METRO CONNECTS Technical Appendices

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Appendix A. Service Network

Service Terms Glossary

Alternative services: Transportation services tailored to meet specific community needs. Metro plans and provides these services with partner support throughout King County. Often, the served community lacks the infrastructure, density or land rights to support traditional, fixed-route bus service. Metro's alternative services include: VanPool, VanShare, Community Access Transportation (CAT), Dial-a-Ride Transit (DART), Community Shuttles, Community Hub and Flexible Rideshare. (See definitions of these services below.)

Bus Bulb: Bus bulbs are curb extensions that align the bus stop with the parking lane, allowing buses to stop and board passengers without ever leaving the travel lane. Bus bulbs help buses move faster and more reliably by decreasing the amount of time lost when merging in and out of traffic.

Carpool: Commuters travelling similar routes can connect on the Metro Rideshare website and share rides in personal vehicles.

Community Access Transportation (CAT): A program that complements paratransit (ACCESS) service by filling service gaps in partnership with nonprofit agencies, such as those serving seniors or people with disabilities.

Custom Bus: A program that serves King County commuters and students who travel to locations not well served by fixed-route transit.

Community Hub: A transportation center that Metro and a community partner provides, that gives people access to various transportation resources according to community need. Examples of these resources include community vans, bikes and information.

Community Shuttle: A route that Metro provides through a community partnership; these shuttles can have flexible service areas if it meets the community needs.

Community Van: A pilot program being developed by Metro and participating cities to provide their community members with shared rides to local destinations.

Dial-A-Ride Transit (DART): Scheduled transit routes in which individual trips may deviate from the fixed route to pick up or drop off a passenger closer to their origin or destination. DART routes may only deviate into pre-specified "DART areas." All current DART routes include a fixed route portion in which passengers can access service from regular bus stops.

Downtown Seattle Circulator: A free downtown circulator bus, provided by the City of Seattle, that stops at 7 locations in downtown Seattle. Two buses drive a fixed route, stopping at each stop every 30 minutes.

Fixed-Route Service: Scheduled transit routes in which trips are required to follow the same routing on every trip.

Flexible Rideshare: An on-demand carpool program using mobile and web-based applications to match up drivers with passengers who want to share a ride. Riders pay a small fare through a mobile app, and drivers earn a per-mile fee.

Hyde Shuttles: Originally created from an endowment from Lillian Hyde, Hyde Shuttles transport seniors and people with disabilities to hot meal programs, medical appointments, senior centers, grocery stores, and other local destinations via van service.

Intelligent transportation systems (ITS): Data collection and sharing technology that allows for more flexible and integrated transit systems. These systems provide real time data regarding transit arrival and seat availability, transit arrivals at stoplights, and integrate a variety of travel options in trip planning.

Manufacturing/Industrial Centers: Areas designated by the Puget Sound Regional Council to serve as an organizing framework for the Freight and Goods component of the region's Metropolitan Transportation System and serve as the primary concentrations of industrial and manufacturing related jobs. The areas have the potential to generate sufficient market demand to make the centers successful.

Metropool: All-electric, zero-emission, rideshare commuting.

Paratransit (ACCESS) service: Van-operated service that has no fixed route or schedule, providing trips to customers who have difficulty using Metro's fixed-route or DART service. Passengers must apply and be found eligible to use Access service in advance of making a trip.

Park-and-Ride: A facility where transit passengers may park their automobile and catch a bus, vanpool or carpool to reach their final destination. Park-and-ride lots are built, owned and maintained by a number of different agencies; some are leased by Metro.

Peak-Only Service: Transit service that operates only during peak travel periods (within 5–9a.m. and 3–7p.m. weekdays), primarily in one direction. Peak-only service typically brings riders from residential areas to job centers.

RapidRide: Routes that travel long distances with infrequent stops**.** Service is provided every 10 minutes, at least, during the busiest morning and evening travel hours. Fifteen minute service is available during off-peak periods.

Real-Time Rideshare: On-the-fly carpooling that makes use of a mobile application to find designated meeting places to match up drivers with passengers who want to rideshare.

Regional Growth Center: Areas designated by the Puget Sound Regional Council to serve as an organizing framework for a regional multimodal transportation system and provide focal points for regional investments in urban services and amenities. The areas have the potential to generate sufficient market demand to make the centers successful.

RideShare: Sharing personal vehicles or vehicles provided by Metro reducing the number of people driving alone.

SchoolPool: A program that serves King County commuters and students who travel to locations not well served by fixed-route transit.

Snoqualmie Valley Transportation: Metro provides scheduling and technical support to Snoqualmie Valley Transportation to provide shuttle service in the Snoqualmie Valley as part of Metro's Alternative Services program.

Transit Control Center (TCC): A transit communication center that responds to operator and service supervisor on-street requests, monitors tunnel security and operating systems, provides

immediate response in security situations and emergencies, and coordinates with county, city, state, and federal emergency management agencies.

Transit-oriented development (TOD): A private or public/private real estate development project that creates, expands, maintains or preserves a mixed-use community or neighborhood within walking distance of a transit center.

Transportation demand management (TDM): Strategies to shift travel from single occupancy vehicles to other modes, or to shift auto trips out of peak periods. Demand management strategies include providing transit alternatives and levying tolls.

Transportation Network Company (TNC): Connects paying passengers with drivers who provide transportation in their own non-commercial vehicles. All parties connect to the service via website and mobile app. Examples: Lyft, Uber.

Taxi Scrip: Certificates to pay for half of the regular price of a taxi service**.** Taxi service is scheduled with a taxi company and paid using the certificates and personal funds. The Metro program provides up to seven books of taxi scrip per month to low-income King County residents who have a disability, or who are ages 65 and over.

TripPool: Volunteer drivers use King County Metro commuter vans to share trips with other riders to the nearest Park & Ride.

University of Washington Shuttles: Metro provides scheduling and technical support to University of Washington's Dial-a-Ride service, which provides rides to students, staff, faculty, and visitors with mobility limitations.

VanPool: Groups of five or more commuters share a ride to work, using a Metro-supplied van.

VanShare: