they are shown geographically in a map in Figure 22. The alignment adjustment from 61st Ave S to 66th Ave S in Tukwila can also be characterized as a speed and reliability change as it will reduce total travel time, but it is not included in this list.

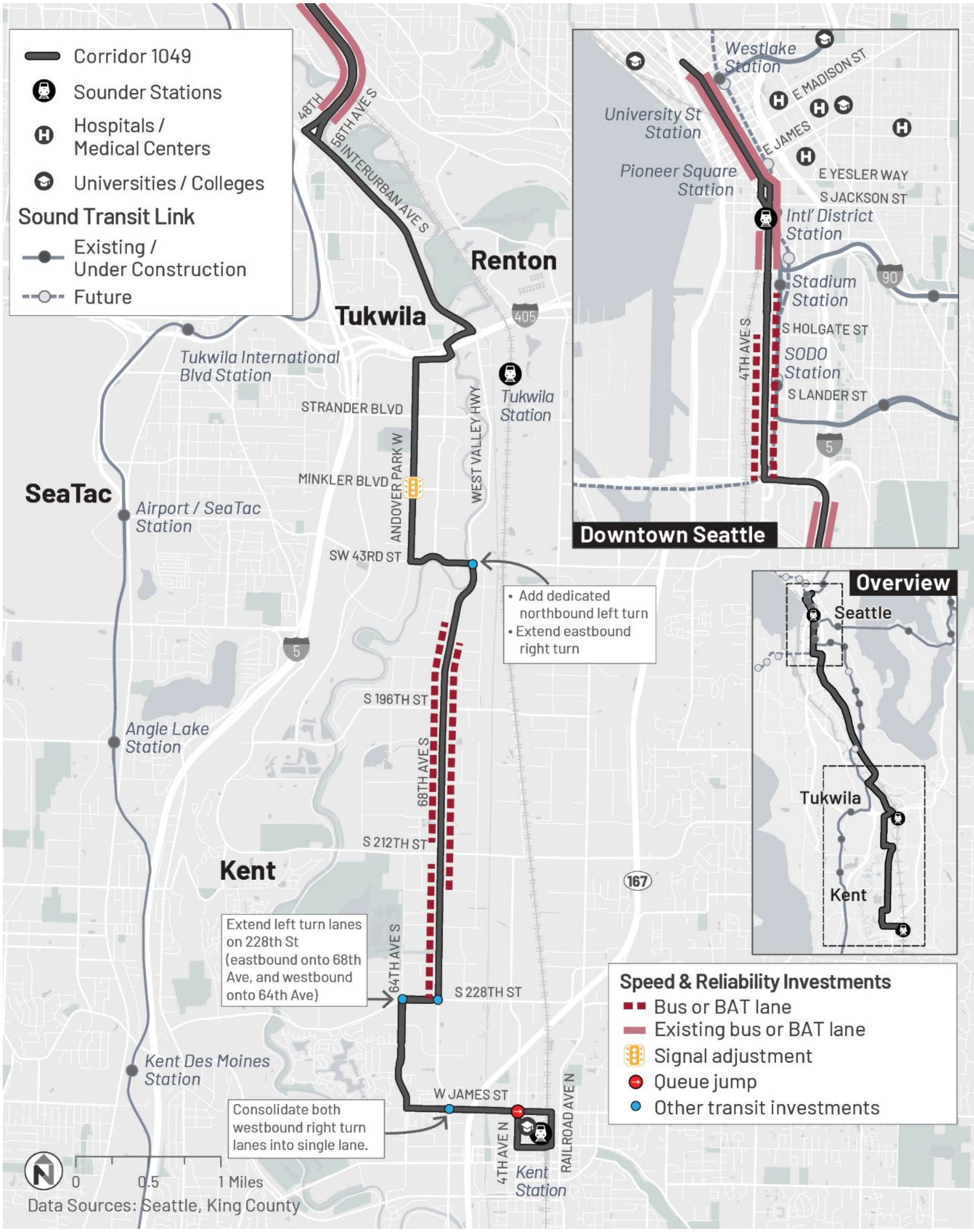
The corridor currently achieves transit priority for 38% of its centerline miles[7], which is just under the RapidRide *minimum* standard of 40%. The additional proposed treatments here would increase the coverage to 58%, which would exceed the *desired* standard of 50%.

[7] This includes the HOV lanes along I-5 between SODO and Tukwila.

Figure 21 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
4th Ave S	Bus/BAT lane	Add northbound bus/BAT lane between Spokane St and Edgar Martinez Drive S, and a southbound bus/BAT lane between S Holgate St and S Spokane St.
Tukwila		
Andover Park W & Minkler Blvd	Signal adjustment	Consider signal changes to reduce cycle time (either through adjustments to overlapping movements and/or split phasing)
180th St & 68th Ave	Other	Extend eastbound right turn lane
Kent		
68th Ave & 180th St	Bus-only turn lane	Convert one northbound left turn lane to a bus-only left turn lane
68th Ave (216th to 190th St)	Bus/BAT lane	Add northbound bus/BAT lane between north of 190th St and 216th St
68th Ave (Todd to 212th St)	Bus/BAT lane	Add southbound bus/BAT lane between south of Todd Blvd to north of S 212th St.
68th Ave (212th to 228th St)	Bus/BAT lane	Add southbound bus/BAT lane between south of S 212th St to S 228th St.
228th St & 68th Ave	Other	Extend eastbound left turn lane
228th St & 64th Ave	Other	Extend westbound left turn lane
W James & Washington Ave	Other	Consolidate westbound right turn lanes at Washington Ave into single lane
W James St & 4th Ave N	Queue jump	Remove curb extension on southeast corner to allow for an eastbound queue jump from right turn lane at 4th Ave N into a far-side receiving lane with a far-side station

Figure 22 Proposed Transit Priority Treatments



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6.4 Forecast Travel Time Savings

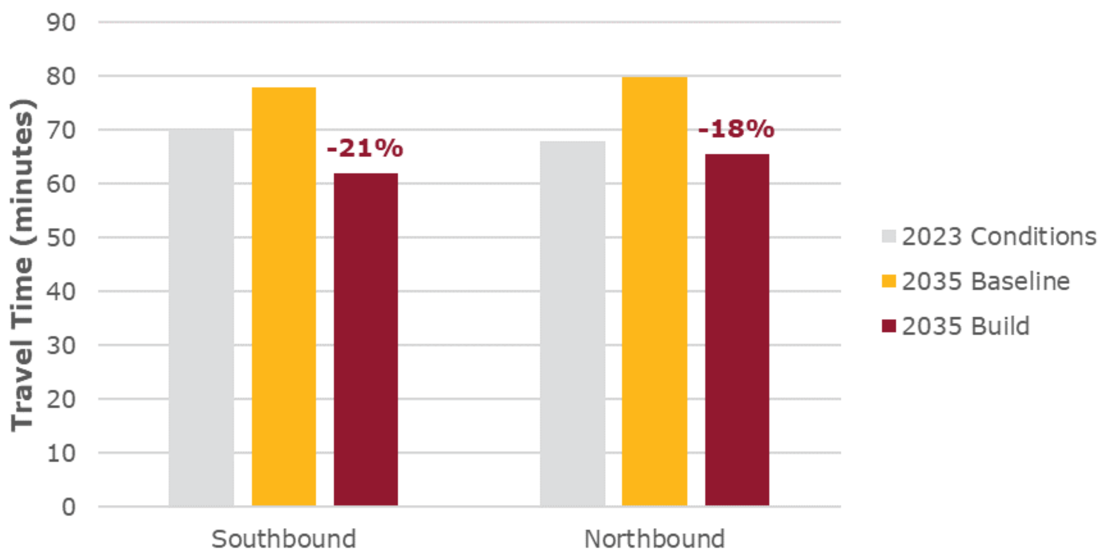
The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1049 alignment are forecast to reduce PM peak Future Build condition travel times 18-21% from Future Baseline conditions. Average bus travel speed is expected to increase to 18-20 mph in the Future Build condition.

Southbound trips will experience a higher reduction in travel times compared to the northbound direction. Introducing BAT lanes and reducing general-purpose through lanes will improve transit operations, both in terms of reduced travel time and improved reliability.

Figure 23 shows transit travel times for the overall route.

Figure 23 Corridor 1049 Modeled PM Peak Transit Travel Times



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7.0 Boardings and Ridership

7.1 Ridership Trends

Route 150 carried approximately 4,100 people per day in Spring 2023, and as much as 5,500 people in Fall 2019. The route has now recovered approximately 75% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[8], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 24 Route 150 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	5,511	-	100%
Fall 2020	2,794	-49%	51%
Fall 2021	3,410	+22%	62%
Spring 2023	4,127	+21%	75%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 25 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 150, plus stops along 4th Ave S in SODO served by Routes 131 and 132.

The busiest stop locations are Kent Station, Andover Park W at Baker Boulevard, and at multiple locations in Downtown Seattle.

[8] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 25 Boarding and Alighting Activity by Stop (Spring 2023)

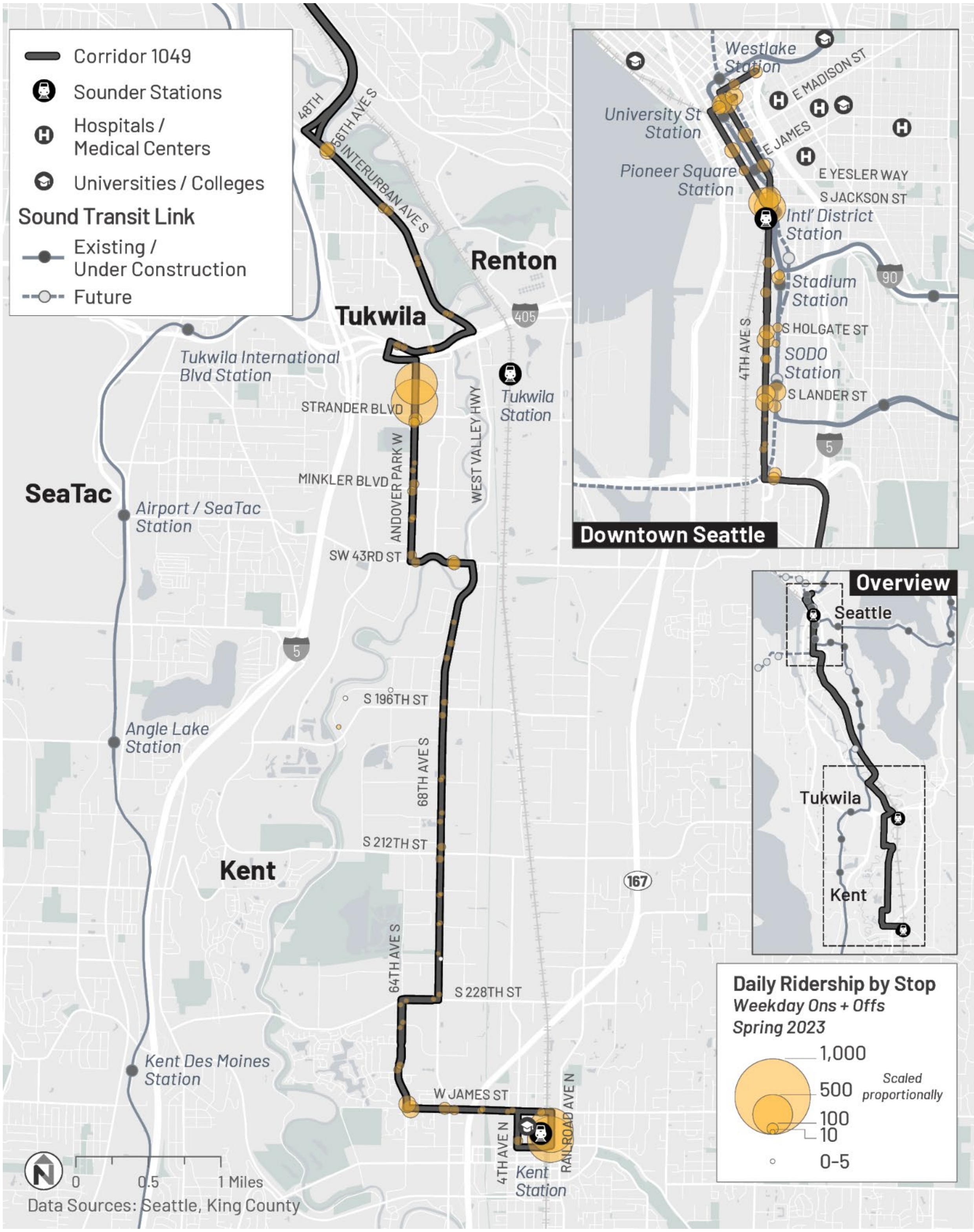

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Figure 26 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Southbound	Northbound	Total
Pike St & Convention Pl	120	-	120
Union St & 5th Ave / Pike St & 6th Ave	96	186	281
Union St & 4th Ave	243	219	462
2nd Ave & Marion / 4th Ave & Madison	149	155	304
2nd Ave & James / 4th Ave & James	130	83	214
2nd Ave Ext/4th Ave S & Jackson	377	359	736
4th Ave S & Royal Brougham	78	-	78
4th Ave S & Edgar Martinez	-	88	88
4th Ave S & Holgate	154	181	334
4th Ave S & Walker	65	70	135
4th Ave S & Lander	197	190	387
4th Ave S & Forest	8	-	8
4th Ave S & Hanford/Horton	26	48	74
4th Ave S & Spokane	119	117	235
Interurban Ave & 52nd Ave (Tukwila Park & Ride)	142	161	303
Interurban Ave & 58th Ave	78	83	161
Interurban Ave & 147th St	34	34	68
Interurban Ave & Fort Dent Way	42	34	76
Southcenter Blvd & 65th Ave	17	36	53
Southcenter Blvd & 62nd Ave	63	44	106
Andover Park W & Baker Blvd	535	592	1,127
Andover Park W & Strander Blvd	121	91	211
Andover Park W & Corporate Dr	16	28	44
Andover Park W & Minkler Blvd	78	70	148
Andover Park W & Midland Dr	32	34	66
Andover Park W & 180th St	72	71	143
180th St & Sperry	128	-	128
West Valley Hwy & Todd Blvd	-	21	21
West Valley Hwy & 190th St	44	34	79
68th Ave & 196th St	41	38	79
68th Ave & 204th St	19	19	38
68th Ave & 208th St	21	24	45
68th Ave & 212th St	58	52	110
68th Ave & 216th St	10	20	30
68th Ave & 220th St	16	6	22
68th Ave & 224th St	4	5	10
68th Ave & 228th St	22	19	41

Stop Pair	Southbound	Northbound	Total
64th Ave & 228th St	20	19	38
64th Ave & 231st St	22	16	38
64th Ave & 236th St	47	49	96
James St & 64th Ave	181	184	366
James St & Washington Ave	111	78	189
James St & Lincoln Ave	28	28	56
James St & 4th Ave	29	24	53
4th Ave & Smith St	70	-	70
James St & 1st Ave	-	59	59
Kent Station	586	564	1,150

Source: King County Metro Spring 2023

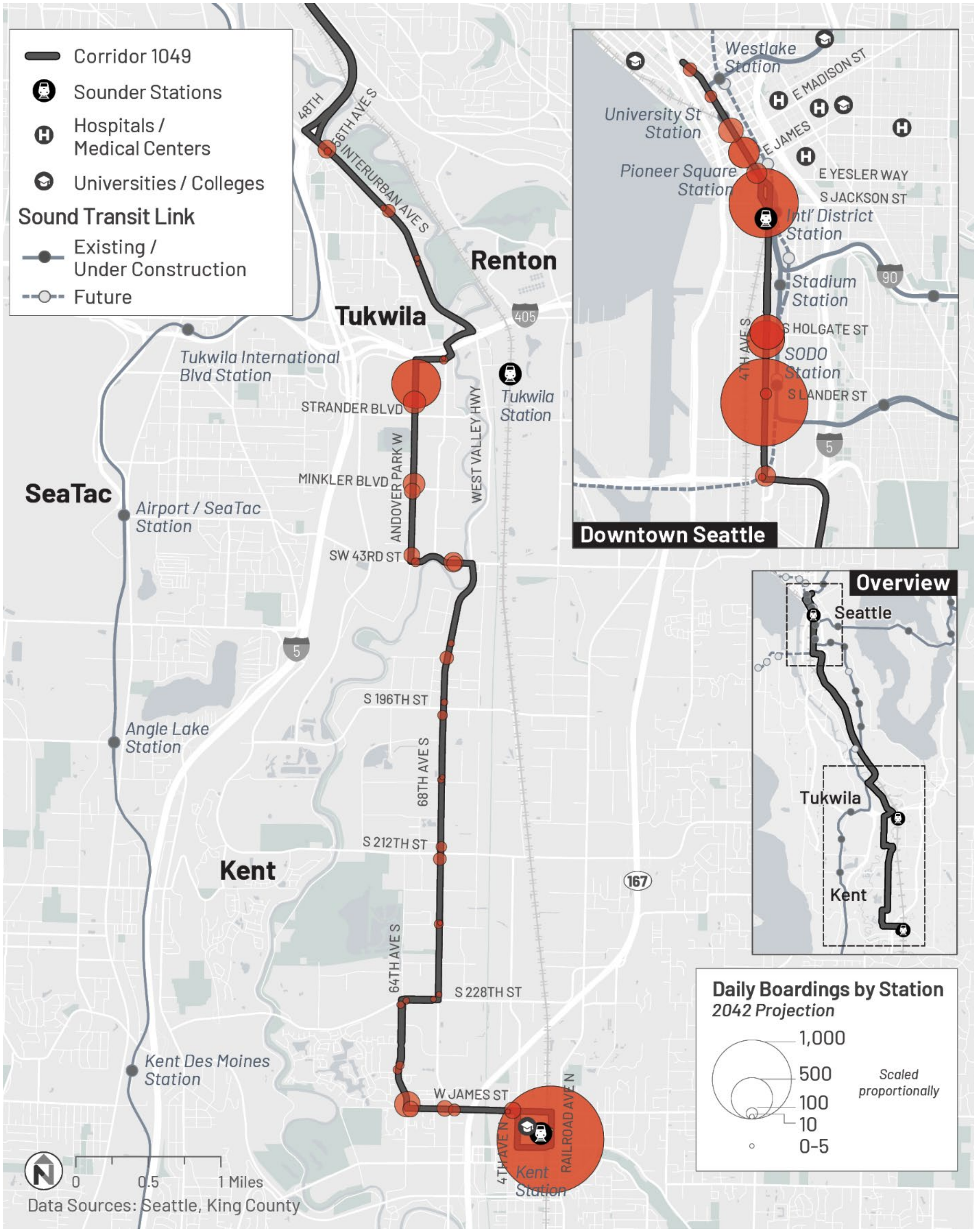
Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership along 4th Ave in SODO is for from Routes 131 and 132.

7.3 Forecast Ridership

Future ridership for Corridor 1049 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1049 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 980 boardings in the PM peak hour and 10,700 daily boardings. Key ridership hubs include stations near Southcenter Mall, the Kent Sounder Station, stations in downtown Seattle, and stations at the Link light rail stations such as SODO and Stadium. Future ridership for each candidate RapidRide station is shown in Figure 27.

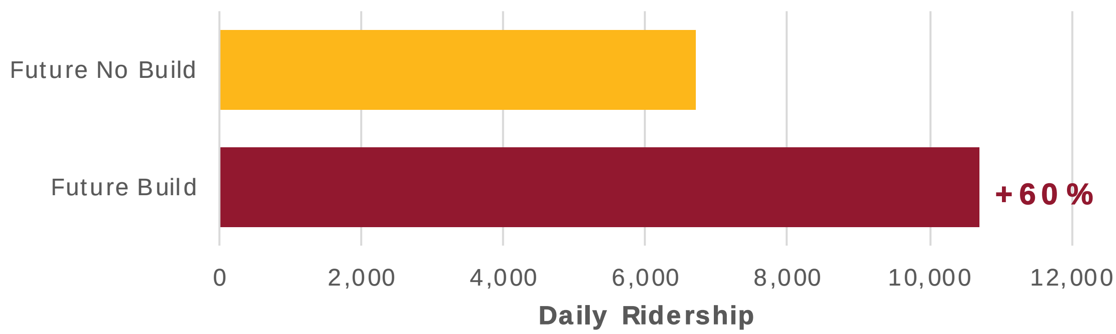
Figure 27 Future Corridor Ridership



7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 4,000 riders per weekday (or 60% increase) is forecast for Corridor 1049 compared to a "baseline" scenario with today's service levels for Route 150.

Figure 28 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1049 is forecast at 51 riders per revenue hour. This would result in an improvement of 32 percent in productivity compared to a future "baseline" of 38 riders per revenue hour. Both productivity values would exceed the productivity in 2019 and 2023 for Route 150 of 24 and 20 riders per revenue hour (respectively). At 51 riders per revenue hour, Corridor 1049 would rank fourth highest out of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

8.1 Equity Priority Areas

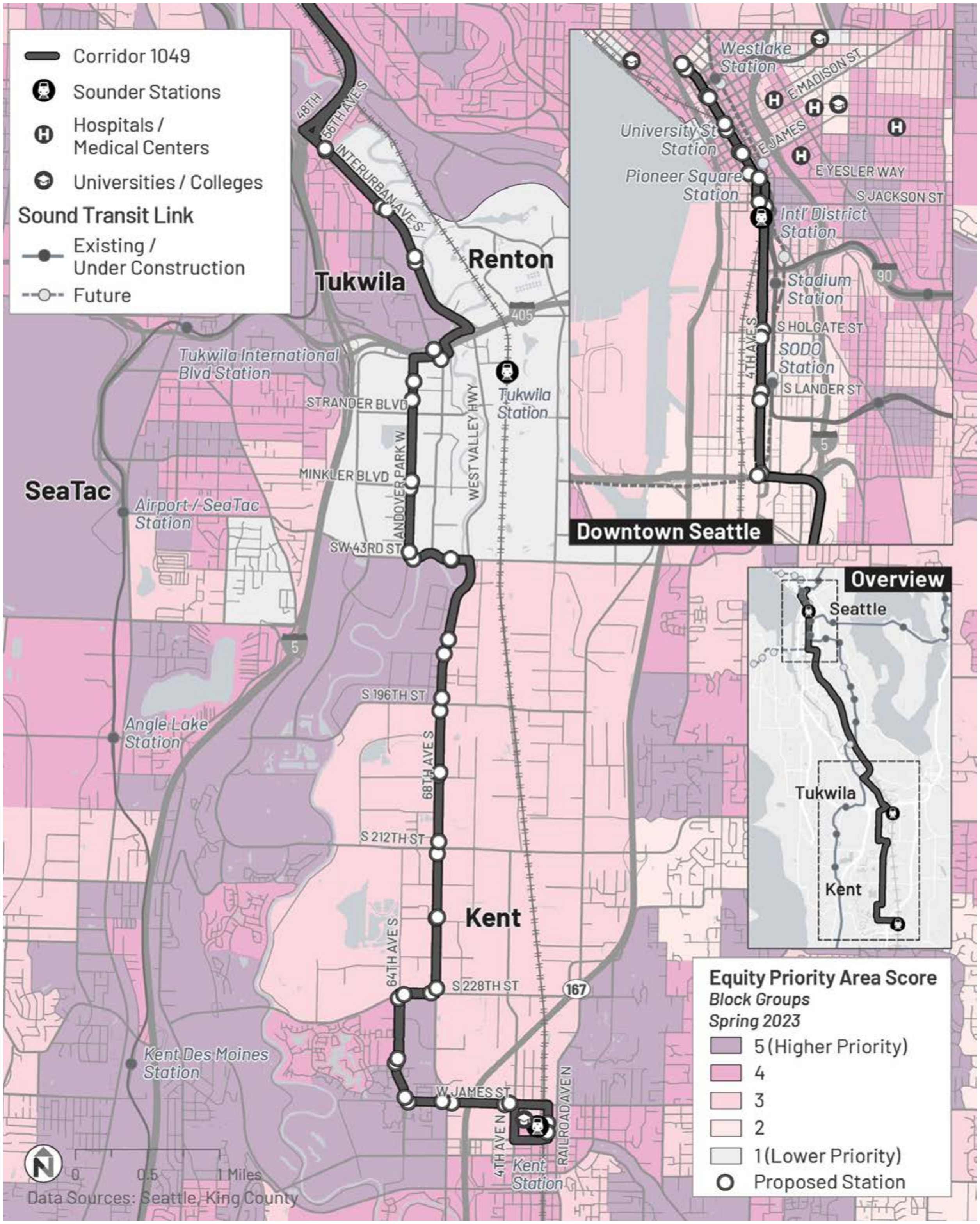
King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[9] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 29 displays equity priority area scores for block groups located along Corridor 1049. In the southern portion of the corridor, the route serves high equity priority areas in Tukwila along Interurban Avenue S and in Kent along 68th Avenue S, 64th Avenue S, W James St, and near the Kent Sounder station. In the northern portion of the corridor, the route serves high equity priority areas in the Downtown and Chinatown-International District neighborhoods of Seattle.

The Southcenter area has the lowest equity priority area score, largely because there are so few residential areas there. However, this is an important area because of a high concentration of low to medium wage jobs and it offers access to services and shopping for higher-scoring equity priority areas elsewhere along the corridor.

[9] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 29 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 30 and Figure 31 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[10] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Route 150, ridership retention was more than 20 percentage points higher than the regional average. This reflects the somewhat unique nature of the route (traveling to downtown Seattle via I-5); employment centers in SODO, Tukwila, and the Kent Industrial Valley having more industrial and retail jobs that are less of a fit for remote work; as well as a higher portion of ridership that may not have access to alternative travel options.

[10] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 30 Ridership Retention (Fall 2020)

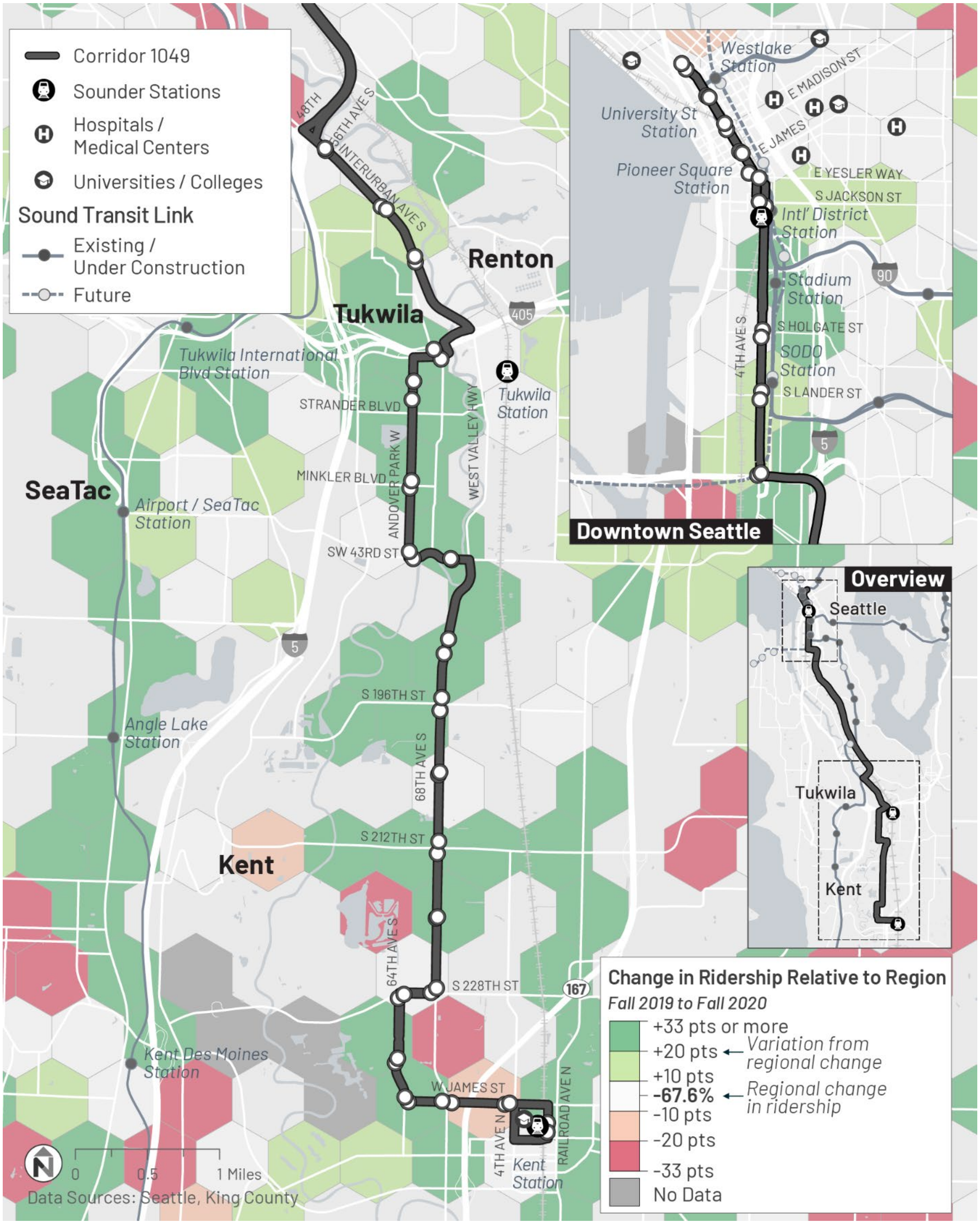

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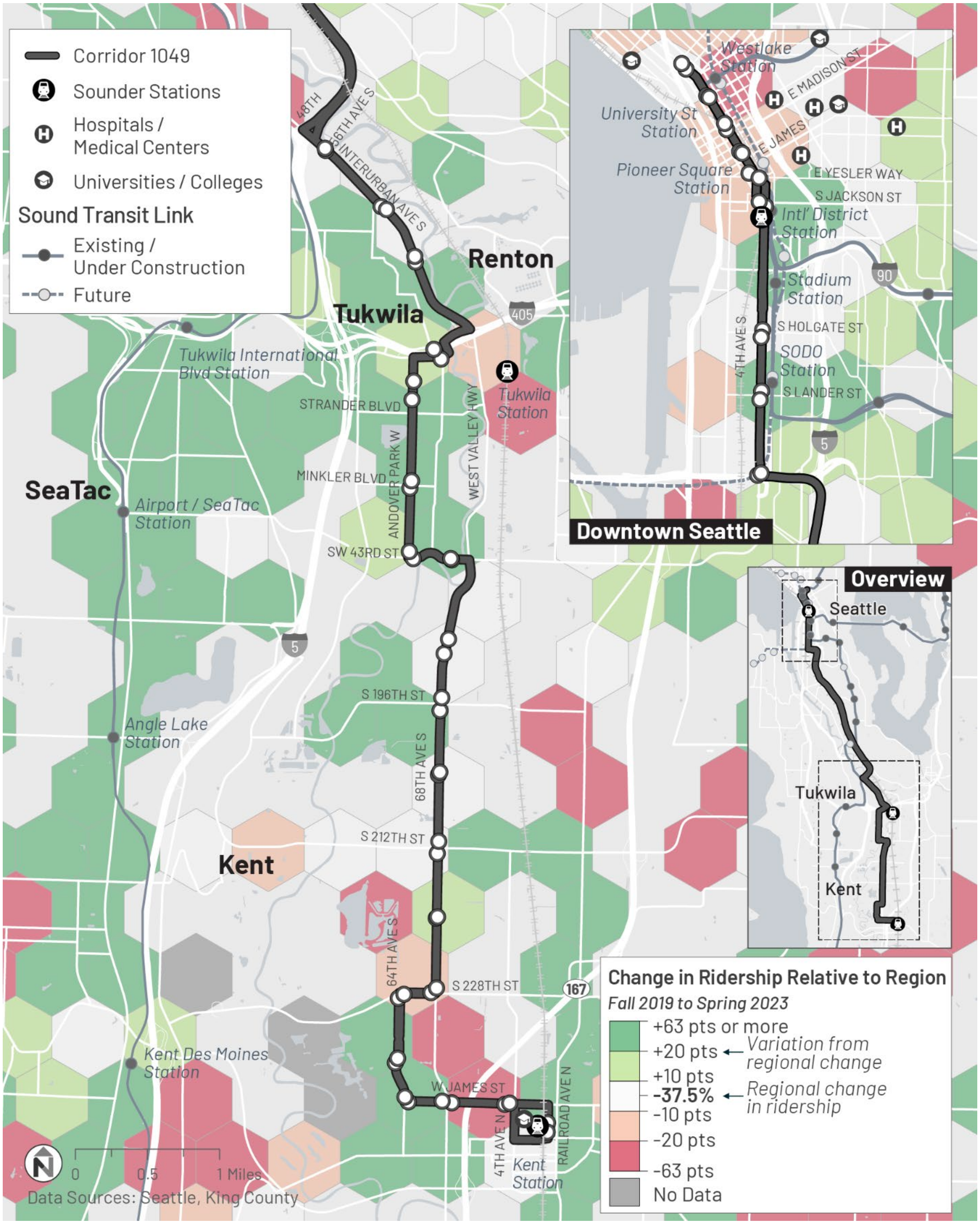
Figure 31 Ridership Retention (Spring 2023)



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8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Route 150 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[11] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 5% for priority populations along the corridor. Compared to other candidate RapidRide corridors, this is the lowest increase in job access.

8.4 GHG Emissions

Ridership gains – and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 150 – will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[12] Approximately 5.86 metric tons of CO_2 would be reduced daily due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the largest reduction.

[11] An “average” access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[12] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 59 intersections along Route 150 to evaluate transit travel time benefits of the proposed improvements. Out of the 59 intersections, 19 signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 40 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values foreach LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 32 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 32 Modeled Delay from Synchro

			Transit Delay (seconds)			Traffic Delay (seconds)		
ID	Intersection	Traffic Control	Existing	2035 Baseline	2035 Build	Existing	2035 Baseline	2035 Build
Southbound								
201	4th Ave S & Holgate St	Signal	19.2	36.8	36.8	19.2	36.8	36.8
202	4th Ave S & Lander St	Signal	63.4	115.8	115.8	63.4	115.8	115.8
203	4th Ave S & Spokane St	Signal	15.7	18.6	13.4	15.7	18.6	16.2
204	Interurban Ave S & I-405 Ramp	Signal	45.3	66.0	62.3	45.3	66.0	62.3
205	Interurban Av & Southcenter Blvd	Signal	42.6	40.5	40.2	42.6	40.5	40.2
206	66th Ave S & Southcenter Blvd	Signal	6.7	8.1	7.8	6.7	8.1	7.8
207	Southcenter Blvd & 61st Ave S	Signal	64.1	111.0	104.6	64.1	111.0	104.6
208	Tukwila Pkwy & 61st Ave S	Signal	18.5	23.1	23.5	18.5	23.1	23.5
209	Tukwila Pkwy & I-405 Ramp	Signal	4.6	5.6	5.6	4.6	5.6	5.6
210	Andover Park W & Tukwila Pkwy	Signal	5.7	8.8	8.9	5.7	8.8	8.9
211	Andover Park W & Strander Blvd	Signal	39.7	43.2	42.9	39.7	43.2	42.9
212	Andover Park W & Minkler Blvd	Signal	38.7	50.7	32.6	38.7	50.7	32.6
213	Andover Park W & S 180th St	Signal	62.6	65.6	65.6	62.6	65.6	65.6
214	Andover Park E & S 180th St	Signal	8.5	13.0	13.4	8.5	13.0	13.4
215	68th Ave S & S 212th St	Signal	219.1	248.4	248.4	219.1	248.4	248.4
216	68th Ave S & S 228th St	Signal	25.0	28.6	25.4	25.0	28.6	25.4
217	64th Ave S & S 228th St	Signal	15.2	25.2	25.2	15.2	25.2	25.2
218	Washington Ave & W James St	Signal	67.1	114.1	114.1	67.1	114.1	114.1
219	4th Ave N & W James St	Signal	28.5	34.8	24.7	28.5	34.8	37.6

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	2035 Baseline	2035 Build	Traffic Delay (seconds) Existing	2035 Baseline	2035 Build
Northbound								
219	4th Ave N & W James St	Signal	48.0	63.0	63.0	48.0	63.0	63.0
218	Washington Ave & W James St	Signal	48.6	86.9	58.5	48.6	86.9	58.5
217	64th Ave S & S 228th St	Signal	9.8	9.2	9.2	9.8	9.2	9.2
216	68th Ave S & S 228th St	Signal	48.8	132.6	77.7	48.8	132.6	77.7
215	68th Ave S & S 212th St	Signal	29.8	29.5	26.4	29.8	29.5	30.6
214	Andover Park E & S 180th St	Signal	16.8	22.5	22.5	16.8	22.5	22.5
213	Andover Park W & S 180th St	Signal	28.2	31.3	31.3	28.2	31.3	31.3
212	Andover Park W & Minkler Blvd	Signal	37.8	48.8	27.0	37.8	48.8	27.0
211	Andover Park W & Strander Blvd	Signal	37.1	38.3	38.3	37.1	38.3	38.3
210	Andover Park W & Tukwila Pkwy	Signal	43.3	98.3	98.3	43.3	98.3	98.3
209	Tukwila Pkwy & I-405 Ramp	Signal	6.7	4.6	4.6	6.7	4.6	4.6
208	Tukwila Pkwy & 61st Ave S	Signal	9.6	11.3	11.3	9.6	11.3	11.3
207	Southcenter Blvd & 61st Ave S	Signal	32.9	60.5	60.5	32.9	60.5	60.5
206	66th Ave S & Southcenter Blvd	Signal	25.0	28.1	28.1	25.0	28.1	28.1
205	Interurban Av & Southcenter Blvd	Signal	80.6	127.4	127.4	80.6	127.4	127.4
204	Interurban Ave S & I-405 Ramp	Signal	33.1	33.0	32.2	33.1	33.0	32.2
203	4th Ave S & Spokane St	Signal	33.0	35.2	34.5	33.0	35.2	38.6
202	4th Ave S & Lander St	Signal	27.9	25.8	3.4	27.9	25.8	19.4
201	4th Ave S & Holgate St	Signal	43.8	38.5	26.0	43.8	38.5	47.1

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 33 summarizes the number of crashes along the corridor by severity level and mode. There were 761 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 24% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 10% resulted in a fatality or serious injury.

Pedestrian involved crashes had the highest rate of severe and fatal crashes. Even though pedestrian crashes overall represented approximately 16% of crashes along the corridor, they accounted for almost half (46%) of crashes with serious injuries or fatalities.

Figure 33 Crash Summary

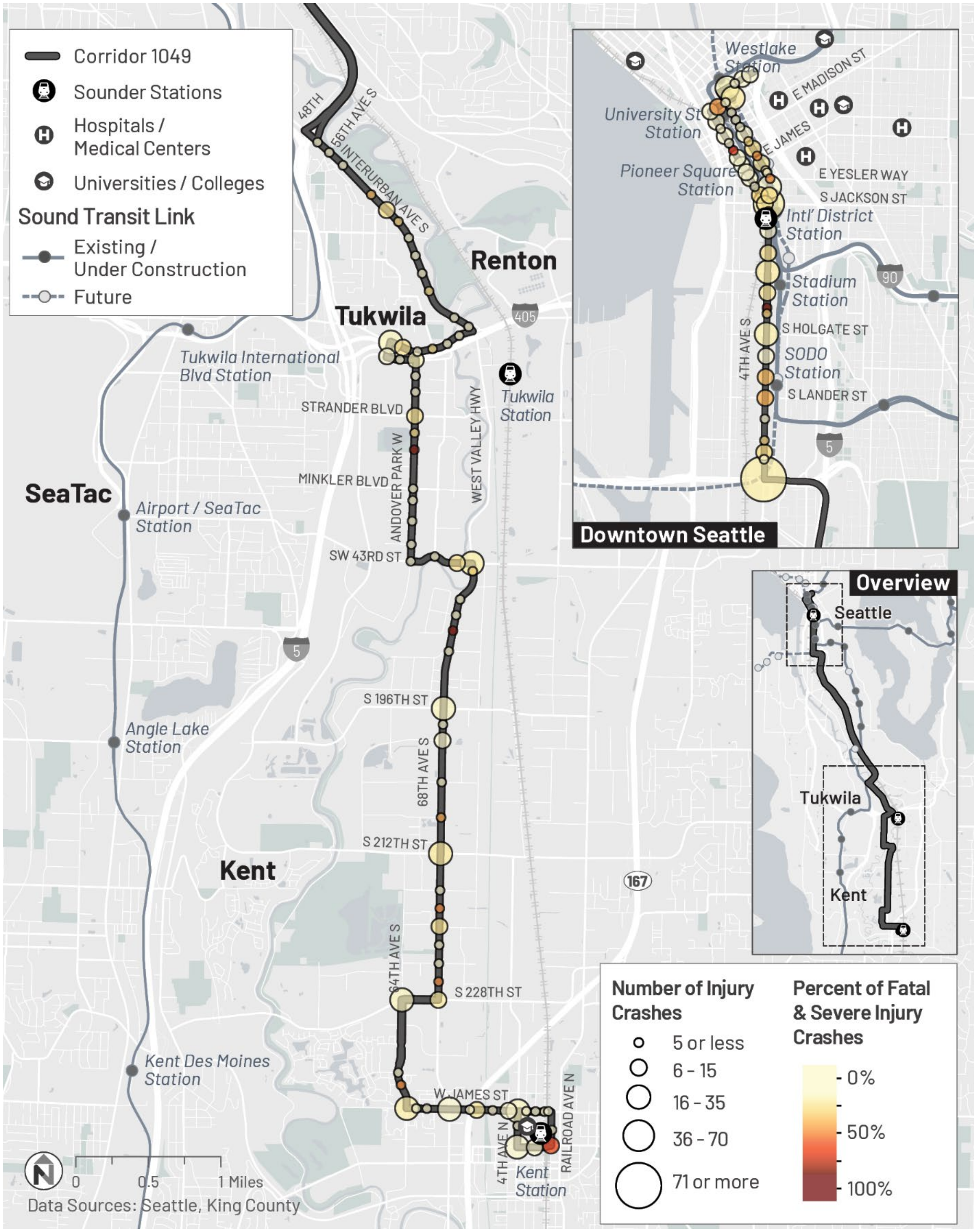
Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	6	1%	6	5%	1	2%	**13**	**2%**
Serious Injury	31	5%	30	25%	4	6%	**65**	**9%**
Minor Injury	154	27%	32	27%	27	41%	**213**	**28%**
Possible Injury	384	67%	52	43%	34	52%	**470**	**62%**
Total	**574**	**100%**	**120**	**100%**	**66**	**100%**	**761**	**100%**

Source: WSDOT (2018-2022)

Figure 34 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections (such as S Royal Brougham Way, S Holgate Street, S Spokane Street, 61st Avenue S at both Southcenter Blvd and Tukwila Pkwy, S 180th Street & 68th Avenue S, S 196th Street, S 212th Street, S 228th Street & 64th Avenue S) and along busy corridors such as 2nd and 4th Ave in Downtown Seattle and W James Street in Kent.

Figure 34 Crash Locations



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11.0 Planned Improvements

Route 150 serves the cities of Seattle, Tukwila, and Kent. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36.

Major projects include a planned roadway reconstruction along 4th Avenue S that will include operational/ITS improvements and a center median pilot as part of SDOT's Vision Zero initiatives. The City of Kent will be investing in pedestrian and bicycle access and safety improvements in the downtown Kent area.

Figure 35 Planned Jurisdictional Investments

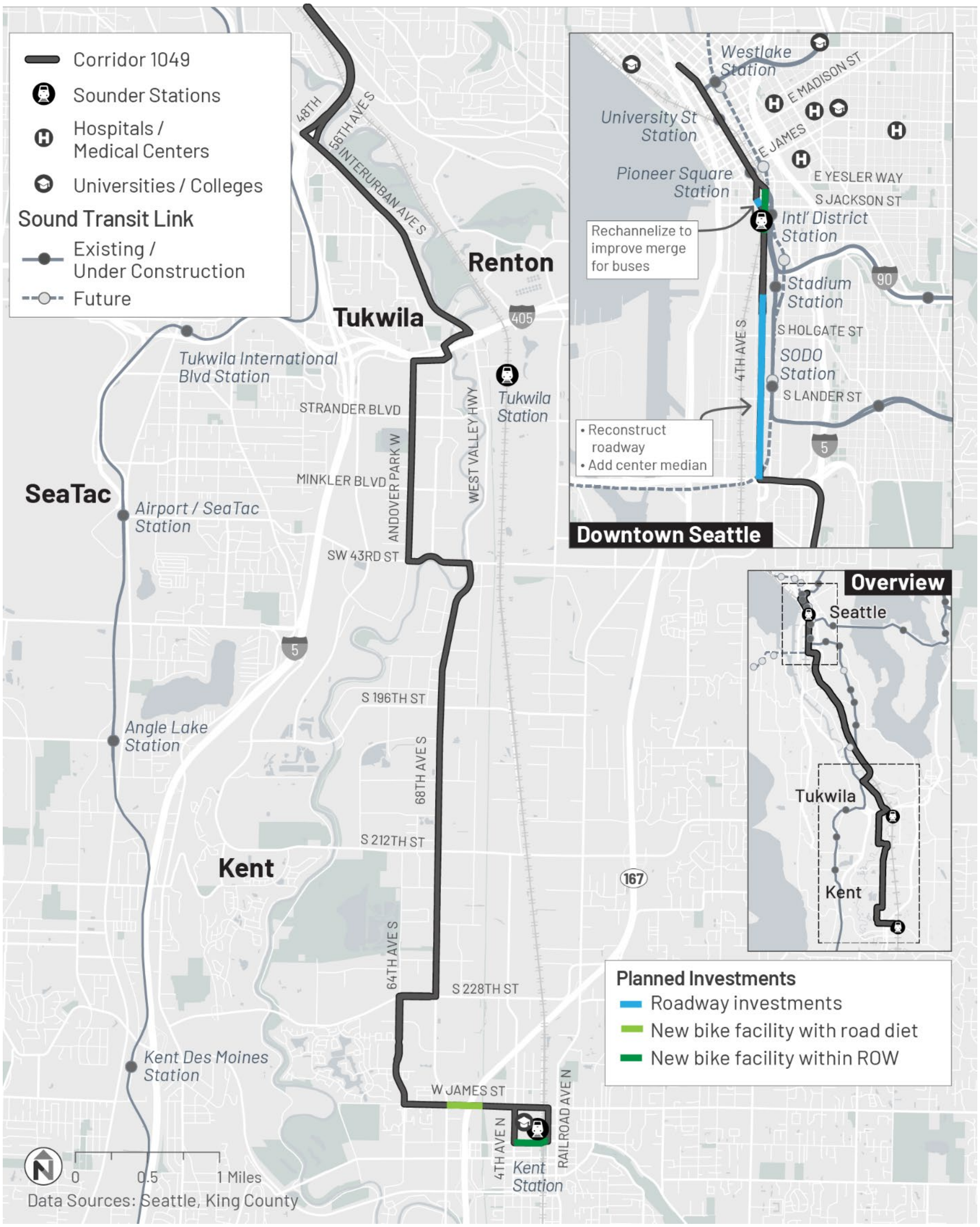

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Figure 36 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Ped Crossing Improvement	HAWK/PHB pedestrian crossing signal and crossing improvements.	W Smith St at Railroad Ave N	Kent Transportation Master Plan Kent 2024-2029 TIP
2	Improve Ped/Bike connectivity	Plan pathway and construct bicycle facilities to connect the Interurban and Kent Station	W Smith St (4th Ave N - Railroad Ave N)	Kent Transportation Master Plan
3	Improve Ped/Bike connectivity	Improve the pedestrian and bicycling experience between the underutilized Kent/James St Park & Ride and Kent Sounder Station.	W James St (Lincoln Ave N - Railroad Ave N) / W Smith St (4th Ave N - Railroad Ave N)	Kent Transportation Master Plan Kent 2024-2029 TIP
4	Kent Station Access Improvements	Construct capital improvements to facilitate access to Kent Station for pedestrians, bicyclists, and drivers. Improvements include additional parking facilities (+/- 450 spaces), pedestrian access improvements, bicycle route improvements and bicycle storage.	Railroad Ave N (W James St - W Smith St)	PSRC Regional Transportation Plan 2022-2050
5	Transit Signal Priority	Implement an adaptive signals and transit signal priority in the City core to improve speed and reliability for transit, movement of goods and people that dynamically adapts to conditions	W James St (4th Ave N - Railroad Ave N) Railroad Ave N (W James St - W Smith St) W Smith St (4th Ave N - Railroad Ave N) 4th Ave N (W James St - W Smith St)	Kent Transportation Master Plan Kent 2024-2029 TIP
6	Ped Crossing Improvements	Install pedestrian gates in the northwest and southeast quadrants. Connect pedestrian gates to existing railroad crossing gate system.	W Smith St at BNSF tracks	Kent 2024-2029 TIP
7	Kent - City Safety Road Diets	This project has three separate locations where the existing roads will be converted to a three-lane roadway with bike lanes. Project locations: (#1) S 260th St -S 259th Pl, from Pacific Hwy to Military Rd S; (#2) Meeker-Lincoln-Smith, from Washington Av	W Smith St at 4th Ave / 4th Ave N at W James St	Kent Transportation Master Plan Kent 2024-2029 TIP PSRC 2023-2026 Regional TIP
8	New sidewalks	Sidewalks (both sides) from 1st Ave N and Railroad Ave N.	James St (1st Ave N - Railroad Ave N)	Kent Transportation Master Plan

ID	Improvement	Description	Extent	Source
9	Kent Transit Center - Access, Mobility and Safety Improvements	Create an eastbound right-turn lane on E James St to Railroad Ave North extending from 1st Ave North to Railroad Ave N. This project will also extend the eastbound bicycle facility on James St that currently terminates approaching the 1st Ave N intersection. In addition, improved pedestrian facilities are planned along the north and south sides of E James St, improving mobility and safety for these users.	W James St (1st Ave N - Railroad Ave N)	Kent 2024-2029 TIP
11	Interurban Trail Crossing Improvements	Construct improved crossing enhancements at four locations along the Interurban Trail. Rebuild the traffic signal and provide crossing improvements at James St.	W James St at Interurban Trail	Kent Transportation Master Plan Kent 2024-2029 TIP
12	Road Diet (4 to 3 lanes) with striped bike lanes	Road Diet (4 to 3 lanes) with striped bike lanes including a traffic analysis prior to design.	James St (Washington Ave N - Interurban Trail)	Kent Transportation Master Plan Kent 2024-2029 TIP
13	Transit Signal Psriority	Implement an adaptive signals and transit signal priority in the City core to improve speed and reliability for transit, movement of goods and people that dynamically adapts to conditions	SR 181/W James St	Kent 2024-2029 TIP
16	Sidewalk improvement	Improve sidewalks and bike facilities from the Green River Trail and the Interurban Trail.	S 228th St at SR 181	Kent Transportation Master Plan
18	Signal Optimization	Optimize signal timing and reconfigure lanes to add a westbound right turn lane and remove one westbound through lane.	SR 181 at S 212th St	Kent Transportation Master Plan
19	S Spokane St ITS Upgrades	Install ITS equipment along the corridor to collect and provide real-time travel time information for trucks and the general public. Specific equipment would include Bluetooth readers and dynamic message signs installed along the corridor to collect and disseminate travel time information between S Airport Way and Chelan Ave SW, including access to Port Terminal 5. An additional project component, which has not yet been evaluated for cost, may be to improve the signal system at the intersection of Chelan Ave SW at the western terminus of the corridor.	S Spokane St (4th Ave S to S Airport Way)	SDOT Freight Master Plan
22	Vision Zero	This work will pilot a center median along 4th Ave S from S Massachusetts St to S Holgate St. Scope will also include increasing ped walk time and LPI at S Holgate St and 4th Ave S and speed limit reduction with signage from S Massachusetts St to S Holgate St.	4th Ave S (Edgar Martinez Dr S to S Spokane St)	SDOT dotMaps

ID	Improvement	Description	Extent	Source
23	4th Ave S Reconstruction and ITS Implementation	Reconstruct and make operational/ITS improvements to 4th Ave S	4th Ave S (S Royal Brougham Way - S Lander St)	SDOT Freight Master Plan
27	Protected Bike Lanes	Upgrade the existing two way bike lane on the Southwest side of 4th Ave to a protected bike lane with barrier separation. Barriers placed to not interfere with loading zones, driveways, and other areas which require street side access	4th Ave S (Yesler Way - Seattle Blvd S)	SDOT Recommended Bicycle Network Map, SDOT 2021-2024 BMP Implementation Plan SDOT dotMaps
29	Lane Re-channelization	Re-channelize southbound 2nd Ave and Jackson St to improve merge for buses	2nd Ave Ext S (S Jackson St - 4th Ave S)	SDOT dotMaps
30	Third Ave Transit Spine	The project includes investments to increase capacity, optimize operations, and improve the traveler experience for transit in this corridor. The project reconfigures the corridor to increase transit capacity and improve operations, expanded transit stops, and installations to improve the traveler experience. The project incorporates ITS, wayfinding, traveler information systems, and electric trolley wire infrastructure. It also includes elements that support bus rapid transit such as dedicated running ways, transit signal priority features, and enhanced fare collection systems. Enhancements to improve access to transit may include pedestrian and bicycle access improvements and amenities such as secure and covered bike parking, digital kiosks, real-time information, lighting, and integrated access.	3rd Ave (Pine St - Yesler Way)	PSRC Regional Transportation Plan 2022-2050 PSRC Proposed 2019-2024 Capital Improvement Program
31	Rapid Ride G Line Projects	Spring St/2nd Ave: EB bus only lanes, EB protected bike lane Spring St/4th Ave: EB bus only lanes, EB protected bike lane Madison St/2nd Ave: WB bus only lane Madison St/4th Ave: WB bus only lane	3rd Ave at Madison St and Spring St	Transit Master Plan, Capital Projects Dashboard, dotMaps, Current Projects
32	Cycle track	Cycle track	Seneca St at 3rd Ave	Recommended Bicycle Network Map
33	Cycle track	Cycle track	Spring St at 3rd Ave	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
34	Seattle CBD - Sand Point - Green Lake	Construct a new RapidRide line connecting Seattle CBD - Sand Point - Green Lake. This project will improve the attractiveness of transit between two Regional Growth Centers and will include the following elements: New transit only or BAT lanes on existing or new right of way along some of the proposed route to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; Upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050
35	RapidRide C Line Improvements	Enhance existing RapidRide C operations with capital components to support efficient and convenient transit service. Capital improvements may include additional bus rapid transit speed and reliability measures such as dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements and supporting facilities.	3rd Ave (Pine St - Columbia St)	Regional Transportation Plan 2022-2050
36	RapidRide D Line Improvements	Enhance existing RapidRide D operations with capital components to support efficient and convenient transit service. Capital improvements may include additional speed and reliability measures such as those identified for new RapidRide corridors including dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements, supporting facilities. Extension of D Line to Northgate and safety improvements to the Ballard Bridge may also be included.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050
37	RapidRide E Line Improvements	Enhance existing RapidRide E operations with capital components to support efficient, safe and convenient transit service including additional bus rapid transit investments. Capital improvements may include additional speed and reliability measures such as BAT lanes, roadway reconstruction, ITS and safety improvements and complementary pedestrian, bike and freight improvements.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050
38	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
39	Priority Bus Corridor (Route 5)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Stop consolidation, Station Upgrades • Investigate multiple termination options on north end • Identify funding to complete improvements outside of Seattle city limits • Consider queue jump options to provide transit priority on Fremont Bridge • Coordinate design of transit priority treatments with ongoing Bicycle Master Plan facility planning on Phinney Ave N	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
40	Priority Bus Corridor (Jefferson/ Yesler)	• Some bus stops have been consolidated and passenger facilities upgraded • The City of Seattle is investing heavily in improved midday service in the corridor • 3rd Ave Transit Corridor Improvements will enhance the pedestrian environment at the intersection of this corridor with the 3rd Ave Transit Spine • Pioneer Square Active Sts Strategy recommends a number of improvements for enhancing pedestrian safety, security and vibrancy of street life on the western end of this corridor; some strategies have been implemented • Electrification of Yesler Way (2nd to 9th) and 9th (Yesler to Jefferson) to reduce turning movements off of Third Ave and to avoid freeway-related congestion on James St • Enhance pedestrian access, particularly around medical center and at key intersections • Provide in-lane bus stops • Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed • Add transit-only lanes or peak period parking restrictions in congested segments of the corridor, particularly where I-5 ramps create peak period traffic congestion • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
41	Westlake Multimodal Transportation Hub	Expand the multimodal hub area to accommodate increased transit service in Downtown and South Lake Union. Make improvements to improve transfer opportunities between transit and other modes, create clear routes and improved wayfinding, provide real-time transit rider information and maximize fare integration. Includes protected bike lane connections, enhanced street furniture, public art, enhanced pedestrian crossings, end-of-trip amenities like secure and covered bike parking, digital kiosks, integrated access amenities like passenger loading zones, dedicated car share stalls, and other multimodal connections. May include satellite access points.	3rd Ave (Pike St - Union St)	Regional Transportation Plan 2022-2050

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Route 150 corridor. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[13]
- Trolley infrastructure (not included in Route 150)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 14. For transit speed and reliability improvements, refer to Figure 21. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 37.

[13] For non-trolley routes only.

Figure 37 Order of Magnitude Project Costs

	Category	% of Total	Costs
	Stops and Stations[14]	42%	$ 8,950,000
	Transit Speed and Reliability Improvements	45%	$ 9,600,000
	Layover and Terminus Facilities	3%	$ 600,000
	Charging Infrastructure	9%	$ 2,000,000
	Trolley Infrastructure	-	-
	Construction Base Subtotal		***$ 21,150,000***
2%	Stormwater Upgrades		$ 430,000
3%	Traffic Control		$ 640,000
10%	Mobilization		$ 2,120,000
2%	TESC		$ 430,000
	Subtotal Construction Cost		***$ 24,770,000***
10.1%	Sales Tax		$ 2,510,000
10%	Construction Contingency		$ 2,730,000
40%	Contingency (Design Allowance and Risk)		$ 12,010,000
	Total Construction Cost		***$ 42,020,000***
10%	Project Management		$ 4,210,000
5%	Planning		$ 2,110,000
15%	Engineering/Design		$ 6,310,000
10%	Construction Management		$ 4,210,000
3%	Environmental Review		$ 1,270,000
2%	Permitting		$ 850,000
	Total Project Cost		***$ 60,980,000***

[14] Note the capacity of Kent Station is uncertain, and therefore the cost of the RapidRide station at Kent Station may be much higher than is accounted for in the assumptions in this report.

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Route 150 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – While the route crosses several designated view corridors in downtown Seattle, the improvements associated with Route 150 will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Route 150 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – Route 150 does not traverse or alter any navigable waterways.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Air Quality - Improvements associated with the project are not anticipated to yield long-term adverse impacts to air quality. The adoption of cleaner and more energy-efficient technologies with zero emission buses will contribute to a healthier and more sustainable urban environment. Best Management Practices (BMPs) for air quality during construction will be implemented to mitigate any minor short-term impacts.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources:

13.3a Cultural Resources

In order to identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The Route 150 corridor passes through Pioneer Square--Skid Road Historic District. The corridor also runs adjacent to Bon Marche Department Store, United Shopping Tower, New Washington Hotel, Moore Theatre and Hotel, Calhoun Hotel, 1411 Fourth Avenue Building, Northern Life Tower, Cobb Building, Seattle First Public School Site, Arctic Building, Rector Hotel, Battle of Seattle Site, Lyon Building, James Nelson House, Seattle Union Station.

Several sites along the alignment are listed or deemed eligible for NRHP and/or local Registers, including those within multiple historic districts. Any alteration or deviation from the established character of these districts or properties would constitute an adverse effect. Preserving the unique historical features of these districts and properties is crucial to avoiding negative impacts on cultural and architectural resources. As such, careful consideration and adherence to preservation principles should guide the project's station design and implementation within these areas.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located along the I-5 near the King County International Airport segment, and in downtown Kent and Seattle.

A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the Ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on the chosen station locations and potential construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. For acquired parcels associated with moderate or high-risk sites, it is recommended to conduct additional Ecology file reviews, examining historical or current release information, and considering potential Phase I or Phase II Environmental Site Assessments (ESAs) during the acquisition process. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 150 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration’s (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

Traffic operational analysis was conducted for 59 intersections along Route 150 to evaluate transit travel time benefits of the proposed improvements. Travel times between the intersections were calculated using the speed and travel distance. The analysis revealed that at 7 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 13 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the projects’ aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 150, can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared, to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. *The FTA Transit Noise and Vibration Impact Assessment Manual* notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 150 corridor include critical areas for liquefaction and steep slopes. These areas will be considered for their potential to impact the project during design. The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures may encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP), a TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

There are wetlands adjacent to the alignment and stops near S 180th Street and 68th Avenue SW, Andover Park W and Treck Drive, and areas where the alignment traverses the Green River.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the alignment of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur. Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.3k Floodplains

The Route 150 and station locations are adjacent to numerous Federal Emergency Management Area (FEMA) 100-year floodplains along Interurban Avenue S. adjacent to the Duwamish River, multiple locations along 68th Avenue SW between S 199th Place and W James Street, and near W James Street and 5th Avenue N.

If project improvements are situated near floodplain buffer areas, there is a potential for adverse effects. A critical areas report will be prepared during the formal environmental review process to confirm the presence and location of floodplains. In cases where station locations are near floodplain areas, relocation may be considered to effects.

13.3l Acquisition and Relocation

Acquisitions for the improvements included in this report involve a 1,800 square foot partial take on southwest corner of W Valley Hwy and S 180th St on the west side of the river. A desktop review revealed that this location is in proximity to the Green River and may impact wetland and FEMA 100-year floodplain buffers. A critical areas report will identify the potential for effects and any needed modifications.

Anticipated property acquisitions are expected to result in minimal effects to other resources as they are limited to the property itself, without impacting existing structures and no displacements are anticipated. Mitigation measures include compensating business and property owners under the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970, as amended. Other potential mitigation efforts could involve considering adjustments to station locations if necessary.

13.4 Cumulative and Indirect Impacts

Route 150 serves the cities of Seattle, Tukwila, and Kent. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. A selection of these projects is mapped in Figure 35 Planned Jurisdictional Investments, and all projects are described in Figure 36 List of Planned Jurisdictional Investments. Major projects include a planned roadway reconstruction along 4th Avenue S that will include operational/ITS improvements and a center median pilot as part of SDOT's Vision Zero initiatives. The City of Kent will be investing in pedestrian and bicycle access and safety improvements in the downtown Kent area.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of "facility modernization" that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way. However, because the project may need to acquire additional property, documentation is required that demonstrates the project will meet the criteria for a CE and that significant environmental effects will not result.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit
- Local Clearing and Grading Permit

RapidRide Prioritization Plan

Corridor 1052 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

King County METRO

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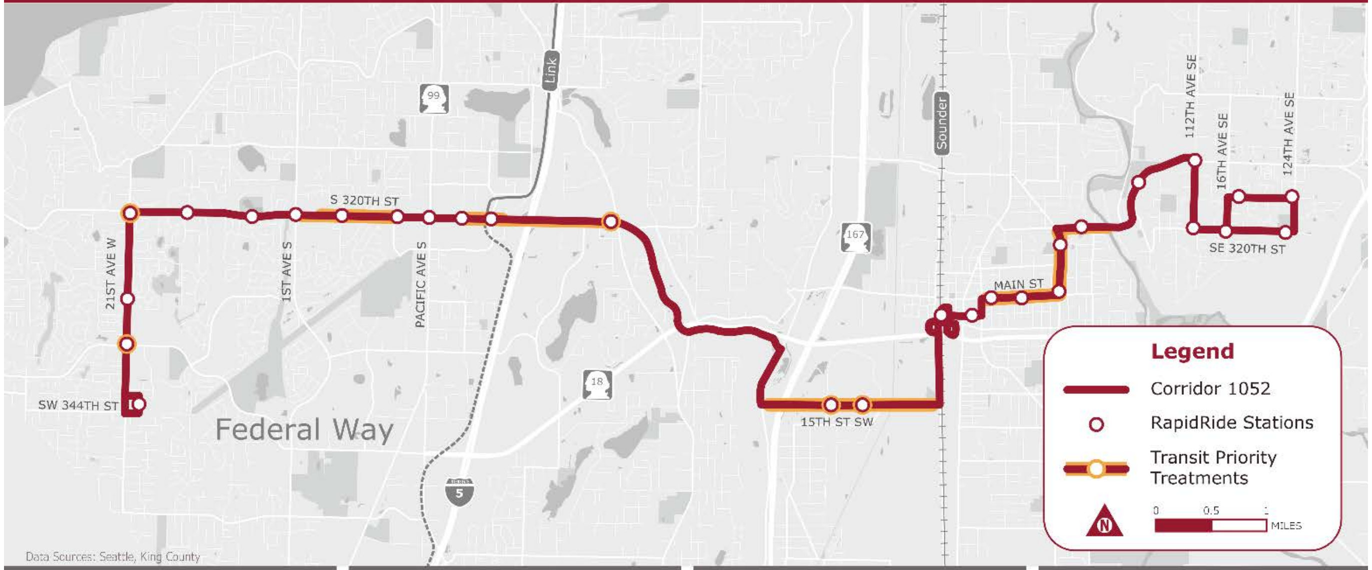
King County METRO

Corridor Summary

Corridor 1052 | Route 181

CORRIDOR SUMMARY



Ridership

No Build

+157%

RapidRide Corridor 1052

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour: +12.8

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour: 35.5

Weekday boardings per revenue hour with RapidRide investment in 2042.

Travel Time

Proposed Travel Time Savings: -19%

Reduction in one way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time: 49

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Equity Priority Area Score

3.8

Average area of need score within 1/2 mile of station locations.

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine corridors for expansion of and further reinvestment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1052 (Route 181). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1052 is currently served by Route 181, which connects the Twin Lakes Park and Ride, through Federal Way and Auburn to Green River College in south King County. The corridor is largely suburban, with key nodes at major destinations such as Green River College, downtown Auburn, and shopping centers such as the Outlet Collection Seattle, and the Commons at Federal Way.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would operate similar to Route 181's alignment, however it would not serve the Federal Way Transit Center, and rather than maintain service along Main St and M St NE in Auburn, it would serve A and B St NW and 8th St NE.

This project conducted a high-level review of the Metro Connects 2050 and interim alignments, as well as the existing Route 181 alignment to identify an alignment to be carried forward to evaluation. Three separate alignments were identified north and east of Downtown Auburn to access 8th St NE, as well the removal of direct service to Federal Way Transit Center.

The result of the alignment screening maintains the existing Route 181 alignment along Main St but removes service from the Federal Way Transit Center.

2.2 Representative Alignment

The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. The representative alignment matches the output from the alignment screening, as no other alignment changes were identified.

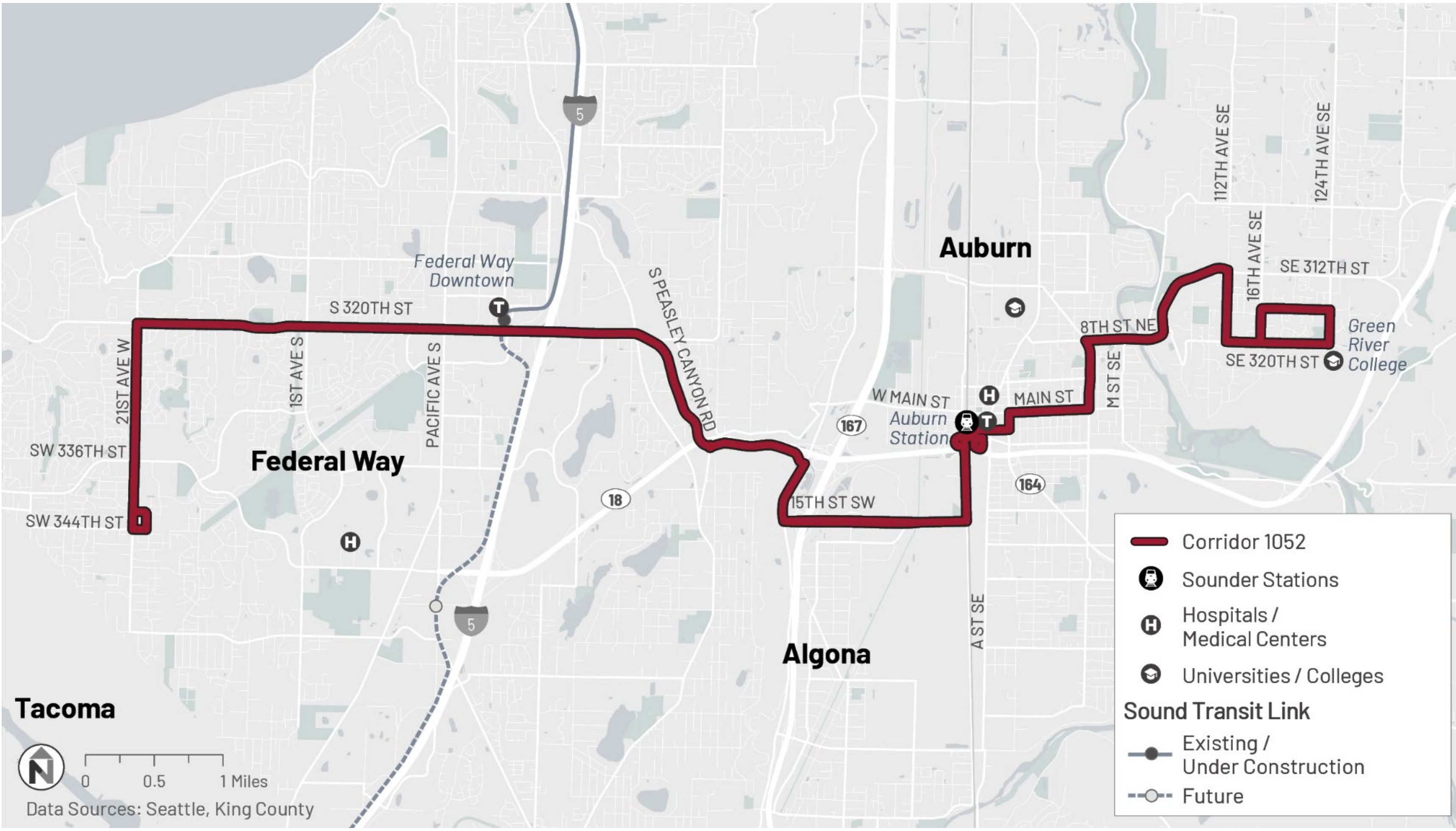
Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 181, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Final Alignment Changes

Alignment Change	Change from… Route 181	Metro Connects	Recommended Alignment in Screening
Eliminate deviation into Federal Way Transit Center, and remain on S 320th St.	✓	✗	✗
Maintain alignment east of Downtown Auburn along Main St and M St NE	✗	✓	✗

RapidRide

Figure 3 Corridor Overview



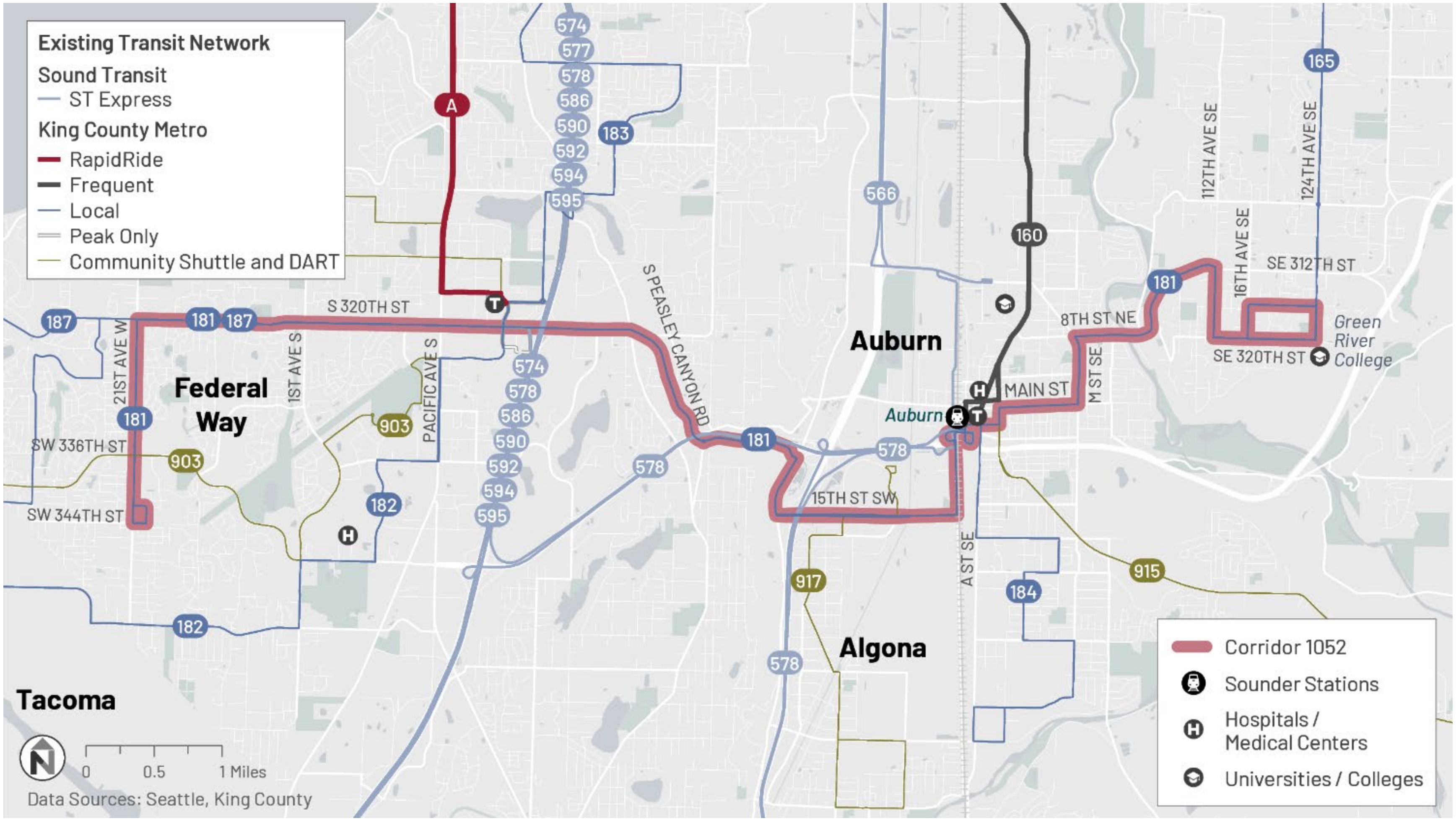
3.0 Transit Network

Route 181 currently provides local bus service, connecting Twin Lakes Park & Ride in Federal Way to Green River College in Auburn, traversing the downtowns of both cities. In the western portion of the alignment, the Federal Way Transit Center connects Route 181 to local and regional bus service, including the RapidRide A Line. In the eastern portion of the alignment, Auburn Station provides connections to additional local and regional bus service, as well as Sound Transit's Sounder commuter rail service.

3.1 Future Network Changes

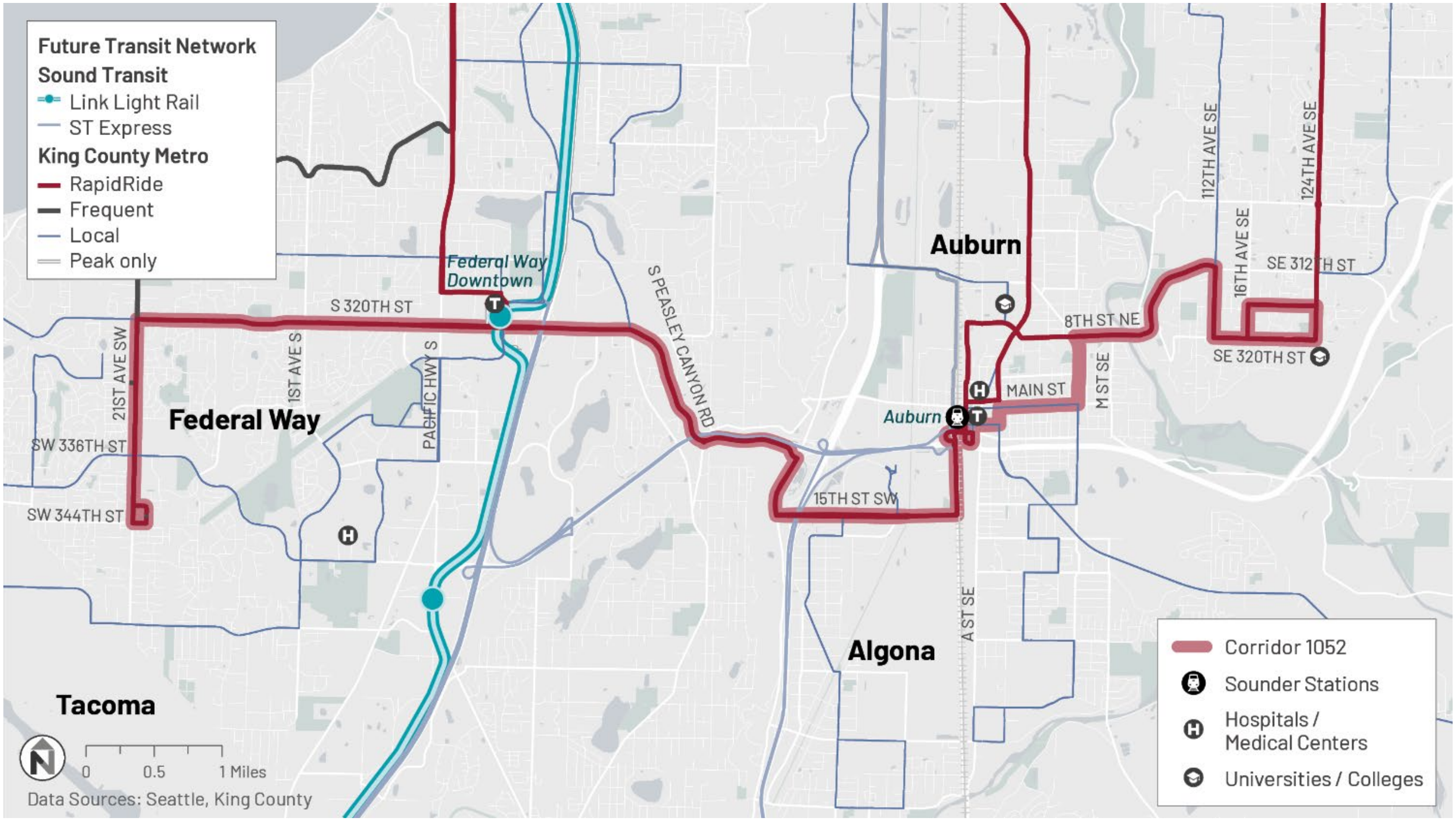
The Metro Connects Interim Network assumes connections between Route 181 and several new transit lines along the alignment. In Federal Way, Route 181 would connect to Link light rail service at Federal Way Downtown Station and north-south RapidRide service in Downtown Auburn and near Green River College. The Federal Way Transit Center and Auburn Sounder station would remain transit hubs connecting Route 181 to local and regional bus and commuter rail service.

Figure 4 Existing Transit Network



King County METRO

Figure 5 Metro Connects Interim Network



4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 181 currently operates infrequent service for most of the day, every day. On Weekdays, route 181 operates every 30 minutes from 5 am to 6 am, and every 20 minutes from 6 am to 9 am, every 30 minutes from 9 am to 10 pm, and every 60 minutes until midnight. On Saturdays, Route 181 runs every 60 minutes from 6 am to 7 am, every 30 minutes from 7 am to 10 pm, and every 60-minute until midnight. On Sundays, Route 181 starts service at 7 am with service every 60 minutes, increasing to every 30 minutes between 8 am and 8 pm, before operating every 45-60 minutes until 10 pm.

Figure 6 Existing Route 181 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>60</td><td>30</td><td colspan="3">20</td><td colspan="12">30</td><td colspan="3">60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td></td><td>60</td><td colspan="15">30</td><td colspan="2">60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td></td><td></td><td>60</td><td colspan="12">30</td><td colspan="2">45-60</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency on Weekdays, Metro would need to increase Route 181 frequency with at least three additional trips per hour for the morning peak period between 6 am to 9 am, at least two trips per hour for midday service between 9 am to 3 pm, at least four additional trips per hour for afternoon peak period between 3 pm and 7 pm, and at least one additional trip per hour for evening service between 9 pm and midnight. On Saturdays, Route 181 would need to add at least three trips per hour for 6 am, two additional trips per hour between 7 am and 7pm, and one additional trip per hour between 10 pm and midnight. On Sundays, Route 181 would need to add frequency and span. It needs at least four trips per hour for 6 am, three trips per hour for 7 am, two trips per hour between 8 am and 7 pm, and one additional trip per hour between 8 pm and 10 pm.

Figure 7 shows the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	3	3	3	2	2	2	2	2	2	4	4	4	4	-	-	1	1	1	-	-	-	-
Saturday	-	-	3	2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	1	1	-	-	-	-
Sunday	-	-	4	3	2	2	2	2	2	2	2	2	2	2	2	-	1	1	-	-	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>60</td><td>30</td><td colspan="3">10</td><td colspan="6">15</td><td colspan="4">10</td><td colspan="2">30</td><td colspan="3">30</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td></td><td colspan="13">15</td><td colspan="2">30</td><td colspan="3">30</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td></td><td colspan="13">15</td><td>30</td><td colspan="4">30</td><td></td><td></td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round-trip will take 98 minutes during the PM peak and 79 minutes during off-peak hours. Assuming the number of trips identified above needed to achieve the minimum RapidRide standard, the corridor would require an increase of approximately 49 service hours each weekday (or a 53% increase), 22 hours on Saturday, and 36 hours on Sundays.

Figure 9 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would also need three additional buses on weekdays to meet this increased level of service (12 buses, relative to the existing 9 buses needed on weekdays). Two additional buses would be needed on Saturdays and Sundays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	Percent
Daily Service Hours				
Weekday	92	152	+60	+65%
Saturday	75	11	+36	+47%
Sunday	61	111	+50	+82%
Daily One-Way Trips				
Weekday	78	158	+80	+103%
Saturday	63	124	+61	+97%
Sunday	52	124	+72	+138%
Fleet				
Weekday	9	12	+3	+33%
Saturday	5	7	+2	+40%
Sunday	5	7	+2	+40%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require at least two layover spaces on each end of the corridor if layover time is distributed proportionally between both termini.[1] Without additional layover capacity at Green River College, most layover time may need to occur at Twin Lakes Park & Ride. In this scenario, layover spaces would be needed.[2]

[1] A one-way travel time of approximately 48 to 51 minutes requires a layover of 10 minutes (20% layover). With buses every 10 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.
[2] A roundtrip travel time of 99 minutes requires a layover of 20 minutes. With buses every 10 minutes, there could be up to three buses at one time.

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a Green River College

Green River College serves as the existing terminus of Routes 165 and 181. The existing layover space is an on-street pullout on SE 320th Street in the eastbound direction. It is approximately 120 feet long, accommodating only two coaches. Limited street connectivity and lack of a way to turnaround require both routes to use a 1.5 mile terminal loop. There are no off-street layover locations in this area.

To accommodate both the 181 RapidRide, as well local service on Route 165 (or even the 165 RapidRide), a longer pullout will be needed. Otherwise, coordination with Green River College will be needed to identify a terminus location on the Green River College campus. With operational concerns associated with live looping a RapidRide line, additional layover at Green River will likely need to be pursued.

4.5b Twin Lakes Park & Ride

Twin Lakes Park & Ride is a King County Metro-owned facility in Federal Way. It currently only serves Route 181, though in the past served more routes as well as services from Pierce Transit.

Layover at this location is currently underutilized. Route 181 uses Bay 2, a sawtooth pullout, and an additional unused sawtooth pullout sits unused at Bay 1. Additionally, there is 270 feet of additional layover space on the access road entering the park & ride from 21st Ave SW. This would be enough to accommodate four articulated buses at one time. There are no existing charging facilities on-site.

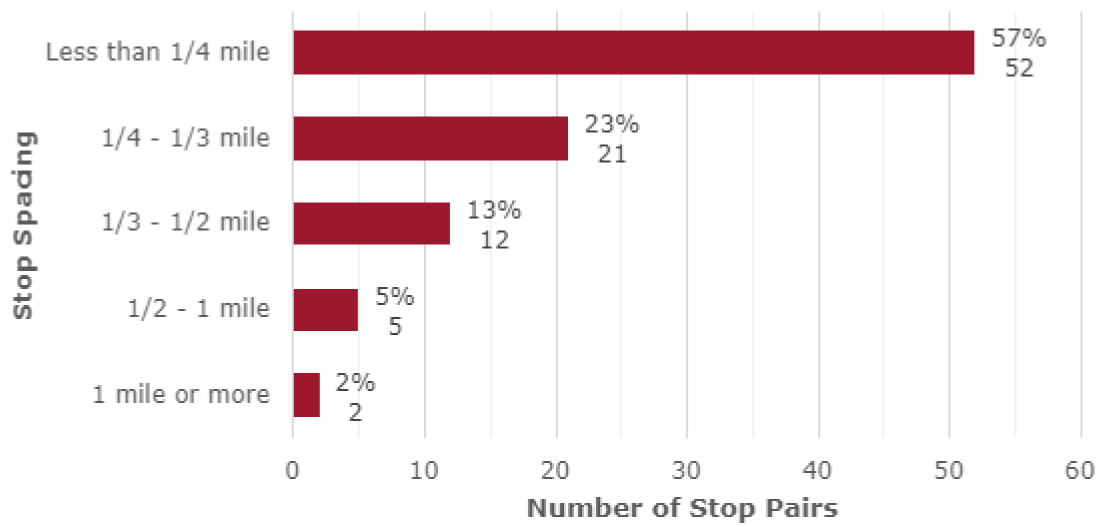
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,700 feet (or approximately one-third mile).

Approximately 60% of stop pairs along the corridor are less than a quarter mile, and with an additional 23% between a quarter and third of a mile (Figure 10).

Figure 10 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

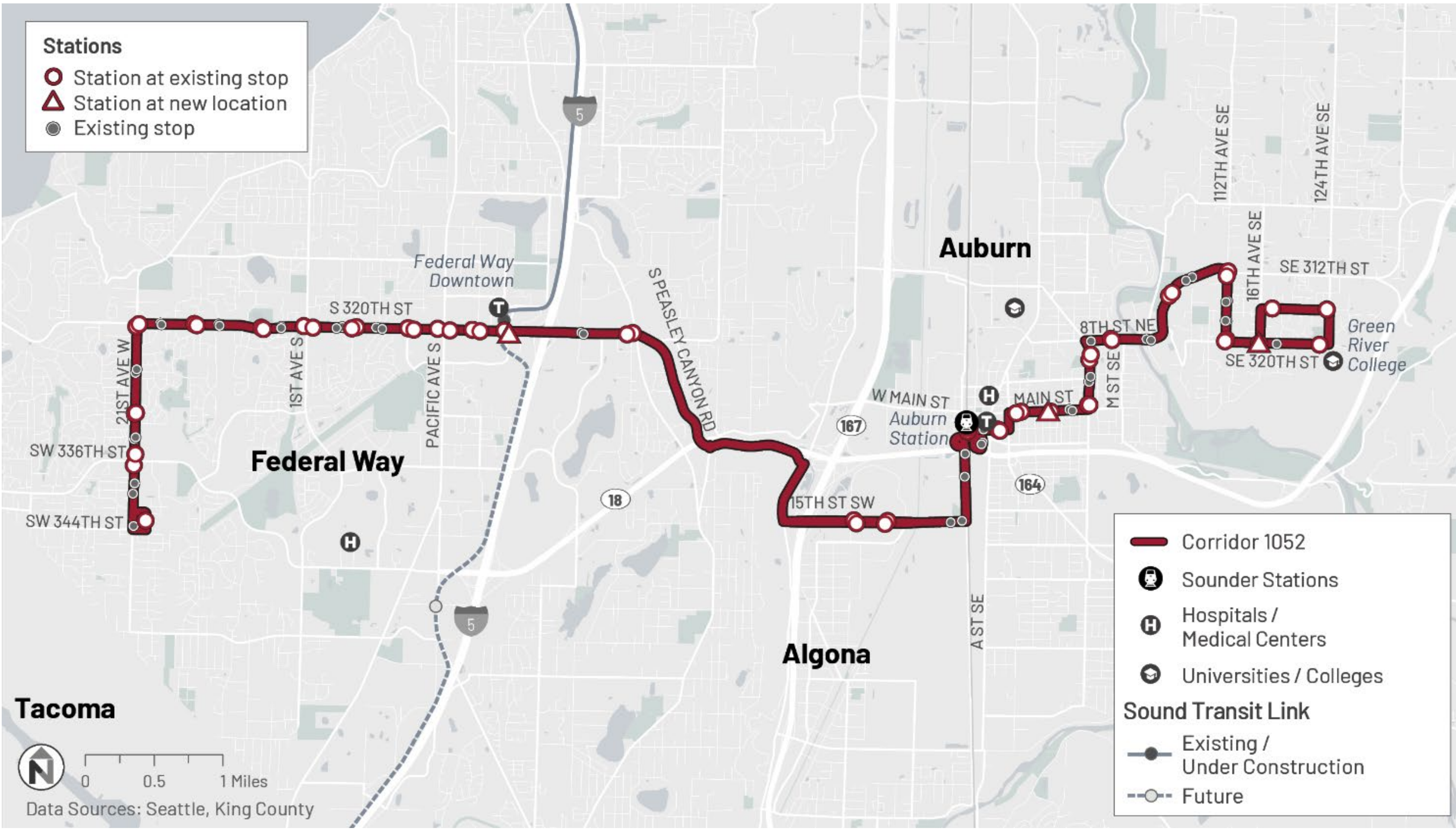
5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 11. The average spacing would be 2,810 feet, or approximately a half mile, which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 11 Proposed Station Locations



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5.4 Station Typologies

There are four station types identified in King County Metro’s RapidRide program. These types, described in Figure 12, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 53.

Figure 12 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 35), each station is categorized into one of the four potential station typologies. The typologies are listed in Figure 13 and summarized in Figure 13.

Figure 13 Station Boardings and Typology

#	Station	Forecast Boardings		Typology	
		EB	WB	EB	WB
1	Green River College	-	890	-	Large Raised
2	SE 316th St & 124th Ave SE	-	10	-	Small
3	SE 316th St & 117th Pl SE	-	10	-	Small
4	SE 320th St & 116th Ave SE	10	10	Small	Small
5	112th Ave SE & SE 320th St	10	10	Small	Small
6	112th Ave SE & Lea Hill Rd SE	10	10	Small	Small
7	Lea Hill Rd SE & 106th Pl SE	10	10	Small	Small
8	8th St NE & Pike St/Henry Rd	10	10	Small	Small
9	M St NE & 6th St NE	10	50	Small	Medium

#	Station	Forecast Boardings		Typology	
		EB	WB	EB	WB
10	M St NE & E Main St	10	10	Small	Small
11	E Main St & H St SE	10	10	Small	Small
12	E Main St & D St SE	10	10	Small	Small
13	2nd St SE & B St SE	10	10	Small	Small
14	Auburn Transit Center	370	500	Large Raised	Large Raised
15	15th St SW & Market St	70	150	Medium	Large
16	15th St SW & O St	230	310	Large	Large
17	S 320th St & Military Rd S	120	130	Medium	Medium
18	S 320th St & 23rd Ave S	400	330	Large Raised	Large
19	S 320th St & 20th Ave S	20	50	Small	Medium
20	S 320th St & Pacific Hwy S	30	40	Small	Small
21	S 320th St & 11th Pl S	60	40	Medium	Small
22	S 320th St & 5th Ave S	30	10	Small	Small
23	S 320th St & 1st Ave S	30	10	Small	Small
24	SW 320th St & 6th Ave SW	40	10	Small	Small
25	SW 320th St & 13th Ave SW	10	10	Small	Small
26	SW 320th St & 21st Ave SW	80	20	Medium	Small
27	21st Ave SW & SW 330th St	90	10	Medium	Small
28	21st Ave SW & SW 336th St/Campus Dr	150	10	Large	Small
29	Twin Lakes Park & Ride	650	-	Large Raised	-

Figure 14 Station Typology Summary

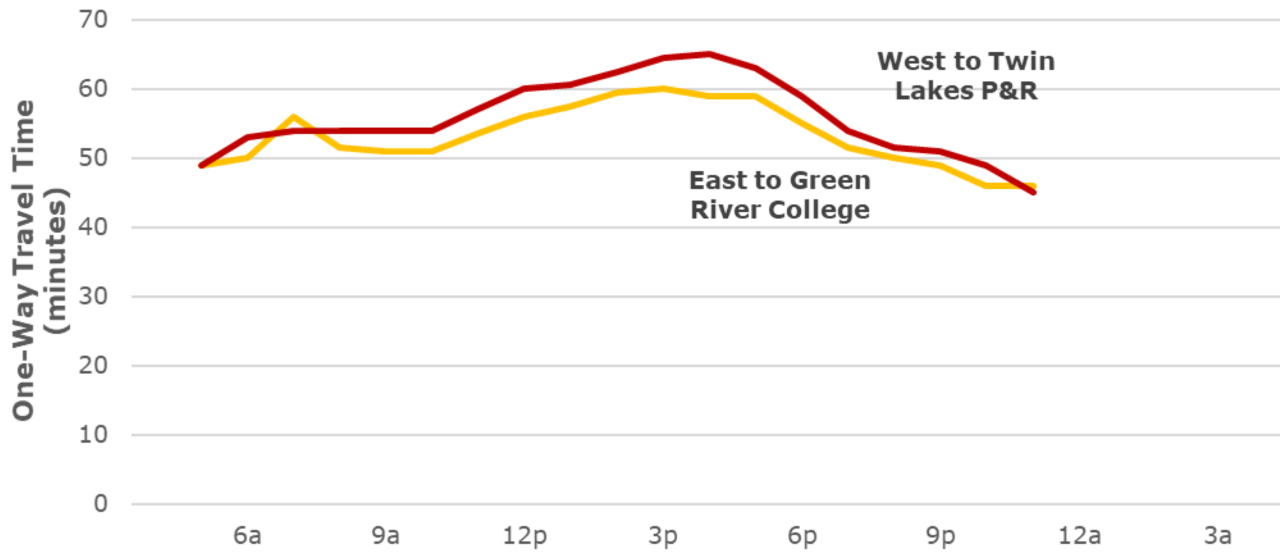
Station Type	Count	Percent
Large Raised Station	5	9%
Large Station	5	9%
Medium Station	8	15%
Small Station	36	67%
Total	**54**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 181 in May 2023 ranged between 45 minutes (late in the evening) to 65 minutes (during the PM peak). On average a one-way trip took 54 minutes.

Figure 15 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

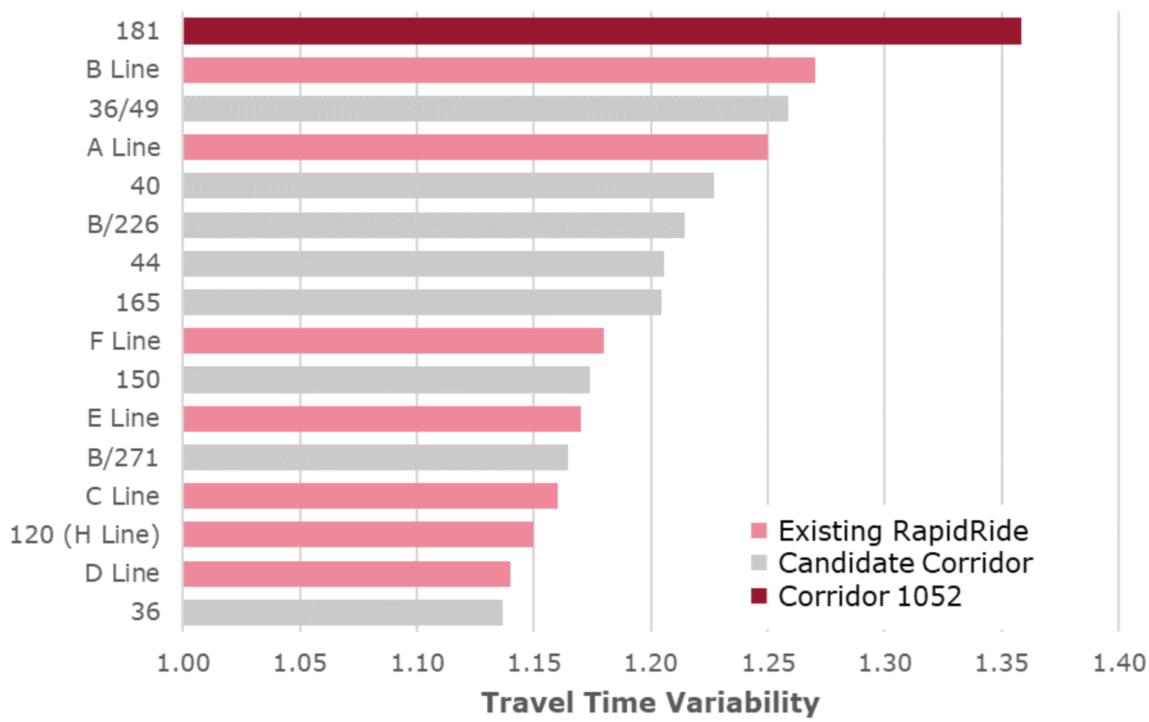
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 1052 experiences delay of almost 22 minutes between the 20th and 80th percentile travel time. This is approximately 0.73 minutes (44 seconds) of trip delay per mile on an average trip. This is the third lowest of all nine candidate corridors.

Eastbound trips at 2 PM and westbound trips at 3 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.18 to 1.36. This indicates the longest travel times (slowest trips) take 18-36% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1052 is performing very poorly as it has the highest variability of any existing or candidate RapidRide corridor. This comparison is shown in Figure 16.

Figure 16 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 17.

Figure 17 Speed & Reliability Summary

Metric	Value
On-time performance[A]	78%
Average speed	19.8 mph
Average trip delay[B]	21.9 min
Average trip delay per mile	44 sec
Lowest median hourly travel time (Reference) [C]	38 min
Highest median hourly travel time	51 min[D]
Travel time variability[E]	1.36

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 6 PM for westbound trips, from Fall 2021.

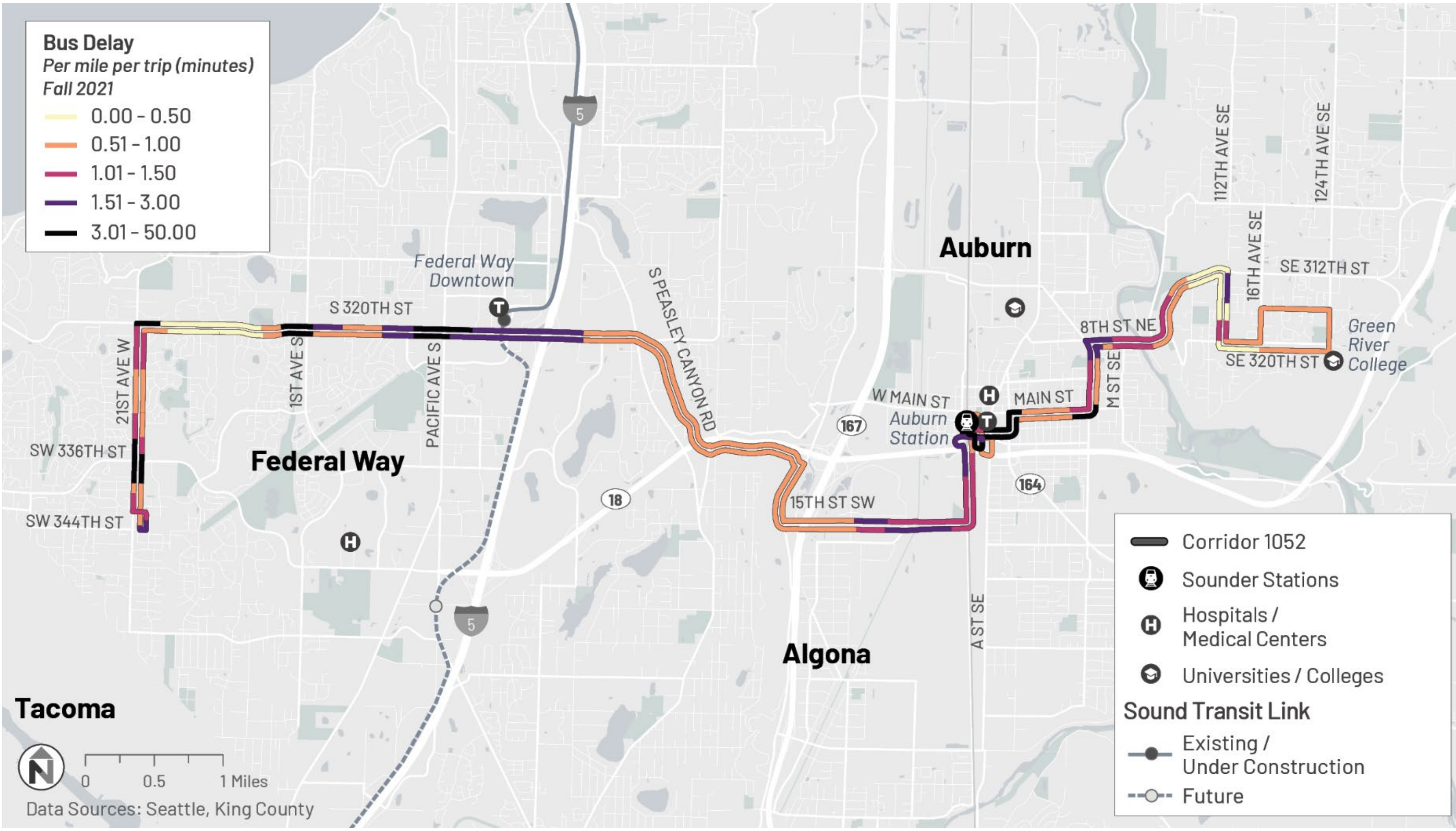
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 18 shows the delay along Corridor 1052 corridor based on King County Metro's AVL data from Fall 2021.[3] The segments shown are existing stop pairs along the Route 181 alignment. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Segments traveling through Downtown Federal Way near Federal Way Transit Center experience the highest delay, as do portions of the corridor near Auburn Station. Other high delay locations occur at major intersections including SW 336th St, 1st Ave S, M St SE at 8th St NE, and entering and leaving Outlet Collection Way.

[3] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 18 Corridor 1052 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

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Figure 19 and Figure 20 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

High delay is present at all segments traveling through Downtown Federal Way. Segments at Twin Lakes Park & Ride, Federal Way Transit Center, and Auburn Transit Center experience high delay throughout the day. Stop pairs approaching major left turns along the alignment, including westbound travel on 21st Ave SW and M St E near Auburn Senior High School experiences high delay all day.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

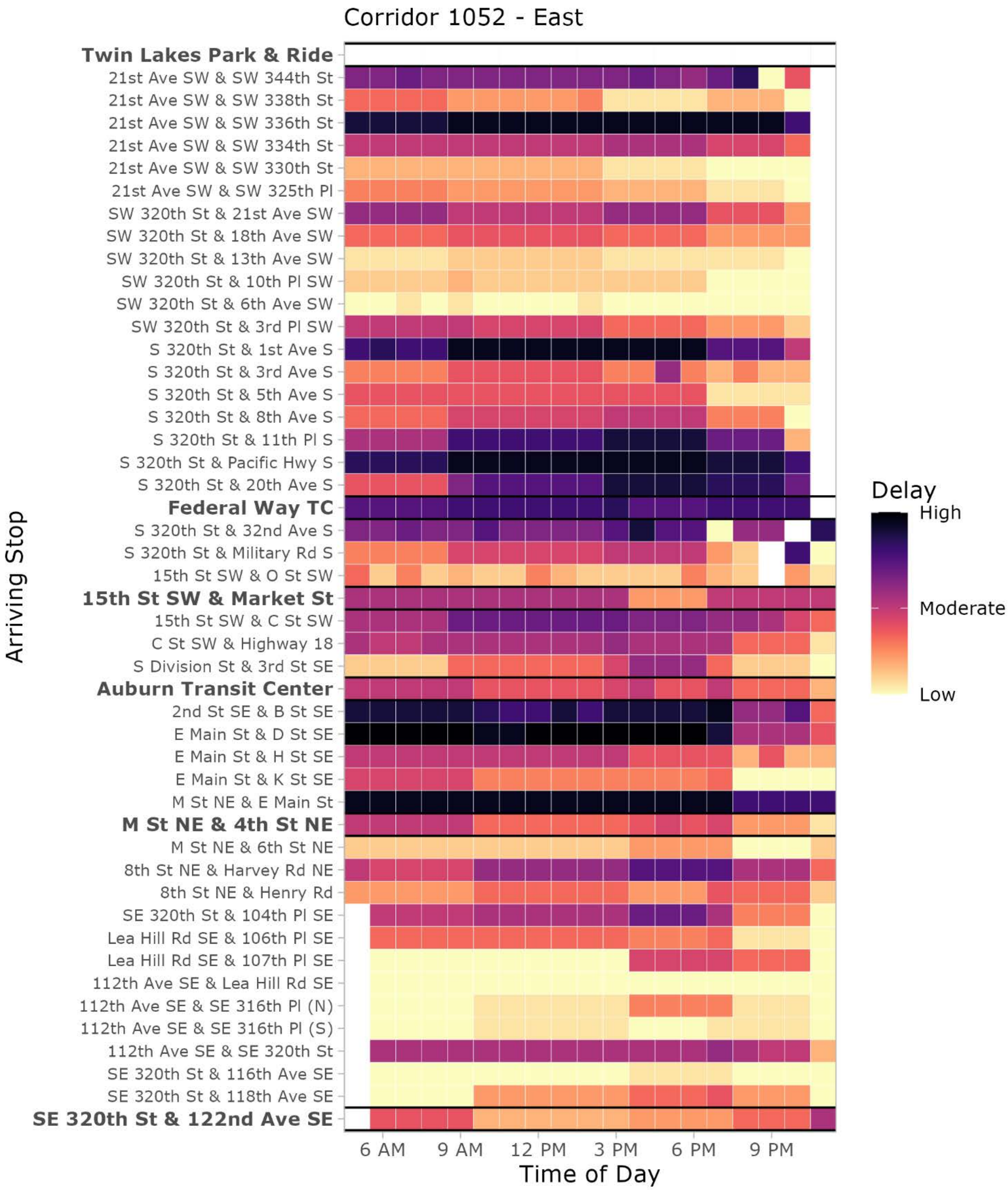
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

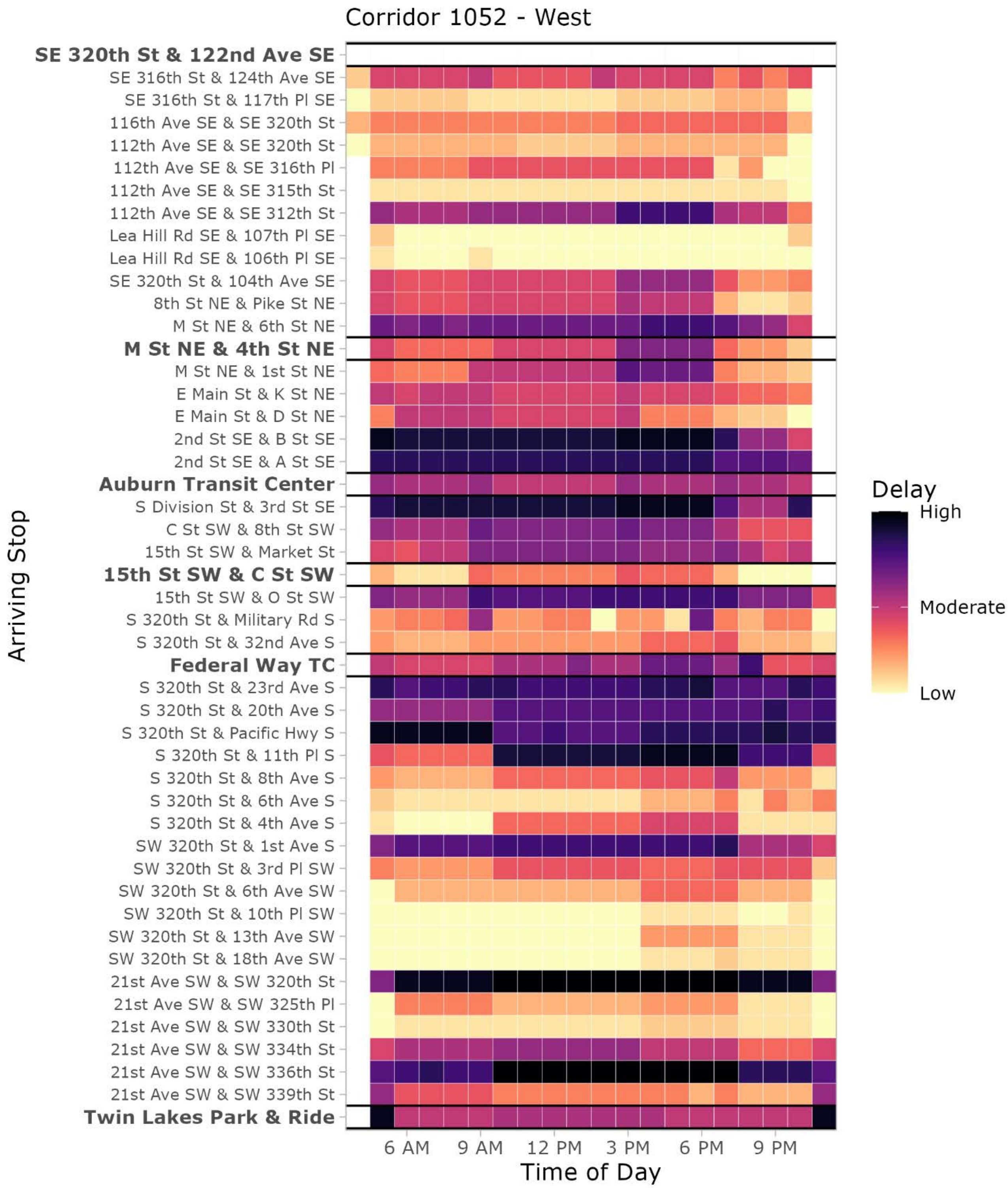
Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 19 Corridor 1052 Eastbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 20 Corridor 1052 Westbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

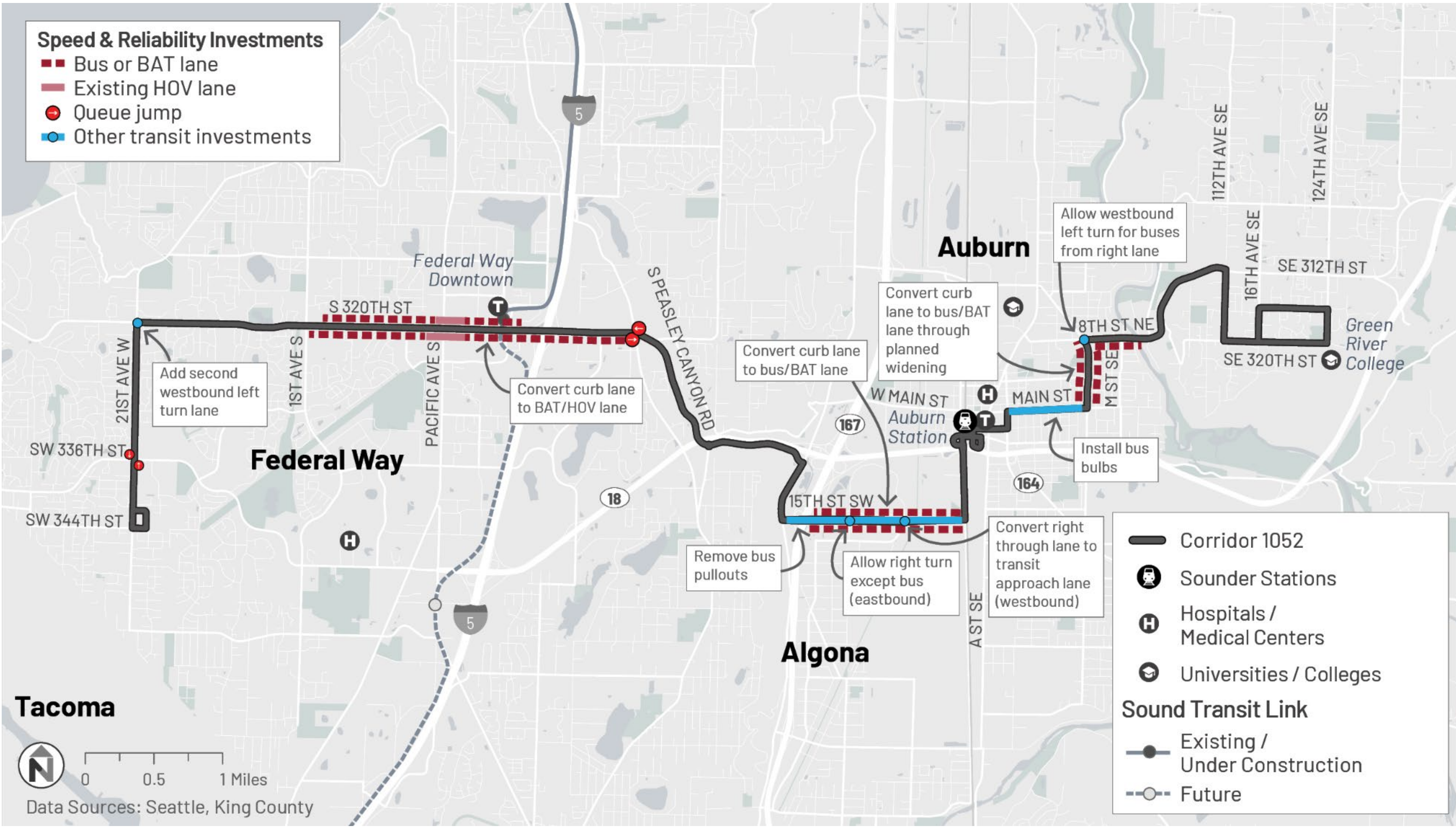
The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 1052 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 21, and they are shown geographically in a map in Figure 22.

The corridor currently achieves transit priority for 4% of its centerline miles, which is well below the RapidRide minimum standard of 40%. The additional proposed treatments here would increase the coverage to 31%. Although these treatments wouldn't achieve the standard transit priority coverage, it would represent a significant increase in transit priority along the corridor, and would result in meeting the minimum travel time saving standard for RapidRide.

Figure 21 List of Proposed Transit Priority Treatments

Location	Type	Description
Federal Way		
21st Ave SW & SW 336th St	Queue jump	Add a shared right turn/queue jump with receiving lane both northbound and southbound at 21st Ave SW & SW 336th St.
SW 320th St & 21st Ave SW	Other	Add second westbound left turn lane (westbound to southbound) for transit or as general-purpose lane at SW 320th St & 21st Ave SW.
S 320th St (1st Ave S to Military Rd S)	Bus/BAT lane	Add eastbound bus/BAT lane between 1st Ave S and Pacific Hwy, convert the curb lane to bus/BAT/HOV lane between Pacific Hwy and 25th Ave S, add eastbound bus/BAT/HOV lane between 25th Ave S and Military Rd S. This requires restriping between I-5 and Military Rd S.
S 320th St (25th Ave S to 1st Ave S)	Bus/BAT lane	Convert westbound curb lane to bus/BAT/HOV lane between 25th Ave S and Pacific Hwy. Add westbound bus/BAT lane between Pacific Hwy and east of 1st Ave S.
S 320th St & Military Rd S	Queue jump	Add eastbound bus-only queue jump lane (from existing right turn lane). Add westbound shared right turn/queue jump at Military Rd S.
Auburn		
15th St SW (W Valley Hwy N to C St W)	Other	Remove all pullout stops and convert all stops along 15th St SW to in-lane stops.
15th St SW (C St W to SR-167)	Bus/BAT lane	Add westbound bus/BAT lane between C St W and SR-167.
E Main St (Auburn Way S to M St SE)	Other	Add bus bulbs and convert all stops on E Main St to in-lane stops.
M St SE (Main to 8th St NE)	Bus/BAT lane	Add bus/BAT lane in both directions along M St SE between Main St and 8th St SE.
8th St NE (M St to 104th Ave SE)	Bus/BAT lane	Add eastbound bus/BAT lane between M St SE and 104th Pl SE.
8th St NE & M St NE	Queue jump	Allow westbound to southbound bus left turn from right turn lane.

Figure 22 Proposed Transit Priority Treatments



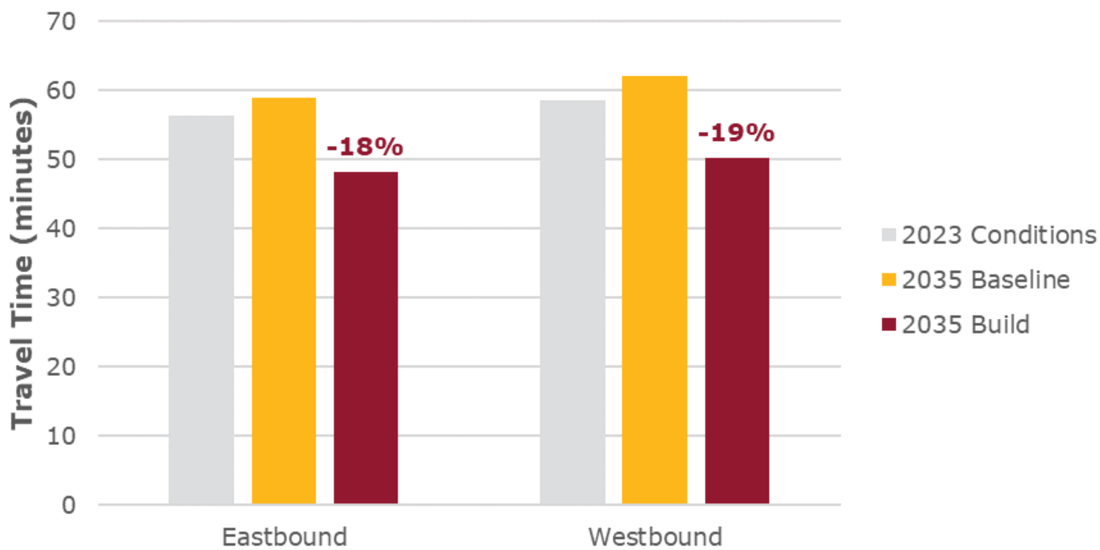
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1052 alignment are forecast to reduce PM peak Future Build condition travel times 18-19% from Future Baseline conditions. Average bus travel speed is expected to increase to 16-17 mph in the Future Build condition. Travel in both directions will experience a similar reduction in travel times. The addition of bus/BAT lanes and converting pull-out bus stops to in-lane stops will improve transit speeds and travel time.

Figure 23 shows transit travel times for the overall route.

Figure 23 Corridor 1052 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 181 carried approximately 1,800 people per day in Spring 2023, and as much as 2,100 people in Fall 2019. The route has now recovered approximately 88% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[4], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 24 Route 181 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	2,053	-	100%
Fall 2020	1,130	-45%	55%
Fall 2021	1,279	+13%	62%
Spring 2023	1,797	+41%	88%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 25 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 181.

The busiest stop locations are near the Federal Way Downtown Transit Center/Future Link Station. Moderate to high ridership occurs near Green River College and the Auburn Sounder Station.

[4] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 25 Boarding and Alighting Activity by Stop (Spring 2023)

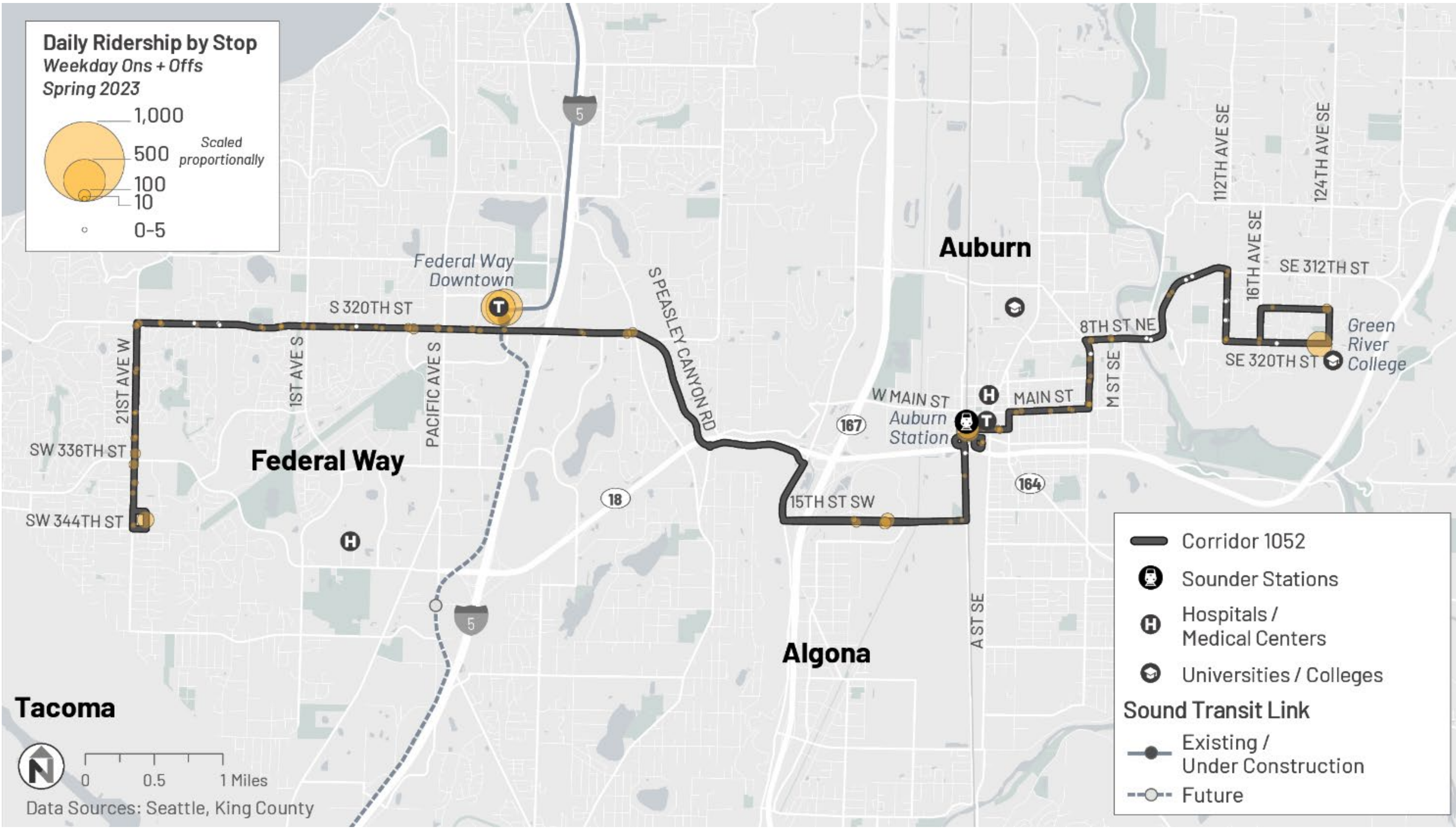


Figure 26 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Westbound	Eastbound	Total
320th St & 118th Ave	-	2	2
Green River College	116	164	280
316th St & 124th Ave	69	-	69
316th St & 117th Pl	8	-	8
320th St & 116th Ave	10	9	19
112th Ave & 320th St	14	14	28
112th Ave & 316th Pl	1	1	1
112th Ave & 315th St	4	-	4
112th Ave & 312th St	7	8	15
Lea Hill Rd & 107th Pl	0	1	1
Lea Hill Rd & 106th Pl	10	8	17
320th St & 104th Ave	3	3	6
8th St & Henry Rd/Pike St	31	8	39
8th St & Harvey Rd	-	35	35
M St & 6th St	19	3	22
M St & 4th St	7	7	13
M St & Main St/1st St	25	21	46
Main St & K St	12	7	19
Main St & H St	-	16	16
Main St & D St	25	18	43
2nd St & B St	35	35	70
2nd St & A St	15	-	15
Auburn Station	242	235	478
Division St & 3rd St	6	15	21
C St & 8th St/SR-18	6	3	9
15th St & C St	6	9	15
15th St & Market St	127	101	227
15th St & O St	27	67	94
320th St & Military Rd	71	61	131
320th St & 32nd Ave S	6	8	14
Federal Way TC	396	430	826
320th St & 23rd Ave S	18	-	18
320th St & 20th Ave S	32	23	55
320th St & Pacific Hwy	42	31	73
320th St & 11th Pl S	50	75	125
320th St & 8th Ave S	5	7	12
320th St & 6th Ave S	5	10	15

Stop Pair	Westbound	Eastbound	Total
320th St & 3rd Ave S	7	10	17
320th St & 1st Ave S	27	28	54
3rd Pl SW	14	21	35
320th St & 6th Ave SW	12	13	24
320th St & 10th Pl SW	3	3	6
320th St & 13th Ave SW	3	7	10
320th St & 18th Ave SW	17	21	39
320th St & 21st Ave	35	42	76
21st Ave & 325th Pl	14	12	26
21st Ave & 330th St	8	13	22
21st Ave & 334th St	33	6	39
21st Ave & 336th St/Campus Dr	70	79	149
21st Ave & 338th/339th St	16	33	49
21st Ave & 344th St	-	17	17
Twin Lakes P&R	90	73	163

Source: King County Metro Spring 2023

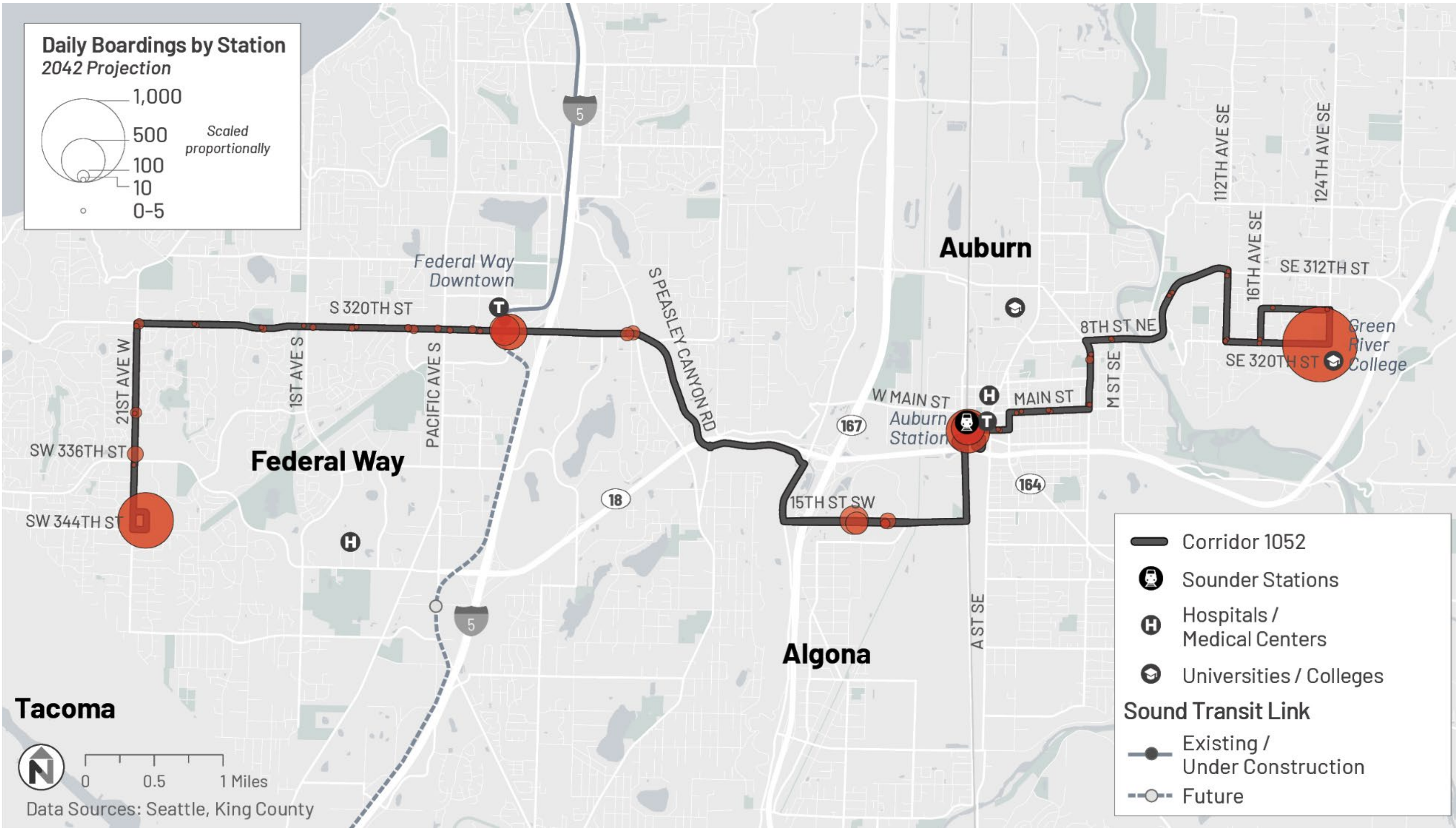
Note: Ridership values represent average weekday boardings plus alightings by stop.

7.3 Forecast Ridership

Future ridership for Corridor 1052 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1052 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 400 boardings in the PM peak hour and 5,400 daily boardings. Key ridership hubs include Twin Lakes Park-and-Ride, Federal Way Downtown Station, 15th St Southwest, Auburn Station and Green River College. Future ridership for each candidate RapidRide station is shown in Figure 27.

Figure 27 Future Corridor Ridership



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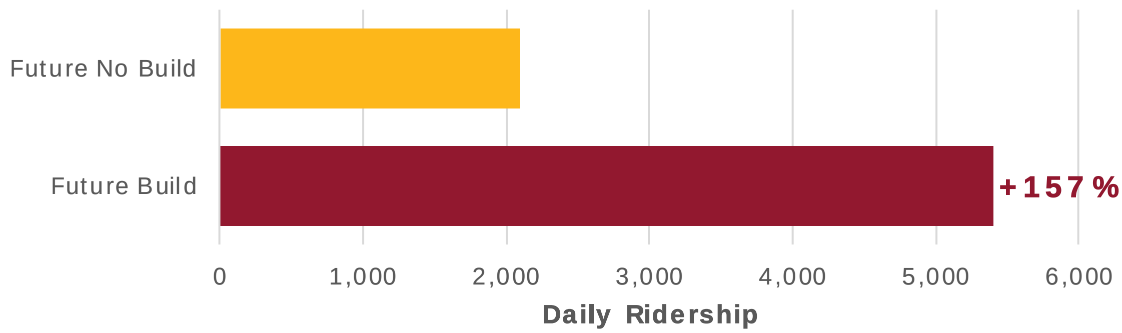
7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 3,300 riders per weekday (or 157% increase) is forecast for Corridor 1052 compared to a "baseline" scenario with today's service levels for Route 181.

Figure 28 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1052 is forecast at 36 riders per platform hour. This would result in an improvement of 56 percent in productivity compared to a future "baseline" 23 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 19 and 16 riders per revenue hour, respectively. At 36 riders per revenue hour, Corridor 1052 would rank third lowest of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

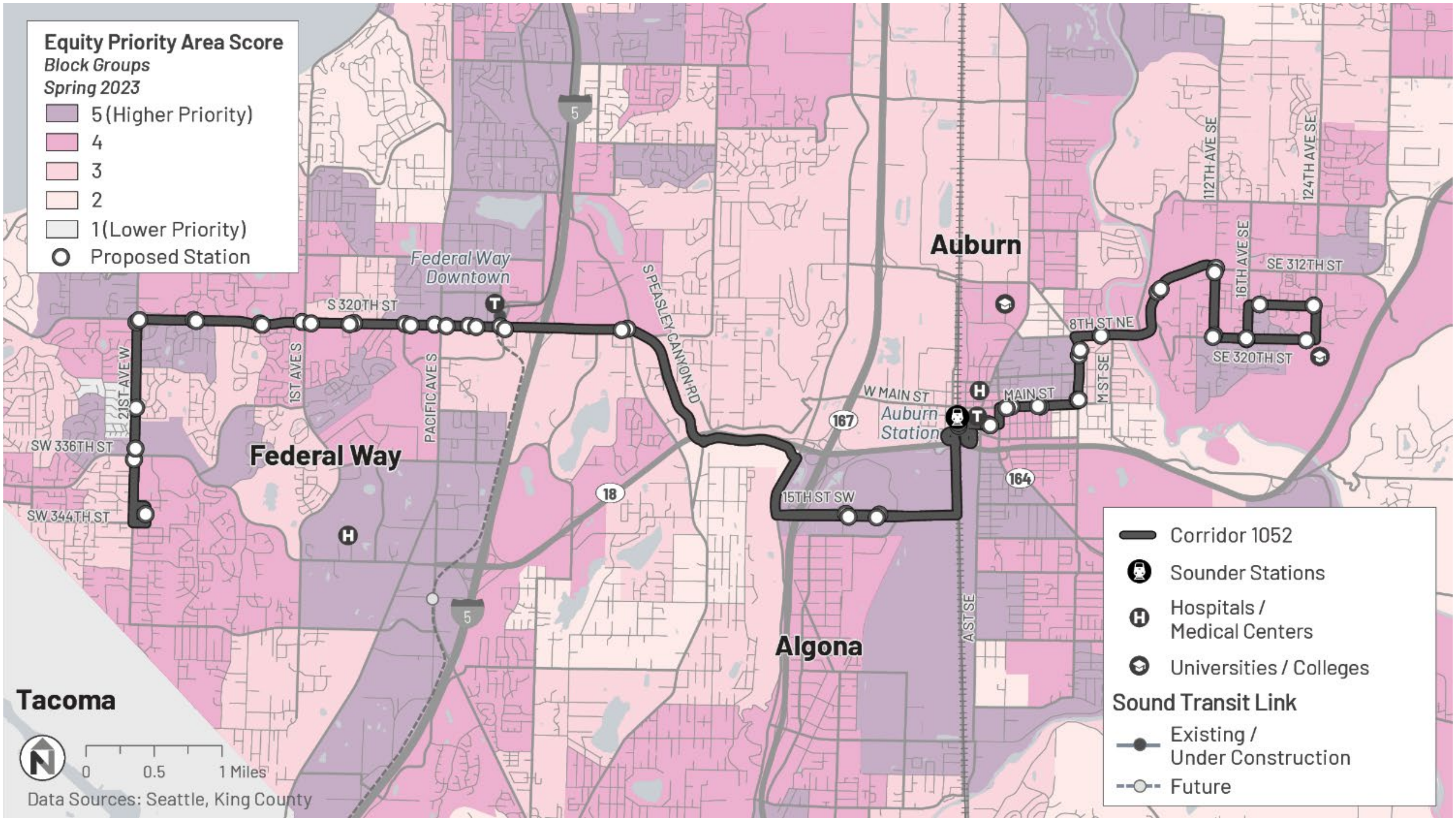
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[5] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 29 displays equity priority area scores for block groups located along Corridor 1052. In the western portion of the alignment, the route serves high equity priority areas along 21st Avenue W in Federal Way near SW 336th Street and SW 320th Street. Continuing east, high equity priority areas along S 320th Street in Downtown Federal Way are served by Route 181. At the eastern end of the alignment in Auburn, Route 181 serves high equity priority areas along W Valley Highway S, 15th Street SW, and C Street SW between Peasley Canyon Road S and SR 18, along Main Street and M Street NE between Auburn Way N and 8th Street NE, and along SE 320th Street between 112th Avenue SE and 120th Place SE.

[5] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 29 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 30 and Figure 31 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[6] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Route 181 in Fall 2020, ridership retention was generally 10-20 points higher than the regional average. By Spring 2023, however, change in ridership east of State Route 167 grew to 20-63 points higher than the region, while ridership change west of SR-167 continued to match a similar trend as before.

[6] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 30 Ridership Retention (Fall 2020)

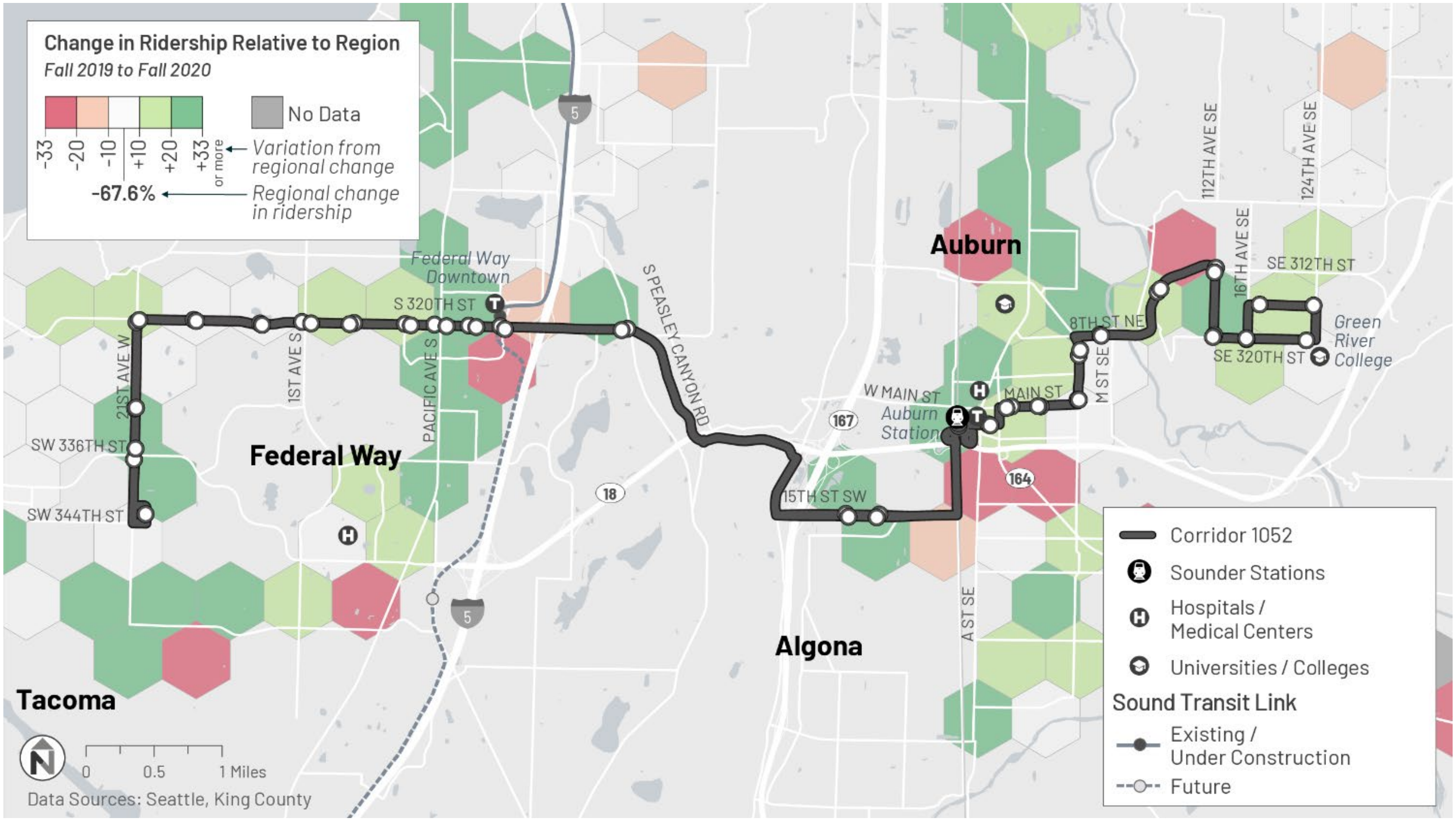

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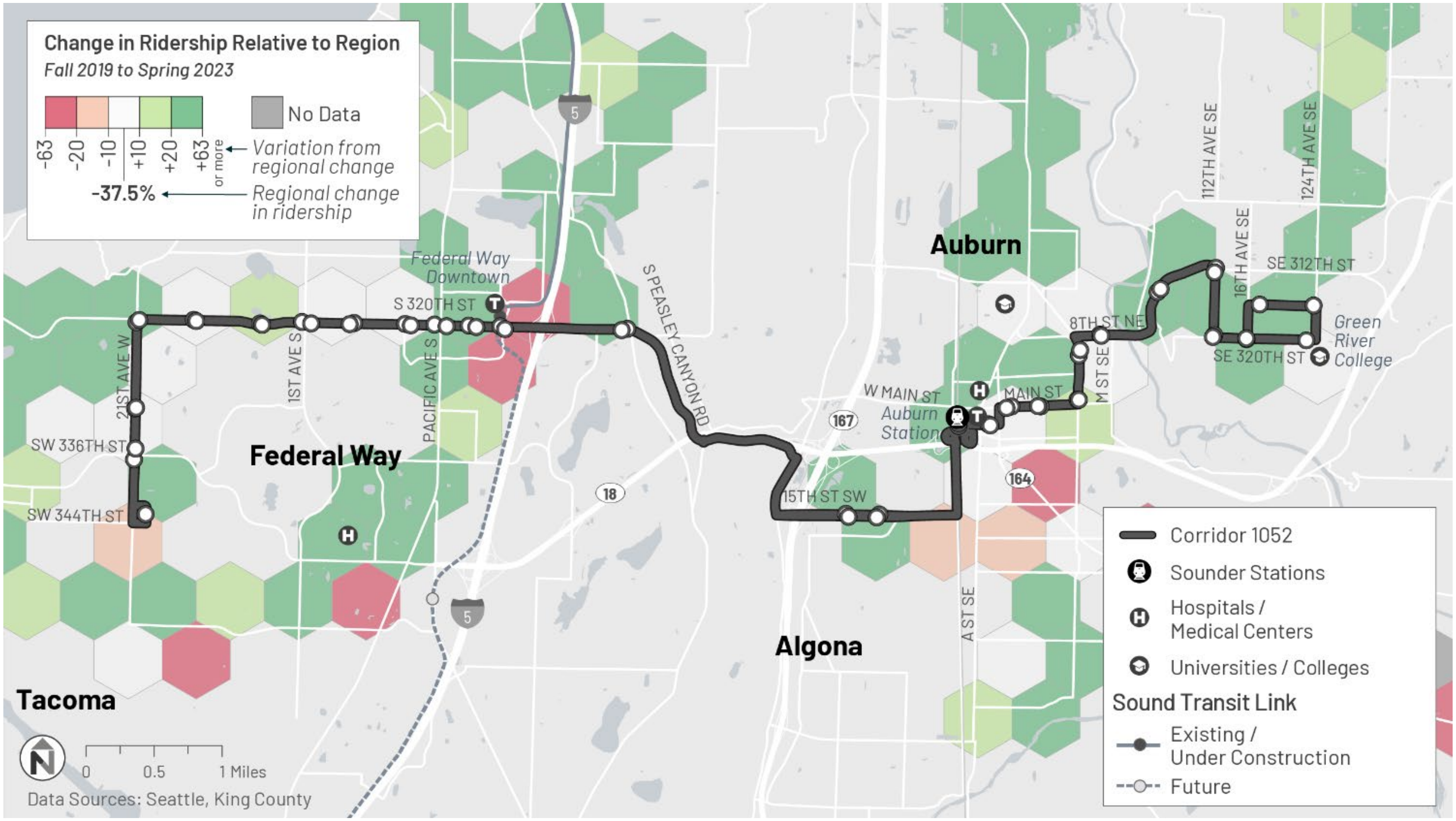
Figure 31 Ridership Retention (Spring 2023)



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8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Route 181 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[7] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 39% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the fifth highest increase in job access.

8.4 GHG Emissions

The ridership gains and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 181 will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[8] Approximately 2.51 metric tons of CO_2 would be reduced on an annual basis due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the fourth largest reduction.

[7] An “average” access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[8] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 44 intersections along Route 181 to evaluate transit travel time benefits of the proposed improvements. Out of the 44 intersections, nine signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 35 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 32 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor.

Figure 32 Modeled Delay from Synchro

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
Eastbound								
301	21st Ave SW & SW 336th St	Signal	54.7	58.6	38.3	54.7	58.6	55.6
302	21st Ave SW & SW 334th St	Signal	1.5	0.8	1.3	1.5	0.8	1.3
303	21st Ave SW & SW 320th St	Signal	10.2	11.9	14.9	10.2	11.9	14.9
304	1st Ave S & S 320th St	Signal	42.6	64.7	26.7	42.6	64.7	98.6
305	Pacific Hwy S & S 320th St	Signal	48.2	42.0	42.4	66.5	59.8	61.1
306	23rd Ave S & S 320th St	Signal	23.4	41.4	20.7	23.4	41.4	61.3
307	A St SW & 2nd St SW	Signal	9.0	8.7	8.7	9.0	8.7	8.7
308	A St SE & 2nd St SE	Signal	19.1	31.7	31.7	19.1	31.7	31.7
309	Auburn Way S & 2nd St SE	Signal	75.5	66.6	66.6	75.5	66.6	66.6
Westbound								
309	Auburn Way S & 2nd St SE	Signal	5.5	7.0	7.0	5.5	7.0	7.0
308	A St SE & 2nd St SE	Signal	14.3	21.5	21.5	14.3	21.5	21.5
307	A St SW & 2nd St SW	Signal	8.9	9.2	9.2	8.9	9.2	9.2
306	23rd Ave S & S 320th St	Signal	23.4	36.6	17.4	23.4	36.6	49.7
305	Pacific Hwy S & S 320th St	Signal	52.0	39.1	39.8	221.2	107.8	115.8
304	1st Ave S & S 320th St	Signal	40.6	76.9	76.9	40.6	76.9	76.9
303	21st Ave SW & SW 320th St	Signal	64.5	86.8	57.3	64.5	86.8	57.3
302	21st Ave SW & SW 334th St	Signal	4.9	6.4	6.4	4.9	6.4	6.4
301	21st Ave SW & SW 336th St	Signal	60.4	90.8	34.5	60.4	90.8	48.4

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 33 summarizes the number of crashes along the corridor by severity level and mode. There were 746 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 13% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 6% resulted in a fatality or serious injury.

Figure 33 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	8	1%	2	3%	1	4%	**11**	**1%**
Serious Injury	26	4%	10	14%	2	8%	**38**	**5%**
Minor Injury	161	25%	31	42%	7	29%	**199**	**27%**
Possible Injury	453	70%	31	42%	14	58%	**498**	**67%**
Total	**648**	**100%**	**74**	**100%**	**24**	**100%**	**746**	**100%**

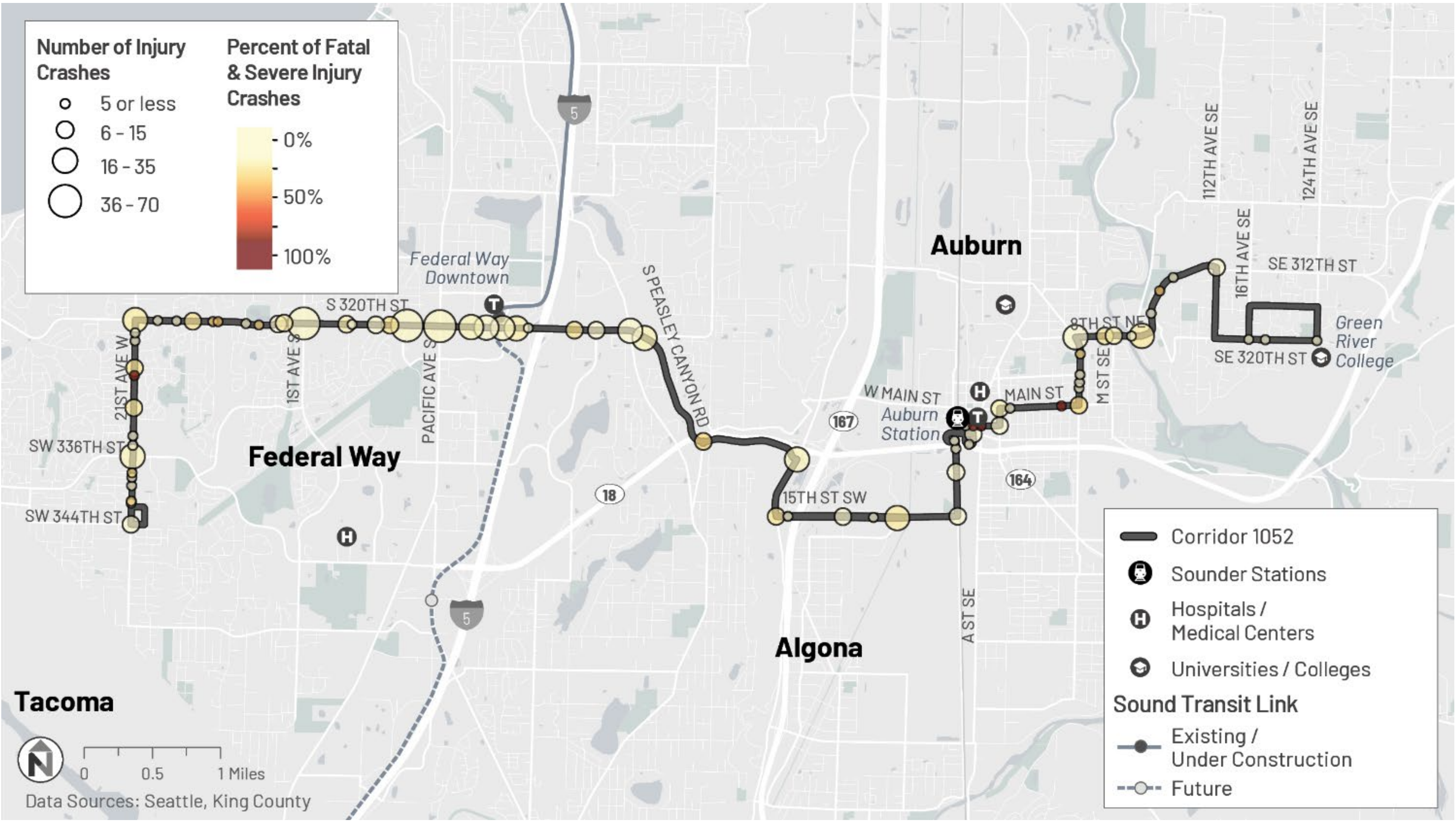
Source: WSDOT (2018-2022)

Figure 34 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along 21st Ave W and S 320th St east of S Peasley Canyon Rd
- Major intersections such as at S Peasley Canyon Rd and W Valley Hwy S and at 15th St SW and Industry Dr SW/Outlet Collection Way.
- Near the Auburn Station
- Major intersections along 8th St NE, including M St SE

Figure 34 Crash Locations



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11.0 Planned Improvements

Route 181 serves the cities of Federal Way and Auburn. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36.

Major projects include the installation of left, right, and through lanes at 1st Ave S and S 320th St, widening of M St SE, and installation of a roundabout and road re-channelization at Lea Hill Rd SE.

Figure 35 Planned Jurisdictional Investments

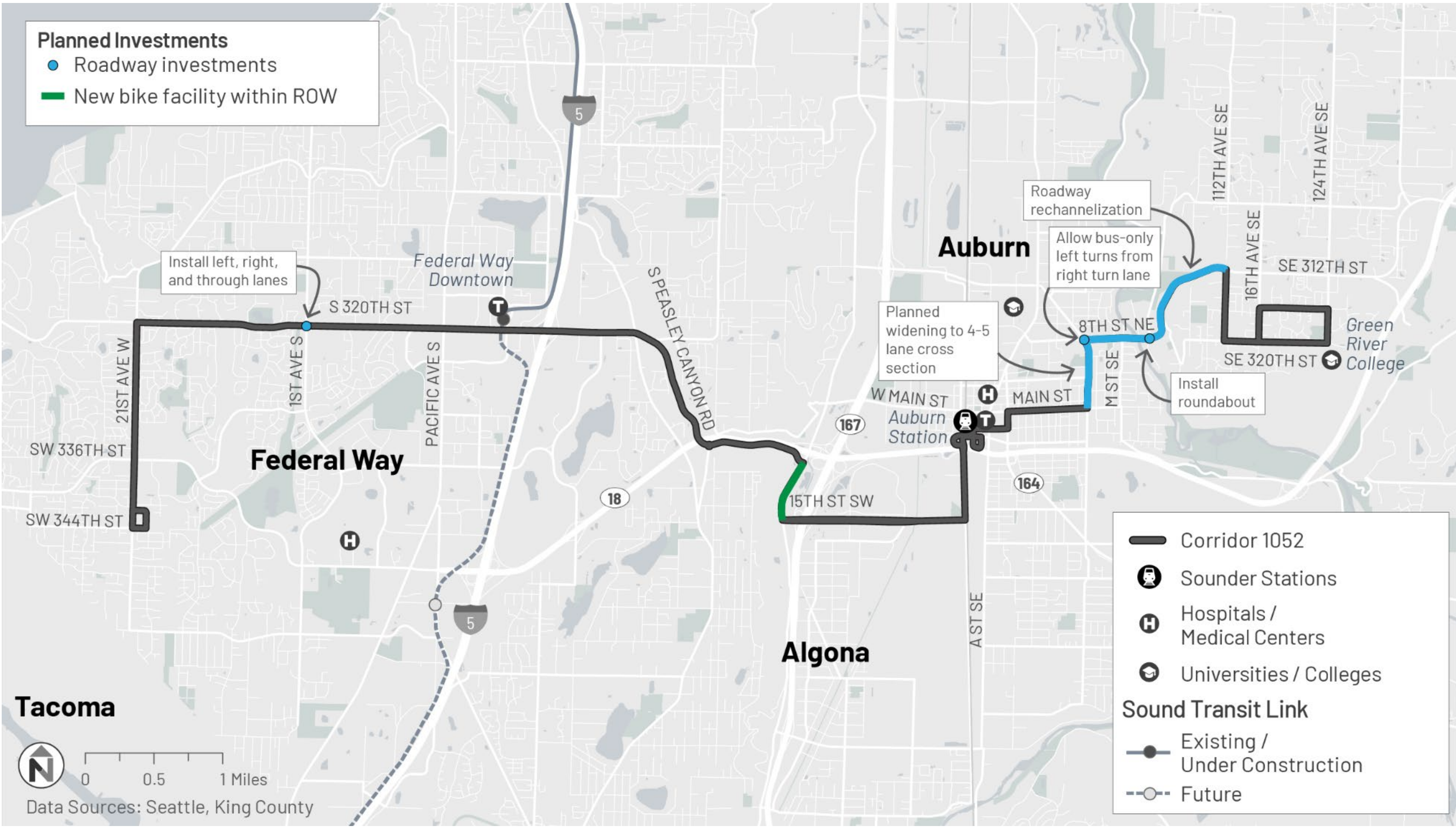

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Figure 36 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Speed and Reliability Improvements	Construct transit speed and reliability improvements on congested segments of Metro Routes 165 and 181 in south King County including, but not limited to implementing enhanced HOV lanes, new bus lanes/bypass lanes, signal queue jumps, intersection turning restrictions, bus bulbs, signal timing optimization, improved bus stop spacing, passenger facility improvements, transit signal priority, off-board fare collection, channelization improvements, improved access to bus stops, and bus layover improvements.	SE 316th St (116th Ave SE - 124th Ave SE) / SE 320th St (116th Ave SE - 124th Ave SE) / 116th Ave SE (SE 316th St - SE 320th St) / 124th Ave SE (SE 316th St - SE 320th St)	Washington State S.T.I.P.
2	Active transportation, intersection design	Active transportation, intersection design	Lea Hill Rd SE (112th Ave SE - 104th Ave SE) / 8th St NE (M St NE - 104th Ave SE)	Lea Hill Road Corridor Plan
3	Auburn - Lea Hill Rd/104th Ave SE Roundabout	Replace the existing signal with a roundabout, install Rectangular Rapid Flashing Beacons at the three main pedestrian crossings, and extend sidewalks to the north and west of the intersection connecting to SE 318th Street and the Lea Hill Bridge	Lea Hill Rd SE / 104th Ave SE	2023-2026 PSRC Regional TIP
4	M Street NE Widening (E Main St to 4th St NE)	This project will construct a complete four/five-lane street section on M St NE from south of E Main St to 4th St NE, and reconstruct the signal at E Main St.	M St NE (E Main St - 4th St NE)	Auburn Street Preservation, Regional Transportation Plan 2022-2050
5	Sound Transit - Auburn Station Improvements	A multi-year project to design (100%) and construct the Auburn Station Access project, which includes a new parking structure with approximately 500 new parking stalls and access improvements around the station, including a pedestrian improvement zone be	B St SW (1st St SW - 2nd St SW)	2023-2026 PSRC Regional TIP, Regional Transportation Plan 2022-2050
6	Auburn - A St Loop	The project will construct a new one-way (eastbound) roadway connection between A Street SW/S Division Street and A Street SE. The new intersection with A Street SE will allow an unsignalized right-turn movement onto southbound A Street SE, providing an	New roadway (S Division St - A St SE)	City of Auburn TIP
7	Auburn - C St SW Preservation	The project will grind and overlay C Street SW between W Main Street and the GSA signal (approximately 2,000 feet to the south of 15th Street SW). The project scope also includes upgrades to ADA curb ramps and pedestrian push buttons; replacement of vehicle detection loops where needed; and improvements to water, storm and sewer.	C St SW (3rd St SW - 15th St SW)	City of Auburn TIP

ID	Improvement	Description	Extent	Source
8	SR 18 Trail (Auburn to Snoqualmie Trail)	Shared use multi-purpose path linking communities and lands from Auburn to Snoqualmie	C St SW / SR 18	Regional Transportation Plan 2022-2050
9	Repaving	Repaving	15th St SW (Industry Dr SW to C St SW)	Auburn Street Preservation
10	Federal Way - Military Rd S Preservation Project	The improvements of Military Road South (South City Limit to S 320th St) will be an HMA Overlay including upgrade of facilities to meet ADA standards, pavement repair, and pavement markings.	Military Rd S at S 320th St	2023-2026 PSRC Regional TIP
11	Nonmotorized facility	Nonmotorized facility	Military Rd S at S 320th St	King County Transportation Needs Report
12	Federal Way - City Center Access Project - Ph 1 (SB Ramp Modifications)	Construct a SB I-5 off-ramp from the existing I-5 / S 320th off-ramp to S 324th. Construct a SB-I-5 on-ramp at S 324th including modifying existing SB I-5/320th on-ramp to a braided ramp from S 320th to S 324th. S 324th will be extended and widened as a	S 320th St at I-5	Federal Way CIP, 2023-2026 PSRC Regional TIP, Regional Transportation Plan 2022-2050
13	Grade separation feasibility study	Grade separation feasibility study	S 320th St at 21st Ave S	Federal Way Capital Projects
14	Signalization and Pedestrian Improvements	Signalization and Pedestrian Improvements	S 320th St at 21st Ave S	Federal Way Capital Projects
15	Federal Way - S 320th St Preservation Project	Replace curb ramps and pedestrian push buttons to meet ADA standards, planning bituminous pavement, HMA pavement repair, HMA overlay, replace dual-faced sloped mountable curbs, and replace traffic signal detector loops with cameras, channelization, and utilities	S 320th St (1st Ave S - SR 99)	Federal Way 2024-2029 TIP, 2023-2026 PSRC Regional TIP
16	S 320th St and 1st Ave S Intersection and Corridor Improvements	Install left turn, right turn and through lanes at the intersection. Widen the road to 5 lanes north of the S 316th Street intersection or use an alternative solution to address capacity issues.	S320th St / 1st Ave S	Federal Way CIP

ID	Improvement	Description	Extent	Source
17	Adaptive Traffic Control System Phase 5	Adaptive Traffic Control System Phase 5	21st Ave SW (SW 344th St to SW 320th St)	CIP Dashboard
18	21st Ave SW	Major Widening (5 lanes). Provides sidewalks; Bikes provided for on parallel route per Comp Plan	21st Ave SW at SW 344th St	Regional Transportation Plan 2022-2050

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Route 181 corridor. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Charging infrastructure[9]
- Trolley Infrastructure (not included in Route 181)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 14. For transit speed and reliability improvements, refer to Figure 21. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 37.

[9] For non-trolley routes only.

Figure 37 Order-of-Magnitude Project Costs

	Category	% of Total	Costs
	Stops and Stations	21%	$ 6,230,000
	Transit Speed and Reliability Improvements	64%	$ 19,090,000
	Layover and Terminus Facilities	2%	$ 600,000
	Charging Infrastructure	13%	$ 4,000,000
	Trolley Infrastructure	-	-
	Construction Base Subtotal		***$ 29,920,000***
2%	Stormwater Upgrades		$ 600,000
3%	Traffic Control		$ 900,000
10%	Mobilization		$ 3,000,000
2%	TESC		$ 600,000
	Subtotal Construction Cost		***$ 35,020,000***
10.1%	Sales Tax		$ 3,540,000
10%	Construction Contingency		$ 3,860,000
40%	Contingency (Design Allowance and Risk)		$ 16,970,000
	Total Construction Cost		***$ 59,390,000***
10%	Project Management		$ 5,940,000
5%	Planning		$ 2,970,000
15%	Engineering/Design		$ 8,910,000
10%	Construction Management		$ 5,940,000
3%	Environmental Review		$ 1,790,000
2%	Permitting		$ 1,190,000
	Total Project Cost		***$ 86,130,000***

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Route 181 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – The project is not within any designated view corridors. The improvements associated with Route 181 will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation sites Route 181 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – Route 181 does not traverse over or alter any navigable waterways.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Air Quality - Improvements associated with the project are not anticipated to yield long-term adverse impacts to air quality. The adoption of cleaner and more energy-efficient technologies with zero emission buses will contribute to a healthier and more sustainable urban environment. Best Management Practices (BMPs) for air quality during construction will be implemented to mitigate any minor short-term impacts.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources:

13.3a Cultural Resources

In order to identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The Route 181 corridor runs adjacent to the Auburn Masonic Temple and Auburn U.S. Post Office. Any alteration or deviation from the established character of these properties would constitute an adverse effect. Preserving the unique historical features of these properties is crucial to avoiding negative impacts on cultural and architectural resources. As such, careful consideration and adherence to preservation principles should guide the project's station design and implementation within these areas.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by a licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanups, are present along the corridor. Higher concentrations of contaminated sites are located in downtown Auburn.

A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the Ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. For acquired parcels associated with moderate or high-risk sites, it is recommended to conduct additional Ecology file reviews, examining historical or current release information, and considering potential Phase I or Phase II Environmental Site Assessments (ESAs) during the acquisition process. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along Route 181 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

Traffic operational analysis was conducted for 44 intersections along Route 181 to evaluate transit travel time benefits of the proposed improvements. The analysis revealed that at 7 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 3 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the project's aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 181 can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared, to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. *The FTA Transit Noise and Vibration Impact Assessment Manual* notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 181 corridor include critical areas for liquefaction and steep slopes. These areas will be considered for their potential to impact to the project during design. The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures may encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP), a TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

There are wetlands adjacent to the alignment as it crosses the Green River near Auburn Way South. There are also wetlands adjacent to the alignment and station locations north of SW 320th Street in Fishers Pond Park.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the location of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur. Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.3k Floodplains

The Route 181 and station locations are adjacent to and cross a Federal Emergency Management Area (FEMA) 100-year floodplains at the intersection of W Valley Hwy S and 15th St SW, and crosses a FEMA 100-year floodplain at 8th St NE, west of the intersection with 102nd Ave SE.

If project improvements are situated near floodplain buffer areas, there is a potential for adverse effects. A critical areas report will be prepared during the formal environmental review process to confirm the presence and location of floodplains. In cases where station locations are near floodplain areas, relocation may be considered to effects.

13.3l Acquisition and Relocation

Acquisitions for the improvements included in this report involve the below partial property impacts:

- 3,000 square foot partial take on northeast corner of SW Campus Dr and 21st Ave SW
- 3,000 square foot partial take on southeast corner of SW Campus Dr and 21st Ave SW
- 3,000 square foot partial take on northwest corner of SW 336th St and 21st Ave SW
- 3,000 square foot partial take on southwest corner of SW 336th St and 21st Ave SW
- 3,000 square foot partial take on northeast corner of SW 320th St and 21st Ave SW
- 3,000 square foot partial take on southwest corner of S 320th St and Military Rd S
- 3,000 square foot partial take on northeast corner of Peasley Canyon Rd S and Military Rd S

These minor and partial property acquisitions are expected to result in minimal effects, limited to the property itself, without impacting existing structures and no displacements are anticipated. Mitigation measures include compensating business and property owners under the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970, as amended. Other potential mitigation efforts could involve considering adjustments to station locations if necessary.

13.4 Cumulative and Indirect Impacts

Route 181 serves the cities of Federal Way and Auburn. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. A selection of these projects are mapped in Figure 35, and all projects are described in Figure 36. Major projects include the installation of left, right, and through lanes at 1st Ave S and S 320th St, widening of M St SE, and installation of a roundabout and road re-channelization at Lea Hill Rd SE.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of "facility modernization" that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way. However, because the project may need to acquire additional property, documentation is required that demonstrates the project will meet the criteria for a CE and that significant environmental effects will not result.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)

- Shoreline Permit
- Local Clearing and Grading Permit

RapidRide Prioritization Plan

Corridor 1056 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

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Corridor Summary

Corridor 1056 | Route 165

CORRIDOR SUMMARY

Ridership

No Build

+150%

RapidRide Corridor 1056

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

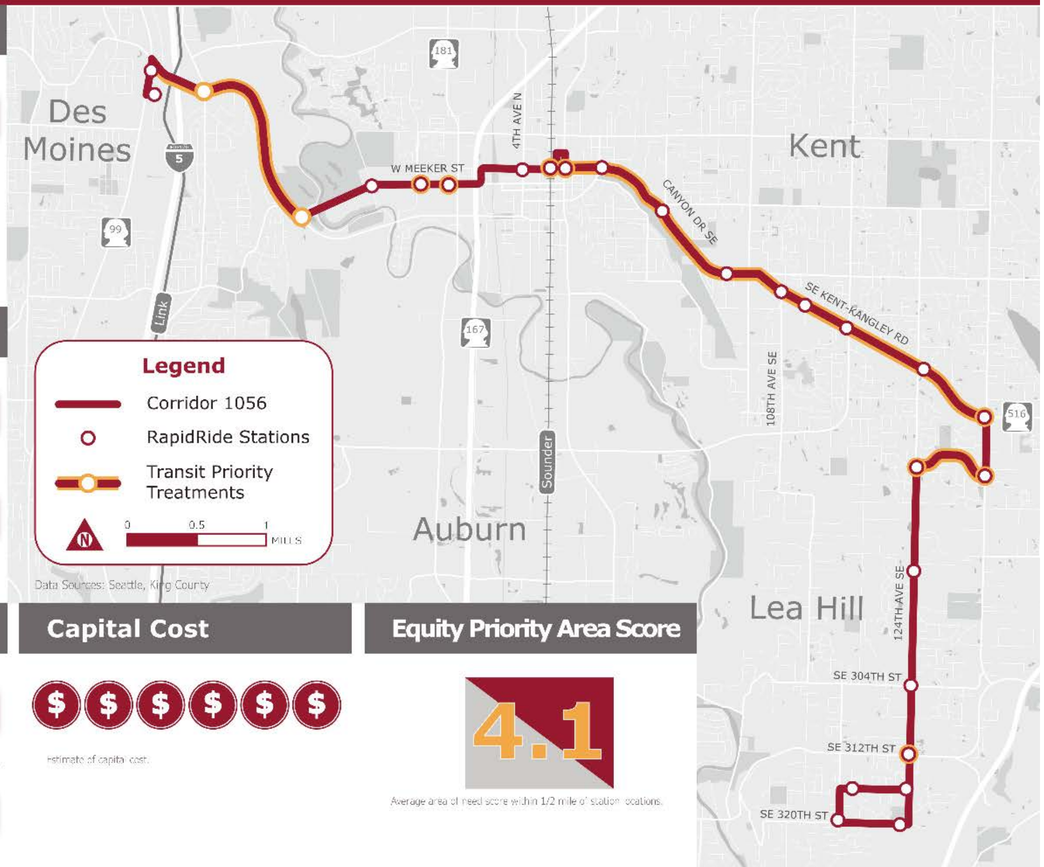
Productivity

Increase in Boardings per Revenue Hour **+10.7**

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour **35.2**

Weekday boardings per revenue hour with RapidRide investment in 2042.



Travel Time

Proposed Travel Time Savings **-29%**

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time **34**

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Equity Priority Area Score

4.1

Average area of need score within 1/2 mile of station locations.

1.0 Project Background

1.1 Project Purpose and Goals

The project provides planning and related services to King County Metro (KCM) to determine corridors for the expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1056 (Route 165). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1056 is currently served by Route 165, which connects Burien, Des Moines, Highline College, Kent, and the Lea Hill area of Auburn to Green River College. The route primarily serves suburban areas of south King County.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would split Route 165 at the Kent/Des Moines Link Station, with RapidRide service east to Green River College. The portion of Route 165 from the Link Station north to Burien would remain local service.

This project conducted a high-level review of the Metro Connects 2050 and interim alignments, as well as an alignment identified in the RapidRide Expansion Program's Corridor Evaluation for Corridor 1056. The alignment chosen in the screening process would operate along Kent-Des Moines Rd and Meeker St, in place of Lakeside Blvd and Veterans Drive. It would also operate along Canyon Dr and Kent Kangley Road instead of along S 240th St between Downtown Kent and 132nd Ave SE.

2.2 Representative Alignment

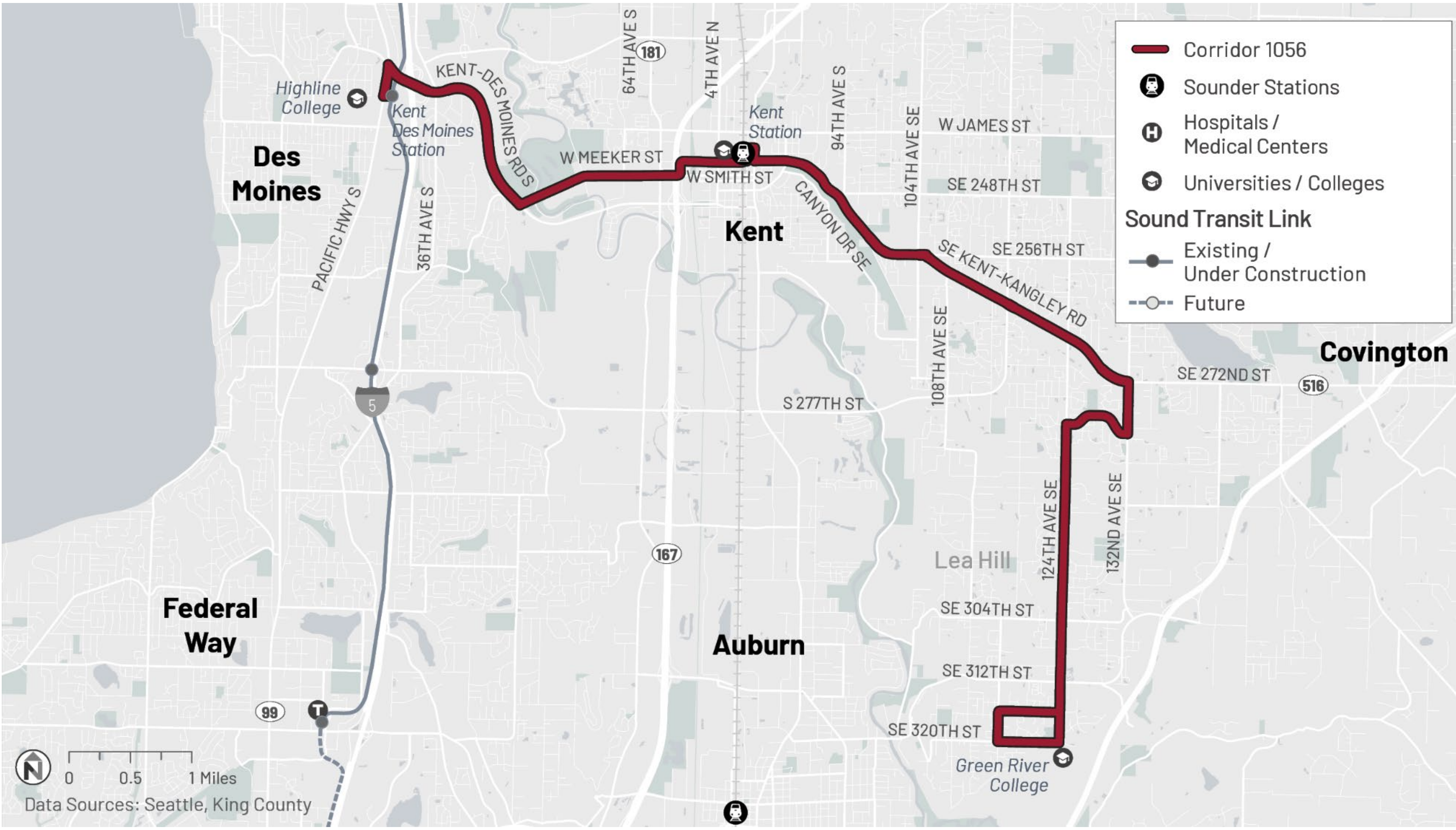
The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. This included adjusting the western terminus from on-street into the Kent/Des Moines Link Station's bus turnaround loop.

Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 165, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Alignment Changes

Alignment Change	Change from… Route 165	Metro Connects	Recommended Alignment in Screening
Split Route 165 near the Kent/Des Moines Link Station.	✓	✗	✗
Adjust western terminus from the intersection of Pacific Highway and S 240th St into the Kent/Des Moines Link Station's bus turnaround loop.	✓	✓	✓
Realign out of the Lakes neighborhood (with service on Veterans Dr, S 228th St, Lakeside Blvd) and onto Kent-Des Moines Road and Meeker Street.	✓	✓	✗
Realign off SE 240th St and 132nd Ave SE and onto SE Kent Kangley Road.	✓	✓	✗

Figure 3 Corridor Overview



King County METRO

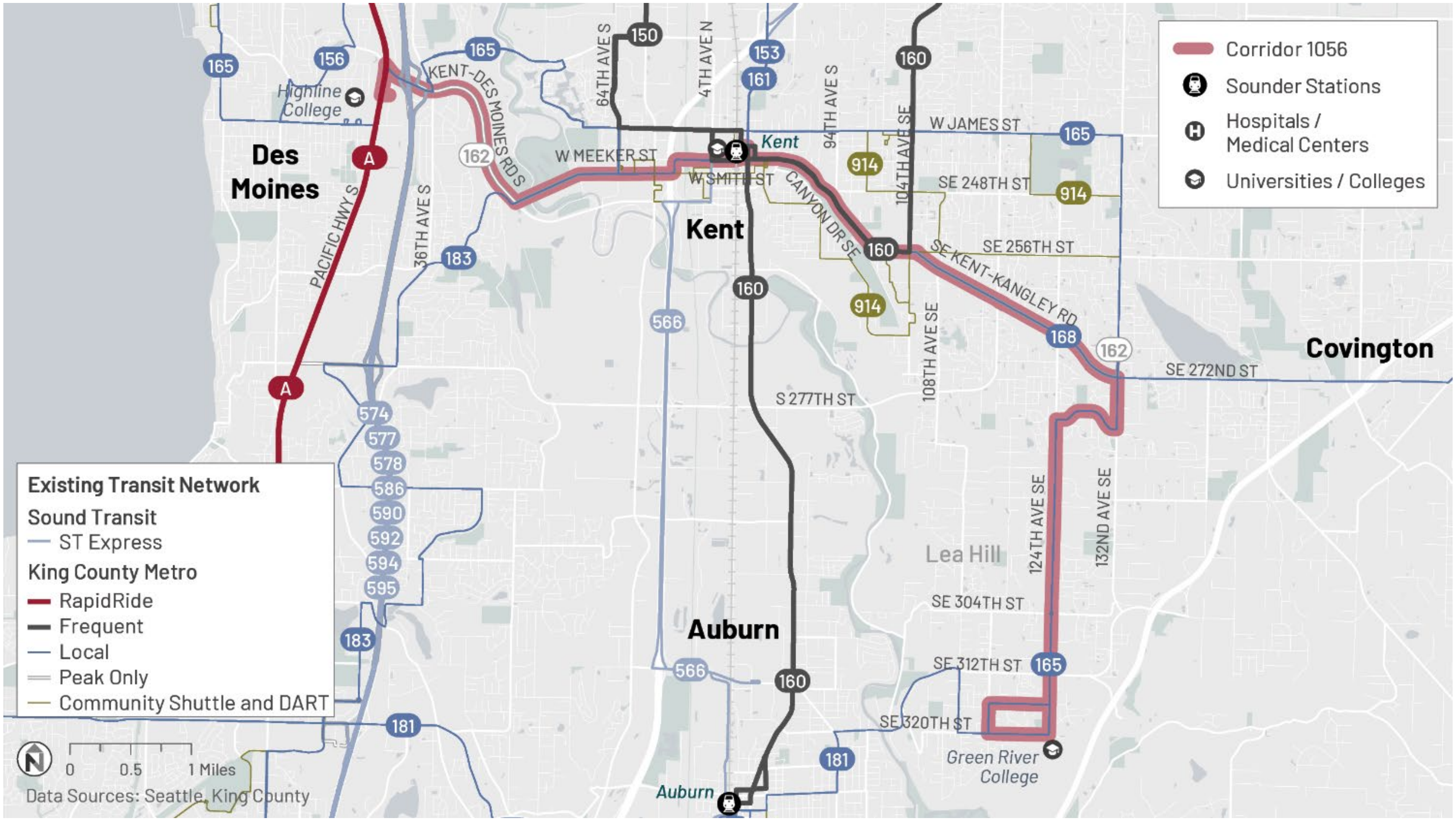
3.0 Transit Network

Route 165 currently operates as a local service line connecting the cities of Des Moines and Kent to Green River College in Auburn. While overlapping with the existing Route 165 along Pacific Highway S and Kent-Des Moines Road S in Des Moines and Kent, and 124th Avenue SE, SE 320th Street, 116th Avenue SE, and SE 316th Street in Auburn, Corridor 1056 largely follows an alignment comprised of other existing routes. These other routes include the RapidRide A Line in Des Moines and Kent, the frequent-service Route 160 in Kent, and local Routes 168 and 183. At Kent Station, Corridor 1056 connects to additional local and regional bus service, as well as Sound Transit's Sounder commuter rail service.

3.1 Future Network Changes

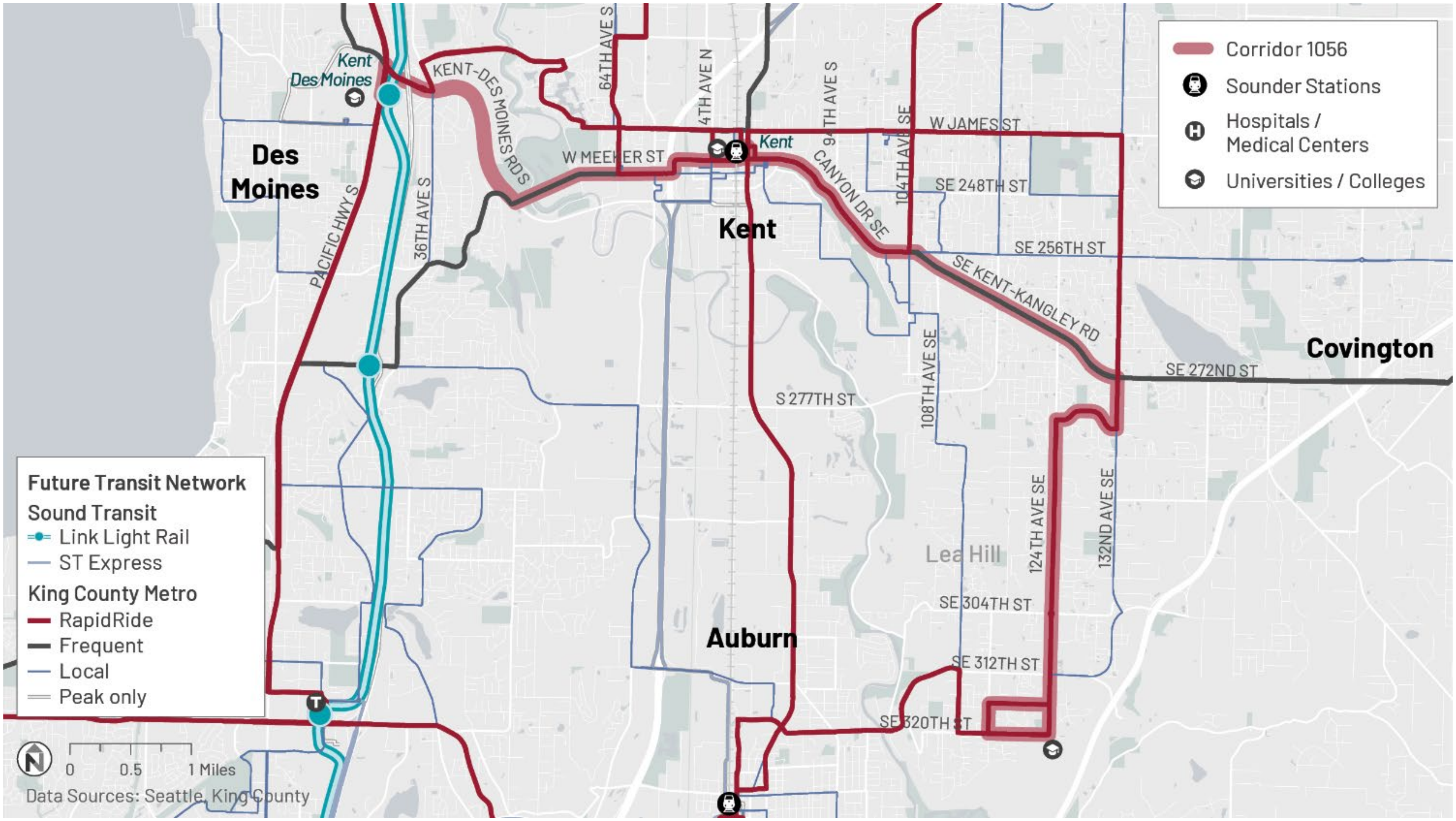
The Metro Connects Interim Network assumes connections between Corridor 1056 and several new transit lines along the alignment. In Des Moines and Kent, Corridor 1056 would connect to Link light rail service at Kent-Des Moines Station, north-south RapidRide service in Downtown Kent, and east-west RapidRide service near Green River College in Auburn. The Kent Sounder station would remain a transit hub connecting Corridor 1056 to local and regional bus and commuter rail service.

Figure 4 Existing Transit Network



King County METRO

Figure 5 Metro Connects Interim Network



King County METRO

4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 165 currently operates infrequent service for most of the day, every day. Route 165 operates every 30 minutes or better from 5 am to 10 pm on Weekdays, and from 6 am to 10 pm on Saturdays. On weekday peak periods, between 6 am and 7 am, and between 4 pm and 6 pm, Route 165 runs every 20 minutes. On Sundays, Route 165 operates every 60 minutes all day from 5 am to midnight.

Figure 6 Existing Route 165 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>60</td><td>30</td><td>20</td><td colspan="9">30</td><td colspan="2">20</td><td colspan="4">30</td><td colspan="3">60</td><td colspan="3"></td></tr>
<tr><td>Saturday</td><td colspan="2"></td><td colspan="16">30</td><td colspan="3">60</td><td colspan="3"></td></tr>
<tr><td>Sunday</td><td></td><td colspan="19">60</td><td colspan="4"></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency and span on weekdays, Metro would need to increase Route 165 frequency on both Weekdays and Weekends. On Weekday morning and afternoon peak periods, Metro would need to add at least three or four trips per hour from 6 am to 9 am, and 3 pm and 7 pm. This addition will ensure 10-minute service for RapidRide standard. On Weekday midday hours, two additional trips per hour would be needed between 9 am and 3 pm to ensure 15-minute service. One additional trip per hour would be needed between 10 pm and midnight to ensure 30-minute service on Weekday nights. On Saturdays, two additional trips per hour would be needed from 6 am to 7 pm, and one additional trip per hour between 10 pm and midnight. This will ensure 15-minute service during the day and 30-minute service at night. On Sundays, three additional trips per hour would be needed from 6 am to 7 pm, and one additional trip per hour between 5 pm and midnight. This will ensure 15-minute service during the day and 30-minute service at night.

Figure 7 shows the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	3	4	4	2	2	2	2	2	2	4	3	3	4	-	-	-	1	1	-	-	-	-
Saturday	-	-	2	2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	1	1	-	-	-	-
Sunday	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>60</td><td>30</td><td colspan="3">10</td><td colspan="6">15</td><td colspan="4">10</td><td colspan="3">30</td><td colspan="2">30</td><td>60</td><td></td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td></td><td colspan="13">15</td><td colspan="3">30</td><td colspan="2">30</td><td>60</td><td></td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td>60</td><td colspan="13">15</td><td colspan="5">30</td><td></td><td></td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round-trip will take 92 minutes during the PM peak and 72 minutes during off-peak hours. Assuming the service hours on the portion of Corridor 1056 along the alignment (between Pacific Avenue and Green River College), Metro would need to add approximately 60 service hours each weekday (or a 74% increase), and increase service hours by 26 hours on Saturdays (or a 39% increase) and 57 hours on Sundays (or a 152% increase), to meet the RapidRide minimum standard.

Figure 9 summarizes the changes needed between existing service (for the relevant portion of Route 165 only) and future service assuming build conditions. King County Metro would also need four additional buses on weekdays to meet this increased level of service (12 buses, relative to the existing 8 buses needed on weekdays). One fewer bus would be needed on Saturdays, and five additional buses on Sundays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	Percent
Daily Service Hours				
Weekday	82	142	+60	+74%
Saturday	69	95	+26	+39%
Sunday	38	95	+57	+152%
Daily One-Way Trips				
Weekday	79	160	+81	+103%
Saturday	68	126	+58	+85%
Sunday	34	126	+92	+271%
Fleet				
Weekday	8	12	+4	+50%
Saturday	7	6	-1	-14%
Sunday	3	6	+3	+100%

Source: King County Metro GTFS May 2023 and Synchro modeling.

Note: Existing values reflect the portion of Route 165 between Pacific Avenue and Green River College only.

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require at least two layover spaces on each end of the corridor.[1] Without additional layover capacity at Green River College, most layover time may need to occur at Kent Des Moines Station. In this scenario, two or three layover spaces would be needed.[2]

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

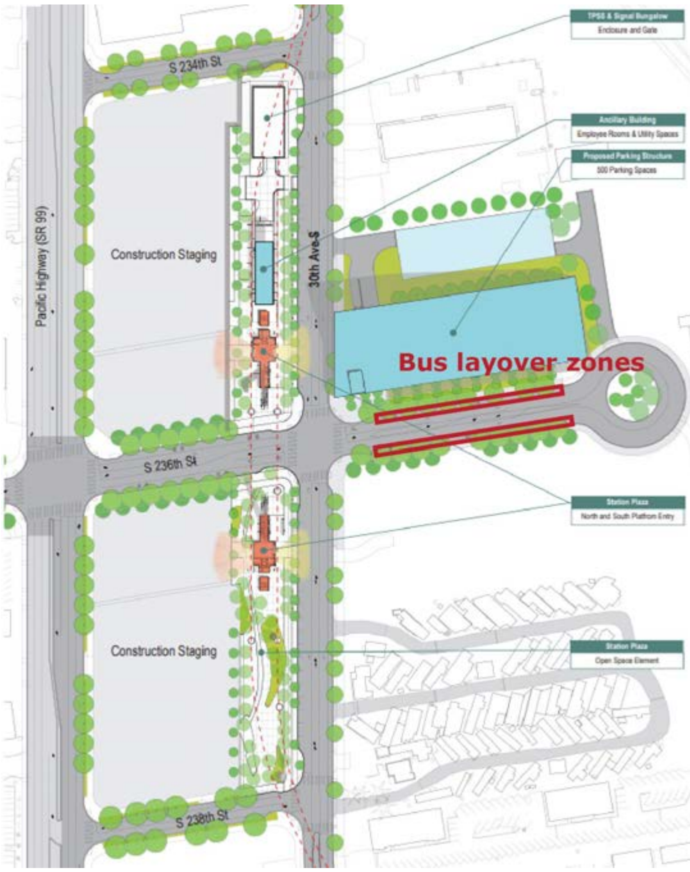
[1] A one-way travel time of approximately 44 to 48 minutes requires a layover of 10 minutes (20% layover). With buses every 10 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

[2] A roundtrip travel time of 92 minutes requires a layover of 18 minutes. With buses every 10 minutes, there could be two buses at one time. Three buses may be present if there's an early arrival and/or late departure.

4.5a Kent Des Moines Station

Kent Des Moines Station is the future Link station along Pacific Highway between Kent Des Moines Road and S 240th St. The future site will contain curb space for bus layover along S 236th St (see Figure 10). This station is being developed, and there are no existing layover facilities here.

Figure 10 Kent Des Moines Station Site Plan



Source: Sound Transit.

Other potential nearby layover locations include Highline College (existing terminus of Route 156), and Kent Des Moines Park and Ride, located on the northeast side of the I-5 interchange with Kent Des Moines Road. The park-and-ride is owned by King County Metro and serves Routes 162 and 193 and Sound Transit Route 574. However, it is not a terminus location for any route today.

4.5b Green River College

Green River College serves as the existing terminus of Routes 165 and 181. The existing layover space is an on-street pullout on SE 320th Street in the eastbound direction. It is approximately 120 feet long, accommodating only two coaches. Limited street connectivity and lack of a way to turnaround require both routes to use a 1.5 mile terminal loop. There are no off-street layover locations in this area.

To accommodate both the 165 RapidRide, as well local service on Route 181 (or even the 181 RapidRide), a longer pullout will be needed. Otherwise, coordination with Green River College will be needed to identify a terminus location on the Green River College campus. With operational concerns associated with live looping a RapidRide line, additional layover at Green River will likely need to be pursued.

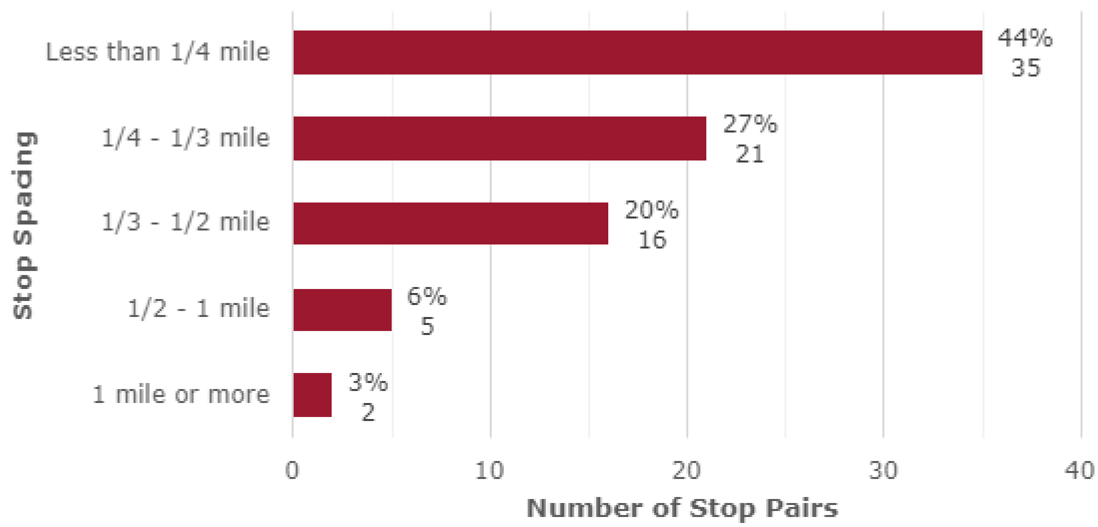
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,700 feet (or approximately one-third mile).

Approximately 45% of stop pairs along the corridor are less than a quarter mile, and with an additional 27% between a quarter and third of a mile (Figure 11).

Figure 11 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program’s Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

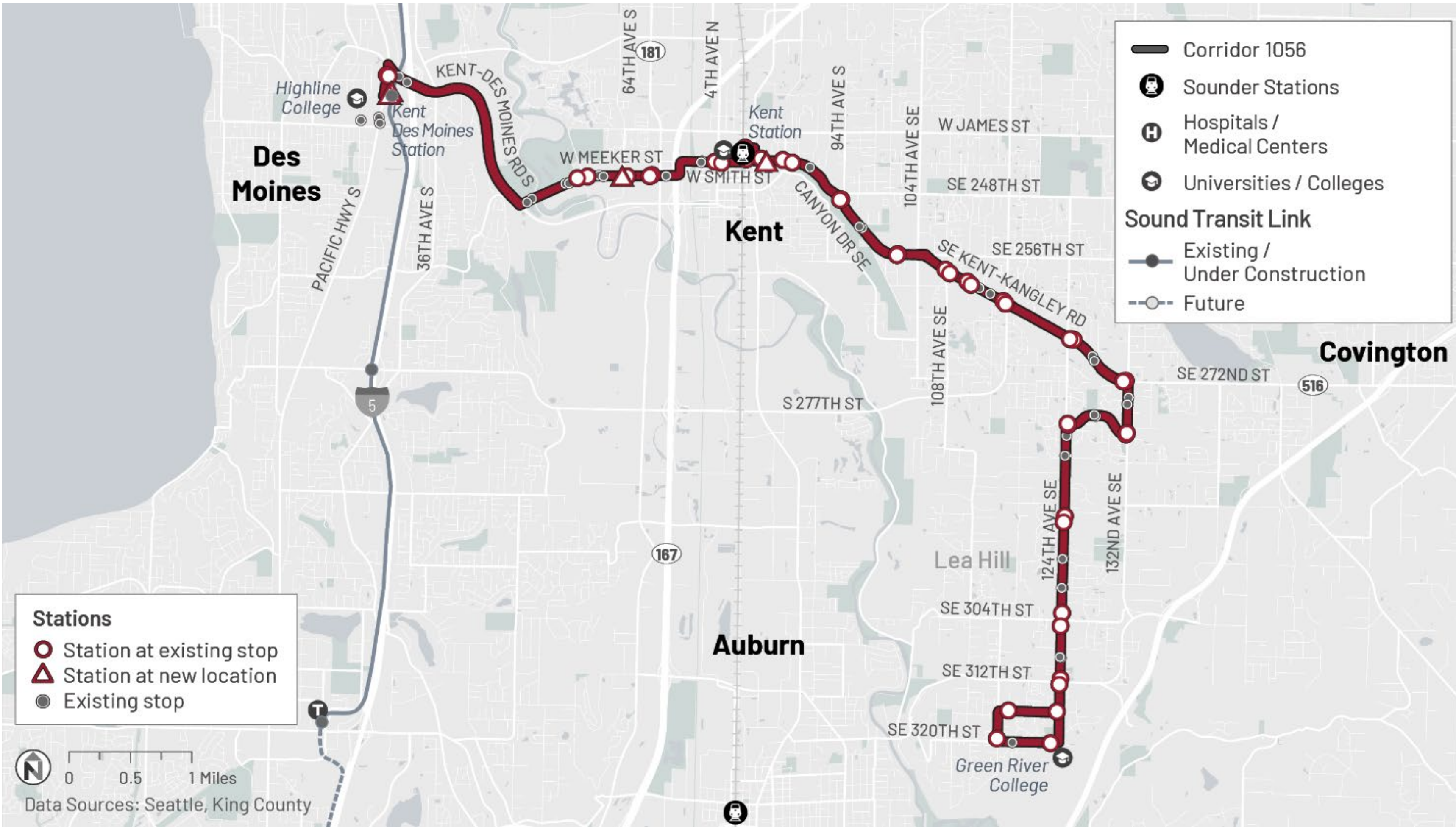
5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 12. The average spacing would be 2,870 feet, or approximately a half mile, which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 12 Proposed Station Locations



King County METRO

5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 13, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 57.

Figure 13 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 36), each station is categorized into one of the four potential station typologies. The typologies are listed in Figure 14 and summarized in Figure 14.

Figure 14 Station Boardings and Typology

		Forecast Boardings		Typology	
#	**Station**	**EB**	**WB**	**EB**	**WB**
1	SE 316th St & 117th Pl SE	10	-	Small	-
2	116th Ave SE & SE 320th St	10	-	Small	-
3	Green River College	-	950	-	Large Raised
4	124th Ave SE & SE 316th St	10	-	Small	-
5	124th Ave SE & SE 312th St	10	270	Small	Large
6	124th Ave SE & SE 304th St	10	30	Small	Small
7	124th Ave SE & SE 288th Pl	20	30	Small	Small
8	124th Ave SE & SE 277th Pl	10	30	Small	Small
9	132nd Ave SE & SE 278th St	10	10	Small	Small

#	Station	Forecast Boardings EB	Forecast Boardings WB	Typology EB	Typology WB
10	Kent Kangley Rd & 132nd Ave SE	100	40	Medium	Small
11	Kent Kangley Rd & 124th Ave SE	60	90	Medium	Medium
12	Kent Kangley Rd & 116th Ave SE	30	50	Small	Medium
13	Kent Kangley Rd & 111th Ave SE	10	20	Small	Small
14	Kent Kangley Rd & 108th Ave SE	50	40	Medium	Small
15	SE 256th St & 101st Ave SE	140	110	Medium	Medium
16	Canyon Dr SE & 94th Ave S	50	90	Medium	Medium
17	Canyon Dr SE & E Titus St/Jason Ave N	50	90	Medium	Medium
18	E Smith St and State Ave N	50	60	Medium	Medium
19	Kent Station[3]	450	530	Large Raised	Large Raised
20	W Smith St & 4th Ave N	10	30	Small	Small
21	W Meeker St & Washington Ave S	10	20	Small	Small
22	W Meeker St & 64th Ave S	10	30	Small	Small
23	W Meeker St & Russell Rd	50	10	Medium	Small
24	Pacific Hwy S & Kent Des Moines Rd	710	10	Large Raised	Large
25	Kent-Des Moines Link Station	730	-	Large Raised	-

Figure 15 Route 165 Station Typology Summary

Station Type	Count	Percent
Large Raised Station	5	11%
Large Station	2	4%
Medium Station	14	31%
Small Station	24	53%
Total	**45**	**100%**

[3] Kent Station is expected to experience capacity constraints within 10 years due to service growth. These capacity limitations may impact the location, design, and cost of RapidRide stations.

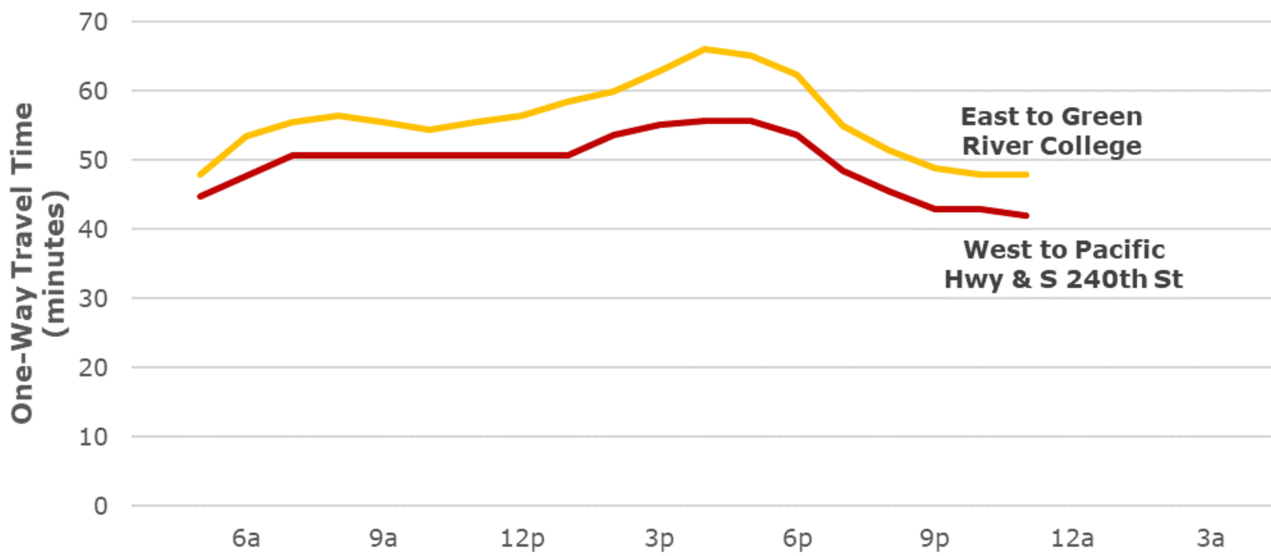
6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 165 in May 2023 (between Pacific Highway and Green River College) ranged between 42 minutes (late in the evening) to 66 minutes (during the PM peak). On average a one-way trip took 53 minutes.

The difference in travel time is largely attributable to additional time given in the eastbound direction from the timepoint at Lakeside Blvd E & 228th St to Kent Station (which includes looping into the station), and from 132nd Ave SE & SE Kent Kangley Rd to Green River College (which includes the one-way loop to 116th Ave SE to access the Green River College eastbound stop).

Figure 16 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

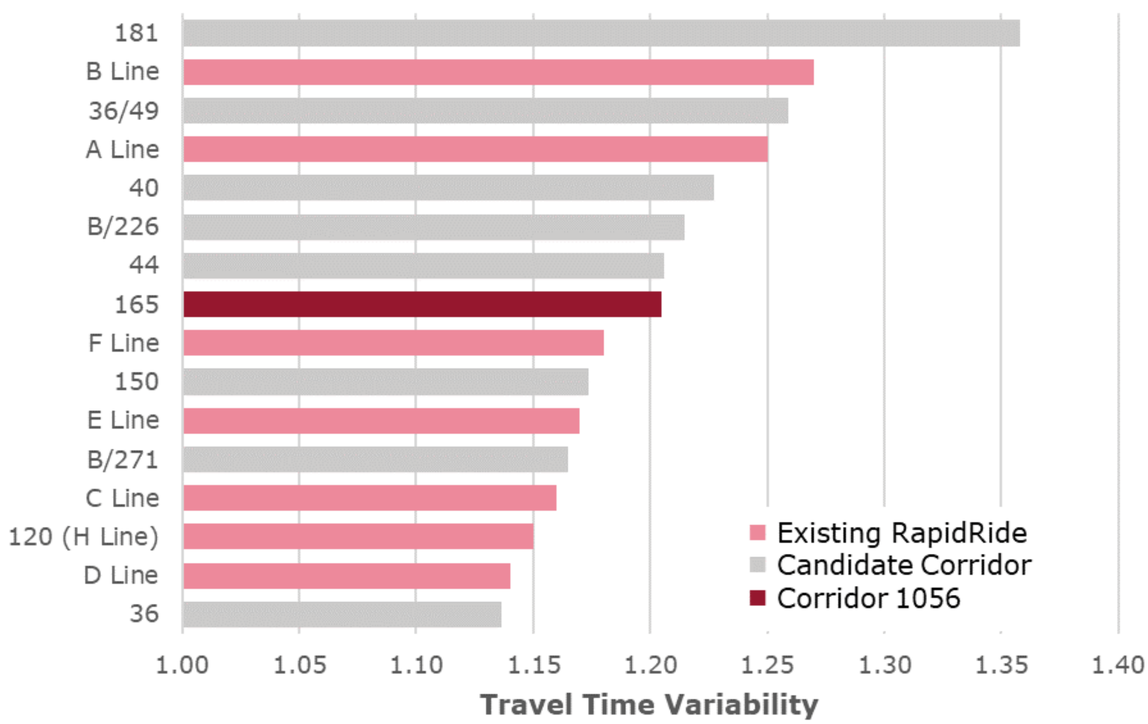
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 1056 experiences delay of just over 16 minutes between the 20th and 80th percentile travel time. This is approximately 0.72 minutes (43 seconds) of trip delay per mile on an average trip. This is the second lowest trip delay of all nine candidate corridors.

Eastbound and westbound trips at 3 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.16 to 1.20. This indicates the longest travel times (slowest trips) take 16-20% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1056's performance is typical. This comparison is shown in Figure 17.

Figure 17 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 18.

Figure 18 Speed & Reliability Summary

Metric	Value
On-time performance[A]	74%
Average speed	19.9 mph
Average trip delay[B]	16.2 min
Average trip delay per mile	43 sec
Lowest median hourly travel time (Reference) [C]	31 min
Highest median hourly travel time	39 min[D]
Travel time variability[E]	1.20

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 5 PM for eastbound trips, from Fall 2021.

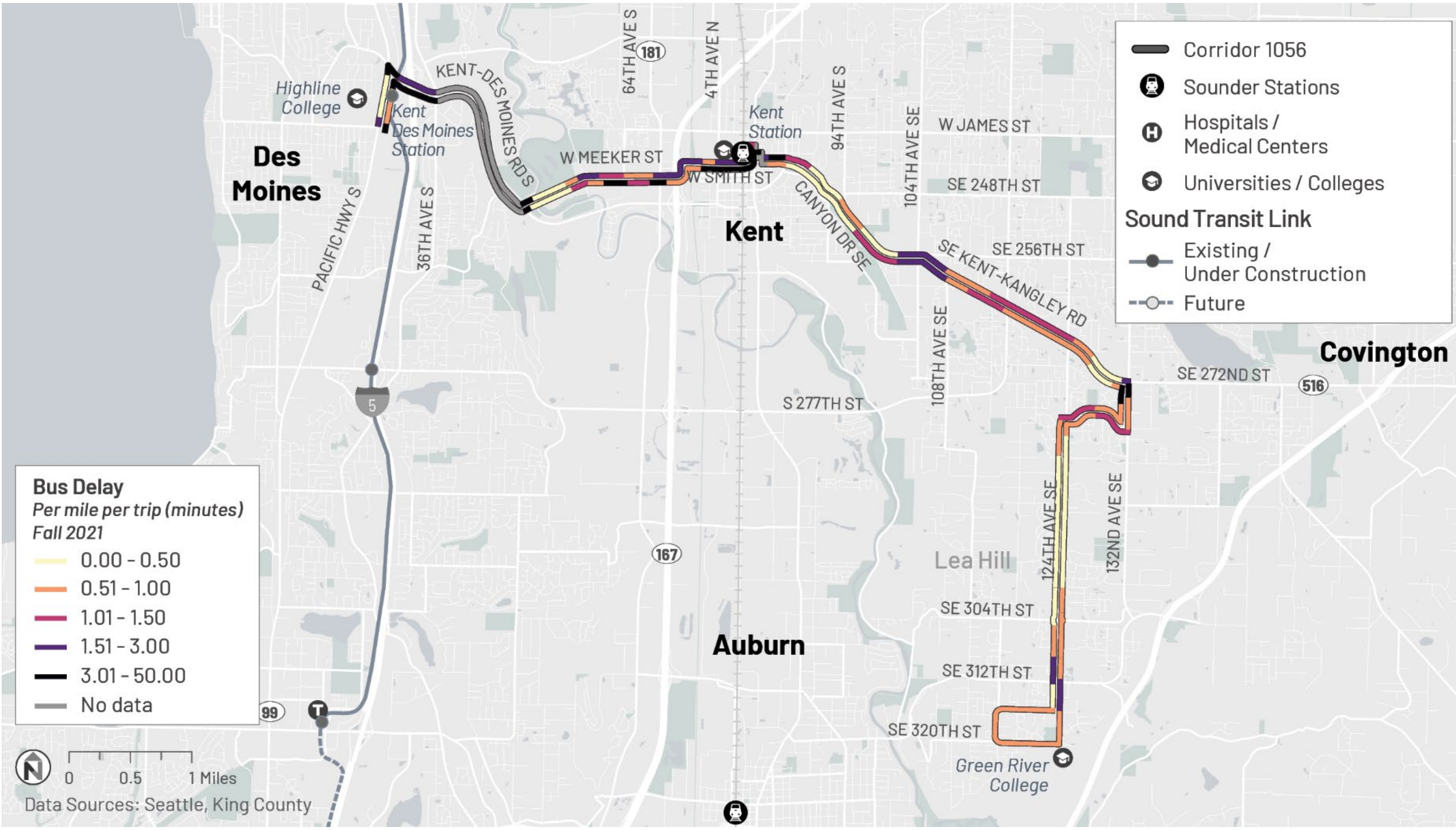
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 19 shows the delay along Corridor 1056 based on King County Metro's AVL data from Fall 2021.[4] The segments shown are existing stop pairs along the representative alignment, not just the Route 165 stop pairs. The data for the stop pairs along W Meeker St is based on Routes 162 and 183, and the data for the stop pairs along SE Kent-Kangley Road is from Route 162. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Locations that experience high delay occur at major intersections, and eastbound travel on W Meeker St. Segments near Kent Station also experience high delay.

[4] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 19 Corridor 1056 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 20 and Figure 21 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

Segments near Highline College experience delay throughout the day in both directions. Segments on Kent Des Moines Rd and near Kent Sounder Station also experience high all-day delay. Both segments approaching SE 312th St experience high delay throughout the day. Stop pairs eastbound towards Green River College experience moderate to high delay between 8 and 11 pm. Overall, high delay locations experience delay throughout the day. Higher level of delay occur between 3 and 7 pm in both directions.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

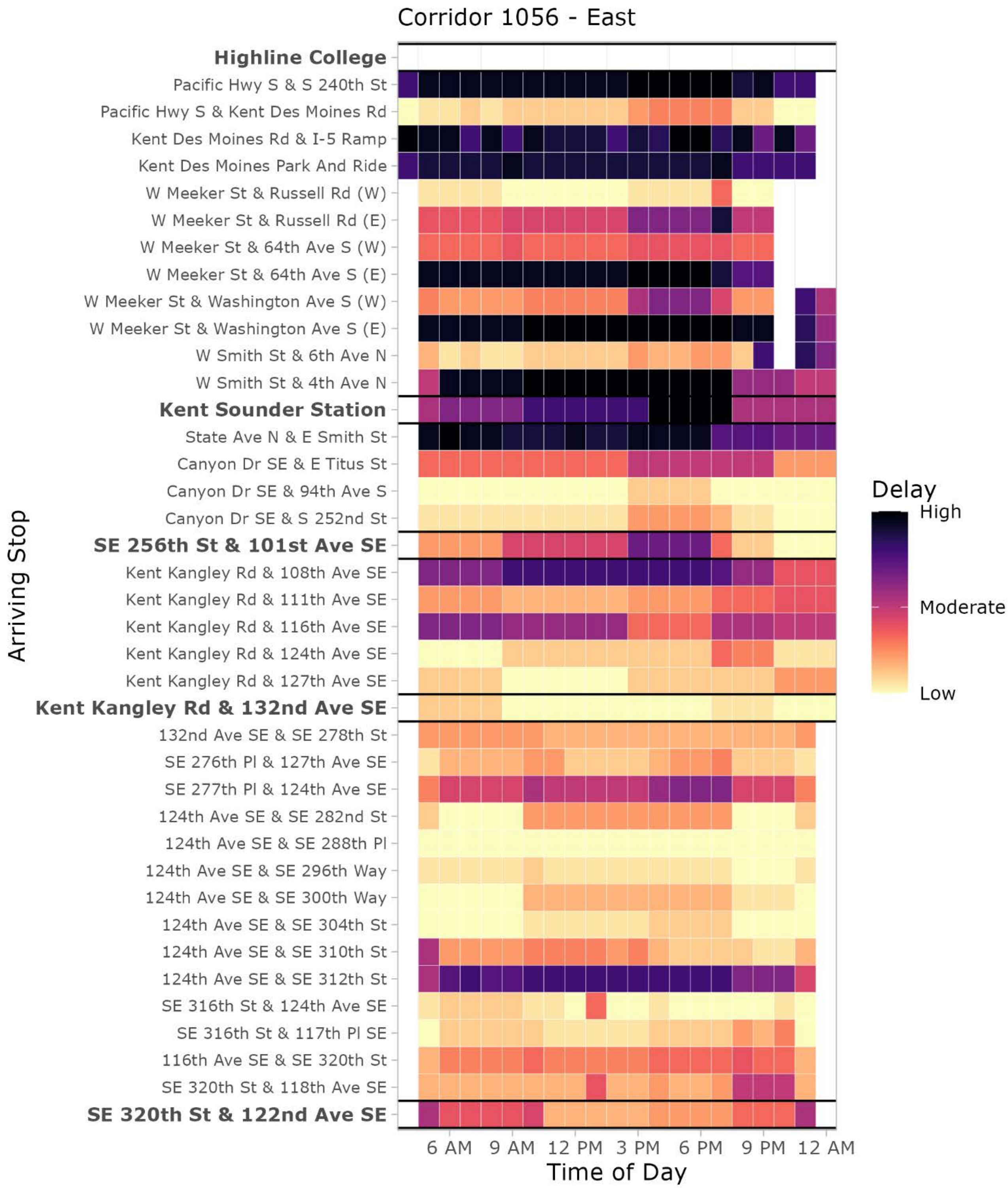
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 20 Corridor 1056 Eastbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 21 Corridor 1056 Westbound – Bus Delay per Mile per Trip

Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along the Corridor 1056 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 22, and they are shown geographically in a map in Figure 23. The alignment adjustment from SE 240th St onto SE Kent Kangley Rd, and from Lakeside Blvd/Veterans Dr onto Kent-Des Moines Rd can also be characterized as speed and reliability changes because of the reduction in travel time, but they are not included in this list.

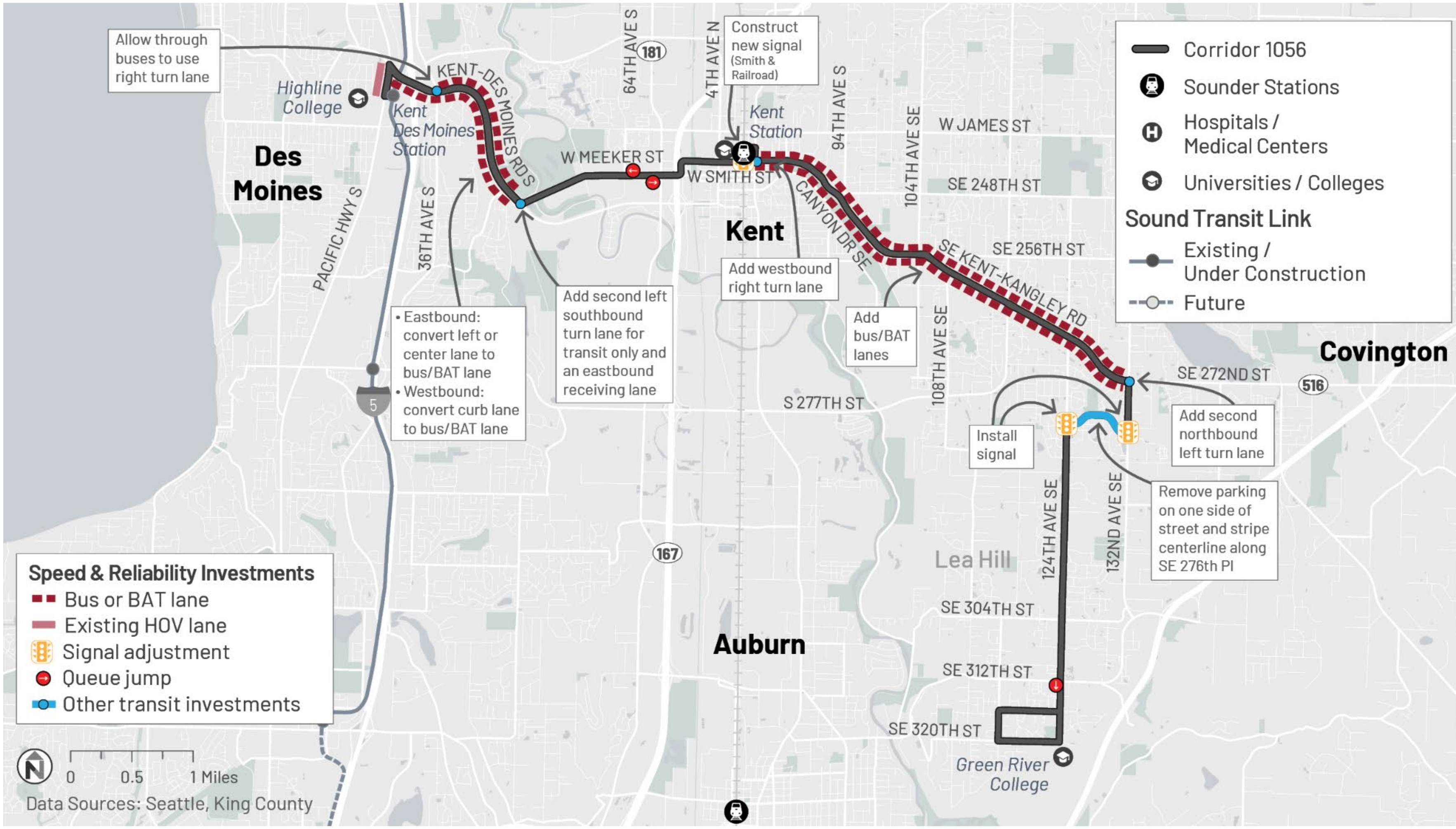
Portions of the corridor are shared with the future RapidRide I Line. The proposed treatments are consistent with the plans for I Line.

The corridor currently achieves transit priority for 2% of its centerline miles, which is well below the RapidRide *minimum* standard of 40%. The additional proposed treatments here would increase the coverage to 43%.

Figure 22 List of Proposed Transit Priority Treatments

Location	Type	Description
Des Moines		
Pacific Hwy S (S 236th Pl to S Kent Des Moines Rd)	Bus/BAT lane	Upgrade HOV lane into BAT lanes in both directions from S 236th Pl to S Kent Des Moines Rd.
Kent		
S Kent Des Moines Rd (Pacific Hwy S to Military Rd S)	Bus/BAT lane	Add curbside eastbound bus/BAT lane from Pacific Hwy S to Military Rd S.
S Kent Des Moines Rd & Military Rd S	Queue jump	Allow right turn except bus at Military Rd S (eastbound) and add a queue jump signal to facilitate movement through intersection.
S Kent Des Moines Rd (Military Rd S to W Meeker St)	Bus/BAT lane	Add bus-only lane on left or center lane (eastbound), convert shoulder lane to bus-only lane (westbound) between Military Rd S to W Meeker St.
S Kent Des Moines Rd & W Meeker St	Other	Add second left turn lane for transit only (southbound to eastbound).
W Meeker St & Frager Rd S	Other	Add second eastbound receiving lane for transit.
W Meeker St & 64th Ave S	Queue jump	Add westbound queue jump lane with signal at 64th Ave S.
W Meeker St & Washington Ave N	Queue jump	Add eastbound queue jump at Washington Ave N.
Smith St & Railroad Ave N	Other	Add signal at Smith St and Railroad Ave N.
Smith St & Central Ave N	Other	Add westbound right turn lane, or convert westbound right lane to right turn only lane at Smith St and Central Ave N.
SR-516 (Central Ave S to 132nd Ave SE)	Bus/BAT lane	Add bus/BAT lane from Central Ave S to 132nd Ave SE through widening or lane repurposing) in both directions.
SE Kent-Kangley Rd & 132nd Ave SE	Other	Add second northbound left turn lane at SE Kent-Kangley Rd & 132nd Ave SE.
132nd Ave SE & SE 278th St	Other	Add signal at 132nd Ave SE & SE 278th St.
SE 276th Pl (124th Ave SE to 132nd Ave SE)	Other	Remove parking on one side of street and add centerline stripe along SE 276th Pl.
SE 277th Pl & 124th Ave SE	Other	Add signal at SE 277th Pl & 124th Ave SE.
Auburn		
SE 312th St & 124th Ave SE	Queue jump	Add southbound queue jump using right turn lane, add southbound receiving lane. May require costly land acquisition.

Figure 23 Proposed Transit Priority Treatments



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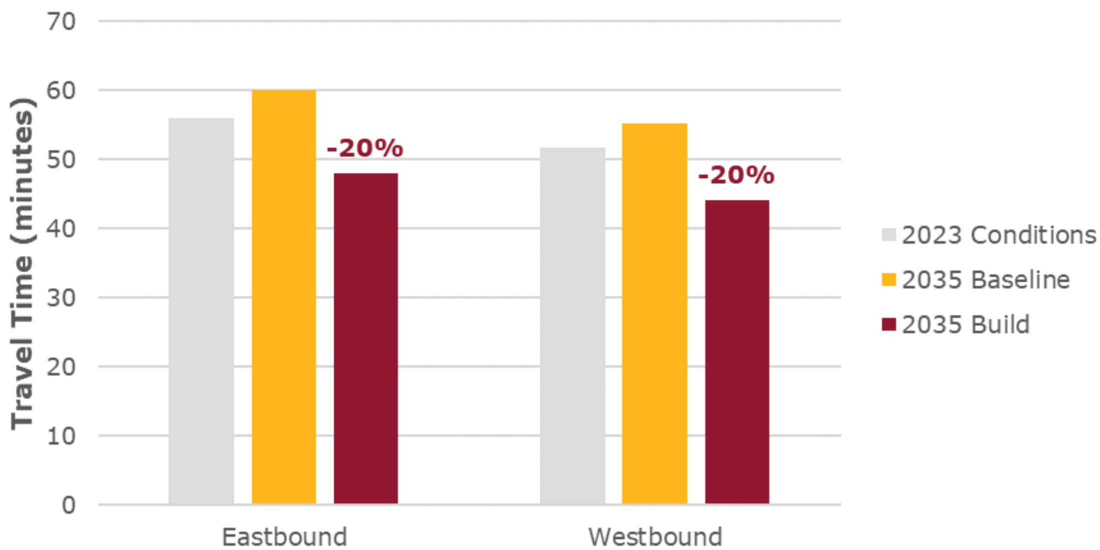
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1056 alignment are forecast to reduce PM peak Future Build condition travel times 20% from Future Baseline conditions. Average bus travel speed is expected to increase to 15-17 mph in the Future Build conditions. Travel in both directions will experience a similar reduction in travel times. Adding bus/BAT lanes at segments of high delay will improve transit speeds and travel time.

Figure 24 shows transit travel times for the overall route.

Figure 24 Route 165 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 165 carried approximately 2,900 people per day in Spring 2023, and as much as 3,500 people in Fall 2019 on Routes 164 and 166 combined.[5] The route has now recovered approximately 83% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[6], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 25 Route 165 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	3,537	-	100%
Fall 2020	1,477	-58%	42%
Fall 2021	1,852	+25%	52%
Spring 2023	2,936	+59%	83%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 26 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 165, plus stops along Routes 162 and 183 where the corridor diverges from the Route 165 alignment.

The busiest stop locations are near the Highline College, at Green River College, and in Downtown Kent. Moderate ridership occurs at SE 256th St and 101st Ave SE, and at Kent-Kangley Road and 132nd Ave SE.

[5] Route 165 was a new route in Fall 2020 which replaced both Routes 164 and 166 for most of their alignments.

[6] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 26 Boarding and Alighting by Stop (Spring 2023)

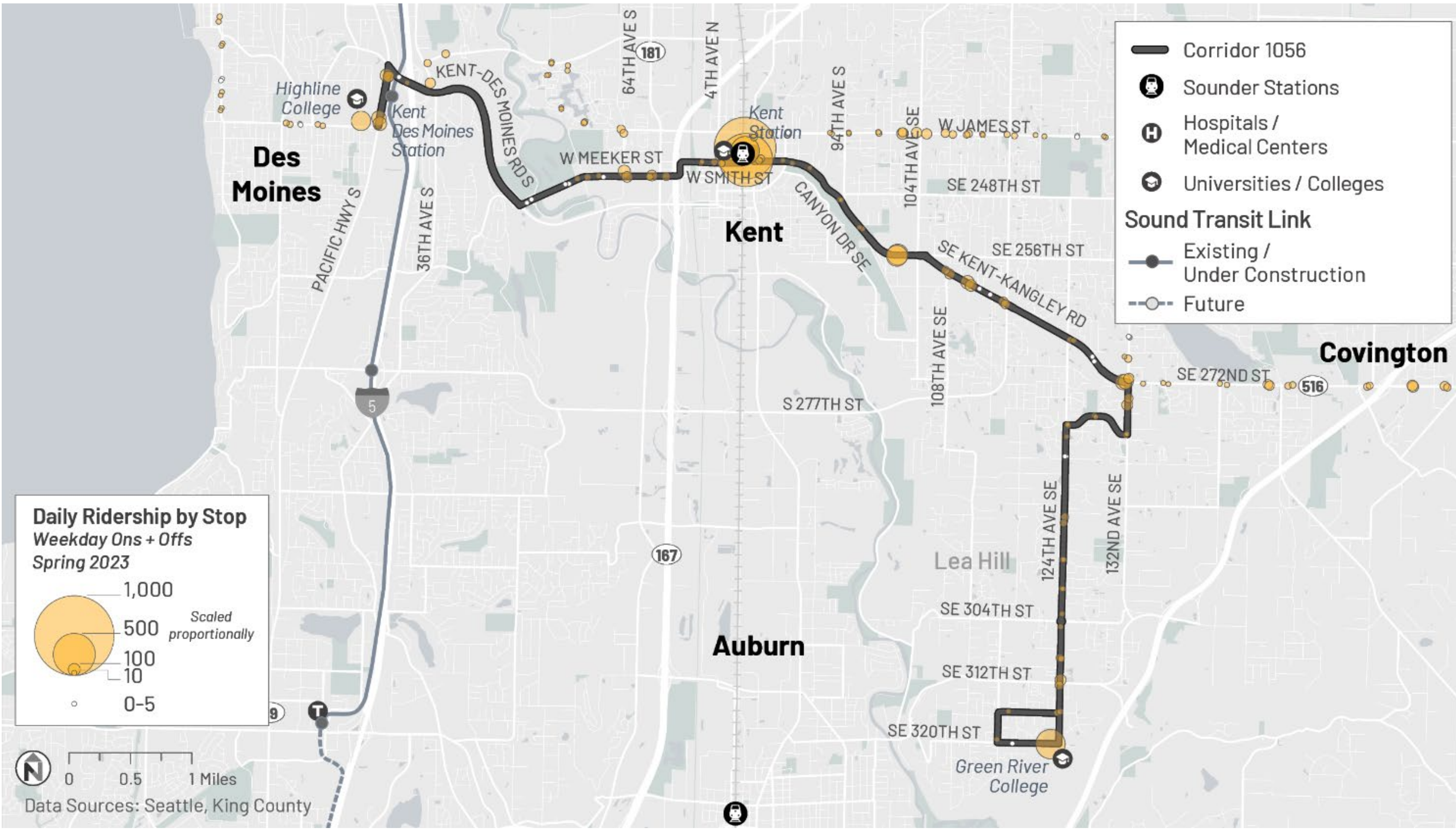


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Figure 27 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Westbound	Eastbound	Total
316th St & 117th Pl	8	-	8
116th Ave & 320th St	10	-	10
320th St & 188th Ave	1	-	1
Green River College	185	146	331
124th Ave & 316th St	20	29	49
124th Ave & 312th St	90	55	144
124th Ave & 310th St	26	44	70
124th Ave & 304th St	13	13	27
124th Ave & 300th Way	11	15	26
124th Ave & 296th Way	15	16	31
124th Ave & 288th Pl	41	35	76
124th Ave & 282nd St	3	3	6
124th Ave & 280th St	5	-	5
124th Ave & 227th Pl	16	12	28
276th Pl & 127th Ave	9	10	19
132nd Ave & 278th St	13	12	25
132nd Ave & 274th St	58	88	146
Kent-Kangley Rd & 132nd Ave	141	144	285
Kent-Kangley Rd & 127th Ave	4	3	6
Kent-Kangley Rd & 124th Ave	15	20	35
Kent-Kangley Rd & 116th Ave	65	61	126
Kent-Kangley Rd & 111th Ave	118	96	214
Kent-Kangley Rd & 108th Ave	48	74	122
256th St & 101st Ave	220	219	439
Canyon Dr & 252nd St	12	8	20
Canyon Dr & 94th Ave	7	10	17
Canyon Dr & Alvord Ave	5	-	5
Canyon Dr & Jason Ave/Titus St	7	11	17
Smith St & State Ave	34	38	72
Kent Station	648	764	1,411
Smith St & 4th Ave	29	35	63
Smith St & 6th Ave	5	7	12
Meeker St & Washington Ave (E)	-	47	47
Meeker St & Washington Ave (W)	83	33	117
Meeker St & 64th Ave	106	82	188
Meeker St & 6200 Block	12	0	12
Meeker St & Russell Rd	15	27	41

Stop Pair	Westbound	Eastbound	Total
Riverbend Golf Complex	0	3	3
Meeker St & Frager Rd	4	4	8
Kent Des Moines P&R	43	37	81
Kent Des Moines Rd & I-5 Ramp	1	8	9
Pacific Hwy & Kent Des Moines	114	87	201
Pacific Hwy & 240th St	132	122	255
Highline College	97	102	199

Source: King County Metro Spring 2023

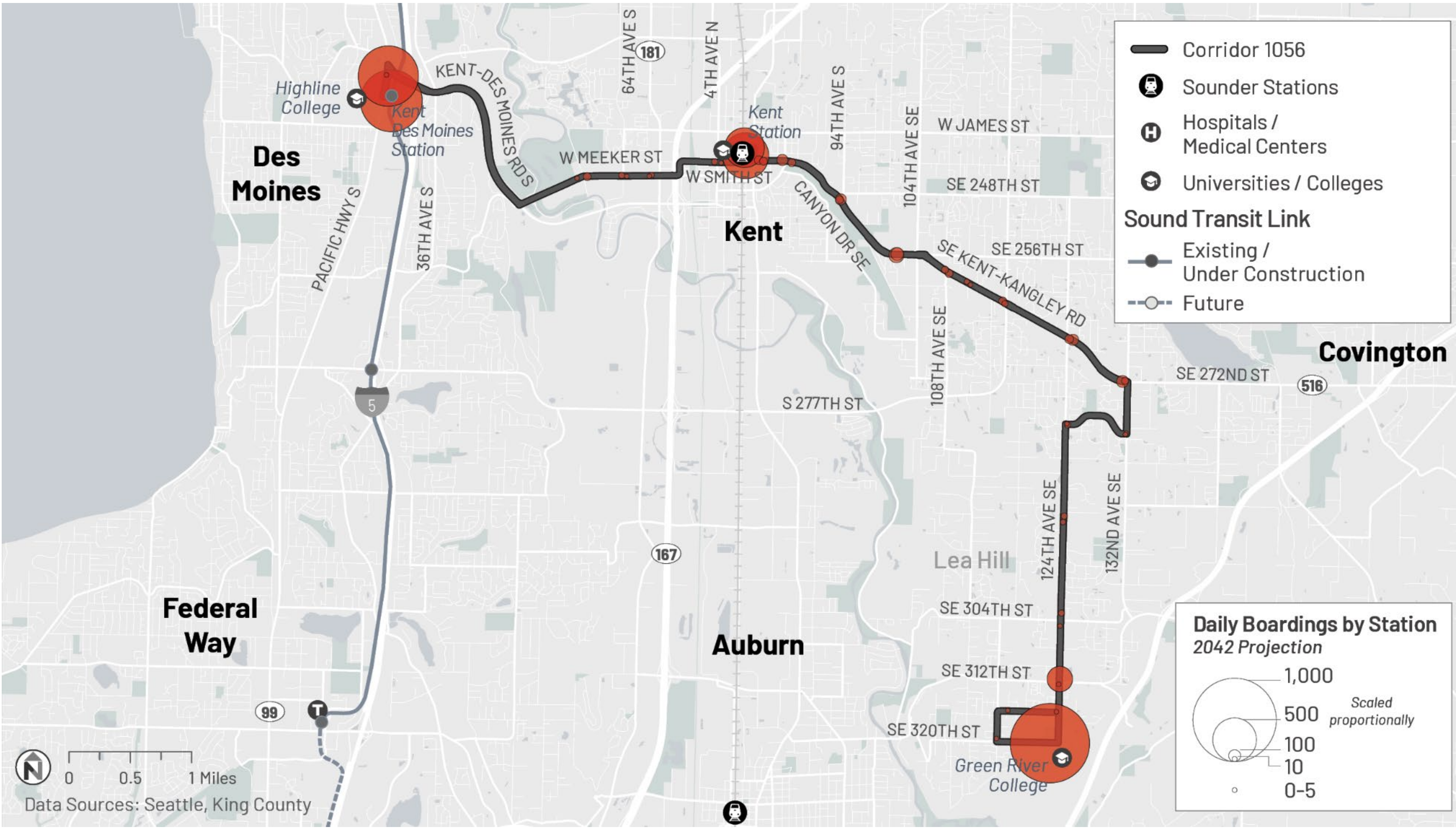
Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership is from Routes 162 and 183 along Meeker St, and from Routes 162 along Kent-Kangley Rd.

7.3 Forecast Ridership

Future ridership for Corridor 1056 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1056 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 330 boardings in the PM peak hour and 5,000 daily boardings. Key ridership hubs include Kent-Des Moines Station, Kent Station and Green River College. Future ridership for each candidate RapidRide station is shown in Figure 28.

Figure 28 Future Corridor Ridership



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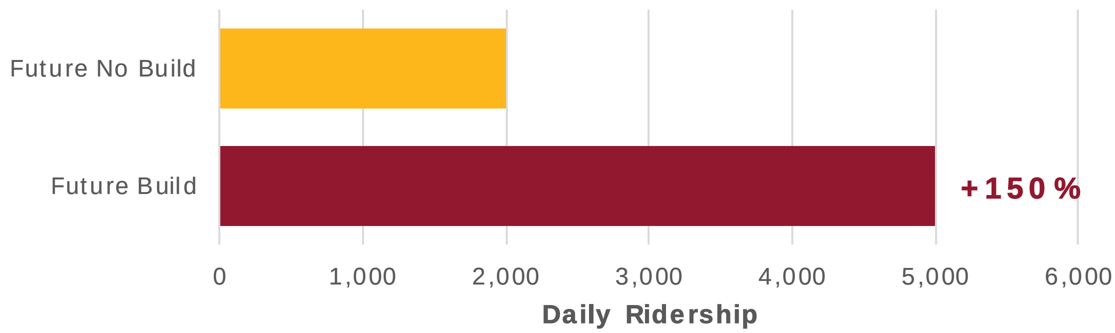
7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 3,000 riders per weekday (or 150% increase) is forecast for Corridor 1056 compared to a "baseline" scenario with today's service levels for Route 165.

Figure 29 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1056 is forecast at 35 riders per revenue hour. This would result in an improvement of 44 percent in productivity compared to a future "baseline" 25 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 31 and 20 riders per revenue hour, respectively. At 35 riders per revenue hour, Corridor 1056 would rank third lowest of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

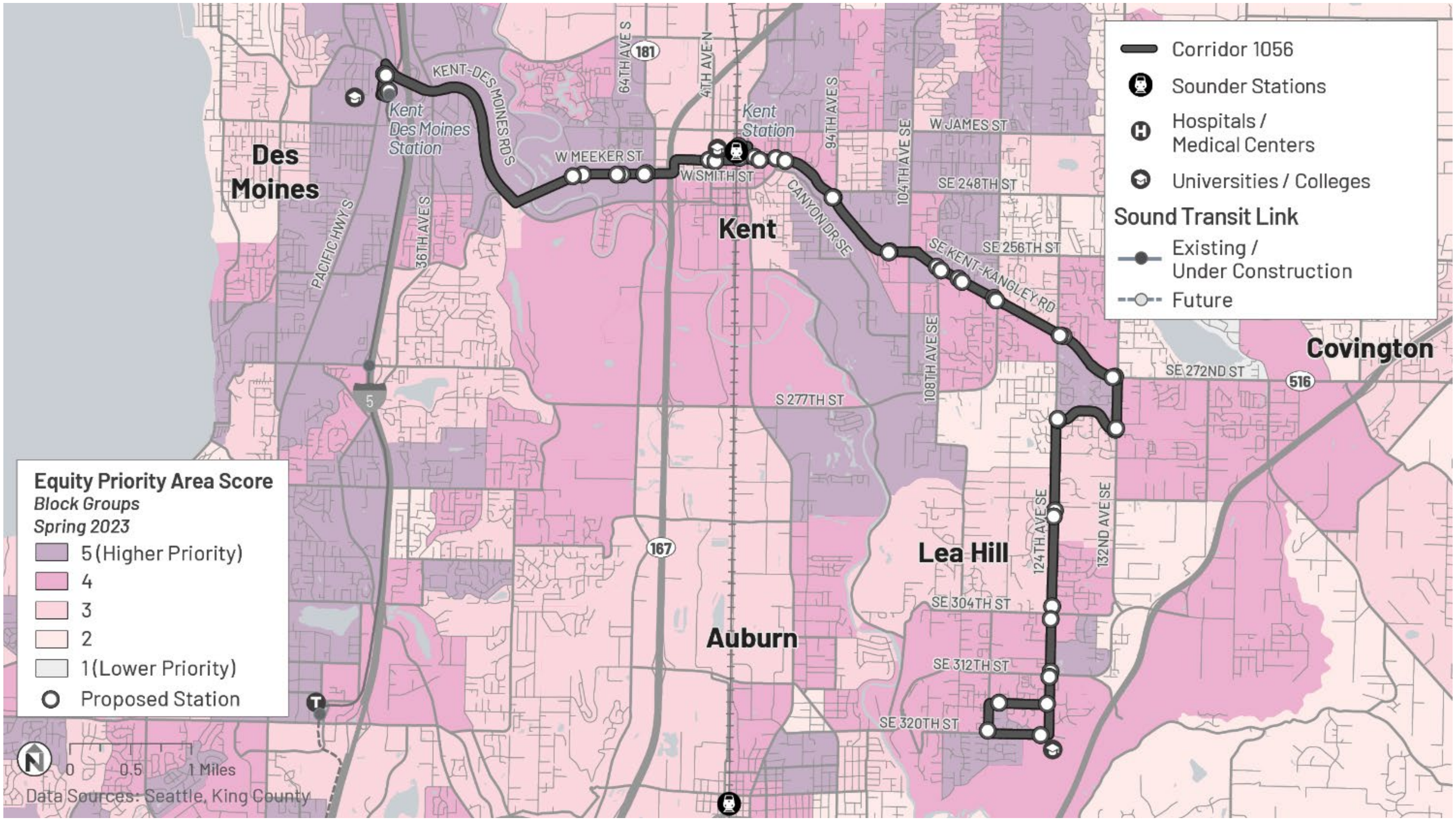
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[7] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 30 displays equity priority area scores for block groups located along Corridor 1056. In the western portion of the alignment, the route serves high equity priority areas in Des Moines and Kent along Pacific Highway S, Kent-Des Moines Road S, and W Meeker Street. To the east of Kent Station, Route 165 serves several high equity priority areas along Canyon Drive S, between E Titus Street and 101st Avenue SE, and along SE Kent-Kangley Road between 101st Avenue SE and 116th Avenue SE and between 124th Avenue SE and 132nd Avenue SE. In Auburn, Route 165 serves high equity priority areas along 124th Avenue SE and SE 320th Street.

[7] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 30 King County Metro Equity Priority Areas



8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 31 and Figure 32 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[8] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Route 165 in Fall 2020, ridership retention was consistent with the regional average or 10-33 points higher than the region. By Spring 2023, however, change in ridership along the 124th Ave SE portion was 20-63 points higher, and the Kent-Des Moines Rd S portion of the corridor was 20-63 points lower than the region, while elsewhere along the corridor, the change in ridership followed a similar trend as before.

[8] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 31 Ridership Retention (Fall 2020)

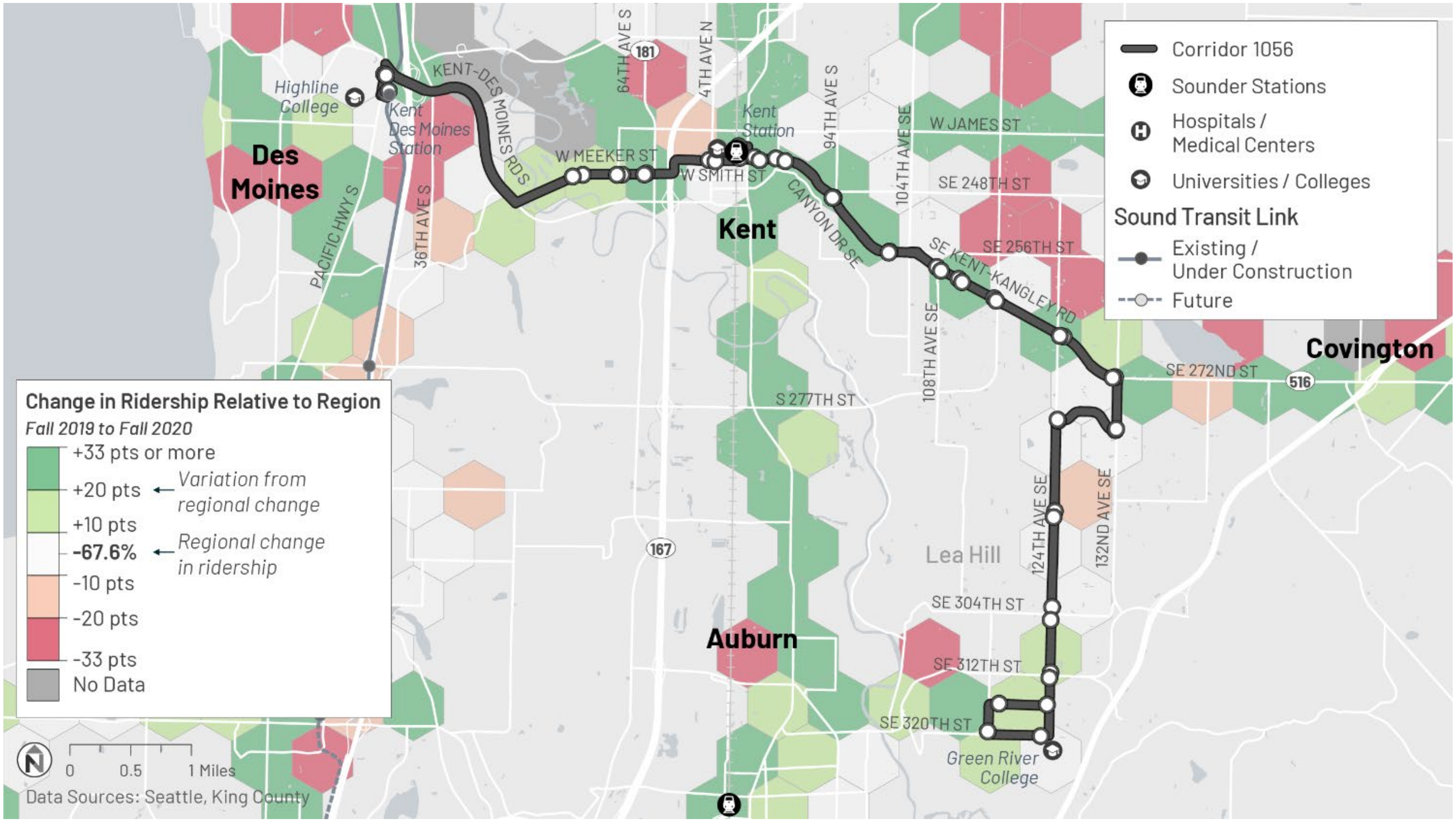
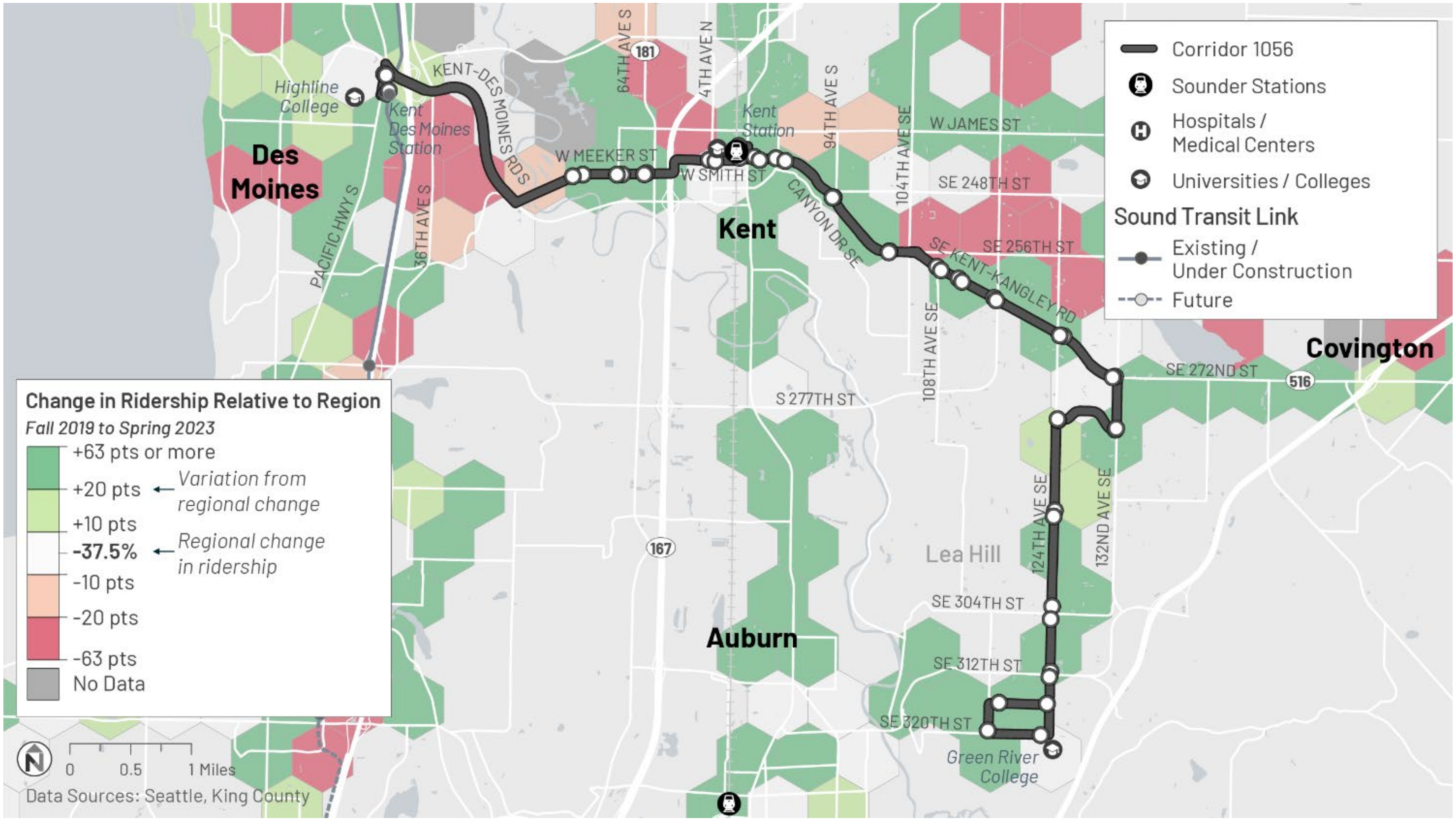


Figure 32 Ridership Retention (Spring 2023)



8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Route 165 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[9] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 40% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the third highest increase in job access, and tied with Corridor 1993.

8.4 GHG Emissions

The ridership gains and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 165 will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[10] Approximately 3.20 metric tons of CO_2 would be reduced on an annual basis due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the third largest reduction.

[9] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[10] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 27 intersections along Route 165 to evaluate transit travel time benefits of the proposed improvements. Out of the 27 intersections, nine signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 18 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 33 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis, could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 33 Modeled Delay from Synchro

			Transit Delay (seconds)			Traffic Delay (seconds)		
ID	Intersection	Traffic Control	Existing	2035 Baseline	2035 Build	Existing	2035 Baseline	2035 Build
Eastbound								
401	SR 99 & SR 516	Signal	47.0	96.3	94.7	47.0	96.3	94.7
402	64th Ave S & W Meeker St	Signal	61.1	51.5	51.5	61.1	51.5	51.5
403	Washington Ave & W Meeker St	Signal	66.3	78.5	49.7	66.3	78.5	70.0
404	4th Ave N & W Smith St	Signal	34.9	44.4	44.4	34.9	44.4	44.4
405	Central Ave N & E Pioneer St	Signal	42.9	42.5	42.5	42.9	42.5	42.5
406	Central Ave N & Smith St	Signal	72.7	61.0	61.3	72.7	61.0	61.3
407	104th Ave SE & SE 256th St	Signal	53.0	104.2	31.7	53.0	104.2	89.4
408	108th Ave SE & Kent-Kangley Rd	Signal	24.4	39.1	16.2	24.4	39.1	36.0
409	132nd Ave SE & Kent-Kangley Rd	Signal	26.4	29.8	28.6	26.4	29.8	28.6
Westbound								
409	132nd Ave SE & Kent-Kangley Rd	Signal	72.0	113.7	59.5	72.0	113.7	59.5
408	108th Ave SE & Kent-Kangley Rd	Signal	4.8	12.5	10.3	4.8	12.5	14.1
407	104th Ave SE & SE 256th St	Signal	35.7	48.7	34.2	35.7	48.7	49.5
406	Central Ave N & Smith St	Signal	23.2	37.4	27.9	23.2	37.4	32.0
405	Central Ave N & E Pioneer St	Signal	2.2	7.2	8.2	2.2	7.2	8.2
404	4th Ave N & W Smith St	Signal	37.6	45.3	45.3	37.6	45.3	45.3
403	Washington Ave & W Meeker St	Signal	64.3	68.5	67.1	64.3	68.5	67.1
402	64th Ave S & W Meeker St	Signal	12.2	50.9	47.3	12.2	50.9	47.3
401	SR 99 & SR 516	Signal	149.5	94.6	94.6	149.5	94.6	94.6

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 34 summarizes the number of crashes along the corridor by severity level and mode. There were 711 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 13% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, howevery 8% resulted in a fatality or serious injury.

Figure 34 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	3	<1%	5	7%	1	6%	**9**	**1%**
Serious Injury	33	5%	18	24%	1	6%	**52**	**7%**
Minor Injury	94	15%	19	26%	6	35%	**119**	**17%**
Possible Injury	490	79%	32	43%	9	53%	**531**	**75%**
Total	**620**	**100%**	**74**	**100%**	**17**	**100%**	**711**	**100%**

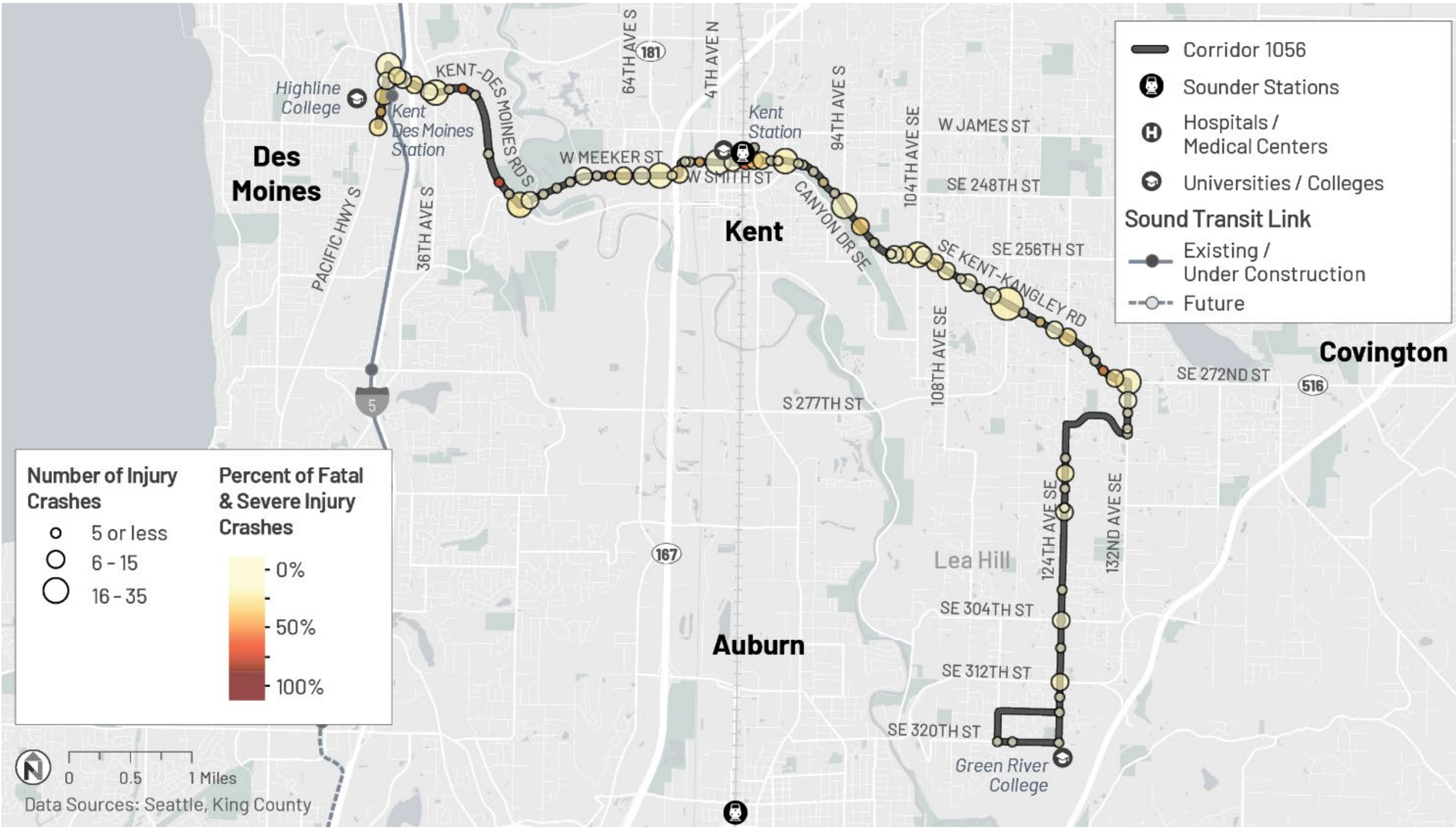
Source: WSDOT (2018-2022)

Figure 35 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along Pacific Hwy S near Highline College toward 38th Ave S
- Along W Meeker St from Kent-Des Moines Rd S to State Route 167
- Along W Smith St near the Kent Link Station
- Along Canyon Dr SE between the Kent Link Station and 104th Ave SE
- Along SE Kent-Kangley Rd between 104th Ave SE 132nd Ave SE

Figure 35 Crash Locations



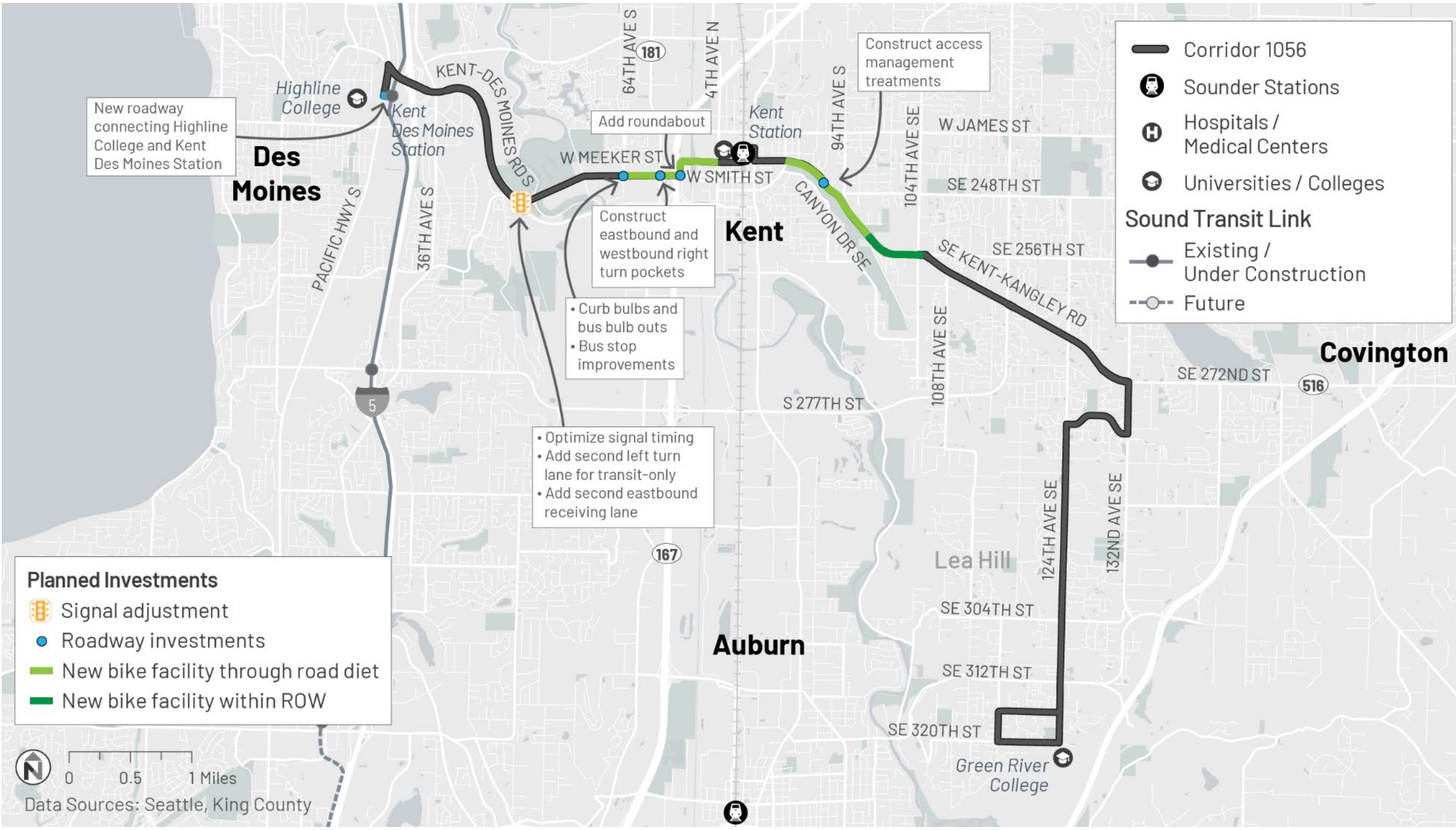
King County METRO

11.0 Planned Improvements

Route 165 serves the cities of Des Moines, Kent, and Auburn. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 36, and all projects are described in Figure 37.

Major projects include a new roadway connecting Highline College and Kent Des Moines Station, transit improvements at Kent-Des Moines Road and Meeker Street, and bike and pedestrian facilities along Smith Street and Canyon Drive near Kent Sounder Station.

Figure 36 Planned Jurisdictional Investments



King County METRO

Figure 37 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Widen Road	Widen roadway to three lanes between 16th Ave S and 20th Ave S and provide a continuous center turn lane, bike path, bike lane, transit stops, curb, gutter, and planters.	S 240th St at SR 99	FY 2022 - 2027 Des Moines Capital Improvement Plan
2	Kent-Des Moines Multimodal Transportation Hub	This project includes a bicycle/pedestrian bridge over I-5 near S 240th Street to improve multimodal access to the Kent-Des Moines light rail station and RapidRide A bus stops. Other multimodal connectivity facilities will include protected bike lanes, enhanced sidewalks, wayfinding, enhanced public spaces, street amenities, bike parking, and passenger loading zones.	SR 99 / S 240th St	Regional Transportation Plan 2022-2050
3	Intersection Improvements	Widen to provide dual left turn pocket for eastbound approach, revise signal timing. Coordinate with the City of Kent.	SR 99 / S 240th St	FY2023 - 2042 Des Moines Transportation Improvement Plan
4	WSDOT - SR 99/S 272nd St to SR 516 Vicinity - Paving & ADA Compliance	This project will resurface the northbound and southbound lanes of SR 99, from S 272nd St to SR 516, to extend the pavement service life and preserve the roadway. The project includes grinding and inlaying the roadway with 0.15' of hot mix asphalt (HMA),	SR 99 (SR 516 to S 240th St)	2023-2026 PSRC Regional TIP, Washington State S.T.I.P.
5	Widen Road	Expand roadway intended to connect the Kent Des Moines light rail station at S 236th Pl and 30th Ave S along 236th Pl and College Way to a street end just inside the western edge of the Highline College.	College Way at SR 99	FY2023 - 2042 Des Moines Transportation Improvement Plan
6	Road Expansion	Widen roadway to provide pedestrian facilities and additional turn lanes. Joint with City of Kent.	SR 516 at SR 99	FY2023 - 2042 Des Moines Transportation Improvement Plan, FY 2022 - 2027 Des Moines Capital Improvement Plan, Regional Transportation Plan 2022-2050
7	Repaving	Repaving	SR99 / SR516	WSDOT Capital Projects
8	Bike, Ped Improvements	Roadway improvements to include full roadway reconstruction, bike lanes, sidewalk, and parking between S 224th St and Kent-Des Moines Road.	30th Ave S at SR 516	FY 2022 - 2027 Des Moines Capital Improvement Plan

ID	Improvement	Description	Extent	Source
9	I-5 Regional Trail	Development of light rail on the west edge if Kent creates the opportunity to develop a multimodal network designed to increase access to high capacity transit. Kent is exploring the possibility of building a multi-use trail running parallel to the light rail alignment, I5, and SR 99 through Kent. The trail would be located between SR 99 and I-5 from Kent-Des Moines Road to S 272nd Street. It would enhance pedestrian and cyclist access to the soon to open Kent-Des Moines light rail station and Star Lake light rails station, as well as connect existing and planned high density housing, local east-west streets, and parks. The north-south trail is a critical regional connection similar to the Interurban Trail that transverses Kent's industrial/manufacturing center. The I-5 Regional Trail is anticipated to connect to future trails from south of the Kent. Kent anticipates launching an outreach effort to understand the needs and preferences of residents and businesses on Kent's West Hill as well as an outreach effort focused on stakeholders and adjacent cities. The outreach effort will result in a report summarizing the key findings and recommendations, documents the process, and includes the preferred trail alignment plan, cross sections, and cost estimate.	30th Ave S at SR 516	Regional Transportation Plan 2022-2050
10	SR 509 Extension (with I-5), Phase 1	This project will construct a new four lane SR 509 from S. 188th St to its connection with I-5. The project will also construct a two-lane southbound collector-distributor along I-5 to SR 516, reconstruct the SR 516 interchange into a diamond interchange and provide a connection to Veteran`s Drive. This project also constructs a NB Auxiliary lane between SR516/Veterans on ramp and SR509 off ramp. The project constructs a half diamond to the south to connect SR509 to 28/24th Ave S. Reconstruct the S 188th St Interchange into a half diamond to the north and construct a Southbound Auxiliary from SR516 down to S 272nd St.	SR 516 at I-5	Regional Transportation Plan 2022-2050
11	Road Diet	Convert Reith Rd from S 253rd Rd and Kent-Des Moines Rd from 4 to 3 lanes.	Reith Rd at SR 516	Kent Transportation Master Plan
12	Signal Optimization	Optimize signal timing.	SR 516 / W Meeker St	Kent Transportation Master Plan
13	New Sidewalk	Sidewalks on north side of Meeker from SR 516 to Frager Rd and on Frager Rd from Meeker Street to the golf course crossing.	W Meeker St (SR 516 - Frager Rd S)	Kent Transportation Master Plan

ID	Improvement	Description	Extent	Source
14	Meeker Street Green River Bridge Rehabilitation	Replace the existing finger expansion joints and bearing pads, deck resurfacing, and bridge repainting	W Meeker St (over Green River)	Kent Transportation Master Plan, 2024-2029 TIP Kent, 2023-2026 PSRC Regional TIP
15	New pedestrian facility	A continuous pedestrian facility will be constructed along Russell Road from Meeker Street to 700 feet north of Meeker Street. Sidewalk treatments will include a combination of asphalt path, concrete sidewalk, and curb separated sidewalk within the existing right-of-way	Russell Rd at W Meeker St	2024-2029 TIP Kent
16	New Sidewalk	Pedestrian facilities (sidewalks and buffer zone) (northside only) from Russell to 64th Ave S.	W Meeker St (Russell Rd - 64th Ave S)	Kent Transportation Master Plan
17	Safe Routes to School	School zone flashers at Kent Elementary	W Meeker St / 64th Ave S	Kent Transportation Master Plan, 2024-2029 TIP Kent
18	Intersection improvement including Transit Signal Priority	Intersection reconstruction, curb bulb-outs and bus bulb-outs to decrease the pedestrian crossing distance and decrease transit board time. The project includes bus stop improvements on the north and south side of W Meeker Street east of 64th Ave S, and signal improvements including transit signal priority.	W Meeker St / 64th Ave S	Kent Transportation Master Plan, 2024-2029 TIP Kent
19	Road Diet with a Bike Lane	Construct new two-way separated bike facility on the south side of the street with on-street parking and roadway median improvements from 64th Ave South to 750 feet east of 64th Ave S. The project will narrow the roadway to 3 lanes with parking on both sides and include construction of raised median islands, buffer between the two-way bike path and travel lanes, street lighting, landscaping, and pedestrian amenities.	W Meeker St (64th Ave S to Washington Ave N)	2024-2029 TIP Kent
20	New Traffic Signal	New traffic signal between 64th Ave S and Washington Ave.	W Meeker St (64th Ave S - Washington Ave N)	Kent Transportation Master Plan
21	Intersection Improvements	Construct east and westbound right turn pockets and modify signal phasing; ADA Curb ramps and crossing improvements.	W Meeker St / Washington Ave N	Kent Transportation Master Plan

ID	Improvement	Description	Extent	Source
22	Kent - City Safety Road Diets	This project has three separate locations where the existing roads will be converted to a three-lane roadway with bike lanes. Project locations: (#1) S 260th St -S 259th Pl, from Pacific Hwy to Military Rd S; (#2) Meeker-Lincoln-Smith, from Washington Av	W Meeker St (Washington Ave N - Lincoln Ave N) / Lincoln Ave N (W Meeker St - W Smith St) / W Smith St (Lincoln Ave N - 4th Ave N)	Transportation Master Plan, 2024-2029 TIP Kent, 2023-2026 PSRC Regional TIP
23	Pedestrian facility improvement	Pedestrian facilities on the south side	W Meeker Street (Washington Ave N - Lincoln Ave N)	Kent Transportation Master Plan
24	Kent - Meet Me on Meeker - Thompson Ave to Interurban Trail	The project will construct a roundabout at the intersection of Meeker Street and Lincoln Ave, a multi-modal promenade along the south side of West Meeker Street that includes a two-way separated bikeway, and sidewalk with buffer and amenity zones. Fur	W Meeker St at Lincoln Ave N	2023-2026 PSRC Regional TIP
25	Intersection Improvement	Construct a roundabout	W Meeker St / Lincoln Ave N	Kent Transportation Master Plan
26	Improve Ped/Bike connectivity	Plan pathway and construct bicycle facilities to connect the Interurban and Kent Station	W Smith St (7th Ave N - Railroad Ave N)	Kent Transportation Master Plan
27	Trail Crossing	Rebuild interurban trail crossing	W Smith St / Interurban Trail	Kent Transportation Master Plan, 2024-2029 TIP Kent
28	Improve Ped/Bike connectivity	Improve the pedestrian and bicycling experience between the underutilized Kent/James Street Park & Ride and Kent Sounder Station. Improvements include pedestrian wayfinding, pedestrian lighting, and related safety improvements.	W Smith St (4th Ave N - Railroad Ave N)	Kent Transportation Master Plan, 2024-2029 TIP Kent
29	Transit Signal Priority	Implement an adaptive signals and transit signal priority in the City core to improve speed and reliability for transit, movement of goods and people that dynamically adapts to conditions.	W Smith St (4th Ave N - Railroad Ave N and Central Ave N - Kennebeck Ave N)	2024-2029 TIP Kent
30	Ped Crossing Improvements	Install pedestrian gates in the northwest and southeast quadrants. Connect pedestrian gates to existing railroad crossing gate system.	W Smith St at BNSF tracks	2024-2029 TIP Kent
31	Ped Crossing Improvement	HAWK/PHB pedestrian crossing signal and crossing improvements.	W Smith St / Railroad Ave N	Kent Transportation Master Plan, 2024-2029 TIP Kent

ID	Improvement	Description	Extent	Source
32	Kent Station Access Improvements	Construct capital improvements to facilitate access to Kent Station for pedestrians, bicyclists, and drivers. Improvements include additional parking facilities (+/- 450 spaces), pedestrian access improvements, bicycle route improvements and bicycle storage.	Railroad Ave N (W Pioneer St - W Smith St)	Regional Transportation Plan 2022-2050
33	Central Ave Plan	The City will complete a study of Central Ave from SR-167 to Willis Street to develop a vision for the future of the corridor. The study will look at transportation needs, including bike and pedestrian needs to promote economic development based in future land use	Central Ave N (E Pioneer St - E Smith St)	2024-2029 TIP Kent
34	Adaptive Signals and Transit Signal Priority	Implement an adaptive signals and transit signal priority in the City core to improve speed and reliability for transit, movement of goods and people that dynamically adapts to conditions.	Central Ave N / E Smith St, E Smith St / State Ave N, E Smith St / Kennebeck Ave N, SR 516 / 94th Ave S, SR 516 / SE 256th St	2024-2029 TIP Kent
35	SR 516 Multimodal Corridor	This project will construct a protected bike facility and sidewalks on State Route 516 (Smith Street/Canyon Drive/SE 256th Street) from E Titus Street to SE Kent-Kangley Road east of 104th Ave SE. Transit stop amenities, transit speed and reliability improvements, intersection improvements and pedestrian crossings are also anticipated.	SR 516 (E Titus St - 104th Ave SE)	Kent Transportation Master Plan, Regional Transportation Plan 2022-2050
36	Road Diet with a Bike Lane	Reconfigure the existing 4 and 5 lane cross section of 4th Ave N to 3 or 4 lanes plus bike lanes and install elements of protected intersection bicycle improvements at 4th Ave and James Street. A second spot location includes access management with curb, median striping and signing at Canyon Drive (SR 516) and Weiland Street.	SR 516 at Weiland St	2024-2029 TIP Kent
37	New Bike/ped facilities	Construct bicycle facilities and fill sidewalk gaps from 97th Pl S and SE Kent-Kangley Rd.	SR 516 (97th Pl S - SE 256th St)	Kent Transportation Master Plan
38	Intersection Study and Design	Conduct and Intersection Study including Alternatives Analysis and Preliminary Engineering for improvements to the intersections of E Canyon Drive (SR516)/SE 256th Street at 104th Ave SE/SE Kent-Kangley Rd and SE256th Street at SE Kent-Kangley Rd.	SR 516 / 104th Ave SE, SR 516 / SE 256th St	Kent Transportation Master Plan, 2024-2029 TIP Kent
39	Intersection improvements.	Intersection improvements.	SR 516 / 124th Ave SE	Kent Transportation Master Plan
40	Intersection improvements.	Intersection improvements.	SR 516 / 132nd Ave SE	Kent Transportation Master Plan

ID	Improvement	Description	Extent	Source
41	Sidewalk construction	Construct a sidewalk along the west side of L32nd Ave SE where sidewalk does not currently exist. This project will include ADA-compliant curb ramps throughout the segment and pavement improvements	132nd Ave SE at SR 516	Kent Transportation Master Plan, 2024-2029 TIP Kent
42	Pedestrian infrastructure and traffic calming	Pedestrian infrastructure and traffic calming	124th Ave SE (SE 304th St - 307th Pl SE)	2024 Neighborhood Improvements
43	Speed and Reliability Improvements	Construct transit speed and reliability improvements on congested segments of Metro Routes 165 and 181 in south King County including, but not limited to implementing enhanced HOV lanes, new bus lanes/bypass lanes, signal queue jumps, intersection turning restrictions, bus bulbs, signal timing optimization, improved bus stop spacing, passenger facility improvements, transit signal priority, off-board fare collection, channelization improvements, improved access to bus stops, and bus layover improvements.	SE 316th St (116th Ave SE - 124th Ave SE) / SE 320th St (116th Ave SE - 124th Ave SE) / 116th Ave SE (SE 316th St - SE 320th St) / 124th Ave SE (SE 316th St - SE 320th St)	Washington State S.T.I.P.

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Route 165 corridor. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stops and Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[11]
- Trolley infrastructure (not included in Route 165)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 15. For transit speed and reliability improvements, refer to Figure 22. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 38.

[11] For non-trolley routes only

Figure 38 Order-of-Magnitude Project Costs

	Category	% of Total		Costs
	Stops and Stations[12]	21%	$	6,410,000
	Transit Speed and Reliability Improvements	61%	$	18,840,000
	Layover and Terminus Facilities	2%	$	750,000
	Charging Infrastructure	16%	$	5,000,000
	Trolley Infrastructure	-		-
	Construction Base Subtotal		***$***	***31,000,000***
2%	Stormwater Upgrades		$	620,000
3%	Traffic Control		$	930,000
10%	Mobilization		$	3,100,000
2%	TESC		$	620,000
	Subtotal Construction Cost		***$***	***36,270,000***
10.1%	Sales Tax		$	3,670,000
10%	Construction Contingency		$	4,000,000
40%	Contingency (Design Allowance and Risk)		$	17,580,000
	Total Construction Cost		***$***	***61,520,000***
10%	Project Management		$	6,160,000
5%	Planning		$	3,080,000
15%	Engineering/Design		$	9,230,000
10%	Construction Management		$	6,160,000
3%	Environmental Review		$	1,850,000
2%	Permitting		$	1,240,000
	Total Project Cost		***$***	***89,240,000***

[12] Note the capacity of Kent Station is uncertain, and therefore the cost of the RapidRide stations at Kent Station may be much higher than is accounted for in the assumptions in this report.

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Route 165 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – The project is not within any designated view corridors. The improvements associated with Route 165 will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Route 165 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – Route 165 does not traverse or alter any navigable waterways.
- Floodplains – Route 165 corridor is adjacent to the Green River, which is within a Federal Emergency Management Agency (FEMA) 100-year floodplain near Mullen Slough Natural Area off of W Meeker Street and S Kent Des Moines Road. Improvements associated with the project are not anticipated to occur within the FEMA floodplain at this location, avoiding adverse impacts on floodplain areas. traverses over any navigable waterways.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Air Quality - Improvements associated with the project are not anticipated to yield long-term adverse impacts to air quality. The adoption of cleaner and more energy-efficient technologies with zero emission buses will contribute to a healthier and more sustainable urban environment. Best Management Practices (BMPs) for air quality during construction will be implemented to mitigate any minor short-term impacts.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources:

13.3a Cultural Resources

In order to identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

Route 165 corridor runs in close proximity (within 500 feet) to the Carnation Milk Factory, which is listed in the Washington National Heritage Register. Any alteration or deviation from the established character of this property would constitute an adverse effect. Preserving the unique historical features of this property is crucial to avoiding negative impacts on cultural and architectural resources. As such, careful consideration and adherence to preservation principles should guide the project's station design and implementation within this area.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located in downtown Kent.

Given their proximity to the project alignment and cleanup status, most of the Department of Ecology (Ecology) cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. For acquired parcels associated with moderate or high-risk sites, it is recommended to conduct additional Ecology file reviews, examining historical or current release information, and considering potential Phase I or Phase II Environmental Site Assessments (ESAs) during the acquisition process. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 165 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

Traffic operational analysis was conducted for 27 intersections along Route 165 to evaluate transit travel time benefits of the proposed improvements. The analysis revealed that at 4 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 9 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the project's' aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 165 can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The *FTA Transit Noise and Vibration Impact Assessment Manual* notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 165 corridor include critical areas for liquefaction and steep slopes. These areas will be considered for their potential to impact the project during design. The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP), a TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

There are wetlands south of the alignment near W Meeker Street and S Kent Des Moines Road, 124th Avenue SE and SE 284th Street, 124th Avenue SE and SE 307th Place, and 124th Avenue SE and SE 300th Way.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the location of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur. Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.3k Acquisition and Relocation

Acquisitions for the improvements included in this report involve a 3,000 square foot partial take on the northeast corner of E Smith Street and Central Avenue N and a 3,000 square foot partial take on southeast corner of SE Kent-Kangley Road and 132nd Avenue SE.

Anticipated minor and partial property acquisitions are expected to result in minimal effects, limited to the property itself, without impacting existing structures and no displacements are anticipated. Mitigation measures include compensating business and property owners under the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970, as amended. Other potential mitigation efforts could involve considering adjustments to station locations if necessary.

13.4 Cumulative and Indirect Impacts

Route 165 serves the cities of Des Moines, Kent, and Auburn. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. A selection of these projects is mapped in Figure 36, and all projects are described in Figure 37. Major projects include a new roadway connecting Highline College and Kent Des Moines Station, transit improvements at Kent-Des Moines Road and Meeker Street, and bike and pedestrian facilities along Smith Street and Canyon Drive near Kent Sounder Station.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of “facility modernization” that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way. However, because the project may need to acquire additional property, documentation is required that demonstrates the project will meet the criteria for a CE and that significant environmental effects will not result.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit
- Local Clearing and Grading Permit

RapidRide Prioritization Plan

Corridor 1064A Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

King County METRO

Table of Contents

King County METRO

Corridor Summary

Corridor 1064A | Route 36/49 — CORRIDOR SUMMARY

Ridership

No Build

+3%

RapidRide Corridor 1064A

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour

+25.1

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour

62.3

Weekday boardings per revenue hour with RapidRide investment in 2042.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Travel Time

Proposed Travel Time Savings

-17%

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time

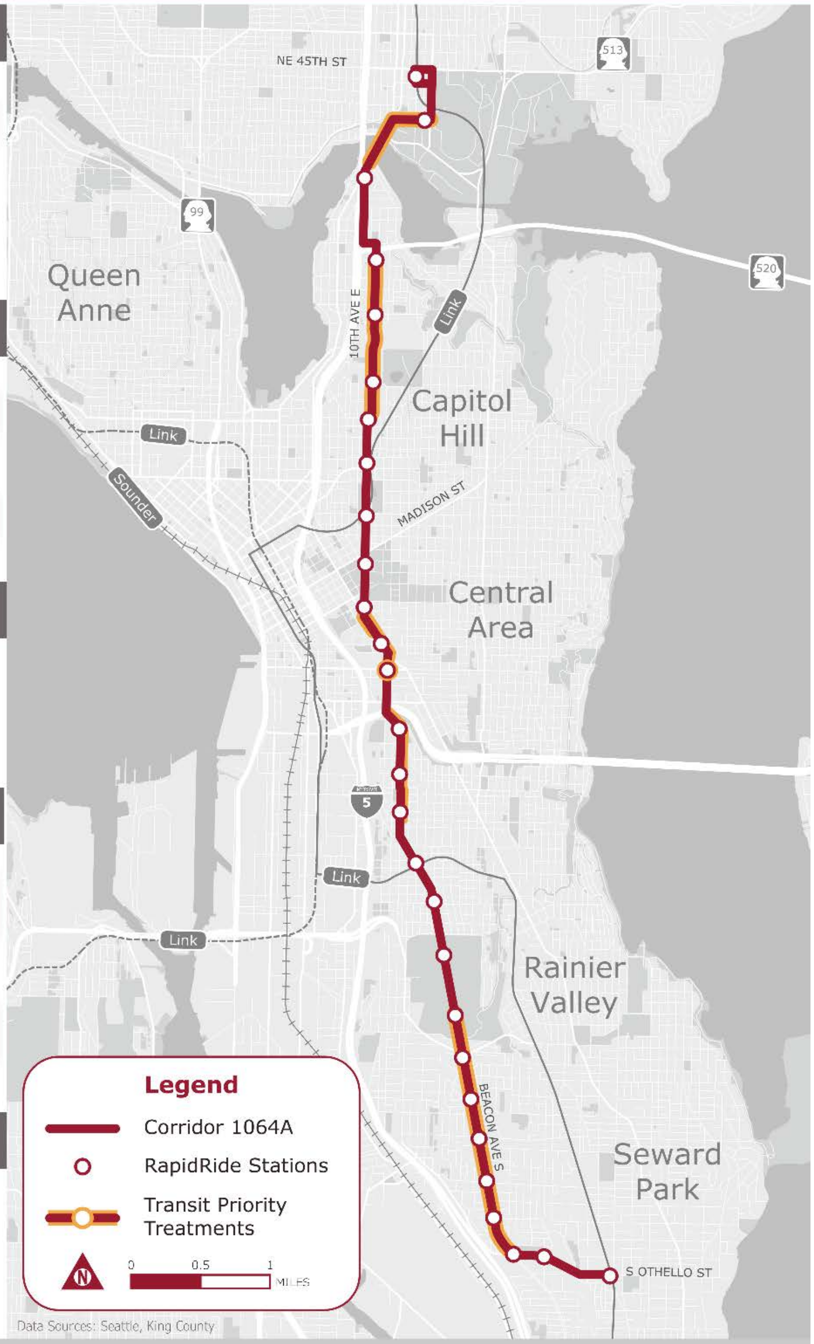
54

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Equity Priority Area Score

3.4

Average area of need score within 1/2 mile of station locations.



Data Sources: Seattle, King County

RAPIDRIDE

King County METRO

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

The project provides planning and related services to King County Metro (KCM) to determine corridors for expansion of and further reinvestment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1064A (Route 36-49). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1064A is currently served by Routes 36 and 49. Route 36 connects South Beacon Hill/New Holly at the Othello Link Station via Beacon Hill and the International District to Downtown. Route 49 connects Downtown to Capitol Hill and the University District. Route 36 serves predominantly residential areas in the south, with major employment and commercial uses in the north. Route 49 operates through denser, more mixed-use neighborhoods. Major institutions served by these routes include the VA Medical Center, Seattle University, Seattle Central College, and University of Washington.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would combine Routes 36 and 49 via Broadway, with no service into Downtown Seattle. A high-level review of this recommended alignment was compared against an option with service from Othello to U District via Beacon Hill, International District, and Downtown, as well as an option for RapidRide service on Route 36 only, with Route 49 remaining as local service. The result was a recommendation for an alignment connected via Broadway (as recommended in Metro Connects), as well as an additional corridor with Route 36 only.

This report focuses on the recommended Metro Connects alignment with Routes 36 and 49. The Route 36 option is documented separately in the Corridor 1064B Summary Report.

2.2 Representative Alignment

The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. These changes include re-aligning northbound service off of 12th Ave S and onto 14th Ave S to eliminate one-way operations, and maintaining the existing alignment of Route 49 in the University District.

Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 36 and 49, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Alignment Changes

Alignment Change	Change from… Routes 36 and 49	Metro Connects	Screening
Eliminate service from Downtown Seattle and instead operate through Capitol Hill and First Hill along Broadway, Boren Ave and 12th Ave S.	✓	✗	✗
Maintain existing alignment of Route 49 in the University District (bi-directionally via NE Campus Pkwy and 15th Ave NE) instead of a one-way, counter-clockwise loop on NE Campus Pkwy, 15th Ave NE, NE 43rd St and Roosevelt Way NE.	✗	✓	✓
Near Pacific Tower in North Beacon Hill, re-route northbound service off of 12th Ave S and onto 14th Ave S to eliminate one-way couplet.	✓	✓	✓

Figure 3 Corridor Overview

King County METRO

3.0 Transit Network

The portion of Route 36 that overlaps with Corridor 1064A serves as a primary, north-south frequent-service line in South Seattle, operating primarily in the Beacon Hill neighborhood. In North Beacon Hill and Chinatown-International District, Route 36 has overlapping service with Route 60, another north-south frequent-service line. The portion of Route 36 that overlaps with Corridor 1064A connects with three other routes as it traverses Beacon Hill: Route 50 south of Jefferson Park and at its southern terminus at the Othello Link station, Route 106 at the Othello Link station, and Route 107 at the Beacon Hill Link station and in South Beacon Hill. Route 36 connects to Link light rail service at Beacon Hill and Othello Stations, as well as to Streetcar service on Jackson Street.

Between the intersection of 12th Avenue S and S Jackson Street in the Chinatown-International District and Boren Avenue and E Yesler Way in First Hill, Corridor 1064A is currently served by Route 60, a primarily north-south frequent-service line. Route 60 also serves the portion of Corridor 1064A along Broadway between E Madison Street and E Pine Street. Corridor 1064A overlaps with Seattle Streetcar service along Broadway between Boren Avenue and E Denny Way.

The portion of Route 49 that overlaps with Corridor 1064A serves as a primary, north-south frequent-service line in Central Seattle, operating in the Capitol Hill, Eastlake, and University District neighborhoods. Within Capitol Hill, Route 49 connects to two other frequent-service lines: Routes 8 and 10. Between the Eastlake and University District neighborhoods, Route 49 overlaps with the frequent-service Route 70 across the University Bridge, representing a key transit connection between Central and North Seattle. In the University District, Route 49 connects with many other local and regional transit lines. Route 49 connects to Link light rail service at Capitol Hill and U District Stations and overlaps with Seattle Streetcar service in the Capitol Hill neighborhood.

3.1 Future Network Changes

Within Beacon Hill, the Metro Connects Interim Network assumes service levels similar to those seen today. Within the Chinatown-International District, Corridor 1064A would intersect with new R Line RapidRide service operating along an alignment similar to the existing Route 7.

The Metro Connects Interim Network assumes that Corridor 1064A would intersect with two new RapidRide lines in the First Hill neighborhood: Corridor 1993 at E Yesler Way, primarily replacing the existing Route 40, and the RapidRide G Line at E Madison Street, largely replacing the existing Route 12. A new frequent-service line is assumed to connect to Corridor 1064A at E Jefferson Street.

Within Capitol Hill, the Metro Connects Interim Network assumes service levels connecting to Corridor 1064 similar to those seen today connecting to Route 49. Overlapping with Corridor 1064 across the University Bridge, new J Line RapidRide service would replace the existing Route 70. Corridor 1064 would also intersect or overlap with future RapidRide service in the University District, operating along alignments similar to the existing Routes 44 and 271, which are also under evaluation as candidate RapidRide corridors.

Figure 4 Existing Transit Network

King County METRO

Figure 5 Metro Connects Interim Network

King County METRO

4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained. In instances where multiple routes are combined, and one route already exceeds the standard, the service levels are assumed to strike a balance between the two routes while still achieving the standard.

4.2 Existing Service Levels

Both Routes 36 and Route 49 currently operate with frequent service for most of the day, every day. Route 36 operates every 15 minutes or better from 6 am to 11 pm all days of the week. On weekdays, it operates approximately every 10 minutes from 6 am to 1 pm, and every 5 to 8 minutes until 7 pm. Route 49 operates every 15 minutes from approximately 7 am to 9 pm all days of the week.

Figure 6 Existing Route 36 Frequency by Time of Day

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30	15	9 - 10							5 - 8						12	15			20	30	60		
Saturday	60	20	15			10									12	15				30		60		
Sunday	60		15				12									15				30		60		

Source: King County Metro GTFS May 2023

Figure 7 Existing Route 49 Frequency by Time of Day

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30		15															20	30			60		
Saturday	30		20	15														20	30			60		
Sunday	30	60	30		15													25	30			60		

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency and span on weekdays, Metro would need to increase Route 49 frequency during the morning and afternoon peak periods. Peak service today operates every 15 minutes, but the minimum standard is every 10 minutes. This would require at least two additional trips per hour for seven hours on weekdays.

On Saturdays, one additional trip per hour would be needed at 6 am to ensure 15-minute service from 6 am to 7 pm. On Sundays, two additional trips per hour would be needed at 6 am and 7 am to ensure 15-minute service from 6 am to 7 pm.

Route 36 already operates at or above the minimum standard and therefore would not require any increase in service levels.

Figure 8 and Figure 9 (Route 36 and Route 49, respectively) show the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 10 and Figure 11 (Route 36 and Route 49, respectively) show the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 8 Additional Trips to Meet Minimum RapidRide Standards (Route 36)

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 9 Additional Trips to Meet Minimum RapidRide Standards (Route 49)

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	2	2	2	-	-	-	-	-	-	2	2	2	2	-	-	-	-	-	-	-	-	-
Saturday	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 10 Changes to Frequency and Span to Meet Minimum Standard (Route 36)

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30	15				9 - 10						5 - 8				12		15		20	30		60	
Saturday	60	20		15						10					12		15			30			60	
Sunday	60			15							12						15			30			60	

Source: King County Metro GTFS May 2023

Figure 11 Changes to Frequency and Span to Meet Minimum Standard (Route 49)

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30			10			15						10			15		20		30			60	
Saturday	30		15							15								20		30			60	
Sunday	30	60	15								15							25		30			60	

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

When combining Routes 36 and 49 together into a RapidRide corridor, the service levels of the new route are assumed to exceed the RapidRide standard due to the high existing service levels and demand on Route 36. However, service would be lower than Route 36's existing levels to prevent an overly aggressive increase in service along Route 49. The span and frequency are shown in Figure 12. If implemented, the reduction in service along the Route 36 portion of the line would need to be supplemented with local service or additional short-line RapidRide trips to maintain existing service levels.

Figure 12 Proposed Frequency and Span

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30	20	10	10	10	12	12	12	12	10	10	10	10	10	10	12	15	15	20	20	30	60	60	60
Saturday	30	30	15	15	15	12	12	12	12	12	12	12	12	12	12	15	15	15	20	30	30	60	60	60
Sunday	60	60	15	15	15	15	12	12	12	12	12	12	12	12	12	15	15	20	20	30	30	60	60	60

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round trip will take 112 minutes during the PM peak and 95 minutes during off-peak hours. Although service would increase on the Route 49 portion of the corridor, it would decrease along the Route 36 portion of the corridor. Together with the travel time savings, and the elimination of duplicate service through Downtown Seattle, the service hours needed to operate Corridor 1064A would decrease. Metro could reduce 138 service hours each weekday (or a 39% reduction), reduce 115 hours on Saturday, and reduce 97 hours on Sundays.

Figure 13 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would save 14 buses on weekdays (14 buses, relative to the existing 28 buses needed on weekdays for both routes combined). Nine fewer buses would be needed on Saturdays and six fewer buses on Sundays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 13 Change in Future Service Levels

Service Day	Existing 36 | 49	Build 2035	Change	Percent
Daily Service Hours				
Weekday	234 | 125	220	-138	-39%
Saturday	173 | 118	176	-115	-39%
Sunday	145 | 121	168	-97	-37%
Daily One-Way Trips				
Weekday	263 | 154	206	-	-
Saturday	206 | 150	176	-	-
Sunday	174 | 142	168	-	-
Fleet				
Weekday	20 | 8	14	-14	-50%
Saturday	11 | 8	10	-9	-47%
Sunday	9 | 7	10	-6	-38%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming the proposed frequency of 10-minute headways (six buses per hour), the corridor would require at least two layover spaces at each end.[1]

[1] A one-way travel time of approximately 55 minutes requires a layover of 11 minutes (20% layover). With buses every 10 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a Othello Station

The terminus near Othello Station would be on surface streets. Today, Route 36 has a layover on S Myrtle Street just west of Martin Luther King Jr Way S. The space is approximately 200 feet long, or enough for three articulated buses, or four 40-foot coaches.

The terminus for RapidRide would be at its current location at Othello Station, or, if needed, at another location identified in the vicinity of the Othello Station. It will remain on-street as there are no existing transit centers or Metro-owned properties in the immediate vicinity. Trolley wires currently only exist along the Route 36 alignment (38th Ave S, S Myrtle St, MLK Jr Way S and S Othello St). If a new terminus location is identified elsewhere, new trolley wire would need to be constructed.

4.5b U District Station

The terminus at the U District Station is served by many routes. Route 49 buses terminate on NE 43rd St, then proceed to a layover location on 12th Ave NE south of NE 45th St. After layover, buses start their trips on NE 45th St at University Way NE. The layover space is approximately 340 feet long, but overhead trolley design limits capacity to a maximum of four coaches. This layover space would need to accommodate RapidRide buses for this corridor as well as Route 70 (future J Line). During the busiest times of day, this layover location typically has four buses, serving Routes 49 and 70.

Other nearby terminus locations could include 11th Ave NE (between NE 45th and NE 47th St) or 12th Ave NE (between NE 47th and 45th St) due to existing trolley wires. Otherwise, new trolley wires would need to be constructed to open more locations for layover. Using a location with existing trolley wire would be the preferred option, given the difficulty and cost of expanding trolley wire.

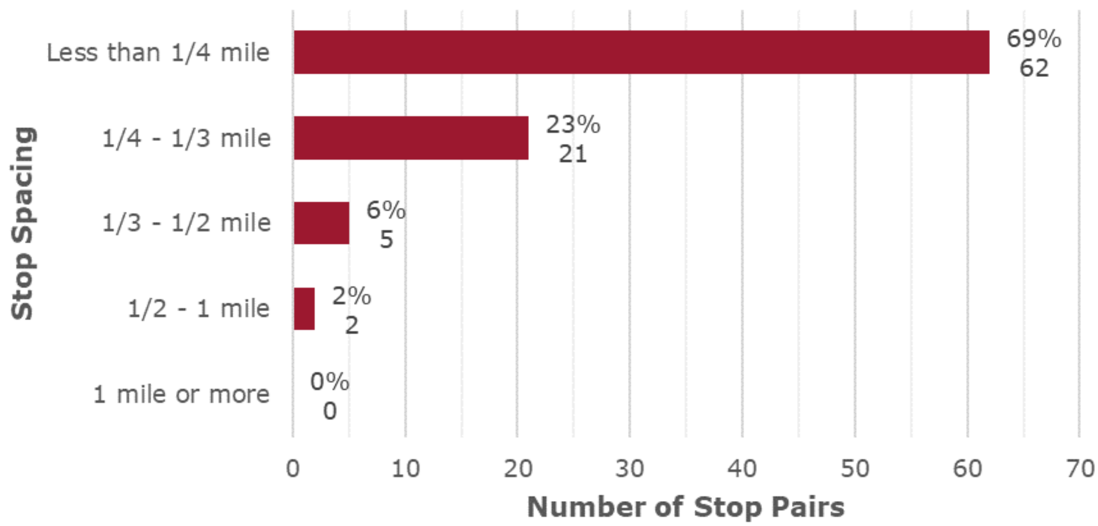
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,100 feet (or approximately one-fifth mile).

Approximately 70% of stop pairs along the corridor are less than a quarter mile apart, and with an additional 23% between a quarter and third of a mile (Figure 14).

Figure 14 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 15. These station locations would achieve an average spacing of 1,900 feet (or approximately one-third mile), which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 15 Proposed Station Locations

King County METRO

5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 16, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 61.

Figure 16 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 36), each station is categorized into one of the four potential station typologies. Station locations with existing RapidRide stations are assumed to not require any new amenities. The typologies are listed in Figure 17 and summarized in Figure 17.

Figure 17 Station Boardings and Typology

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
1	U District Station	550	-	Large Raised	Small
2	15th Ave NE & NE Campus Pkwy	670	110	Large Raised	Medium
3	Harvard Ave E & Eastlake Ave E	270	290	Large	Large
4	10th Ave E & E Miller St	600	170	Large Raised	Large
5	10th Ave E & E Howe St	230	160	Large	Large
6	10th Ave E & E Prospect St	240	350	Large	Large Raised
7	Broadway & Mercer / Roy St & Broadway	510	240	Large Raised	Large
8	Broadway E & E Thomas St	370	1,360	Large Raised	Large Raised

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
9	Broadway & Pine St	380	180	Large Raised	Large
10	Broadway & Marion St	260	50	Large	Medium
11	Broadway & Terrace St	440	50	Large Raised	Medium
12	Boren Ave & E Yesler Way	270	10	Large	Small
13	12th Ave S & S Jackson St	620	190	Large Raised	Large
14	14th Ave S & Golf Dr S	60	270	Medium	Large
15	14th Ave S & S Massachusetts St	130	530	Medium	Large Raised
16	14th Ave S & S Hill St	120	160	Medium	Large
17	Beacon Ave S & S Lander St	640	500	Large Raised	Large Raised
18	Beacon Ave S & S Hanford St	90	10	Medium	Small
19	Beacon Ave S & Jefferson Comm. Center	30	60	Small	Medium
20	Beacon Ave S & VA Hospital	40	110	Small	Medium
21	Beacon Ave S & S Columbian Way	100	160	Medium	Large
22	Beacon Ave S & S Bennett St	90	430	Medium	Large Raised
23	Beacon Ave S & S Orcas St	140	340	Medium	Large
24	Beacon Ave S & S Graham St	200	430	Large	Large Raised
25	Beacon Ave S & S Holly St	10	80	Small	Medium
26	S Myrtle St & Beacon Ave S	10	90	Small	Medium
27	S Myrtle Pl & 32nd Ave S	10	50	Small	Medium
28	Martin Luther King Jr Way S & S Othello St	-	380	Small	Large Raised

Figure 18 Route 36-49 Station Typology Summary

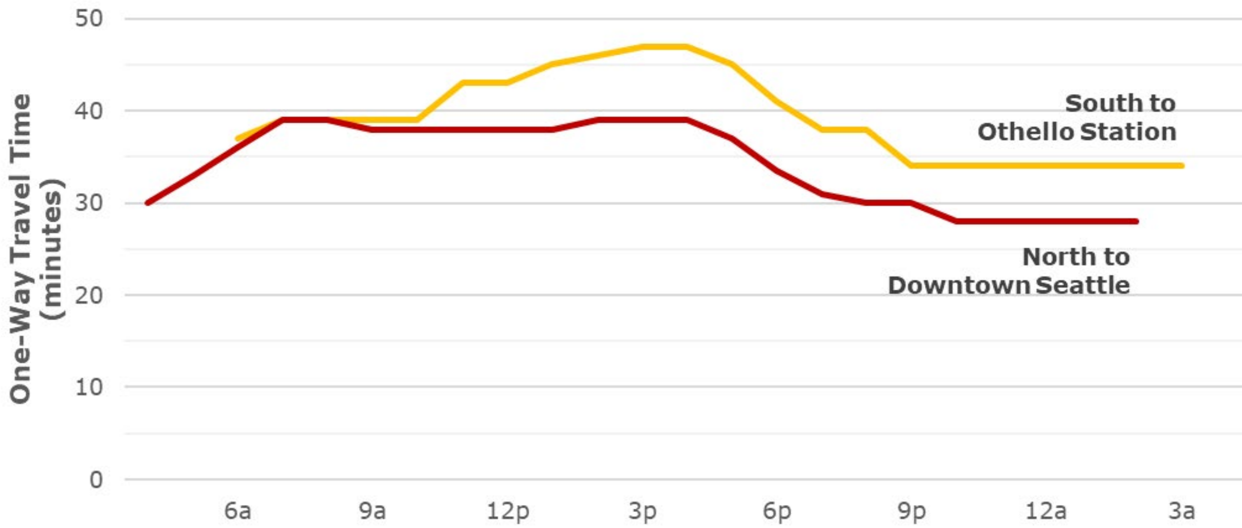
Station Type	Count	Percent
Large Raised Station	16	29%
Large Station	16	29%
Medium Station	15	27%
Small Station	9	16%
Total	**56**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 36 in May 2023 ranged between approximately 30 minutes (late in the evening) to 47 minutes (during the PM peak). On average a one-way trip took 37 minutes.

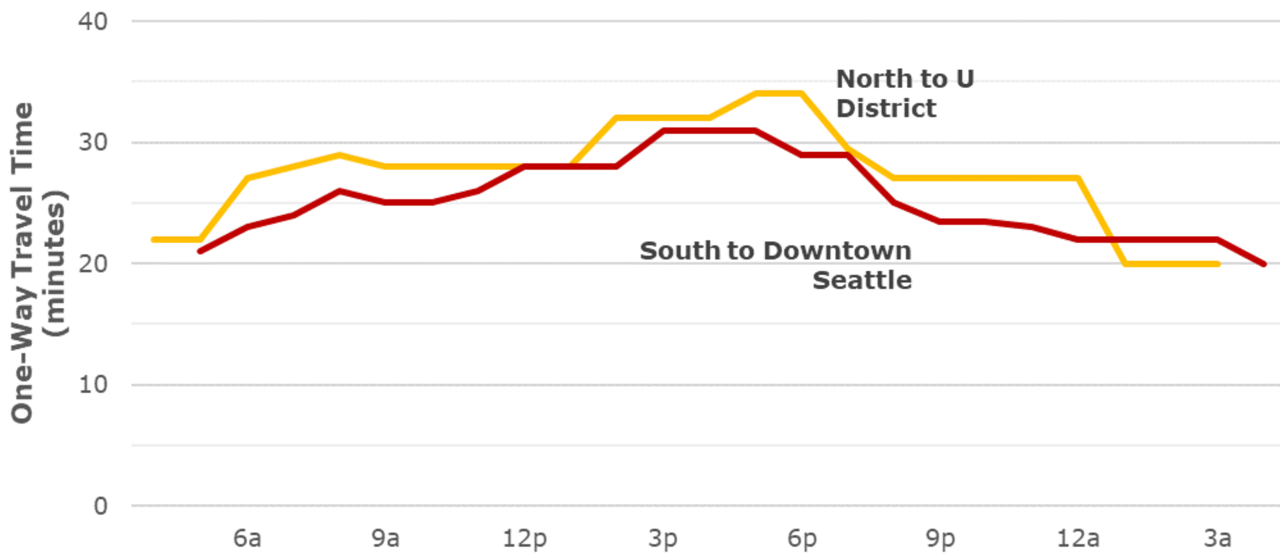
Figure 19 Scheduled Travel Time Route 36 (weekdays)



Source: King County Metro GTFS May 2023

End-to-end scheduled travel times per direction for Route 49 in May 2023 ranged between 21 minutes (early in the morning) to 48 minutes (during the PM peak). On average a one-way trip took 26 minutes.

Figure 20 Scheduled Travel Time Route 49 (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

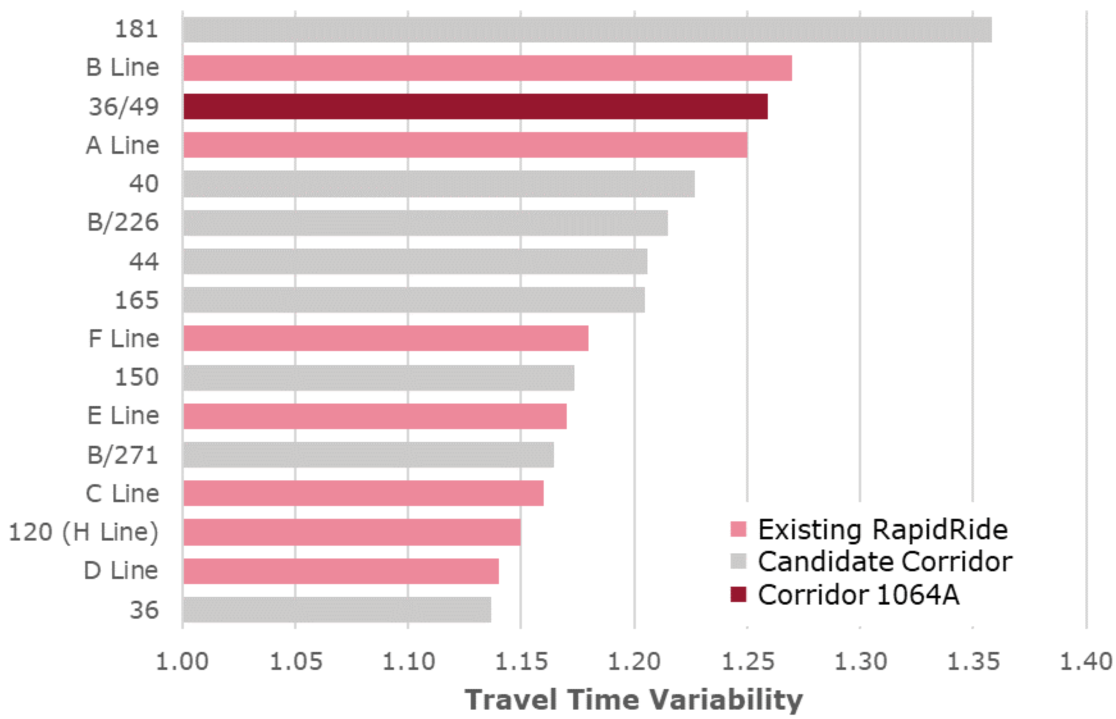
For analysis of delay, the stop pairs along Routes 36 and 49 were aggregated to create a representative trip along the Corridor 1064A using observed data obtained from King County Metro's AVL repository from Fall 2021.[2]

[2] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

On average, an end-to-end trip for Corridor 1064A (between Othello Station and U District) experiences delay of 21 minutes between the 20th and 80th percentile travel time. This is approximately 1.15 minutes (69 seconds) of trip delay per mile on an average trip. This is the third highest trip delay of all nine corridors.

Northbound trips and southbound trips at 4 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.16-1.26. This indicates the longest travel times (slowest trips) take 16-26% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1064A is performing relatively poorly. This comparison is shown in Figure 21.

Figure 21 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 22.

Figure 22 Speed & Reliability Summary

Metric	Value
On-time performance[A]	72%
Average speed	15.3 mph
Average trip delay[B]	21.4 min
Average trip delay per mile	69 sec
Lowest median hourly travel time (Reference) [C]	33 min
Highest median hourly travel time	42 min[D]
Travel time variability[E]	1.26

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 4 PM for northbound trips, from Fall 2021.

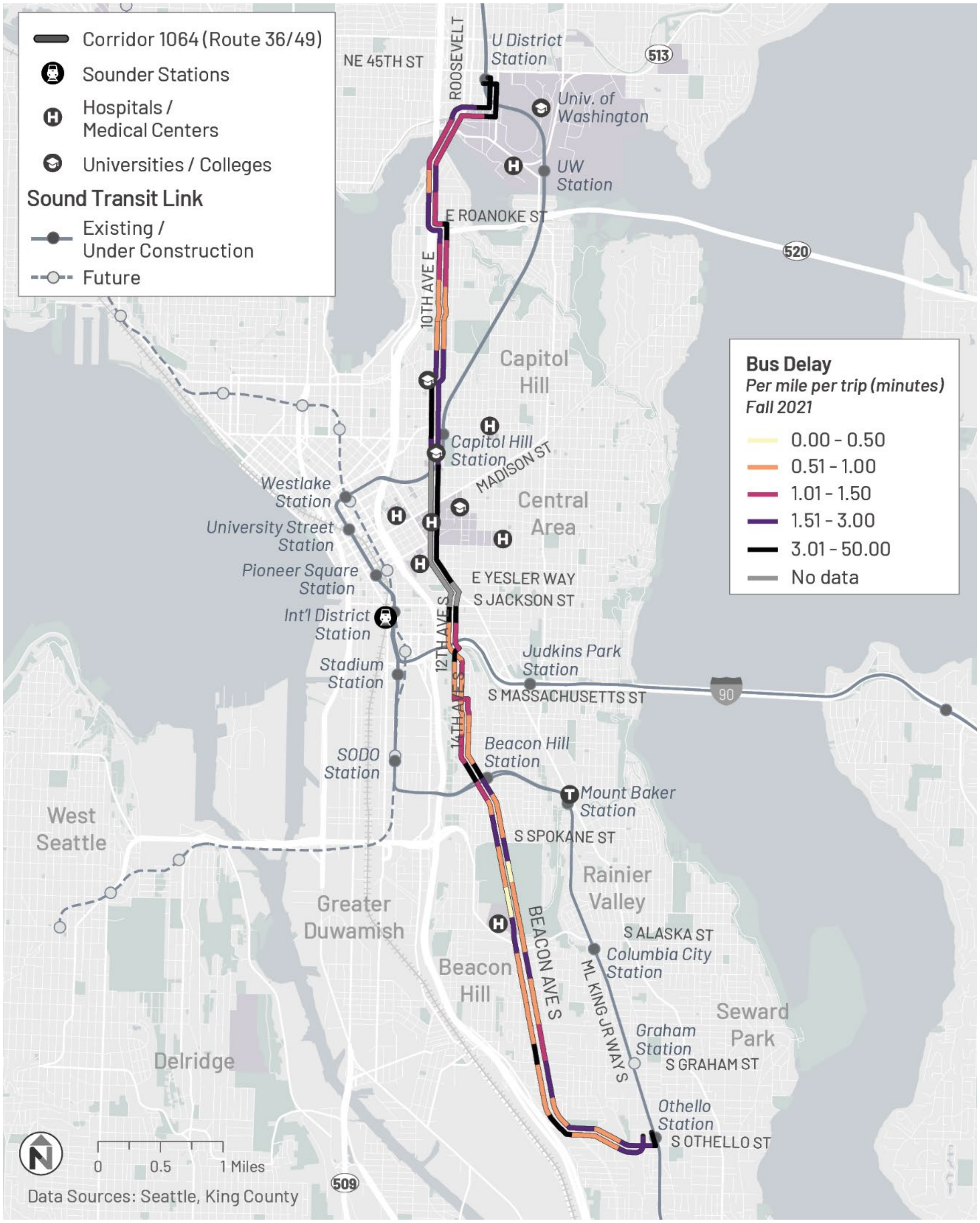
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 23 shows the delay along Corridor 1064A based on King County Metro's AVL data from Fall 2021.[3] The segments shown are existing stop pairs along the representative alignment, not just the Route 36 and 49 stop pairs. The data for the stop pairs along Broadway are based on Routes 9 and 60. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

University District, Capitol Hill, and First Hill are areas with high levels of delay, including both northbound and southbound portions of the corridor on Broadway. Other locations of delay occur near Link stations, including Beacon Hill Station and Othello Station.

[3] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 23 Corridor 1064A Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 24 and Figure 25 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

For both northbound and southbound travel, stop segments approaching Downtown along Broadway experience high levels of delay throughout the day, as do the approaches to both termini Othello Link Station and U-District Link station. Northbound travel sees PM peak delay at several locations along Beavon Ave S, and moderate to high delay throughout the day north of Lander St. Southbound travel sees higher delay between 3 and 9 PM, even in locations with low to moderate delay throughout the day.

Overall, high delay locations experience delay throughout the day. Locations of high delay are found north of Downtown and at corridor termini. Other locations experience higher delay during peak period travel, between 6 and 9 am and 3 and 6 pm.

HOW TO READ DELAY CHARTS

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

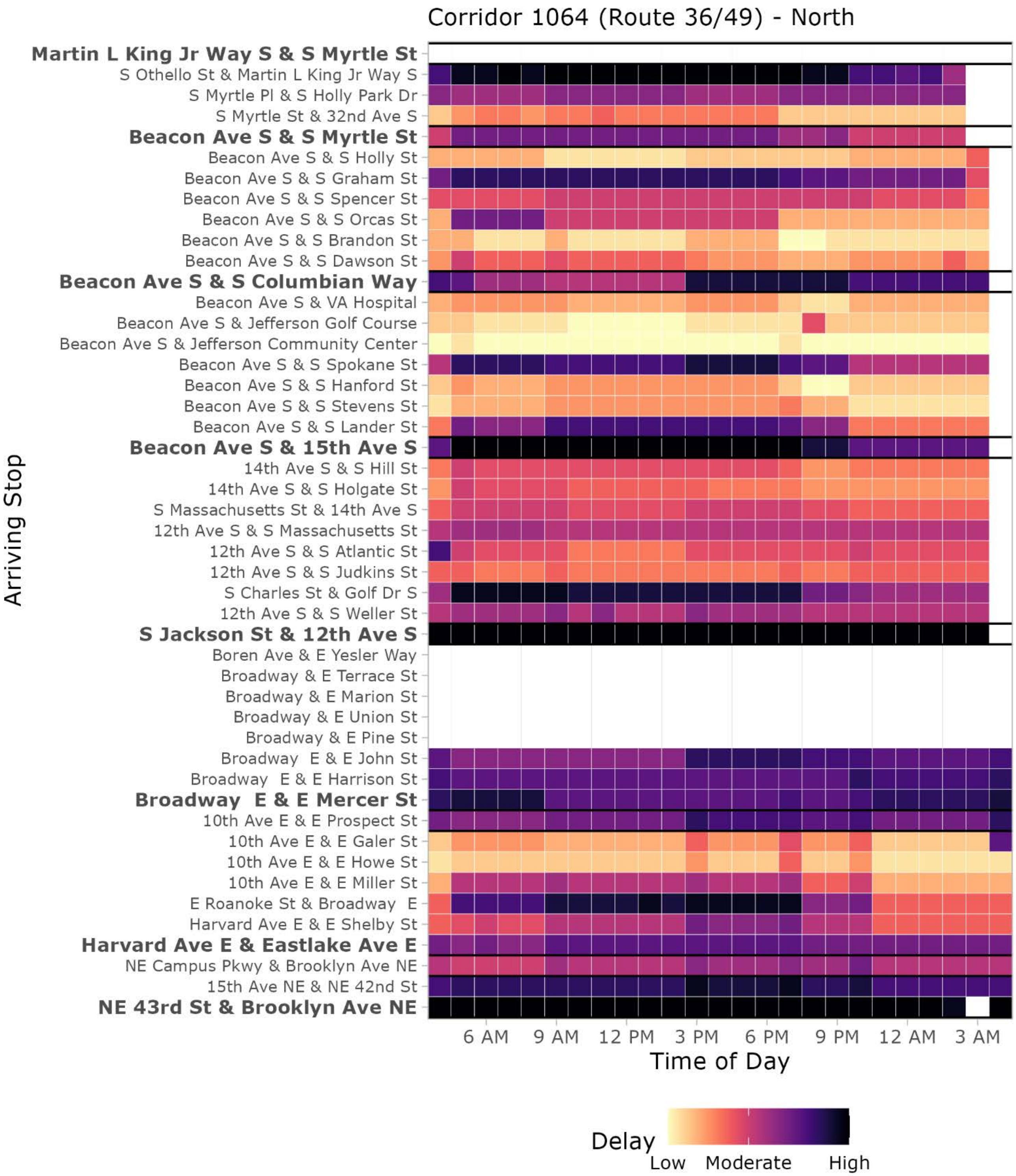
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

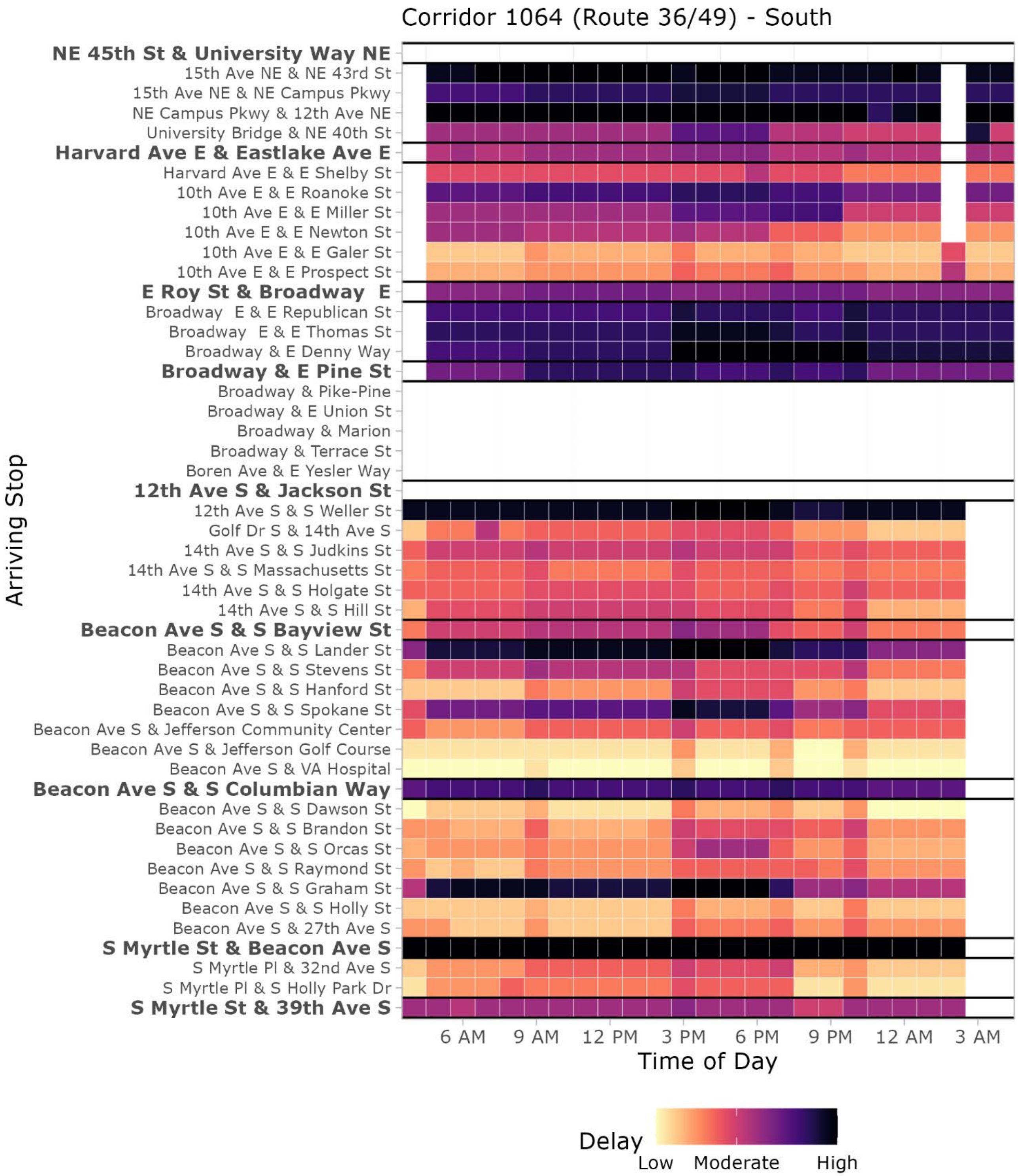
Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 24 Corridor1064A Northbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 25 Corridor 1064A Southbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor1064A. Transit priority opportunities were identified where there was high delay, and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 26, and they are shown geographically in a map in Figure 27.

The corridor currently achieves transit priority for 5% of its centerline miles, which is well below the RapidRide *minimum* standard of 40%. The projects treatments proposed here would increase the coverage to 53%, which would meet the *desired* standard of 50%.

Figure 26 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
NE Campus Pkwy (Eastlake Ave E to 15th Ave NE)	Bus/BAT lane	Convert curb lane in both directions on NE Campus Pkwy to bus/BAT lane.
Eastlake Ave E (NE 40th St to Fuhrman Ave E)	Bus/BAT lane	Convert curb lane on University Bridge to bus/BAT or HOV lane.
10th Ave E (E Roanoke St to E Roy St)	Bus/BAT lane	Add northbound or southbound bus/BAT lane between E Roanoke St and E Roy St. If not feasible, consider queue jumps
10th Ave E (E Roanoke St to E Roy St)	Queue Jump	If bus/BAT lane not feasible, consider queue jumps with removal of parking or center lane.
Boren Ave (Broadway to 12th Ave S)	Bus/BAT lane	Add northbound bus/BAT lane between 12th Ave S and Broadway. Add southbound bus/BAT lane between Broadway and Fir St.
Boren Ave (Broadway to 12th Ave S)	Other	Convert a shared through-left lane to a left turn lane for buses only (Northbound 12th Ave S onto northbound Boren Ave).
12th Ave S & S King St	Queue Jump	Add southbound queue jump at 12th Ave S & S King St.
12th Ave S (Boren Ave to S Jackson St)	Bus/BAT lane	Add bus/BAT lane in both directions between Boren Ave to S Jackson St.
14th Ave S (S College St to Golf Dr S)	Bus/BAT lane	Remove parking and add northbound bus/BAT lane from S College St to Gold Dr S.
Beacon Ave (Alaska St to Myrtle St)	Bus/BAT lane	Remove parking and add bus/BAT lane in both directions between Myrtle St and Alaska St.

Figure 27 Proposed Transit Priority Treatments

King County METRO

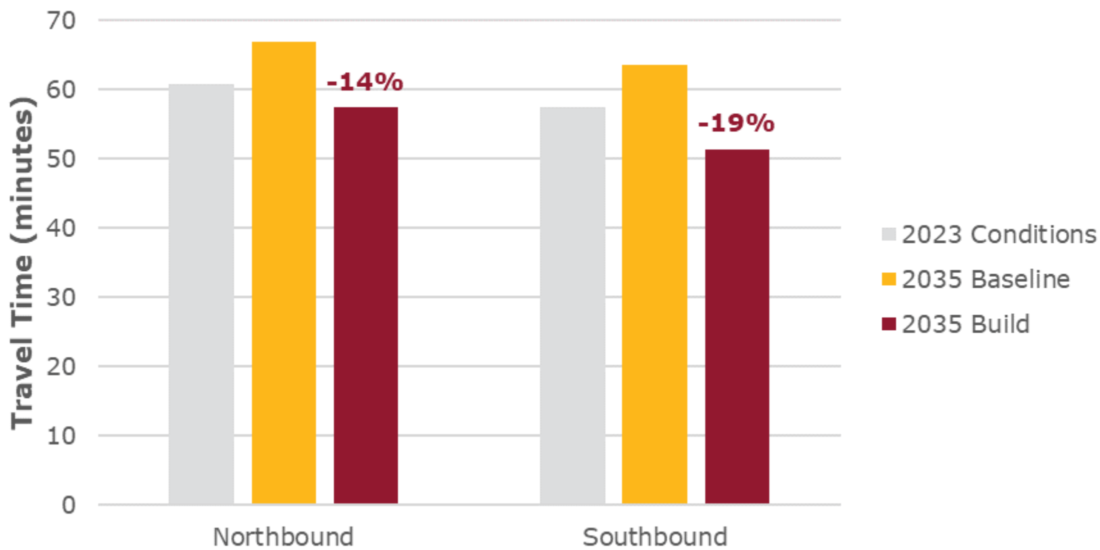
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along Corridor 1064A are forecast to reduce PM peak Future Build condition travel times 14-19% from Future Baseline conditions. Average bus travel speed is expected to increase to 11-12 mph in the Future Build conditions.

Figure 28 shows transit travel times for the overall route.

Figure 28 Corridor 1064A Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 36 and Route 49 together carried approximately 10,200 people per day in Spring 2023, and as much as 16,100 people in Fall 2019. These routes have now recovered approximately 64% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[4], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 29 Route 36 and Route 49 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	16,095	-	100%
Fall 2020	6,017	-63%	37%
Fall 2021	8,309	+38%	52%
Spring 2023	10,244	+23%	64%

Source: King County Metro

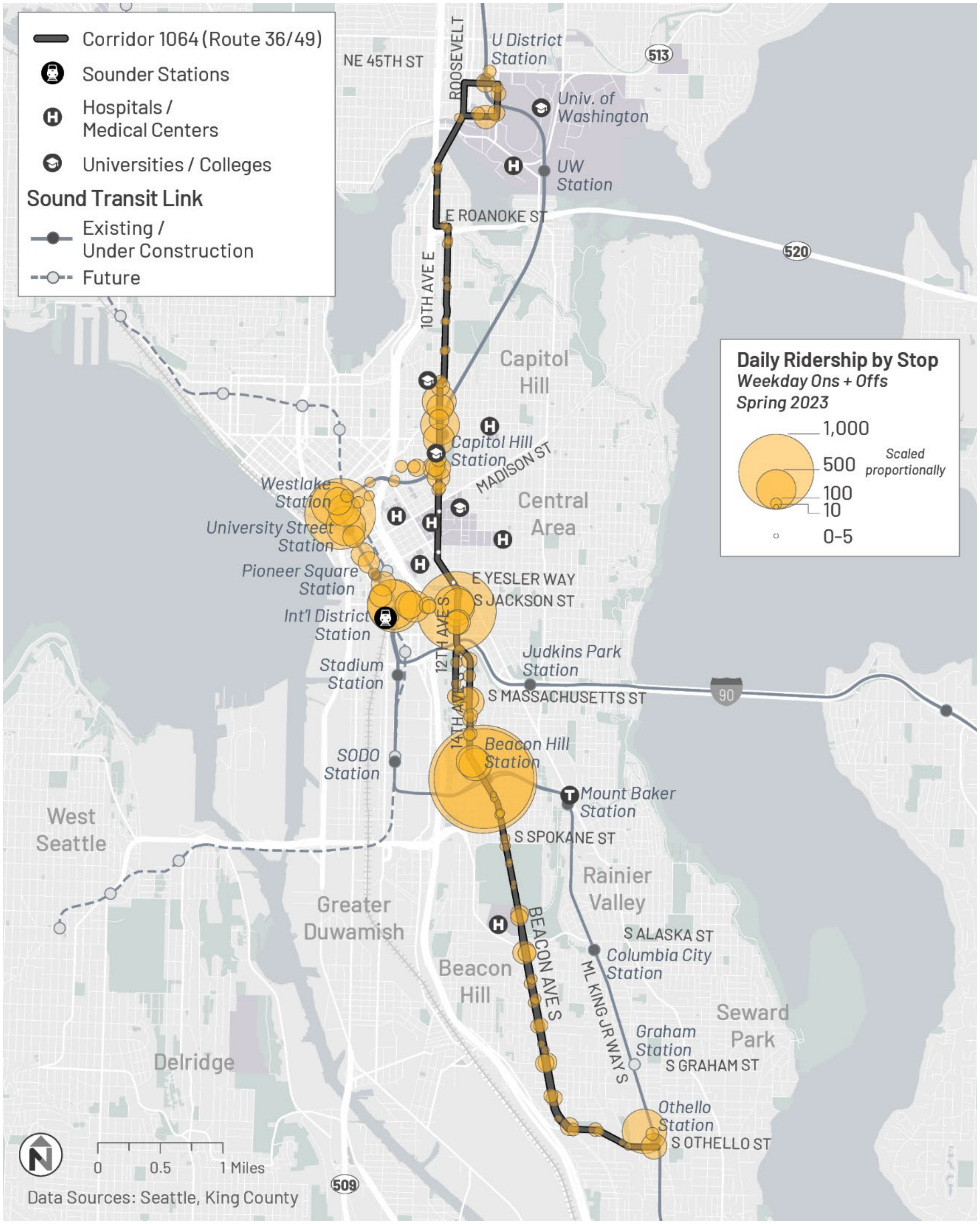
7.2 Boardings and Alightings by Stop

Figure 30 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Routes 36 and 49, plus stops along Routes 9 and 60 where it overlaps the corridor. Although there is streetcar service along Broadway between International District and Capitol Hill, no buses regularly serve those stops throughout the day, which is why limited ridership is shown there.

The busiest stop locations are in Capitol Hill, near Jackson and 12th, and in Beacon Hill. Moderate to high ridership occurs at most stops along Beacon Ave from the VA Hospital to the Southern Terminus at Othello Station, indicating a corridor with strong demand.

[4] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 30 Boarding and Alighting Activity by Stop (Spring 2023)



King County METRO

Figure 31 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Southbound	Northbound	Total
U District Station	124	208	332
15th Ave NE & NE 42nd St	100	157	257
15th Ave NE & NE Campus Pkwy	177	-	177
NE Campus Pkwy & 12th Ave/Brooklyn	131	275	405
University Bridge & 40th St	75	-	75
Harvard Ave & Eastlake Ave	83	61	143
Harvard Ave & Shelby St	17	32	49
10th Ave E & Roanoke St	69	58	127
10th Ave E & Miller St	82	68	150
10th Ave E & Newton St/Howe St	45	50	95
10th Ave E & Galer St	50	49	99
10th Ave E & Prospect St	64	69	133
Broadway & Mercer	124	203	327
Broadway & Republican/Harrison	419	317	736
Broadway & John/Thomas	220	488	708
Broadway & Denny	381	-	381
Broadway & Pine	148	252	400
Broadway & Pike	263	-	263
Broadway & Union	127	121	248
Broadway & Marion	0	0	0
Broadway & Terrace	0	0	0
Boren Ave & Yesler	0	0	0
Jackson St & 12th Ave S	1,056	392	1,448
12th Ave S & Weller St	274	300	574
Charles St & Golf Dr	-	88	88
12th Ave S & Judkins / Golf Dr & 14th Ave	165	103	267
12th Ave S & Atlantic / 14th Ave S & Judkins	117	80	198
12th Ave S & Massachusetts	-	178	178
14th Ave S & Massachusetts	375	262	637
14th Ave S & Holgate	139	138	277
14th Ave S & Hill	110	131	241
Beacon Ave S & 15th Ave	391	403	793
Beacon Ave S & Lander (Beacon Hill Station)	1,466	1,347	2,813
Beacon Ave S & Stevens	47	30	77
Beacon Ave S & Hanford	70	64	134
Beacon Ave S & Spokane	87	80	167
Jefferson Community Center	39	24	63

Stop Pair	Southbound	Northbound	Total
Jefferson Golf Course	23	19	42
VA Hospital	183	195	378
Beacon Ave S & Columbian Way	265	-	265
Beacon Ave S & Dawson	101	85	187
Beacon Ave S & Brandon	91	90	181
Beacon Ave S & Orcas	142	140	282
Beacon Ave S & Raymond/Spencer	46	51	97
Beacon Ave S & Graham	202	206	408
Beacon Ave S & Holly	138	167	305
Beacon Ave S & 27th Ave	43	-	43
Beacon Ave S & Myrtle	118	195	314
S Myrtle Pl & 32nd Ave	82	134	216
S Myrtle Pl & Holly Park Dr	46	33	79
S Othello St & MLK Jr Way	-	303	303
MLK Jr Way S & Myrtle	569	124	694

Source: King County Metro Spring 2023

Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership from Route 9 and Route 60 are included along Broadway.

7.3 Forecast Ridership

Future ridership for Corridor 1064A will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1064A (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 1,200 boardings in the PM peak hour and 13,700 daily boardings. Key ridership hubs include University District, Capitol Hill, Yesler Terrace, and Beacon Hill. Future ridership for each candidate RapidRide station is shown in Figure 32.

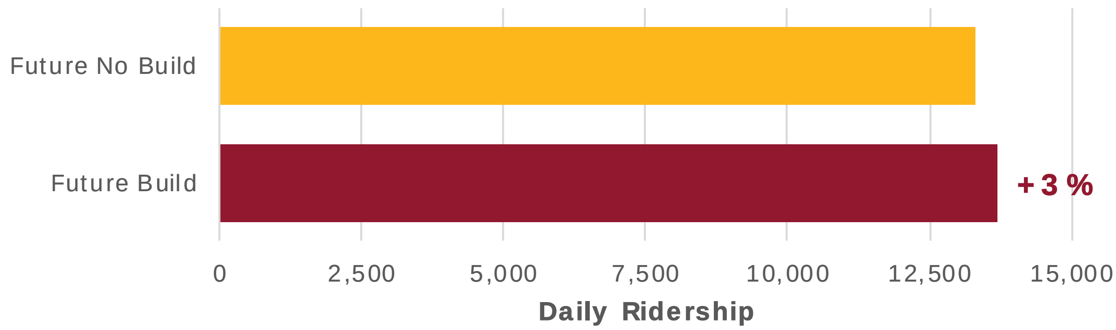
Figure 32 Future Corridor Ridership

King County METRO

7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 400 riders per weekday (or 3% increase) is forecast for Corridor 1064A compared to a "baseline" scenario with today's service levels for Route 36 and Route 49 on their current alignments.

Figure 33 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1064A is forecast at 62 riders per revenue hour. This would result in an improvement of 68 percent in productivity compared to a future "baseline" 37 riders per revenue hour. This compares well with the 2019 and 2023 productivity of Routes 36 and 49 combined at 38 and 26 riders per revenue hour, respectively. At 62 riders per revenue hour, Corridor 1064A would rank third highest of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

8.1 Equity Priority Areas

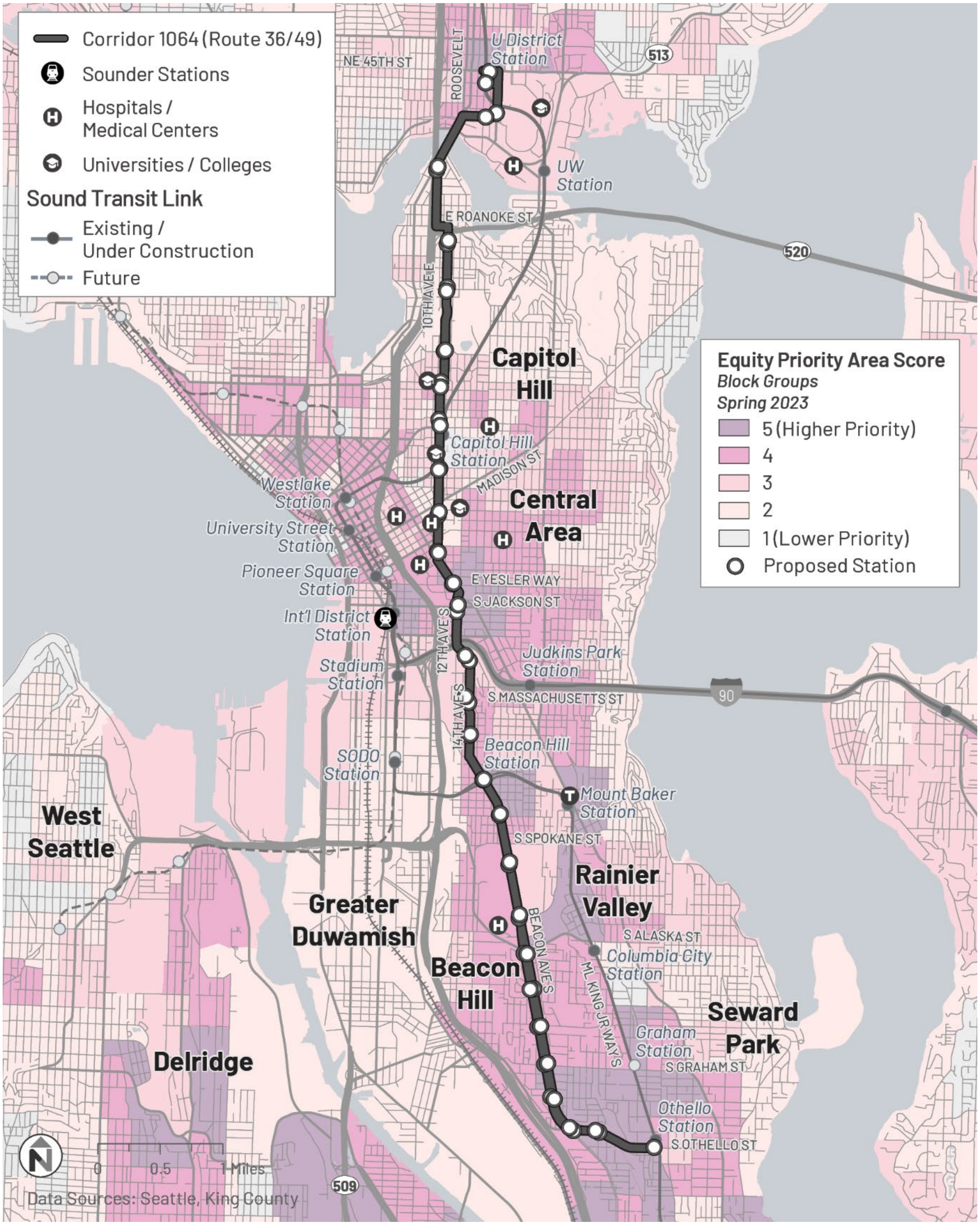
King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[5] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 34 displays equity priority area scores for block groups located along Corridor 1064A. In the southern portion of the alignment, Corridor 1064A serves high equity priority areas in the Othello and South Beacon Hill neighborhoods of Seattle along Martin Luther King Jr Way S, S Othello Street/S Myrtle Street, and Beacon Avenue S. In Central and North Beacon Hill, Corridor 1064A serves high equity priority areas along Beacon Avenue S near S Columbian Way and the Beacon Hill Link light rail station.

In the northern portion of the alignment, Corridor 1064A serves high equity priority areas in the Chinatown-International District and Central District neighborhoods along 12th Avenue S and Boren Avenue near S Jackson Street and E Yesler Way. Corridor 1064A also serves a high equity priority area located north of NE 45th Street in the University District.

[5] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 34 King County Metro Equity Priority Areas



8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 35 and Figure 36 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[6] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Corridor 1064A in Fall 2020, ridership retention was consistent with the regional average. By Spring 2023, however, change in ridership along the Beacon Ave portion of the corridor was generally 10-20 points higher than the region, while the northern half of the corridor (along Broadway, 10th Ave and in the University District) generally continued to match the regional change.

[6] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 35 Ridership Retention (Fall 2020)

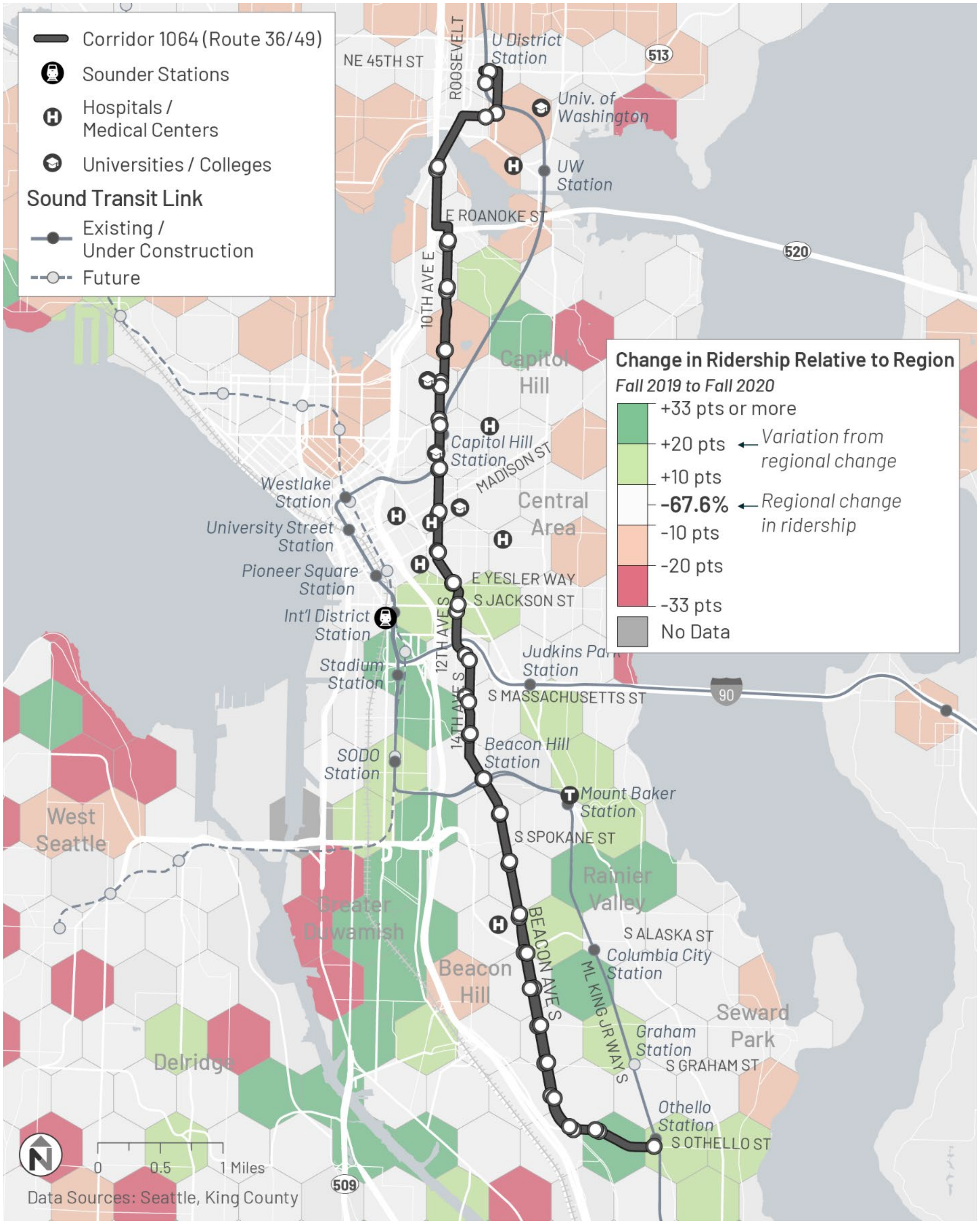
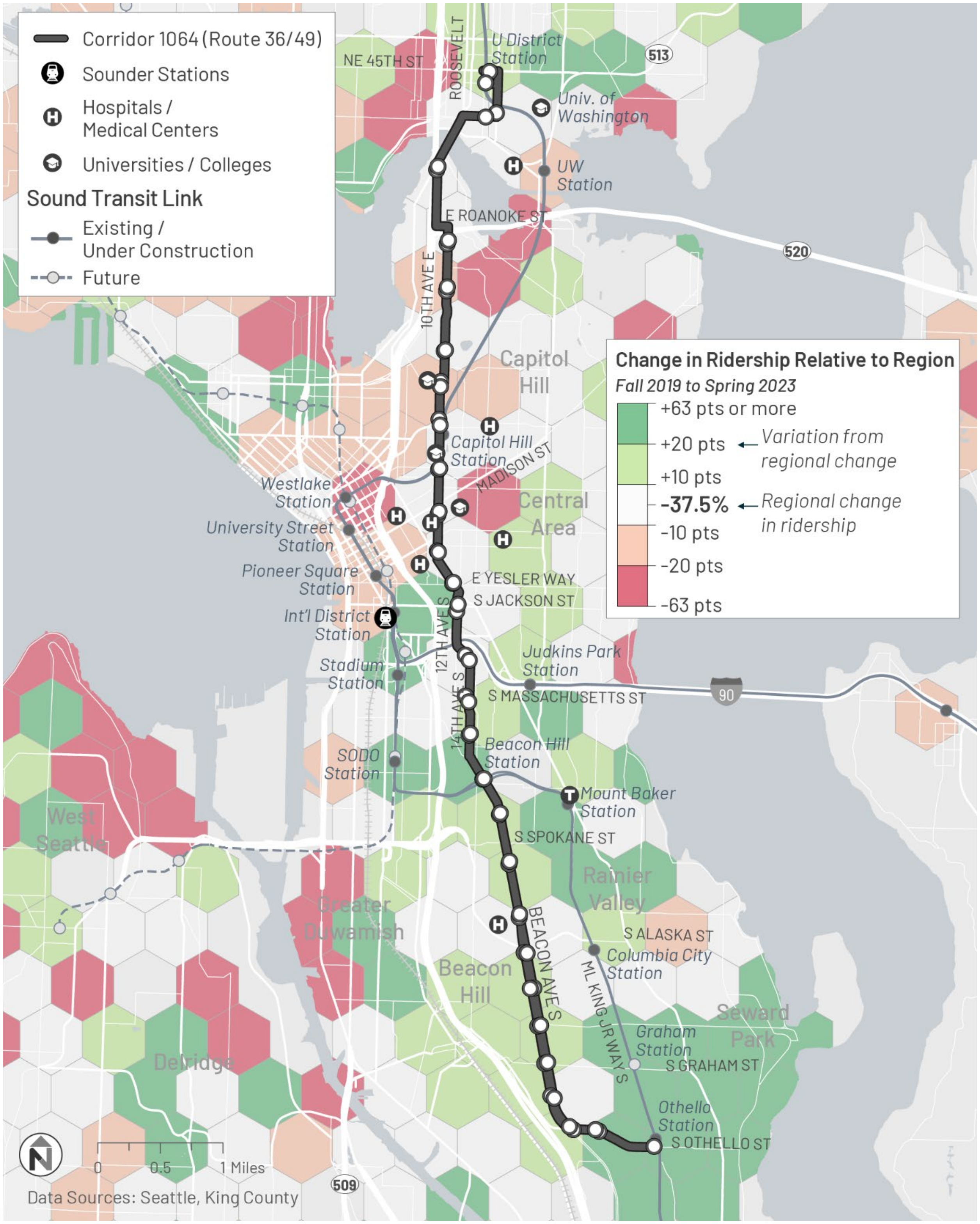


Figure 36 Ridership Retention (Spring 2023)



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8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Corridor 1064A will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[7] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 25% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the fourth lowest increase in job access.

8.4 GHG Emissions

Ridership gains – and therefore the shift from vehicle modes of travel because of RapidRide implementation of Corridor 1064A – will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[8] Approximately 0.16 metric tons of CO_2 would be reduced daily due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the smallest reduction.

[7] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[8] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 52 intersections along Routes 36 and 49 to evaluate transit travel time benefits of the proposed improvements. Out of the 52 intersections, 28 signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 24 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 37 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 37 Modeled Delay from Synchro

			Transit Delay (seconds)			Traffic Delay (seconds)		
ID	Intersection	Traffic Control	Existing	2035 Baseline	2035 Build	Existing	2035 Baseline	2035 Build
Southbound								
501	15th Ave NE & NE Campus Pkwy	Signal	12.0	10.3	10.3	12.0	10.3	10.3
502	University Way NE & NE Campus Pkwy	Signal	25.7	19.5	23.9	25.7	19.5	19.6
503	Brooklyn Ave NE & NE Campus Pkwy	Signal	11.4	21.2	21.2	21.7	20.9	20.9
504	Broadway Ave E & E Mercer St	Signal	9.0	17.2	17.2	9.0	17.2	17.2
505	Broadway Ave E & E Republican St	Signal	8.3	13.2	13.2	8.3	13.2	13.2
506	Broadway Ave E & E Harrison St	Signal	4.4	6.4	6.4	4.4	6.4	6.4
507	Broadway Ave E & E Thomas St	Signal	3.5	9.0	9.0	3.5	9.0	9.0
508	Broadway Ave E & E Olive Way	Signal	19.4	8.1	8.1	19.4	8.1	8.1
509	Broadway Ave E & E Denny Way	Signal	26.8	26.4	26.4	26.8	26.4	26.4
510	Broadway Ave E & E Pike St	Signal	16.5	20.1	20.1	16.5	20.1	20.1
511	Broadway Ave E & E Union St	Signal	17.4	16.0	16.2	17.4	16.0	16.2
512	Broadway Ave & Madison St	Signal	27.9	16.6	16.4	27.9	16.6	16.4
513	Broadway Ave & Columbia St	Signal	13.6	14.7	14.7	13.6	14.7	14.7
514	Broadway Ave & Cherry St	Signal	9.3	9.7	9.7	9.3	9.7	9.7
515	Broadway Ave & James St	Signal	38.2	46.7	41.5	38.2	46.7	41.5
516	Broadway Ave & Jefferson St	Signal	3.4	3.3	3.4	3.4	3.3	3.4
517	Boren Ave & Broadway Ave	Signal	35.1	50.9	49.2	35.1	50.9	49.2
518	Boren Ave & Yesler Way	Signal	20.0	25.4	25.4	20.0	25.4	25.4
519	Boren Ave & 12th Ave S	Signal	9.7	23.9	28.7	9.7	23.9	28.7
520	12th Ave S & S Jackson St	Signal	26.1	25.2	25.2	26.1	25.2	25.2
521	12th Ave S & S King St	Signal	10.5	14.7	4.7	10.5	14.7	14.2
522	12th Ave S & S Weller St	Signal	31.3	62.7	62.7	31.3	62.7	62.7

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	2035 Baseline	2035 Build	Traffic Delay (seconds) Existing	2035 Baseline	2035 Build
523	15th Ave S & Beacon Ave S	Signal	38.2	48.3	40.8	38.2	48.3	40.8
524	Beacon Ave S & S Hanford St	Signal	2.6	2.5	2.5	2.6	2.5	2.5
525	Beacon Ave S & S Spokane St	Signal	24.5	38.2	38.2	24.5	38.2	38.2
526	Beacon Ave S & S Columbian Way	Signal	34.0	23.9	21.6	34.0	23.9	22.1
527	Beacon Ave S & S Graham St	Signal	40.9	40.1	21.3	40.9	40.1	36.8
528	Beacon Ave S & S Myrtle St	Signal	65.5	51.5	29.2	65.5	51.5	37.9
Northbound								
528	Beacon Ave S & S Myrtle St	Signal	30.4	41.1	33.7	30.4	41.1	55.4
527	Beacon Ave S & S Graham St	Signal	36.3	44.1	28.0	36.3	44.1	40.3
526	Beacon Ave S & S Columbian Way	Signal	40.7	30.6	24.1	40.7	30.6	28.6
525	Beacon Ave S & S Spokane St	Signal	33.0	45.0	45.0	33.0	45.0	45.0
524	Beacon Ave S & S Hanford St	Signal	2.7	2.7	2.7	2.7	2.7	2.7
523	15th Ave S & Beacon Ave S	Signal	33.8	39.2	38.3	33.8	39.2	34.9
522	12th Ave S & S Weller St	Signal	8.7	9.4	9.4	8.7	9.4	9.4
521	12th Ave S & S King St	Signal	17.9	11.3	12.7	17.9	11.3	12.7
520	12th Ave S & S Jackson St	Signal	33.7	11.0	8.6	33.7	11.0	16.9
519	Boren Ave & 12th Ave S	Signal	39.8	37.8	37.8	39.8	37.8	37.8
518	Boren Ave & Yesler Way	Signal	5.8	8.2	15.6	5.8	8.2	13.3
517	Boren Ave & Broadway Ave	Signal	37.5	40.9	36.5	37.5	40.9	36.5
516	Broadway Ave & Jefferson St	Signal	22.9	23.6	19.9	22.9	23.6	19.9
515	Broadway Ave & James St	Signal	48.1	29.6	25.0	48.1	29.6	25.0
514	Broadway Ave & Cherry St	Signal	8.8	9.3	10.4	8.8	9.3	10.4
513	Broadway Ave & Columbia St	Signal	8.5	8.6	8.7	8.5	8.6	8.7
512	Broadway Ave & Madison St	Signal	17.9	22.0	22.0	17.9	22.0	22.0

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
511	Broadway Ave E & E Union St	Signal	10.4	32.6	32.9	10.4	32.6	32.9
510	Broadway Ave E & E Pike St	Signal	23.4	24.7	24.7	23.4	24.7	24.7
509	Broadway Ave E & E Denny Way	Signal	22.9	29.5	29.5	22.9	29.5	29.5
508	Broadway Ave E & E Olive Way	Signal	21.4	14.3	14.3	21.4	14.3	14.3
507	Broadway Ave E & E Thomas St	Signal	4.8	18.6	18.6	4.8	18.6	18.6
506	Broadway Ave E & E Harrison St	Signal	11.1	24.4	24.4	11.1	24.4	24.4
505	Broadway Ave E & E Republican St	Signal	10.2	13.4	13.4	10.2	13.4	13.4
504	Broadway Ave E & E Mercer St	Signal	3.5	7.2	7.2	3.5	7.2	7.2
503	Brooklyn Ave NE & NE Campus Pkwy	Signal	12.3	29.6	28.0	12.3	29.6	32.3
502	University Way NE & NE Campus Pkwy	Signal	12.8	4.8	7.2	12.8	4.8	4.4
501	15th Ave NE & NE Campus Pkwy	Signal	19.7	46.6	52.4	19.7	46.6	52.4

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 38 summarizes the number of crashes along the corridor by severity level and mode. There were 384 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 41% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 8% resulted in a fatality or serious injury.

Figure 38 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	0	0%	2	2%	0	0%	**2**	**1%**
Serious Injury	8	4%	13	15%	6	8%	**27**	**7%**
Minor Injury	64	28%	31	36%	34	47%	**129**	**34%**
Possible Injury	155	68%	39	46%	32	44%	**226**	**59%**
Total	**227**	**100%**	**85**	**100%**	**72**	**100%**	**384**	**100%**

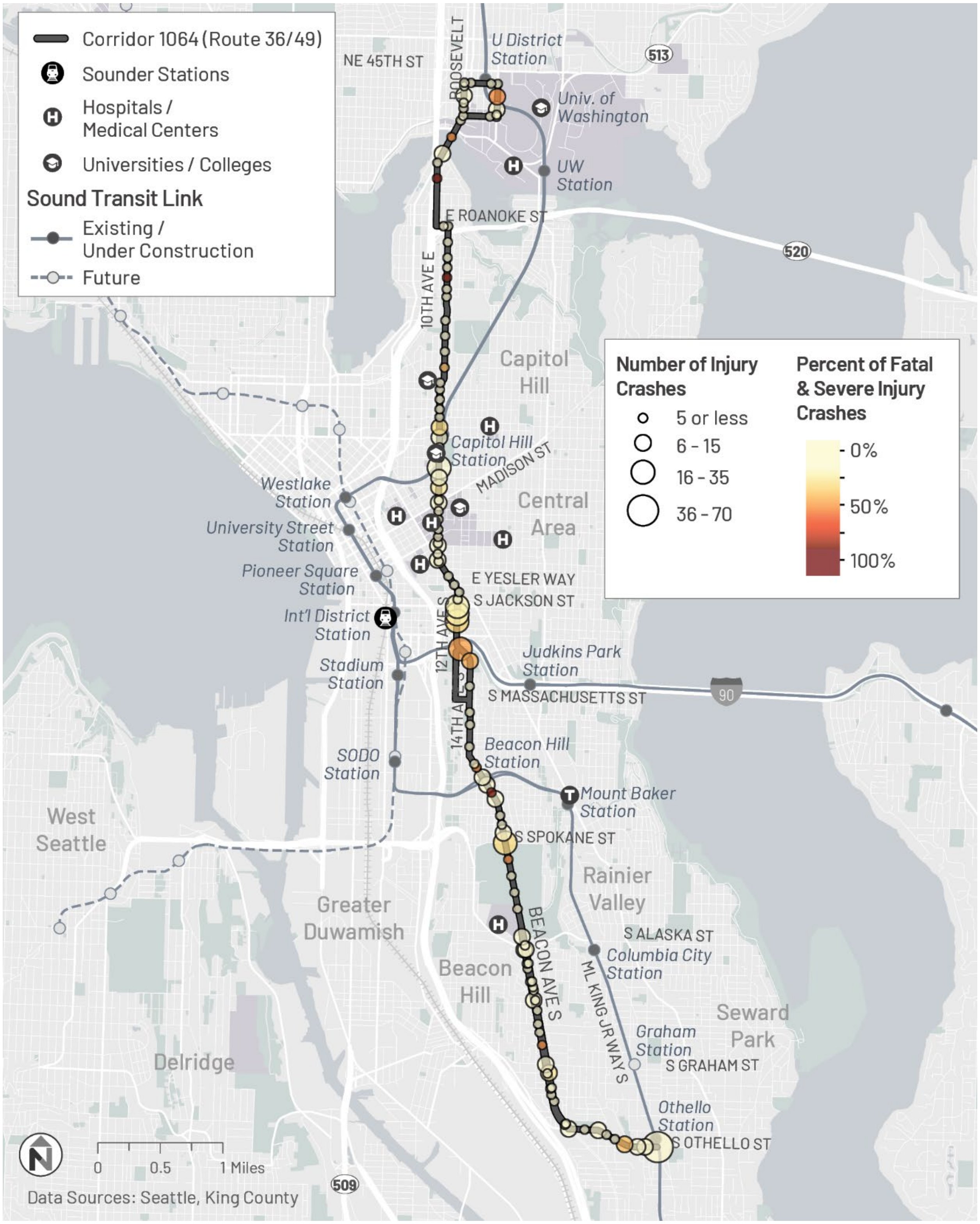
Source: WSDOT (2018-2022)

Figure 39 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest one-eighth-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along 15th Ave NE and Roosevelt Way NE in the University District
- Along Broadway in Capitol Hill
- Along 12th Ave S from S Jackson St to S Massachusetts St
- Major intersections along Beacon Ave S, including 15th Ave S, Spokane St, Columbian Way, and S Graham St
- Along S Myrtle St and S Othello St between Beacon Ave S and MLK Jr Way S

Figure 39 Crash Locations



King County METRO

11.0 Planned Improvements

Corridor 1064A serves the City of Seattle. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 40, and all projects are described in Figure 41. Major projects include new bike facilities along Beacon Ave S, Broadway, and 10th Ave E.

Figure 40 Planned Jurisdictional Investments

King County METRO

Figure 41 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Priority Bus Corridor (Crown Hill - Green Lake - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Electrification • Evaluate electrification cost/benefit north of 50th Street • Evaluate turnaround and layover options at east and west ends of the corridor • Conduct traffic analysis east of I-5 to determine key congested intersections and priority bus treatment options • Conduct study of routing options through Greenlake east of Aurora Ave • Coordinate with existing planned improvements south of 50th Street	15th Ave NE (N E 45th St - NE Campus Pkwy) / NE 45th St (University Way NE - 15th Ave NE)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
2	Loyal Heights to U District via Green Lake	Construct a new RapidRide line connecting Loyal Heights and the University District via Green Lake. This project would improve the attractiveness of transit for a regional growth center and include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops. This project will connect to one Regional Growth Center, University District. It will expand transit access to existing and planned Light Rail, Commuter Rail and Sound Transit BRT services.	15th Ave NE (N E 45th St - NE Campus Pkwy) / NE 45th St (University Way NE - 15th Ave NE)	Regional Transportation Plan 2022-2050
3	Priority Bus Corridor (Lake City - Northgate - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Stop Consolidation • Conduct further analysis of alignment options along Lake City Way/80th Street/Roosevelt Way • Integrate route design/transit priority treatments with ongoing Bicycle Master Plan facility planning on Roosevelt Way between NE 40th Street and NE 65th Street • Create high quality connections between the route and U-District Link Station on Brooklyn Ave	15th Ave NE (N E 45th St - NE Campus Pkwy)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
4	Cycle track	Cycle track	15th Ave NE (N E 45th St - NE Campus Pkwy)	Recommended Bicycle Network Map
5	Cycle track	Cycle track	NE Campus Pkwy (University Way NE - 15th Ave NE)	Recommended Bicycle Network Map
6	In-street facility with minor separation	In-street facility with minor separation	Brooklyn Ave NE at Campus Pkwy NE	Recommended Bicycle Network Map
7	Neighborhood greenway	Neighborhood greenway	12th Ave NE at Campus Pkwy NE	Recommended Bicycle Network Map
8	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, Transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	Eastlake Ave E (Campus Pkwy NE - Harvard Ave E) / NE 43rd St (Brooklyn Ave NE - 15th Ave NE)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
9	Neighborhood greenway	Neighborhood greenway	Fuhrman Ave E at Eastlake Ave E	Recommended Bicycle Network Map
10	Seattle - RapidRide Roosevelt (J Line), Eastlake Segment	The RapidRide Roosevelt (J-Line), Eastlake Segment, is a critical component to the RapidRide Roosevelt (J-Line) Project. This project is a partnership between the City of Seattle (City) and King County Metro to implement bus rapid transit (BRT)	Eastlake Ave E (Fuhrman Ave E - Harvard Ave E)	2023-2026 PSRC Regional TIP
11	Cycle track	Cycle track	Eastlake Ave E (Fuhrman Ave E - Harvard Ave E) / Harvard Ave E (Eastlake Ave E - E Shelby St)	Recommended Bicycle Network Map
12	In-street facility with minor separation	In-street facility with minor separation	Harvard Ave E (E Shelby St - E Roanoke St)	Recommended Bicycle Network Map
13	Neighborhood greenway	Neighborhood greenway	E Roanoke St (Broadway E - 10th Ave E) / 10th Ave E (E Roanoke St - SR 520)	Recommended Bicycle Network Map
14	Curb and Sidewalk Repair	Repair existing curb and sidewalk at bus zone on southbound 10th Ave E and E Roanoke Street	E Roanoke St at 10th Ave E	dotMaps

ID	Improvement	Description	Extent	Source
15	SR-520 connection across Portage Bay	A multi-use path on the Portage Bay Bridge to provide direct connection between Montlake and Capitol Hill. This all ages and abilities facility would significantly alleviate travel between these two heavily used corridors and provide access to the east side.	SR 520 (I-5 - Montlake Blvd E)	Bicycle Master Plan
16	Cycle track	Cycle track	10th Ave E (SR 520 - E Roy St) / Broadway (E Roy St - E Denny Way)	Recommended Bicycle Network Map
17	Neighborhood greenway	Neighborhood greenway	E Miller St at 10th Ave E	Recommended Bicycle Network Map
18	Road Repaving	HMA Mill & Overlay	10th Ave E (E Highland Dr to E Galer St)	dotMaps
19	Sidewalk Safety Repair Program	Sidewalk repair on east side of Broadway	Broadway Ave (E Howell St to E Pine St)	dotMaps
20	Neighborhood greenway	Neighborhood greenway	E Republican St at Broadway	Recommended Bicycle Network Map
21	First Hill Streetcar - Broadway Extension	Implement the First Hill Streetcar Line segment from Denny Way north to E Aloha St and extend the protected bike lane on east side of street. Streetcar service will provide connections to Pioneer Square, China Town/International District, First Hill, Link Light Rail, and Capitol Hill. The project phase from S Jackson St to Denny Way is in operation. The Broadway Streetcar Extension phase from Denny Way to E Aloha St includes an estimated cost of $24.5 million.	Broadway (E Aloha St - E Denny Way)	Regional Transportation Plan 2022-2050
22	Priority Bus Corridor (Lower Queen Anne - South lake Union - Capitol Hill via Denny)	•Proposed Transit Improvements include - TSP, Electrification, Multimodal Projects, Pedestrian enhancements along Denny Way • Design solutions to limit impact of I-5 ramps are needed • Conduct corridor study to analyze transit priority options for Denny Way • Investigate electrification options on Denny Way and Elliott/15th Ave • As primary east-west route, ensure seamless connections to north/south RapidRide routes and Capitol Hill Link Station	E John St at Broadway	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
23	Interbay - Madison Park via Capitol Hill	Construct a new RapidRide line connecting Interbay to Madison Park via Capitol Hill. This project would improve the attractiveness of transit to a regional growth centers and include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use.	E John St at Broadway	Regional Transportation Plan 2022-2050
24	Neighborhood greenway	Neighborhood greenway	E Denny Way at Broadway	Recommended Bicycle Network Map
25	Priority Bus Corridor (Pike/Pine - Center City)	• Pine Street BAT Lane between 3rd Ave and 9th Ave • The Pike/Pine Renaissance Plan provides streetscape design considerations for the western end of this corridor • SDOT is conducting a multimodal study for this corridor that will evaluate options for improving safety and mobility for all modes • Consider as early pilot corridor for off-board fare payment • Continue to implement access and transit priority treatments to avoid transit delay at congested intersections or corridor segments • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	Pike St and Pine St at Broadway	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
26	Rapid Ride G Line Projects	Center-running bus lanes	E Madison St at Broadway	Seattle Transit Master Plan, Capital Projects Dashboard, dotMaps, Current Projects, Regional Transportation Plan 2022-2050
27	Neighborhood greenway	Neighborhood greenway	E Marion St at Broadway	Recommended Bicycle Network Map
28	Neighborhood greenway	Neighborhood greenway	E Columbia St at Broadway	Recommended Bicycle Network Map
29	Neighborhood greenway	Neighborhood greenway	E Cherry St at Broadway	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
30	Priority Bus Corridor (Jefferson/ Yesler)	• Some bus stops have been consolidated and passenger facilities upgraded • The City of Seattle is investing heavily in improved midday service in the corridor • 3rd Ave Transit Corridor Improvements will enhance the pedestrian environment at the intersection of this corridor with the 3rd Ave Transit Spine • Pioneer Square Active Streets Strategy recommends a number of improvements for enhancing pedestrian safety, security and vibrancy of street life on the western end of this corridor; some strategies have been implemented Electrification of Yesler Way (2nd to 9th) and 9th (Yesler to Jefferson) to reduce turning movements off of Third Ave and to avoid freeway-related congestion on James Street • Enhance pedestrian access, particularly around medical center and at key intersections • Provide in-lane bus stops • Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed • Add transit-only lanes or peak period parking restrictions in congested segments of the corridor, particularly where I-5 ramps create peak period traffic congestion • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	E Jefferson St at Broadway	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
31	Neighborhood greenway	Neighborhood greenway	E Alder St at Broadway	Recommended Bicycle Network Map
32	ITS upgrades on Boren Ave	Upgrade all signals in Major Truck Street corridor to current standards and improve north-south mobility in center city	Boren Ave (Howell St - S Jackson St)	Freight Master Plan
33	Cycle track	Cycle track	Boren Ave S at 12th Ave S	Recommended Bicycle Network Map
34	Central Seattle – 12th Ave King St to Yesler	Protected Bike Lane	12th Ave S (Boren Ave S - S King St)	Recommended Bicycle Network Map, 2021-2024 BMP Implementation Plan

ID	Improvement	Description	Extent	Source
35	Vision Zero Improvements	Implementation of Vision Zero 12th Ave project for spot improvements and possible rechannel along 12th Ave E/12th Ave/ 12th Ave S corridor.	12th Ave S (Boren Ave S - S Weller St)	dotMaps
36	Cycle track	Cycle track	Yesler Way at Boren Ave S	Recommended Bicycle Network Map
37	King County - 12th and Jackson Transit Hub	Construct new transit passenger and pedestrian facilities at all four bus stops at the intersection. Work includes new unique and high visibility bus shelters with weather protected seating, sidewalk widening and curb bulb-outs, traveler information and wayfinding signs including real-time passenger information, pedestrian scale lighting, pedestrian guardrails, ADA curb ramps, and enhanced electrical infrastructure.	12th Ave S/S Jackson St	2023-2026 PSRC Regional TIP, Washington State S.T.I.P
38	Speed and Reliability Corridor Improvements	Design and construct transit speed, reliability, and access improvements along Metro Route 36, a trolley bus route, operating between Othello Link Light Rail Station and Downtown Seattle (12th Ave S and S Jackson St) via Beacon Hill. Improvements may include transit signal priority, bus-only lanes, signage, bus zone bulb-outs, bus stop consolidation and optimization, improved lighting, crosswalk and sidewalk improvements, and other treatments. The project will design and implement Overhead Contact System modifications needed to accommodate the proposed improvements to maintain trolley bus operations.	12th Ave S (S Jackson St - S Charles St) / Golf Dr S (S Charles St - 14th Ave S) / 14th Ave S (Golf Dr S - Beacon Ave S) / 12th Ave S (Golf Dr S - S Massachusetts St) / S Massachusetts St (12th Ave S - 14th Ave S) / Beacon Ave S (14th Ave S - S Myrtle St) / S Myrtle St (Beacon Ave S - 32nd Ave S) / S Myrtle Pl (32nd Ave S - Holly Park Dr S) / S Othello St (Holly Park Dr S - Martin Luther King Jr Way S) / 38th Ave S (S Myrtle St - S Othello St) / S Myrtle St (38th Ave S - Martin Luther King Jr Way S) / Martin Luther King Jr Way S (S Myrtle St - S Othello St)	Washington State S.T.I.P
39	Mountains to Sound Trail over I-5	A crossing of I-5 at the north end of Beacon Hill, near Dr. Jose Rizal Park and the International District, to provide a more direct connection to downtown Seattle for those coming off the I-90 Trail.	West side of Dr. Jose Rizal Park - intersection of Airport Way S and S Royal Brougham Way	Bicycle Master Plan

ID	Improvement	Description	Extent	Source
40	Beacon Ave S & 15th Ave S Safety Project	Project will construct a protected bike lane along Beacon Ave S between S Spokane St and 15th Ave S, on 15th Ave S. between Beacon Ave S and 14th Ave S, and on Golf Dr S between 15th Ave S and S Charles St. Scope elements include curb and gutter, sidewalk, curb ramps, storm drainage improvements, concrete and asphalt paving, tree pits, signal modifications and pavement markings.	Golf Dr S (S Charles St - 14th Ave S) / Beacon Ave S (15th Ave S - S Spokane St)	Current Projects, dotMaps, 2021-2024 BMP Implementation Plan, 2023-2026 PSRC Regional TIP
41	Cycle track	Cycle track	S Massachusetts St (12th Ave S - 13th Ave S) / 12th Ave S (Golf Dr S - S Massachusetts St)	Recommended Bicycle Network Map
42	SRTS (Beacon Hill ES)	Neighborhood greenway	13th Ave S at S Massachusetts St	Recommended Bicycle Network Map, 2021-2024 BMP Implementation Plan
43	Neighborhood greenway	Neighborhood greenway	S Hill St at 14th Ave S	Recommended Bicycle Network Map
44	Neighborhood greenway	Neighborhood greenway	S College St at 14th Ave S	Recommended Bicycle Network Map
45	Neighborhood greenway	Neighborhood greenway	14th Ave S at Beacon Ave S	Recommended Bicycle Network Map
46	Off-street facility	Off-street facility	Beacon Ave S at 14th Ave S	Recommended Bicycle Network Map
47	Road Repaving	HMA Mill & Overlay	Beacon Ave (14th Ave S to 15th Ave S)	dotMaps
48	Neighborhood greenway	Neighborhood greenway	S Forest St at Beacon Ave S	Recommended Bicycle Network Map
49	Beacon Hill Healthy Street	Marked crosswalks; New Curbside push buttons for crossings; ADA Ramps; New concrete curb bulbs with Healthy Street signage. As part of the Beacon Hill Ave S and 15th Ave S Safety project, the intersection will also include: New floating bus stops on the east and west side of Beacon Ave S; Remove median islands and install c-curbs for the new protect bike lanes.	Beacon Ave S/S Hanford St	Current Projects

ID	Improvement	Description	Extent	Source
50	In-street facility with minor separation	In-street facility with minor separation	S Spokane St at Beacon Ave S	Recommended Bicycle Network Map
51	Cycle track	Cycle track	Beacon Ave S (S Spokane St - S Alaska St)	Recommended Bicycle Network Map
52	Neighborhood greenway	Neighborhood greenway	S Alaska St at Beacon Ave S	Recommended Bicycle Network Map
53	Neighborhood greenway	Neighborhood greenway	S Dawson St at Beacon Ave S	Recommended Bicycle Network Map
54	Speed Cushions	Installation of speed cushions, daylight improvements, and candy cane backing to stop signs	S Orcas St at Beacon Ave S	dotMaps
55	Neighborhood greenway	Neighborhood greenway	S Morgan St at Beacon Ave S	Recommended Bicycle Network Map
56	Off-street facility	Off-street facility	Beacon Ave S (S Alaska St - S Myrtle St)	Recommended Bicycle Network Map, dotMaps
57	Speed Humps	Installation of speed humps	32nd Ave S at S Myrtle St	dotMaps
58	Neighborhood Greenway	New Holly Home Zone Neighborhood Greenway South	Holly Park Dr S at S Myrtle Pl	dotMaps
59	Neighborhood Greenway	Neighborhood Greenway	S Myrtle St (38th Ave S - Martin Luther King Jr Way S)	Recommended Bicycle Network Map
60	Cycle track	Cycle track	Martin Luther King Jr Way S (S Myrtle St - S Othello St)	Recommended Bicycle Network Map

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Corridor 1064A. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[9] (not included in Route 36-49)
- Trolley infrastructure

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 18. For transit speed and reliability improvements, refer to Figure 26. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 15.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 42.

[9] For non-trolley routes only.

Figure 42 Order-of-Magnitude Project Costs

	Category	% of Total	Costs
	Stops and Stations	61%	$ 13,080,000
	Transit Speed and Reliability Improvements	32%	$ 6,880,000
	Layover and Terminus Facilities	3%	$ 600,000
	Charging Infrastructure	-	-
	Trolley Infrastructure	4%	$ 770,000
	Construction Base Subtotal		***$ 21,330,000***
2%	Stormwater Upgrades		$ 430,000
3%	Traffic Control		$ 640,000
10%	Mobilization		$ 2,140,000
2%	TESC		$ 430,000
	Subtotal Construction Cost		***$ 24,970,000***
10.1%	Sales Tax		$ 2,530,000
10%	Construction Contingency		$ 2,750,000
40%	Contingency (Design Allowance and Risk)		$ 12,100,000
	Total Construction Cost		***$ 42,350,000***
10%	Project Management		$ 4,240,000
5%	Planning		$ 2,120,000
15%	Engineering/Design		$ 6,360,000
10%	Construction Management		$ 4,240,000
3%	Environmental Review		$ 1,280,000
2%	Permitting		$ 850,000
	Total Project Cost		***$ 61,440,000***

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Corridor 1064A. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational ROW. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – While the route crosses several designated view corridors, the improvements associated with Corridor 1064A will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Corridor 1064A is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – While Corridor 1064A traverses Lake Union via a bridge, the project will remain within the operational right-of-way and is not anticipated to have an impact on the navigability or water quality of Lake Union.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Acquisitions and Displacements – At present, there are no identified requirements for permanent easements or property acquisitions along Corridor 1064A.
- Floodplains - Improvements associated with the project are not anticipated to occur within any FEMA floodplains.
- Air Quality - The project is expected to contribute to long-term improvements in air quality. Temporary impacts will be minimized through standard BMPs for air quality and no adverse effects are anticipated.

- Wetlands – There are no known wetlands in the vicinity of the project.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources.

13.3a Cultural Resources

In order to comprehensively identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The Route 36-49 corridor passes through a number of historic districts, notably Roanoke Park Historic District, Yesler Terrace Low Income Housing Project, the U.S. Marine Hospital - Seattle, and the International Special Review District. Adjacent to the corridor are properties listed in both the National Register of Historic Places and the Washington National Heritage Register, including significant sites such as and runs adjacent to the University National Bank Building, William Parsons House, Eliza Ferry Leary House, Pierre P. Ferry House, and the Harvard-Belmont District. Additionally, Route 36-49 passes over the University Bridge and 12th Avenue South Bridge.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located in the University of Washington Campus and Downtown Seattle.

A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation during the formal environmental review process may address potential moderate or high-risk sites, depending on the chosen station locations and potential construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. Any contaminated soils encountered would be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 36-49 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

A comprehensive traffic operational analysis was conducted to evaluate the transit travel time benefits of proposed improvements at 52 intersections along Corridor 1064A. The analysis revealed that at 11 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 15 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

The removal of parking for conversion to a bus or BAT lane along the corridor would have a potential adverse effect. The removal of parking spaces will need to be evaluated in a transportation technical report, including a parking study.

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the projects' aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 36-49 can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared, to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The FTA Transit Noise and Vibration Impact Assessment Manual notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological/Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces. This is the case even for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along Corridor 1064A reveal known critical areas susceptible to landslides, liquefaction, and peat settlement. The route passes through a potential landside area on 12th Avenue S between S Lane Street and S Dearborn Street and briefly where it crosses over I-90. Liquefaction prone areas are present on Beacon Ave S from S Stevens Street until Jefferson Park and on S Myrtle St from the Van Asselt Playground until the intersection with ML King Jr Way S. The University of Washington Campus stretch of the corridor is all in a peat settlement prone area as well as small portion of S Myrtle Place at Van Asselt Playground.

The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces, and it is situated within three different stormwater basins. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the City of Seattle Stormwater Code and Manual, and water quality treatment may be required based on the square footage of pollution-generating impervious surfaces (PGIS) created. Mitigation measures encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control (if applicable, as per the City of Seattle requirements), and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP) or TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.4 Cumulative and Indirect Impacts

Corridor 1064A serves the city of Seattle. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking and are described in Figure 41, List of Planned Jurisdictional Investments.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of "facility modernization" that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

However, if the loss of parking is substantial enough that it causes public controversy or possible significant adverse impacts, FTA may require an Environmental Assessment to be prepared. This would be unusual but not without precedent in Seattle—the former Roosevelt RapidRide (now J Line) BRT went through an EA process at least in part because of the amount of potential parking loss.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Air Quality Technical Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation

- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit

RapidRide Prioritization Plan

Corridor 1064B Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

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Corridor Summary

Corridor 1064B | Route 36

CORRIDOR SUMMARY

Ridership

No Build

+19%

RapidRide Corridor 1064B

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour

+12.2

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour

41.3

Weekday boardings per revenue hour with RapidRide investment in 2042.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Travel Time

Proposed Travel Time Savings

-15%

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time

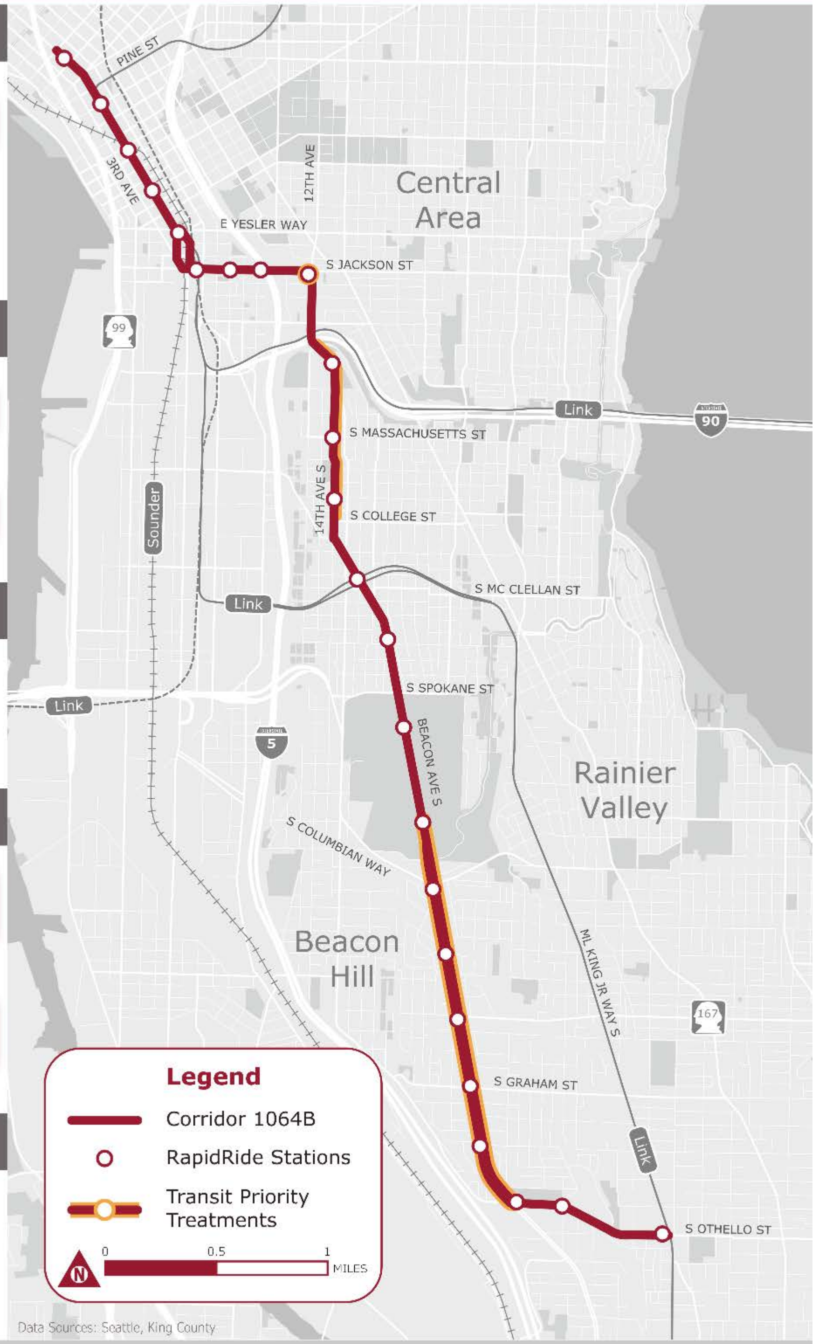
38

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Equity Priority Area Score

3.7

Average area of need score within 1/2 mile of station locations.



RAPIDRIDE

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I,J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects Corridor 1064B (Route 36). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1064B is currently served by Route 36, which connects South Beacon Hill/New Holly at the Othello Link Station via Beacon Hill and the International District to Downtown. Route 36 serves predominantly residential areas in the south, with employment and commercial uses in the north.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would combine Routes 36 and 49 via Broadway, with no service into Downtown Seattle. A high-level review of this recommended alignment was compared against an option with service from Othello to U District via Beacon Hill, International District, and Downtown, as well as an option for RapidRide service on Route 36 only, with Route 49 remaining as local service. The result was a recommendation for an alignment connected via Broadway (as recommended in Metro Connects), as well as an additional corridor with Route 36 only.

This report focuses on the additional corridor with Route 36 only. The alignment combining Routes 36 and 49 is documented separately in the Corridor 1064A Summary Report.

2.2 Representative Alignment

The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. These changes include re-aligning northbound service off of 12th Ave S and onto 14th Ave S to eliminate one-way operations, and adjusting the northern terminus from Pine St to Lenora St.

Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 36, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Alignment Changes

Alignment Change	Change from… Route 36	Metro Connects	Screening
Implement RapidRide on the Route 36 alignment and maintain Route 49 as local service.	✗	✓	✗
Near Pacific Tower in North Beacon Hill, re-route northbound service off of 12th Ave S and onto 14th Ave S to eliminate one-way couplet.	✓	✓	✓
Change northern terminus in Downtown Seattle from 3rd Ave and Pine St to 3rd Ave and Lenora St.	✓	✓	✓

Figure 3 Corridor Overview

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3.0 Transit Network

Route 36 serves as a primary, north-south frequent-service line in South Seattle, operating primarily in the Beacon Hill neighborhood. In North Beacon Hill and Chinatown-International District, Route 36 has overlapping service with Route 60, another north-south frequent-service line. Route 36 connects to Link light rail service at Beacon Hill, Othello, and Chinatown-International District Stations, as well as the Pioneer Square, University Street, and Westlake Stations along the 3rd Avenue transit spine in Downtown Seattle. Route 36 connects to Sounder commuter rail service at King Street Station, Seattle Streetcar service in the Chinatown-International District, and many other bus lines in downtown Seattle.

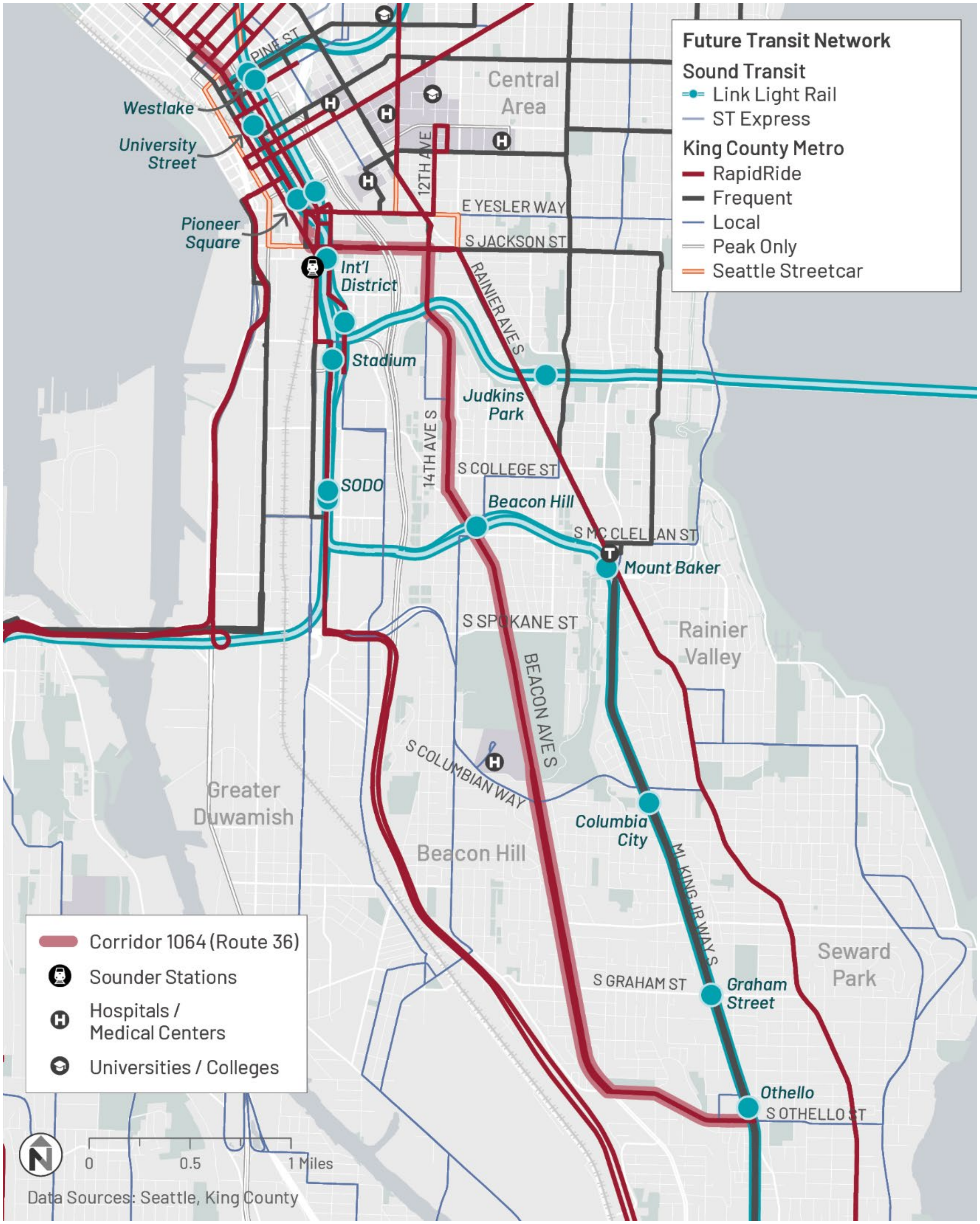
3.1 Future Network Changes

Within Beacon Hill, the Metro Connects Interim Network assumes service levels similar to those seen today. Within the Chinatown-International District, Route 36 would intersect and overlap with new R Line RapidRide service operating along an alignment similar to the existing Route 7. Downtown Seattle would remain a transit hub, connecting Route 36 to additional local and regional bus service, Link light rail service, and Sounder commuter rail service.

Figure 4 Existing Transit Network

King County METRO

Figure 5 Metro Connects Interim Network



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4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 36 currently operates with frequent service for most of the day, every day. It operates every 15 minutes or better from 6 am to 11 pm all days of the week. On weekdays, it operates approximately every 10 minutes from 6 am to 1 pm, and every 5 to 8 minutes until 7 pm.

Figure 6 Existing Route 36 Frequency by Time of Day

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30	15	9 - 10							5 - 8						12	15			20	30	60		
Saturday	60	20	15			10									12	15				30		60		
Sunday	60		15				12									15				30		60		

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

Route 36 already operates at or above the minimum standard and therefore would not require any increase in service levels.

Figure 7 shows the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	30	15				9 - 10						5 - 8				12		15		20	30		60	
Saturday	60	20		15						10					12		15			30			60	
Sunday	60			15							12						15			30			60	

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round trip will take 76 minutes during the PM peak and 67 minutes during off-peak hours. Although service frequency and span would remain the same as today, the service hours needed to operate Corridor 1064B would decrease because of the travel time savings. Metro could save approximately 38 service hours each weekday (or a 16% decrease), save 24 hours on Saturday, and 18 hours on Sundays.

Figure 9 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would save three buses on weekdays (17 buses, relative to the existing 20 buses needed on weekdays). Two fewer buses would be needed on Saturdays and Sundays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	Percent
Daily Service Hours				
Weekday	234	196	-38	-16%
Saturday	173	149	-24	-14%
Sunday	145	127	-18	-12%
Daily One-Way Trips				
Weekday	263	256	-7	-3%
Saturday	206	196	-10	-5%
Sunday	174	172	-2	-1%
Fleet				
Weekday	20	17	-3	-15%
Saturday	11	9	-2	-18%
Sunday	9	7	-2	-22%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming the minimum existing frequency of 5-to-8-minute headways (or 7-12 buses per hour), the corridor would require at least two layover spaces at each end.[1]

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a Othello Station

The terminus near Othello Station would be on surface streets. Today, Route 36 has a layover on S Myrtle Street just west of Martin Luther King Jr Way S. The space is approximately 200 feet long, or enough for three articulated buses.

The terminus for RapidRide would be anywhere in the vicinity of the Othello Station, including at its current location. It will remain on-street as there are no existing transit centers or Metro-owned properties in the immediate vicinity. Trolley wires currently only exist along the Route 36 alignment (38th Ave S, S Myrtle St, MLK Jr Way S and S Othello St). If a new terminus location is identified elsewhere, new trolley wire would need to be constructed.

4.5b Downtown Seattle

The terminus in Downtown Seattle would be on surface streets and shared with other King County Metro routes. Today, Route 36 has a layover on Virginia and 5th Avenue, with capacity

[1] A one-way travel time of approximately 37-40 minutes requires a layover of 8 minutes (20% layover). With buses every 5 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

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for two buses. However, if converted to RapidRide service, the route's terminus could be shifted to a current or future RapidRide terminus to share amenities with other routes.

Route 36 uses overhead wires, so whatever terminus location is selected would need to align with that infrastructure, but also provide sufficient capacity for the new RapidRide line in addition to whatever other services use the terminus location.

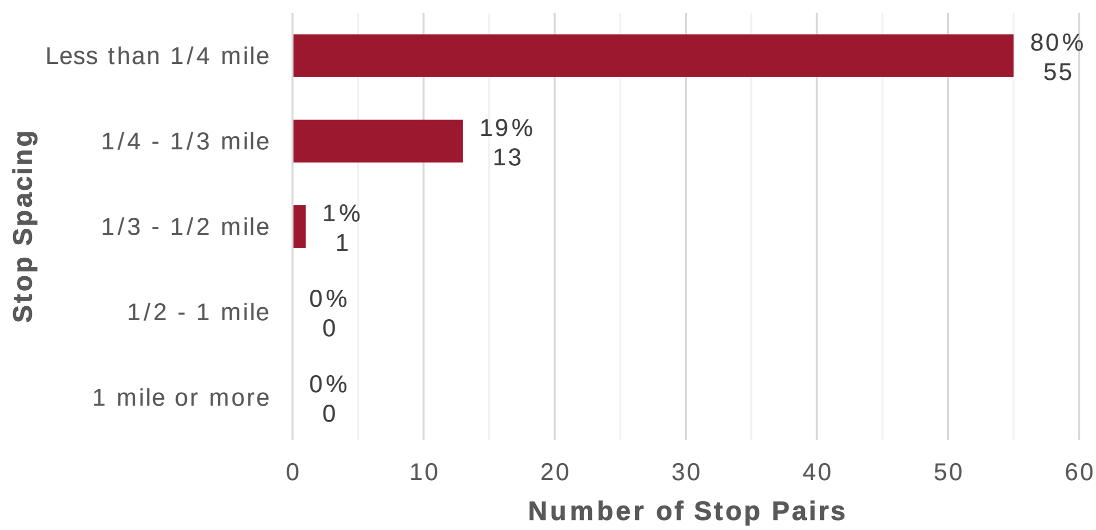
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,000 feet (or almost one-fifth mile).

Approximately 80% of stop pairs along the corridor are less than a quarter mile, and with an additional 19% between a quarter and third of a mile (Figure 10).

Figure 10 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridors segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the

locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 11. These station locations would achieve an average spacing of 1,590 feet (or approximately one-third mile), which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 11 Proposed Station Locations

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5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 12, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 57.

Figure 12 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 34), each station is categorized into one of the four potential station typologies. Station locations with existing RapidRide stations are assumed to not require any new amenities. The typologies are listed in Figure 13 and summarized in Figure 14.

Figure 13 Station Boardings and Typology

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
1	3rd Ave & Virginia St	60	-	Existing	-
2	3rd Ave & Pike St	90	10	Existing	Existing
3	3rd Ave & Seneca St	290	10	Existing	Existing
4	3rd Ave & Columbia St	130	10	Existing	Existing
5	Prefontaine Pl S & Yesler Way	-	10	-	Existing
6	S Jackson St & 5th Ave S	970	10	Large Raised	Small
7	S Jackson St & Maynard Ave S	410	60	Large Raised	Medium
8	S Jackson St & 8th Ave S	170	40	Large	Small

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
9	S Jackson St & 12th Ave S	610	110	Large Raised	Medium
10	14th Ave S & Golf Dr S	70	340	Medium	Large
11	14th Ave S & S Massachusetts St	140	610	Medium	Large Raised
12	14th Ave S & S Hill St	170	180	Large	Large
13	Beacon Ave S & S Lander St	600	170	Large Raised	Large
14	Beacon Ave S & S Hanford St	80	10	Medium	Small
15	Beacon Ave S & Jefferson Comm. Center	10	60	Small	Medium
16	Beacon Ave S & VA Hospital	10	110	Small	Medium
17	Beacon Ave S & S Columbian Way	100	160	Medium	Large
18	Beacon Ave S & S Bennett St	110	540	Medium	Large Raised
19	Beacon Ave S & S Orcas St	120	440	Medium	Large Raised
20	Beacon Ave S & S Graham St	140	470	Medium	Large Raised
21	Beacon Ave S & S Holly St	10	110	Small	Medium
22	S Myrtle St & Beacon Ave S	10	120	Small	Medium
23	S Myrtle Pl & 32nd Ave S	10	60	Small	Medium
24	Martin Luther King Jr Way S & S Othello St	-	310	Small	Large

Figure 14 Station Typology Summary

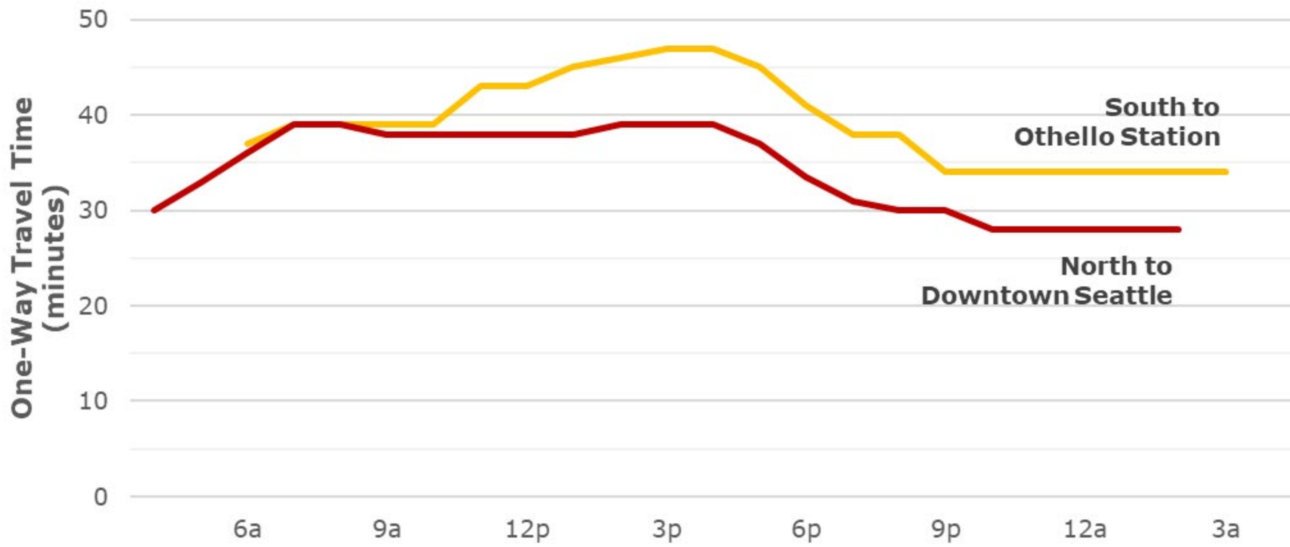
Station Type	Count	Percent
Large Raised Station	8	21%
Large Station	7	18%
Medium Station	14	37%
Small Station	9	24%
Total	**38**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 36 in May 2023 ranged between approximately 30 minutes (late in the evening) to 47 minutes (during the PM peak). On average a one-way trip took 37 minutes.

Figure 15 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

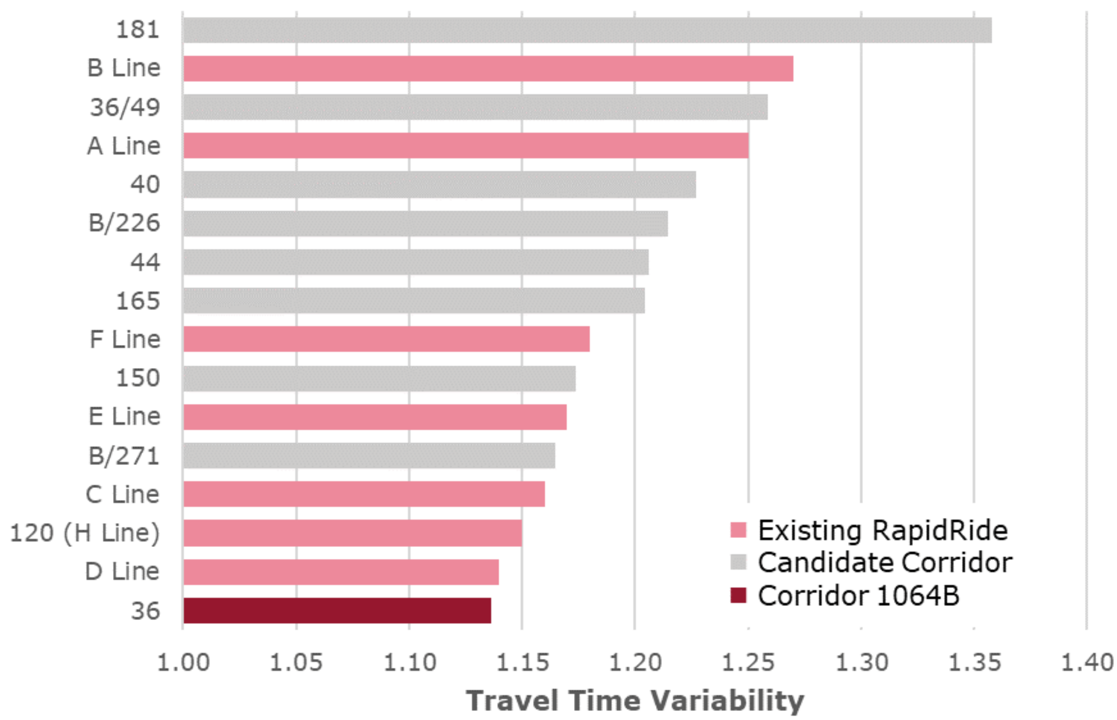
Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day. On average, an end-to-end trip for Corridor 1064B experiences delay of just over 13 minutes between the 20th and 80th percentile travel time. This is approximately 1 minute (59 seconds) of trip delay per mile on an average trip. This is the fourth highest delay of all nine corridors.

Northbound trips at 3 PM and southbound trips between 7-8 AM and 2-4 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.10 to 1.14. This indicates the longest travel times (slowest trips) take 10-14% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1064B is performing very well. This comparison is shown in Figure 16.

Figure 16 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 17.

Figure 17 Speed & Reliability Summary

Metric	Value
On-time performance[A]	73%
Average speed	15.2 mph
Average trip delay[B]	13.3 min
Average trip delay per mile	59 sec
Lowest median hourly travel time (Reference) [C]	26 min
Highest median hourly travel time	29 min[D]
Travel time variability[E]	1.14

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 6 PM for northbound trips, from Fall 2021.

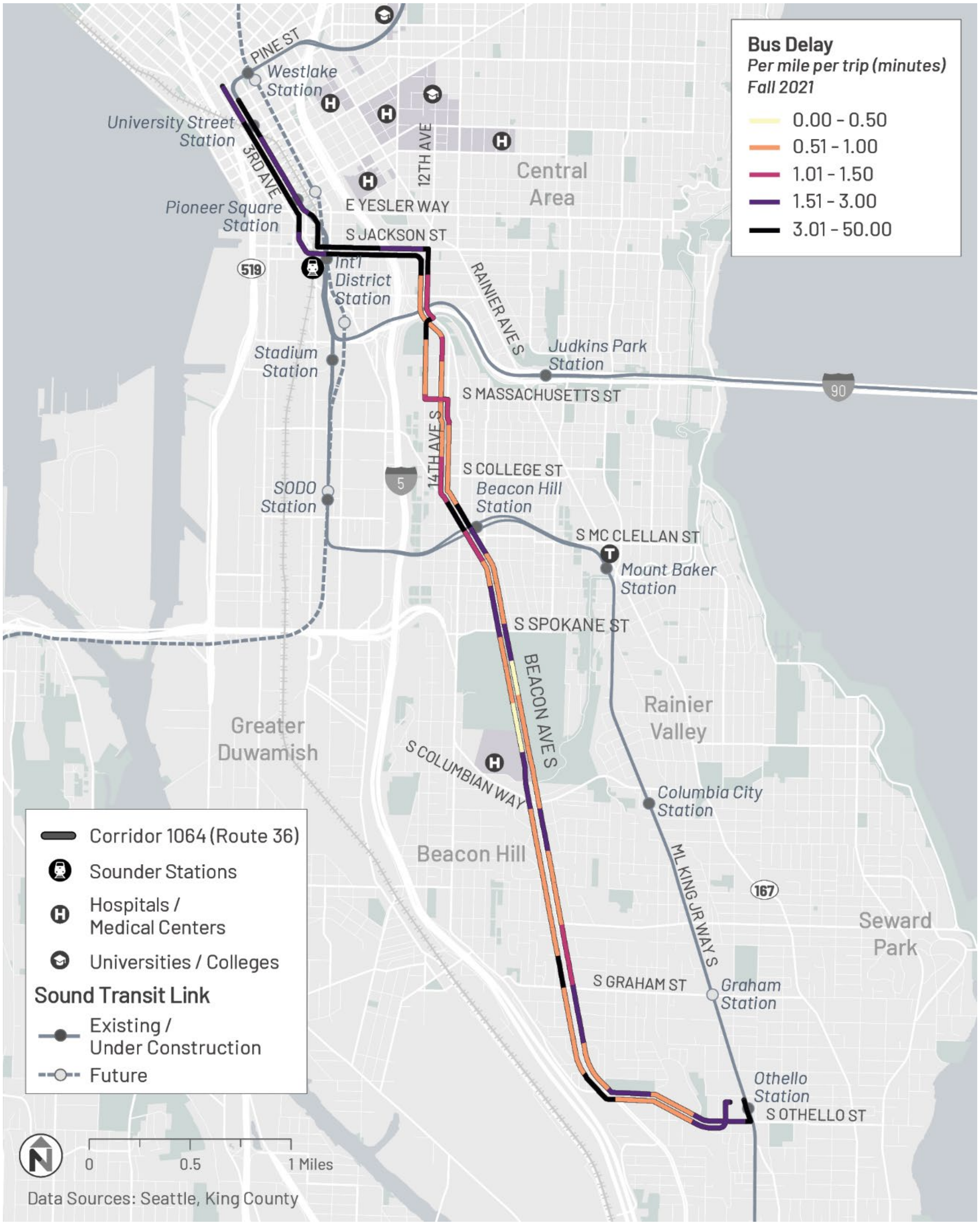
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 18 shows the delay along the Corrido 1064B based on King County Metro's AVL data from Fall 2021.[2] The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Service operating in Downtown Seattle and the Chinatown-International District experience high levels of delay, especially along 3rd Ave and S Jackson St. Other high delay locations occur at major intersections including S Spokane St, S Columbian Way, S Graham St, and S Myrtle St. Delay is also found near Beacon Hill Station and Othello Station.

[2] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 18 Corridor 1064B Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 19 and Figure 20 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

In Downtown Seattle and the Chinatown-International District, delays are present at all portions of the corridor for northbound and southbound travel. All-day delays are largely concentrated at key destinations and transfer locations, as seen in the high all-day delay near Beacon Hill Station and Othello Station. Delay is also seen approaching major intersections, with northbound segments approaching S Columbian Way experiencing high delay in the evening and southbound segments experiencing high all-day delay.

Overall, high delay locations tend to experience delay throughout the day. Higher levels of delay occur between 5 and 9 am and between 3 and 8 pm for many stop pairs.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

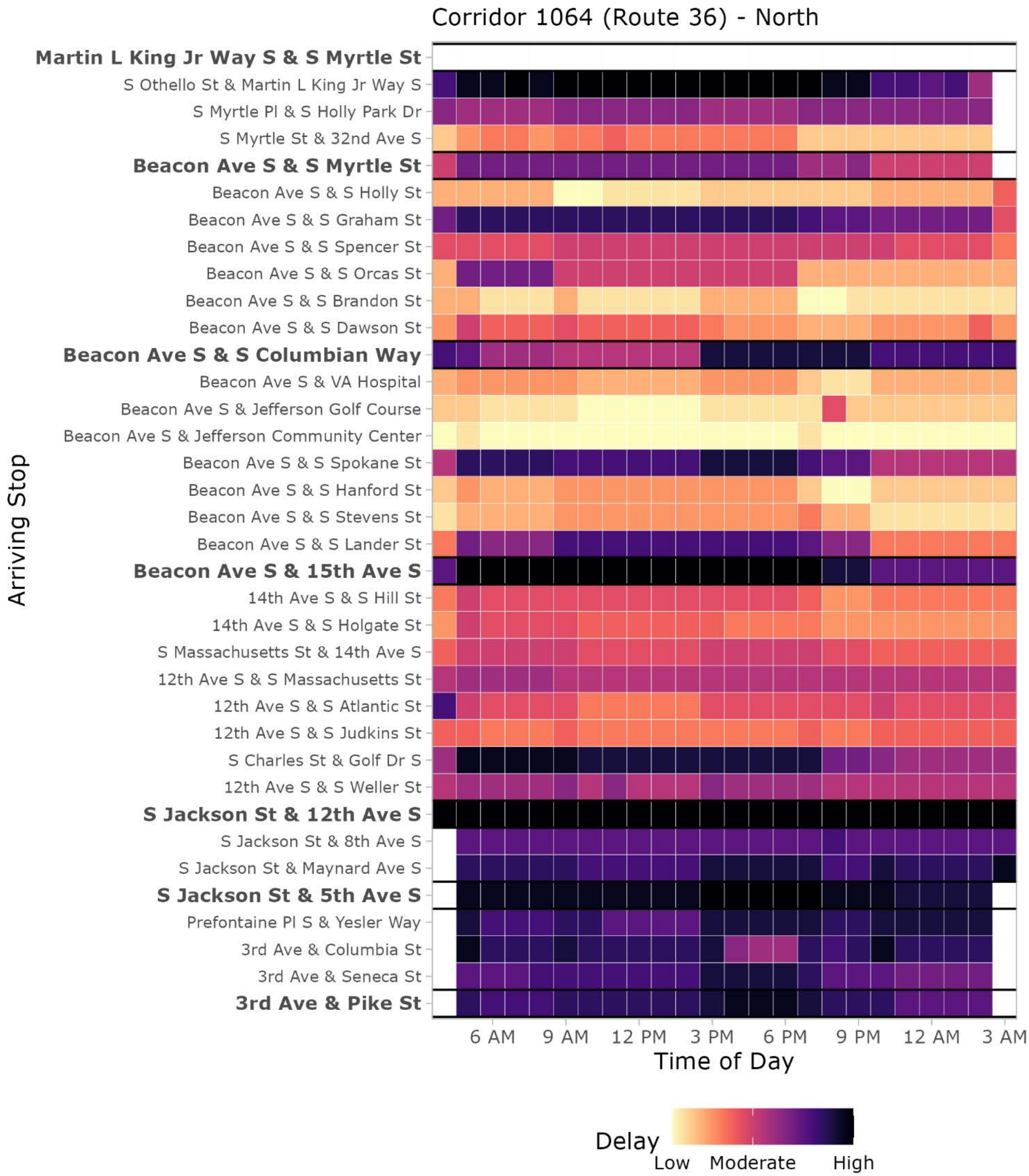
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 19 Corridor 1064B Northbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

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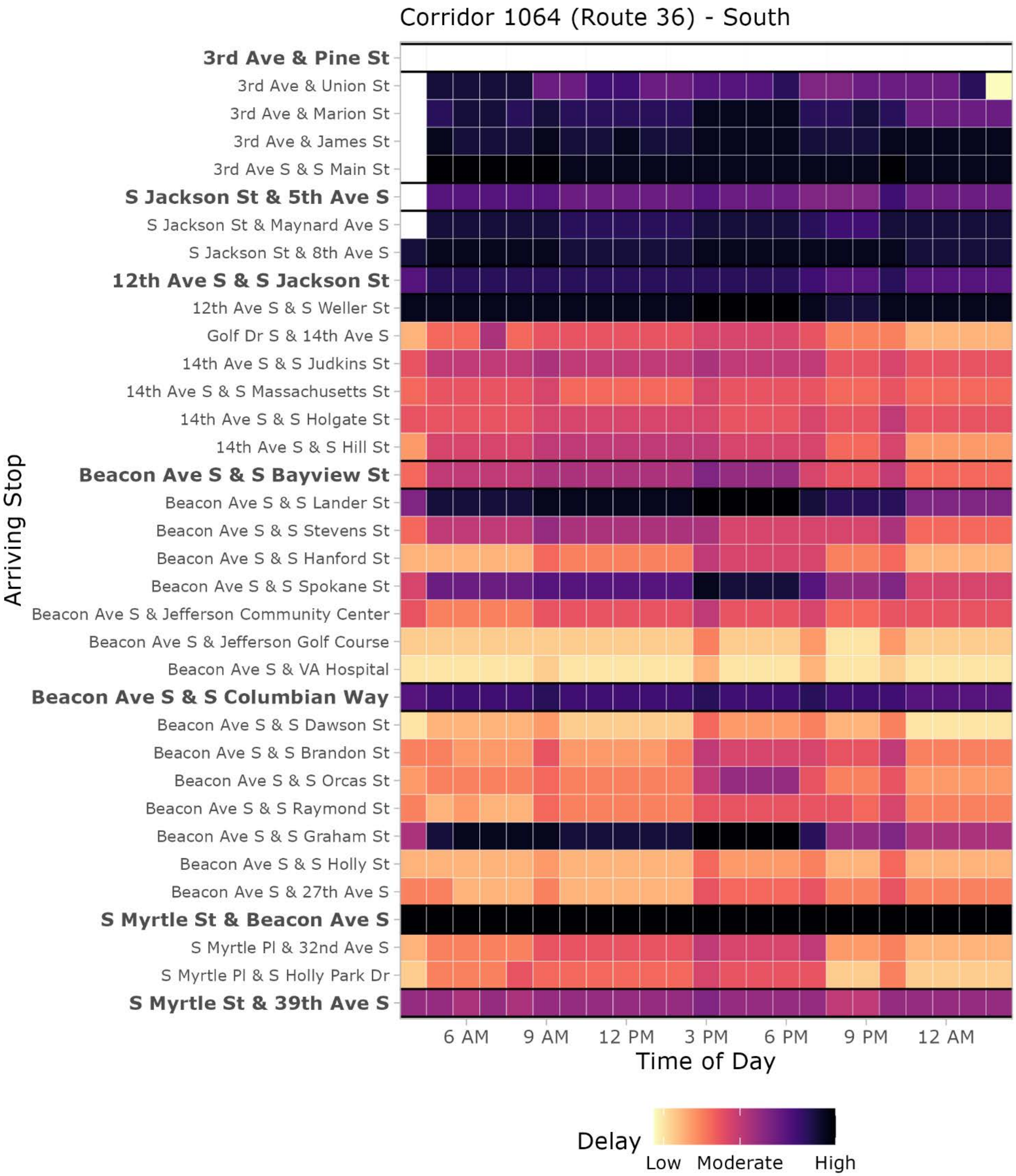
Figure 20 Corridor 1064B Southbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

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6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along the Corridor 1064B alignment. Transit priority opportunities were identified where there was high delay, and there was available space for bus/BAT lanes, and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 21, and they are shown geographically in a map in Figure 22.

The corridor currently achieves transit priority for 16% of its centerline miles, which is below the RapidRide *minimum* standard of 40%. The additional proposed treatments here would increase the coverage to 51%, which would exceed the *desired* standard of 50%.

Figure 21 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
12th Ave S & S King St	Queue Jump	Add southbound queue jump at S King St.
14th Ave S (Golf Dr S to S College St)	Bus/BAT lane	Add a northbound bus lane from Golf Dr S to S College St.
Beacon Ave S (S Alaska St to S Myrtle St)	Bus/BAT lane	Convert southbound and northbound curbside parking to bus only lane from S Alaska St to S Myrtle St.

Figure 22 Proposed Transit Priority Treatments

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6.4 Forecast Travel Time Savings

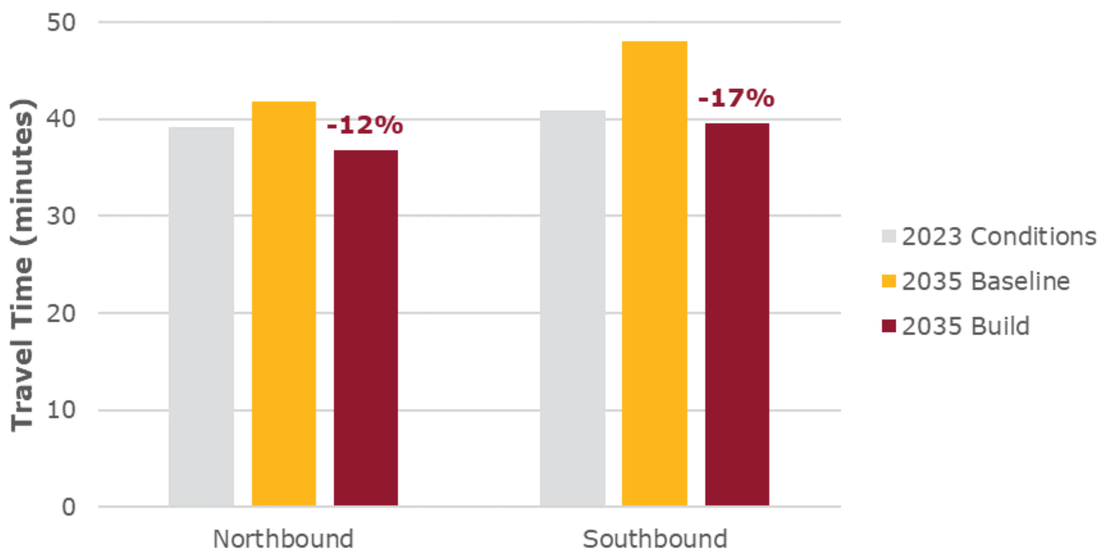
The RapidRide Program standards set a goal to improve travel time by 15-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1064B alignment are forecast to reduce PM peak Future Build condition travel times 12-17% from Future Baseline conditions. Average bus travel speed is expected to increase to 10-11 mph in the Future Build conditions.

Southbound trips will experience a higher reduction in travel times compared to the northbound direction. Introducing BAT lanes by removing curbside parking at high delay locations will maintain general-purpose throughput capacity while improving transit speeds and travel time.

Figure 23 shows transit travel times for the overall route.

Figure 23 Corridor 1064B Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 36 carried approximately 7,300 people per day in Spring 2023, and as much as 9,700 people in Fall 2019. The route has now recovered approximately 75% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[3], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 24 Route 36 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	9,699	-	100%
Fall 2020	4,018	-59%	41%
Fall 2021	5,799	+44%	60%
Spring 2023	7,305	+26%	75%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 25 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 36.

The busiest stop locations are in Downtown Seattle, near Jackson and 12th, and in Beacon Hill. Moderate to high ridership occurs at most stops along Beacon Ave from the VA Hospital to the Southern Terminus at Othello Station, indicating a corridor with strong demand.

[3] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 25 Boarding and Alighting Activity by Stop (Spring 2023)

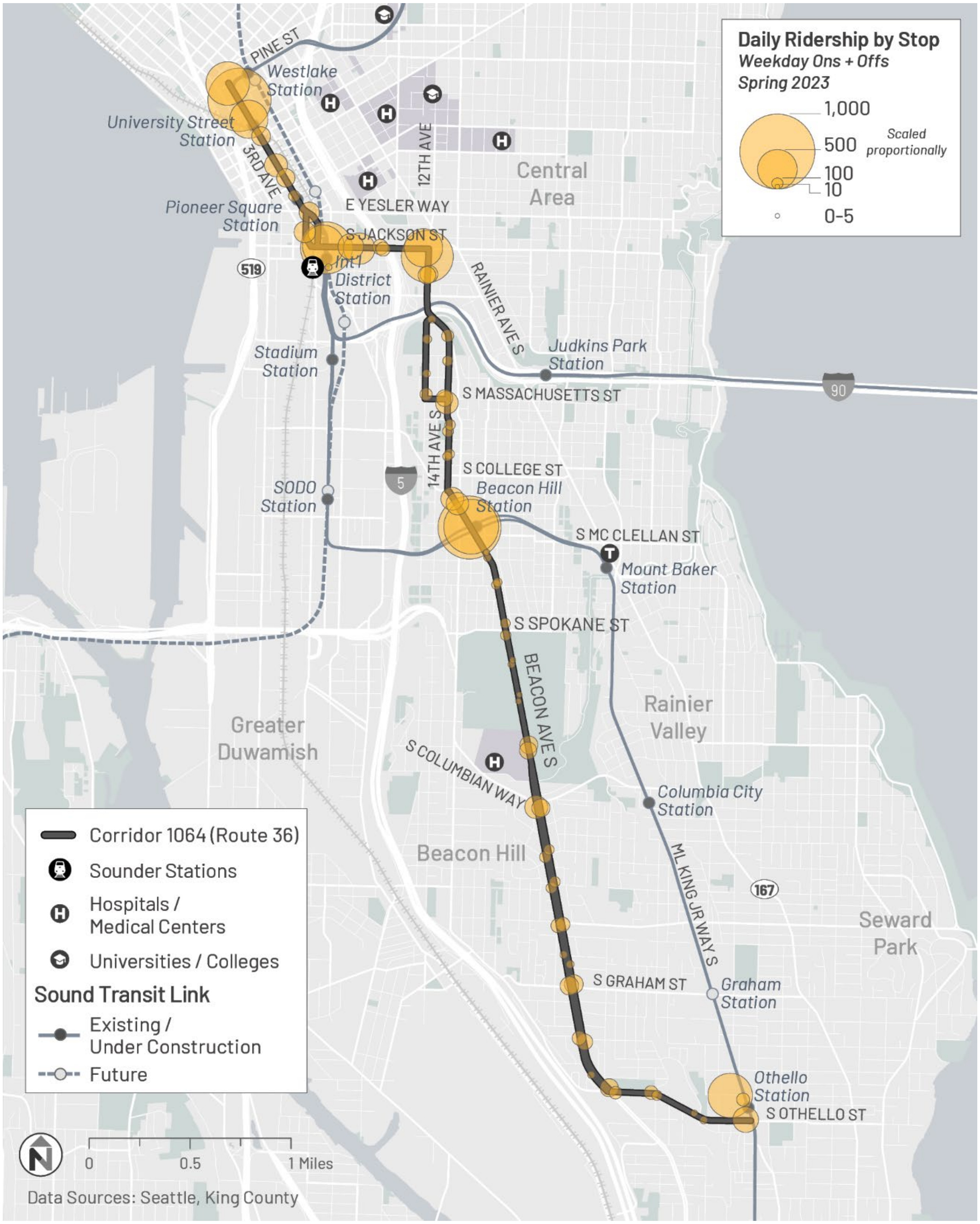


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Figure 26 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Southbound	Northbound	Total
3rd Ave & Pike St/Pine St	555	834	1,389
3rd Ave & Union St/Seneca St	479	207	686
3rd Ave & Marion St/Columbia St	266	201	467
3rd Ave & James St/Yesler Way	99	227	326
3rd Ave S & S Main St	244	-	244
Jackson St & 5th Ave	674	528	1,203
Jackson St & Maynard Ave	385	304	690
Jackson St & 8th Ave	141	159	300
Jackson & 12th Ave	676	482	1,158
12th Ave & Weller St	189	191	380
Charles St & Golf Dr	-	53	53
12th Ave & Judkins St / Golf Dr & 14th Ave	111	66	177
12th Ave & Atlantic St / 14th Ave & Judkins St	82	50	132
12th Ave & Massachusetts St	-	113	113
14th Ave & Massachusetts St	261	176	437
14th Ave & Holgate St	96	89	186
14th Ave & Hill St	71	81	153
Beacon Ave & 15th Ave	264	258	522
Beacon Ave & Lander St (Beacon Hill Station)	831	714	1,545
Beacon Ave & Stevens St	47	30	77
Beacon Ave & Hanford St	70	64	134
Beacon Ave & Spokane St	87	80	167
Jefferson Community Center	39	24	63
Jefferson Golf Course	23	19	42
VA Hospital	183	195	378
Beacon Ave & Columbian Way	265	196	461
Beacon Ave & Dawson St	101	85	187
Beacon Ave & Brandon St	91	90	181
Beacon Ave & Orcas St	142	140	282
Beacon Ave & Raymond St/Spencer St	46	51	97
Beacon Ave & Graham St	202	206	408
Beacon Ave & Holly St	138	167	305
Beacon Ave & 27th Ave	43	-	43
Beacon Ave & Myrtle St	118	195	314
Myrtle Pl & 32nd Ave	82	134	216
Myrtle Pl & Holly Park Dr	46	33	79
Othello St & MLK Jr Way	-	303	303
MLK Jr Way & Myrtle St	569	124	694

Source: King County Metro Spring 2023

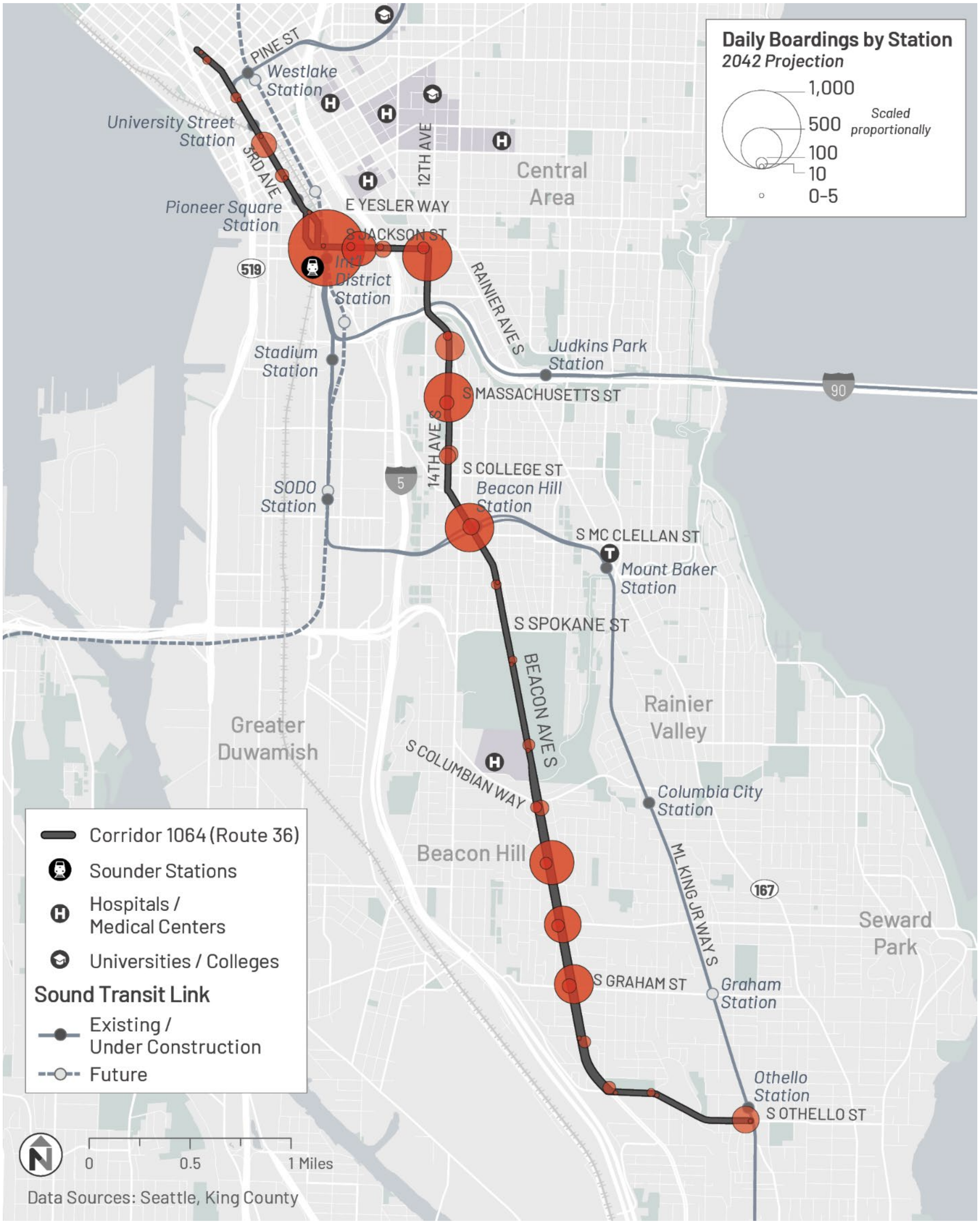
Note: Ridership values represent average weekday boardings plus alightings by stop.

7.3 Forecast Ridership

Future ridership for Corridor 1064B will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1064B (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 670 boardings in the PM peak hour and 8,100 daily boardings. Key ridership hubs include the International District, Beacon Hill, and Beacon Avenue between Columbian Way and Graham Street. Future ridership for each candidate RapidRide station is shown in Figure 27.

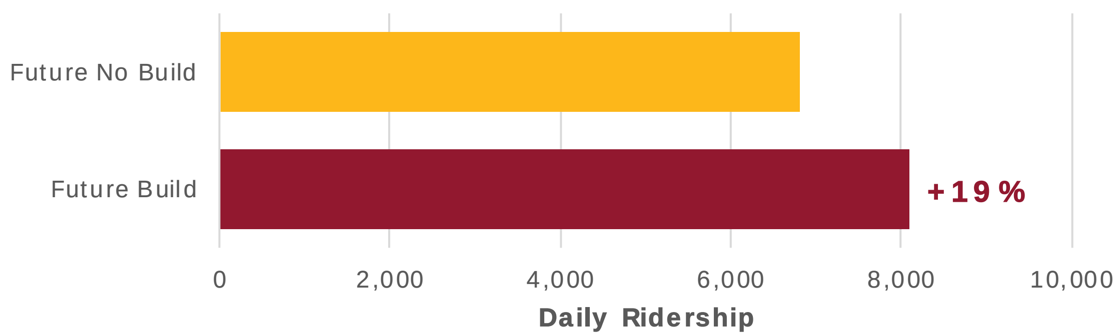
Figure 27 Future Corridor Ridership



7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future “baseline” to a future “build” scenario with the RapidRide elements assumed. A net increase of 1,300 riders per weekday (or 19% increase) is forecast for Corridor1064B compared to a “baseline” scenario with today’s service levels for Route 36. Because service frequency and span are expected to remain the same, this increase is mostly attributable to travel time savings.

Figure 28 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1064B is forecast at 41 riders per revenue hour. This would result in an improvement of 42 percent in productivity compared to a future “baseline” of 29 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 38 and 28 riders per revenue hour, respectively. At 41 riders per revenue hour, Corridor 1064B would rank in the middle (fifth) of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

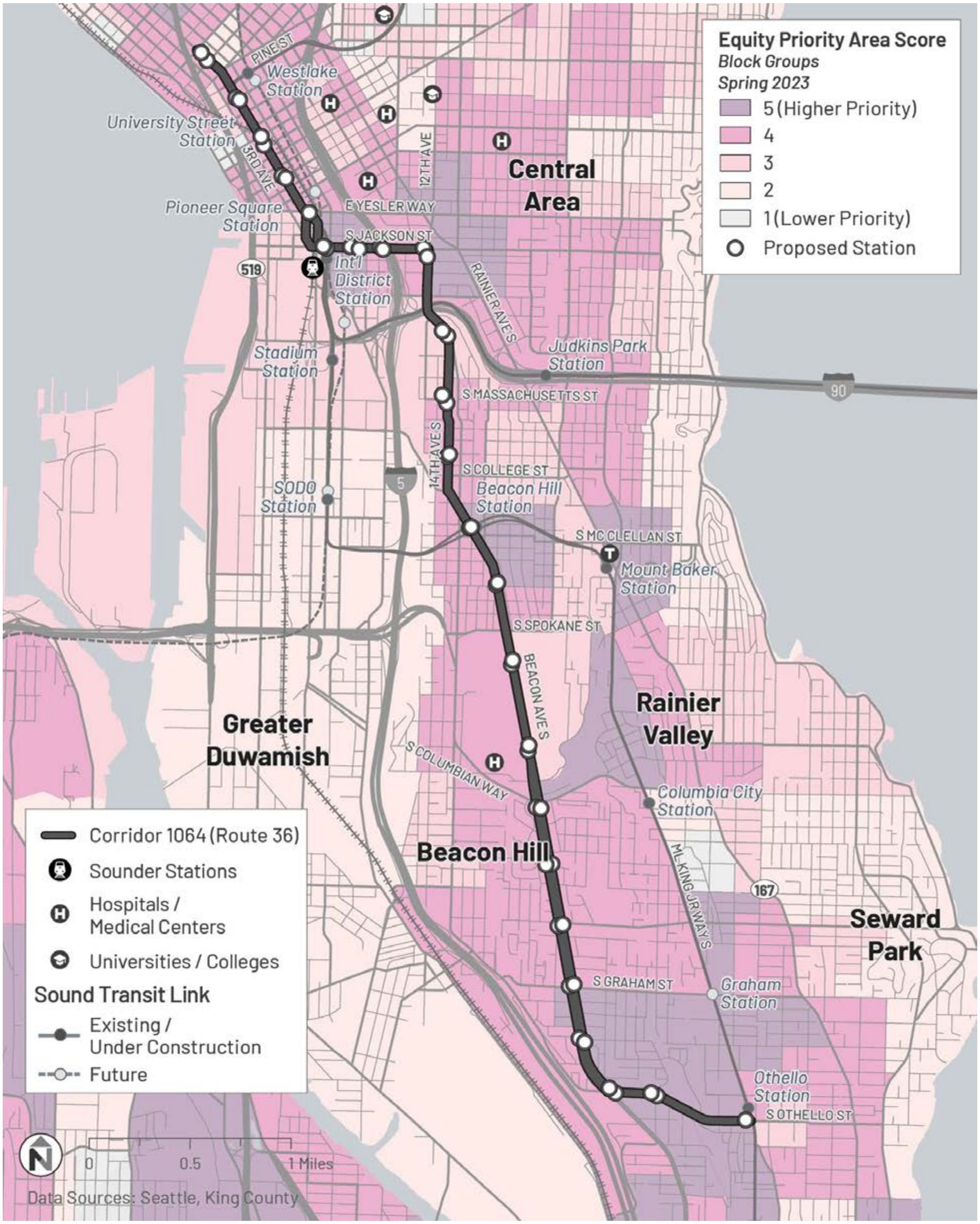
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[4] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 29 displays equity priority area scores for block groups located along Corridor 1064B. In the southern portion of the alignment, Corridor 1064B serves high equity priority areas in the Othello and South Beacon Hill neighborhoods of Seattle along Martin Luther King Jr Way S, S Othello Street/S Myrtle Street, and Beacon Avenue S. In Central and North Beacon Hill, Corridor 1064B serves high equity priority areas along Beacon Avenue S near S Columbian Way and the Beacon Hill Link light rail station. In the northern portion of the alignment, Corridor 1064B serves high equity priority areas in the Chinatown-International District neighborhood along 12th Avenue S, S Jackson Street, and 4th Avenue S.

[4] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 29 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 30 and Figure 31 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[5] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Corridor 1064B in Fall 2020, ridership retention was consistent with the regional average. By Spring 2023, however, change in ridership along the corridor was generally 10-20 points higher than the region, while the portion of the corridor north of S Jackson St was generally 10-20 points lower than the region.

[5] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 30 Ridership Retention (Fall 2020)

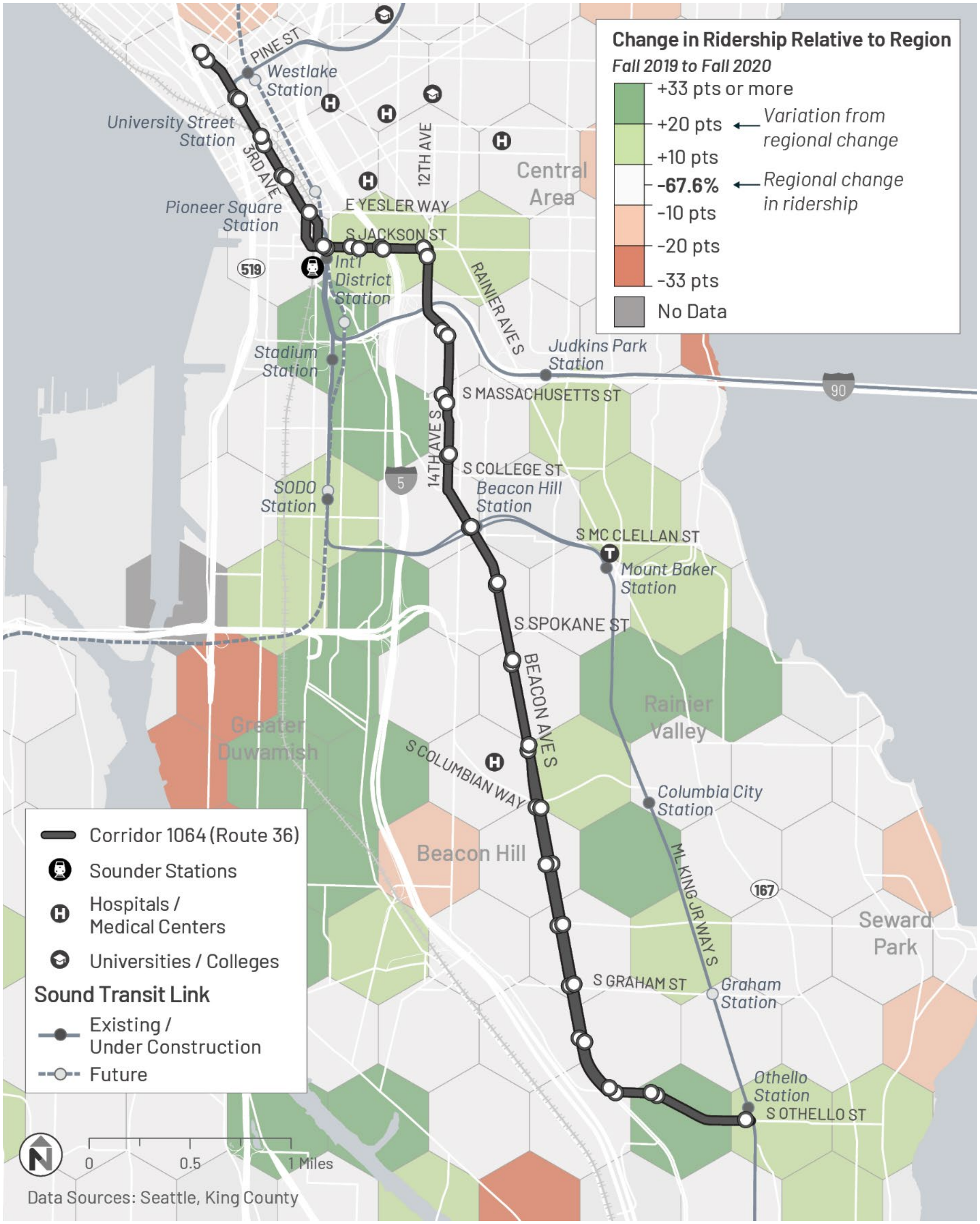
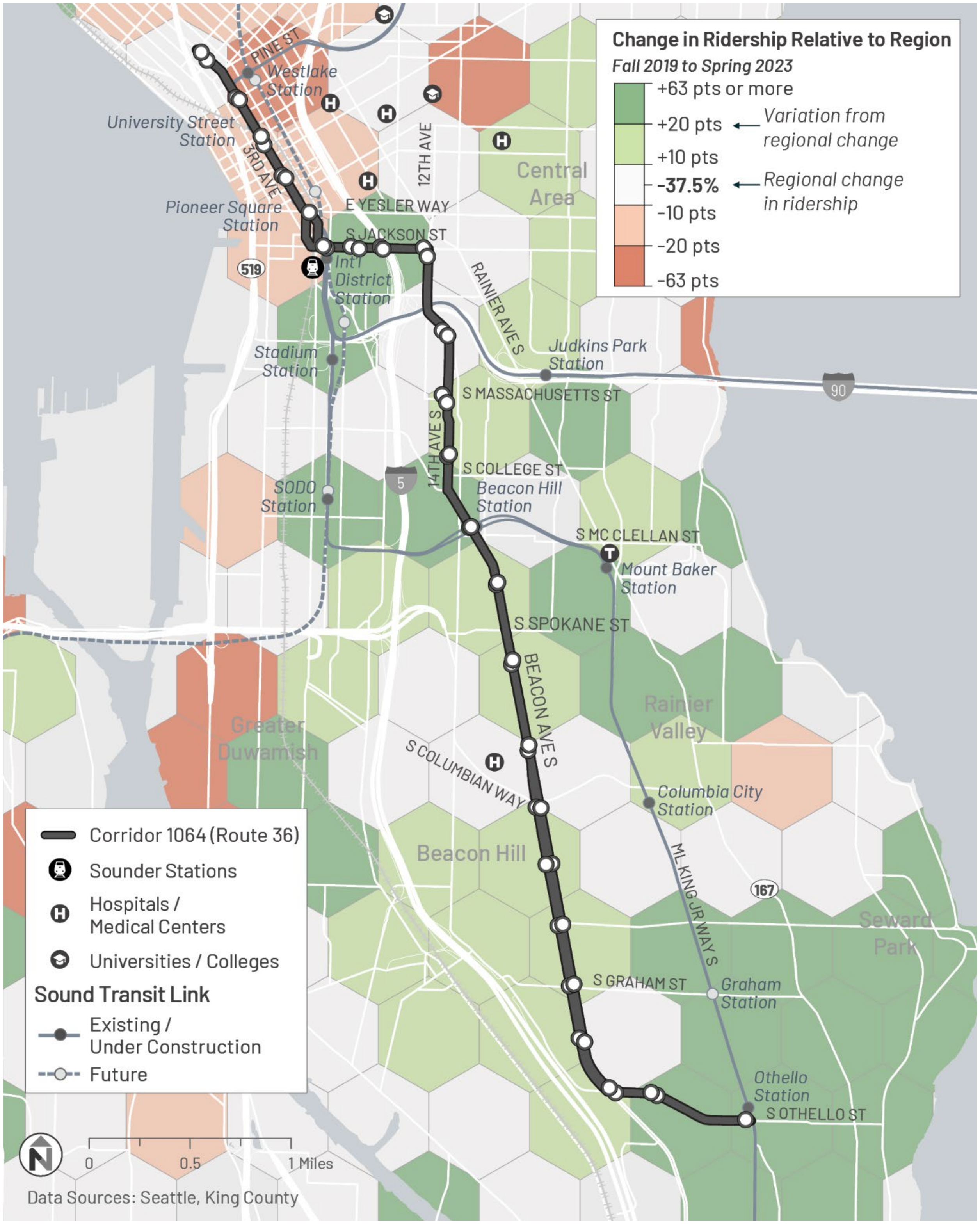


Figure 31 Ridership Retention (Spring 2023)



8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Corridor 1064B will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[6] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 19% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the second lowest increase in job access.

8.4 GHG Emissions

Ridership gains – and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 36 – will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[7] Approximately 0.55 metric tons of CO_2 would be reduced daily due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the third smallest reduction.

[6] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[7] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 39 intersections along Corridor 1064B to evaluate transit travel time benefits of the proposed improvements. Out of the 39 intersections, nine signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 30 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 32 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 32 Modeled Delay from Synchro

			Transit Delay (seconds)			Traffic Delay (seconds)		
ID	Intersection	Traffic Control	Existing	2035 Baseline	2035 Build	Existing	2035 Baseline	2035 Build
Southbound								
520	12th Ave S & S Jackson St	Signal	26.1	25.2	25.2	26.1	25.2	25.2
521	12th Ave S & S King St	Signal	10.5	14.7	4.7	10.5	14.7	14.7
522	12th Ave S & S Weller St	Signal	31.3	62.7	62.7	31.3	62.7	62.7
523	15th Ave S & Beacon Ave S	Signal	38.2	39.3	39.4	38.2	39.3	39.4
524	Beacon Ave S & S Hanford St	Signal	2.6	2.5	2.5	2.6	2.5	2.5
525	Beacon Ave S & S Spokane St	Signal	24.5	38.2	38.2	24.5	38.2	38.2
526	Beacon Ave S & S Columbian Way	Signal	34.0	23.9	21.6	34.0	23.9	58.1
527	Beacon Ave S & S Graham St	Signal	40.9	40.1	21.3	40.9	40.1	51.3
528	Beacon Ave S & S Myrtle St	Signal	65.5	51.5	26.6	65.5	51.5	26.6
Northbound								
520	12th Ave S & S Jackson St	Signal	33.7	11.0	16.9	33.7	11.0	16.9
521	12th Ave S & S King St	Signal	17.9	11.3	11.3	17.9	11.3	11.3
522	12th Ave S & S Weller St	Signal	8.7	9.4	9.4	8.7	9.4	9.4
523	15th Ave S & Beacon Ave S	Signal	12.0	13.9	9.8	12.0	13.9	9.8
524	Beacon Ave S & S Hanford St	Signal	2.7	2.7	2.7	2.7	2.7	2.7
525	Beacon Ave S & S Spokane St	Signal	33.0	45.0	45.0	33.0	45.0	45.0
526	Beacon Ave S & S Columbian Way	Signal	40.7	30.6	24.1	40.7	30.6	90.8
527	Beacon Ave S & S Graham St	Signal	36.3	44.1	28.0	36.3	44.1	47.2
528	Beacon Ave S & S Myrtle St	Signal	30.4	41.1	50.0	30.4	41.1	50.0

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 33 summarizes the number of crashes along the corridor by severity level and mode. There were 354 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 33% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 11% resulted in a fatality or serious injury.

Figure 33 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	0	0%	1	1%	0	0%	**1**	**<1%**
Serious Injury	9	4%	27	30%	4	16%	**40**	**11%**
Minor Injury	73	31%	25	27%	13	52%	**111**	**31%**
Possible Injury	156	66%	38	42%	8	32%	**202**	**57%**
Total	**238**	**100%**	**91**	**100%**	**25**	**100%**	**354**	**100%**

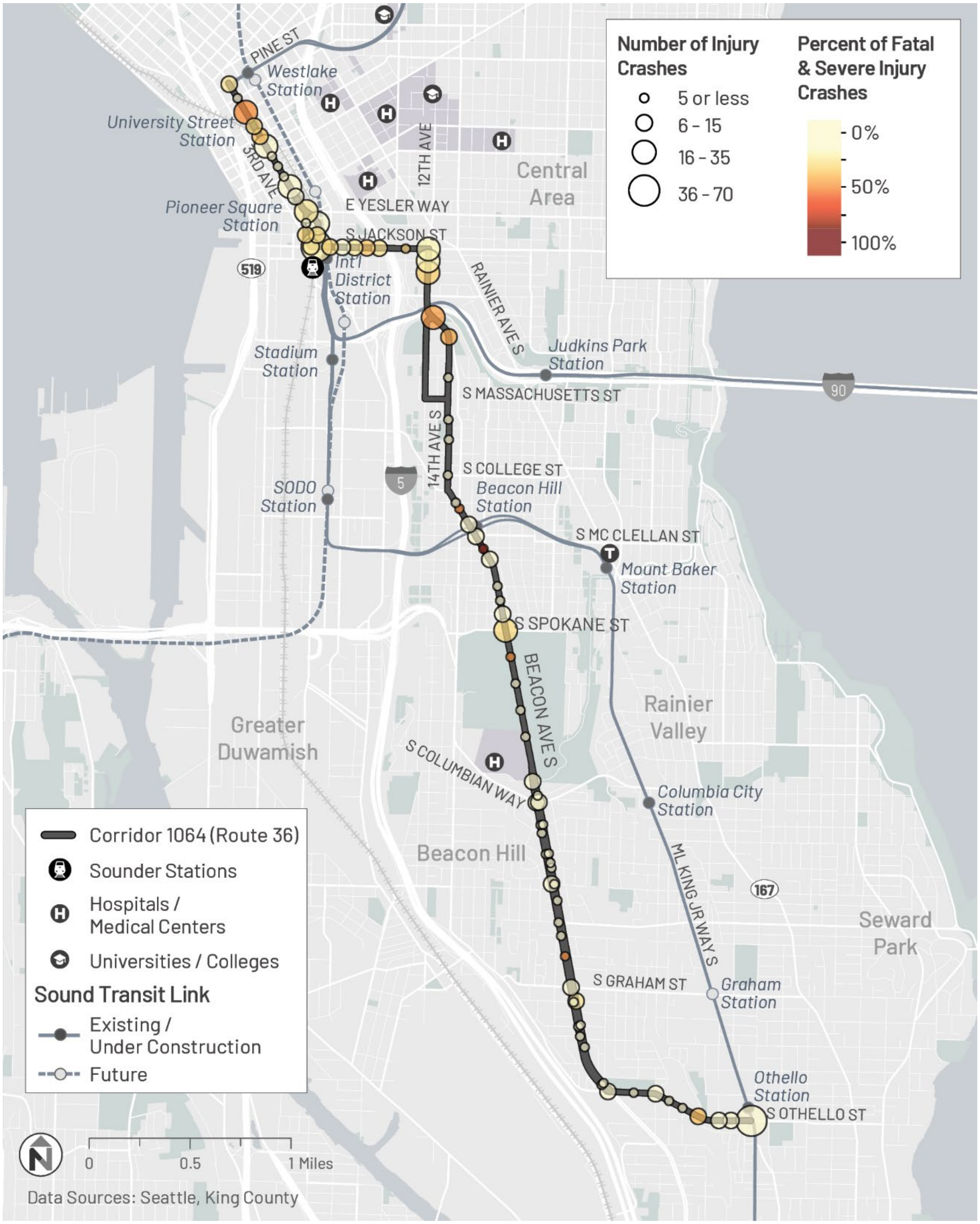
Source: WSDOT (2018-2022)

Figure 34 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest one-eighth-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Major intersections along 3rd Ave, near the Link Stations, between Pine St and S Jackson St
- Along S Jackson St between 3rd Ave and 12th Ave
- Along 12th Ave between S Jackson St and S Massachusetts St
- Major intersections along Beacon Ave S, including 15th Ave S, Spokane St, Columbian Way, and S Graham St
- Along S Myrtle St and S Othello St between Beacon Ave S and MLK Jr Way S

Figure 34 Crash Locations



King County METRO

11.0 Planned Improvements

Corridor 1064B serves Seattle. The project team identified planned projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36. Major projects include multiple bicycle facilities within the existing right-of-way from Beacon Hill Station to S Myrtle St.

Figure 35 Planned Jurisdictional Investments

King County METRO

Figure 36 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Priority Bus Corridor (Jefferson/ Yesler)	• Some bus stops have been consolidated and passenger facilities upgraded • The City of Seattle is investing heavily in improved midday service in the corridor • 3rd Avenue Transit Corridor Improvements will enhance the pedestrian environment at the intersection of this corridor with the 3rd Avenue Transit Spine • Pioneer Square Active Streets Strategy recommends a number of improvements for enhancing pedestrian safety, security and vibrancy of street life on the western end of this corridor; some strategies have been implemented Electrification of Yesler Way (2nd to 9th) and 9th (Yesler to Jefferson) to reduce turning movements off of Third Avenue and to avoid freeway-related congestion on James Street • Enhance pedestrian access, particularly around medical center and at key intersections • Provide in-lane bus stops • Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed • Add transit-only lanes or peak period parking restrictions in congested segments of the corridor, particularly where I-5 ramps create peak period traffic congestion • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
2	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
3	Seattle CBD - Sand Point - Green Lake	Construct a new RapidRide line connecting Seattle CBD - Sand Point - Green Lake. This project will improve the attractiveness of transit between two Regional Growth Centers and will include the following elements: New transit only or BAT lanes on existing or new right of way along some of the proposed route to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; Upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
4	Third Ave Transit Spine	This project was previously identified as the southern segment of Priority Bus Corridor 8 (T2040 ID:5095). The Third Ave Corridor is also an integral part of Priority Bus Corridor 7 (T2040 ID 5164); RapidRide Corridors 2, 3, 6, and 7 (T2040 ID: 5087, 5165, 5141, 5152); and RapidRide C, D, and E (T2040 ID: 5097, 5091, 4092). The project includes investments to increase capacity, optimize operations, and improve the traveler experience for transit in this corridor. The project reconfigures the corridor to increase transit capacity and improve operations, expanded transit stops, and installations to improve the traveler experience. The project incorporates ITS, wayfinding, traveler information systems, and electric trolley wire infrastructure. It also includes elements that support bus rapid transit such as dedicated running ways, transit signal priority features, and enhanced fare collection systems. Enhancements to improve access to transit may include pedestrian and bicycle access improvements and amenities such as secure and covered bike parking, digital kiosks, real-time information, lighting, and integrated access.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050, 2019-2024 Proposed Capital Improvement Program
5	RapidRide D Line Improvements	Previously named 'Seattle Priority Bus Corridor 10' (T2040 TD 5091). Enhance existing RapidRide D operations with capital components to support efficient and convenient transit service. Capital improvements may include additional speed and reliability measures such as those identified for new RapidRide corridors including dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements, supporting facilities. Extension of D Line to Northgate and safety improvements to the Ballard Bridge may also be included.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050
6	RapidRide E Line Improvements	Previously named \`Seattle Priority Bus Corridor 9\` (T2040 ID:4092). Enhance existing RapidRide E operations with capital components to support efficient, safe and convenient transit service including additional bus rapid transit investments. Capital improvements may include additional speed and reliability measures such as BAT lanes, roadway reconstruction, ITS and safety improvements and complementary pedestrian, bike and freight improvements.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
7	Priority Bus Corridor (Route 5)	• Proposed Transit Improvements include - TSP, Bus Bulbs, Stop consolidation, Station Upgrades • Investigate multiple termination options on north end • Identify funding to complete improvements outside of Seattle city limits • Consider queue jump options to provide transit priority on Fremont Bridge • Coordinate design of transit priority treatments with ongoing Bicycle Master Plan facility planning on Phinney Ave N	3rd Ave (Pine St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
8	RapidRide C Line Improvements	Previously named `Seattle Priority Bus Corridor 1` (T2040 ID: 5097). Enhance existing RapidRide C operations with capital components to support efficient and convenient transit service. Capital improvements may include additional bus rapid transit speed and reliability measures such as dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements and supporting facilities.	3rd Ave (Pine St - Columbia St)	Regional Transportation Plan 2022-2050
9	Westlake Multimodal Transportation Hub	Expand the multimodal hub area to accommodate increased transit service in Downtown and South Lake Union. Make improvements to improve transfer opportunities between transit and other modes, create clear routes and improved wayfinding, provide real-time transit rider information and maximize fare integration. Includes protected bike lane connections, enhanced street furniture, public art, enhanced pedestrian crossings, end-of-trip amenities like secure and covered bike parking, digital kiosks, integrated access amenities like passenger loading zones, dedicated car share stalls, and other multimodal connections. May include satellite access points.	3rd Ave (Pine St - Union St)	Regional Transportation Plan 2022-2050
10	Priority Bus Corridor (Pike/Pine - Center City)	• Pine Street BAT Lane between 3rd Avenue and 9th Avenue • The Pike/Pine Renaissance Plan provides streetscape design considerations for the western end of this corridor • SDOT is conducting a multimodal study for this corridor that will evaluate options for improving safety and mobility for all modes • Consider as early pilot corridor for off-board fare payment • Continue to implement access and transit priority treatments to avoid transit delay at congested intersections or corridor segments • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	3rd Ave at Pine St and Pike St	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
11	Pike Streetscape and Bicycle Improvement	Pike Streetscape and Bicycle Improvement	Pike St at 3rd Ave	dotMaps

ID	Improvement	Description	Extent	Source
12	Cycle track	Cycle track	Union St at 3rd Ave	Recommended Bicycle Network Map
13	Cycle track	Cycle track	Seneca St at 3rd Ave	Recommended Bicycle Network Map
14	Cycle track	Cycle track	Spring St at 3rd Ave	Recommended Bicycle Network Map
15	Rapid Ride G Line Projects	Spring St: EB bus only lane, EB protected bike lane, station at SW corner Madison St: WB bus only lane, station at NW corner	3rd Ave at Madison St and Spring St	Seattle Transit Master Plan, Capital Projects Dashboard, dotMaps, Current Projects, Regional Transportation Plan 2022-2050
16	Safety Improvements	Curb bulbs, bike lane shift / crossbike, some concrete panel replacement	Yesler Way at 3rd Ave	dotMaps
17	Third Avenue and Main Street Bus Stop Improvements	Improve King County Metro stop 515 (southbound Third Avenue and Main Street) facilities, e.g. passenger waiting area and amenities.	3rd Ave S at S Main St	dotMaps
18	Protected Bike Lanes	Upgrade the existing two-way bike lane on the Southwest side of 4th Ave to a protected bike lane with barrier separation. Barriers placed to not interfere with loading zones, driveways, and other areas which require street side access	4th Ave S (S Washington St - S Jackson St)	Current Projects, Recommended Bicycle Network Map, 2021-2024 BMP Implementation Plan, dotMaps
19	Neighborhood greenway	Neighborhood greenway	S Washington St at 4th Ave S	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
20	Kent Tukwila Seattle	Construct a new RapidRide line connecting Kent to Seattle via Tukwila. This project will include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speed; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops. This project will connect at least two Regional Growth Centers, Kent and Tukwila, along with other jobs and amenities in the Manufacturing Industrial Center of Kent and North Tukwila. It also increases access to other regional transit services including the Sounder station in Kent and Link Light Rail in Seattle.'	2nd Ave at S Main St / 4th Ave S at S Jackson St	Regional Transportation Plan 2022-2050
21	King County - 12th and Jackson Transit Hub	Construct new transit passenger and pedestrian facilities at all four bus stops at the intersection. Work includes new unique and high visibility bus shelters with weather protected seating, sidewalk widening and curb bulb-outs, traveler information and wayfinding signs including real-time passenger information, pedestrian scale lighting, pedestrian guardrails, ADA curb ramps, and enhanced electrical infrastructure.	12th Ave S/S Jackson St	2023-2026 PSRC Regional TIP, Washington State S.T.I.P
22	Central Seattle – 12th Ave King St to Yesler	Protected Bike Lane	12th Ave S (S Jackson St - S King St)	2021-2024 BMP Implementation Plan
23	Vision Zero Improvements	Implementation of Vision Zero 12th Ave project for spot improvements and possible rechannelization along 12th Ave E/12th Ave/ 12th Ave S corridor.	12th Ave S (S Jackson St - S Weller St)	dotMaps

ID	Improvement	Description	Extent	Source
24	Priority Bus Corridor (Route 36/49)	• Proposed Transit Improvements include - TSP, Electrification on 12th Ave, Bus Bulbs, Station Upgrades • Evaluate turnaround and layover options at north and south ends of the corridor • Creation of new transit street on 12th Ave including electrification, TSP, and bus bulbs • Electrification needed on NE 11th/Roosevelt N. of Campus Parkway • Work with Sound Transit to ensure safe, attractive, and convenient connections at the 4 Link stations served by this corridor	12th Ave S (S Jackson St - S Charles St) / Golf Dr S (S Charles St - 14th Ave S) / 14th Ave S (Golf Dr S - Beacon Ave S) / 12th Ave S (Golf Dr S - S Massachusetts St) / S Massachusetts St (12th Ave S - 14th Ave S) / Beacon Ave S (14th Ave S - S Myrtle St) / S Myrtle St (Beacon Ave S - 32nd Ave S) / S Myrtle Pl (32nd Ave S - Holly Park Dr S) / S Othello St (Holly Park Dr S - Martin Luther King Jr Way S) / 38th Ave S (S Myrtle St - S Othello St) / S Myrtle St (38th Ave S - Martin Luther King Jr Way S) / Martin Luther King Jr Way S (S Myrtle St - S Othello St)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
25	Mountains to Sound Trail over I-5	A crossing of I-5 at the north end of Beacon Hill, near Dr. Jose Rizal Park and the International District, to provide a more direct connection to downtown Seattle for those coming off the I-90 Trail.	West side of Dr. Jose Rizal Park - intersection of Airport Way S and S Royal Brougham Way	Bicycle Master Plan
26	Beacon Ave S & 15th Ave S Safety Project	Project will construct a protected bike lane along Beacon Ave S between S Spokane St and 15th Ave S, on 15th Ave S. between Beacon Ave S and 14th Ave S, and on Golf Dr S between 15th Ave S and S Charles St. Scope elements include curb and gutter, sidewalk, curb ramps, storm drainage improvements, concrete and asphalt paving, tree pits, signal modifications and pavement markings.	Golf Dr S (S Charles St - 14th Ave S) / Beacon Ave S (15th Ave S - S Spokane St)	Current Projects, dotMaps, 2021-2024 BMP Implementation Plan, 2023-2026 PSRC Regional TIP

ID	Improvement	Description	Extent	Source
27	Cycle track	Cycle track	S Massachusetts St (12th Ave S - 13th Ave S) / 12th Ave S (Golf Dr S - S Massachusetts St)	Recommended Bicycle Network Map
28	SRTS (Beacon Hill ES)	Neighborhood greenway	13th Ave S at S Massachusetts St	Recommended Bicycle Network Map, 2021-2024 BMP Implementation Plan
29	Neighborhood greenway	Neighborhood greenway	S Hill St at 14th Ave S	Recommended Bicycle Network Map
30	Neighborhood greenway	Neighborhood greenway	S College St at 14th Ave S	Recommended Bicycle Network Map
31	Neighborhood greenway	Neighborhood greenway	14th Ave S at Beacon Ave S	Recommended Bicycle Network Map
32	Off-street facility	Off-street facility	Beacon Ave S at 14th Ave S	Recommended Bicycle Network Map
33	Road Repaving	HMA Mill & Overlay	Beacon Ave (14th Ave S to 15th Ave S)	dotMaps
34	Neighborhood greenway	Neighborhood greenway	S Forest St at Beacon Ave S	Recommended Bicycle Network Map
35	Beacon Hill Healthy Street	Marked crosswalks; New Curbside push buttons for crossings; ADA Ramps; New concrete curb bulbs with Healthy Street signage. As part of the Beacon Hill Ave S and 15th Ave S Safety project, the intersection will also include: New floating bust stops on the east and west side of Beacon Ave S; Remove median islands and install c-curbs for the new protect bike lanes.	Beacon Ave S/S Hanford St	Current Projects
36	In-street facility with minor separation	In-street facility with minor separation	S Spokane St at Beacon Ave S	Recommended Bicycle Network Map
37	Cycle track	Cycle track	Beacon Ave S (S Spokane St - S Alaska St)	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
38	Neighborhood greenway	Neighborhood greenway	S Alaska St at Beacon Ave S	Recommended Bicycle Network Map
39	Neighborhood greenway	Neighborhood greenway	S Dawson St at Beacon Ave S	Recommended Bicycle Network Map
40	Speed Cushions	Installation of speed cushions, daylight improvements, and candy cane backing to stop signs	S Orcas St at Beacon Ave S	dotMaps
41	Neighborhood greenway	Neighborhood greenway	S Morgan St at Beacon Ave S	Recommended Bicycle Network Map
42	Off-street facility	Off-street facility	Beacon Ave S (S Alaska St - S Myrtle St)	Recommended Bicycle Network Map, dotMaps
43	Speed Humps	Installation of speed humps	32nd Ave S at S Myrtle St	dotMaps
44	Neighborhood Greenway	New Holly Home Zone Neighborhood Greenway South	Holly Park Dr S at S Myrtle Pl	dotMaps
45	Neighborhood greenway	Neighborhood greenway	S Myrtle St (38th Ave S - Martin Luther King Jr Way S)	Recommended Bicycle Network Map
46	Cycle track	Cycle track	Martin Luther King Jr Way S (S Myrtle St - S Othello St)	Recommended Bicycle Network Map

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to Corridor 1064B. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[8] (not included in Route 36)
- Trolley Infrastructure

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 14. For transit speed and reliability improvements, refer to Figure 21. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 37.

[8] For non-trolley routes only.

Figure 37 Order-of-Magnitude Project Costs

	Category	% of Total		Costs
	Stops and Stations	68%	$	8,040,000
	Transit Speed and Reliability Improvements	24%	$	2,880,000
	Layover and Terminus Facilities	5%	$	600,000
	Charging Infrastructure	-		-
	Trolley Infrastructure	3%	$	370,000
	Construction Base Subtotal		***$***	***11,890,000***
2%	Stormwater Upgrades		$	240,000
3%	Traffic Control		$	360,000
10%	Mobilization		$	1,190,000
2%	TESC		$	240,000
	Subtotal Construction Cost		***$***	***13,920,000***
10.1%	Sales Tax		$	1,410,000
10%	Construction Contingency		$	1,540,000
40%	Contingency (Design Allowance and Risk)		$	6,750,000
	Total Construction Cost		***$***	***23,620,000***
10%	Project Management		$	2,370,000
5%	Planning		$	1,190,000
15%	Engineering/Design		$	3,550,000
10%	Construction Management		$	2,370,000
3%	Environmental Review		$	710,000
2%	Permitting		$	480,000
	Total Project Cost		***$***	***34,290,000***

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Corridor 1064B. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right of way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – While the route crosses several designated view corridors in downtown Seattle, the improvements associated with Route 36 will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Route 36 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – Route 36 does not traverse over or alter any navigable waterways.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Acquisitions and Displacements – At present, there are no identified requirements for permanent easements or property acquisitions along Route 36.
- Floodplains - Improvements associated with the project are not anticipated to occur within any Federal Emergency Management Agency (FEMA) floodplains.
- Air Quality - The project is expected to contribute to long-term improvements in air quality. Temporary impacts will be minimized through standard BMPs for air quality and no adverse effects are anticipated.

- Wetlands – There are no known wetlands in the vicinity of the project.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources.

13.3a Cultural Resources

In order to comprehensively identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The Route 36 corridor passes through a number of historic districts, notably Pioneer Square--Skid Road Historic District, Seattle Chinatown Historic District, the U.S. Marine Hospital, and the International Special Review District. Adjacent to the corridor are properties listed in both the National Register of Historic Places and the Washington National Heritage Register, including significant sites such as Bon Marche Department Store, United Shopping Tower, Northern Life Tower, First Seattle Public School Site, Arctic Building, Rector Hotel, Lyon Building, Battle of Seattle Site, New Richmond Hotel, and Union Station. Additionally, Route 36 passes over the 12th Avenue South Bridge.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located in Downtown Seattle. A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation during the formal environmental review process will address potential moderate or high-risk sites, depending on the chosen station locations and potential construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could implemented prior to construction activities. Any contaminated soils encountered would be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 36 corridor and the corridor is almost entirely within a Design Review Equity Area. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

A comprehensive traffic operational analysis was conducted to evaluate the transit travel time benefits of proposed improvements at 39 intersections along Route 36. The analysis revealed that at seven locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at two locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

The removal of parking for conversion to a bus or BAT lane along the corridor would have a potential adverse effect; however, the areas where parking is proposed to be removed appear to have sufficient alternative parking within the adjacent neighborhoods. The removal of parking spaces will be evaluated in a transportation technical report, including a parking study.

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the projects' aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 36 can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared, to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The FTA Transit Noise and Vibration Impact Assessment Manual (FTA 2018) notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads.

BMPs for noise and vibration will be developed before construction and may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological/Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces. This is the case even for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required. Alternatively, if runoff is sufficiently treated or no new PGIS is created or replaced, the FTA's ESA checklist will confirm no effects, and a No Effects letter will be submitted as part of the NEPA documentation.

Mitigation measures may include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process. Route adjustments to minimize impacts on critical wildlife habitats may be introduced as necessary. In addition, establishing vegetated buffer zones along the BRT corridor may minimize direct impacts on sensitive habitats. Implementing seasonal construction restrictions during critical periods, such as breeding seasons, may be introduced to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 36 corridor reveal known critical areas susceptible to landslides, liquefaction, and peat settlement. The route passes through a potential landside area on 12th Ave S briefly where it crosses over I-90. Liquefaction prone areas are present on Beacon Avenue S from S Stevens Street until Jefferson Park and on S Myrtle Street from the Van Asselt Playground until the intersection with ML King Jr Way S. A peat settlement prone area occurs between Yesler Way and S Jackson Street, as well as small portion of S Myrtle Place at Van Asselt Playground.

The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations. The identified landslide, liquefaction, and peat settlement areas will be considered for their potential to impact the project during design.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces, and it is situated within two different stormwater basins. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures may encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP) or TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.4 Cumulative and Indirect Impacts

Route 36 serves the city of Seattle. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. Planned projects are described in Figure 36, List of Planned Jurisdictional Investments.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of "facility modernization" that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Air Quality Technical Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation

- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit

RapidRide Prioritization Plan

Corridor 1993 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

King County METRO

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Corridor 1993 | Route 40

CORRIDOR SUMMARY

Ridership

No Build

+34%

RapidRide Corridor 1993

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour

+10.5

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour

34.4

Weekday boardings per revenue hour with RapidRide investment in 2042.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Travel Time

Proposed Travel Time Savings

-20%

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time

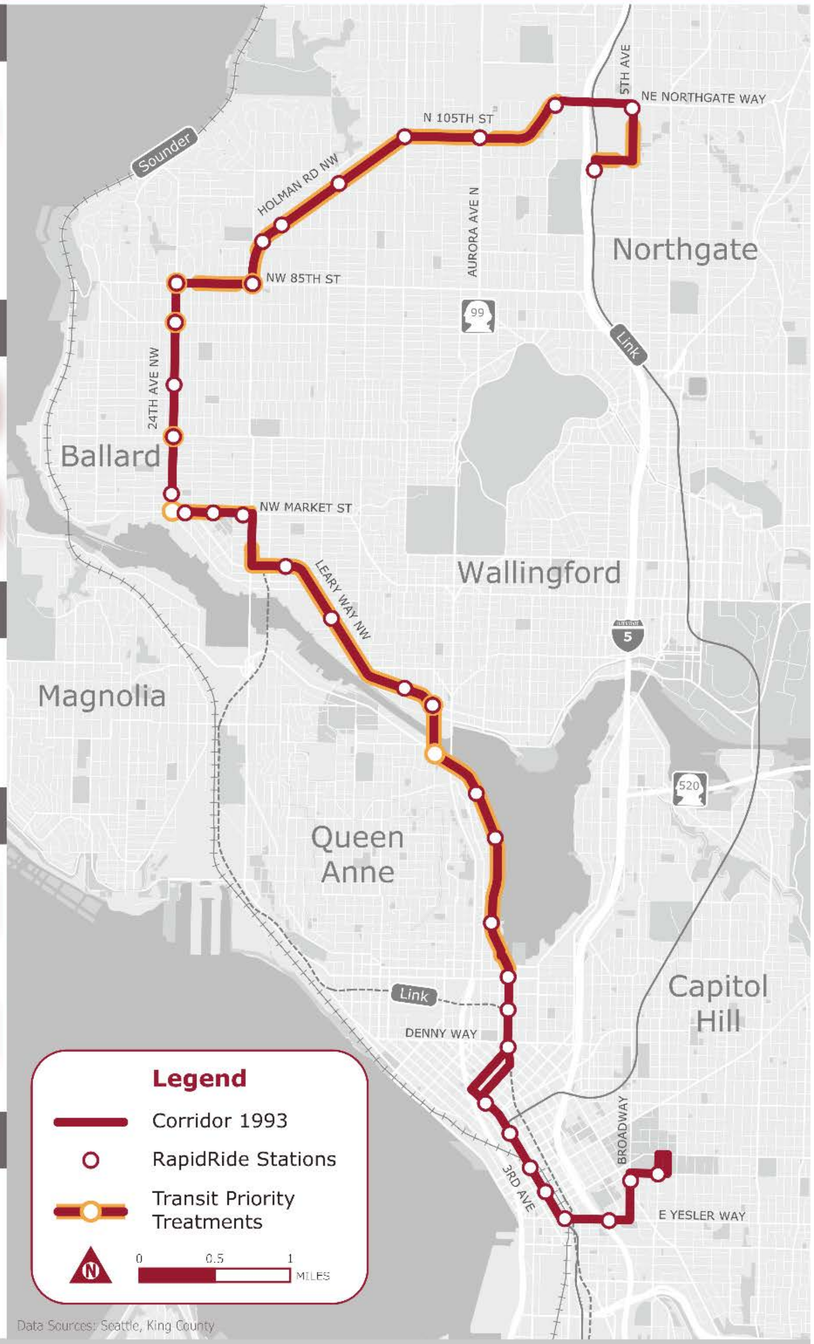
70

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Equity Priority Area Score

2.8

Average area of need score within 1/2 mile of station locations.



Data Sources: Seattle, King County

RAPIDRIDE

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine the corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1993 (Route 40). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1993 is currently served by Route 40, which connects Pioneer Square via Downtown, South Lake Union, Fremont, Ballard, Crown Hill, and North Seattle College to Northgate Station. Route 40 connects many residential areas and their community centers in the north with the city's primary employment and commercial areas in the south.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would extend the southern terminus from 3rd Ave and Yesler via E Yesler Wy and 12th Ave, to 12th Ave and E James Way in First Hill. In Northgate, the recommended alignment would access Northgate Station via NE Northgate Way and bypass North Seatle College.

This project conducted a high-level review of the Metro Connects 2050 alignment compared to the existing and Metro Connects Interim routes. However, given potential impacts to current riders, as well as the potential opportunity to deploy operating cost savings for additional service on the corridor (or elsewhere), additional analysis will be needed in the future to understand the Metro Connects alignment. The final alignment included a change in Ballard to ensure connectivity with the future Link station at NW Market St and 15th Ave NW, as well as an alignment along Broadway and E Jefferson St in First Hill rather than 12th Ave.

2.2 Representative Alignment

The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. No further changes were made to the alignment during the analysis phase.

Figure 2 highlights all the differences in the final representative alignment relative to the existing Route 40, and the Metro Connects interim alignment. The representative alignment is shown in Figure 3.

Figure 2 Final Alignment Changes

Alignment Change	Change from… Route 40	Change from… Metro Connects	Change from… Screening
Extend southern terminus from Pioneer Square to First Hill via Yesler Way, Broadway and E Jefferson St	✓	✓	✗
Adjust alignment in Ballard to serve NW Market St & 15th Ave NW, with no service on NW Leary Way between NW Market and 15th Ave NW.	✓	✓	✗
Adjust alignment in Licton Springs and Northgate to serve NE Northgate Way and 5th Ave NE east of Meridian Ave, with no service to North Seattle College along Meridian Ave N, College Way N or N 92nd St.	✓	✓	✗

Figure 3 Corridor Overview

King County
METRO

3.0 Transit Network

Route 40 currently provides frequent bus service between the Chinatown-International District and Northgate neighborhoods of Seattle. Corridor 1993 largely follows the existing Route 40, with an extension to the east into the Central District that overlaps with multiple routes, as well as the Seattle Streetcar. In Downtown Seattle, Corridor 1993 traverses the 3rd Avenue transit spine, connecting to Link light rail service at four stations, Sounder commuter rail service at King Street Station, and additional local and regional bus service. Corridor 1993 connects with Seattle Streetcar service in the Chinatown-International District.

North of Downtown Seattle, Corridor 1993 connects to RapidRide C Line service in the South Lake Union neighborhood of Seattle, RapidRide D Line service in the Ballard and Crown Hill neighborhoods, and RapidRide E Line service in the Greenwood neighborhood. At the route's northern terminus, Corridor 1993 connects to Link light rail service at Northgate Station. In addition to the Downtown Seattle and Northgate transit hubs, Corridor 1993 connects to local and regional bus service at many points along its alignment.

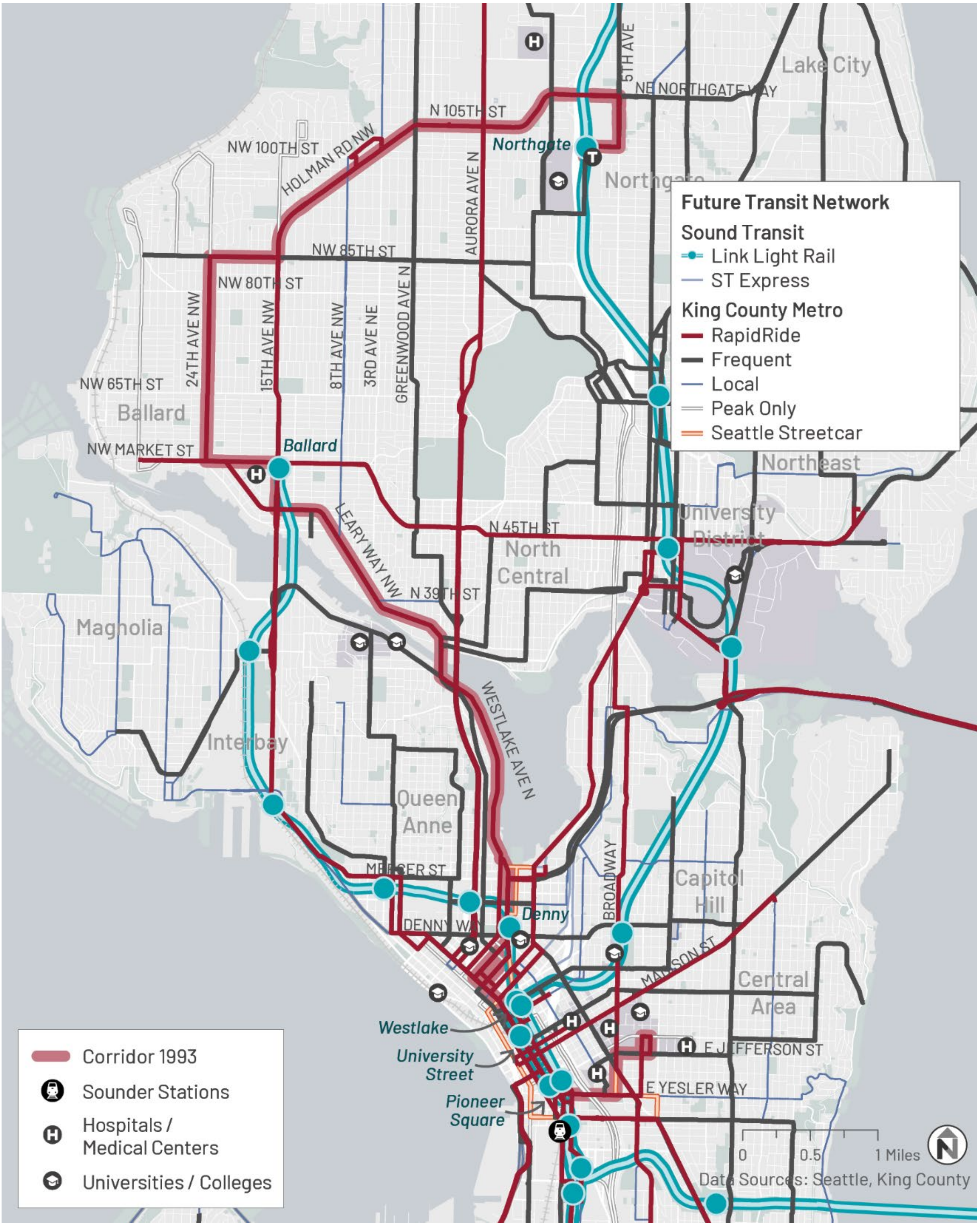
3.1 Future Network Changes

The Metro Connects Interim Network assumes Corridor 1993 connections to new RapidRide service in the Central District, Downtown, South Lake Union, and Ballard neighborhoods of Seattle. New Link light rail connections would be provided within Downtown Seattle, South Lake Union, and Ballard. Downtown Seattle and Northgate would continue to act as transit hubs, with Corridor 1993 continuing to connect with additional local and regional bus service at many points along its alignment.

Figure 4 Existing Transit Network

King County METRO

Figure 5 Metro Connects Interim Network



King County METRO

4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained.

4.2 Existing Service Levels

Route 40 currently operates frequent service for most of the day, every day. It operates every 15 minutes or better from 6 am to 11 pm on Weekdays, and 15 minutes from 7 am to 7 pm on Saturdays and Sundays. During Weekday peak hours, Route 40 runs every 10 to 12 minutes.

Figure 6 Existing Route 40 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td colspan="2">60</td><td>15</td><td colspan="2">10</td><td colspan="7">15</td><td>12</td><td colspan="3">10</td><td colspan="3">15</td><td>20</td><td>30</td><td colspan="3">60</td></tr>
<tr><td>Saturday</td><td></td><td>60</td><td>20</td><td colspan="12">15</td><td>20</td><td colspan="5">30</td><td colspan="3">60</td></tr>
<tr><td>Sunday</td><td></td><td>60</td><td>20</td><td colspan="12">15</td><td>20</td><td colspan="5">30</td><td colspan="3">60</td></tr>
</table>

Source: King County Metro GTFS May 2023

King County METRO

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency and span on Weekdays, Metro would need to increase Route 40 frequency during the morning and afternoon peak periods for Weekdays, and during mornings for Saturdays and Sundays. Between 6 am and 7 am, and between 3 pm and 5 pm, Route 40 operates every 12 to 15 minutes today while the minimum standard is every 10 minutes for Weekday peak periods. This would require at least two additional trips per hour from 6 to 7 am and 3 to 4 pm, and one additional trip per hour from 4 to 5 pm. On Saturdays and Sundays, one additional trip per hour would be needed from 6 to 7 am to ensure 15-minute service for Weekend standards.

Figure 7 shows the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 8 shows the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 7 Additional Trips to Meet Minimum RapidRide Standards

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	2	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 8 Changes to Frequency and Span to Meet Minimum Standard

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60		10	10					15			10			10			15		20	30		60	
Saturday		60	15							15						20			30				60	
Sunday		60	15							15						20			30				60	

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a roundtrip will take 139 minutes during the PM peak and 114 minutes during off-peak hours. Although frequency would increase, the service hours needed to operate Corridor 1993 would decrease because of the travel time savings. Metro could save approximately 18 service hours each weekday (or a 7% decrease), save 20 hours on Saturdays, and 20 hours on Sundays.

Figure 9 summarizes the changes needed between existing service and future service assuming build conditions. King County Metro would save two buses on weekdays (17 buses, relative to the existing 19 buses needed on weekdays). One fewer vehicle would be needed on Saturdays and Sundays (10 buses, relative to the existing 11 buses). These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 9 Change in Future Service Levels

Service Day	Existing	Build 2035	Change	Percent
Daily Service Hours				
Weekday	268	250	-18	-7%
Saturday	194	174	-20	-10%
Sunday	194	174	-20	-10%
Daily One-Way Trips				
Weekday	178	188	+10	+6%
Saturday	131	138	+7	+5%
Sunday	131	138	+7	+5%
Fleet				
Weekday	19	17	-2	-11%
Saturday	11	10	-1	-9%
Sunday	11	10	-1	-9%

Source: King County Metro GTFS May 2023 and Synchro modeling.

4.5 Layover and Terminus Facilities

During peak hours, assuming the proposed frequency of 10-minute headways (or six buses per hour), the corridor would require at least two layover spaces at each end.[1]

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a First Hill

The terminus in First Hill would be on surface streets. The only routes that terminate in this vicinity are Routes 193, 302 and 303 on Jefferson St at 17th Ave, and Route 322 on 12th Avenue at Alder Street. Each of these routes provide peak service only. Route 302 is planned for elimination with the Lynnwood Link restructure, and Route 322 could shift to its location if needed. Therefore, the Route 40 RapidRide should not require a new all-day layover location as it can take the layover on 12th Avenue at Alder Street.

4.5b Northgate Station

Northgate Station is an off-street transit center owned by King County Metro. It provides 15 layover spaces among many routes. During the busiest times of day, 14 layover spaces are

[1] A one-way travel time of approximately 70 minutes requires a layover of 14 minutes (20% layover). With buses every 10 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

usually in use. A continued peak need of 14 spaces is also assumed for the Lynnwood Link restructure. In the Lynnwood Link assumptions, three spaces are allocated for Route 40.

The station provides restrooms for operators. Although no charging infrastructure exists today, it could be retrofitted to include bus charging.

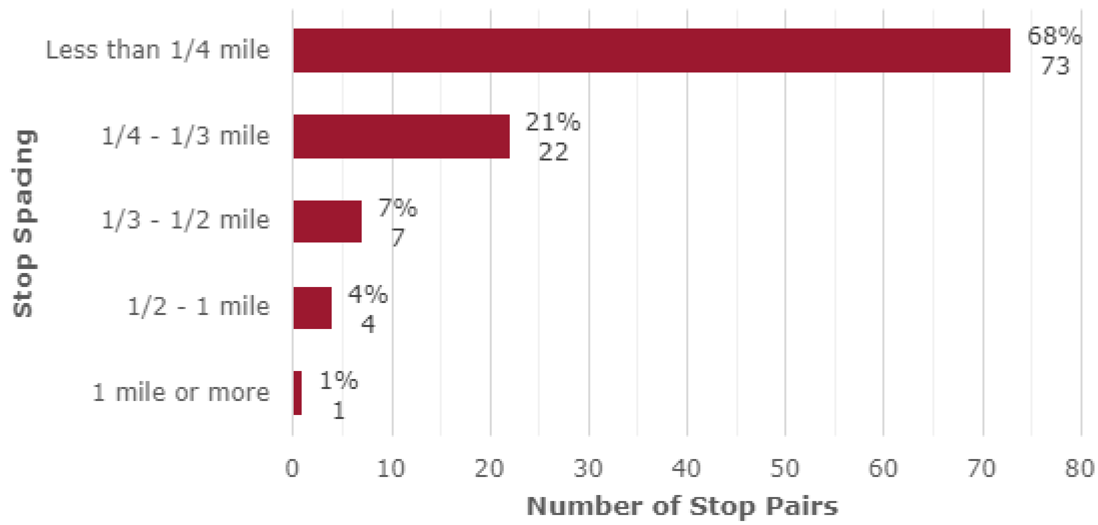
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,300 feet (or almost one-fourth mile).

Approximately 70% of stop pairs along the corridor are less than a quarter mile apart, and with an additional 22% between a quarter and third of a mile (Figure 10).

Figure 10 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the

locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 11. The average spacing would be 2,030 feet, or approximately one-third mile, which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 11 Proposed Station Locations

5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 12, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 65.

Figure 12 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 35), each station is categorized into one of the four potential station typologies. Station locations in downtown Seattle along 3rd Avenue are assumed to not require any new amenities because of the existing stations there. The typologies are listed in Figure 13 and summarized in Figure 13.

Figure 13 Station Boardings and Typology

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
1	Northgate Station	1,310	-	Large Raised	-
2	NE Northgate Way & 5th Ave NE	110	70	Medium	Medium
3	N Northgate Way & Meridian Ave N	90	210	Medium	Large
4	N 105th St & Aurora Ave N	180	170	Large	Large
5	N 105th St & Greenwood Ave N	170	160	Large	Large
6	Holman Rd NW & 7th Ave NW	50	80	Medium	Medium
7	Holman Rd NW & 13th Ave NW	20	70	Small	Medium
8	Holman Rd NW & Mary Ave NW	30	70	Medium	Medium

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
9	NW 85th St & 15th Ave NW	40	100	Small	Large
10	24th Ave NW & NW 85th St	40	70	Small	Medium
11	24th Ave NW & NW 80th St	120	80	Medium	Medium
12	24th Ave NW & NW 73rd St	120	40	Medium	Small
13	24th Ave NW & NW 65th St	150	60	Large	Medium
14	24th Ave NW & NW 57th St	170	70	Large	Medium
15	NW Market St & Ballard Ave NW	220	150	Large	Large
16	NW Market St & 20th Ave NW	140	100	Medium	Medium
17	NW Market St & 15th Ave NW	380	940	Large Raised	Large Raised
18	NW Leary Way & 11th Ave NW	70	60	Medium	Medium
19	Leary Way NW & NW 43rd St	150	70	Large	Medium
20	N 36th St & Phinney Ave N	140	60	Medium	Medium
21	Fremont Ave N & N 34th St	190	100	Large	Medium
22	Westlake Ave N and Halladay St	30	20	Small	Small
23	Westlake Ave N & Crockett St	40	10	Small	Small
24	Westlake Ave N & Highland Dr	90	40	Medium	Small
25	Westlake Ave N & Mercer St	70	120	Large	Medium
26	Westlake Ave N & Harrison St	80	80	Large	Medium
27	Westlake Ave & 9th Ave	60	70	Large	Large
28	3rd Ave & Virginia St	80	80	Existing	Existing
29	3rd Ave & Pike St	70	120	Existing	Existing
30	3rd Ave & Seneca St	60	40	Existing	Existing
31	3rd Ave & Columbia St	130	50	Existing	Existing
32	Yesler Way & 3rd Ave	40	30	Small	Small
33	Yesler Way & 8th Ave S	10	30	Small	Small
34	Broadway & E Terrace St	10	70	Small	Medium
35	Jefferson St & 12th Ave	-	70	Small	Medium

Figure 14 Station Typology Summary

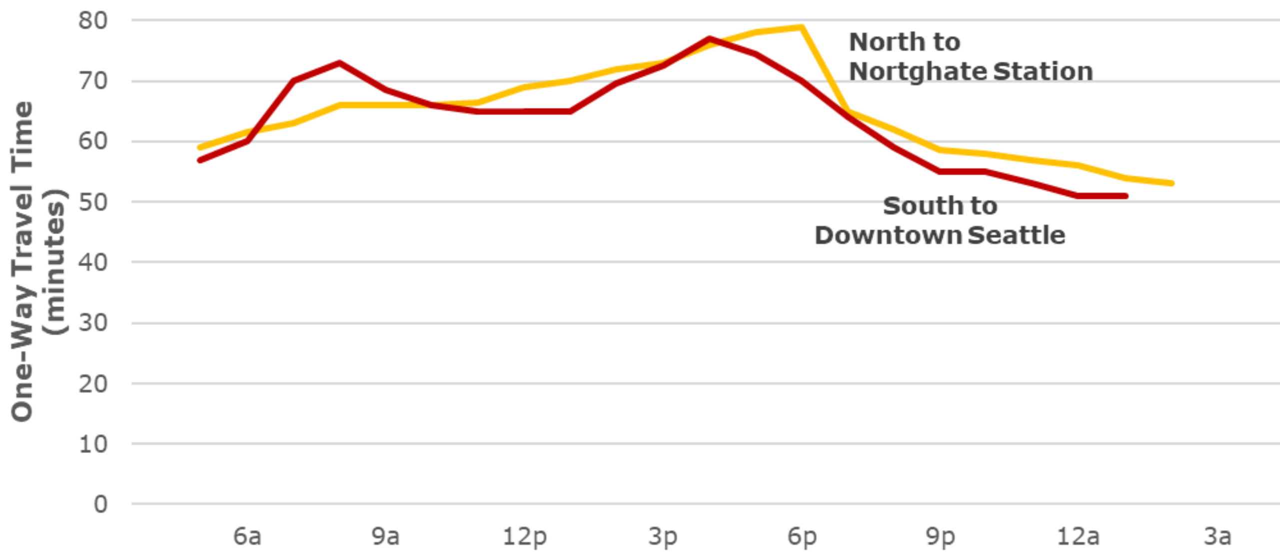
Station Type	Count	Percent
Large Raised Station	3	5%
Large Station	16	26%
Medium Station	27	44%
Small Station	15	25%
Total	**61**	**100%**

6.0 Speed & Reliability

6.1 Existing Travel Time

End-to-end scheduled travel times per direction for Route 40 in May 2023 ranged between 51 minutes (late evening) to 80 minutes (during the PM peak). On average a one-way trip took 64 minutes.

Figure 15 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

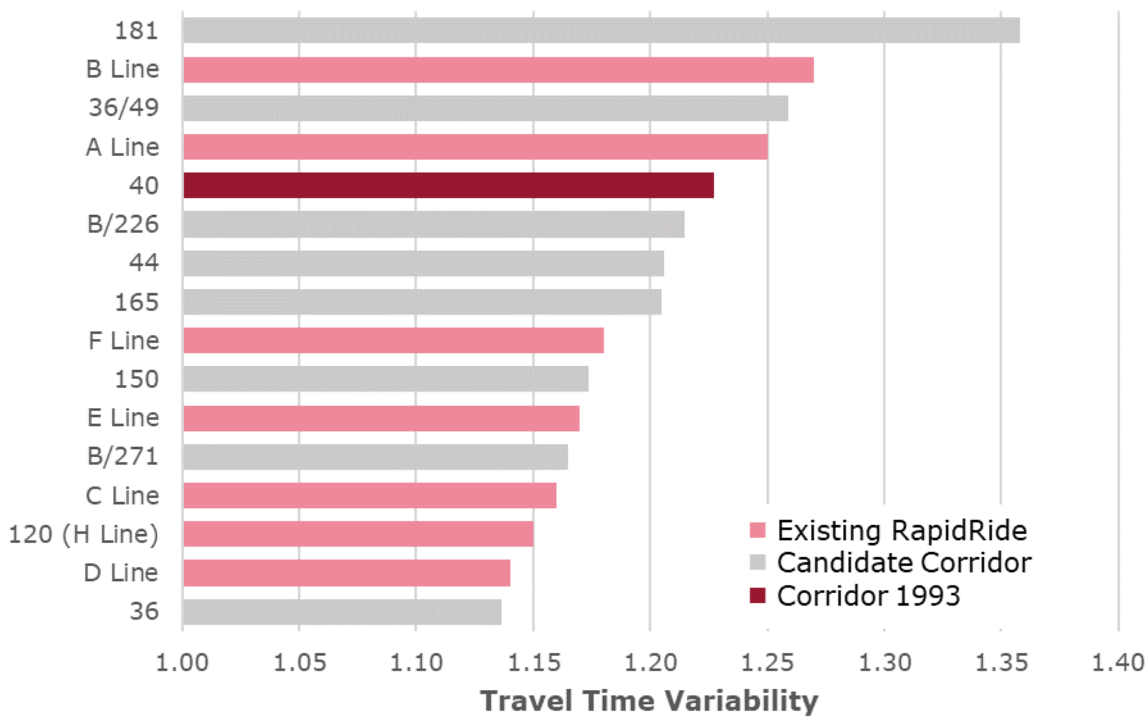
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 1993 experiences delay of almost 27 minutes between the 20th and 80th percentile travel time. This is approximately 1.17 minutes (70 seconds) of trip delay per mile on an average trip. This is the second highest delay of all nine candidate corridors.

Northbound trips at 4 PM and southbound trips at 5 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.12 to 1.23. This indicates the longest travel times (slowest trips) take 12-23% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1993's performance is marginally poor. This comparison is shown in Figure 16.

Figure 16 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 17.

Figure 17 Speed & Reliability Summary

Metric	Value
On-time performance[A]	67%
Average speed	15.1 mph
Average trip delay[B]	26.7 min
Average trip delay per mile	70 sec
Lowest median hourly travel time (Reference) [C]	42 min
Highest median hourly travel time	50 min[D]
Travel time variability[E]	1.23

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 6 PM for northbound trips, from Fall 2021.

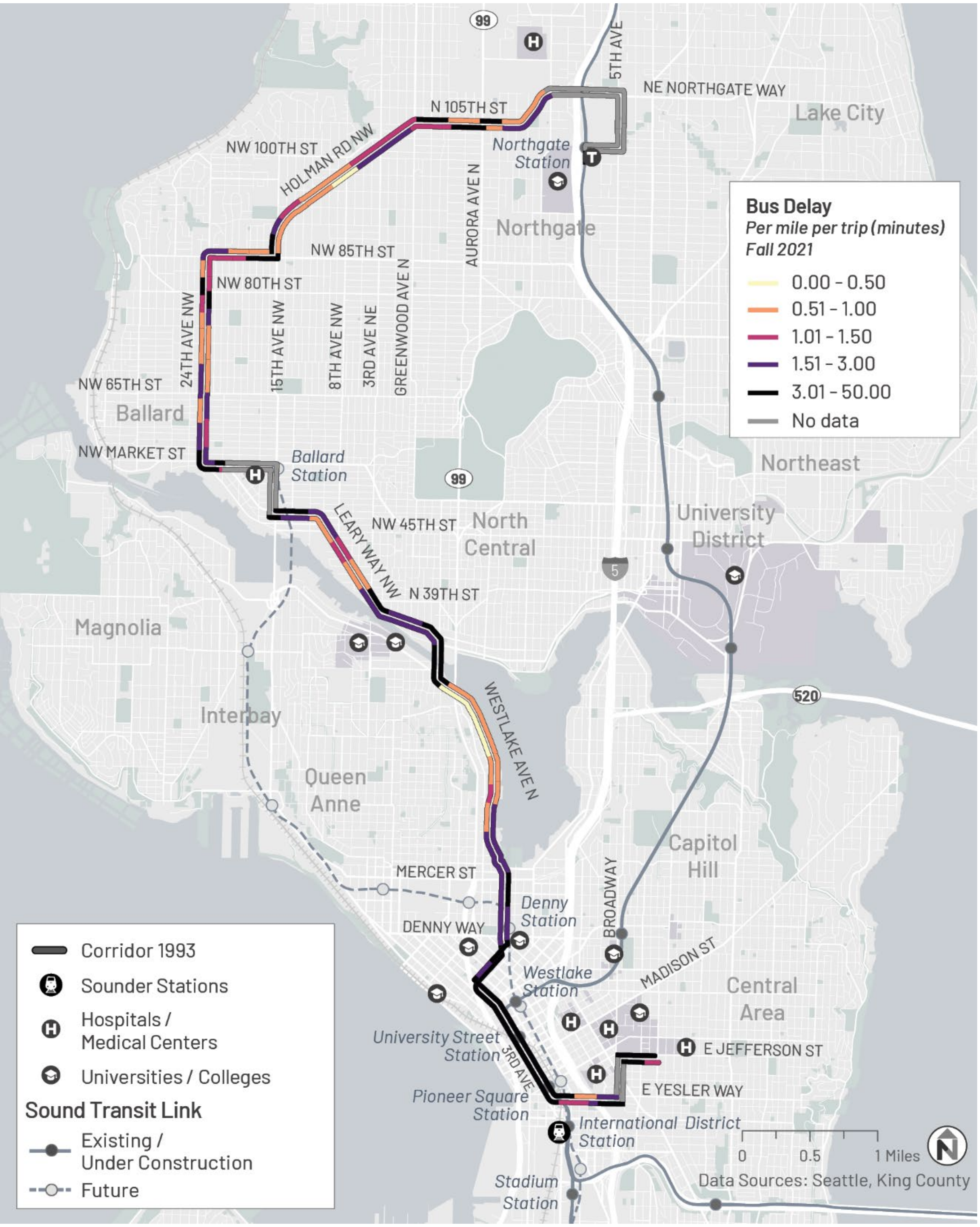
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 18 shows the delay along Corridor 1993 based on King County Metro's AVL data from Fall 2021.[2] The segments shown are existing stop pairs along the representative alignment, including data from Route 27 for the portion along Yesler Way, Routes 3 and 4 for the stop pairs along E Jefferson St. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Downtown Seattle and segments travelling through South Lake Union experience high levels of delay, as do the portions of the corridor along E Jefferson St, Fremont Bridge and N 36th St. Other high delay locations include approaching major intersections such as 15th Ave NW at Leary Wy NE, and at NW 85th St, 24th Ave NW at NW Market St, at NW 65th St, and NW 80th St, and N 105th St at Aurora Ave N.

[2] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 18 Corridor 1993 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 19 and Figure 20 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

Portions of the corridor in Downtown Seattle and South Lake Union experience high delay throughout the day. All-day delay is also concentrated at the Fremont Bridge and at stop pairs approaching major intersections.

Overall, high delay locations tend to experience delay throughout the day. Higher levels of delay occur between 7 and 9 am, between 3 and 7 pm, and at 10 pm for both northbound and southbound travel.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

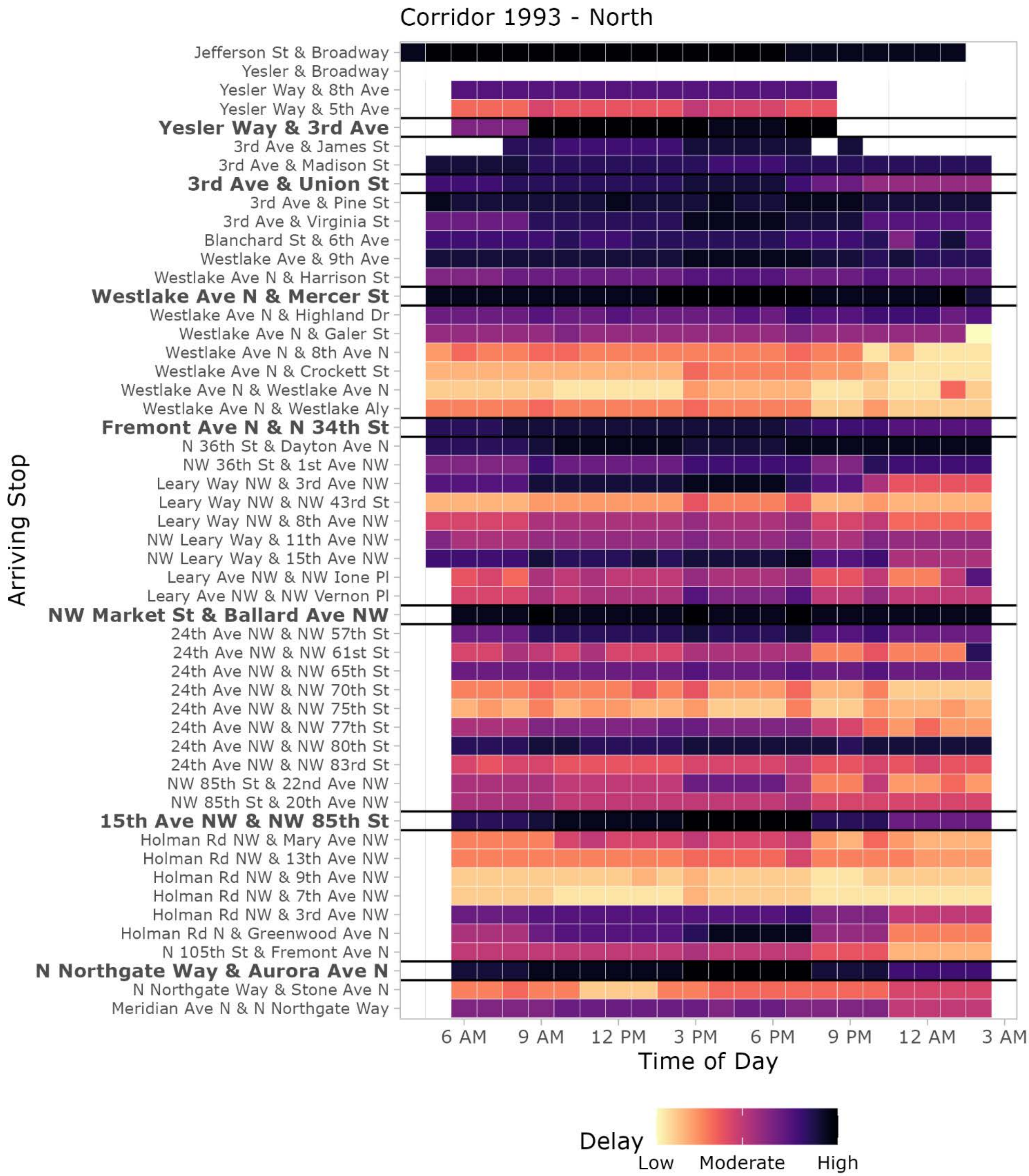
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

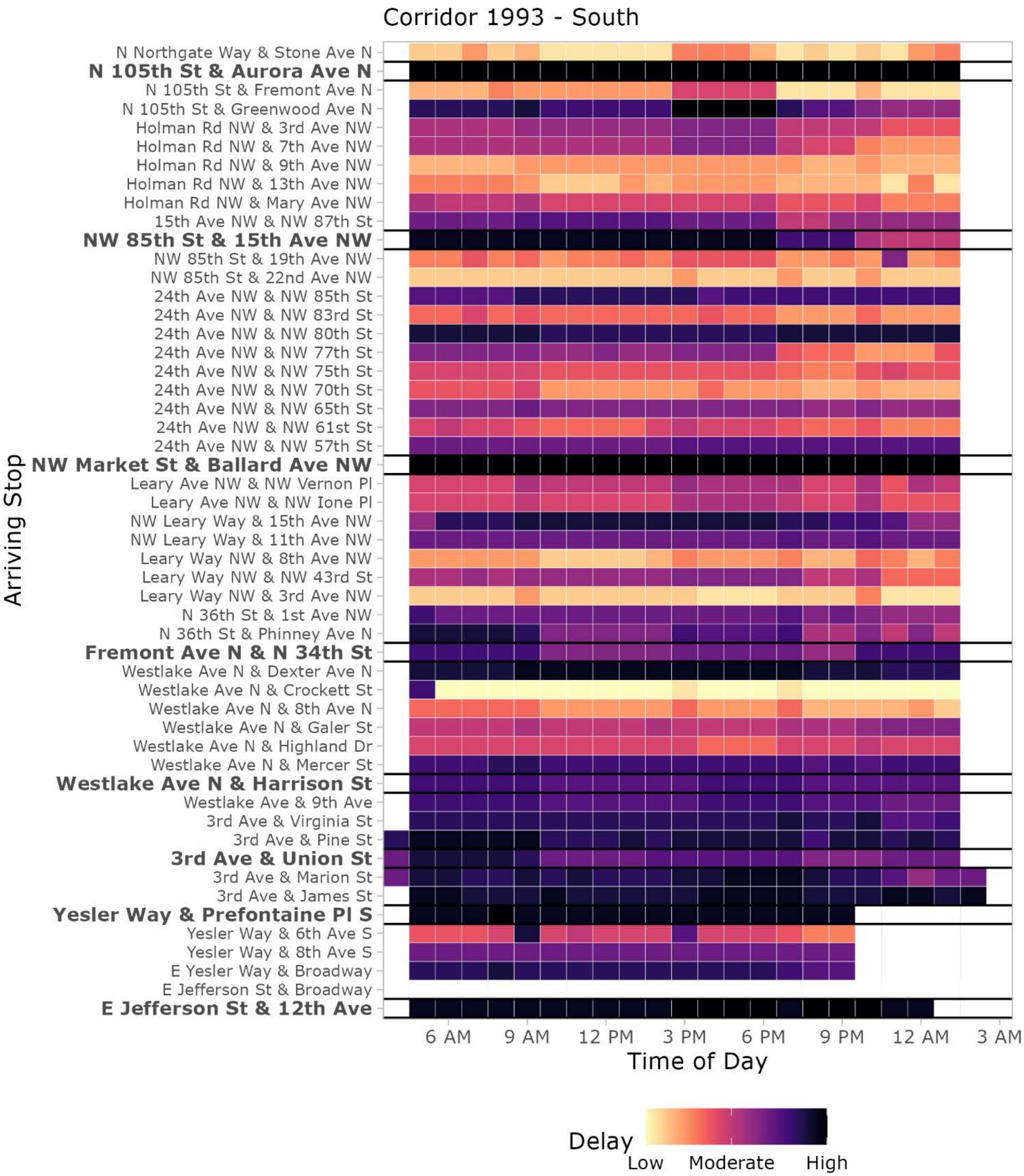
Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 19 Corridor 1993 Northbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 20 Corridor 1993 Southbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 1993 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 21, and they are shown geographically in a map in Figure 22.

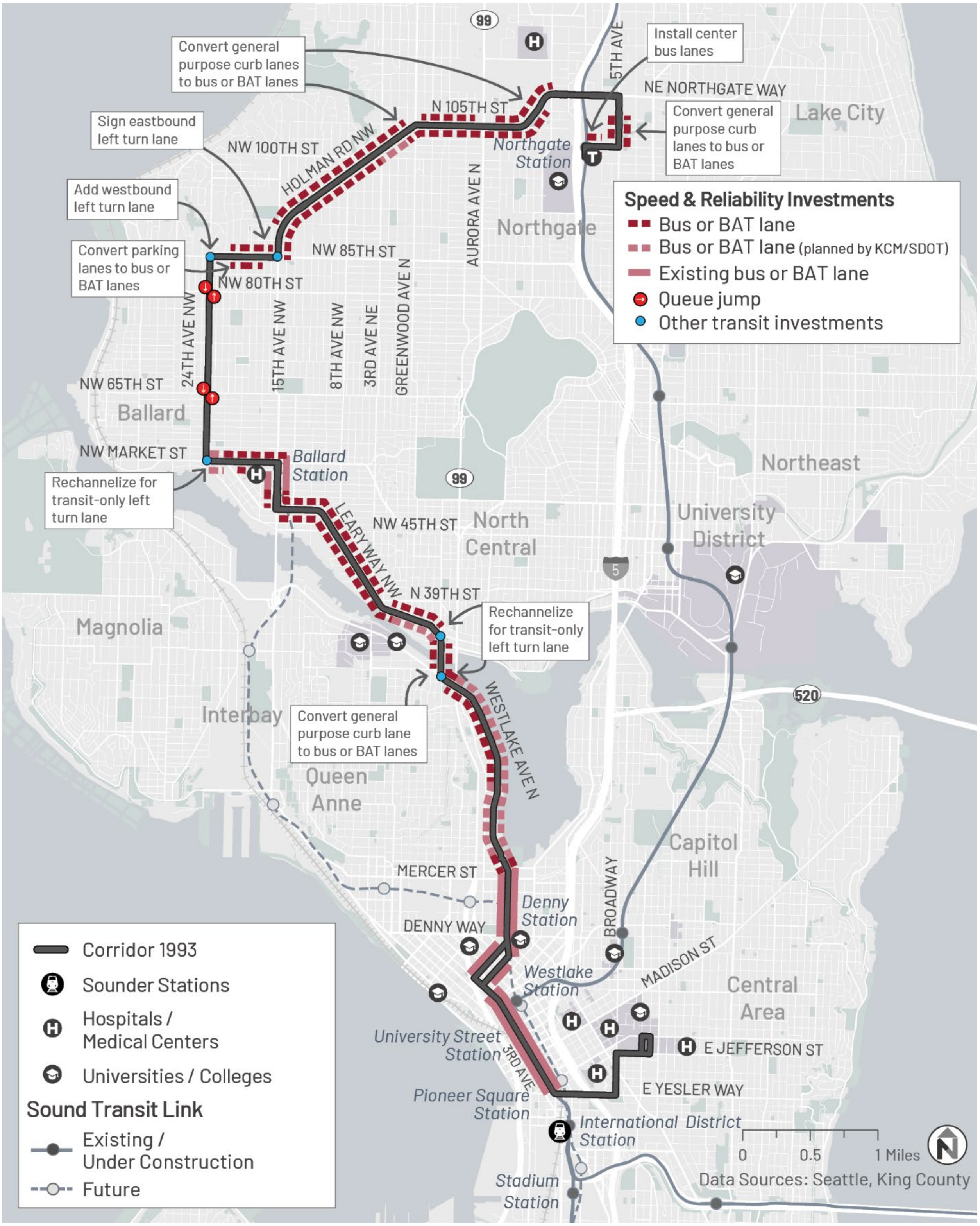
The corridor currently achieves transit priority for 17% of its centerline miles, which is below the *minimum* RapidRide minimum standard of 40%. The projects treatments proposed here would increase the coverage to 70%, which would exceed the *desired* standard of 50%.

Figure 21 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
NE 103rd St (Northgate Station to 5th Ave NE)	Bus/BAT lane	Narrow lanes to add a center bus lane for one direction to minimize conflicts with general purpose traffic between 5th Ave NE and Northgate Transit Center.
5th Ave NE (NE 106th St to NE 103rd St)	Bus/BAT lane	Convert a general-purpose curb lane to bus/BAT lane.
N Northgate Way/N 105th St/Holman Rd N (Meridian Ave N to NW 85th St)	Bus/BAT lane	Add southbound bus-only lane between Meridian Ave N and Stone Ave N, Whitman Ave N and Phinney Ave N, N 104th St and 15th Ave NW. Add northbound bus-only lane from NW 85th to N 107th St. Maintain all lanes near major intersections to avoid traffic impacts.
NW 85th St & 15th Ave NW	Other	Convert the eastbound left lane from a shared through/left into a left-turn only lane.
NW 85th St (15th Ave NW to 22nd Ave NW)	Bus/BAT lane	Convert on-street parking to bus/BAT lane, westbound between 22nd Ave NW and 15th Ave NW, eastbound between 22nd Ave NW and 17th Ave NW.
24th Ave NW & NW 80th St	Queue Jump	Add northbound and southbound queue jumps with removal of parking
24th Ave NW & NW 65th St	Queue Jump	Add northbound and southbound queue jumps and a shared right turn with removal of parking.
24th Ave NW & NW Market St	Transit only left turn lane	Convert southbound through lane to transit only left. Conver the right turn lane to a shared through/right lane.
NW Market/NW 15th/Leary Way NW/NW 36th St	Bus/BAT lane	Add eastbound/southbound bus/BAT lane on NW Market St between 20th Ave NW and 17th Ave NW, on 15th Ave NW between NW 54th St and NW 49th St, on Leary Way NW between 15th Ave NW and Florentia St. The portion along NW Market St between 24th Ave NW and 22nd Ave NW is planned as part of the Route 40 TPMC.

Location	Type	Description
NW Market/NW 15th/Leary Way NW/NW 36th St	Bus/BAT lane	Add northbound/westbound bus/BAT lane from Fremont Ave N at N 35th St to Leary Way NW at N 39th St, and from Leary Way NW at N 39th St to 15th Ave NW, and on NW Market St from 15th Ave NW to 22nd Ave NW. The portion along NW Market St between 22nd Ave NW and 24th Ave NW is planned as part of the Route 40 TPMC.
Fremont Ave N & N 34th St	Other	Re-channel intersection to allow for bus only left from Fremont Ave N to Fremont Pl N.
4th Ave N / Fremont Bridge (N 34th St to Florentia St)	Bus/BAT lanes	Convert northbound and southbound curb lanes to bus/BAT lane.
Westlake Ave N (Westlake Aly to Mercer St)	Bus/BAT lane	Fill in bus/BAT lane gaps along Westlake Ave N between the Dexter/Nickerson/Westlake intersection and Mercer St.
Westlake Ave N (Mercer St to 9th Ave)	Bus/BAT lane	Fill in bus/BAT lane gaps from Mercer St to 9th Ave.

Figure 22 Proposed Transit Priority Treatments



6.4 Forecast Travel Time Savings

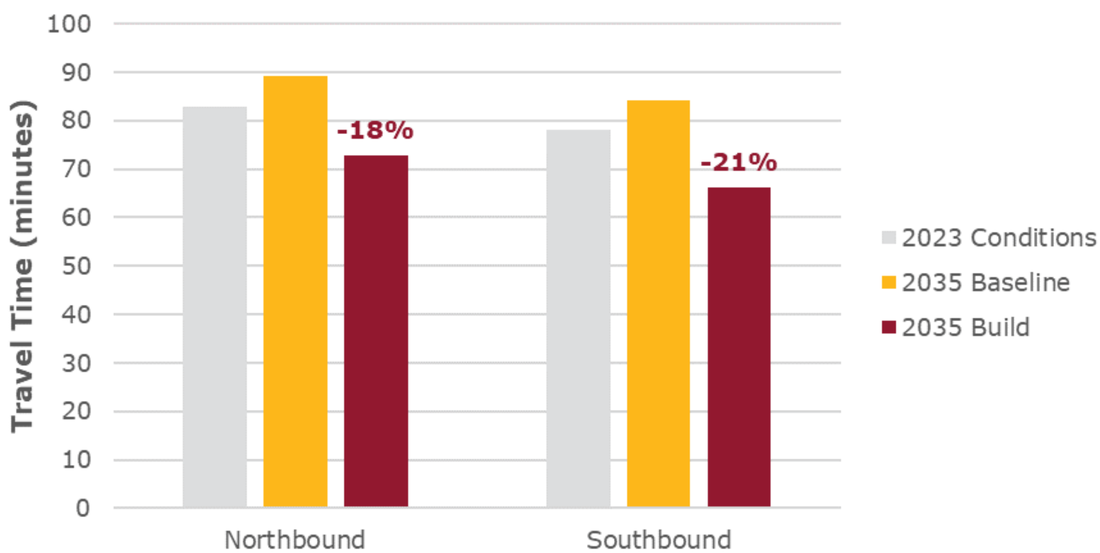
The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1993 alignment are forecast to reduce PM peak Future Build condition travel times 18-21% from Future Baseline conditions. Average bus travel speed is expected to increase to 10-11 mph in the Future Build conditions.

Southbound trips will experience a higher reduction in travel times compared to the northbound direction. Introducing bus/BAT lanes along high delay segments and addressing intersection treatments at the numerous turns along the corridor will improve transit speeds and travel times.

Figure 23 shows transit travel times for the overall route.

Figure 23 Corridor 1993 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

Route 40 carried approximately 7,100 people per day in Spring 2023, and as much as 13,000 people in Fall 2019. The route has now recovered approximately 55% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[3], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 24 Route 40 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	13,034	-	100%
Fall 2020	3,605	-72%	28%
Fall 2021	5,687	+58%	44%
Spring 2023	7,132	+25%	55%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 25 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along Route 40, plus stops along Routes 3, 4, 27, 44 and 67 where the corridor deviates off of the Route 40 alignment.

The busiest stop locations are near the Northgate Transit Center and Link Station, near NW Market St and 24th Ave NW, and in Downtown Seattle. Moderate to high ridership occurs at the Ballard Link Station, near the Fremont Bridge, and near Broadway and E Jefferson St.

[3] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 25 Boarding and Alighting Activity by Stop (Spring 2023)

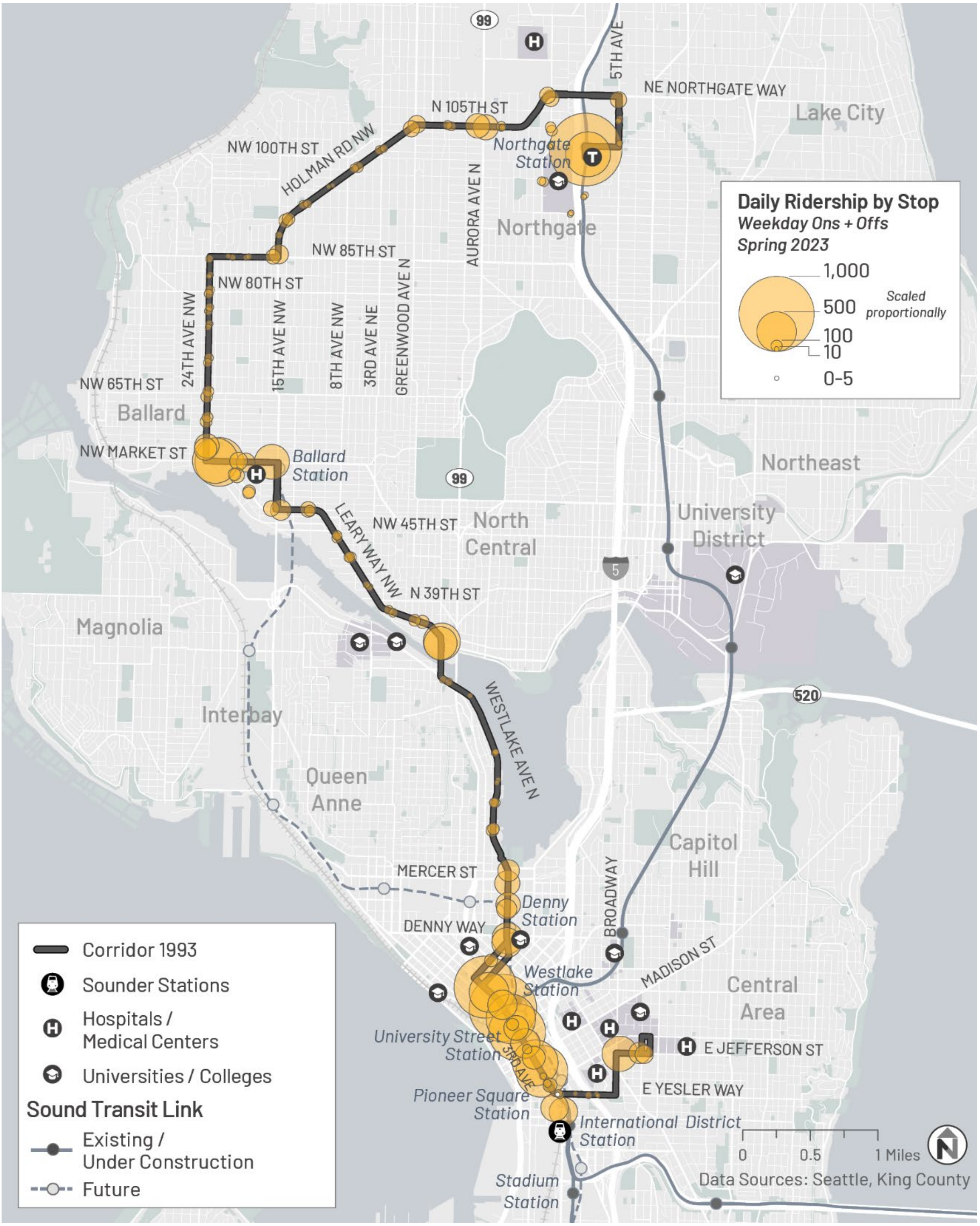


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Figure 26 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Southbound	Northbound	Total
Northgate Station	575	512	1,087
5th Ave & 103rd St	27	-	27
5th Ave & 106th St (Northgate Mall)	33	24	58
5th Ave & Northgate Way	-	171	171
Northgate Way & Meridian Ave	169	172	341
Northgate Way & Stone Ave	79	31	110
Northgate Way & Aurora Ave	284	297	581
N 105th St & Fremont Ave	64	67	132
N 105th St & Greenwood Ave	190	170	359
Holman Rd & 3rd Ave	64	45	109
Holman Rd & 7th Ave	61	87	148
Holman Rd & 9th Ave	7	7	13
Holman Rd & 13th Ave	60	52	112
Holman Rd & Mary Ave	132	117	250
15th Ave & 87th St	39	-	39
15th Ave & 85th St	150	212	361
85th St & 19th/20th Ave	20	21	41
85th St & 22nd Ave	13	28	41
24th Ave & 85th St	47	-	47
24th Ave & 83rd St	7	28	35
24th Ave & 80th St	65	66	131
24th Ave & 77th St	53	50	103
24th Ave & 75th St	29	38	67
24th Ave & 70th St	58	64	122
24th Ave & 65th St	104	94	198
24th Ave & 61st St	108	94	202
24th Ave & 57th St	258	286	545
Market St & Ballard Ave	629	583	1,212
Market St & 20th Ave	207	193	399
Market St & 15th Ave	230	433	663
Leary Way & 11th Ave	95	161	256
Leary Way & 8th Ave	87	75	162
Leary Way & 43rd St	87	96	183
Leary Way & 3rd Ave	36	40	76
36th St & 1st Ave	63	64	127
36th St & Phinney Ave/Dayton Ave	106	126	231
Fremont Ave & 34th St	408	464	871

Stop Pair	Southbound	Northbound	Total
Westlake Ave & 4th Ave/Dexter Ave	48	47	95
Westlake Ave & Westlake Ave	-	15	15
Westlake Ave & Crockett	40	28	68
Westlake & 8th Ave	13	16	30
Westlake Ave & Galer St	73	76	149
Westlake Ave & Highland Dr	119	104	222
Westlake Ave & Mercer St	295	246	542
Westlake Ave & Harrison St	226	287	514
Westlake Ave & Denny Way	363	379	742
Blanchard St & 6th Ave	-	122	122
3rd Ave & Virginia St	502	816	1,318
3rd Ave & Pine St	891	356	1,246
3rd Ave & Union St	742	290	1,031
3rd Ave & Marion St/Madison St	587	264	851
3rd Ave & James St	50	138	188
Yesler Way & 3rd Ave	57	51	108
Yesler Way & 5th/6th Ave	37	10	47
Yesler Way & 8th Ave	9	10	19
Jefferson St & Broadway	439	-	439
Jefferson St & 12th Ave	-	244	244

Source: King County Metro Spring 2023

Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership along 5th Ave NE is from Route 67, along Market St is from Route 44, along Yesler Way is from Route 27, and along Jefferson St is from Routes 3 and 4.

7.3 Forecast Ridership

Future ridership for Corridor 1993 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1993 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 800 boardings in the PM peak hour and 8,600 daily boardings. Key ridership hubs include Northgate Station and Ballard Station. Future ridership for each candidate RapidRide station is shown in Figure 27.

Figure 27 Future Corridor Ridership

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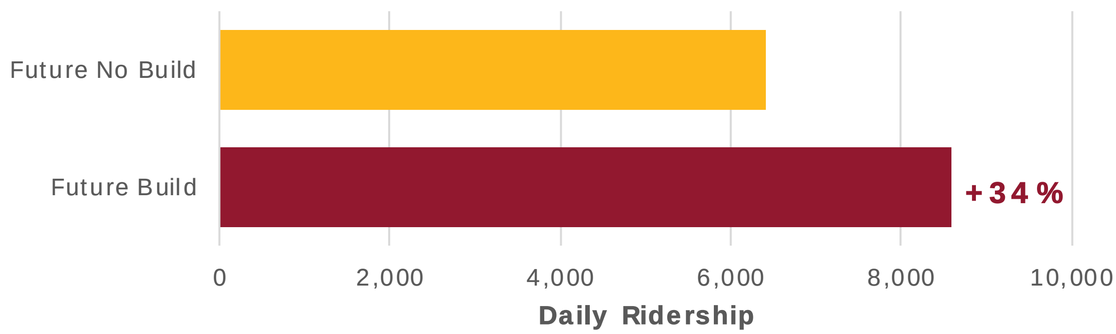
7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 2,200 riders per weekday (or 34% increase) is forecast for Corridor 1993 compared to a "baseline" scenario with today's service levels for Route 40.

Figure 28 Modeled Weekday Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1993 is forecast at 34 riders per revenue hour. This would result in an improvement of 44 percent in productivity compared to a future "baseline" 24 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 39 and 35 riders per revenue hour, respectively. At 34 riders per revenue hour, Corridor 1993 would rank second lowest of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

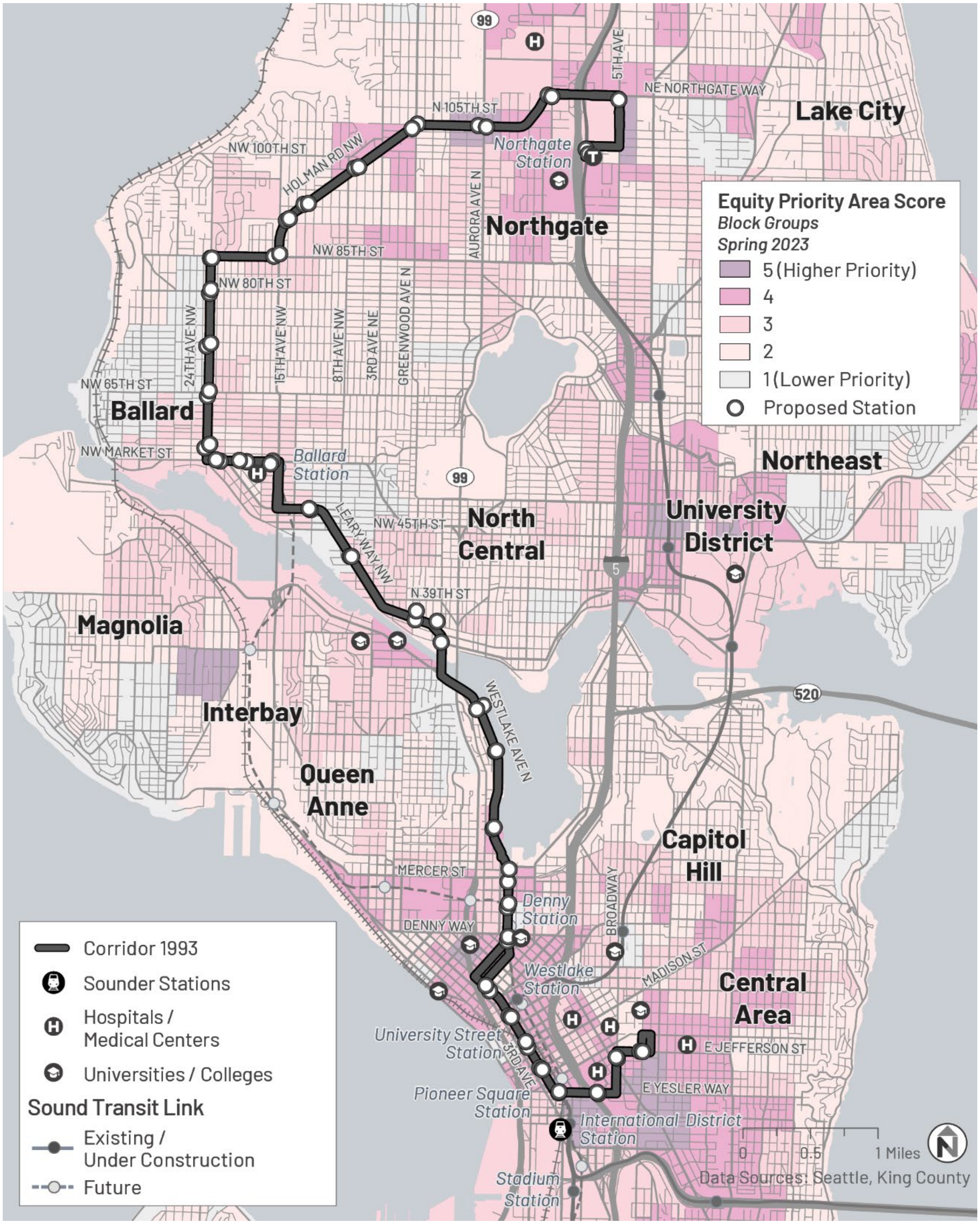
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[4] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 29 displays equity priority area scores for block groups located along Corridor 1993. In the southern portion of the alignment, the route serves high equity priority areas in the Central District, First Hill, and Chinatown-International District neighborhoods of Seattle along E Jefferson Street, Broadway, and E Yesler Way. In the northern portion of the alignment, Route 40 serves high equity priority areas in the Greenwood and Northgate neighborhoods of Seattle along N 105th Street, N Northgate Way, and 5th Avenue NE.

[4] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 29 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 30 and Figure 31 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[5] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along Route 40 in Fall 2020, ridership retention was consistent with the regional average, except along Westlake Ave N, where the change in ridership was generally 10-20 points lower than the region. By Spring 2023, the change in ridership generally continued to match the regional change, except along Westlake Ave N, 24th Ave NW, and NW Market St, and in Downtown Seattle, where the ridership change was about 10-63 points lower than the region.

[5] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 30 Ridership Retention (Fall 2020)

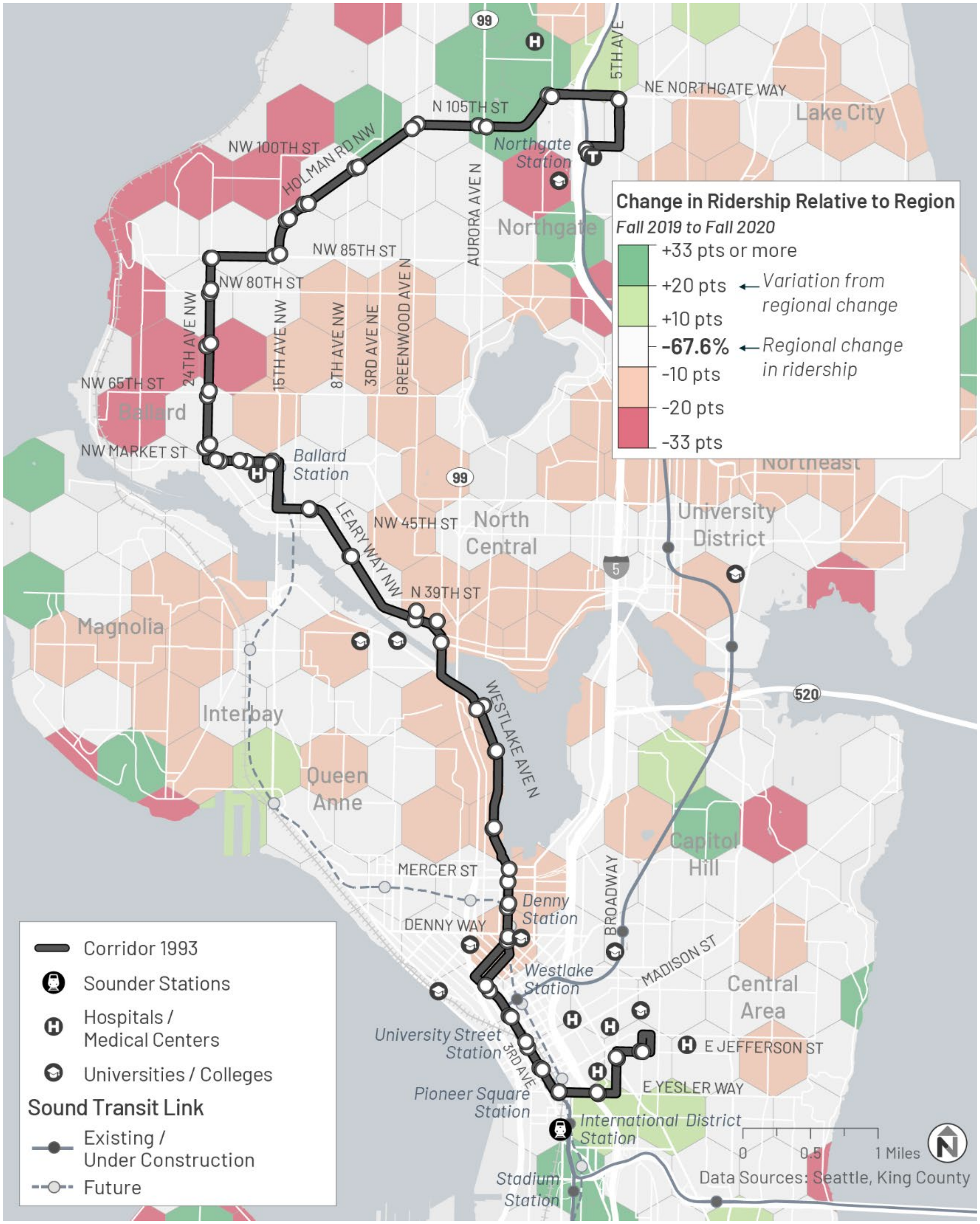

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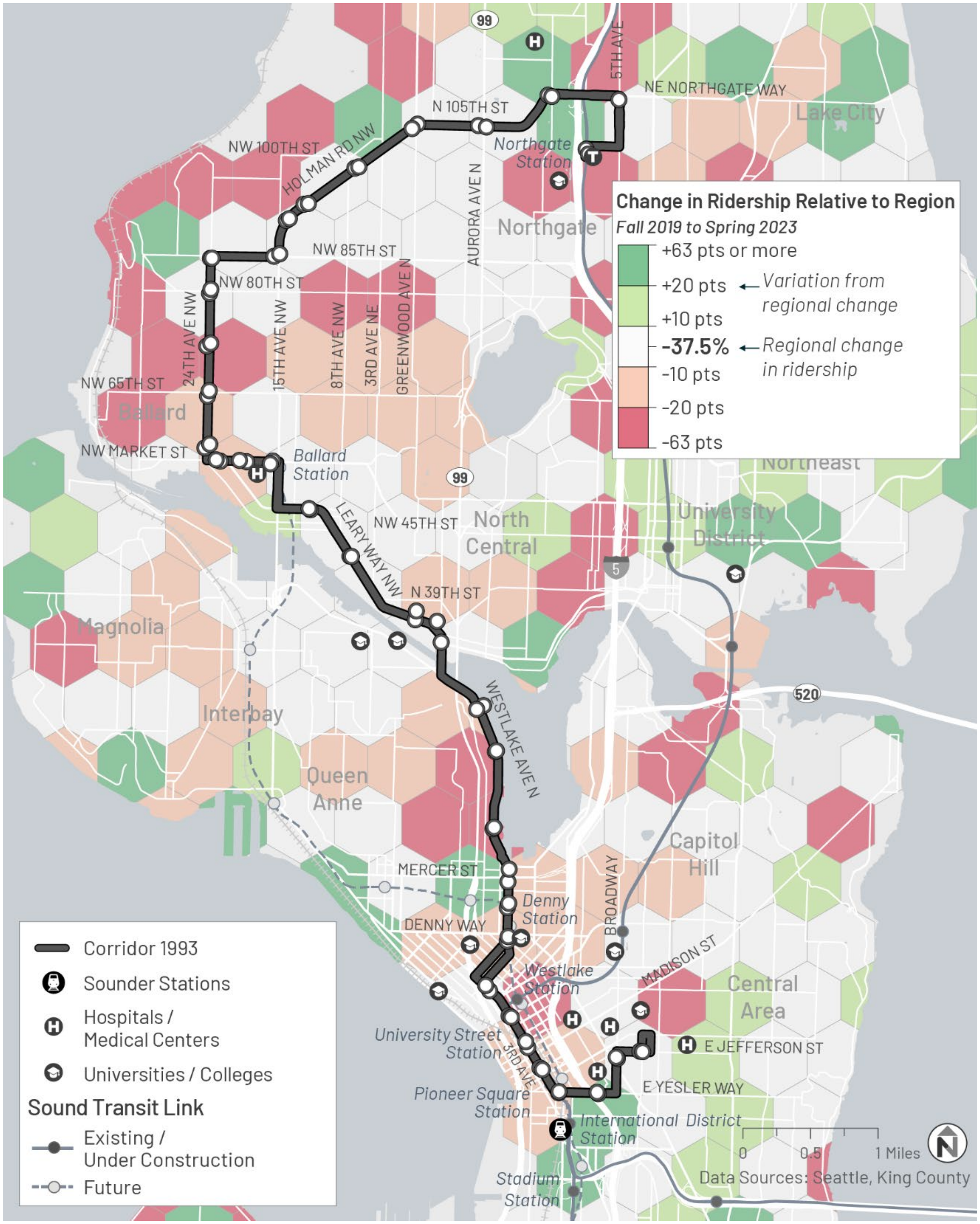
Figure 31 Ridership Retention (Spring 2023)



8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of Route 40 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[6] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 40% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the third highest increase in job access, and tied with Corridor 1052.

8.4 GHG Emissions

Ridership gains – and therefore the shift from vehicle modes of travel because of RapidRide implementation of Route 40 – will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[7] Approximately 1.07 metric tons of CO_2 would be reduced daily due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the fifth largest reduction.

[6] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[7] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model.

9.0 Traffic Conditions

Traffic operational analysis was conducted for 75 intersections along Route 40 to evaluate transit travel time benefits of the proposed improvements. Out of the 75 intersections, 33 signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 42 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 32 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 32 Modeled Delay from Synchro

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
Southbound								
601	I-5 Express Ramps & NE 103rd St	Signal	20.5	21.7	19.4	-	21.7	22.6
602	5th Ave NE & NE 103rd St	Signal	177.9	143.4	143.4	-	143.4	143.4
603	5th Ave NE & NE Northgate Way	Signal	85.7	118.2	118.2	-	118.2	118.2
604	I-5 NB Ramp & NE Northgate Way	Signal	20.7	19.9	19.9	-	19.9	19.9
605	Corliss Ave NE & NE Northgate Way	Signal	12.7	20.1	20.1	-	20.1	20.1
606	Meridian Ave N & N Northgate Way	Signal	44.0	109.6	105.2	-	109.6	105.2
607	Aurora Ave N & N 105th St	Signal	138.9	185.2	185.2	-	185.2	185.2
608	Dayton Ave N & N 105th St	Signal	11.4	12.1	12.1	-	12.1	12.1
609	Greenwood Ave N & Holman Rd NW	Signal	115.5	178.7	178.7	-	178.7	178.7
610	15th Ave NW & Holman Rd NW	Signal	12.3	17.6	17.6	-	17.6	17.6
611	15th Ave NW & NW 85th St	Signal	104.9	112.4	107.4	-	112.4	107.4
612	24th Ave NW & NW 57th St	Signal	5.4	5.6	5.6	-	5.6	5.6
613	24th Ave NW & NW Market St	Signal	61.9	63.9	37.6	-	63.9	62.8
614	Ballard Ave NW & NW Market St	Signal	4.8	4.7	4.6	-	7.0	7.8
615	22nd Ave NW & NW Market St	Signal	24.6	28.1	28.1	-	27.0	27.0
616	NW Market St & Barnes Ave NW	Signal	1.5	1.5	1.2	-	1.5	2.4
617	17th Ave NW & NW Market St	Signal	7.9	8.0	3.1	-	8.0	12.0
618	15th Ave NW & NW Market St	Signal	55.9	59.2	59.2	-	59.2	59.2
619	15th Ave NW & NW Leary Way	Signal	85.3	85.1	85.1	-	85.1	85.1
620	14th Ave NW & NW Leary Way	Signal	7.1	7.4	5.7	-	7.4	11.1
621	Leary Way NW & NW 39th St	Signal	9.4	14.4	9.6	-	14.4	39.2
622	Phinney Ave N & N 36th St	Signal	7.2	6.2	6.0	-	14.9	14.9

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
623	Dayton Ave N & N 36th St	Signal	8.8	8.6	6.8	-	27.0	26.2
624	Fremont Ave N & N 35th St	Signal	19.7	11.7	11.7	-	89.4	89.4
625	Fremont Ave N & N 34th St	Signal	35.5	16.6	16.5	-	122.5	116.3
626	Dexter Ave N & Nickerson St	Signal	51.2	56.3	56.3	-	56.3	56.3
627	Westlake Ave & Highland Dr	Signal	5.7	4.0	4.0	-	11.3	11.1
628	Westlake Ave & Valley St	Signal	10.5	11.6	11.6	-	13.8	13.8
629	Westlake Ave & Mercer St	Signal	26.6	29.8	26.0	-	29.0	26.1
630	Westlake Ave N & Republican St	Signal	25.9	24.1	24.4	-	15.8	15.9
631	Westlake Ave & Harrison St	Signal	10.3	10.8	10.8	-	15.1	14.8
632	Boren Ave & Broadway Ave	Signal	34.9	35.3	35.3	-	35.3	35.3
633	Broadway Ave & Jefferson St	Signal	7.3	8.1	8.1	-	8.1	8.1
Northbound								
633	Broadway Ave & Jefferson St	Signal	54.3	55.3	55.3	-	55.3	55.3
632	Boren Ave & Broadway Ave	Signal	31.8	32.0	32.0	-	32.0	32.0
631	Westlake Ave & Harrison St	Signal	9.0	9.0	9.0	-	15.1	15.1
630	Westlake Ave N & Republican St	Signal	6.2	7.8	7.8	-	7.8	7.8
629	Westlake Ave & Mercer St	Signal	41.1	55.2	43.7	-	84.8	59.2
628	Westlake Ave & Valley St	Signal	22.5	17.6	16.5	-	17.6	15.2
627	Westlake Ave & Highland Dr	Signal	6.1	4.8	4.8	-	15.7	15.7
626	Dexter Ave N & Nickerson St	Signal	20.7	21.4	21.4	-	21.4	21.4
625	Fremont Ave N & N 34th St	Signal	26.0	26.3	26.3	-	26.3	26.3
624	Fremont Ave N & N 35th St	Signal	34.4	68.4	68.4	-	52.0	52.0
623	Dayton Ave N & N 36th St	Signal	9.9	10.5	7.0	-	10.5	27.6
622	Phinney Ave N & N 36th St	Signal	1.7	9.6	5.9	-	9.6	25.0

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay 2035 Baseline	Transit Delay 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay 2035 Baseline	Traffic Delay 2035 Build
621	Leary Way NW & NW 39th St	Signal	22.6	36.6	36.6	-	36.6	36.6
620	14th Ave NW & NW Leary Way	Signal	8.3	8.9	6.2	-	8.9	16.9
619	15th Ave NW & NW Leary Way	Signal	23.2	22.3	16.8	-	25.5	79.1
618	15th Ave NW & NW Market St	Signal	67.6	122.7	122.7	-	122.7	122.7
617	17th Ave NW & NW Market St	Signal	11.6	12.0	8.7	-	12.0	21.9
616	NW Market St & Barnes Ave NW	Signal	1.4	1.5	1.9	-	1.5	2.5
615	22nd Ave NW & NW Market St	Signal	28.0	33.9	29.1	-	33.9	43.1
614	Ballard Ave NW & NW Market St	Signal	2.2	1.8	3.8	-	8.3	8.5
613	24th Ave NW & NW Market St	Signal	91.7	64.7	62.5	-	64.7	62.5
612	24th Ave NW & NW 57th St	Signal	6.2	6.6	6.4	-	6.6	6.4
611	15th Ave NW & NW 85th St	Signal	66.1	81.3	81.3	-	81.3	81.3
610	15th Ave NW & Holman Rd NW	Signal	1.1	0.9	0.4	-	0.9	44.4
609	Greenwood Ave N & Holman Rd NW	Signal	118.7	137.2	132.8	-	137.2	132.8
608	Dayton Ave N & N 105th St	Signal	9.3	9.6	6.8	-	9.6	17.0
607	Aurora Ave N & N 105th St	Signal	55.2	54.5	38.4	-	54.5	51.6
606	Meridian Ave N & N Northgate Way	Signal	38.8	41.3	41.3	-	41.3	41.3
605	Corliss Ave NE & NE Northgate Way	Signal	18.0	37.8	36.3	-	37.8	36.3
604	I-5 NB Ramp & NE Northgate Way	Signal	96.0	117.0	113.5	-	117.0	113.5
603	5th Ave NE & NE Northgate Way	Signal	52.8	75.3	75.3	-	75.3	75.3
602	5th Ave NE & NE 103rd St	Signal	22.4	23.1	23.1	-	23.1	23.1
601	I-5 Express Ramps & NE 103rd St	Signal	0.0	0.0	0.0	-	0.0	0.0

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 33 summarizes the number of crashes along the corridor by severity level and mode. There were 694 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 28% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 8% resulted in a fatality or serious injury.

Figure 33 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	2	<1%	1	1%	0	0%	**3**	**<1%**
Serious Injury	25	5%	26	20%	6	9%	**57**	**8%**
Minor Injury	155	31%	51	39%	35	55%	**241**	**35%**
Possible Injury	318	64%	52	40%	23	36%	**393**	**57%**
Total	**500**	**100%**	**130**	**100%**	**64**	**100%**	**694**	**100%**

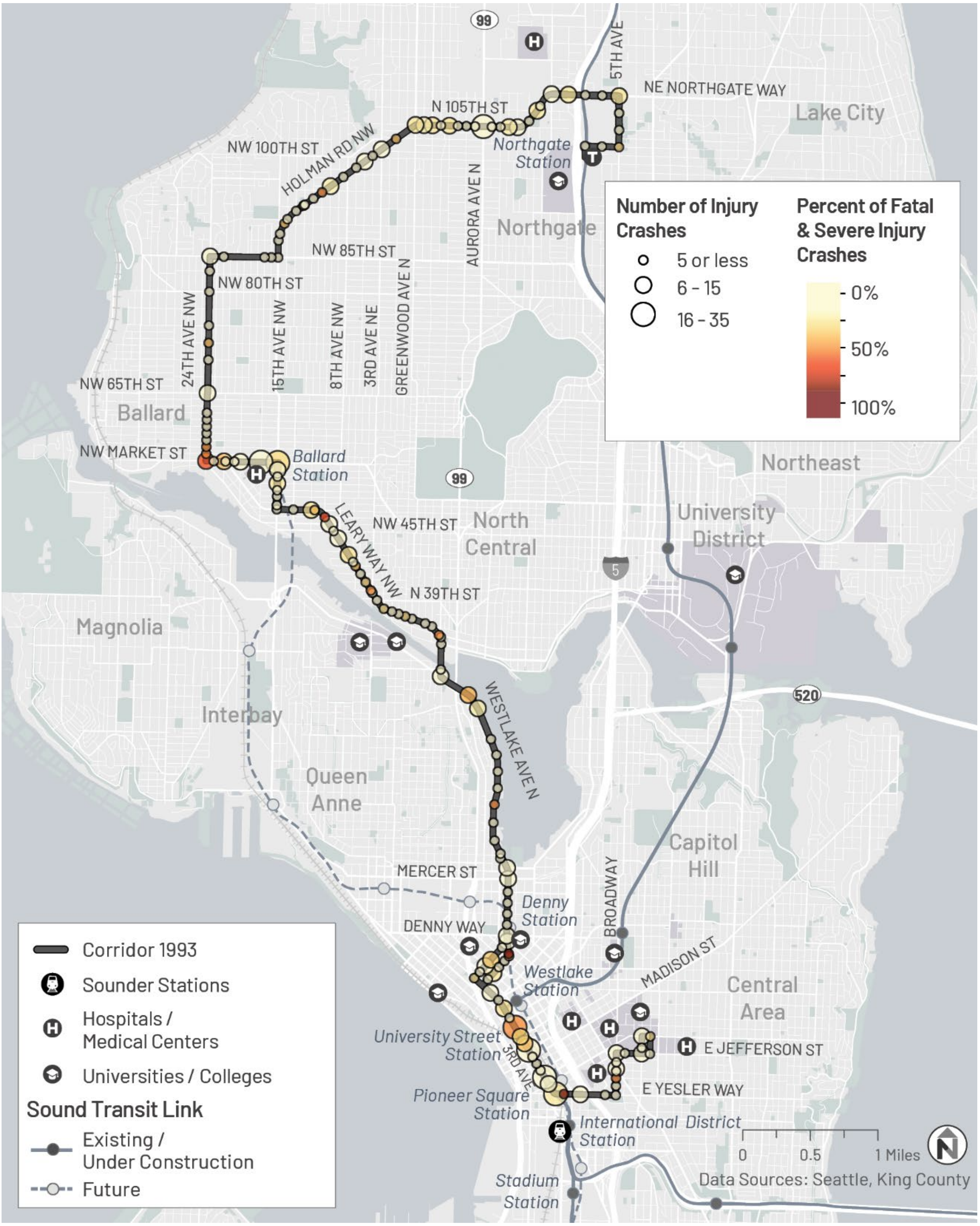
Source: WSDOT (2018-2022)

Figure 34 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at major intersections and near major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along NE Northgate Way, N 105th St, and Holman Rd NW, in Northgate
- Along 24th Ave NW, NW Market St, and 15th Ave NW, in Ballard
- Along Leary Way NW, in North Central
- Major intersections along Westlake Ave N, including driveways east of State Route 99 and Mercer St
- Major intersections in Downtown Seattle between Denny Way and E Yesler Way and near Broadway and E Jefferson St

Figure 34 Crash Locations



King County METRO

11.0 Planned Improvements

Route 40 serves the City of Seattle. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 35, and all projects are described in Figure 36.

Major projects include several planned road upgrades along Westlake Ave N, an ITS corridor on Denny Way, and several pedestrian and bicycle access and safety improvements in downtown Seattle.

Figure 35 Planned Jurisdictional Investments

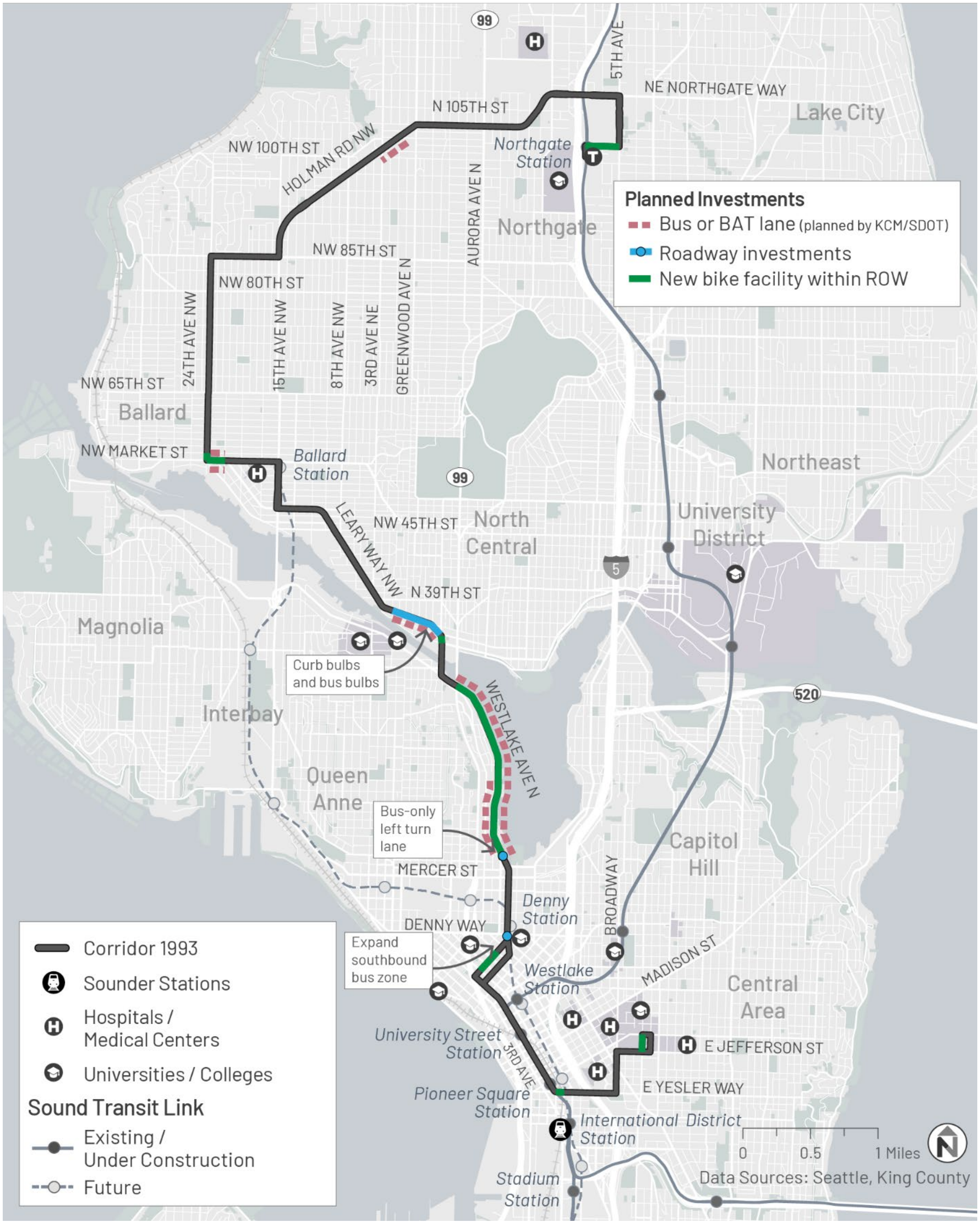


Figure 36 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Speed Cushions	Installation of speed cushions, daylight improvements, and candy cane backing to stop signs	1st Ave NE at NE 103rd St	dotMaps
2	Northgate Light Rail- 1st Ave NE Multi-Use Path	Multi-Use Path	1st Ave NE at NE Northgate Way and NE 103rd St	2021-2024 BMP Implementation Plan
3	Neighborhood greenway	Neighborhood greenway	NE 103rd St (1st Ave NE - 5th Ave NE)	Recommended Bicycle Network Map
4	Priority Bus Corridor (Lake City - Northgate - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Stop consolidation • Conduct further analysis of alignment options along Lake City Way/80th Street/Roosevelt Way • Integrate route design/transit priority treatments with ongoing Bicycle Master Plan facility planning on Roosevelt Way between NE 40th Street and NE 65th Street • Create high quality connections between the route and U-District Link Station on Brooklyn Ave	5th Ave NE (NE Northgate Way - NE 103rd St) / NE 103rd St (1st Ave NE - 5th Ave NE)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
5	Sidewalk Safety Repair Program	Installation of speed cushions, daylight improvements, and candy cane backing to stop signs	NE Northgate Way (5th Ave NE - 8th Ave NE)	dotMaps
6	Pedestrian Space	Interlake Ave Dedicated Pedestrian Space	Interlake Ave N at N Northgate Way	dotMaps
7	Neighborhood greenway	Neighborhood greenway	Stone Ave N at N Northgate Way	Recommended Bicycle Network Map
8	TPMC Proposed Investment Area	TPMC Proposed Investment Area	N 105th St / Aurora Ave N	Route 40 TPMC 2025
9	RapidRide E Line Improvements	Previously named 'Seattle Priority Bus Corridor 9' (T2040 ID:4092). Enhance existing RapidRide E operations with capital components to support efficient, safe and convenient transit service including additional bus rapid transit investments. Capital improvements may include additional speed and reliability measures such as BAT lanes, roadway reconstruction, ITS and safety improvements and complementary pedestrian, bike and freight improvements.	3rd Ave (Blanchard St - Yesler Way) / Aurora Ave N at N 105th St	Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
10	ITS improvements Aurora Ave N	Modify signal timing on northbound Aurora Ave N to improve freight traffic during the morning peak	Aurora Ave N at N 105th St	Freight Master Plan
11	SDOT Healthy Street	SDOT Healthy Street	Fremont Ave N at N 105th St	Healthy Streets Program
12	Off-street facility	Off-street facility	Interurban Trail at N 105th St	Recommended Bicycle Network Map
13	TPMC Proposed Investment Area	TPMC Proposed Investment Area	Holman Rd NW (3rd Ave NW - Greenwood Ave N)	Route 40 TPMC 2025
14	Cycle track	Cycle track	3rd Ave NW at Holman Rd NW	Recommended Bicycle Network Map
15	Sidewalk Safety Repair Program	Beveling evaluations	Holman Rd NW (3rd Ave NW - 4th Ave NW)	dotMaps
16	RapidRide D Line Improvements	Previously named 'Seattle Priority Bus Corridor 10' (T2040 TD 5091). Enhance existing RapidRide D operations with capital components to support efficient and convenient transit service. Capital improvements may include additional speed and reliability measures such as those identified for new RapidRide corridors including dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements, supporting facilities. Extension of D Line to Northgate and safety improvements to the Ballard Bridge may also be included.	3rd Ave (Blanchard St - Yesler Way) / 15th Ave NW (Holman Rd NW - NW 85th St) / Holman Rd NW (15th Ave NW - 3rd Ave NW)	Regional Transportation Plan 2022-2050
17	Neighborhood greenway	Neighborhood greenway	12th Ave NW at Holman Rd NW	Recommended Bicycle Network Map
18	Holman Rd NW / 13th Ave W Intersection improvements	Remove height limitation from existing pedestrian overpass and install half signal.	Holman Rd NW / 13th Ave NW	Freight Master Plan
19	Neighborhood greenway	Neighborhood greenway	NW 87th St at 15th Ave NW	Recommended Bicycle Network Map
20	TPMC Proposed Investment Area	TPMC Proposed Investment Area	NW 85th St (18th Ave NW - 15th Ave NW)	Route 40 TPMC 2025

ID	Improvement	Description	Extent	Source
21	Priority Bus Corridor (Crown Hill - Green Lake - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Electrification • Evaluate electrification cost/benefit north of 50th Street • Evaluate turnaround and layover options at east and west ends of the corridor • Conduct traffic analysis east of I-5 to determine key congested intersections and priority bus treatment options • Conduct study of routing options through Greenlake east of Aurora Ave • Coordinate with existing planned improvements south of 50th Street	NW 85th St (24th Ave NW - 15th Ave NW)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
22	SDOT Healthy Street	SDOT Healthy Street	17th Ave NW at NW 85th St	Healthy Streets Program
23	Neighborhood greenway	Neighborhood greenway	23rd Ave NW at NW 85th St	Recommended Bicycle Network Map
24	Neighborhood greenway	Neighborhood greenway	NW 83rd St at 24th Ave NW	Recommended Bicycle Network Map
25	Neighborhood greenway	Neighborhood greenway	NW 77th St at 24th Ave NW	Recommended Bicycle Network Map
26	Curb Ramps	Curb Ramps	24th Ave NW at NW 73rd St	dotMaps
27	Neighborhood greenway	Neighborhood greenway	NW 70th St at 24th Ave NW	Recommended Bicycle Network Map
28	Curb Ramps	Curb Ramps	24th Ave NW at NW 65th St	dotMaps
29	Neighborhood greenway	Neighborhood greenway	NW 64th St at 24th Ave NW	Recommended Bicycle Network Map
30	In-street facility with minor separation	In-street facility with minor separation	24th Ave NW (NW 58th St - NW Market St)	Recommended Bicycle Network Map
31	TPMC Proposed Investment Area	TPMC Proposed Investment Area	24th Ave NW (NW 58th St - NW Market St) / NW Market St (24th Ave NW - Leary Ave NW)	Route 40 TPMC 2025

ID	Improvement	Description	Extent	Source
32	Burke Gilman Trail Missing Link	New trail	Shilshole Ave NW at NW Market St	SDOT Bicycle Master Plan, 2021-2024 Implementation Plan, Regional Transportation Plan 2022-2050
33	Missing Link Bike Route Study on NW Market St - Leary Ave NW - 17th Ave NW	Missing Link Bike Route Study on NW Market St - Leary Ave NW - 17th Ave NW	NW Market St (24th Ave NW - 22nd Ave NW)	Current Projects
34	NW Market St / Leary Way NW / N 36th St Improvements	Reconstruct and make operational/ITS improvements to Leary Way NW corridor to facilitate freight movement. This project would coordinate specific truck operational improvements with the BINMIC Truck Route Improvements.	NW Market St (24th Ave NW - 22nd Ave NW) / Leary Way NW (15th Ave NW - NW 36th St) / N 36th St (Leary Way NW - Fremont Pl N) / Fremont Pl N (N 36th St - N 35th St)	Freight Master Plan
35	NW Market St Paving Project	Full concrete reconstruction of NW Market St between 24th Ave NW and 15th Ave NW (excluding intersections at 24th Ave NW and 15th Ave NW), Curb ramp upgrades and replacements, Sidewalk repair, Tree pit expansion, Water main upgrades, Stormwater drainage improvements	NW Market St (24th Ave NW - 15th Ave NW)	Current Projects
36	Bike Lanes	Add bike lanes on 20th Ave NW between Market and Leary by converting the parking to parallel paid parking all along route. Maintain 11 ft travel lanes and 5 ft bike lanes and 7 ft parking along the curbside.	20th Ave NW at NW Market St	dotMaps, Recommended Bicycle Network Map
37	15th Ave NW / NW Market St Intersection Improvement	Improve southeast corner curb radius, which would impact existing signal equipment.	15th Ave NW / NW Market St	Freight Master Plan
38	Road Upgrade	Paving, curb ramps, drainage improvements, electrical	15th Ave NW (NW Market St - NW Leary Way)	dotMaps

ID	Improvement	Description	Extent	Source
39	Seattle - 15th Ave W/NW and Ballard Bridge	Scope includes resurfacing and restriping 15th Ave W/NW from W Nickerson St to NW 58th St including the approach decks of Ballard Bridge. Concrete panels to be replaced on off ramps and upgrades made to bus stop pads. Curb repairs and curb ramps to be added.	15th Ave NW (NW Market St - Leary Way NW)	2023-2026 PSRC Regional TIP
40	Neighborhood greenway	Neighborhood greenway	NW 50th St at 15th Ave NW	Recommended Bicycle Network Map
41	Repaving	Repaving	15th Ave NW / Leary Way NW	Levy to Move Seattle AAC Paving Program
42	In-street facility with minor separation	In-street facility with minor separation	14th Ave NW at Leary Way NW	Recommended Bicycle Network Map
43	Neighborhood greenway	Neighborhood greenway	8th Ave NW at Leary Way NW	Recommended Bicycle Network Map
44	Neighborhood greenway	Neighborhood greenway	6th Ave NW at Leary Way NW	Recommended Bicycle Network Map, Neighborhood Greenways Program
45	Neighborhood greenway	Neighborhood greenway	NW 42nd St at Leary Way NW	Recommended Bicycle Network Map
46	In-street facility with minor separation	In-street facility with minor separation	NW 39th St at Leary Way NW	Recommended Bicycle Network Map
47	Neighborhood greenway	Neighborhood greenway	NW 39th St at Leary Way NW	Recommended Bicycle Network Map
48	Neighborhood greenway	Neighborhood greenway	1st Ave NW at NW 36th St	Recommended Bicycle Network Map
49	TPMC Proposed Investment Area	TPMC Proposed Investment Area	N 36th St (1st Ave NW - Fremont Pl N) / Fremont Pl N (N 36th St - N 35th St) / Fremont Ave N (N 35th St - Westlake Ave N)	Route 40 TPMC 2025

ID	Improvement	Description	Extent	Source
50	Sidewalk Safety Repair Program	Sidewalk safety repair program	N 36th St (Greenwood Ave N - Phinney Ave N)	dotMaps
51	Neighborhood greenway	Neighborhood greenway	Phinney Ave N at N 36th St	Recommended Bicycle Network Map
52	Speed and Reliability Corridor Improvements	Design and construct transit speed, reliability, and access improvements along Metro Route 36, a trolley bus route, operating between Othello Link Light Rail Station and Downtown Seattle (12th Ave S and S Jackson St) via Beacon Hill. Improvements may include transit signal priority, bus-only lanes, signage, bus zone bulb-outs, bus stop consolidation and optimization, improved lighting, crosswalk and sidewalk improvements, and other treatments. The project will design and implement Overhead Contact System modifications needed to accommodate the proposed improvements to maintain trolley bus operations.	3rd Ave (Pine St - Yesler Way)	Washington State S.T.I.P.
53	Cycle track	Cycle track	Fremont Ave N (N 35th St - N 34th St)	Recommended Bicycle Network Map
54	North 34th St and Fremont Ave intersection	Intersection improvements to ensure safe bicycle turning movements at this high bicycle volume crossing of the Ship Canal, especially bicyclists wanting to head westbound to Ballard without first traveling eastbound along N 34th St.	Fremont Ave N / N 34th St	Bicycle Master Plan
55	Shared street	Shared street	Florentia St at Fremont Ave N	Recommended Bicycle Network Map
56	In-street facility with minor separation	In-street facility with minor separation	Nickerson St at Westlake Ave N	Recommended Bicycle Network Map
57	Intersection improvements at 4th Ave N, Westlake Ave N, Dexter Ave N, and Nickerson St	Evaluate the intersection of 4th Ave N, Westlake Ave N, Dexter Ave N, and Nickerson St to improve freight mobility.	4th Ave N / Westlake Ave N / Dexter Ave N / Nickerson St	Freight Master Plan
58	TPMC Proposed Investment Area	TPMC Proposed Investment Area	Westlake Ave N (Fremont Ave N - Mercer St)	Route 40 TPMC 2025
59	Cycle track	Cycle track	Westlake Ave N (Aurora Bridge - 9th Ave N)	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
60	Road Upgrade	Rainier Asphalt pavement restoration along Westlake Ave N	Westlake Ave N (Highland Dr - Ward St)	dotMaps
61	Cycle track	Cycle track	Valley St at Westlake Ave N	Recommended Bicycle Network Map
62	RapidRide C Line Improvements	Previously named 'Seattle Priority Bus Corridor 1' (T2040 ID: 5097). Enhance existing RapidRide C operations with capital components to support efficient and convenient transit service. Capital improvements may include additional bus rapid transit speed and reliability measures such as dedicated running ways, transit signal priority and other ITS features, enhanced stations, specialized vehicles, enhanced fare collection systems, wayfinding, multimodal improvements and supporting facilities.	3rd Ave (Blanchard St - Yesler Way) / Blanchard St (Westlake Ave - 3rd Ave) / Lenora St (Westlake Ave - 3rd Ave) / Westlake Ave N (Valley St - Lenora St)	Regional Transportation Plan 2022-2050
63	In-street facility with minor separation	In-street facility with minor separation	Republican St at Westlake Ave N	Recommended Bicycle Network Map
64	Seattle - Harrison St Transit Pathway	Rebuild Harrison St and improve connecting transit corridors to serve high-frequency bus routes and significantly increased pedestrian activity. Primary project elements include roadway upgrades such as repaving and rechannelization, traffic signal upgrade	Harrison St at Westlake Ave N	2023-2026 PSRC Regional TIP
65	Neighborhood greenway	Neighborhood greenway	Thomas St at Westlake Ave N	Recommended Bicycle Network Map
66	Sidewalk Safety Repair Program	Sidewalk safety repair program	Westlake Ave N at John St and Thomas St	dotMaps

ID	Improvement	Description	Extent	Source
67	Thomas Street Project	Establish Thomas Street as the principal connection between Seattle Center, Uptown and the South Lake Union urban villages through the construction of a multi-use pathway between the north sidewalk and the vehicle travel lanes. This revised cross section will utilize the Thomas Street right of way to prioritize safety for people walking, biking and using transit to connect with the dense employment and entertainment hubs in these urban villages. Safety will be enhanced through the construction of a protected intersection at Dexter Ave N and a separation of the bike facility from the streetcar tracks between Westlake Ave N and Terry Ave N. The citywide bicycle network will be knit together by connecting the north-south routes along Dexter Ave N and 9th Ave N to this east-west connection. The separated multi-use pathway will extend from 5th Ave N to Fairview Ave N, further connection to the Eastlake Ave N protected bike lane will be made using a combination of neighborhood greenway and protected bike lanes.	Westlake Ave N at Thomas St	Regional Transportation Plan 2022-2050
68	Center City Gateway and S Michigan St ITS	The project will construct an ITS corridor along Denny Way between Western Ave and Stewart St and consist of traffic signal modifications including controller cabinet upgrades, 12'' LED signal heads, countdown pedestrian signal heads, Accessible Pedestrian Signals (APS) pushbuttons, traffic signal detection, and system detection. The project also includes new Closed Circuit Television (CCTV) cameras, one new Dynamic Message Sign (DMS), and Americans with Disabilities Act (ADA) compliant curb ramps.	Denny Way at Westlake Ave	Capital Projects Dashboard
69	Denny Way Paving Project	Mill and overlay repaving of Denny Way from approximately 5th Ave to Stewart Ave Mill and overlay repaving of Yale Ave from Denny Way to Howell St Select areas of base repair Curb ramp and drainage upgrades. "No turn on red" signage and stop bars at every signalized intersection Signal phasing modifications to enhance pedestrian access and safety Hardened centerlines reinforcing existing turn restrictions Intermittent sidewalk repair and replacement work Bus stop consolidation as requested by King County Metro to improve transit travel time and reliability	Denny Way at Westlake Ave	Current Projects, 2023-2026 PSRC Regional TIP, dotMaps
70	Denny Way ITS	Update signal timing, vehicle detection, CCTV cameras, dynamic message signs, and fiber communications to improve traffic flow and provide enhanced traveler information along Denny Way from I-5 to Western Ave.	Denny Way at Westlake Ave	Freight Master Plan, NODO Mobilit Action Plan

ID	Improvement	Description	Extent	Source
71	Priority Bus Corridor (Lower Queen Anne - South lake Union - Capitol Hill via Denny)	•Proposed Transit Improvements include - TSP, Electrification, Multimodal Projects, Pedestrian enhancements along Denny Way, • Design solutions to limit impact of I-5 ramps are needed • Conduct corridor study to analyze transit priority options for Denny Way • Investigate electrification options on Denny Way and Elliott/15th Ave • As primary east-west route, ensure seamless connections to north/south RapidRide routes and Capitol Hill Link Station	Denny Way at Westlake Ave	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
72	Interbay - Madison Park via Capitol Hill	Construct a new RapidRide line connecting Interbay to Madison Park via Capitol Hill. This project would improve the attractiveness of transit to a regional growth centers and include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use.	Denny Way at Westlake Ave	Regional Transportation Plan 2022-2050
73	Expand bus zone	Expand existing southbound bus zone at Westlake at Denny to accommodate two coaches.	Westlake Ave at Denny Way	dotMaps
74	Center City - 8th Ave	Protected bike lanes	8th Ave at Blanchard St and Westlake Ave	2021-2024 BMP Implementation Plan
75	In-street facility with minor separation	In-street facility with minor separation	Blanchard St (4th Ave - 7th Ave)	Recommended Bicycle Network Map
76	In-street facility with minor separation	In-street facility with minor separation	5th Ave at Blanchard St and Lenora St	Recommended Bicycle Network Map
77	Neighborhood greenway	Neighborhood greenway	Blanchard St (3rd Ave - 4th Ave)	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
78	Third Ave Transit Spine	This project was previously identified as the southern segment of Priority Bus Corridor 8 (T2040 ID:5095). The Third Ave Corridor is also an integral part of Priority Bus Corridor 7 (T2040 ID 5164); RapidRide Corridors 2, 3, 6, and 7 (T2040 ID: 5087, 5165, 5141, 5152); and RapidRide C, D, and E (T2040 ID: 5097, 5091, 4092). The project includes investments to increase capacity, optimize operations, and improve the traveler experience for transit in this corridor. The project reconfigures the corridor to increase transit capacity and improve operations, expanded transit stops, and installations to improve the traveler experience. The project incorporates ITS, wayfinding, traveler information systems, and electric trolley wire infrastructure. It also includes elements that support bus rapid transit such as dedicated running ways, transit signal priority features, and enhanced fare collection systems. Enhancements to improve access to transit may include pedestrian and bicycle access improvements and amenities such as secure and covered bike parking, digital kiosks, real-time information, lighting, and integrated access.	3rd Ave (Blanchard St - Yesler Way)	Regional Transportation Plan 2022-2050, 2019-2024 Proposed Capital Improvement Program
79	Priority Bus Corridor (Route 5)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Stop consolidation, Station Upgrades • Investigate multiple termination options on north end • Identify funding to complete improvements outside of Seattle city limits • Consider queue jump options to provide transit priority on Fremont Bridge • Coordinate design of transit priority treatments with ongoing Bicycle Master Plan facility planning on Phinney Ave N	3rd Ave (Blanchard St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
80	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	3rd Ave (Virginia St - Yesler Way)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
81	Road Repaving	3rd Re-Paving between Pine and Virginia	3rd Ave (Virginia St - Pine St)	dotMaps
82	Center City Connector	The project includes procurement of up to ten additional streetcars and design and construction of track and guideway; station shelters and platforms; overhead contact system; traction power substation; storage facility expansion; roadway and drainage; ADA curb ramps; curb space management; and urban streetscape. This project is on-hold pending the outcome of an assessment of engineering, design and financial analysis.	Stewart St at 3rd Ave	2019-2024 Proposed Capital Improvement Program, Seattle Transit Masterplan, 2023-2026 PSRC Regional TIP, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
83	Priority Bus Corridor (Pike/Pine - Center City)	• Pine Street BAT Lane between 3rd Avenue and 9th Avenue • The Pike/Pine Renaissance Plan provides streetscape design considerations for the western end of this corridor • SDOT is conducting a multimodal study for this corridor that will evaluate options for improving safety and mobility for all modes • Consider as early pilot corridor for off-board fare payment • Continue to implement access and transit priority treatments to avoid transit delay at congested intersections or corridor segments • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	3rd Ave at Pine St and Pike St	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
84	Westlake Multimodal Transportation Hub	Expand the multimodal hub area to accommodate increased transit service in Downtown and South Lake Union. Make improvements to improve transfer opportunities between transit and other modes, create clear routes and improved wayfinding, provide real-time transit rider information and maximize fare integration. Includes protected bike lane connections, enhanced street furniture, public art, enhanced pedestrian crossings, end-of-trip amenities like secure and covered bike parking, digital kiosks, integrated access amenities like passenger loading zones, dedicated car share stalls, and other multimodal connections. May include satellite access points.	3rd Ave (Pine St - Union St)	Regional Transportation Plan 2022-2050
85	Seattle CBD - Sand Point - Green Lake	Construct a new RapidRide line connecting Seattle CBD - Sand Point - Green Lake. This project will improve the attractiveness of transit between two Regional Growth Centers and will include the following elements: New transit only or BAT lanes on existing or new right of way along some of the proposed route to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; Upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops.	3rd Ave (Pine St - Yesler Way)	Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
86	Priority Bus Corridor (Jefferson/ Yesler)	• Some bus stops have been consolidated and passenger facilities upgraded • The City of Seattle is investing heavily in improved midday service in the corridor • 3rd Avenue Transit Corridor Improvements will enhance the pedestrian environment at the intersection of this corridor with the 3rd Avenue Transit Spine • Pioneer Square Active Streets Strategy recommends a number of improvements for enhancing pedestrian safety, security and vibrancy of street life on the western end of this corridor; some strategies have been implemented Electrification of Yesler Way (2nd to 9th) and 9th (Yesler to Jefferson) to reduce turning movements off of Third Avenue and to avoid freeway-related congestion on James Street • Enhance pedestrian access, particularly around medical center and at key intersections • Provide in-lane bus stops • Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed • Add transit-only lanes or peak period parking restrictions in congested segments of the corridor, particularly where I-5 ramps create peak period traffic congestion • Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities	3rd Ave (Pine St - Yesler Way) / Yesler Way (3rd Ave - 9th Ave) / E Jefferson St (Broadway - 13th Ave)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
87	Pike Streetscape and Bicycle Improvement	Pike Streetscape and Bicycle Improvement	Pike St at 3rd Ave	dotMaps
88	Cycle track	Cycle track	Union St at 3rd Ave	Recommended Bicycle Network Map
89	Cycle track	Cycle track	Seneca St at 3rd Ave	Recommended Bicycle Network Map
90	Cycle track	Cycle track	Spring St at 3rd Ave	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
91	Rapid Ride G Line Projects	Spring St: EB bus only lane, EB protected bike lane, station at SW corner Madison St: WB bus only lane, station at NW corner	3rd Ave at Spring St and Madison St	Seattle Transit Master Plan, Capital Projects Dashboard, dotMaps, Current Projects, Regional Transportation Plan 2022-2050
92	Safety Improvements	Curb bulbs, bike lane shift/crossbike, some concrete panel replacement	Yesler Way (3rd Ave - 4th Ave)	dotMaps
93	Protected Bike Lanes	Upgrade the existing two-way bike lane on the Southwest side of 4th Ave to a protected bike lane with barrier separation. Barriers placed to not interfere with loading zones, driveways, and other areas which require street side access	4th Ave S at Yesler Way	Current Projects, Recommended Bicycle Network Map, 2021-2024 BMP Implementation Plan, dotMaps
94	Neighborhood greenway	Neighborhood greenway	Terry Ave at Broadway	Recommended Bicycle Network Map
95	Parking Lane Markings	Adding a parking lane line & signage to indicate extent of parking lane.	Broadway Ave (E Fir St - E Spruce St)	dotMaps
96	Vision Zero Improvements	Implementation of Vision Zero 12th Ave project for spot improvements and possible rechannelization along 12th Ave E/12th Ave/ 12th Ave S corridor.	12th Ave (E Cherry St - E Jefferson St)	dotMaps
97	In-street facility with minor separation	In-street facility with minor separation	E Cherry St at 12th Ave	Recommended Bicycle Network Map

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the Route 40 corridor. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities (not included in Route 40)
- Charging infrastructure[8]
- Trolley infrastructure (not included in Route 40)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 14. For transit speed and reliability improvements, refer to Figure 21. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 14.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 37.

[8] For non-trolley routes only.

Figure 37 Order-of-Magnitude Project Costs

	Category	% of Total		Costs
	Stops and Stations	37%	$	12,420,000
	Transit Speed and Reliability Improvements	54%	$	17,960,000
	Layover and Terminus Facilities	-		-
	Charging Infrastructure	9%	$	3,000,000
	Trolley Infrastructure	-		-
	Construction Base Subtotal		***$***	***33,380,000***
2%	Stormwater Upgrades		$	670,000
3%	Traffic Control		$	1,010,000
10%	Mobilization		$	3,340,000
2%	TESC		$	670,000
	Subtotal Construction Cost		***$***	***39,070,000***
10.1%	Sales Tax		$	3,950,000
10%	Construction Contingency		$	4,310,000
40%	Contingency (Design Allowance and Risk)		$	18,940,000
	Total Construction Cost		***$***	***66,270,000***
10%	Project Management		$	6,630,000
5%	Planning		$	3,320,000
15%	Engineering/Design		$	9,950,000
10%	Construction Management		$	6,630,000
3%	Environmental Review		$	1,990,000
2%	Permitting		$	1,330,000
	Total Project Cost		***$***	***96,120,000***

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the Route 40 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational ROW. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – While the route crosses several designated view corridors, the improvements associated with Route 40 will be consistent with the existing visual character of the surroundings and is not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, Route 40 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – While Route 40 traverses Salmon Bay via a bridge, the project will remain within the operational right-of-way and is not anticipated to have an impact on the navigability or water quality of Salmon Bay.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Acquisitions and Displacements – At present, there are no identified requirements for permanent easements or property acquisitions along Route 40.
- Floodplains – Route 40 is situated adjacent to a Federal Emergency Management Act (FEMA) 100-year floodplain on the south-branch of Thornton Creek. Improvements associated with the project are not anticipated to occur within the floodplain.
- Air Quality - The project is expected to contribute to long-term improvements in air quality. Temporary impacts will be minimized through standard Best Management Practices (BMPs) for air quality and no adverse effects are anticipated.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources.

13.3a Cultural Resources

In order to comprehensively identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The Route 40 corridor passes through a number of historic districts, notably Ballard Avenue Historic District, Pioneer Square--Skid Road Historic District, and the Yesler Terrace Low Income Housing Project. Adjacent to the corridor are properties listed in both the National Register of Historic Places and the Washington National Heritage Register, including significant sites such as Seattle Carnegie Library - Ballard Branch, Ballard Fire Station No. 18, Fremont Building, Bon Marche Department Store, United Shopping Tower, Northern Life Tower, Seattle First Public School Site, Arctic Building, Rector Hotel, Lyon Building, and the Battle of Seattle Site. Additionally, Route 40 traverses the Fremont Bridge which crosses over the Chittenden Locks and Lake Washington Ship Canal and passes underneath the Aurora Avenue Bridge.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located along the 15th Avenue segment, Leary Way segment, and in Downtown Seattle.

A high-level desktop review was conducted on Ecology cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the Department of Ecology (Ecology) cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. Any contaminated soils encountered would be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the Route 40 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

A comprehensive traffic operational analysis was conducted to evaluate the transit travel time benefits of proposed improvements at 75 intersections along Route 40. The analysis revealed that at 17 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 14 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

The removal of parking for conversion to a bus or BAT lane along the corridor would have a potential adverse effect. The removal of parking spaces and opportunities for mitigation will need to be evaluated in a transportation technical report, including a parking study.

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the project's aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along Route 40 can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The FTA Transit Noise and Vibration Impact Assessment Manual (FTA 2018) notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads.

BMPs could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces. This is the case even for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the Route 40 corridor reveal known critical areas susceptible to landslides and liquefaction. The portion of Route 40 which traverses Westlake Ave N, along Lake Union, until the intersection with 8th Ave N is a potential landslide and liquefaction area.

The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations. The identified landslide and liquefaction area will be considered for their potential to impact the project during design.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces, and it is situated within three different stormwater basins. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the City of Seattle Stormwater Code and Manual, and water quality treatment may be required based on the square footage of pollution-generating impervious surfaces (PGIS) created. Mitigation measures encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control (if applicable, as per the City of Seattle requirements), and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP) or TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

The portion of the alignment on 5th Ave NE, north of NE 103rd Street runs adjacent to a Freshwater/Forested Shrub Wetland at Thornton Creek. Additionally, the portion of the project on Holman Road between 7th Ave NW and 8th Ave NW passes through a wetland in a riparian corridor of a tributary to Piper's Creek.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the location of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur.

Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.4 Cumulative and Indirect Impacts

Route 40 serves the city of Seattle. The existing conditions for cumulative and indirect effects are relevant only to locations where an investment is proposed. Planned projects along the corridor include roadway changes and investments in biking and walking and are described in Figure 36, List of Planned Jurisdictional Investments. Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. To address this, comprehensive impact assessments will be conducted, and measures will be implemented to address cumulative effects. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of “facility modernization” that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

However, if the loss of parking is substantial enough that it causes public controversy or possible significant adverse impacts, FTA may require an Environmental Assessment to be prepared. This would be unusual but not without precedent in Seattle—the former Roosevelt RapidRide (now J Line) BRT went through an EA process at least in part because of the amount of potential parking loss.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Air Quality Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit

RapidRide Prioritization Plan

Corridor 1999 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

Table of Contents

Corridor Summary

Corridor 1999 | B Line/226 — CORRIDOR SUMMARY

Ridership

No Build

+19%

RapidRide Corridor 1999

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour

+0.1

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour

25.7

Weekday boardings per revenue hour with RapidRide investment in 2042.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Travel Time

Proposed Travel Time Savings

-15%

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time

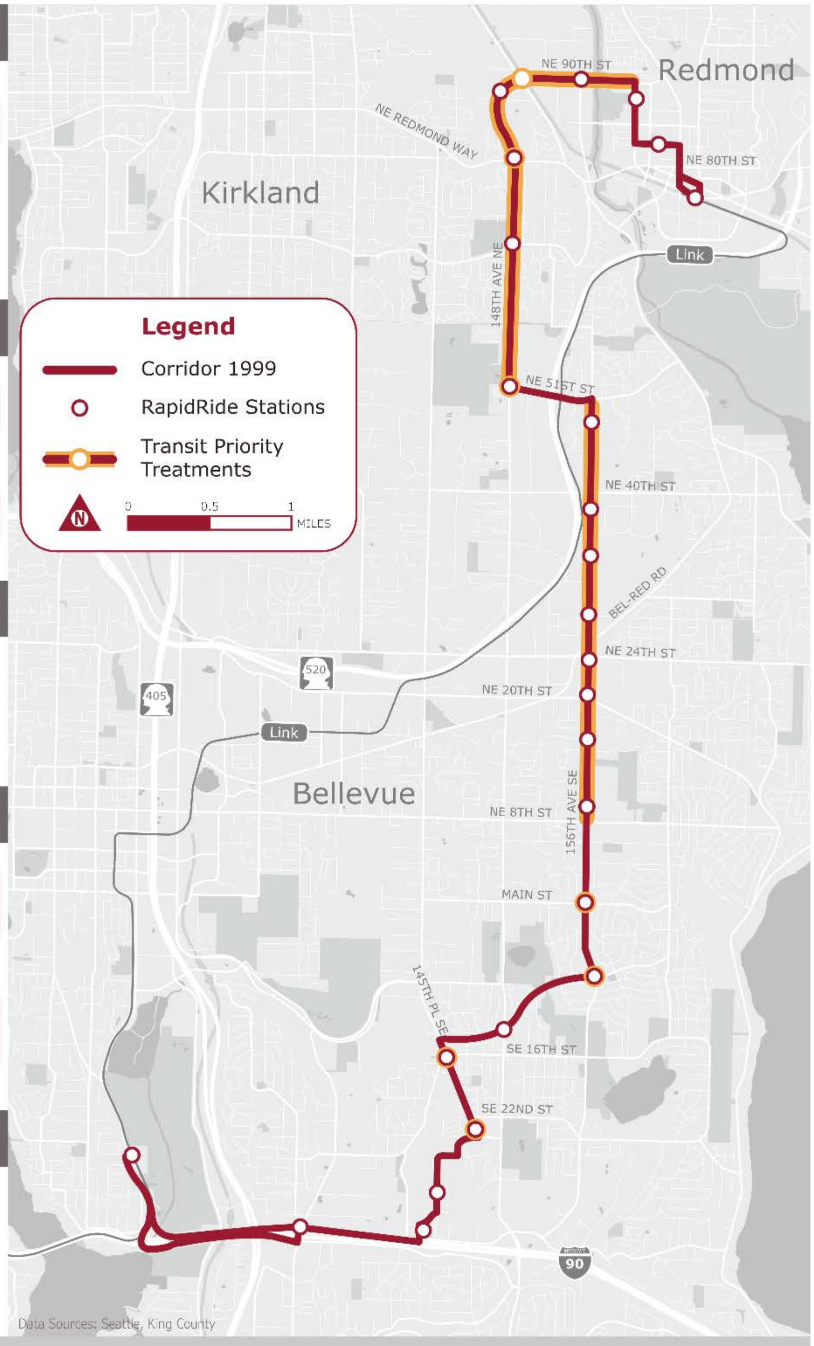
43

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Equity Priority Area Score

3.6

Average area of need score within 1/2 mile of station locations.



Data Sources: Seattle, King County

RAPIDRIDE

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

The project provides planning and related services to King County Metro (KCM) to determine the corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G) and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101 + 1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 1999 (RapidRide B Line and 226). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 1993 is currently served by B Line and Route 226. B Line connects Downtown Bellevue to Downtown Redmond along NE 8th St and 148th Ave NE, providing access to the Overlake Village area and Microsoft headquarters. Route 226 connects Downtown Bellevue to Eastgate Park and Ride via Bel-Red Road, Northeast Bellevue, Lake Hills and Bellevue College. The corridor is largely suburban but serves a high concentration of jobs.

The Corridor 1993 would be a mix of the northern portion of B Line (from Downtown Redmond to NE 8th St) and the southern portion of Route 226 (from NE 8th St to Eastgate Park and Ride). The other half of B Line (to Downtown Bellevue) would be integrated into another RapidRide corridor (3101+1028), which is documented in a separate corridor report.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would operate from Downtown Redmond through Overlake Village and the Bellevue College Connection to South Bellevue Link Station.

This project conducted a high-level review of the Metro Connects 2050 and interim alignments, as well as the existing alignments for the B Line and Route 226 to identify an alignment to be carried forward for analysis.

2.2 Representative Alignment

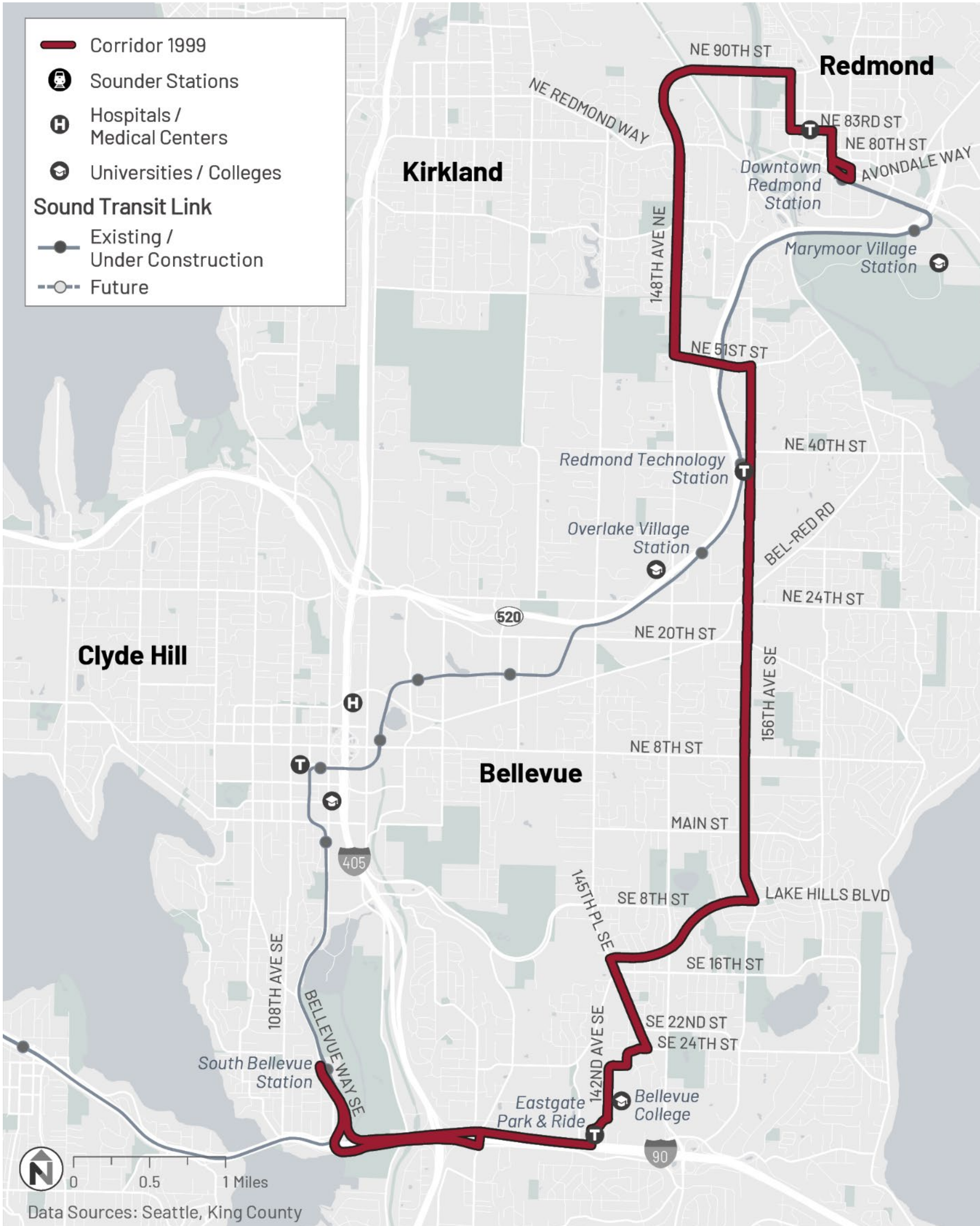
The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. These changes include modifying the alignment in Redmond to continue serving the Redmond Transit Center along NE 83rd Street, and to connect Eastgate Park and Ride with South Bellevue Station via SE Eastgate Way, rather than via 142nd Pl SE and I-90.

Figure 2 highlights all the differences in the final representative alignment relative to the existing B Line and Route 226, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Final Alignment Changes

Alignment Change	Change from… B Line / 226	Metro Connects	Recommended Alignment in Screening
Move northern terminus from Redmond Transit Center to Downtown Redmond Link Station as part of Link restructure.	✓	✗	✗
Operate along NE 83rd St in Redmond between 160th Ave NE and 164th Ave NE.	✓	✗	✓
Transition from 148th Ave NE to 156th Ave NE along NE 51st St.	✓	✓	✗
Avoid deviation to Overlake Village, and maintain service on 156th Ave NE.	✓	✓	✗
Operate along 145th Pl SE and Lakes Hills Boulevard, rather than 156th Ave SE and SE 22nd St, or 148th Ave SE and Lake Hills Boulevard.	✓	✓	✗
Assume Bellevue College Connection, rather than service through the center of Bellevue College	✓	✗	✗
Operate through the Eastgate Park and Ride bus loop and along SE Eastgate Way instead of along 142nd Pl SE and I-90 to connect to South Bellevue Link Station	✓	✓	✓

Figure 3 Corridor Overview



King County METRO

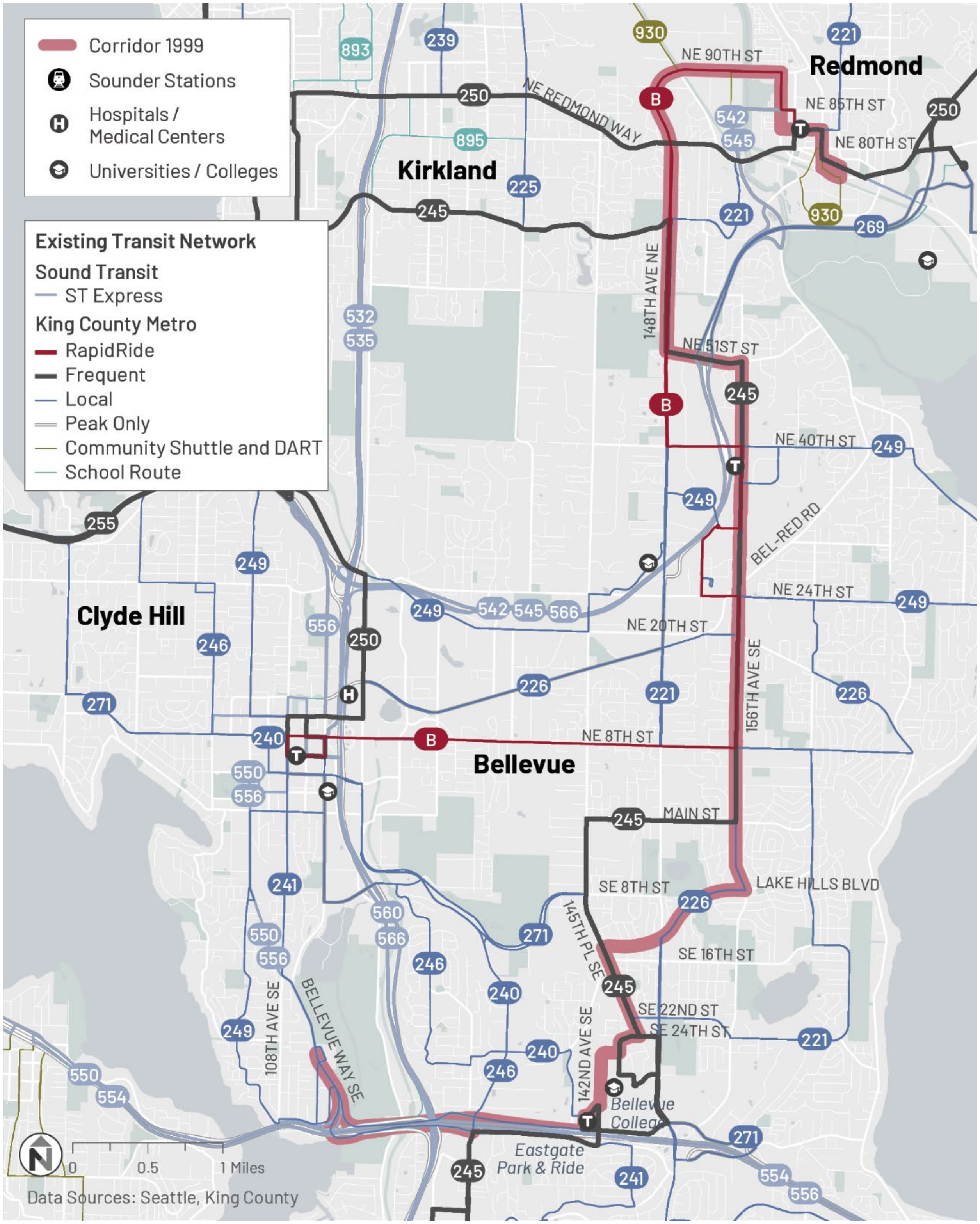
3.0 Transit Network

The RapidRide B Line currently provides frequent bus service between the downtowns of Redmond and Bellevue, while Route 226 operates local bus service between Downtown Bellevue and Eastgate Park & Ride. Corridor 1999 largely follows portions of the existing B Line and Route 226 alignments, connecting Downtown Redmond to Eastgate Park & Ride and south Bellevue. Redmond Transit Center in Downtown Redmond, Redmond Technology Station in south Redmond, and Eastgate Park & Ride and South Bellevue Station in Bellevue act as transit hubs connecting Corridor 1999 to additional local and regional bus service.

3.1 Future Network Changes

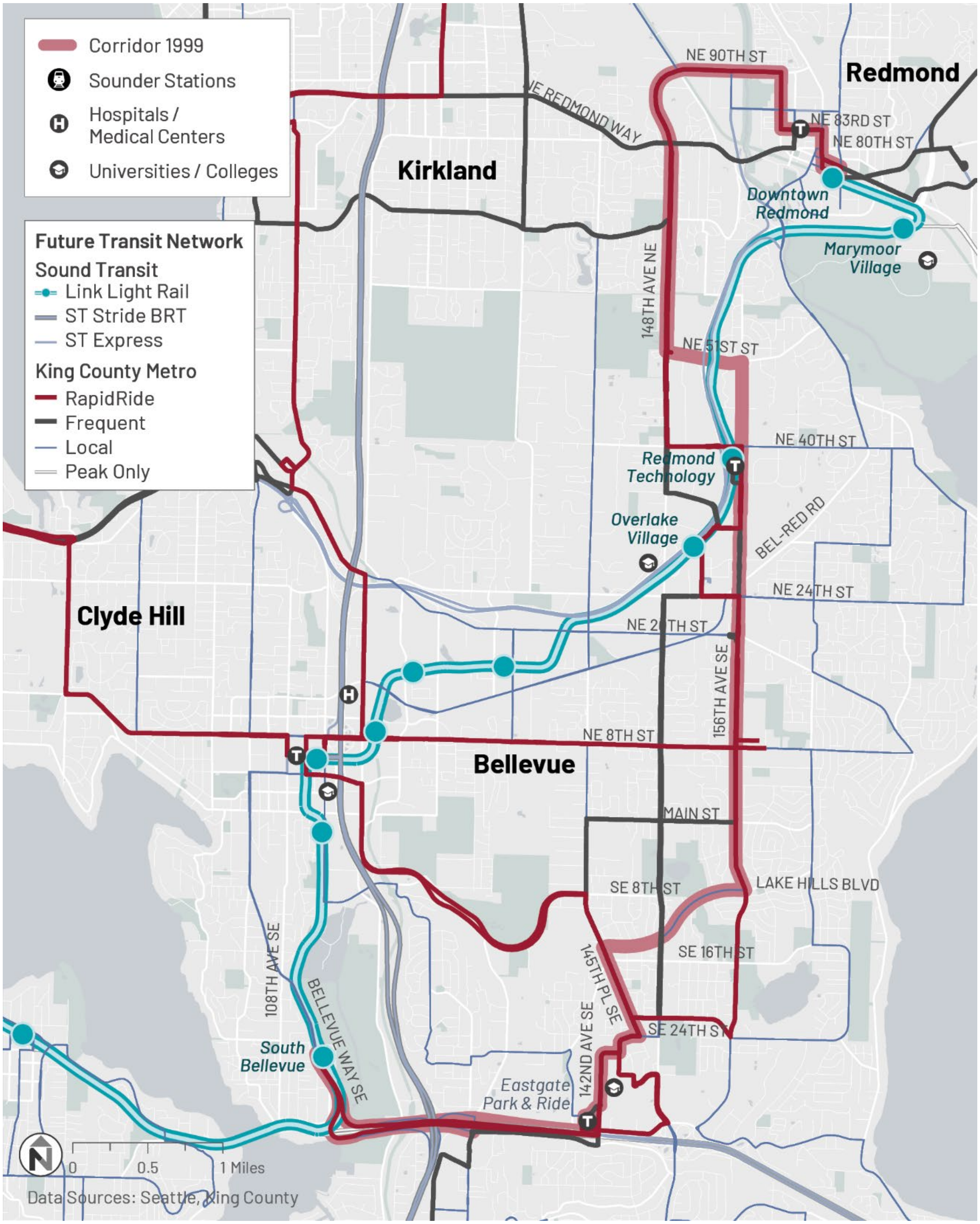
The Metro Connects Interim Network assumes connections between Corridor 1999 and several new transit lines along the alignment. In Redmond, Corridor 1999 would connect to Link light rail service at the Downtown Redmond and Redmond Technology Stations. An additional connection to Link light rail service would be provided at South Bellevue Station, the route's southwestern terminus. New RapidRide service would connect to Corridor 1999 at NE 8th Street in east Bellevue and near Bellevue College in south Bellevue. Redmond Transit Center in Downtown Redmond, Overlake Transit Center in south Redmond, and Eastgate and South Bellevue Park & Rides in Bellevue would continue to act as transit hubs connecting Corridor 1999 to additional local and regional bus service.

Figure 4 Existing Transit Network



King County METRO

Figure 5 Metro Connects Interim Network



King County METRO

4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained. In instances where multiple routes are combined, and one route already exceeds the standard, the service levels are assumed to strike a balance between the two routes while still achieving the standard.

4.2 Existing Service Levels

RapidRide B Line currently operates frequent service for most of the day, every day. It operates every 15 minutes or better on weekdays between 6 am and 10pm, and every 15 minutes on Saturdays and Sundays between 6 am to 10 pm. On weekday peak periods, RapidRide B Line operates 12 minutes or better from 6 am to 10 am, and from 3 pm to 8 pm. Service operates early in the morning (between 4 am and 6 am) or at night (from 10 pm to 2 am) at lower frequencies, primarily every 30 to 60 minutes.

Route 226 operates infrequent service all days of the week. On weekdays, Route 226 operates every 30 minutes from 6 am to 8 pm, with 60-minute service from 5 am to 6 am and from 8 pm to 1 am. On Saturdays, Route 226 runs every 60 minutes from 5 am to 10 am, 30 minutes from 10 am to 4 pm, and every 60 minutes from 4 pm to midnight. Route 226 runs every 60 minutes from 5 am to midnight on Sundays.

Figure 6 Existing B Line Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>45</td><td>30</td><td>12</td><td colspan="2">10</td><td>12</td><td colspan="5">15</td><td>12</td><td colspan="3">10</td><td>12</td><td colspan="2">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td>60</td><td colspan="16">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td>60</td><td colspan="16">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

Figure 7 Existing Route 226 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td></td><td>60</td><td colspan="14">30</td><td colspan="5">60</td><td></td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td colspan="5">60</td><td colspan="6">30</td><td colspan="8">60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td colspan="19">60</td><td></td><td></td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency on weekdays, Metro would need to increase B Line frequency by adding one additional trip per hour for 6 to 7 am and 3 to 4 pm. This will ensure 10-minute service for Weekday peak periods.

Route 226 would need to add additional trips for almost all hours and all days of the week. On Weekdays, Route 226 would need to add four additional trips per hour for morning and afternoon peak periods, which is between 6 am and 9 am, and between 3 pm to 7 pm. Route 226 also needs to add two additional trips per hour for midday service between 9 am and 3 pm, and one additional trip per hour for evening service between 8 pm and midnight. On Saturdays, Route 226 would need three additional trips per hour between 6 am and 10 am, and between 4 pm and 7 pm. It also needs one additional trip per hour between 7 pm and midnight on Saturdays. On Sundays, Route 226 would need three additional trips per hour between 6 am and 7 pm, and one additional trip per hour between 7 pm and midnight. These additions would ensure 15-minute service on Weekday off-peak periods, Saturdays, and Sundays, and 10-minute service on Weekday peak periods per the RapidRide standard.

Figure 8 and Figure 9 (B Line and Route 226, respectively) show the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 9 and Figure 11 (B Line and Route 226, respectively) show the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

Figure 8 Additional Trips to Meet Minimum RapidRide Standards (B Line)

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 9 Additional Trips to Meet Minimum RapidRide Standards (Route 226)

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	-	-	4	4	4	2	2	2	2	2	2	4	4	4	4	-	1	1	1	1	-	-	-	-
Saturday	-	-	3	3	3	3	2	2	2	2	2	2	3	3	3	1	1	1	1	1	-	-	-	-
Sunday	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	-	-	-	-

Figure 10 Changes to Frequency and Span to Meet Minimum Standard (B Line)

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	45	30	10	10		12			15			10		10		12	15		20	30		60		
Saturday		60								15									20	30		60		
Sunday		60								15									20	30		60		

Source: King County Metro GTFS May 2023

Figure 11 Changes to Frequency and Span to Meet Minimum Standard (Route 226)

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday		60		10				15					10					30			60			
Saturday		60								15								30						
Sunday		60								15								30						

Source: King County Metro GTFS May 2023

4.4 Future Service Levels

When combining B Line and Route 226 together into a single RapidRide corridor, the service levels of the new route are assumed to exceed the RapidRide standard due to higher existing service levels on the B Line.[1] The proposed frequency and span of the combined route would be comparable to the current B Line. The proposed span and frequency are shown in Figure 12.

Figure 12 Proposed Frequency and Span

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60	30	10	10	10	12	15	15	15	15	15	10	10	10	10	12	15	20	30	30	30	60		
Saturday		60	15	15	15	15	15	15	15	15	15	15	15	15	15	15	20	20	30	30	30	60		
Sunday		60	15	15	15	15	15	15	15	15	15	15	15	15	15	15	20	20	30	30	30	60		

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round-trip will take 87 minutes during the PM peak and 69 minutes during off-peak hours. Assuming the

[1] B Line exceeds the minimum RapidRide standards on weekdays between 4 am and 6 am (minimum standard has no service before 6 am), between 9 am and 10 am (standard is for service every 15 minutes), between 7 pm and 10 pm (standards is for service every 30 minutes), and after midnight (minimum standard has no service after midnight). On Saturday and Sunday, B Line exceeds the standard before 6 am, after midnight, and between 7 pm and 10 pm.

service hours on the portions of B Line and Route 226 along the alignment,[2] Metro would need to add approximately 23 service hours each weekday (or a 18% increase), 17 hours on Saturday, and 26 hours on Sundays.

Figure 13 summarizes the changes needed between existing service (for relevant portions of the routes only) and future service assuming build conditions. King County Metro would not need any additional buses on weekdays or Saturdays but would need one additional bus on Sundays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 13 Change in Future Service Levels

Service Day	Existing B | 226	Build 2035	Change	Percent
Daily Service Hours				
Weekday	100 | 25	148	+23	+18%
Saturday	75 | 15	107	+17	+19%
Sunday	69 | 12	107	+26	+33%
Daily One-Way Trips				
Weekday	173 | 66	178	-	-
Saturday	139 | 48	140	-	-
Sunday	139 | 36	140	-	-
Fleet				
Weekday	9 | 2	11	0	0%
Saturday	5 | 1	6	0	0%
Sunday	4 | 1	6	+1	+20%

Source: King County Metro GTFS May 2023 and Synchro modeling.

Note: Existing values account for the portions of B Line and Route 226 along the corridor alignment only.

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require at least two layover spaces on each end of the corridor if layover time is distributed proportionally between both termini.[3]

[2] Route 226 between Eastgate Park and Ride and NE 8th St, and B Line between NE 8th St and Redmond Transit Center.
[3] A one-way travel time of approximately 42 to 45 minutes requires a layover of 9 minutes (20% layover). With buses every 10 minutes, there could be two buses laying over at one time. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a South Bellevue Station

South Bellevue Station is a future Link station for the 2 Line along Bellevue Way north of I-90. The station will open on April 27, 2024. The station includes a park-and-ride and several bus bays for connecting transit services. Today, four routes (Routes 241, 249, 550, 556) use the station, but only one route (Route 249) uses the station as a terminus. There are no planned charging facilities on-site.

With the proposed changes for East Link, the layover will be used more intensively with Routes 111, 203, 226, and 249 all terminating at South Bellevue Station. They are expected to use five of the six layover spaces. Additional capacity may be needed for the B/226 RapidRide.

4.5b Downtown Redmond Station

Downtown Redmond Station is the future Link terminus station in Downtown Redmond. This station is being developed, and there are no existing layover facilities here. The site will include provisions for on-street bus stops and layover zones. There are no planned charging facilities on-site.

With East Link, B Line is planned to extend from the existing Redmond Transit Center terminus to a new one at the Downtown Redmond Station, laying over NE 76th Street in the eastbound direction, along with a new Route 223. This location has layover capacity for four coaches.

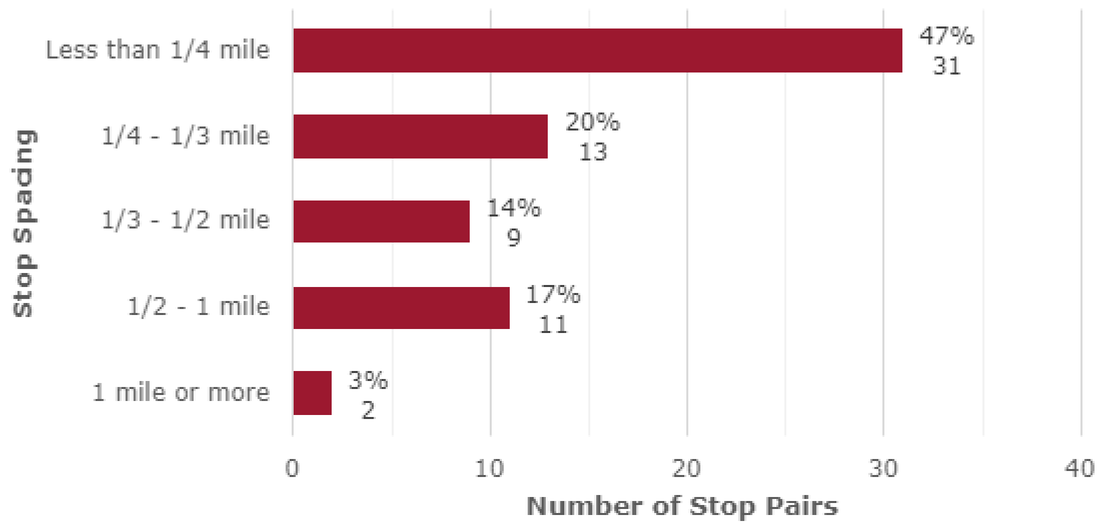
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 1,980 feet (or around one-third mile).

Approximately 45% of stop pairs along the corridor are less than a quarter mile apart, and with an additional 20% between a quarter and third of a mile (Figure 14).

Figure 14 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

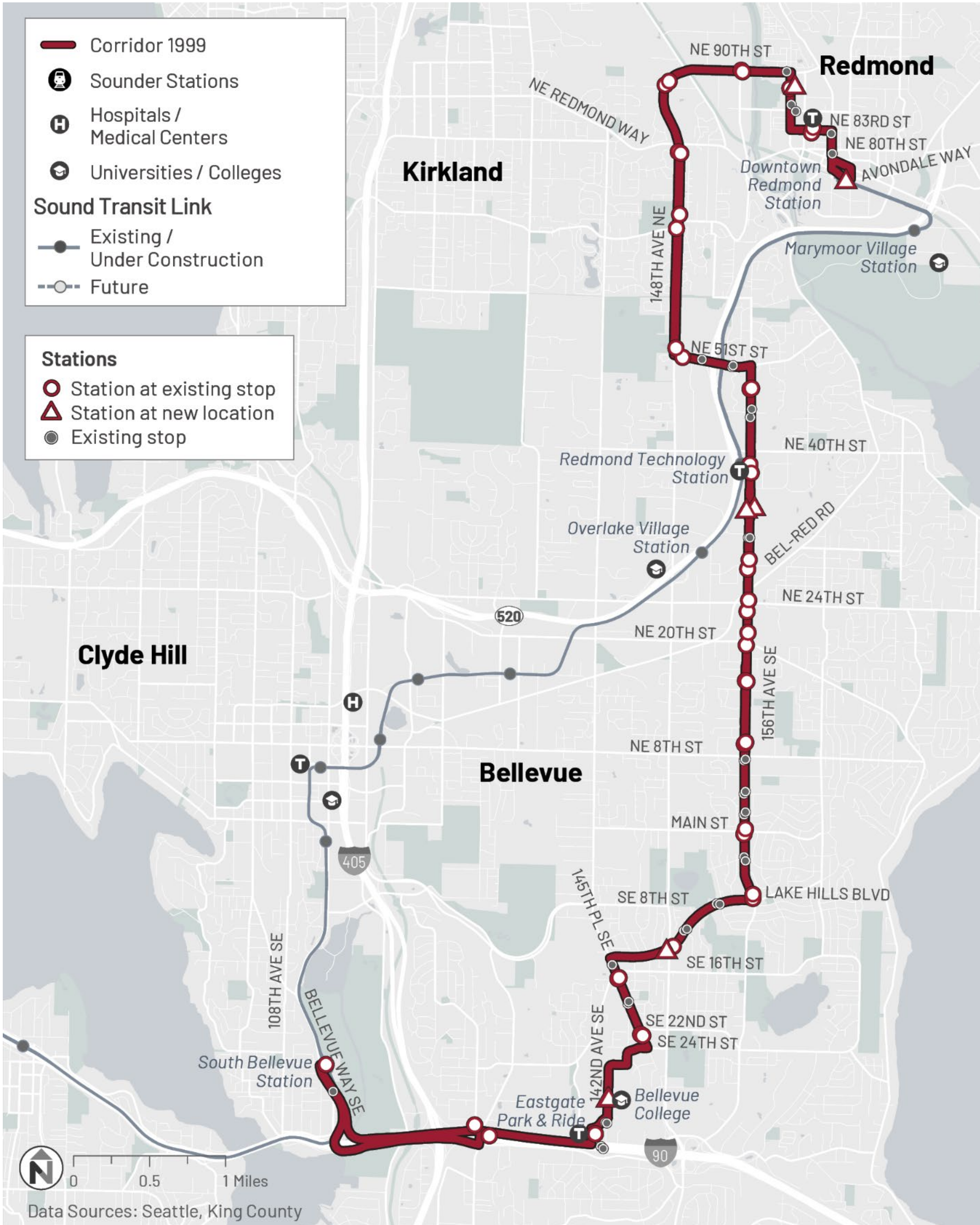
The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the

locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 15. The average spacing would be 2,840 feet (or approximately a half mile), which aligns well with the RapidRide standards and reflects some station consolidation along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 15 Proposed Station Locations



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5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 16, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 56.

Figure 16 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 36), each station is categorized into one of the four potential station typologies. The typologies are listed in Figure 17 and summarized in Figure 17.

Figure 17 Station Boardings and Typology

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
1	Downtown Redmond Link Station	280	-	NA*	-
2	Redmond Transit Center	270	80	Large	Medium
3	160th Ave NE & 90th St	100	150	Medium	Large
4	NE 90th St & 154th Ave NE	30	50	Small	Medium
5	148th Ave NE & NE 87th St	200	20	Large	Small
6	148th Ave NE & NE Redmond Way	70	10	Medium	Small
7	148th Ave NE & NE Old Redmond Rd	180	60	Large	Medium
8	148th Ave NE & NE 51st St	70	90	Medium	Large
9	156th Ave NE & NE 51st St	50	50	Medium	Medium

#	Station	Forecast Boardings SB	Forecast Boardings NB	Typology SB	Typology NB
10	156th Ave NE & Redmond Technology Station	200	440	NA*	Large Raised
11	156th Ave NE and NE 33rd St	40	40	Small	Small
12	156th Ave NE & NE 28th St	30	70	Small	Medium
13	156th Ave NE & NE 24th St	50	60	Large	Medium
14	156th Ave NE & NE 20th St	40	160	Small	Large
15	156th Ave NE & NE 15th St	100	90	Large	Large
16	156th Ave NE & NE 10th St	20	50	Large	Large
17	156th Ave SE & Main St	60	40	Medium	Small
18	156th Ave SE & Lake Hills Blvd	20	60	Small	Medium
19	Lake Hills Blvd & 148th Ave SE	10	20	Small	Small
20	145th Pl SE & SE 16th St	30	30	Small	Small
21	145th Pl SE & SE 22nd St	10	10	Small	Small
22	Bellevue College	50	70	Medium	Medium
23	Eastgate Park & Ride	10	30	Small	Small
24	Eastgate Way & Richards Rd	40	10	Small	Small
25	South Bellevue Station	-	180	-	Large

* Note: Station to be added or updated as part of separate work for integration with 2 Line (East Link).

Figure 18 Station Typology Summary

Station Type	Count	Percent
Large Raised Station	1	2%
Large Station	12	26%
Medium Station	14	30%
Small Station	19	41%
Total	**46**	**100%**

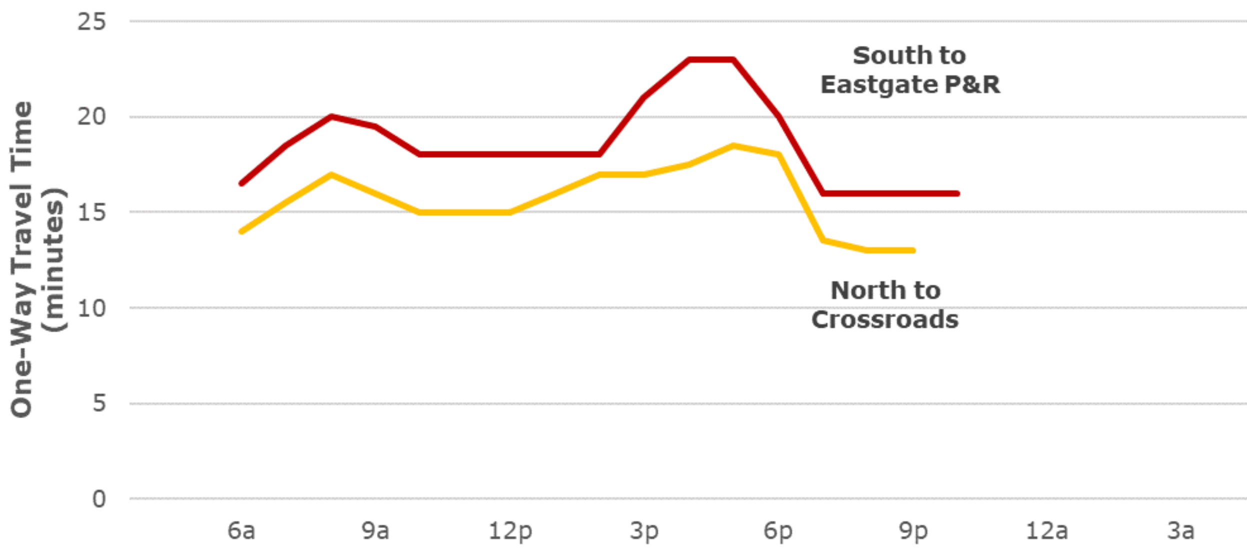
6.0 Speed & Reliability

6.1 Existing Travel Time

Scheduled travel times per direction for *Route 226* in May 2023 between Eastgate Park and Ride and Crossroads ranged between 13 minutes (at night) to 23 minutes (during the PM peak). On average a one-way trip took 17 minutes.

Scheduled travel times per direction for *B Line* in May 2023 between Crossroads and Redmond Transit Center ranged between 16 minutes (in the early morning) to 37 minutes (during the PM peak). On average a one-way trip took 27 minutes.

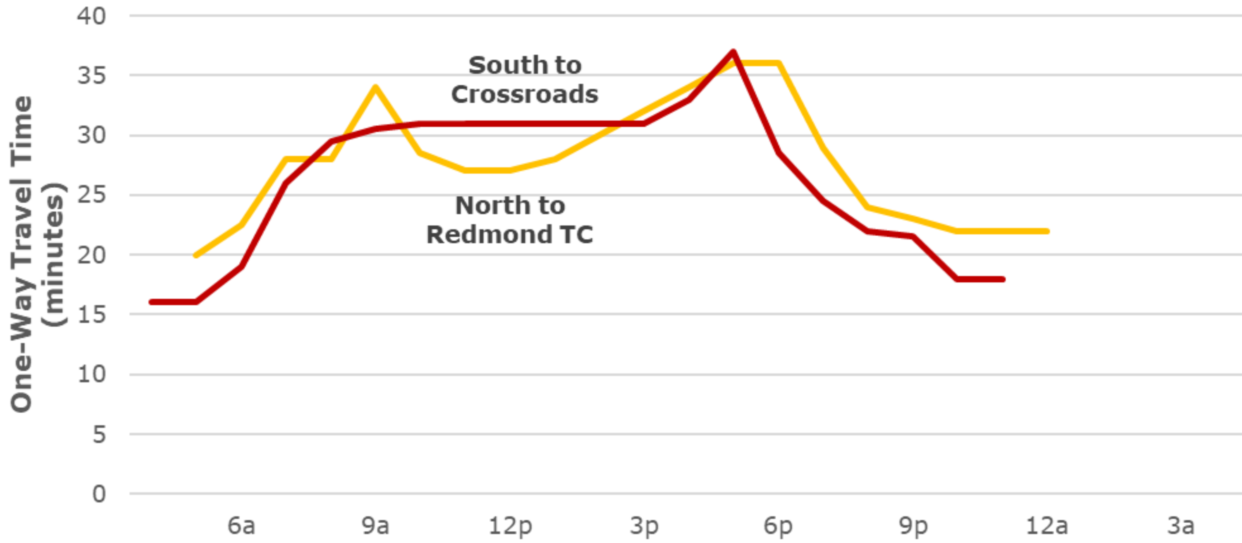
Figure 19 Route 226 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

Note: Represents the Route 226 portion between Eastgate P&R and Crossroads only.

Figure 20 B Line Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

Note: Represents the B Line portion between Crossroads and Redmond TC only.

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

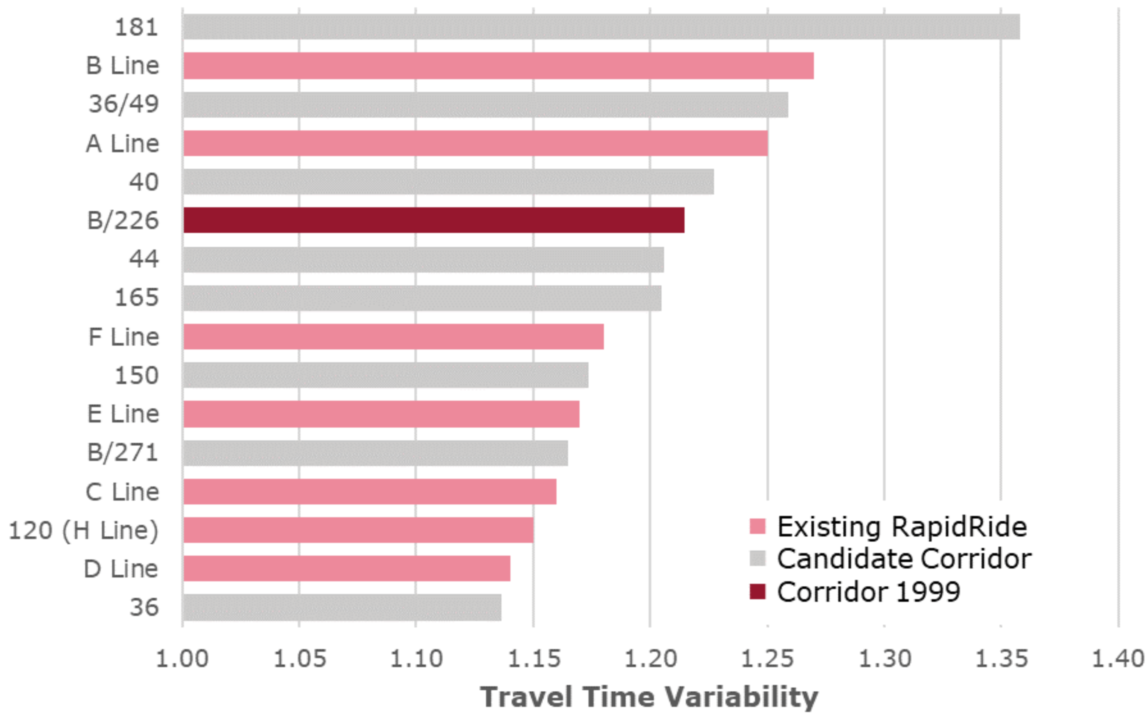
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 1999 experiences delay of 14 minutes between the 20th and 80th percentile travel time. This is approximately 0.78 minutes (47 seconds) of trip delay per mile on an average trip. This is the fourth lowest delay of all nine candidate corridors.

For Route 226, westbound and eastbound trips at 4 PM and 5 PM have the longest observed travel times. For B Line, east/northbound trips at 6 PM and west/southbound trips at 6 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) ranges from 1.12 to 1.21. This indicates the longest travel times (slowest trips) take 12-21% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 1999's performance is typical. This comparison is shown in Figure 21.

Figure 21 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 22.

Figure 22 Speed & Reliability Summary

Metric	Value
On-time performance[A]	72%
Average speed	20.6 mph
Average trip delay[B]	14.0 min
Average trip delay per mile	47 sec
Lowest median hourly travel time (Reference)[C]	24 min
Highest median hourly travel time	30 min[D]
Travel time variability[E]	1.21

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly run time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 4 PM for southbound trips, from Fall 2021.

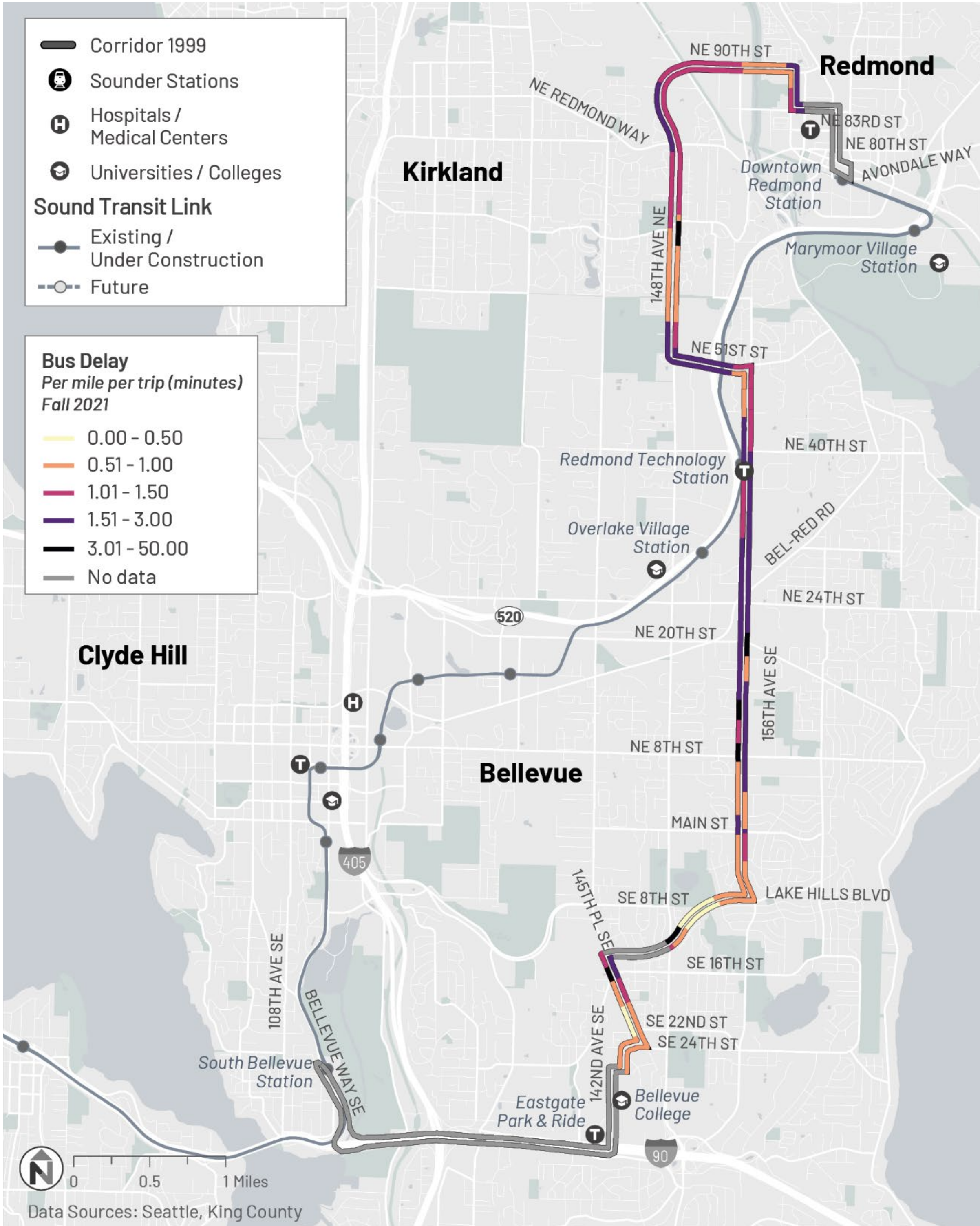
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 23 shows the delay along Corridor 1999 based on King County Metro's AVL data from Fall 2021.[4] The segments shown are existing stop pairs along the representative alignment, not just the B Line and 226 stop pairs, but also Route 245. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

Delay is present at portions of the corridor along 156th Ave SE near Microsoft Headquarters, including near Redmond Technology Station. Other locations of high delay include turn movements from 148th Ave NE to NE 51st St.

[4] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 23 Corridor 1999 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

Figure 24 and Figure 25 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

Most of the corridor experiences moderate all-day delay. Northbound travel sees high all-day delay at the intersection of 156th Ave NE & Northup Way and southbound travel sees high all-day delay at the intersection of 156th Ave NE & NE 8th St near Crossroads Bellevue shopping mall. Southbound travel also sees high all-day delay along Lake Hills Blvd. Overall, high delay locations experience delay through the day, and among other segments higher levels of delay occur at 9 am and between 3 and 7 pm.

HOW TO READ DELAY CHARTS

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

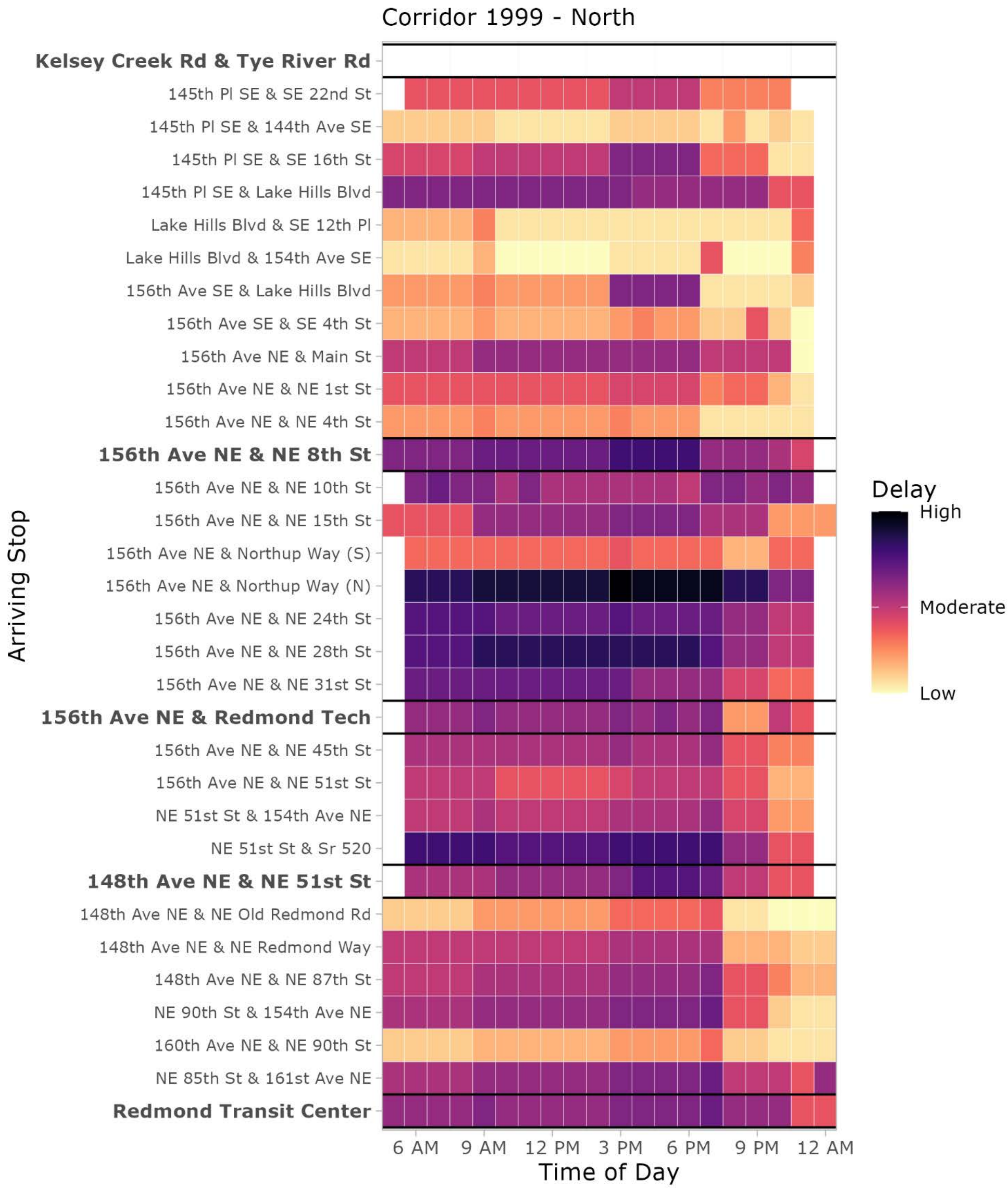
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 24 Corridor 1999 Northbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

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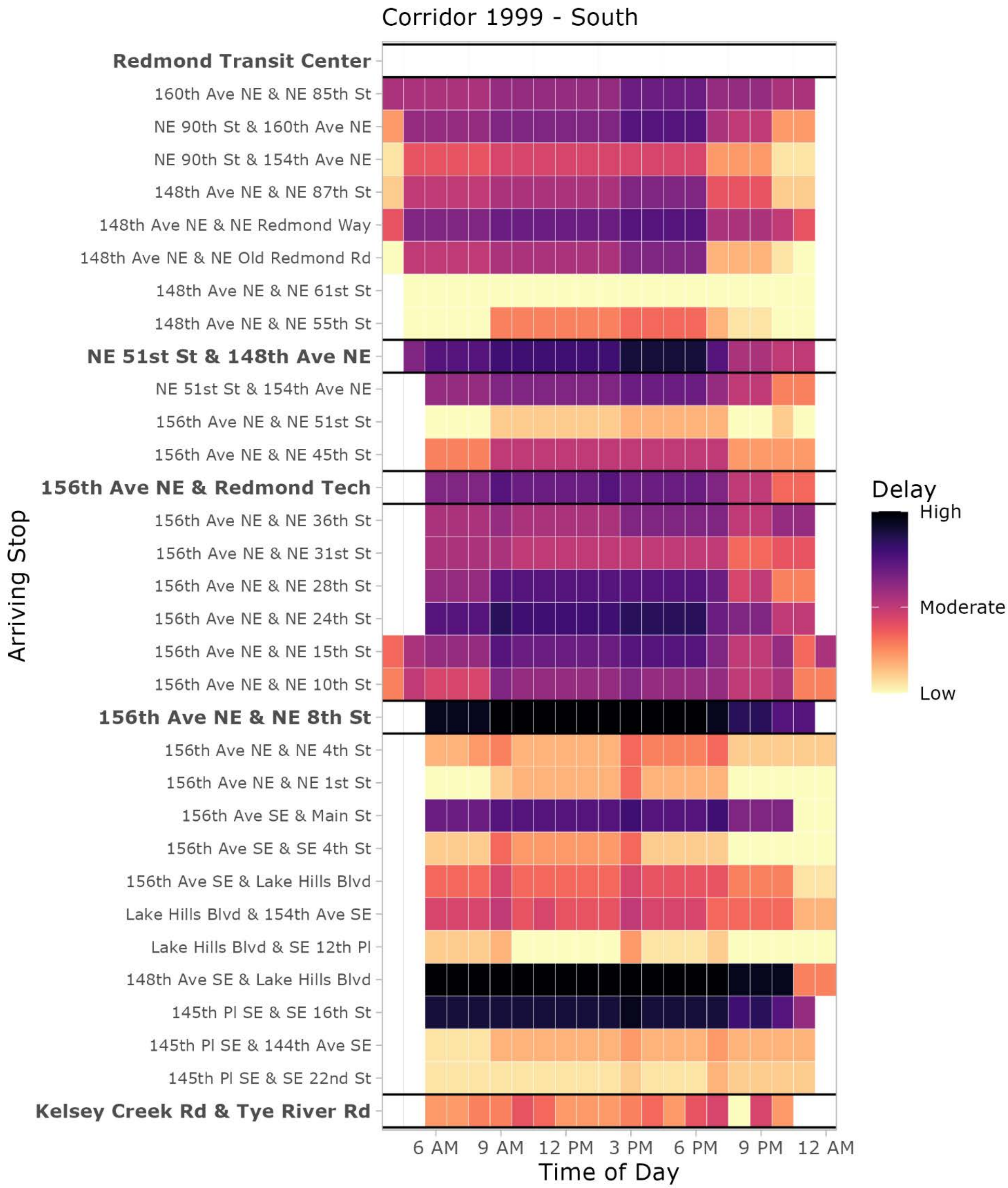
Figure 25 Corridor 1999 Southbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

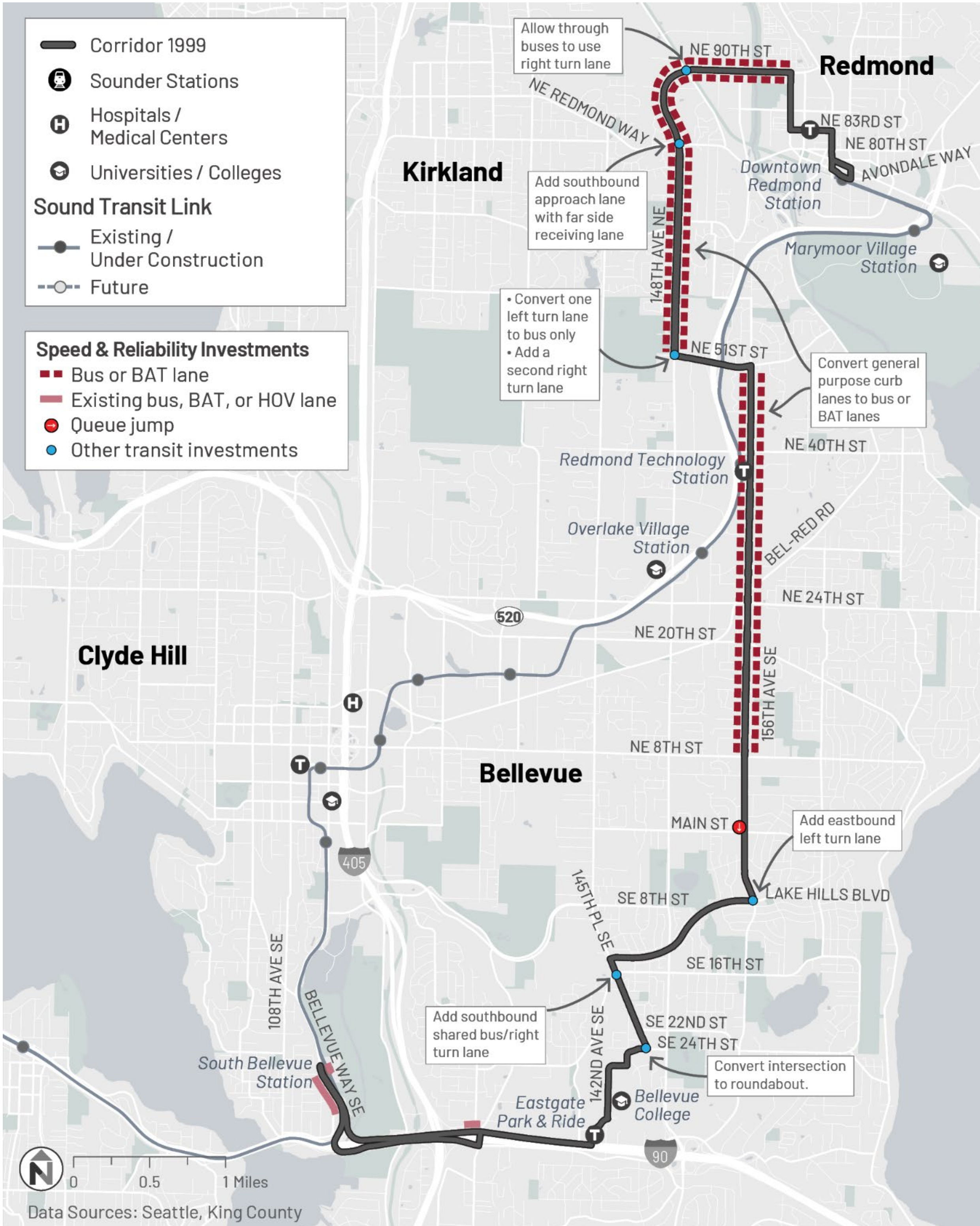
The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 1999 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 26, and they are shown geographically in a map in Figure 27.

The corridor currently achieves transit priority for 6% of its centerline miles, which is well below the RapidRide minimum standard of 40%. The additional proposed treatments here would increase the coverage to 42%, meeting the standard.

Figure 26 List of Proposed Transit Priority Treatments

Location	Type	Description
Redmond		
NE 90th St/148th Ave NE (160th Ave NE to NE 51st St)	Bus/BAT lane	Convert one lane northbound and southbound to bus-only between 160th Ave NE and NE 51st St.
NE 90th St & Willows Rd NE	Other	Reconfigure intersection to allow bus through movement from right turn lane at Willows Rd NE
148th Ave NE & Redmond Way	Queue jump	Add southbound approach lane with receiving lane far side at Redmond Way.
NE 51st St & 148th Ave NE	Other	Convert inside southbound left turn lane to bus-only at NE 51st St. Add a second westbound right turn lane.
156th Ave NE (NE 51st St to NE 8th St)	Bus/BAT lane	Convert lane northbound and southbound to BAT lane between NE 51st St and NE 8th St.
Bellevue		
156th Ave SE & Main St	Queue jump	Remove southbound left turn lane at Main St to add queue jump. Add new replacement left turn at NE 1st St or SE 4th St.
Lake Hills Blvd & 156th Ave SE	Other	Add left turn lane on Lake Hills Blvd eastbound onto 156th Ave SE northbound.
145th Pl SE & SE 16th St	Other	Add southbound shared bus and right turn lane at SE 16th St.
145th Pl SE & SE 24th St	Other	Convert intersection to roundabout.

Figure 27 Proposed Transit Priority Treatments



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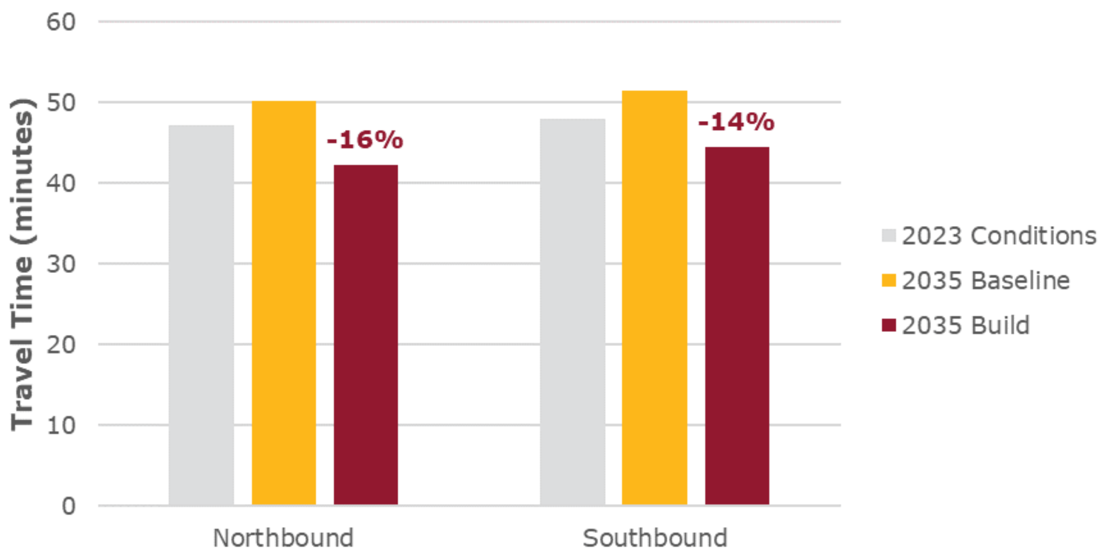
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 1999 alignment are forecast to reduce PM peak Future Build condition travel times 14-16% from Future Baseline conditions. Average bus travel speed is expected to increase to 17-18 mph in the Future Build conditions. Northbound travel will experience a slightly higher decrease in travel time compared to southbound travel. The introduction of bus/BAT lanes combined with queue jumps will help buses navigate the turns along the alignment and improve both transit speed and travel times.

Figure 28 shows transit travel times for the overall route.

Figure 28 B Line and Route 226 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

B Line and Route 226 carried approximately 5,400 people per day in Spring 2023, and as much as 7,700 people in Fall 2019. These routes have now recovered approximately 70% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[5], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 29 B Line and Route 226 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	7,663	-	100%
Fall 2020	2,466	-68%	32%
Fall 2021	3,564	+45%	47%
Spring 2023	5,383	+51%	70%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 30 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along B Line and Route 226, plus stops along Route 245 along 156th Ave and Lake Hills Blvd.

The busiest stop locations are at the Bellevue Transit Center and along 158th Ave SE between NE 24th St and NE 8th St. Moderate to high ridership occurs near the Redmond Technology and Downtown Redmond Link Stations.

[5] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 30 Boarding and Alighting Activity by Stop (Spring 2023)

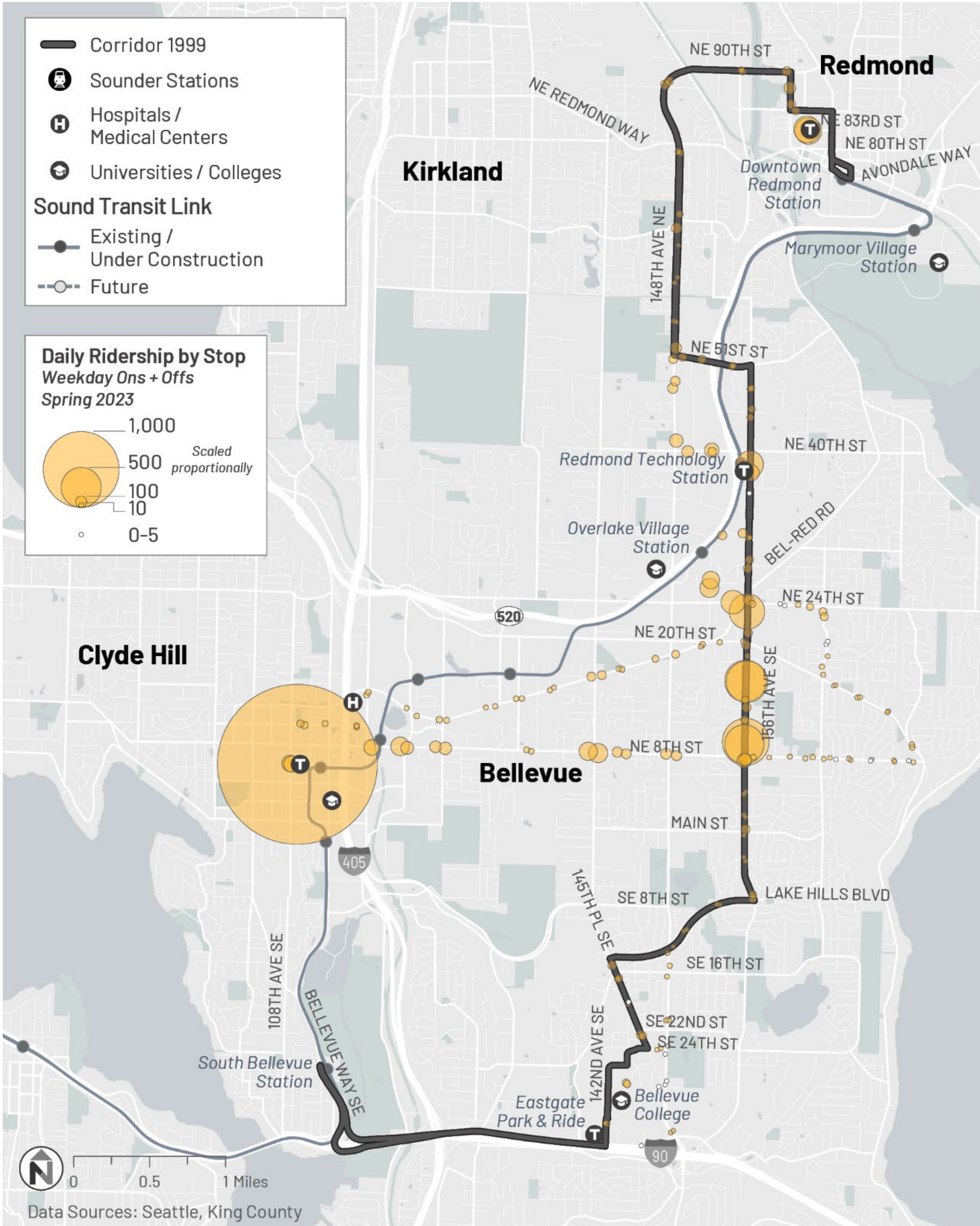


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Figure 31 Boarding and Alighting Activity by Stop Pair

Stop Pair	Southbound	Northbound	Total
Redmond TC	310	312	623
161st Ave & 85th St	62	47	108
90th St & 160th Ave	69	105	173
90th St & 154th Ave	31	39	70
148th Ave & 87th St	70	59	129
148th Ave & Redmond Wy	31	32	62
148th Ave & Old Redmond Rd	84	37	121
148th Ave & 66th St	-	5	5
148th Ave & 61st St	10	8	18
148th Ave & 55th St	14	8	21
148th Ave & 51st Ave	53	96	149
51st St & SR-520	-	52	52
51st St & 154th Ave	29	29	58
156th Ave & 51st St	28	28	56
156th Ave & 45th St	36	41	77
Redmond Technology Station	320	166	486
156th Ave & 36th St	1	-	1
156th Ave & 31st St	25	13	38
156th Ave & 28th St	60	56	115
156th Ave & 24th St	435	84	520
156th Ave & 20th St/Northup Way	60	66	126
156th Ave & Northup Way (S)	-	18	18
156th Ave & NE 15th St	521	519	1,040
156th Ave & NE 15th Pl	44	-	44
156th Ave & NE 13th St	52	69	122
156th Ave & NE 10th St	487	595	1,082
156th Ave & NE 8th St	138	113	252
156th Ave & NE 4th St	8	9	17
156th Ave & NE 1st St	13	7	20
156th Ave & Main St	12	68	80
156th Ave & SE 4th St	8	9	18
156th & Lake Hills Blvd	48	46	94
Lake Hills Blvd & 154th Ave	10	10	20
Lake Hills Blvd & 12th Pl	10	8	18
Lake Hills Blvd & 148th Ave	12	7	19
145th Pl & Lake Hills Blvd	60	-	60
145th Pl & 16th St	30	41	70

Stop Pair	Southbound	Northbound	Total
145th Pl & 144th Ave	5	3	8
145th Pl & 22nd St	62	47	109
Kelsey Creek Rd & Tye River Rd	46	44	90
148th Ave SE & Landerholm Cir	-	1	1
150th Ave & Eastgate Way	8	8	16
Eastgate Way & 146th Pl	0	3	3
Eastgate Park & Ride	42	44	86
South Bellevue Park & Ride	-	-	0

Source: King County Metro Spring 2023

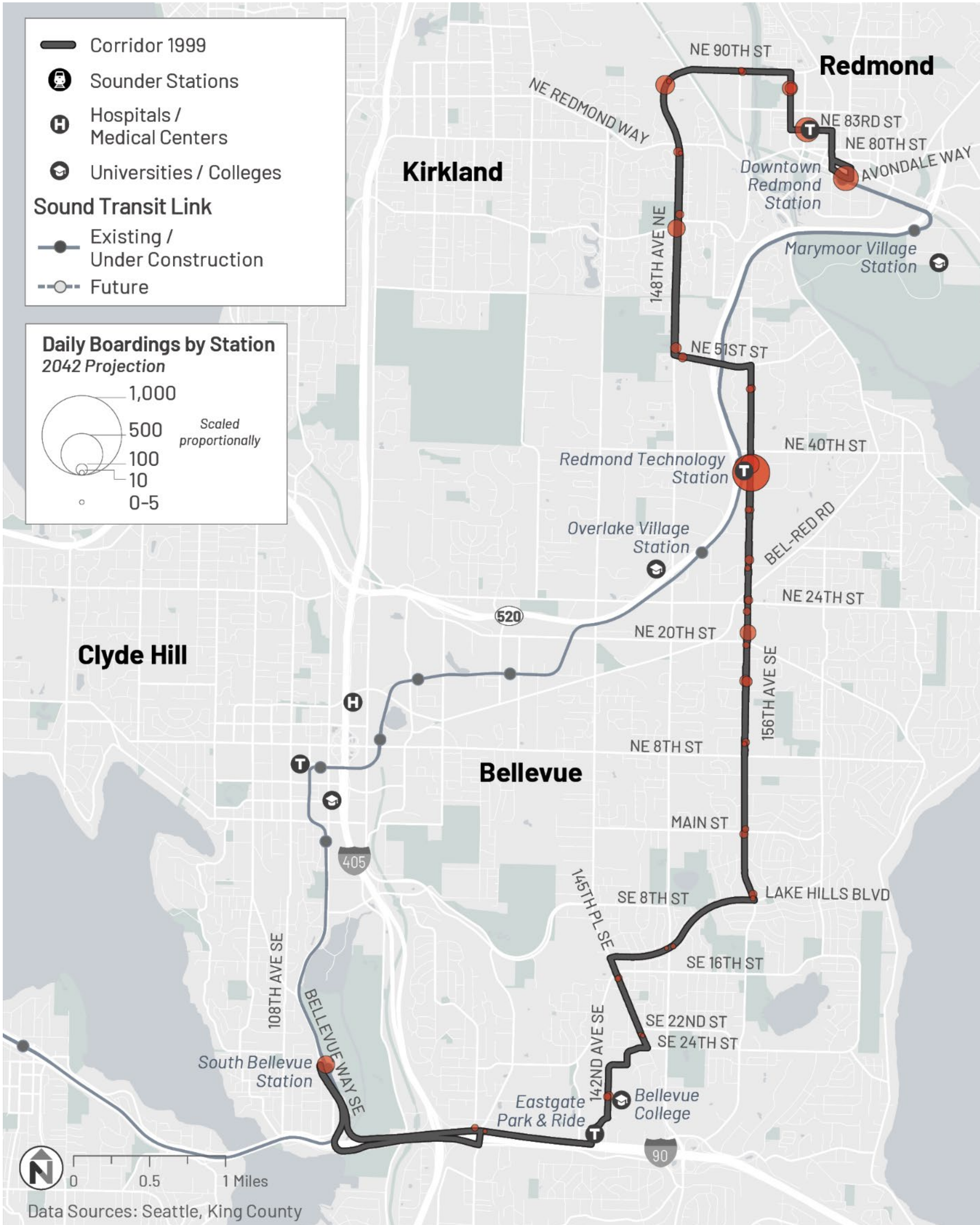
Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership along 156th Ave and Lake Hills Boulevard is from Route 245.

7.3 Forecast Ridership

Future ridership for Corridor 1999 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 1999 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 340 boardings in the PM peak hour and 4,300 daily boardings. Key ridership hubs include Downtown Redmond and Redmond Technology Station. Future ridership for each candidate RapidRide station is shown in Figure 32.

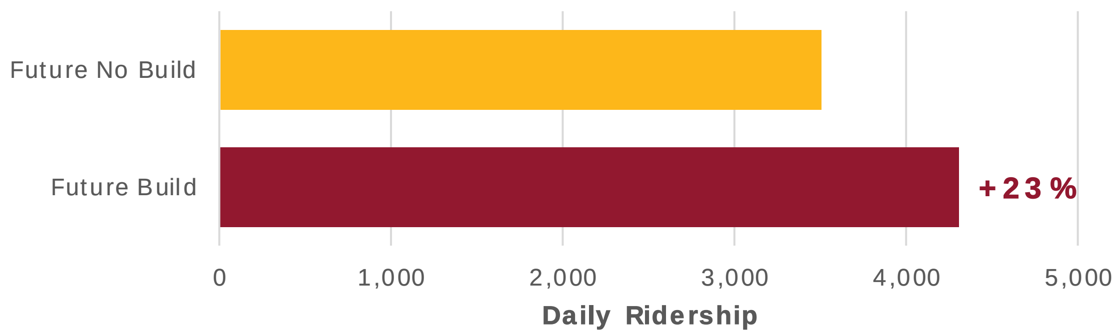
Figure 32 Future Corridor Ridership



7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 800 riders per day (or 23% increase) is forecast for Corridor 1999 compared to a "baseline" scenario with today's service levels for B Line and Route 226.

Figure 33 Modeled Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 1999 is forecast at 25.7 riders per revenue hour. This would result in an improvement of 1 percent in productivity compared to a future "baseline" 25.5 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 32 and 22 riders per revenue hour, respectively. At 25.7 riders per revenue hour, Corridor 1999 would rank lowest of the nine candidate RapidRide corridors.

8.0 Equity and Sustainability

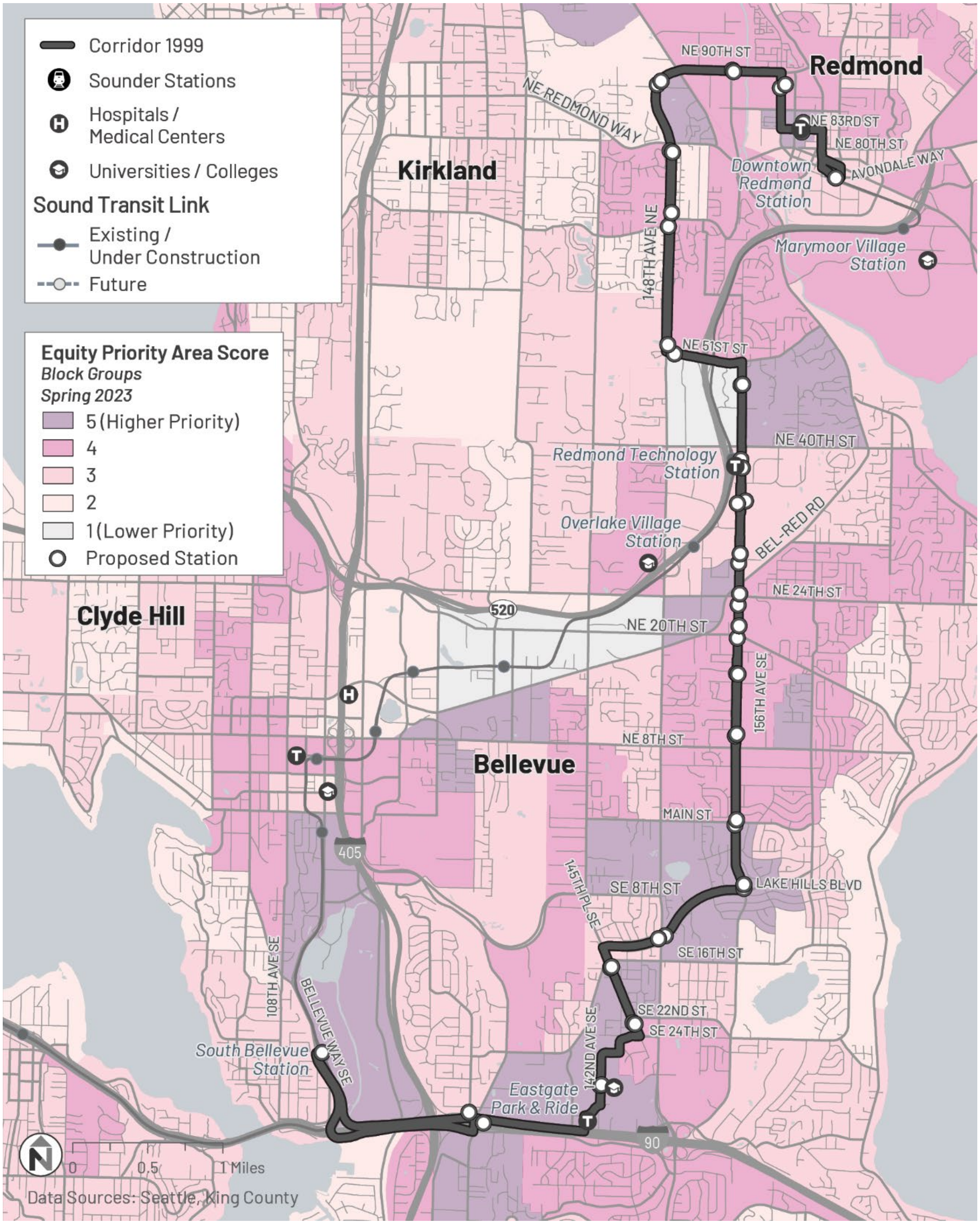
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[6] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 34 displays equity priority area scores for block groups located along Corridor 1999. In the southern portion of the alignment, Corridor 1999 serves high equity priority areas in Bellevue along Bellevue Way SE and Eastgate Way SE. Within the Lake Hills neighborhood of Bellevue, Corridor 1999 serves high equity priority areas along 142nd Place SE, Snoqualmie River Road, Kelsey Creek Road, SE 24th Street, 145th Place SE, Lake Hills Boulevard, and 156th Avenue SE. In Redmond, Corridor 1999 serves high equity priority areas along 156th Avenue SE between Bel-Red Road and NE 28th Street and between NE 40th Street and NE 51st Street. In the northern portion of the alignment in Redmond, Corridor 1999 serves high equity priority areas along 148th Avenue NE, 160th Avenue NE, and NE 83rd Street.

[6] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 34 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 35 and Figure 36 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[7] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along the B-Line and Route 226 in Fall 2020, ridership retention was generally 10-33 points lower than the regional average, with areas along NE 90th St, 148th Ave NE, and 156th Ave SE that were consistent with the regional change. By Spring 2023, however, change in ridership along the routes was generally consistent with or 10-63 points higher than the regional change.

[7] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 35 Ridership Retention (Fall 2020)

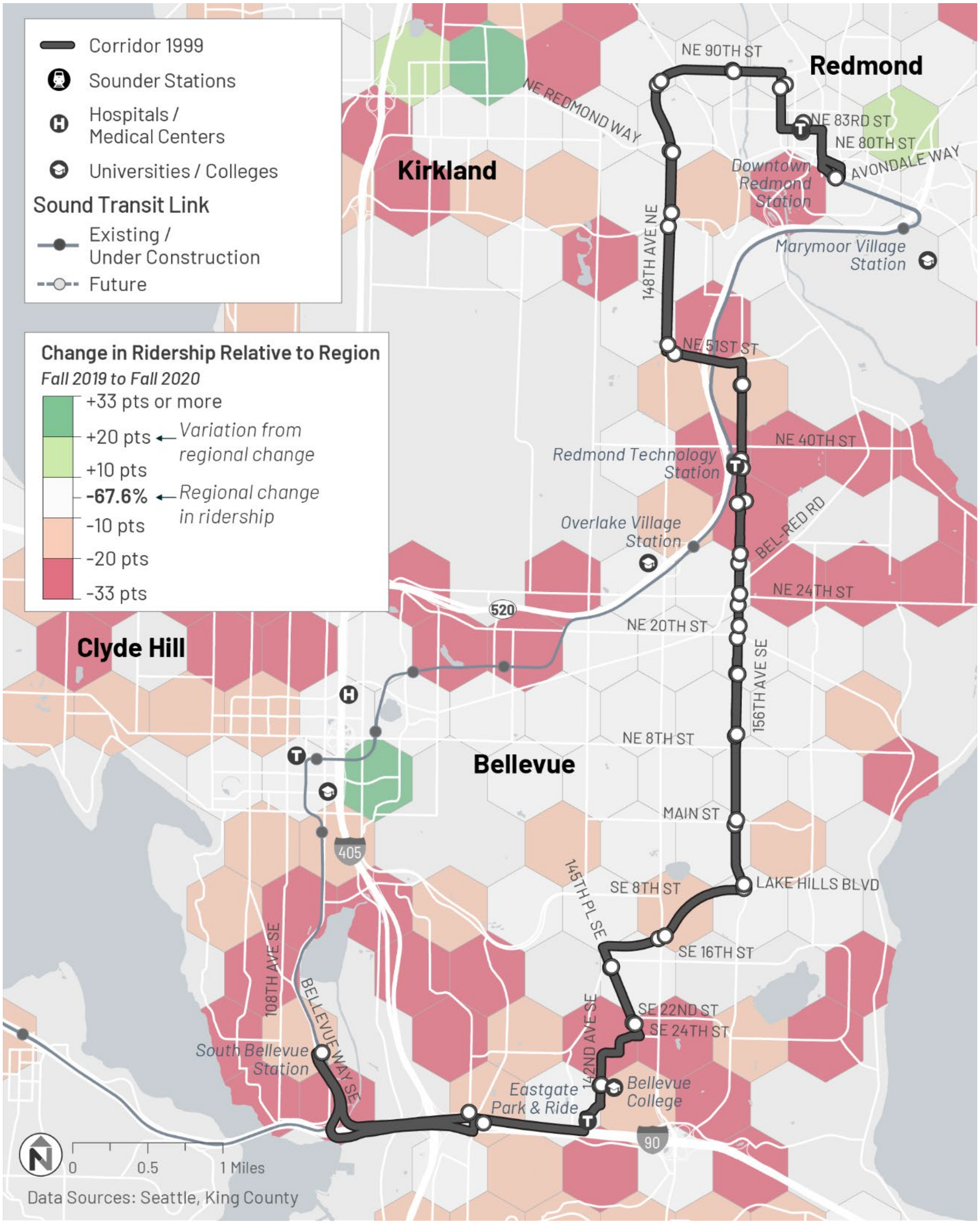

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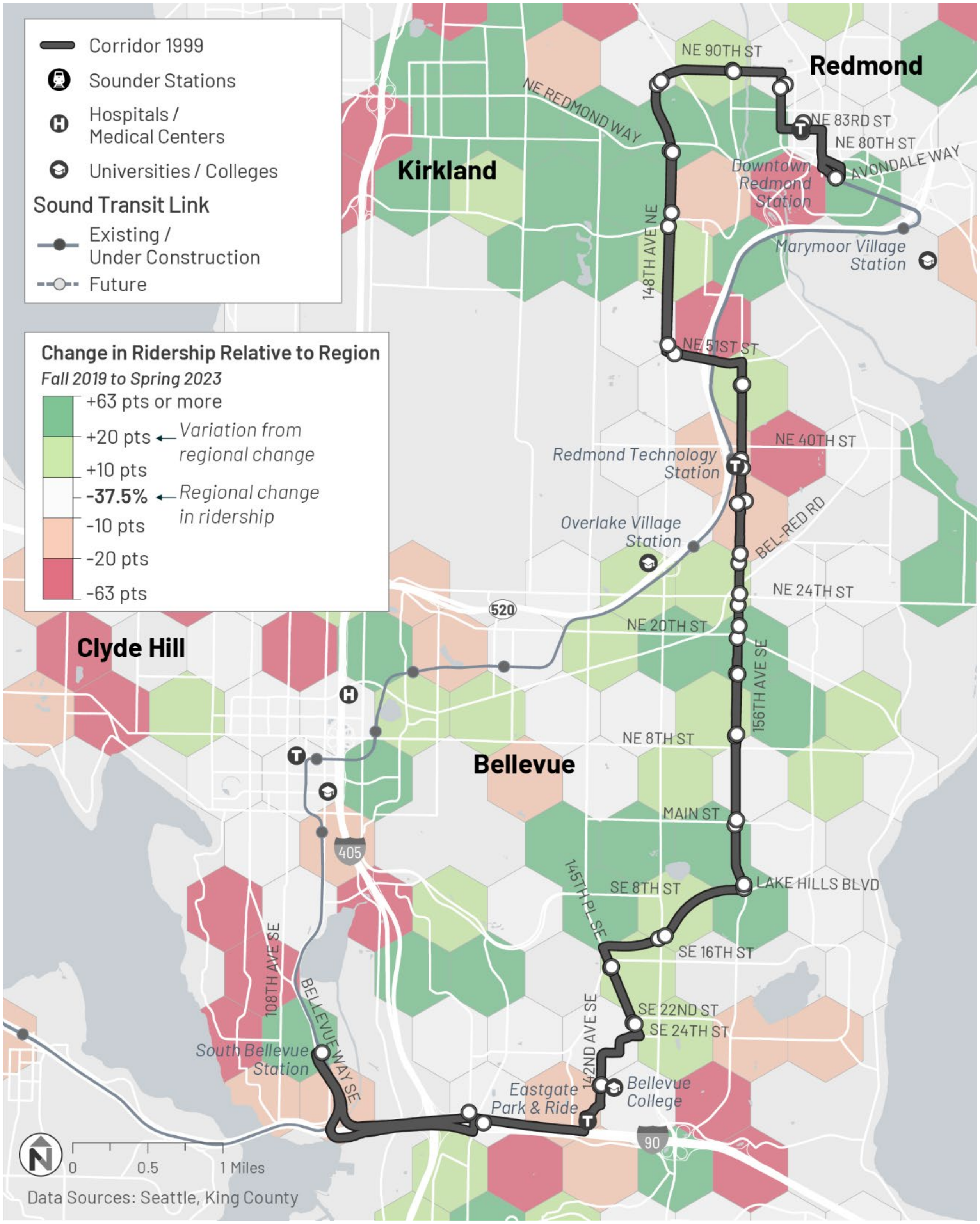
Figure 36 Ridership Retention (Spring 2023)



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8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of B Line and Route 226 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[8] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 93% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the largest increase in job access.

8.4 GHG Emissions

The ridership gains and therefore the shift from vehicle modes of travel because of RapidRide implementation of B Line and Route 226 will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[9] Approximately 0.33 metric tons of CO_2 would be reduced on an annual basis due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the second smallest reduction.

[8] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[9] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 39 intersections along B Line and Route 226 to evaluate transit travel time benefits of the proposed improvements. Out of the 39 intersections, two signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 37 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 37 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 37 Modeled Delay from Synchro

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay (seconds) 2035 Baseline	Transit Delay (seconds) 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay (seconds) 2035 Baseline	Traffic Delay (seconds) 2035 Build
Southbound								
702	156th Ave NE & NE 8th St	Signal	25.4	30.5	28.6	25.4	30.5	28.6
701	145th Pl SE & Kamber Rd/SE 16th	Signal	31.9	33.2	33.2	31.9	33.2	33.2
Northbound								
701	145th Pl SE & Kamber Rd/SE 16th	Signal	14.6	14.5	14.5	14.6	14.5	14.5
702	156th Ave NE & NE 8th St	Signal	26.8	41.6	33.6	26.8	41.6	48.9

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 38 summarizes the number of crashes along the corridor by severity level and mode. There were 238 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 26% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 7% resulted in a fatality or serious injury.

Figure 38 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	2	1%	2	4%	0	0%	**4**	**2%**
Serious Injury	6	3%	7	14%	0	0%	**13**	**5%**
Minor Injury	50	28%	25	49%	3	27%	**78**	**33%**
Possible Injury	118	67%	17	33%	8	73%	**143**	**60%**
Total	**176**	**100%**	**51**	**100%**	**11**	**100%**	**238**	**100%**

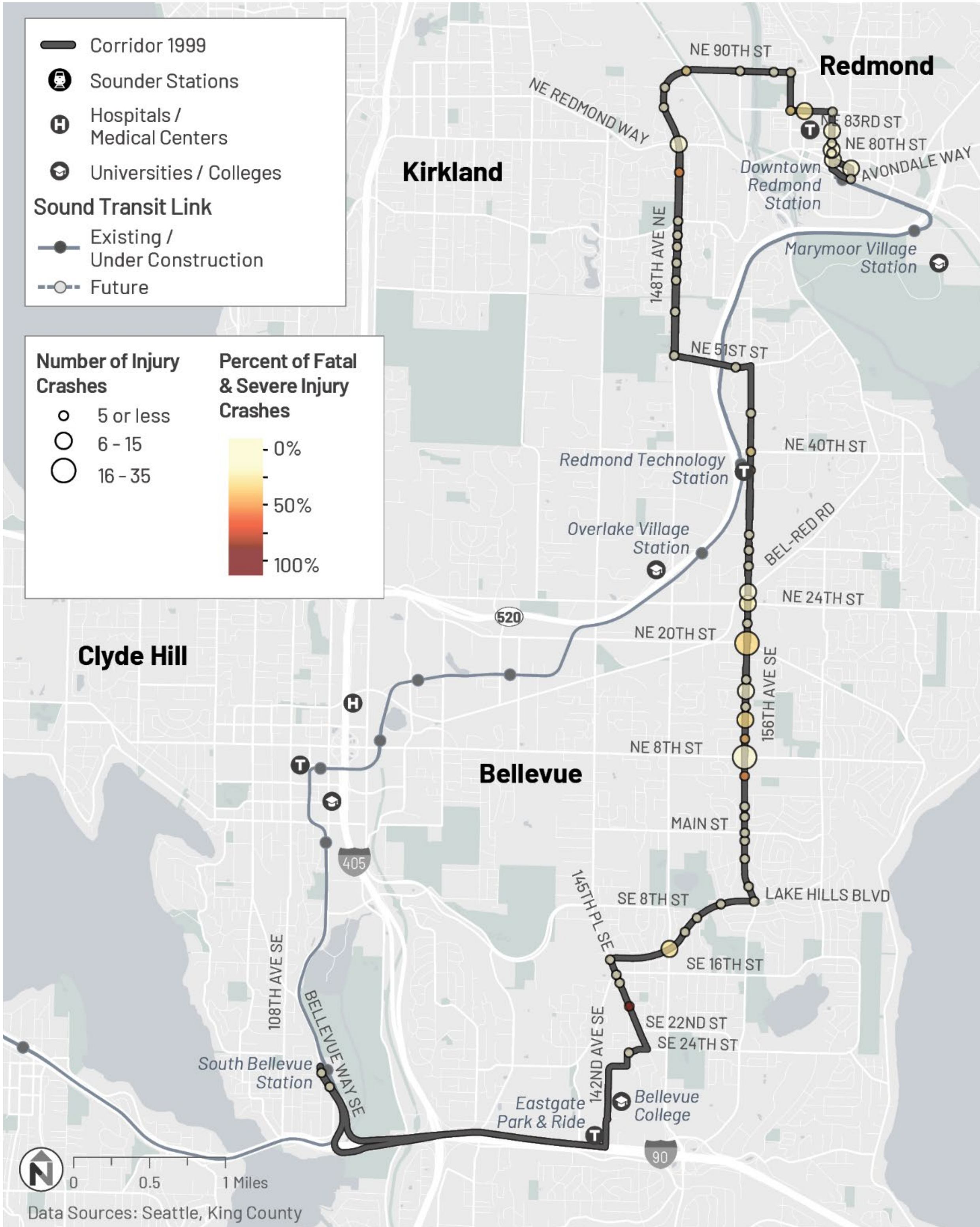
Source: WSDOT (2018-2022)

Figure 39 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at some major intersections and near a few major destinations along the corridor. Areas with a higher frequency of crashes include:

- Along 158th Ave SE between NE 24th St to NE 8th St
- Near the Downtown Redmond Link Station

Figure 39 Crash Locations



11.0 Planned Improvements

The B Line and Route 226 serves the cities of Redmond and Bellevue. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 40, and all projects are described in Figure 41.

Major projects include bicycle facilities along 156th Ave SE near Redmond Technology Station and Lake Hills Blvd, transit signal priority along 156th Ave SE, and signal adjustments at Lake Hills Blvd to improve eastbound and westbound movements.

Figure 40 Planned Jurisdictional Investments

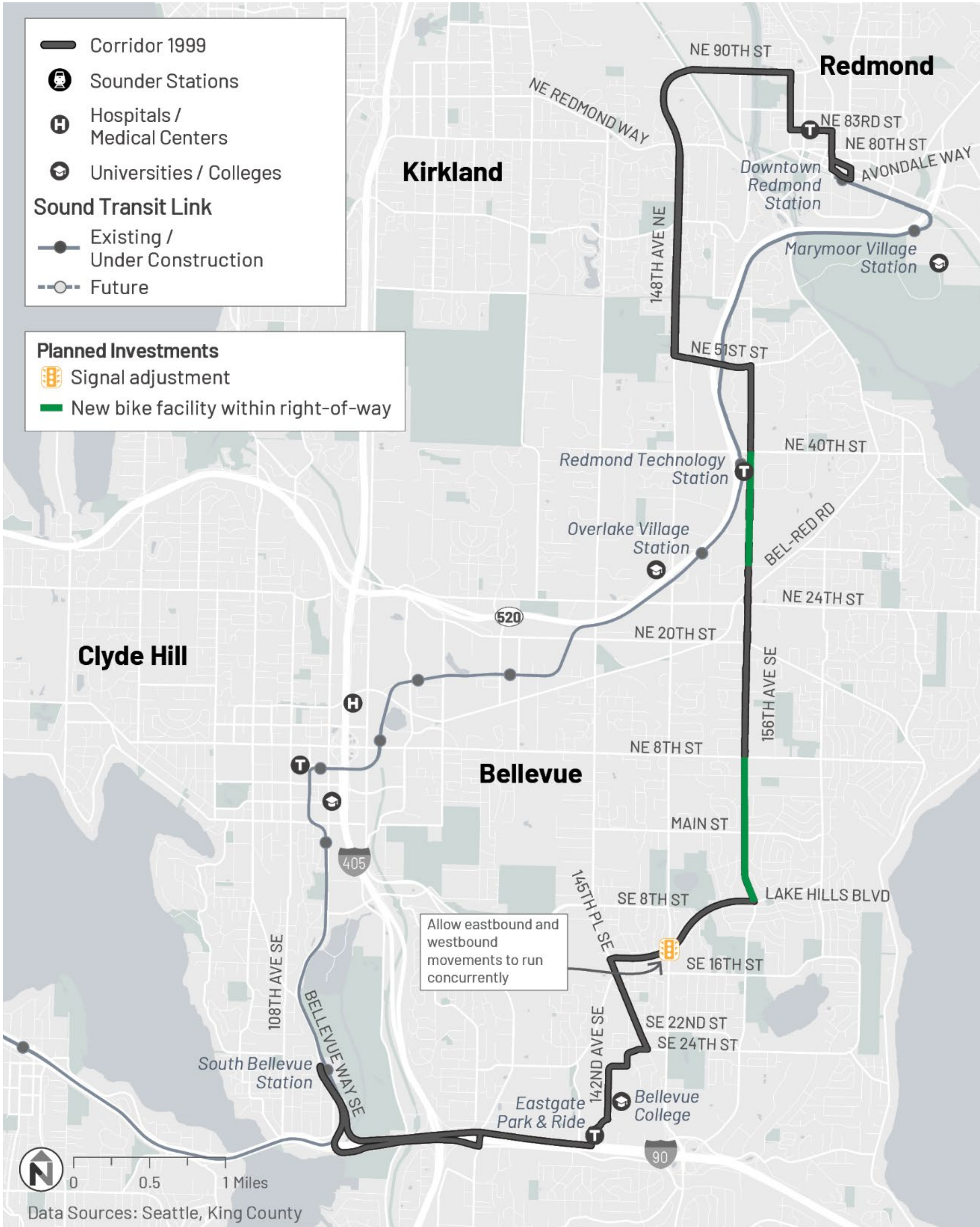


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Figure 41 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Redmond Central Connector	Shared use bike path from approximately NE 100th Ct to NE 124th St and from the Bear Creek Trail to the East Lake Sammamish Trail via the SR 520 interchange.	166th Ave NE / Cleveland St	Regional Transportation Plan 2022-2050
2	Cleveland St Sidewalk Rehabilitation	Replace sidewalks	Cleveland St (164th Ave NE - 166th Ave NE)	Redmond Transportation Master Plan
3	Redmond Way Westbound Right Turn Lane - 168th Ave NE to 166th Ave NE	Add second westbound lane and parking on the north side of Redmond Way between 168th Ave and 166th Ave. Project includes travel lane, on-street parking, sidewalk, right-of-way, utilities and streetscape improvements.	Redmond Way / 166th Ave NE	Regional Transportation Plan 2022-2050
4	Redmond Way Widening	Add second westbound lane and parking on the north side of Redmond Way between 168th Ave and 164th Ave. Project would include one travel lane, on-street parking, sidewalk, right-of-way, utilities and streetscape improvements	Redmond Way (164th Ave NE - 166th Ave NE)	Redmond Transportation Master Plan
5	164th Ave NE Rechannelization	Reconfigure 164th Ave NE	164th Ave NE (Redmond Way - NE 85th St)	Redmond Transportation Master Plan
6	NE 80th St Bicycle Facilities	Complete bicycle facilities on 80th St with a combination of bicycle lanes and bicycle boulevard treatment as appropriate for each segment of corridor.	NE 80th St at 164th Ave NE	2024-2029 Transportation Improvement Program
7	Cycle Track-161st Ave	Replace bicycle lanes and parking on one side of 161st Ave with two-way cycle track, from the Redmond Central Connector to NE 90th St.	161st Ave NE at NE 85th St	2024-2029 Transportation Improvement Program
8	NE 90th St Bridge Deck Overlay	Reseal concrete bridge deck with epoxy overlay.	NE 90th St Bridge	2024-2029 Transportation Improvement Program
9	148th Ave NE Pavement Rehabilitation	Rehabilitate and overlay pavement surface to extend the useful life of 148th Ave NE from Redmond Way to Willows Road.	148th Ave NE (Redmond Way - Willows Rd NE)	2024-2029 Transportation Improvement Program
10	Transit Signal priority	Northbound, Southbound	148th Ave NE (NE 57th St - NE 55th St)	Bellevue Transit Master Plan

ID	Improvement	Description	Extent	Source
11	Westbound Right-turn Lane	Add a second right-turn lane from westbound NE 51st St to northbound 148th Ave NE.	148th Ave NE / NE 51st St	Redmond Transportation Master Plan, 2024-2029 Transportation Improvement Program
12	Redmond - 156th Ave Shared Use Path	Paved shared use path on 156th Ave	156th Ave NE (NE 51st St - NE 40th St)	2023-2026 PSRC Regional TIP
13	156th Cycle Track	156th Cycle Track	156th Ave (28th St - 40th St)	Redmond Project Viewer
14	Crossroads-Overlake Transit Connection	Evaluate, design, and implement transit speed and reliability improvements along Frequent Transit Network corridors connecting the Downtown and Crossroads activity centers.	156th Ave NE (NE 8th St - NE 24th St)	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
15	Transit Signal priority	Northbound, Southbound	156th Ave NE / NE 15th St	Bellevue Transit Master Plan
16	Transit Signal priority	Northbound, Southbound	156th Ave NE / NE 13th Way	Bellevue Transit Master Plan
17	Transit Signal priority	Northbound, Southbound	156th Ave NE / NE 10th St	Bellevue Transit Master Plan
18	Intersection Improvement	Improve the southbound to westbound turn radius.	NE 8th St /156th Ave NE	Bellevue Transit Master Plan
19	Intersection Improvement	Improve the eastbound to northbound left turn through timing prioritization and TSP. If improvements are inadequate, consider construction of a second left turn lane	NE 8th St /156th Ave NE	Bellevue Transit Master Plan

ID	Improvement	Description	Extent	Source
20	Crossroads Bellevue U District	Create a new RapidRide line by modifying the existing B Line and extending it west to the University of Washington. This project will include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speed; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops. This project will connect two Regional Growth Centers, Bellevue and University District, along with other jobs and amenities in Crossroads and the growing Bel-Red district. It also increases access to other regional transit services including Link Light Rail in Bellevue and the University of Washington.	NE 8th St/156th Ave NE	Regional Transportation Plan 2022-2050
21	East Bellevue Bicycle Network Study	Advance the planning and design of safe and connected bikeways that link neighborhoods to schools, local destinations	156th Ave NE (Lake Hills Blvd - NE 8th St)	Projects in Your Neighborhood
22	Downtown – Eastgate Transit Connection	Evaluate, design, and implement transit speed and reliability improvements along Frequent Transit Network corridors connecting the Downtown and Crossroads activity centers.	Lake Hills Blvd (156th Ave SE - 145th Pl SE) / 145th Pl SE (Lake Hills Blvd - SE 24th St)	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
23	156th Ave SE Safety Improvements	Install new traffic signals at two key intersections in the Lake Hills neighborhood - Lake Hills Blvd/156th Ave SE and Main St/156th Ave SE. Project will include ADA curb ramp upgrades, minor storm improvements and pavement replacement.	Lake Hills Blvd / 156th Ave SE and Main St / 156th Ave SE	City of Bellevue 2024-2029 Transportation Improvement Program
24	148th Ave Intersection Improvements	Add a second westbound left turn pocket to increase the queuing space for this movement and to allow the eastbound and westbound through movements to run concurrently, reducing the overall intersection delay	Lake Hills Blvd / 148th Ave SE	Projects in Your Neighborhood, City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan

ID	Improvement	Description	Extent	Source
25	Crossroads – Eastgate Transit Connection	Evaluate, design, and implement transit speed and reliability improvements along Frequent Transit Network corridors connecting the Downtown and Crossroads activity centers.	Lake Hills Blvd / 148th Ave SE	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
26	Repaving, curb and sidewalk repair	Repaving, curb and sidewalk repair	Lake Hills Blvd (145th Pl SE - 143rd Ave SE)	Bellevue Pavement Management Program
27	Bellevue - 2022 Rectangular Rapid Flashing Beacon Crosswalks	Install rectangular rapid flashing beacons (RRFBs), sidewalk, and a median refuge island, including sign and pavement marking upgrades in four locations. Install rectangular rapid flashing beacons (RRFBs), sidewalk, and a median refuge island, including	145th Pl SE (144th Ave SE and SE 22nd St)	2023-2026 PSRC Regional TIP
28	Transit Signal priority	Eastbound, Southbound	SE 24th St / 145th Pl SE	Bellevue Transit Master Plan
29	Bellevue College Connection	Reconstruct the roadway to support frequent transit bus service, construct sidewalks and accessible bus stops and modify the 142nd Place SE/SE 32nd Street intersection. Included is a separated off-street path connecting 145th Place SE bike lanes to the Mountains to Sound Greenway Trail. Also included is weather protection on 142nd Pl SE for transit users, pedestrians and bicyclists. A Bellevue College Transit Center will be developed along the corridor	Snoqualmie River Rd (Kelsey Creek Rd - Coal Creek Rd)	City of Bellevue 2024-2029 Transportation Improvement Program, Bellevue Transit Master Plan, 2023-2026 PSRC Regional TIP
30	New roadway	Establish a new east-west roadway on the south edge of the Bellevue College campus between 142nd Place SE/Snoqualmie River Road and 148th Ave SE along the south campus	Coal Creek Rd at 142nd Ave SE	City of Bellevue 2024-2029 Transportation Improvement Program
31	Repaving, curb and sidewalk repair	Repaving, curb and sidewalk repair	142nd Pl SE (I-90 - Coal Creek Rd)	Bellevue Pavement Management Program
32	I-90 / Seattle to Issaquah - Managed Lanes	Convert HOV lanes to HOT lanes	I-90 (Bellevue Way SE - 142nd Ave SE)	Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
33	I-90 Factoria Blvd Exit Expansion	In coordination with the Mountains to Sound Greenway, relocate the current trail undercrossing of the ramp between northbound I-405 and eastbound I-90 to a new bridge south of the existing undercrossing, and add a second off-ramp lane to the current ramp undercrossing. Evaluate how to best stripe the off-ramp lanes to ensure reliable transit operations.	I-90 / Factoria Blvd SE	Bellevue Transit Master Plan
34	WSDOT - I-90/EB Mercer Slough Bridge - Rehabilitation	Construct improvements to stabilize and preserve the structural integrity of the eastbound I-90 bridge over the Mercer Slough, which is experiencing movement that will otherwise accelerate deterioration of the structure.	I-90 (Bellevue Way SE - 118th Ave SE)	2023-2026 PSRC Regional TIP
35	Downtown – Factoria Transit Connection Transit Connection	Evaluate, design, and implement transit speed and reliability improvements along Frequent Transit Network corridors connecting the Downtown and Crossroads activity centers.	Bellevue Way SE (112th Ave SE - I-90)	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan

12.0 Capital Costs

This section summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the B Line and Route 226 corridor. Capital costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[10]
- Trolley infrastructure (not included in B Line and Route 226)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 18. For transit speed and reliability improvements, refer to Figure 26. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 15.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 42.

[10] For non-trolley routes only.

Figure 42 Order-of-Magnitude Project Costs

	Category	% of Total		Costs
	Stops and Stations	29%	$	7,730,000
	Transit Speed and Reliability Improvements	53%	$	14,070,000
	Layover and Terminus Facilities	2%	$	600,000
	Charging Infrastructure	15%	$	4,000,000
	Trolley Infrastructure	-		-
	Construction Base Subtotal		***$***	***26,400,000***
2%	Stormwater Upgrades		$	530,000
3%	Traffic Control		$	800,000
10%	Mobilization		$	2,640,000
2%	TESC		$	530,000
	Subtotal Construction Cost		***$***	***30,900,000***
10.1%	Sales Tax		$	3,130,000
10%	Construction Contingency		$	3,410,000
40%	Contingency (Design Allowance and Risk)		$	14,980,000
	Total Construction Cost		***$***	***52,420,000***
10%	Project Management		$	5,250,000
5%	Planning		$	2,630,000
15%	Engineering/Design		$	7,870,000
10%	Construction Management		$	5,250,000
3%	Environmental Review		$	1,580,000
2%	Permitting		$	1,050,000
	Total Project Cost		***$***	***76,050,000***

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the B Line and Route 226 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – The project is not within any designated view corridors, nor would it alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, B Line and Route 226 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways –B Line and Route 226 does not traverses over or alter any navigable waterways.
- Floodplains –The B Line and Route 226 travels through a Federal Emergency Management Act (FEMA) 100-year floodplains at NE 90th Street near the Sammamish River, Lake Hills Greenbelt Park, and Mercer Slough near I-90. Improvements associated with the project are not anticipated to occur within the FEMA floodplain at these locations, avoiding adverse impacts on floodplain areas.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Air Quality – Improvements associated with the project are not anticipated to yield long-term adverse impacts to air quality. The adoption of cleaner and more energy-efficient technologies with zero emission buses will contribute to a healthier and more sustainable urban environment. Best Management Practices (BMPs) for air quality during construction will be implemented to mitigate any minor short-term impacts.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources:

13.3a Cultural Resources

In order to identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The B Line and Route 226 corridor does not pass through any known historic districts or near any known properties listed or determined to be eligible for listing on the National Register of Historic Places (NRHP) and/or local Registers.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located in downtown Redmond.

Given their proximity to the project alignment and cleanup status, most of the Department of Ecology (Ecology) cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. For acquired parcels associated with moderate or high-risk sites, it is recommended to conduct additional Ecology file reviews, examining historical or current release information, and considering potential Phase I or Phase II Environmental Site Assessments (ESAs) during the acquisition process. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the B Line and Route 226 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

Traffic operational analysis was conducted for 39 intersections along B Line and Route 226 to evaluate transit travel time benefits of the proposed improvements. The analysis revealed that at one location along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at one location along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the project's aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along B Line and Route 226, can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared, to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The *FTA Transit Noise and Vibration Impact Assessment Manual* notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological / Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces. Even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the B Line and Route 226 corridor include critical areas for liquefaction and steep slopes. These areas will be considered for their potential to impact the project during design. The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures may encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow control, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP) or TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

There are wetlands adjacent to the alignment along NE 90th St. and 160th Avenue NE near the Sammamish River with sensitive habitats. Wetlands are present at the South Bellevue Station near Mercer Slough extending south of the I-90 and Bellevue Way SE, and a small wetland adjacent to alignment at 148th Avenue NE and NE 61st Court.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the alignment of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur. Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.3k Acquisition and Relocation

Acquisitions for the improvements included in this report involve a 3,000 square foot partial take on the southwest corner of Kamber Road and 145th Pl SE.

Anticipated minor and partial property acquisitions are expected to result in minimal effects, limited to the property itself, without impacting existing structures and no displacements are anticipated. Mitigation measures include compensating business and property owners under the

Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970, as amended. Other potential mitigation efforts could involve considering adjustments to station locations if necessary.

13.4 Cumulative and Indirect Impacts

The B Line and Route 226 serve Redmond and Bellevue. Planned projects within these cities along the corridor, such as roadway changes and investments in biking and walking, were identified by the project team. Figure 40 Planned Jurisdictional Investmentsmaps a selection of these projects, while Figure 41 List of Planned Jurisdictional Investments provides descriptions for all projects. Major improvements include the introduction of bicycle facilities near Redmond Technology Station and Lake Hills Blvd along 156th Ave SE, the implementation of transit signal priority on 156th Ave SE, and signal adjustments at Lake Hills Blvd to enhance eastbound and westbound movements.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of “facility modernization” that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way. However, because the project may need to acquire additional property, documentation is required that demonstrates the project will meet the criteria for a CE and that significant environmental effects will not result.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum

- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit
- Local Clearing and Grading Permit for anticipated acquisitions

RapidRide Prioritization Plan

Corridor 3101+1028 Summary Report

May 2024

Photo credit: Oran Viriyincy via Flickr (CC BY-SA 2.0)

King County METRO

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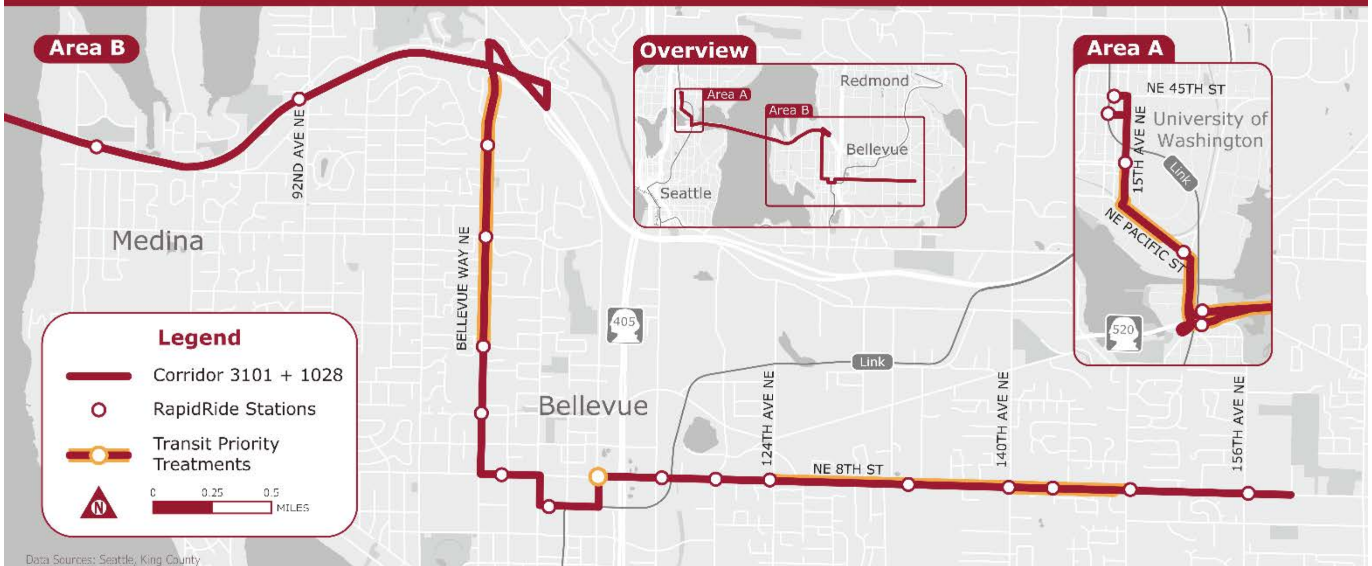
King County METRO

Corridor Summary

Corridor 3101+1028 | B Line/271

CORRIDOR SUMMARY



Ridership

No Build

+65%

RapidRide Corridor 3101 + 1028

= approximately 2,000 people

Comparison of weekday boardings along corridor with and without RapidRide investment in 2042.

Productivity

Increase in Boardings per Revenue Hour **+24.1**

Change in weekday boardings per revenue hour from 2042 no build to 2042 build.

Future Boardings per Revenue Hour **57.9**

Weekday boardings per revenue hour with RapidRide investment in 2042.

Travel Time

Proposed Travel Time Savings **-18%**

Reduction in one-way PM peak travel time from 2035 no build to 2035 build.

2035 Corridor End-To-End Travel Time **39**

One-way PM peak travel time (minutes) with RapidRide investment in 2035.

Capital Cost

$ $ $ $ $ $

Estimate of capital cost.

Equity Priority Area Score

3.4

Average area of need score within 1/2 mile of station locations.

RAPIDRIDE

King County METRO

1.0 Project Background

1.1 Project Purpose and Goals

This project provides planning and related services to King County Metro (KCM) to determine corridors for expansion of and further investment into Metro's RapidRide network. RapidRide is an integral part of the region's high-capacity transit network that improves mobility along major corridors and connects key destinations and regional growth centers. The current RapidRide network consists of seven lines (A-F and H) with one additional line under construction (G), and four lines in the planning and design stage (I, J, K, and R).

The RapidRide Expansion Program (completed in 2018) established new standards for RapidRide service and conducted evaluations of six suburban corridors. Additionally, the Metro Connects long-range plan, adopted in 2021, identified a pool of eight candidates for new or significantly modified RapidRide routes (Figure 1).

Figure 1 Metro Connects Interim Network RapidRide Candidate Corridors

Current Equivalent Routes	Metro Connects Corridor Number	Representative Alignment in RRPP
Route 44	1012	Ballard, Wallingford, UW Hospital/Husky Stadium
Route 150	1049	Kent, Southcenter, Seattle CBD
Route 181	1052	Twin Lakes, Federal Way, Green River CC
Route 165	1056	Highline CC, Kent, Green River CC
Route 36 and 49	1064	U. District, Beacon Hill, Othello
Route 36	N/A	Downtown Seattle, Beacon Hill, Othello
Route 40	1993	Northgate, Ballard, Seattle CBD, First Hill
B Line and 226	1999	Redmond, Overlake, Eastgate
B Line and 271	3101+1028	Crossroads, Bellevue, U. District

The ordinance adopting Metro Connects requires the creation of a RapidRide Prioritization Plan to determine the specific candidates to be developed as part of the interim network. The RapidRide Prioritization Plan will be submitted to the Regional Transit Committee for review and acceptance by motion no later than **June 2024**.

The project will develop a Prioritization Plan to determine the number and specific candidates to be developed as RapidRide lines as part of the interim network, which is the system Metro is envisioning to be in service in time for the Ballard Link extension, currently planned for 2039. To do this, this project will identify a reasonable conceptual alternative for each candidate corridor (see Figure 1) and conduct a preplanning level corridor study for each corridor. Corridors will be evaluated and prioritized relative to each other based on a comprehensive evaluation framework; a top tier of candidate corridors will be identified as the next planned RapidRide

investments. The number of corridors in the top tier will depend on projected project costs and estimated Metro funding and delivery capacity.

This corridor study is for Metro Connects corridor 3101+1028 (RapidRide B Line and Route 271). It addresses route alignment options, operations plan, capital investment needs, potential ridership, and provides planning level cost estimates. The corridor study offers a pre-design perspective on the corridor and serves as a basis for comparison against other corridors identified in Figure 1.

2.0 Corridor Overview

2.1 Alignment Screening

Corridor 3101+1028 is currently served by B Line and Route 271. B Line connects Downtown Bellevue to Downtown Redmond along NE 8th St and 148th Ave NE, providing access to the Overlake Village area and Microsoft headquarters. Route 271 connects the University District, Downtown Bellevue, Eastgate Park and Ride to Issaquah. The corridor is largely suburban but serves a high concentration of jobs and students.

The Corridor 3101+1028 would be a mix of the southern portion of B Line (from 156th Ave SE to Downtown Bellevue) and the western portion of Route 271 (from Downtown Bellevue to the University District). The other half of B Line (to Downtown Redmond) would be integrated into another RapidRide corridor (1993), which is documented in a separate corridor report.

The RRPP Alignment Memo summarizes the full set of alignment options that were considered. The Metro Connects 2050 vision identifies an alignment that would operate from the University District, along SR-520, through Medina and Clyde Hill along 84th Ave NE, through Downtown Bellevue, and east on NE 8th St to the Crossroads at 156th Ave SE.

The result of the alignment screening resulted in a new alignment between SR-520 and Downtown Bellevue via Bellevue Way, with no service along 84th Ave NE.

2.2 Representative Alignment

The alignment selected in the screening process was chosen to be the representative alignment that would be analyzed as part of this corridor report and compared with other candidate corridors for prioritization. However, additional changes were identified during the analysis phase. These changes include re-aligning westbound access to SR-520 from Bellevue Way to 108th Ave NE via Northup Way, and circulation in the University District.

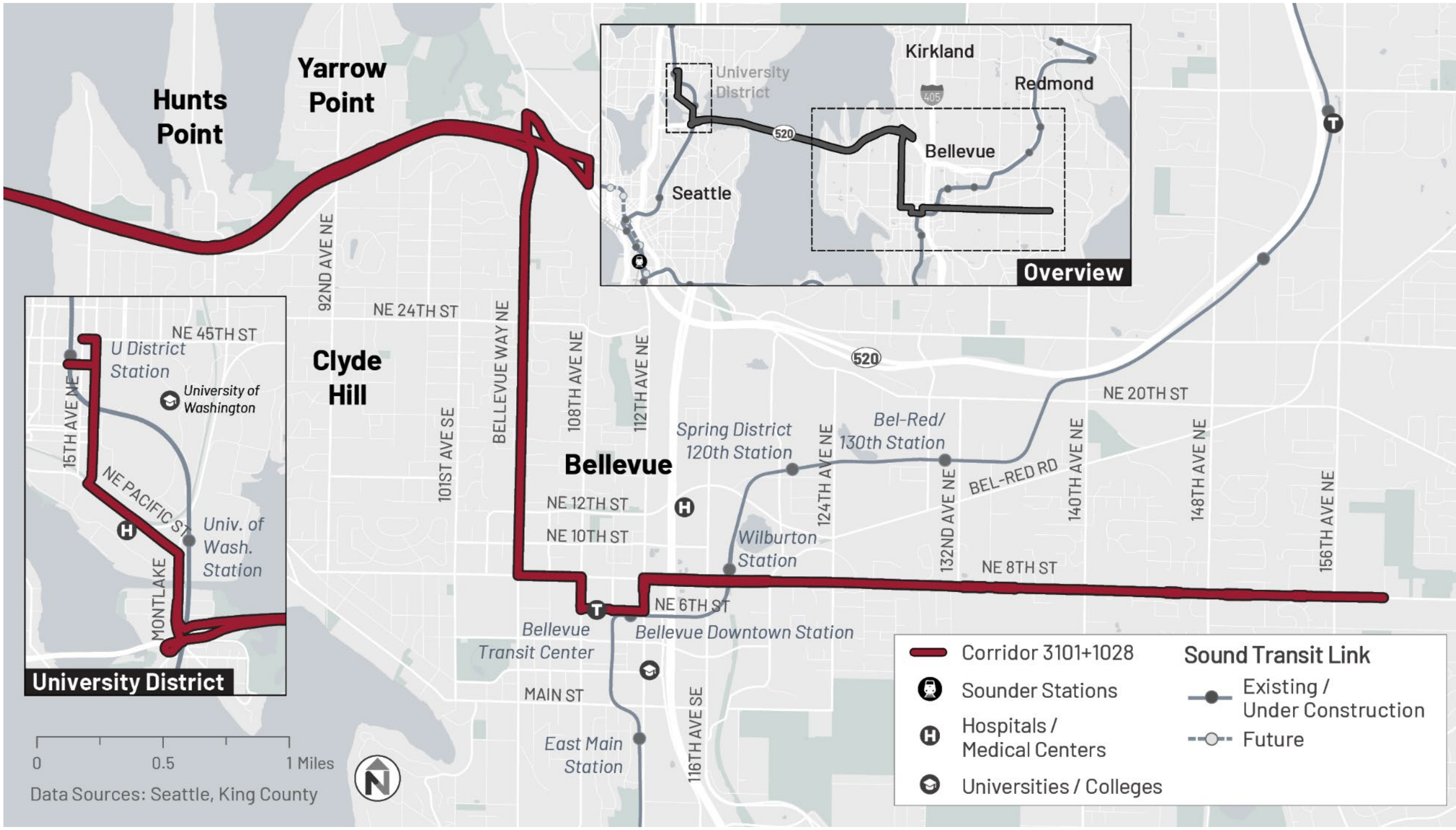
Figure 2 highlights all the differences in the final representative alignment relative to the existing B Line and Route 271, the Metro Connects interim alignment, and the original recommendation from the alignment screening. The representative alignment is shown in Figure 3.

Figure 2 Final Alignment Changes

Alignment Change	Change from… B Line / 271	Metro Connects	Recommended Alignment in Screening
Change pathway between SR-520 and Downtown Bellevue from 84th Ave NE in Medina and Clyde Hill to Bellevue Way in Bellevue (proposed change in East Link Connections network).	✓	✓	✗
Adjust westbound access to SR-520 from Bellevue Way on-ramp to 108th Ave NE HOV on-ramp, via Northup Way.	✓	✓	✓
Adjust terminus alignment in the University District to reflect arriving buses on NE 43rd St, and departing buses on NE 45th St.	✓	✓	✓

RapidRide

Figure 3 Corridor Overview



King County METRO

3.0 Transit Network

The RapidRide B Line currently provides frequent bus service between the downtowns of Redmond and Bellevue, while Route 271 operates local bus service between the University District neighborhood of Seattle and the Issaquah Transit Center. Corridor 3101+1028 largely follows portions of the existing B Line and Route 271 alignments, connecting the University District to the Crossroads neighborhood in eastern Bellevue. The University District and University of Washington Link light rail stations in Seattle and the Bellevue Transit Center in Downtown Bellevue act as transit hubs connecting Corridor 3101+1028 to additional local and regional bus service.

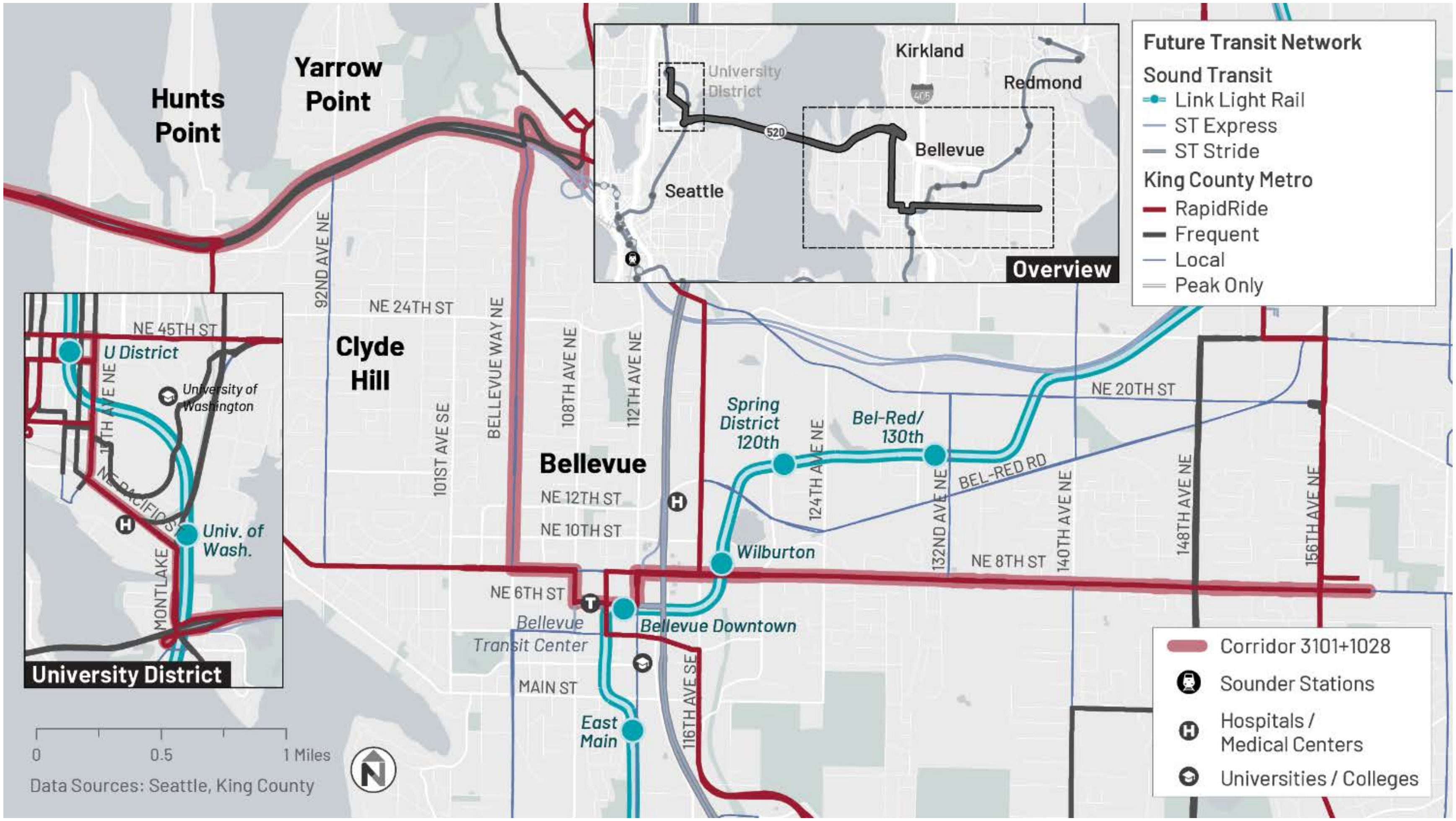
3.1 Future Network Changes

The Metro Connects Interim Network assumes connections between Corridor 3101+1028 and several new transit lines along the alignment. In the University District neighborhood of Seattle, Corridor 3101+1028 would connect to new north-south and east-west RapidRide service. New connections to Link light rail service would be provided at the Bellevue Downtown and Wilburton Stations. In Bellevue, Corridor 3101+1028 would connect to new RapidRide service in Downtown and in the Crossroads neighborhood, near the route’s eastern terminus. The University District of Seattle and Downtown Bellevue would continue to act as transit hubs connecting Corridor 3101+1028 to additional local and regional bus service, including future Stride I-405 BRT service at Downtown Bellevue.

Figure 4 Existing Transit Network

King County METRO

Figure 5 Metro Connects Interim Network



King County METRO

4.0 Service Levels & Operations

This section provides an overview of the assumed service levels, changes from existing service, and other details for successful operation of RapidRide service. The assumed build year is 2035, which is also used for traffic analysis and run time estimates. However, 2042 was used for ridership forecasting.

4.1 RapidRide Standard Service Levels

This study focuses on meeting the *minimum* frequency and span for RapidRide service as defined in the *RapidRide Expansion Program Standards and Implementation Guidance*. It assumes service operates from 6 am to midnight at a minimum, seven days per week, and that service is operated every 15 minutes or better between 6 am and 7 pm, with 10-minute service on weekdays during peak hours.

The RapidRide Expansion Program's Standards and Implementation Guidance also includes a *desired* frequency and span. According to this standard, service would operate 24 hours per day, with service every 10 minutes between 5 am and 7 pm (7.5-minute service on weekdays during peak hours), and every 15 minutes between 7 pm and 2 am.

The large variation between the minimum and desired service levels is a recognition that different corridors throughout the King County Metro service area have differing transit needs. Land use considerations and variations in residential and commercial densities will determine the most appropriate level of service for each corridor. Corridors are expected to improve from the minimum to the desired standard over time as there is a demonstrated need for additional service frequency and span.

This planning study assumes that all routes will at least meet the minimum frequency standards. If any routes already have higher levels of service, those service levels are assumed to be maintained. In instances where multiple routes are combined, and one route already exceeds the standard, the service levels are assumed to strike a balance between the two routes while still achieving the standard.

4.2 Existing Service Levels

Route B Line currently operates frequent service for most of the day, every day. It operates every 15 minutes on weekdays between 10 am and 3 pm and 8 pm to 10pm, every 15 minutes on Saturdays and Sundays between 6 am to 10 pm. During weekday peak periods, Route B Line operates 12 minutes or better from 6 am to 10 am, and from 3 pm to 8 pm. Between Bellevue and the University District, Route 271 operates frequent service on Weekdays and infrequent service for Saturdays and Sundays. On weekdays, this segment of Route 271 operates every 20 minutes or better from 7 am to 7pm. On Saturdays, Route 271 runs every 30 minutes from 10 am to 7 pm. On Sundays, Route 271 starts its service at 7 am and runs every 30 minutes from noon to 8 pm.

Figure 6 Existing B Line Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td>45</td><td>30</td><td>12</td><td colspan="2">10</td><td>12</td><td colspan="5">15</td><td>12</td><td colspan="3">10</td><td>12</td><td colspan="2">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td>60</td><td colspan="16">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td>60</td><td colspan="16">15</td><td>20</td><td colspan="2">30</td><td>60</td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

Figure 7 Existing Route 271 Frequency by Time of Day

<table>
<tr><th></th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th><th>18</th><th>19</th><th>20</th><th>21</th><th>22</th><th>23</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Weekday</td><td></td><td>60</td><td>30</td><td>20</td><td colspan="8">15</td><td colspan="2">12</td><td>20</td><td colspan="3">30</td><td colspan="2">60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Saturday</td><td></td><td></td><td colspan="4">60</td><td colspan="9">30</td><td colspan="5">60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sunday</td><td></td><td></td><td></td><td colspan="5">60</td><td colspan="8">30</td><td colspan="4">60</td><td></td><td></td><td></td><td></td></tr>
</table>

Source: King County Metro GTFS May 2023

4.3 Changes to Meet Standard

To meet the minimum RapidRide frequency on weekdays, Metro would need to increase Route B Line frequency by adding one additional trip per hour for 6 to 7 am and 3 to 4 pm. This will ensure 10-minute service for Weekday peak periods.

For Route 271, at least two to four additional trips per hour would be needed for Weekday morning peak periods between 6 am and 9 am to meet the minimum RapidRide frequency. At least one to three additional trips per hour would be needed for Weekday afternoon peak periods between 3 pm and 7pm. One additional trip per hour would be needed for Weekday evening service hours between 10 pm and midnight. On Saturdays, Route 271 would need to add at least three additional trips per hour from 6 am to 10 am, two additional trips per hour between 10 am to 7 pm, and one additional trip per hour between 7 pm and midnight. On Sundays, four additional trips would need to be added between 6 am and 7 am, three additional trips per hour between 7 am and noon, two additional trips per hour between noon and 7 pm, and one additional trip per hour between 8 pm and midnight. These additions would ensure 15-minute service on Weekday off-peak periods, Saturdays, and Sundays, and 10-minute service on Weekday peak periods per the RapidRide standard.

Figure 8 and Figure 9 (Route B Line and Route 271, respectively) show the number of additional trips needed per direction by hour and day of the week to meet the minimum RapidRide standards. Figure 10 and Figure 11 (Route B Line and Route 271, respectively) show the updated frequency and span, with colored cells indicating specific hours where service would be improved to meet the standard. Gray cells indicate where service levels would remain unchanged.

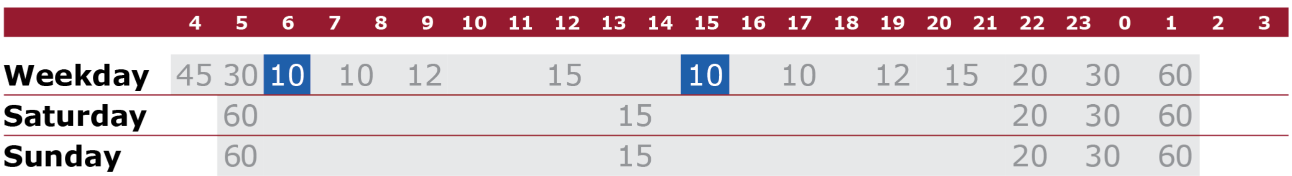
Figure 8 Additional Trips to Meet Minimum RapidRide Standards (Route B Line)

	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Saturday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunday	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 9 Additional Trips to Meet Minimum RapidRide Standards (Route 271)

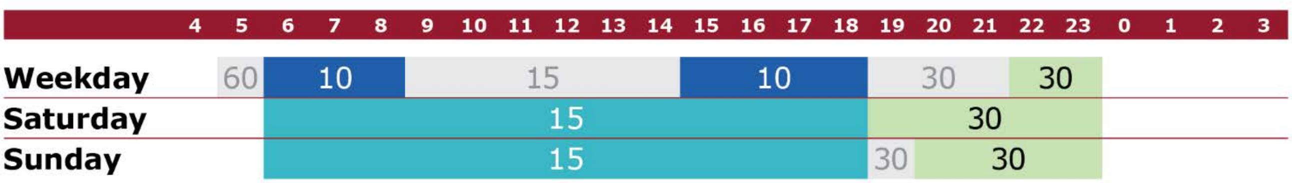
	4		6		8		10		12		14		16		18		20		22		0		2	
Weekday	-	-	4	3	2	-	-	-	-	-	-	2	1	1	3	-	-	-	1	1	-	-	-	-
Saturday	-	-	3	3	3	3	2	2	2	2	2	2	2	2	2	1	1	1	1	1	-	-	-	-
Sunday	-	-	4	3	3	3	3	3	2	2	2	2	2	2	2	-	1	1	1	1	-	-	-	-

Figure 10 Changes to Frequency and Span to Meet Minimum Standard (B Line)



Source: King County Metro GTFS May 2023

Figure 11 Changes to Frequency and Span to Meet Minimum Standard (Route 271)



Source: King County Metro GTFS May 2023

4.4 Future Service Levels

When combining B Line and Route 271 into a single RapidRide corridor, the service levels of the new route are assumed to exceed the RapidRide standard due to higher existing service levels on the B Line.[1] The proposed frequency and span of the combined route would be comparable to the current B Line. The span and frequency are shown in Figure 12.

[1] B Line exceeds the minimum RapidRide standards on weekdays between 4 am and 6 am (minimum standard has no service before 6 am), between 9 am and 10 am (standard is for service every 15 minutes), between 7 pm and 10 pm (standards is for service every 30 minutes), and after midnight (minimum standard has no service after midnight). On Saturday and Sunday, B Line exceeds the standard before 6 am, after midnight, and between 7 pm and 10 pm.

Figure 12 Proposed Frequency and Span

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3
Weekday	60	30	10	10	10	12	15	15	15	15	15	10	10	10	10	12	15	20	30	30	30	60		
Saturday		60	15	15	15	15	15	15	15	15	15	15	15	15	15	15	20	20	30	30	30	60		
Sunday		60	15	15	15	15	15	15	15	15	15	15	15	15	15	15	20	20	30	30	30	60		

Based on the forecast travel times (see Section 6.4 Forecast Travel Time Savings), a round-trip will take 78 minutes during the PM peak and 67 minutes during off-peak hours. Assuming the service hours on the portions of B Line and Route 271 along the alignment,[2] the corridor would save approximately 5 service hours each weekday (or a 3% savings), but require an increase of 19 service hours each Saturday (a 22% increase), and 25 service hours each Sunday (a 31% increase)

Figure 13 summarizes the changes needed between existing service (for relevant potions of the routes only) and future service assuming build conditions. King County Metro would save three buses on weekdays (10 buses, relative to the existing 13 buses needed on weekdays). One new bus would be needed on Sundays, with no change to buses on Saturdays. These fleet assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more vehicles will be needed.

Figure 13 Change in Future Service Levels

Service Day	Existing B | 271	Build 2035	Change	Percent
Daily Service Hours				
Weekday	55 | 90	140	-5	-3%
Saturday	46 | 40	105	+19	+22%
Sunday	43 | 36	105	+25	+31%
Daily One-Way Trips				
Weekday	173 | 130	178	-	-
Saturday	139 | 51	140	-	-
Sunday	139 | 46	140	-	-
Fleet				
Weekday	8 | 5	10	-3	-23%
Saturday	3 | 3	6	-	-
Sunday	2 | 3	6	+1	+20%

Source: King County Metro GTFS May 2023 and Synchro modeling.

Note: Existing values account for the portions of B Line and Route 271 along the alignment only.

[2] Route 271 between University District and Bellevue Transit Center, and B Line between Bellevue Transit Center and 156th Ave NE

4.5 Layover and Terminus Facilities

During peak hours, assuming 10-minute headways (six buses per hour), the corridor would require one space on each end of the corridor, with up to two spaces if factoring in variability of arrivals and departures.[3] If no layover space can be identified on the east end of the corridor, and all layover time occurs only at U District Station, the corridor would require two spaces.[4]

These layover assumptions are based on projected running times, which assume the speed and reliability improvements identified in section 6.3. If those improvements are not implemented and running times are higher than projected, more layover space will be needed.

4.5a U District Station

The terminus at the U District Station serves many routes. Route 271 buses terminate on 15th Ave NE north of NE 42nd St, then proceed to a layover location on Memorial Way. After layover, buses loop back and start their trips on 15th Ave NE south of NE 43rd St NE. Memorial currently has adequate layover for additional buses, but it is currently at risk for displacement.

There is approximately 375 feet of additional layover space nearby on 12th Ave NE, or enough for approximately five articulated buses. This layover space would need to accommodate RapidRide buses for this corridor as well as other routes such as ST 542. With the East Link restructure, Route 271 is proposed to be replaced by new Route 270 (shorter UW to Bellevue Transit Center route), but this would have the same U District pathway and similar layover need. 12th Ave NE lacks charging facilities.

4.5b Crossroads

The proposed eastern terminus location for the corridor would be in the vicinity of the Crossroads Bellevue shopping center near NE 8th Street and 156th Ave NE. No routes terminate here today, and this new layover location would likely be on-street.

However, there could be opportunities for an off-street layover facility in the parking lot of the shopping center. The alignment from Metro Connects assumes a turnaround here using the mall access road parallel to NE 8th Street on the south side of the shopping center. If feasible, this could be where the layover and charging facilities are provided. Such a layover facility may impact the cost of implementing this RapidRide corridor.

Another potential option may require coordination with the City of Bellevue for access to city-owned property (Crossroads Park and Fire Station 3) on the north side of NE 8th Street west of 164th Ave NE to turn around.

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[3] A one-way travel time of approximately 37 to 41 minutes requires a layover of eight minutes (20% layover). With buses every 10 minutes, there would be one laying over at one time, with up to two buses if buses arrive too early or depart too late. If the corridor advances to project development, additional operational details, including more specific layover assumptions and requirements, would be used to estimate layover time and needed layover spaces.

[4] A roundtrip travel time of 78 minutes requires a layover of 16 minutes. With buses every 10 minutes, there could be up to two buses at one time.

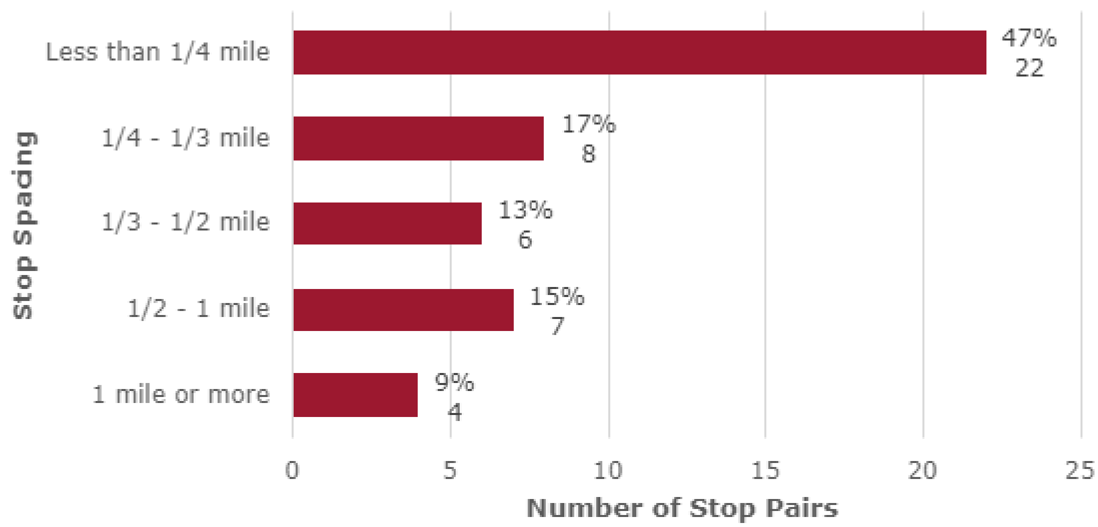
5.0 Stops and Stations

5.1 Existing Stop Spacing

Based on existing stop locations along the conceptual alignment, without any stop consolidation or rebalancing, the average spacing is approximately 2,700 feet (or approximately one-half mile), excluding the alignment along SR-520 between University District and Evergreen Point.

Approximately 45% of stop pairs along the corridor are less than a quarter mile apart, and with an additional 17% between a quarter and third of a mile (Figure 14).

Figure 14 Distribution of Existing Stop Spacing



5.2 Station Spacing Standards

The RapidRide Expansion Program's Standards and Implementation Guidance identifies a desired station spacing of every one-third to one-half mile.

Wider station spacing (one-half to 1.0 mile) is acceptable in low-density corridor segments or in segments where other local services provide access (on the condition that the local service operates at least every 30 minutes for 18 hours per day, seven days per week). Wider spacing can also be implemented where there are gaps in demand (due to land use), along limited-access roadways, or where topography reduces network access.

Narrower spacing as close as one-quarter mile is acceptable for individual station pairs where demand or local context deem it appropriate.

5.3 Proposed Station Locations

The project team identified proposed stations based on existing ridership, transfer opportunities to other bus or rail lines, and access to major destinations. Stations were first identified at the locations with the busiest ridership today, and where connections would be made to rail lines or other major bus routes. Secondly, additional station locations were identified between these preliminary locations based on existing ridership, key destinations, and street connectivity. The goal was to align station locations with the RapidRide spacing standards, but deviations from this were made where local conditions merited, such as existing locations of signals and crossings, or connections to other transit routes.

The proposed station locations are shown in Figure 15. The average spacing would be 3,460 feet (or approximately three-quarters of a mile), which aligns well with the RapidRide standards and reflects some station consolidations along portions of the corridor with lower density and transit demand.

The proposed station locations are representative and are primarily for the purpose of comparison. Station locations will be refined in future stages of project development, which will include community engagement.

Figure 15 Proposed Station Locations

5.4 Station Typologies

There are four station types identified in King County Metro's RapidRide program. These types, described in Figure 16, are assigned to each station based on daily boardings. Stations with more than 350 people per day are expected to have the most amenities and largest stations. The cost for each station type is provided in Section 12.0 Capital Costs on page 58.

Figure 16 Station Typologies

Station Amenity	Large Raised Station	Large Station	Medium Station	Small Station
Daily Boardings	**350+**	**150-349**	**50-149**	**<50**
Bench	✓	✓	✓	✓
Shelter	✓	✓	✓	✗
Lighting	✓	✓	✓	✗
Trash Can	✓	✓	✓	✗
Wayfinding	✓	✓	✓	✗
Real Time Information	✓	✓	✓	✗
Bike Racks	✓	✓	✗	✗
ORCA Card Reader	✓	✓	✗	✗
Raised Platform	✓	✗	✗	✗

Source: RapidRide Expansion Program

Based on the estimated ridership by station in the Forecast Ridership section (on page 35), each station is categorized into one of the four potential station typologies. Station locations with existing RapidRide stations are assumed to not require any new amenities. The typologies are listed in Figure 17 and summarized in Figure 18.

Figure 17 Station Boardings and Typology

		Forecast Boardings		Typology	
#	**Station**	**EB**	**WB**	**EB**	**WB**
1	U District Station	430	-	Large Raised	Small
2	15th Ave & Campus Pkwy	1,090	280	Large Raised	Large
3	Pacific St & Montlake Blvd	930	50	Large Raised	Medium
4	SR-520 & Montlake Blvd	310	190	Large	Large
5	SR-520 & Evergreen Point Rd	100	120	Medium	Medium
6	SR-520 & Clyde Hill/Yarrow Pt	60	130	Medium	Medium
7	Bellevue Way NE & NE 30th Pl	250	220	Large	Large
8	Bellevue Way NE & NE 24th St	10	50	Small	Medium

#	Station	Forecast Boardings EB	Forecast Boardings WB	Typology EB	Typology WB
9	Bellevue Way NE & NE 17th St	80	140	Medium	Medium
10	Bellevue Way NE & NE 12th St	70	530	Medium	Large Raised
11	NE 8th St & 106th Ave NE	200	390	Large	Large Raised
12	Bellevue Transit Center	830	1,230	Existing	Large Raised
13	NE 8th St & 116th Ave NE	80	-	Medium	-
14	NE 8th St & 120th Ave NE	50	50	Medium	Medium
15	NE 8th St & 124th Ave NE	40	50	Large	Large
16	NE 8th St & 131st/134th Ave NE	10	50	Medium	Medium
17	NE 8th St & 140th Ave NE	0	160	Large	Large
18	NE 8th St & 143rd Ave NE	0	50	Medium	Medium
19	NE 8th St & 148th Ave NE	0	240	Medium	Large
20	NE 8th St & 156th Ave NE	-	700	Small	Large Raised

Figure 18 B Line and Route 271 Station Typology Summary

Station Type	Count	Percent
Large Raised Station	7	18%
Large Station	11	29%
Medium Station	11	45%
Small Station	3	8%
Total	**38**	**100%**

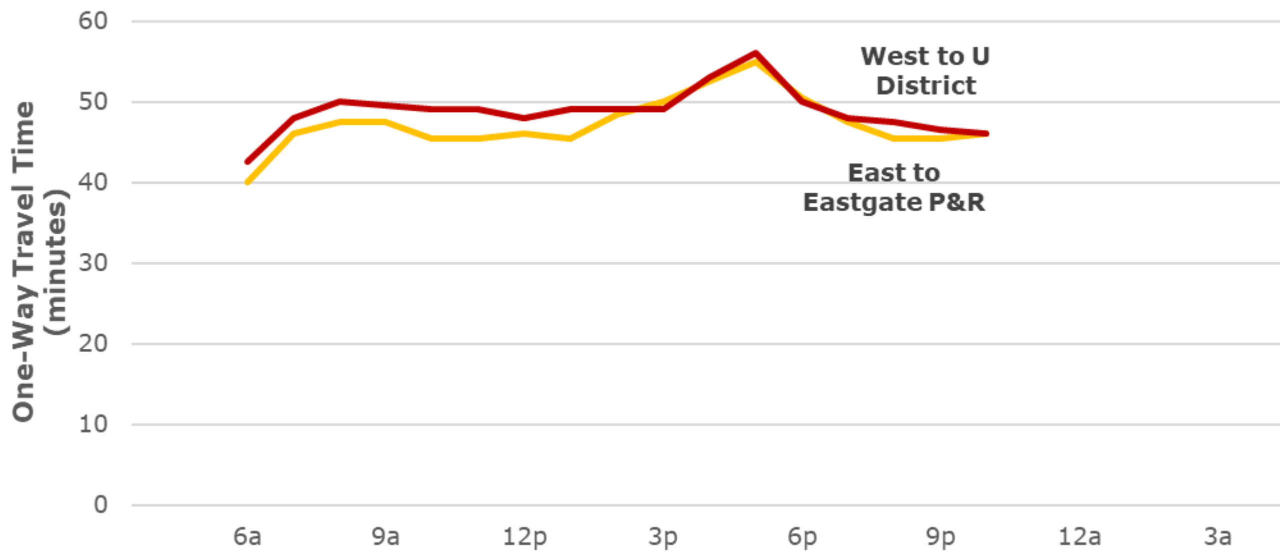
6.0 Speed & Reliability

6.1 Existing Travel Time

Scheduled travel times per direction for Route 271 in May 2023 (between U District and Eastgate Park & Ride) ranged between 40 minutes (early in the morning) to 56 minutes (in the PM peak). On average a one-way trip took 48 minutes.

Scheduled travel times per direction for Route B Line in May 2023 (between Downtown Bellevue and Crossroads) ranged between 8 minutes (in the early morning) to 19 minutes (during the PM peak). On average a one-way trip took 13 minutes.

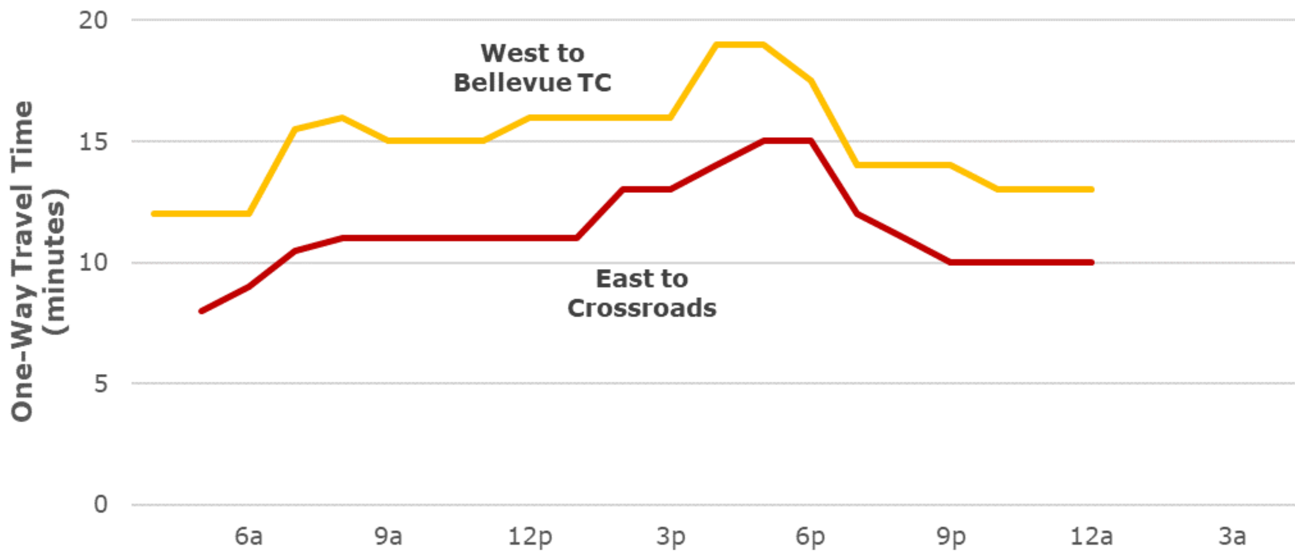
Figure 19 Route 271 Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

Note: Represents the Route 271 portion between U District and Eastgate P&R only.

Figure 20 B Line Scheduled Travel Time (weekdays)



Source: King County Metro GTFS May 2023

Note: Represents the B Line portion between Downtown Bellevue and Crossroads only.

6.2 Existing Speed and Reliability

Two primary metrics are used in this report to assess speed and reliability: bus delay and travel time variability.

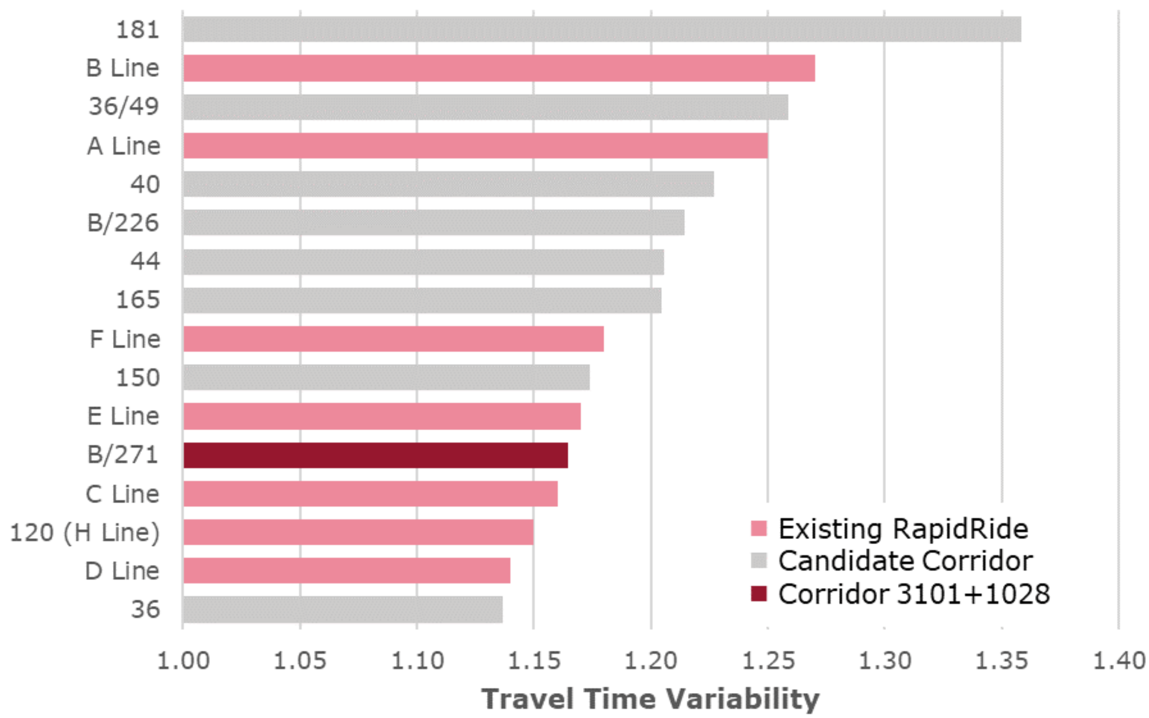
Bus delay refers to the difference between the 20th and 80th percentile travel times for actual observed trips (these percentiles are chosen to represent typical fast and slow travel times, respectively). A larger range indicates high variability of travel time, or inconsistency day-to-day. To passengers, a larger range means buses are not operating consistently, reducing confidence in the service.

Travel time variability is the ratio of the peak period travel time to the shortest travel time between 6 AM and 9 PM. Ratios closer to 1.0 are better, because it indicates travel times are not much longer for peak periods compared to the fastest time of day. To passengers, this is seen as consistency and reliability. Larger ratios indicate much longer travel times at peak periods relative to other times of day.

On average, an end-to-end trip along Corridor 3101+1028 experiences delay of 11 minutes between the 20th and 80th percentile travel time. This is approximately 0.9 minutes (54 seconds) of trip delay per mile on an average trip. This is the fifth lowest (and median) delay of the nine candidate corridors.

For Route 271, eastbound trips at 10 PM and westbound trips at 9 AM have the longest observed travel times. For B Line, east/northbound trips at 6 PM and west/southbound trips at 6 PM have the longest observed travel times. The ratio of travel time at these hours to the shortest travel time during the day (6 AM to 9 PM) is 1.16. This indicates the longest travel times (slowest trips) take 16% longer than trips at faster times of day. Compared to the other candidate RapidRide corridors, which have an average ratio of 1.22, and the existing RapidRide corridors which have an average ratio of 1.19, Corridor 3101+1028 is performing relatively well. This comparison is shown in Figure 21.

Figure 21 Comparison of Travel Time Variability by Corridor



A summary of various speed and reliability metrics is listed in Figure 22.

Figure 22 Speed & Reliability Summary

Metric	Value
On-time performance[A]	70%
Average speed	15.7 mph
Average trip delay[B]	11.3 min
Average trip delay per mile	54 sec
Lowest median hourly travel time (Reference) [C]	22 min
Highest median hourly travel time	27 min[D]
Travel time variability[E]	1.16

[A] On-time performance is measured for weekdays from January through mid-December 2023, arriving no more than 59 seconds early and departing no more than 5 minutes 29 seconds late.

[B] Delay is the difference between the 20th and 80th percentile end-to-end run time, excluding dwell, from Fall 2021.

[C] Reference travel time is the fastest (lowest) median hourly travel time during the day (from 6 AM to 9 PM). Excludes dwell. Data from Fall 2021.

[D] 5 and 6 PM for eastbound trips, from Fall 2021.

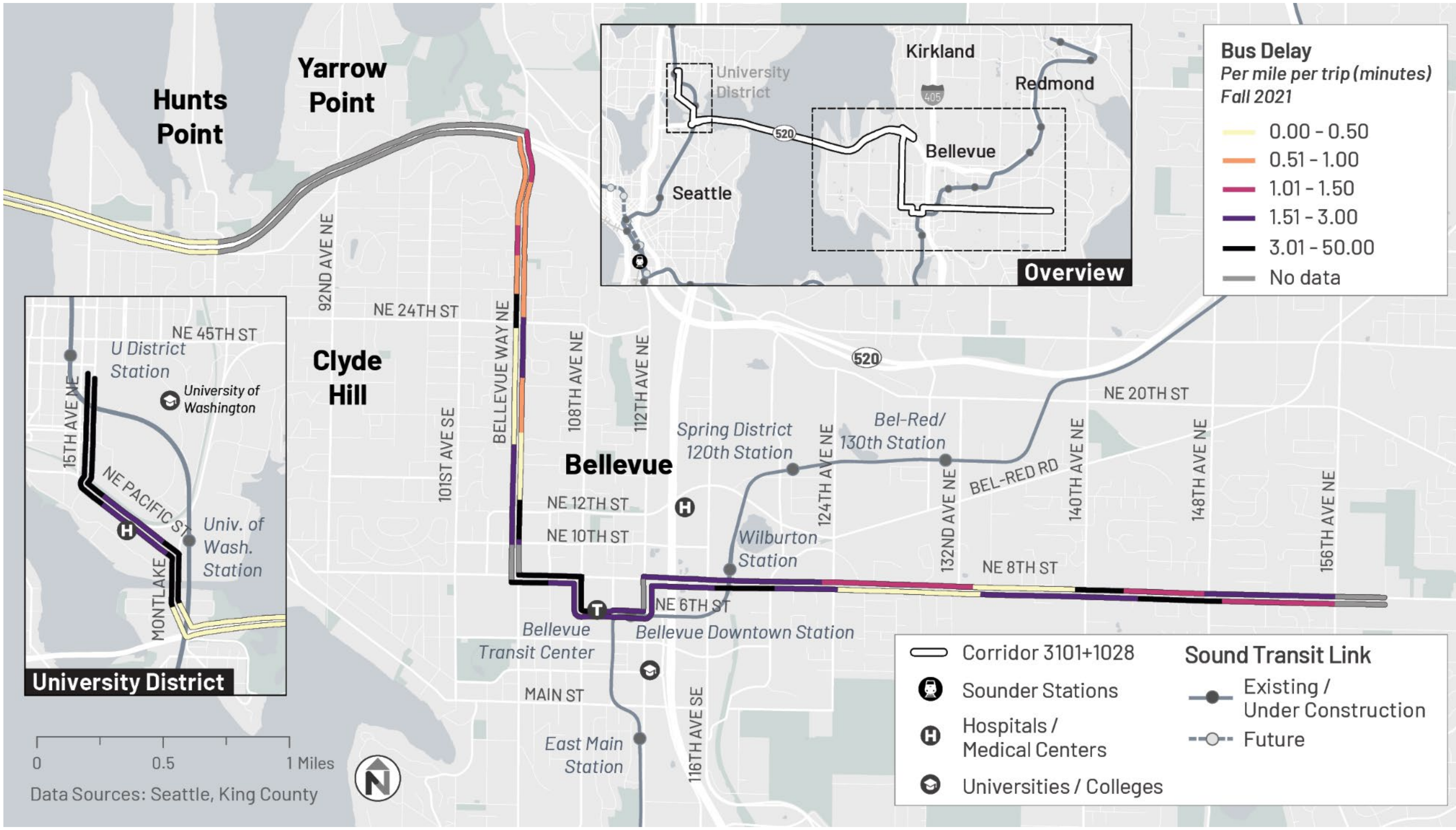
[E] Variability is a ratio of the highest median hourly travel time relative to the reference travel time. Data from Fall 2021.

Figure 23 shows the delay along Corridor 3101+1028 based on King County Metro's AVL data from Fall 2021.[5] The segments shown are existing stop pairs along the representative alignment, including B Line and Route 271, as well as Route 249 for the stop pairs along Bellevue Way. The values shown are cumulative daily delay, normalized by distance (per mile) and level of service (per trip) to account for variations in length and frequency of service.

The U District and Bellevue Transit Center experience high levels of delay, as do the portions of the corridor near Wilburton Station, and between 132nd Ave NE and 156th Ave NE along NE 8th St. Other high delay locations occur at major intersections such as NE 24th St, NE 12th St, and NE 10th St.

[5] It is important to note that the COVID-19 pandemic and its impacts on travel were still prevalent in Fall 2021. Since then, travel patterns have been returning to a new normal, including increased traffic on the roadway and higher transit ridership. The speed and reliability data should be understood within that context.

Figure 23 Corridor 3101+1028 Daily Bus Delay



Source: King County Metro Fall 2021 AVL

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Figure 24 and Figure 25 show the delay for each individual existing stop pair by hour of the day. Like the map above, these values are also normalized by distance and number of trips. Each chart shows a single direction, with the departing stop identified in the x-axis.

Segments of the corridor in the U District experience high all-day delay in both directions. High all-day delay is also seen near Bellevue Transit Center. Travel eastbound sees high all-day delay at Bellevue Way NE & NE 17th St. Travel in both direction sees high delay at NE 8th St & 143rd Ave NE. Overall, high delay locations tend to experience delay throughout the day. Higher levels of delay occur between 6 and 9 pm and between 3 and 6 pm for many stop pairs.

How to Read Delay Charts

The charts on the following pages show the delay (i.e., difference between the 20th and 80th percentile run times).

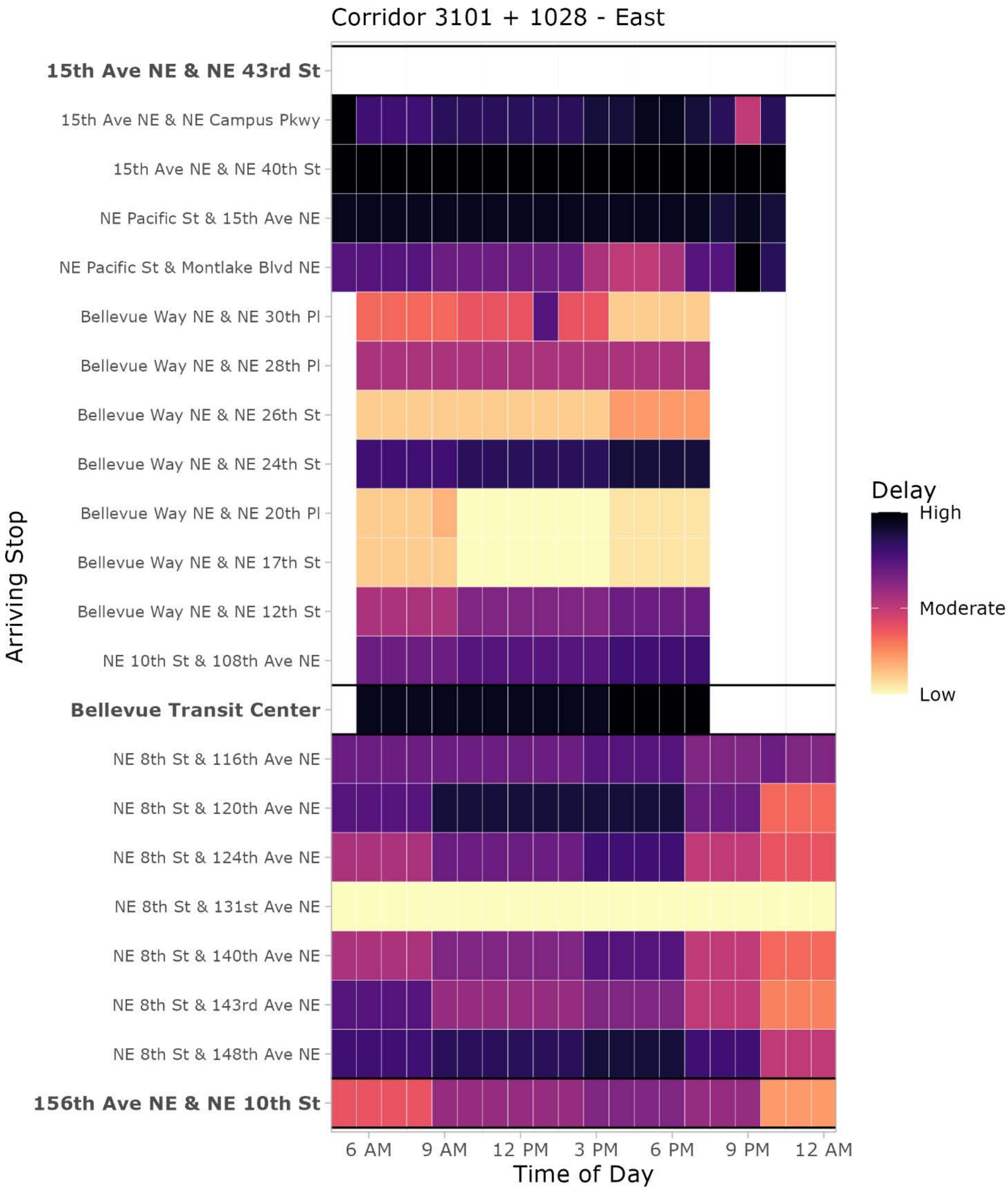
Each row represents a single stop pair. The first row on the top is the first stop on the route in one direction, and the stops are listed in consecutive order. Stops that are timepoints are bolded, and those rows are outlined with black borders.

Each column represents a single hour of the day, from the start of service on the left, to the end of service on the right.

The darker colors indicate more delay, or a larger difference between the 20th and 80th percentile run times, as observed across all weekday observations during the Fall 2021 service period. These are locations and hours when buses experience much longer travel time on some days than others, and where speed and reliability investments may have the greatest benefit.

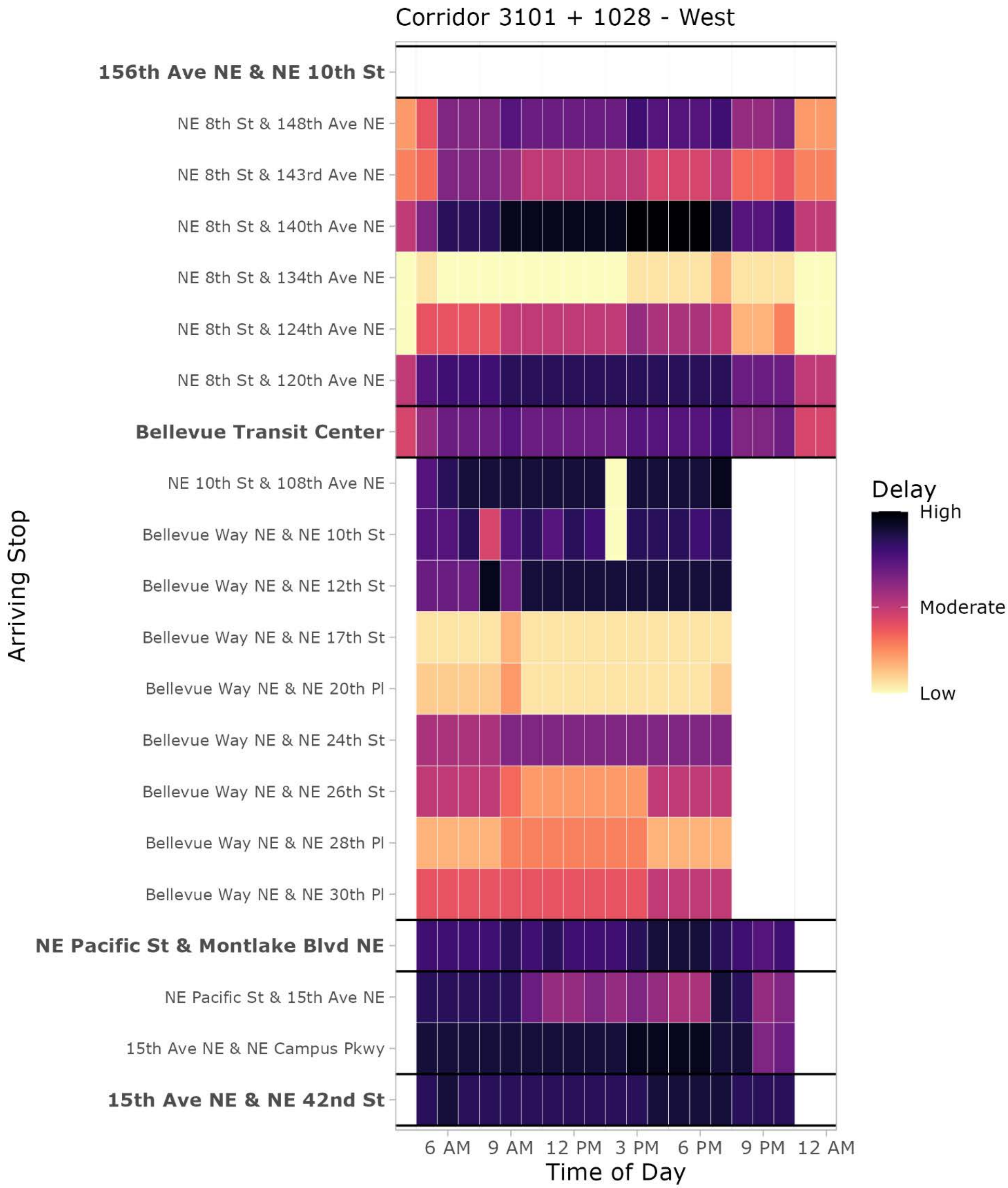
Darker colors that occur throughout a row indicate delay occurring all-day between two consecutive stops. Darker colors along individual columns indicate higher delay at certain times of day (such as morning and afternoon peak periods).

Figure 24 Corridor 3101+1028 Eastbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

Figure 25 Corridor 3101+1028 Westbound – Bus Delay per Mile per Trip



Source: King County Metro Fall 2021 AVL

6.3 Proposed Transit Priority

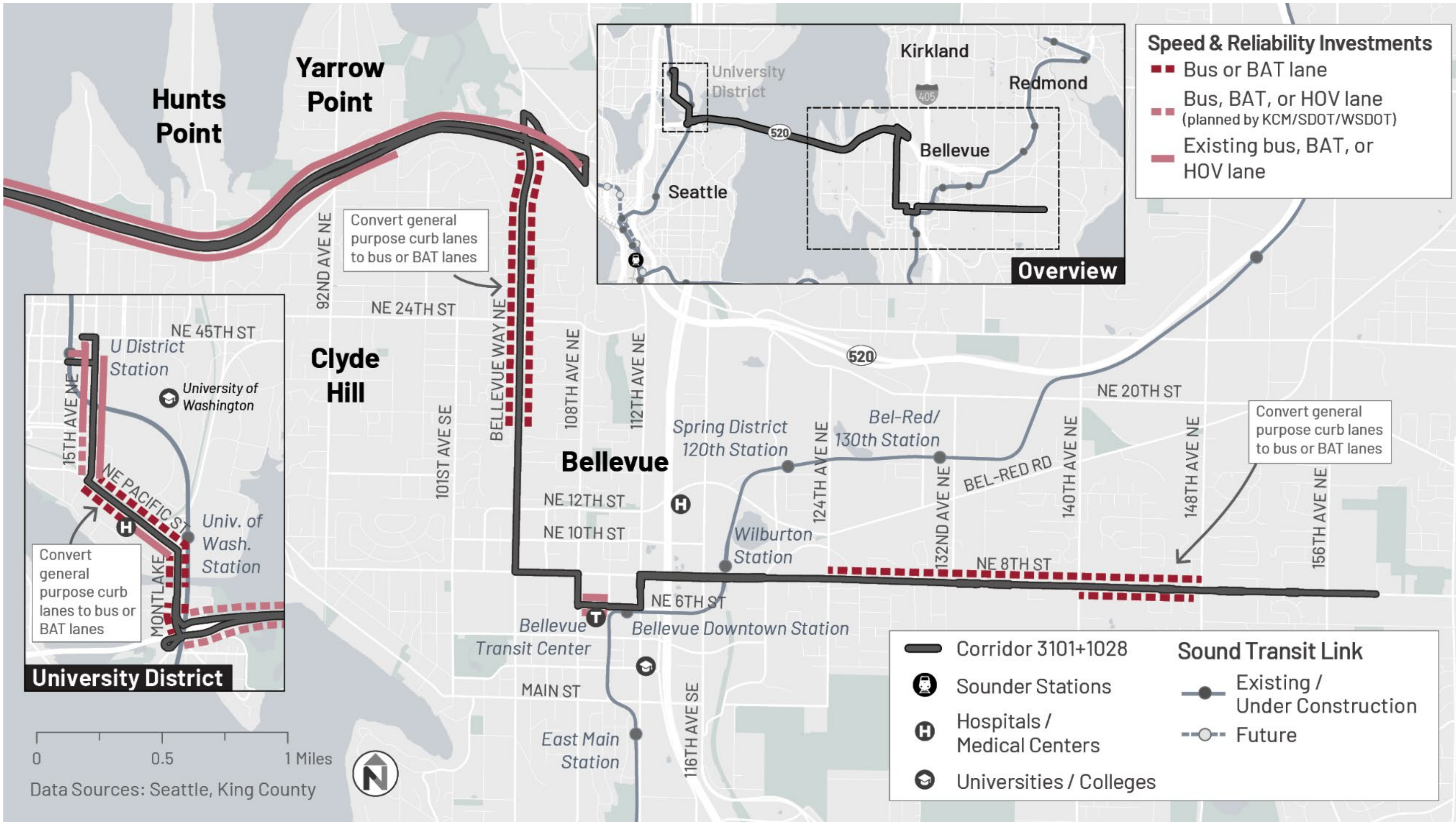
The project team identified several opportunities to improve transit reliability and reduce travel times along Corridor 3101+1028 alignment. Transit priority opportunities were identified where there was high delay and there was available space for bus/BAT lanes and/or other potential interventions that could improve transit speed and reliability. A list of the proposed treatments is in Figure 26, and they are shown geographically in a map in Figure 27.

The corridor currently achieves transit priority for 37% of its centerline miles, which nearly meets the RapidRide *minimum* standard of 40%. The additional proposed treatments here would increase the coverage to 74%, which would be well above the *desired* standard of 50%. This level of bus/BAT lane coverage may be more aggressive than can be implemented. A lower coverage may reduce travel time savings and may result in a minimal reduction in projected ridership.

Figure 26 List of Proposed Transit Priority Treatments

Location	Type	Description
Seattle		
NE Pacific St (15th Ave NE to Montlake Blvd NE)	Bus/BAT lane	Where there currently is no bus/BAT lane, convert general purpose curb lanes to bus/BAT lane between 15th Ave NE and Montlake Blvd NE in both directions.
Montlake Blvd NE (NE Pacific St to E Shelby St)	Bus/BAT lane	Convert one southbound curb lane to bus/BAT lane between NE Pacific St and E Shelby St. Convert inner northbound lane to bus/BAT lane between E Shelby St and NE Pacific St.
Montlake Blvd NE (E Hamlin St to SR-520)	Bus/BAT lane	Convert one southbound lane to bus/BAT lane between E Hamlin St and SR-520. Convert inner northbound lane to bus/BAT lane between SR-520 and E Hamlin St.
Bellevue		
Bellevue Way NE (SR-520 to NE 17th St)	Bus/BAT lane	Convert one lane to bus/BAT lane between SR-520 and NE 8th St in both directions.
NE 8th St (140th Ave SE to 148th Ave SE)	Bus/BAT lane	Convert outer eastbound lane to bus/BAT lane between 140th Ave SE and west of 148th Ave SE.
NE 8th St (148th Ave SE to 124th Ave SE)	Bus/BAT lane	Convert outer westbound lane to bus/BAT lane from 148th Ave SE to 124th Ave SE.

Figure 27 Proposed Transit Priority Treatments



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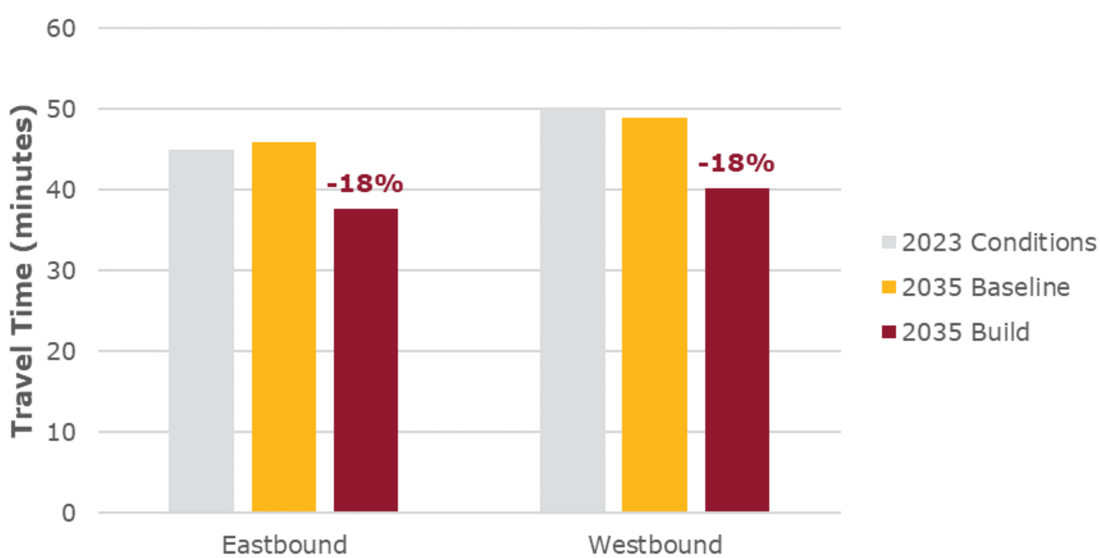
6.4 Forecast Travel Time Savings

The RapidRide Program standards set a goal to improve travel time by 15%-30%, with target travel speed of 12-15 miles per hour. For the purposes of this project, future travel improvements will be compared to the 2035 baseline scenario to best represent the benefit of the RapidRide project compared to a no-action scenario.

Overall, the proposed improvements along the Corridor 3101+1028 alignment are forecast to reduce PM peak Future Build condition travel times 18% from Future Baseline conditions. Average bus travel speed is expected to increase to 17-18 mph in the Future Build conditions. Westbound travel will experience a higher reduction in travel times compared to eastbound travel. The introduction of bus/BAT/HOV lanes throughout the corridor at high delay areas will improve transit speed and travel times.

Figure 28 shows transit travel times for the overall route.

Figure 28 B Line and Route 271 Modeled PM Peak Transit Travel Times



7.0 Boardings and Ridership

7.1 Ridership Trends

B Line and Route 271 carried approximately 7,000 people per day in Spring 2023, and as much as 11,400 people in Fall 2019. These routes have now recovered approximately 62% of the Fall 2019 ridership. By comparison, systemwide bus ridership recovered to 62%[6], and existing RapidRide lines recovered to 73%. Since Fall 2019, King County Metro has reduced hundreds of thousands of service hours systemwide to address the loss of revenue and due to limited operational capacity. Ridership often is tied to service levels, so these ridership figures reflect both reduced demand and reduced service.

Figure 29 B Line and Route 271 Average Weekday Ridership Trends

Season	Weekday Boardings	Change from previous	Relative to Fall 2019
Fall 2019	11,445	-	100%
Fall 2020	3,198	-72%	28%
Fall 2021	4,855	+52%	42%
Spring 2023	7,074	+46%	62%

Source: King County Metro

7.2 Boardings and Alightings by Stop

Figure 30 shows the ridership by stop in Spring 2023. The circles are sized relative to the total stop activity (boardings plus alightings) on an average weekday. The ridership includes all stops along the B Line and Route 271, plus stops for Route 249 along Bellevue Way.

The busiest stop locations are at Bellevue Transit Center and along 156th Ave NE between NE 8th and NE 24th St. Moderate ridership occurs near the University of Washington and U-District Link Stations.

[6] The Northgate Link extension opened in October 2021, and included a restructure of bus services. This ridership change may undercount additional systemwide ridership that might have otherwise been on the bus network.

Figure 30 Boarding and Alighting Activity by Stop (Spring 2023)

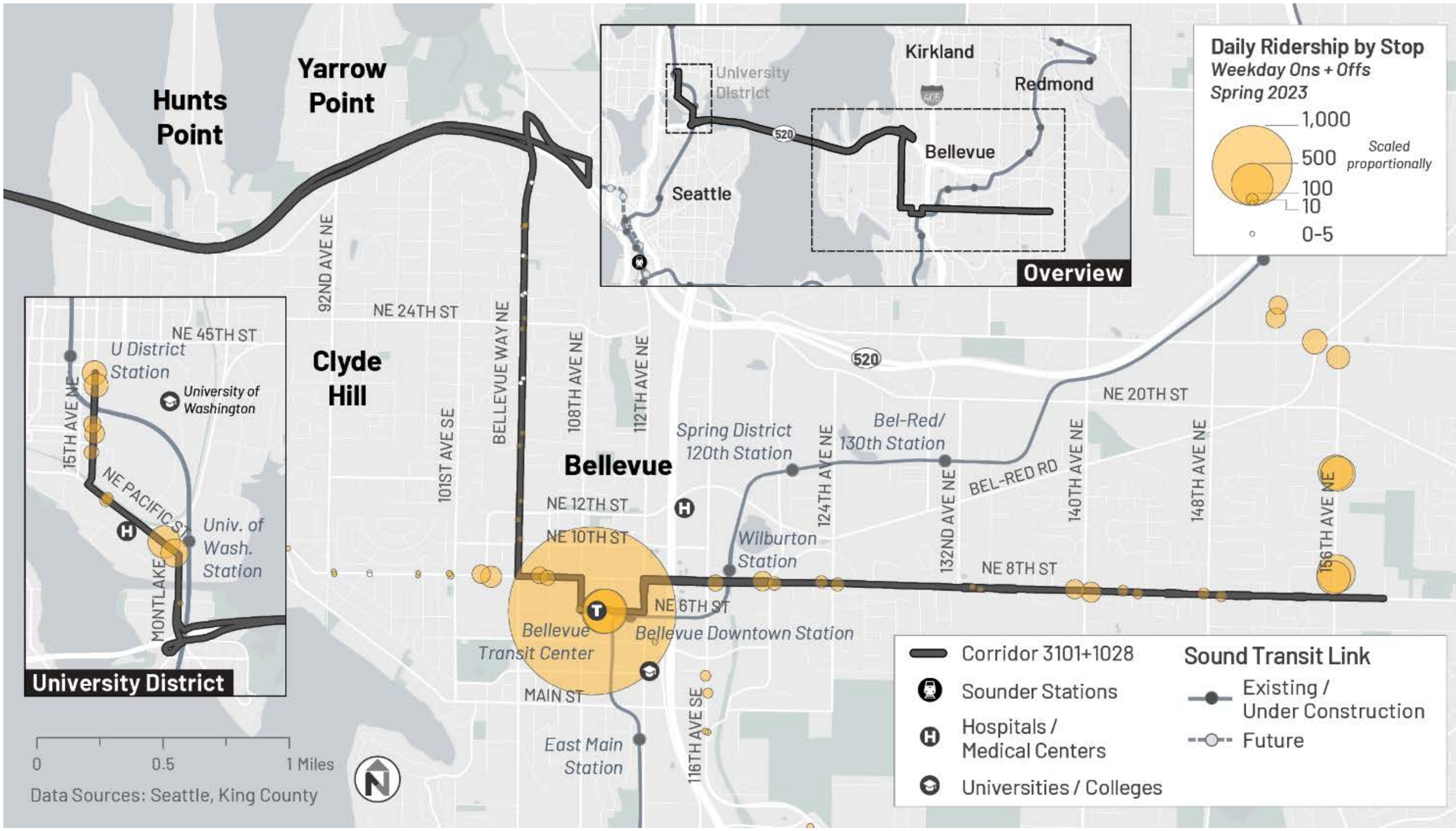


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Figure 31 Daily Boarding and Alighting Activity by Stop Pair

Stop Pair	Eastbound	Westbound	Total
15th Ave & 42nd/43rd St	265	258	524
15th Ave & Campus Pkwy	173	208	381
15th Ave & 40th St	133	-	133
Pacific St & 15th Ave	107	95	202
Pacific St & Montlake Blvd	314	370	685
Montlake Blvd & Shelby St	-	13	13
Bellevue Way & 103rd Ave	-	2	2
Bellevue Way & 30th Pl	21	19	40
Bellevue Way & 28th Pl	4	7	11
Bellevue Way & 26th St	4	4	8
Bellevue Way & 24th St	9	8	17
Bellevue Way & 20th Pl	1	2	4
Bellevue Way & 17th St	5	8	13
Bellevue Way & 12th St	14	6	20
Bellevue Way & 10th St	-	13	13
8th St & 106th Ave	141	162	304
Bellevue Transit Center	1,116	531	1,647
8th St & 116th Ave	157	-	157
8th St & 120th Ave	120	201	322
8th St & 124th Ave	116	105	221
8th St & 131st/134th Ave	21	24	44
8th St & 140th Ave	208	196	404
8th St & 143rd Ave	80	83	163
8th St & 148th Ave	83	90	173
8th St & 156th Ave	449	386	835

Source: King County Metro Spring 2023

Note: Ridership values represent average weekday boardings plus alightings by stop. Ridership along Bellevue Way is from Route 249.

7.3 Forecast Ridership

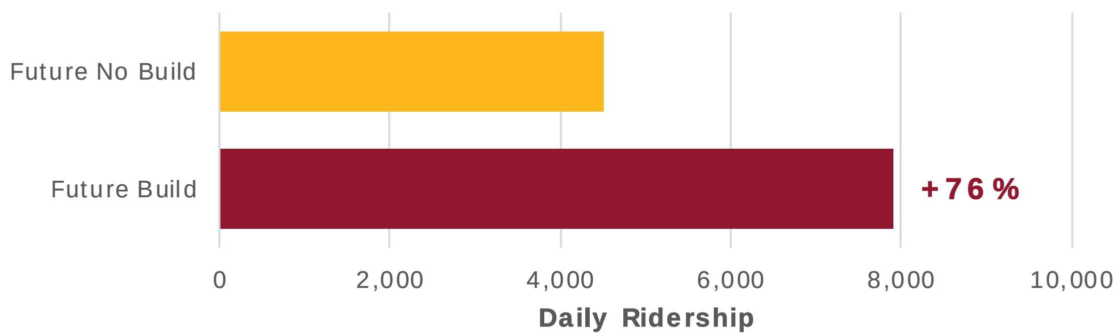
Future ridership for Corridor 3101+1028 will be impacted by several factors, including future population and employment density, future service levels, and speed and reliability improvements. The Sound Transit Incremental Ridership Model provided the future year forecasts by incorporating RapidRide elements for Corridor 3101+1028 (frequency and speed improvements, station location optimization, etc.) into a regional transit network assumed for 2042. As described below, key outputs leveraged from the ridership model include the future year ridership, the net gain in ridership due to RapidRide implementation and the future year productivity of the route.

Future year ridership for the corridor based on ridership forecasting is 740 boardings in the PM peak hour and 7,900 daily boardings. Key ridership hubs include University District, Downtown Bellevue, and Crossroads at 156th Avenue. Future ridership for each candidate RapidRide station is shown in Figure 33.

7.3a Ridership Gains

An important factor for comparison between potential RapidRide corridors is the net impact on ridership due to frequency improvements, station optimization, and speed & reliability improvements. The ridership gains from RapidRide implementation are measured separately from the gains due to land use growth by comparing a future "baseline" to a future "build" scenario with the RapidRide elements assumed. A net increase of 3,400 riders per weekday (or 76% increase) is forecast for Corridor 3101+1028 compared to a "baseline" scenario with today's service levels for B Line and Route 271. Lower bus/BAT lane coverage may result in a diminished ridership increase (e.g., a 50% reduction in bus/BAT lanes may result in 4-6% lower ridership).

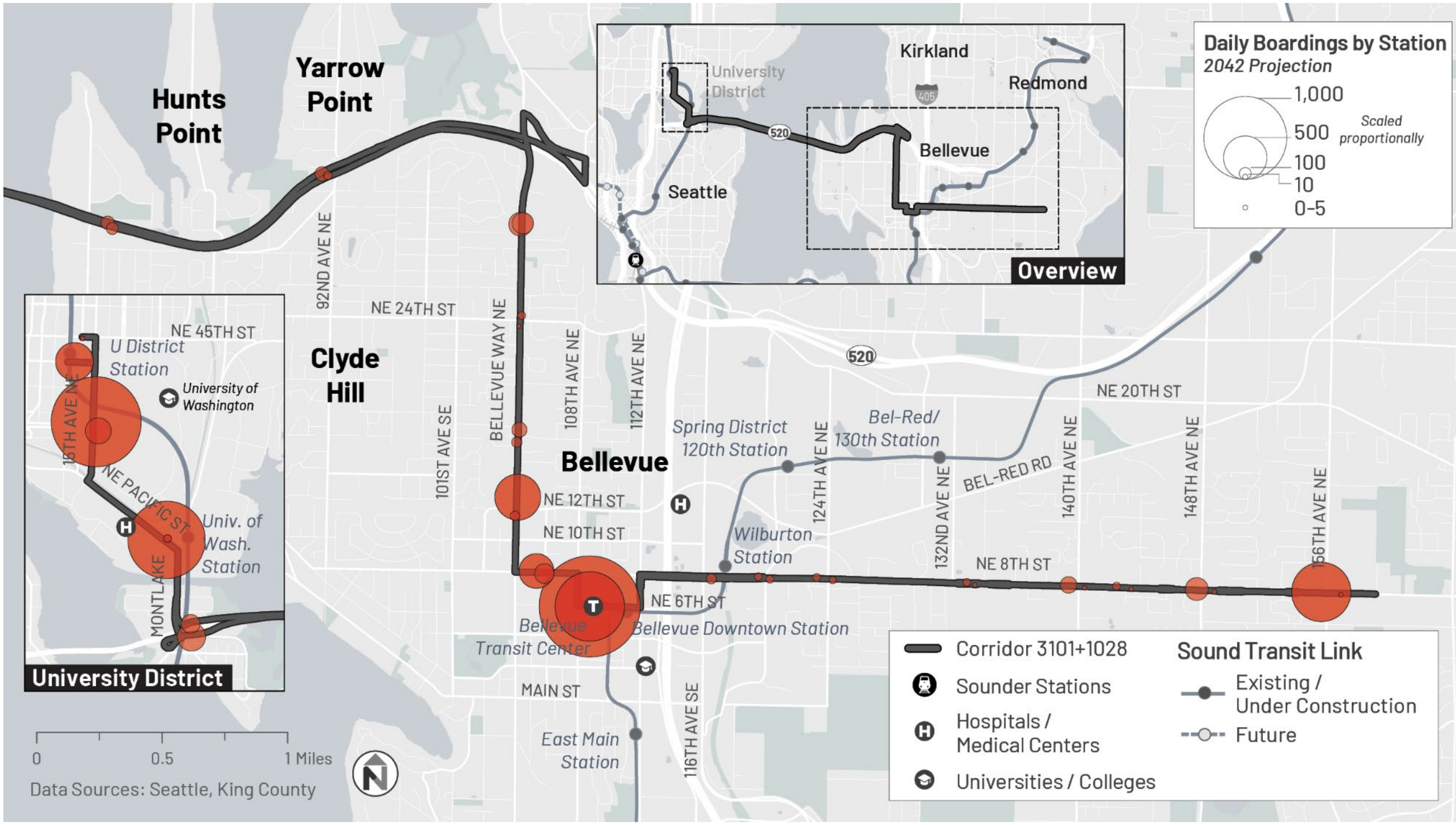
Figure 32 Modeled Ridership



7.3b Corridor Productivity

The average weekday productivity for Corridor 3101+1028 is forecast at 73 riders per platform hour. This would result in an improvement of 115 percent in productivity compared to a future "baseline" 34 riders per revenue hour. This compares with the productivity in 2019 and 2023 of 28 and 19 riders per revenue hour, respectively. At 73 riders per revenue hour, Corridor 3101+1028 would rank second highest of the nine candidate RapidRide corridors.

Figure 33 Future Corridor Ridership



8.0 Equity and Sustainability

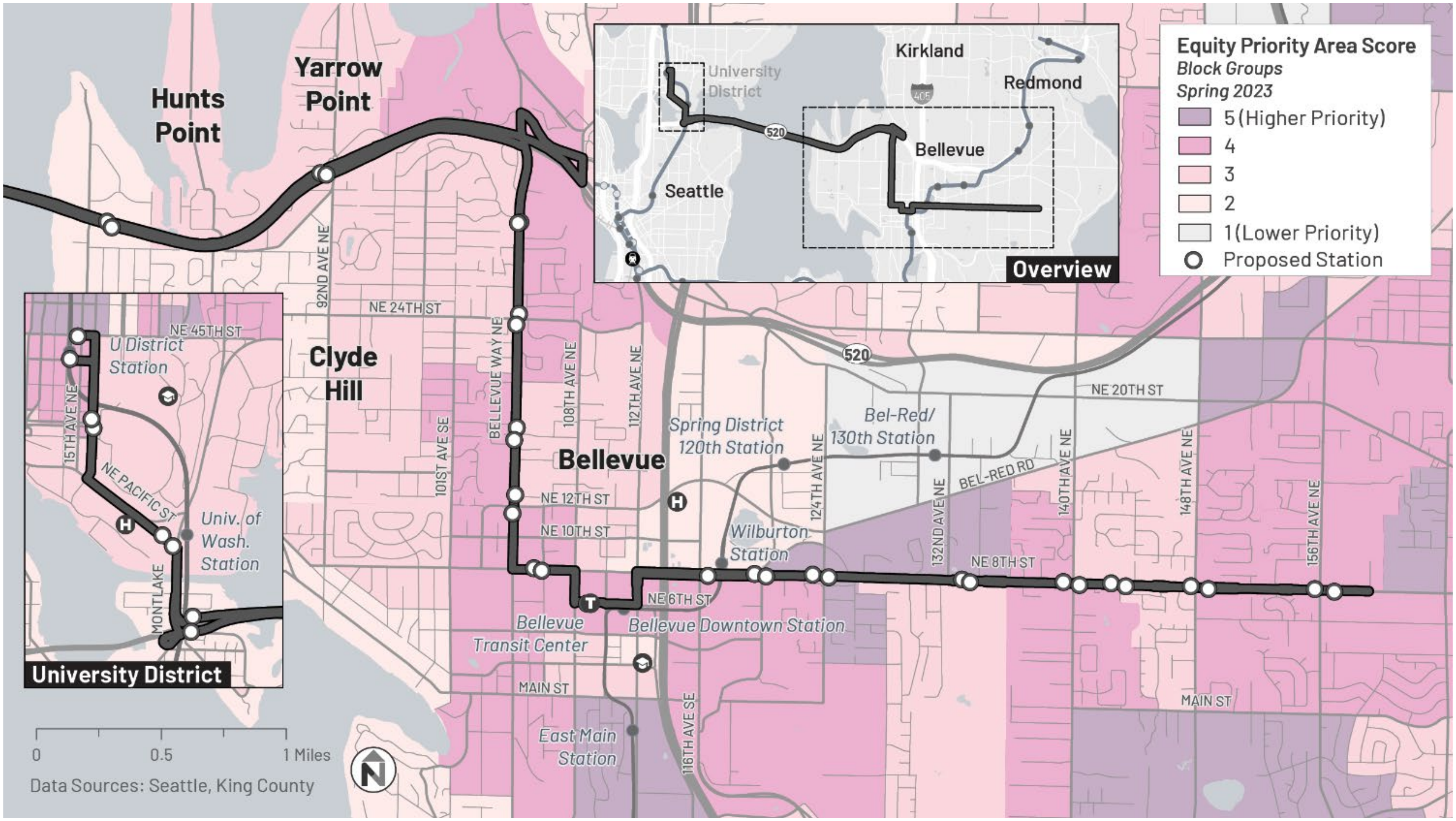
8.1 Equity Priority Areas

King County Metro's Mobility Framework and 2021-2031 Strategic Plan recognize the importance of providing service for groups that depend more on transit service. King County Metro developed an equity priority score that is a composite of multiple demographic criteria[7] calculated by Census Block Group for all of King County. Each block group is assigned a score of one through five, representing low to high equity priority.

Figure 34 displays equity priority area scores for block groups located along Corridor 3101+1028. In the western portion of the alignment, the route serves high equity priority areas in the University District neighborhood of Seattle along NE 45th Street. Across Lake Washington in Bellevue, the B Line and Route 271 corridor serves high equity priority areas along NE 8th Street between 120th Avenue NE and 136th Avenue NE.

[7] (1) Population that is non-White or Hispanic, (2) population living below 200% of the Federal Poverty Line, (3) population that is foreign-born, (4) households with limited-English speakers, and (5) population living with a disability.

Figure 34 King County Metro Equity Priority Areas



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8.2 Ridership Resiliency

The impacts of the COVID-19 pandemic on transit ridership also provide information about the importance of transit service for communities throughout King County Metro's service area. Areas that maintained a higher share of their pre-COVID (Fall 2019) ridership relative to the regional average are representative of places where residents and workers are more dependent on transit, and locations where transit is more competitive with other modes.

The maps in Figure 35 and Figure 36 show the relative difference in bus ridership resiliency compared to the regional change in bus ridership.[8] Although regional ridership dropped by nearly 70% in Fall 2020 and nearly 40% in Spring 2023 relative to Fall 2019, some areas retained ridership at higher rates (i.e., experienced a smaller reduction in ridership). These areas show up in green, whereas areas where ridership dropped even more than the regional average show up in red.

In most areas along the B Line and Route 226 in Fall 2020, ridership retention was consistent with the regional average along the 8th St portion of the corridor and generally 10-33 points lower than the region elsewhere. By Spring 2023, however, change in ridership showed improvement in areas that became consistent with the regional change and in other areas that became 10-20 points higher than the region.

[8] Ridership on these maps exclude ridership on Link or Sounder. It also excludes Sound Transit bus lines.

Figure 35 Ridership Retention (Fall 2020)

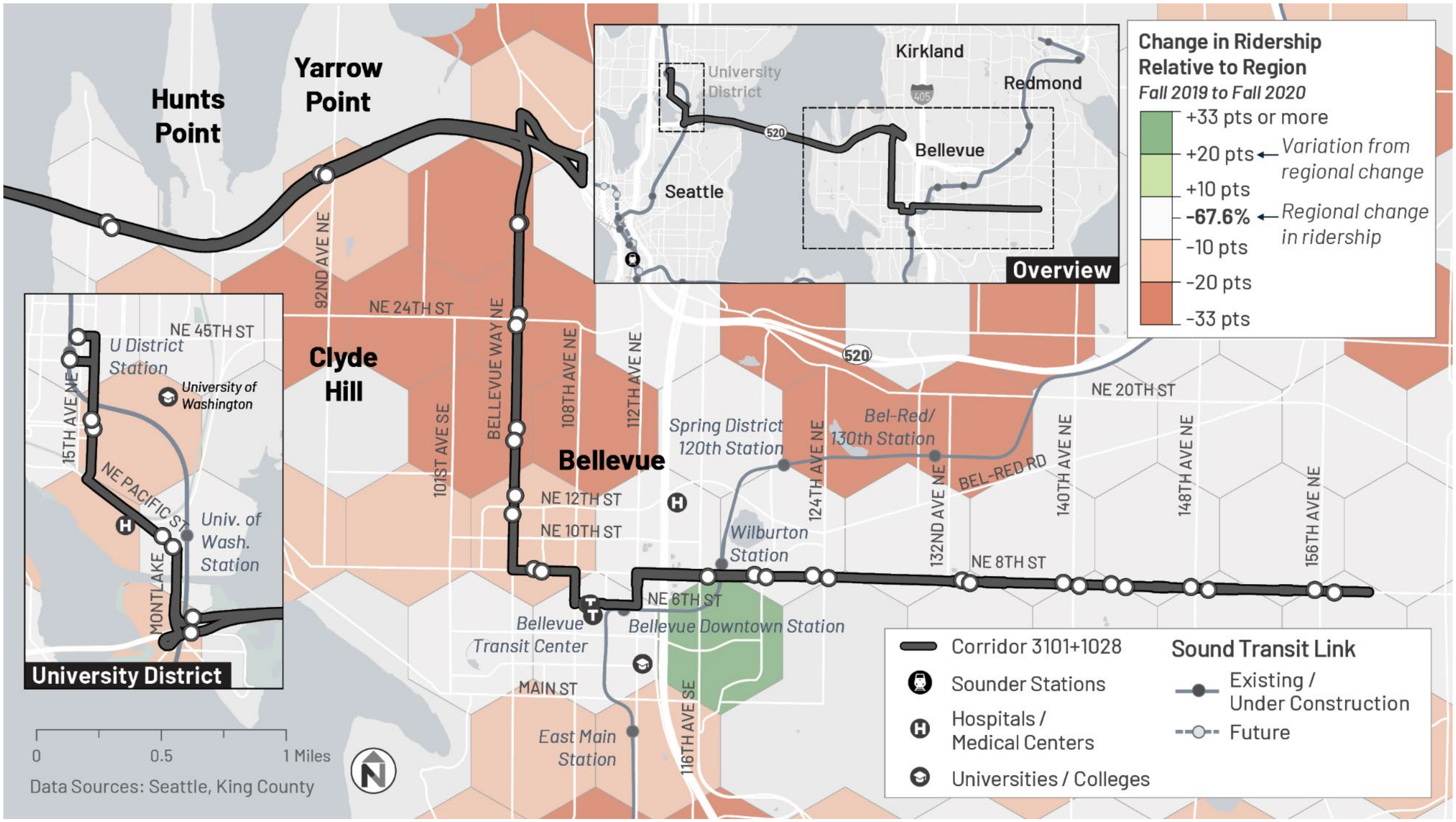
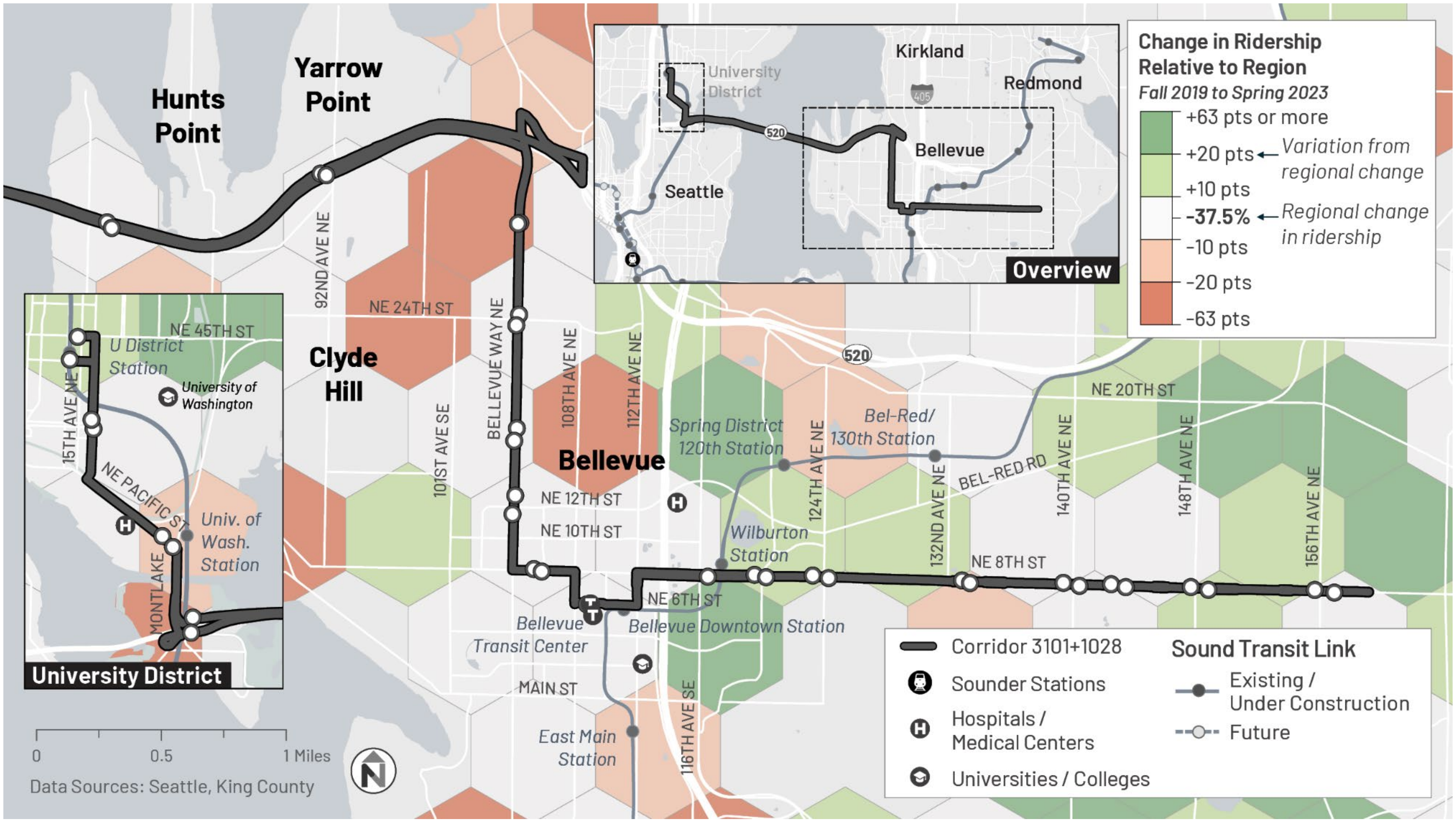


Figure 36 Ridership Retention (Spring 2023)



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8.3 Improved Access to Jobs for Priority Populations

Providing faster travel times and increased frequency as part of a RapidRide implementation of B Line and Route 271 will expand access to opportunities for riders, specifically priority populations within King County. The estimate of improved job access for priority populations is based on the average number of low-wage jobs accessible within 45-minutes via transit for each census block group within a half-mile of the RapidRide corridor.[9] A RapidRide implementation would increase the average number of jobs reachable within 45-minutes via transit by 86% for priority populations along the corridor. Compared to the other candidate RapidRide corridors, this is the second highest increase in job access.

8.4 GHG Emissions

The ridership gains and therefore the shift from vehicle modes of travel because of RapidRide implementation of B Line and Route 271 will have an impact on transportation-related greenhouse gas emissions. The estimate of the reduction in greenhouse gas emissions due to RapidRide implementation is based on incorporating the average passenger trip length from the Sound Transit ridership model and multiplying it by the net change in ridership and the average vehicle emissions factor.[10] Approximately 3.79 metric tons of CO_2 would be reduced on an annual basis due to the reduced vehicle-miles traveled caused by an increase in ridership. Compared to the other candidate RapidRide corridors, this would be the second largest reduction.

[9] An "average" access-to-jobs value for the corridor was based on multiplying the jobs accessible by the total population of each priority population demographic group and dividing by the total priority population and weighting the values for each demographic group as defined in the Service Guidelines.
[10] Based on emissions factors assumed in the Puget Sound Regional Travel Demand Model

9.0 Traffic Conditions

Traffic operational analysis was conducted for 30 intersections along B Line and Route 271 to evaluate transit travel time benefits of the proposed improvements. Out of the 30 intersections, 15 signalized intersections were modeled in Synchro to obtain transit movement delay at those intersections. HCM 2000 Measures of Effectiveness (MOE) report was used to obtain transit delay from the Synchro modeled intersections. The remaining 15 intersections' delay values were estimated based on the overall intersection level of service (LOS), with default delay values for each LOS rating. Travel times between the intersections were calculated using the speed limit and travel distance.

The proposed speed and reliability treatments and reductions to general-purpose through lanes may reduce general-purpose throughput capacity and may increase delay for general-purpose traffic. Adjusting signal timings for future proposed conditions will offset some of the increased general-purpose delays. Transit signal priority (TSP) can also have some negative impact to general-purpose traffic operation on certain cycles. The overall impact of TSP on general-purpose traffic operation is not significant compared to the benefits it produces to transit operation and total person delay.

Figure 37 shows the transit and general-purpose traffic delays at the Synchro modeled intersections for the PM peak hour for the movement of the bus. Locations where delay increased from baseline to build conditions are shown in red. Locations where delay decreased from baseline to build conditions are shown in green. These changes show the estimated impacts of the transit priority concepts for both buses and traffic. Locations where transit delay decreases demonstrate well-performing transit priority treatments. However, large increases in GP delay at those locations indicate potential negative traffic impacts that could diminish transit benefits upstream, or be politically challenging to implement.

The traffic analysis conducted for this study is at a strategic planning level to assess priorities of candidate RapidRide corridors. Future design phases should use Microsimulation to better, and more precisely, evaluate the impacts and benefits for all corridor users. This refined analysis could be the basis of adjusting the treatments proposed along the corridor, or potentially identifying new treatments.

Figure 37 Modeled Delay from Synchro

			Transit Delay (seconds)			Traffic Delay (seconds)		
ID	Intersection	Traffic Control	Existing	2035 Baseline	2035 Build	Existing	2035 Baseline	2035 Build
Eastbound								
801	Univ Hospital Dr & NE Pacific St	Signal	13.4	14.0	15.6	17.3	18.7	20.9
802	Montlake Blvd NE & NE Pacific St	Signal	11.2	8.0	7.6	21.0	27.5	23.0
803	Montlake Blvd E & E Shelby St	Signal	23.6	15.7	15.7	23.6	15.7	15.7
804	Montlake Blvd E & E Hamlin St	Signal	4.5	2.9	2.9	4.5	2.9	2.9
805	Montlake Blvd E & E Lake Wash Blvd	Signal	31.1	83.0	83.0	31.1	83.0	83.0
806	Bellevue Way NE & NE 8th St	Signal	68.1	71.8	71.8	68.1	71.8	71.8
807	108th Ave NE & NE 6th St	Signal	19.8	20.5	20.5	34.1	41.8	41.8
808	110th Ave NE & NE 6th St	Signal	43.1	43.3	43.3	-	-	-
809	112th Ave NE & NE 6th St	Signal	27.3	26.2	26.2	48.9	26.2	26.2
810	112th Ave NE & NE 8th St	Signal	85.3	96.0	96.0	85.3	96.0	96.0
811	116th Ave NE & NE 8th St	Signal	25.0	32.0	32.0	25.0	32.0	32.0
812	120th Ave NE & NE 8th St	Signal	19.4	38.8	38.8	19.4	38.8	38.8
813	140th Ave NE & NE 8th St	Signal	31.2	14.6	18.5	31.2	41.0	89.7
814	148th Ave NE & NE 8th St	Signal	59.7	29.5	29.5	59.7	63.4	63.4
815	156th Ave NE & NE 8th St	Signal	46.7	54.2	54.2	46.7	46.1	46.1
Westbound								
815	156th Ave NE & NE 8th St	Signal	48.7	47.7	47.7	48.7	47.7	47.7
814	148th Ave NE & NE 8th St	Signal	85.2	46.6	46.6	85.2	71.1	71.1
813	140th Ave NE & NE 8th St	Signal	31.6	28.7	18.5	31.6	41.0	36.1
812	120th Ave NE & NE 8th St	Signal	35.9	47.8	47.8	35.9	47.8	47.8
811	116th Ave NE & NE 8th St	Signal	16.8	20.8	20.8	16.8	20.8	20.8
810	112th Ave NE & NE 8th St	Signal	70.3	77.9	77.9	70.3	77.9	77.9

ID	Intersection	Traffic Control	Transit Delay (seconds) Existing	Transit Delay (seconds) 2035 Baseline	Transit Delay (seconds) 2035 Build	Traffic Delay (seconds) Existing	Traffic Delay (seconds) 2035 Baseline	Traffic Delay (seconds) 2035 Build
809	112th Ave NE & NE 6th St	Signal	22.5	25.8	25.8	22.5	25.8	25.8
808	110th Ave NE & NE 6th St	Signal	65.3	65.3	65.3	-	-	-
807	108th Ave NE & NE 6th St	Signal	136.0	169.1	169.1	-	-	-
806	Bellevue Way NE & NE 8th St	Signal	24.4	25.2	25.2	24.4	25.2	25.2
805	Montlake Blvd E & E Lake Wash Blvd	Signal	56.6	59.2	59.2	56.6	59.2	59.2
804	Montlake Blvd E & E Hamlin St	Signal	2.6	2.9	2.9	2.6	2.9	2.9
803	Montlake Blvd E & E Shelby St	Signal	6.3	4.2	4.2	65.3	21.6	21.6
802	Montlake Blvd NE & NE Pacific St	Signal	34.2	46.3	11.9	34.2	46.3	85.2
801	Univ Hospital Dr & NE Pacific St	Signal	0.4	1.2	0.0	0.4	1.2	6.7

Delay increased from baseline to build conditions.
Delay decreased from baseline to build conditions.

10.0 Safety

WSDOT provided five years of crash data (2018 through 2022) for all reported crashes along the corridor. Crashes are included in the analysis if they resulted in an injury or fatality, are located within 50 feet of the representative alignment, and are on surface streets. Therefore, the crashes may include incidents on perpendicular roadways and are included here due to their proximity to the corridor. Property damage crashes are not included, nor are crashes on freeways, limited-access grade-separated highways, or on/off ramps.

Figure 38 summarizes the number of crashes along the corridor by severity level and mode. There were 193 reported injury crashes along the corridor between 2018 and 2022. Most crashes involved vehicles only, but approximately 24% of crashes involved either pedestrians or bicycles. Most crashes resulted in minor or possible injuries, however 7% resulted in a fatality or serious injury.

Figure 38 Crash Summary

Crash Severity	Vehicle Crashes		Pedestrian Crashes		Bicycle Crashes		All Crashes	
Fatality	0	0%	2	7%	1	6%	**3**	**2%**
Serious Injury	4	3%	4	13%	2	12%	**10**	**5%**
Minor Injury	36	25%	13	43%	9	53%	**58**	**30%**
Possible Injury	106	73%	11	37%	5	29%	**122**	**63%**
Total	**146**	**100%**	**30**	**100%**	**17**	**100%**	**193**	**100%**

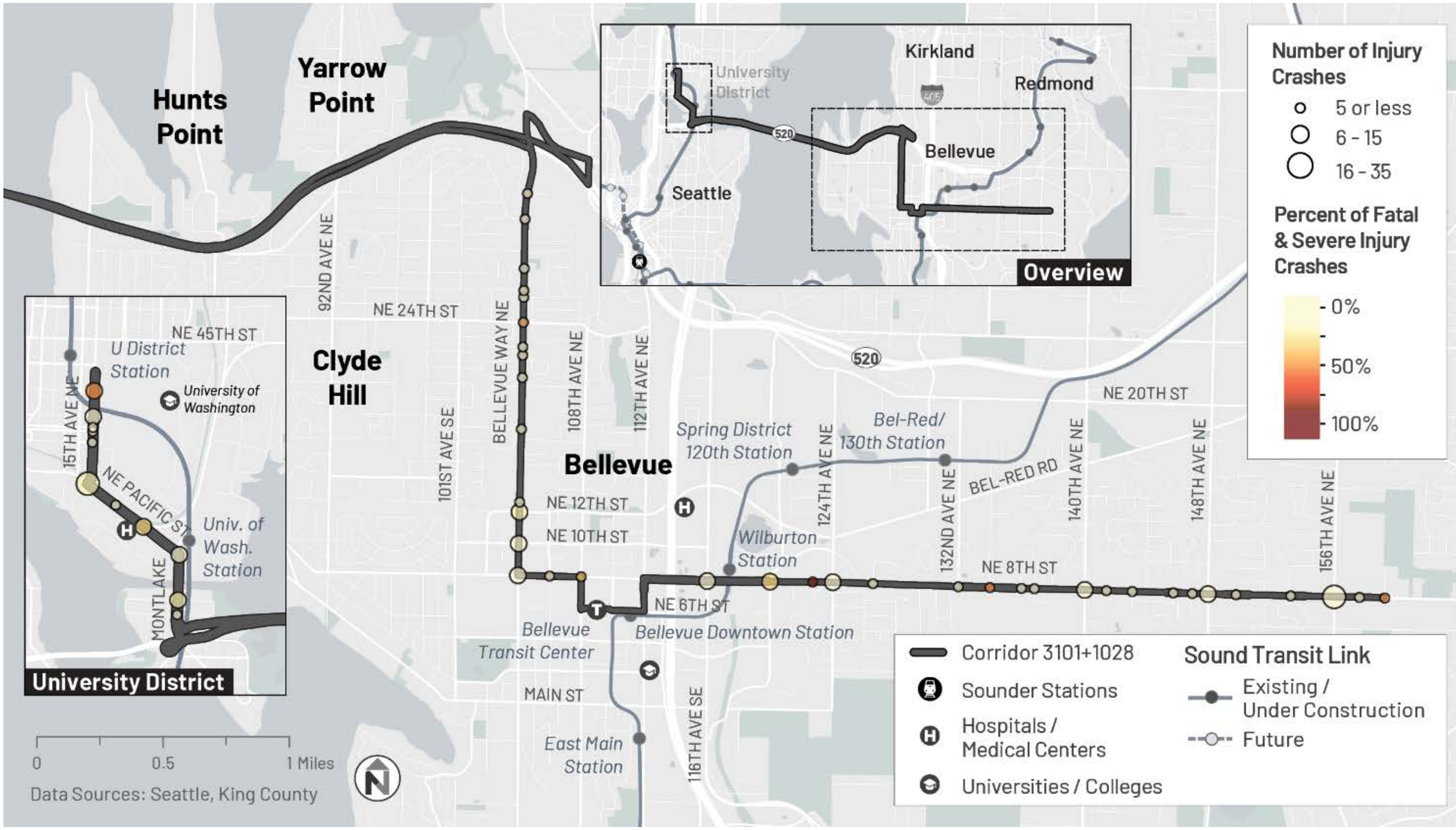
Source: WSDOT (2018-2022)

Figure 39 shows the location of crashes along the corridor. The circle size represents the number of crashes, and shading represents severity of crashes. Crashes displayed on this map are aggregated to the nearest intersection (or the nearest 1/8-mile interval for streets with longer block sizes) for a simpler display of the data.

Crashes tend to concentrate at some major intersections and near a few major destinations along the corridor. Areas with a higher frequency of crashes include:

- In the U-District along 15th Ave NE, NE Pacific St, and Montlake Bridge
- Major intersections along NE 8th St, including 158th Ave NE, 148th Ave NE, 140th Ave NE, 124th Ave NE, 120th Ave NE, and 116th Ave NE
- Major intersections along Bellevue Way NE, including NE 8th St, NE 10th St, and NE 12th St

Figure 39 Crash Locations



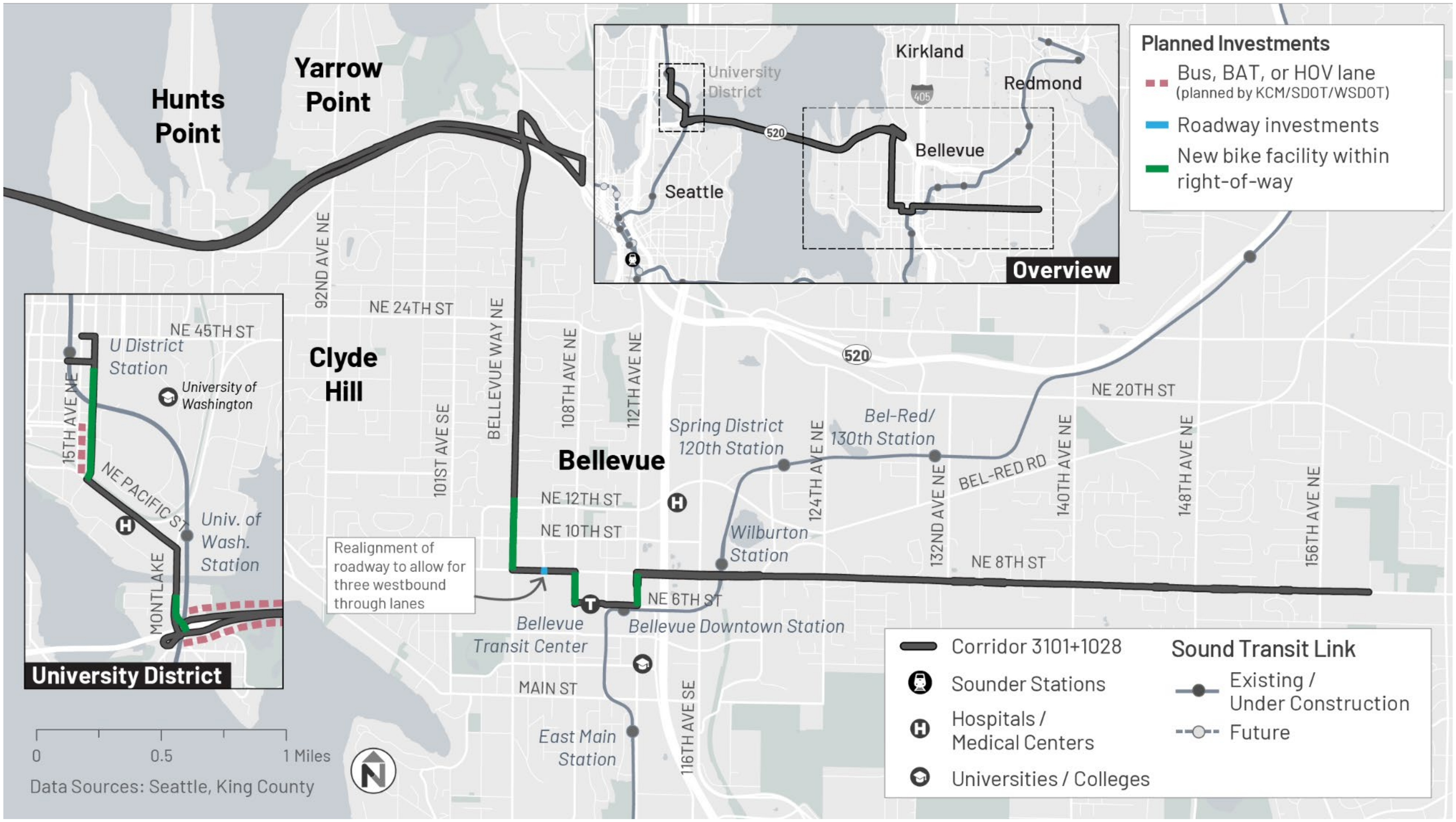
King County METRO

11.0 Planned Improvements

B Line and Route 271 serves the cities of Seattle and Bellevue. The project team identified projects along the corridor, including roadway changes and investments in biking and walking. The projects include efforts already underway, as well as non-funded projects from master plans and other long-term planning documents. A selection of these projects is mapped in Figure 40, and all projects are described in Figure 41.

Major projects include introducing bike facilities in U District and near Bellevue Transit Center and Bellevue Downtown Station. Another major project is the realignment of roadway on NE 8th St.

Figure 40 Planned Jurisdictional Investments



King County METRO

Figure 41 List of Planned Jurisdictional Investments

ID	Improvement	Description	Extent	Source
1	Vision Zero Rapid Build Data Driven Safety Program	Data driven rapid build road safety projects along this High Injury Network	NE 8th St (160th Ave NE - I-405)	FY2021-2027 Capital Investment Program
2	Priority Bus Corridor	Priority Bus Corridor	NE 8th St (160th Ave NE - 112th Ave NE and 108th Ave NE - Bellevue Way NE)	Bellevue Comprehensive Plan
3	Transit Signal priority	Eastbound, Westbound	NE 8th St/158th Ave NE	Bellevue Transit Master Plan
4	Intersection Improvement	Improve the southbound to westbound turn radius.	NE 8th St/156th Ave NE	Bellevue Transit Master Plan
5	Crossroads-Overlake Transit Connection	Evaluate, design, and implement transit speed and reliability improvements along Frequent Transit Network corridors connecting the Downtown and Crossroads activity centers.	NE 8th St / 156th Ave NE	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan, Regional Transportation Plan 2022-2050
6	Intersection Improvement	Improve the eastbound to northbound left turn through timing prioritization and TSP. If improvements are inadequate, consider construction of a second left turn lane	NE 8th St/156th Ave NE	Bellevue Transit Master Plan
7	East Bellevue Bicycle Network Study	Advance the planning and design of safe and connected bikeways that link neighborhoods to schools, local destinations	156th Ave NE at NE 8th St	Projects in Your Neighborhood
8	Queue jump	Add a queue jump to the southbound, eastbound and northbound right turn lane.	NE 8th St / 148th Ave NE	Bellevue Transit Master Plan
9	Transit Master Plan Implementation Program	Construct queue jump lanes in the eastbound, northbound, and southbound directions.	148th Ave NE / NE 8th St	City of Bellevue 2024-2029 Transportation Improvement Program

ID	Improvement	Description	Extent	Source
10	Transit Signal priority	Eastbound, Westbound	NE 8th St / 143rd Ave NE	Bellevue Transit Master Plan
11	Queue jump	Add a queue jump to the southbound, westbound, eastbound and northbound right turn lane.	NE 8th St / 140th Ave NE	Bellevue Transit Master Plan
12	New receiving Lane	Convert the existing southbound right turn lane to a through-right lane and will widen the south leg to create space for an approximately 250 foot receiving lane that will merge back into the existing through lane.	NE 8th St / 140th Ave NE	City of Bellevue 2024-2029 Transportation Improvement Program
13	Transit Signal priority	Eastbound, Westbound, Northbound, Southbound	NE 8th St / 140th Ave NE	Bellevue Transit Master Plan
14	Off-street multi-use paved path along the east side of 140th Ave NE between NE 24th St and NE 8th St,	replacing a separated gravel path that exists on much of The segment;	NE 8th St / 140th Ave NE	City of Bellevue 2024-2029 Transportation Improvement Program
15	Transit Signal priority	Eastbound, Westbound	NE 8th St (134th Ave NE - 132nd Ave NE)	Bellevue Transit Master Plan
16	Bellevue - 124th Ave NE Improvement Project	From NE 12th St to Northup Way; widen to 5 lanes, w/ 2 travel lanes in each direction w/ turn pockets or a center turn lane, traffic signals, curb, gutter, sidewalks and bike facilities or multi-use paths on both sides, redesign and replacement of existing infrastructure	NE 8th St at 124th Ave NE	2023-2026 PSRC Regional TIP
17	Transit Signal priority	Eastbound, Westbound	NE 8th St / 124th Ave NE	Bellevue Transit Master Plan
18	Transit Signal priority	Northbound, Westbound	NE 8th St / 120th Ave NE	Bellevue Transit Master Plan
19	Intersection Improvement	Add a second westbound to southbound turn lane and restrict to HOV and transit.	NE 8th St / 120th Ave NE	Bellevue Transit Master Plan
20	New sidewalk	Construct interim sidewalk on the south side of NE 8th St	NE 8th St (116th Ave NE - 120th Ave NE)	City of Bellevue 2024-2029 Transportation Improvement Program

ID	Improvement	Description	Extent	Source
21	Eastrail (East Side Rail Corridor Trail)	Acquisition, design, and construction of paved and soft-surface regional trail segments with interconnections to surrounding regional trails network and other routes.	NE 8th St at Eastrail corridor	Regional Transportation Plan 2022-2050
22	I-405 Corridor: NE 8th St. and SR 520 Interchange Improvements	Complete the I-405 Corridor Program Master Plan improvements, including: (a) Reconstruct the NE 8th St interchange with pedestrian and bicycle improvements; and (b) Reconstruct the SR 520 interchange to include HOV direct connector ramps in the northwest and southwest quadrants.	NE 8th St / I-405	Regional Transportation Plan 2022-2050
23	Bellevue - NE 8th St	This project will plane the top surface of the pavement, overlay with new HMA, and perform minor pavement repairs. Curb ramps will be upgraded as required by the ADA along with associated traffic signal modifications (including detector loops) and the in	NE 8th St (Bellevue Way - 108th Ave NE and 112th Ave NE - I-405)	City of Bellevue, Pavement preservation Program, 2023-2026 PSRC Regional TIP
24	Construct multipurpose path (12' wide + 2' shoulder on each side) on west side of 114th Ave from SE 8th St to NE 8th St	Project includes construction of a tunnel under Main St, west of the Main St bridge abutment wall, to replace the interim sidewalk and will require reconstruction of the retaining walls on the north and south sides of Main St at this location.	114th Ave NE at NE 8th St	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
25	Shared Roadway	Shared bicycle facilities	112th Ave NE (NE 6th St - NE 8th St)	City of Bellevue Downtown Transportation Plan Update
26	Five-lane roadway with sidewalks	Complete implementation of a five-lane roadway section with sidewalks where missing between NE 6th and NE 8th St	110th Ave NE at NE 6th St	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan

ID	Improvement	Description	Extent	Source
27	Construct multimodal roadway enhancements along 108th Ave NE.	Design elements include enhanced floating transit platforms and related transit amenities for Bay 1 and Bay 12 of the Bellevue Transit Center, protected bike lanes, upgraded communications & signals, channelization, and pedestrian scale lighting.	108th Ave NE (NE 6th St to NE 8th St)	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
28	Transit Signal priority	Northbound, Southbound	NE 8th St / 108th Ave NE	Bellevue Transit Master Plan
29	Realignment of Roadway to South	Realignment of the roadway to the south will better utilize the new westbound travel lane (between 108th and 106th Aves NE) and preserve the existing large sequoia tree. This realignment will allow NE 8th St three through lanes westbound from I-405 to Bellevue Way.	NE 8th St / 106th Ave NE	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
30	Add a southbound to westbound right-turn lane.	Add a southbound to westbound right-turn lane.	Bellevue Way / NE 8th St	City of Bellevue 2024-2029 Transportation Improvement Program, 2022-2033 Transportation Facilities Plan
31	Shared Roadway	Shared bicycle facilities	Bellevue Way NE (NE 12th Pl - NE 8th St)	City of Bellevue Downtown Transportation Plan Update
32	Priority Bus Corridor	Priority Bus Corridor	Bellevue Way NE (SR 520 - NE 8th St)	Bellevue Comprehensive Plan
33	Intersection Improvement	Improve the southbound to eastbound turn movement through signal timing prioritization and TSP. Improve the westbound to northbound movement through conversion of the right through lane to a right-turn only lane.	Bellevue Way NE / NE 10th St	Bellevue Transit Master Plan
34	Queue jump	Add a queue jump to the northbound right turn lane.	Bellevue Way / NE 12th St	Bellevue Transit Master Plan
35	Transit Signal priority	Northbound, Southbound	Bellevue Way / NE 12th St	Bellevue Transit Master Plan

ID	Improvement	Description	Extent	Source
36	Transit Signal priority	Northbound, Southbound	Bellevue Way NE / NE 17th St	Bellevue Transit Master Plan
37	Transit Signal priority	Northbound, Southbound	Bellevue Way NE / NE 24th St	Bellevue Transit Master Plan
38	Transit Signal priority	Northbound, Southbound	Bellevue Way NE/ NE 29th St	Bellevue Transit Master Plan
39	Transit Signal priority	Northbound, Eastbound	Bellevue Way NE / SR-520	Bellevue Transit Master Plan
40	SR 520 / Seattle to Redmond - Managed Lanes	Convert HOV lanes to HOT lanes.	SR 520 (Montlake Blvd E - Bellevue Way)	Regional Transportation Plan 2022-2050
41	WSDOT - SR 520/I-5 to Floating Bridge - Bridge Replacement and HOV	The project will reconstruct the SR 520 corridor from I-5 to the new Evergreen Point Floating Bridge, resulting in a 6-lane corridor including two HOV lanes and a new, second bascule bridge across the Montlake Cut. This is a multiyear project and the pr	SR 520 (Montlake Blvd E - Foster Island)	2023-2026 PSRC Regional TIP, Washinton State S.T.I.P
42	SR-520 connection across Portage Bay	A multi-use path on the Portage Bay Bridge to provide direct connection between Montlake and Capitol Hill. This all ages and abilities facility would significantly alleviate travel between these two heavily used corridors and provide access to the east side.	Montlake Blvd E at SR 520	Bicycle Master Plan
43	Cycle track	Cycle track	Montlake Blvd E (E Shelby St - SR 520)	Recommended Bicycle Network Map
44	Off-street facility	Off-street facility	New pathway north of Montlake Cut	Recommended Bicycle Network Map
45	Cycle track	Cycle track	15th Ave NE (N E 43rd St - NE Pacific St)	Recommended Bicycle Network Map
46	In-street facility with minor separation	In-street facility with minor separation	NE Campus Pkwy at 15th Ave NE	Recommended Bicycle Network Map

ID	Improvement	Description	Extent	Source
47	Loyal Heights to U District via Green Lake	Construct a new RapidRide line connecting Loyal Heights and the University District via Green Lake. This project would improve the attractiveness of transit for a regional growth center and include the following elements: New transit only or BAT lanes on existing or new right of way along the proposed routing to maintain high transit travel speeds; Major intersection investments at priority intersections to improve traffic flow, transit reliability and increase transit speeds; New transit signal priority at many of the signalized intersections along the route; upgraded passenger amenities with better information and passenger safety to facilitate greater transit use and remove barriers of existing use by building RapidRide stations, Enhanced RapidRide stops, and standard RapidRide stops. This project will connect to one Regional Growth Center, University District. It will expand transit access to existing and planned Light Rail, Commuter Rail and Sound Transit BRT services.	15th Ave NE (N E 43rd St - NE Campus Pkwy)	Regional Transportation Plan 2022-2050
48	Priority Bus Corridor (Route 36/49)	•Proposed Transit Improvements include - TSP, Electrification on 12th Ave, Bus Bulbs, Station Upgrades • Evaluate turnaround and layover options at north and south ends of the corridor • Creation of new transit street on 12th Ave including electrification, TSP, and bus bulbs • Electrification needed on NE 11th/Roosevelt N. of Campus Parkway • Work with Sound Transit to ensure safe, attractive, and convenient connections at the 4 Link stations served by this corridor	15th Ave NE (N E 43rd St - NE Campus Pkwy)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
49	Priority Bus Corridor (Lake City - Northgate - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Stop consolidation • Conduct further analysis of alignment options along Lake City Way/80th Street/Roosevelt Way • Integrate route design/transit priority treatments with ongoing Bicycle Master Plan facility planning on Roosevelt Way between NE 40th Street and NE 65th Street • Create high quality connections between the route and U-District Link Station on Brooklyn Ave	15th Ave NE (N E 43rd St - NE Campus Pkwy)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

ID	Improvement	Description	Extent	Source
50	Priority Bus Corridor (Crown Hill - Green Lake - U District)	•Proposed Transit Improvements include - TSP, Bus Bulbs, Electrification • Evaluate electrification cost/benefit north of 50th Street • Evaluate turnaround and layover options at east and west ends of the corridor • Conduct traffic analysis east of I-5 to determine key congested intersections and priority bus treatment options • Conduct study of routing options through Greenlake east of Aurora Ave • Coordinate with existing planned improvements south of 50th Street	15th Ave NE (N E 43rd St - NE Campus Pkwy)	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050
51	Proposed RapidRide Corridor (J Line)	Potential Improvements include Bus Bulbs, transit Signal Priority, Station Upgrades, Floating Bus Stop, Queue Jump Lanes, and Layover locations	15th Ave NE / NE 43rd St	Seattle Transit Master Plan, Regional Transportation Plan 2022-2050

12.0 Capital Costs

This chapter summarizes the order-of-magnitude cost estimate to design and construct the previously identified improvements to the B Line and Route 271 corridor. Costs have been divided into several cost category packages, based on the improvements included within this report:

- Stations, including communications and technology
- Transit speed and reliability improvements
- Layover and terminus facilities
- Bus charging infrastructure[11]
- Trolley infrastructure (not included in B Line and Route 271)

Quantities were developed using the information provided within this report for each cost category. For stops and stations, refer to Figure 17. For transit speed and reliability improvements, refer to Figure 26. For layover, terminus facilities and charging infrastructure, refer to the chapter narrative on page 16.

Order-of-magnitude cost estimates are rough estimates that use parametric factors and broad assumptions of scope to identify anticipated costs. For detailed cost estimating guidelines, see RapidRide Prioritization Plan Cost Methodology Memorandum and the associated cost estimates Excel file. Operations and maintenance are not included in these cost estimates. Right-of-way costs are included within each cost category, if applicable. The order-of-magnitude costs by design package are summarized in Figure 42.

[11] For non-trolley routes only.

Figure 42 Order-of-Magnitude Project Costs

	Category	% of Total		Costs
	Stops and Stations	45%	$	9,320,000
	Transit Speed and Reliability Improvements	32%	$	6,600,000
	Layover and Terminus Facilities[12]	3%	$	600,000
	Charging Infrastructure	19%	$	4,000,000
	Trolley Infrastructure	-		-
	Construction Base Subtotal		***$***	***20,520,000***
2%	Stormwater Upgrades		$	420,000
3%	Traffic Control		$	620,000
10%	Mobilization		$	2,060,000
2%	TESC		$	420,000
	Subtotal Construction Cost		***$***	***24,040,000***
10.1%	Sales Tax		$	2,430,000
10%	Construction Contingency		$	2,650,000
40%	Contingency (Design Allowance and Risk)		$	11,650,000
	Total Construction Cost		***$***	***40,770,000***
10%	Project Management		$	4,080,000
5%	Planning		$	2,040,000
15%	Engineering/Design		$	6,120,000
10%	Construction Management		$	4,080,000
3%	Environmental Review		$	1,230,000
2%	Permitting		$	820,000
	Total Project Cost		***$***	***59,140,000***

[12] Note the feasibility of a layover facility at Crossroads is uncertain, and may be much higher than these initial estimates.

13.0 Environmental Screening

13.1 Introduction

This section summarizes the screening-level research and reporting on environmental conditions and potential areas of impact completed for the B Line and Route 271 corridor. The evaluations responded to the project elements identified in the conceptual design.

13.2 Key Findings – Resources with No Effects

The environmental screening review yielded no anticipated adverse effects or required mitigation for the following resources:

- Land use and zoning – The BRT line and station locations are predominantly situated within the existing operational right-of-way. The project alignment is consistent with current zoning regulations and the conduced use of the roadway for bus activities.
- Visual/Aesthetics – The project is not within any designated view corridors. The improvements associated with B Line and Route 271 will be consistent with the existing visual character of the area and are not anticipated to alter historic properties or areas.
- Parks and Recreation – While the corridor is home to known parks and recreation resources, B Line and Route 271 is not anticipated to require any permanent or temporary acquisitions and will remain within the existing roadway, avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. avoiding any impacts to parks, recreation, and Section 4(f) recreational resources. Refer to Cultural Resources regarding Section 4(f) historical resources.
- Prime and Unique Farmlands – There are no prime or unique farmlands in the project area.
- Navigable Waterways – While B Line and Route 271 traverses Lake Washington via a bridge, the project will remain within the operational right-of-way and is not anticipated to have an impact on the navigability or water quality of Lake Washington.
- Public Services and Utilities – The project would require utility improvements; however, these improvements are not anticipated to have any long-term effects on utilities in the project area. No impacts are anticipated to emergency service providers are anticipated.
- Acquisitions and Displacements – At present, there are no identified requirements for permanent easements or property acquisitions along the B Line and Route 271.
- Floodplains - The B Line and Route 271 corridor at Yarrow Point is situated adjacent to a Federal Emergency Management Agency (FEMA) 100-year floodplain within Yarrow Bay Wetlands Park. Improvements associated with the project are not anticipated to occur within the FEMA floodplain at Yarrow Bay Wetlands Park, avoiding adverse impacts on floodplain areas.

- Air Quality - Improvements associated with the project are not anticipated to yield long-term adverse impacts to air quality. The adoption of cleaner and more energy-efficient technologies with zero emission buses will contribute to a healthier and more sustainable urban environment. Best Management Practices (BMPs) for air quality during construction will be implemented to mitigate any minor short-term impacts.

13.3 Key Findings – Resources with Potential for Effects

Additional analysis is recommended for the following resources:

13.3a Cultural Resources

In order to comprehensively identify historic built environment resources along the route, a desktop review of Washington State Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archeological Records Data (WISAARD) online database was conducted.

The B Line and Route 271 corridor passes through a number of historic districts, notably the Montlake Historic District, and Chittenden Locks and Lake Washington Ship Canal. Adjacent to the corridor are properties listed in both the National Register of Historic Places and the Washington National Heritage Register, including significant sites such as Bagley Hall, Parrington Hall, Denny Hall, Naval Military Hangar, Ye College Inn, University Methodist-Episcopal Church, Site KI01304 (1926 Model Brick Home), and Arboretum Sewer Trestle.

Several sites along the alignment are listed or deemed eligible for NRHP and/or local Registers, including those within multiple historic districts. Any alteration or deviation from the established character of these districts or properties would constitute an adverse effect.

The corridor, having undergone prior disturbances from roadway and utility placements, characterized by depths ranging from 3 to 5 feet, is anticipated to have minimal impact on archaeological sites. These prior disturbances have likely altered the subsurface conditions to an extent where significant archaeological resources are not expected to be present within the specified depth range.

The project will undergo Section 106 consultation as part of the formal environmental review process. This may include development of a Cultural Resources Technical Report with a historic properties inventory, prepared by licensed archeologists and architectural historians. This report will provide avoidance measures and recommended station relocations if necessary. An Inadvertent Discovery Plan, outlining procedures for encountering archaeological resources during construction, would be prepared, and depending on the recommendations from the Section 106 consultation process an Archaeology Construction Monitoring Plan may be implemented at the alignment location. Property determined to be significant under the Section 106 process may be considered a Section 4(f) property, the use of which is required to be avoided under Federal Transit Administration (FTA) policy. No adverse effects are anticipated to Section 4(f) historic resources.

13.3b Hazardous Materials

Contaminated sites, in various stages of cleanup, are present along the corridor. Higher concentrations of contaminated sites are located near the University of Washington campus and downtown Bellevue.

A high-level desktop review was conducted on Department of Ecology (Ecology) cleanup sites and spill sites. Given their proximity to the project alignment and cleanup status, most of the Ecology cleanup sites are anticipated to pose a low potential risk, with little to no impact on the project. However, further investigation through the development of a Hazardous Materials Technical Memorandum during the formal environmental review process will address potential moderate or high-risk sites, depending on station locations and construction sites.

As a mitigative measure, a Contaminated Media Management Plan (CMMP) that delineates procedures to be followed in the event of encountering contaminated soils, could be implemented prior to construction activities. For acquired parcels associated with moderate or high-risk sites, it is recommended to conduct additional Ecology file reviews, examining historical or current release information, and considering potential Phase I or Phase II Environmental Site Assessments (ESAs) during the acquisition process. Any contaminated soils encountered would need to be managed in accordance with applicable federal, state, and local requirements.

13.3c Environmental and Social Justice

Known Environmental and Social Justice (ESJ) populations have been identified along the B Line and Route 271 corridor. In accordance with Presidential Executive Order 12898, United States Department of Transportation Order 5610.2, Federal Transit Laws, and Title 49, a comprehensive Environmental Justice (EJ) analysis will be conducted during the formal environmental review process. It will assess whether any low-income households or minority populations would be disproportionately impacted by the Project, following guidelines outlined in the Federal Transit Administration's (FTA) Environmental Justice Policy Guidance for FTA Recipients (2012). The project will provide a number of benefits, foremost among them being the enhancement of transit operations and travel times throughout the corridor.

13.3d Traffic

Traffic operational analysis was conducted for 30 intersections along B Line and Route 271 to evaluate transit travel time benefits of the proposed improvements. The analysis revealed that at 8 locations along the alignment, there was an increase in delay from baseline to build conditions. Conversely, at 5 locations along the alignment, there was a decrease in delay from baseline to build conditions (refer to the Traffic Conditions Section for more details).

Changes in traffic patterns and vehicle movement can have various environmental impacts, including impacts to air quality, noise levels, and overall ecosystem health. Increased traffic may lead to higher emissions, contributing to air pollution and impacting air quality. Additionally, traffic-related noise can affect the surrounding environment and communities.

However, the projects' aim of improving traffic flow and transit operations may have positive environmental effects. For example, the proposed improvements along B Line and Route 271, can enhance transit efficiency, potentially reducing the reliance on individual vehicles and, in turn, decreasing emissions and traffic congestion.

13.3e Noise and Vibration

The corridor aligns with existing bus routes, experiencing noise and vibration from buses and other vehicles. The project may lead to the loss of some on-street parking, and buses would travel closer to sensitive receptors. However, due to electric bus technology, no new noise impacts are expected. Rubber-tired vehicles are not anticipated to cause vibration impacts. A comprehensive Noise and Vibration Technical Report will be prepared to assess potential noise and vibration impacts during the formal environmental review process. Construction activities may temporarily increase noise levels in the project area, but operation and maintenance of the project would generate minimally audible noise, especially compared to existing ambient noise conditions. The *FTA Transit Noise and Vibration Impact Assessment Manual* notes that vibration from sources like buses and trucks is typically imperceptible, even in locations close to major roads (2018).

During construction activities, Best Management Practices (BMPs) could be implemented to minimize noise, particularly during sensitive hours. BMPs for noise and vibration may involve measures such as using properly sized and maintained mufflers on construction equipment, turning off idling equipment, placing noisy equipment away from sensitive receptors, using portable noise barriers, and avoiding construction in residential areas during nighttime hours.

13.3f Biological/Plants and Animals

The project alignment traverses a highly urbanized area, with some segments in close proximity to waterways and bridges. Despite this, project improvements generally fall within the existing right-of-way, and construction activities are not expected to impact plant or animal species directly. Improvements that create or replace pollution-generating impervious surfaces (PGIS) have the potential to harm ESA-listed species through exposure to contaminants in runoff from those surfaces even, in certain cases, for runoff that has passed through a facility designed to provide water quality treatment. Due to the proximity of the project to waterbodies with ESA listed species, a Biological Assessment and consultation with NMFS and USFWS may be required.

Mitigation measures could include conducting a comprehensive ecological survey to understand existing biodiversity and wildlife habitats along the proposed BRT route during the formal environmental review process, making route adjustments to minimize impacts on critical wildlife habitats if necessary, establishing vegetated buffer zones along the BRT corridor to minimize direct impacts on sensitive habitats, and implementing seasonal construction restrictions during critical periods, such as breeding seasons, to avoid disturbing nesting and reproduction activities of wildlife.

13.3g Seismicity and Soils

The existing conditions along the B Line and Route 271 corridor include critical areas for liquefaction and steep slopes. These areas will be considered for their potential impact to the project during design. The project alignment is characterized by pre-existing streets, sidewalks, and extensively developed surfaces that have been paved and graded in the past. Due to the already developed nature of the surrounding area, it is anticipated that the project will not encounter significant challenges related to soils or seismic considerations.

13.3h Water Quality

The project area is characterized by almost 100 percent impervious surfaces. Despite the predominantly impervious nature of the corridor, minor increases in impervious surfaces are expected. Anticipated impacts are minor, if any, as the project does not involve in-water work or construction activities in close proximity to water bodies. The project is also not located within a sole source aquifer.

Stormwater management is governed by the local stormwater code, and water quality treatment may be required based on the square footage of additional and replaced pollution-generating impervious surfaces (PGIS) created. Mitigation measures encompass the replacement and upgrade of any disturbed existing stormwater facilities, on-site stormwater management, installation of detention pipes for flow, and exploring opportunities for the installation of green stormwater infrastructure.

13.3i Construction Impacts

Construction activities may involve enhancements along the corridor, encompassing alterations to roadways, intersection improvements, utility upgrades, station amenities, and investments in biking and walking.

Construction-related impacts may include temporary increases in noise, visual disturbances, dust, and traffic congestion. Potential utility outages and the need for temporary detours around construction activities are also anticipated. While construction in any one location is expected to be short in duration, there may be instances where nighttime construction is required, in which case a noise variance would be obtained.

Mitigation measures include implementing BMPs in compliance with federal, state, and local regulations and ordinances, preparing and implementing health and safety and spill plans prior to construction, maintaining property access, measures such as shielding construction lighting during nighttime work, and adhering to the local Stormwater and Drainage Code. Additionally, the project will prepare a Stormwater Pollution Prevention Plan (SWPPP), a TESC Plan, and a Spill Prevention, Control, and Countermeasures (SPCC) Plan. King County Metro will communicate construction activities to the public, businesses, transit riders, and stakeholders through various channels, including email notifications, scheduled meetings, the project website, and social media or flyers.

13.3j Wetlands

There are wetlands adjacent to the alignment and stops near State Route 520 and Montlake Blvd., State Route 520 near Yellow Bay Wetlands, and an additional wetland crossing over the alignment near NE 8th Street and 148th Ave. NE.

The project is situated within the existing right-of-way at these wetland locations, and adverse effects are not anticipated due to the location of improvements. However, considering the proximity of project segments to wetlands, buffer impacts have the potential to occur. Construction activities and station locations near wetland areas will be subject to thorough assessment and, if necessary, adjustments to avoid, minimize, or mitigate impacts on wetland buffer areas.

A critical areas report will be prepared during the formal environmental review process to confirm the presence of wetlands and, if near improvements, to determine necessary buffers. In cases where station locations are near wetland areas, relocation may be considered to avoid wetland buffer areas.

13.4 Cumulative and Indirect Impacts

B Line and Route 271 serves the cities of Seattle and Bellevue. The project team identified planned projects within these jurisdictions that are along the corridor, including roadway changes and investments in biking and walking. A selection of these projects is mapped in Figure 40, and all projects are described in Figure 41. Major projects include introducing bike facilities in U District and near Bellevue Transit Center and Bellevue Downtown Station. Another major project is the realignment of roadway on NE 8th Street.

Potential impacts are not anticipated to be cumulatively considerable, with the only likely potential cumulative impact associated with construction traffic if schedules overlap with other major projects in the corridor. The project will also track projects and coordinate schedules with other major projects in the area to minimize potential impacts. Additionally, reasonably foreseeable future actions will be identified as part of the cumulative impacts analysis and the development of timelines for planned development in the corridor to understand any potential issues related to construction schedules.

13.5 NEPA Screening

Given the details of the project and its potential impacts presented above, the undertaking appears to fit within the description of “facility modernization” that would require a Documented Categorical Exclusion (DCE) as described in the Code of Federal Regulations (CFR) 771.118(d)(8): Modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as bridges, stations, or rail yards.

The project involves activities that could qualify for a Categorical Exclusion under Sections 771.118(c)(1) utilities and other appurtenances, (c)(5) repairs, replacements, and rehabilitations, or (c)(12) projects that would take place entirely within the existing operational right-of-way. However, because the project may need to acquire additional property, documentation is required that demonstrates the project will meet the criteria for a CE and that significant environmental effects will not result.

Based on preliminary evaluation, the project likely qualifies as a Documented Categorical Exclusion.

POTENTIAL DOCUMENTATION REQUIRED:

- Cultural Resources Technical Report
- Hazardous Materials Technical Memorandum
- Environmental and Social Justice Technical Report
- Traffic and Transportation Technical Report (Parking Study included)
- Noise and Vibration Technical Report
- Critical Areas Report

POTENTIAL PERMITS REQUIRED:

- Coastal Zone Management Certification
- ESA and EFH Consultation
- National Historic Preservation Act – Section 106 Consultation
- National Pollutant Discharge Elimination System permit (if disturbing more than one acre)
- Shoreline Permit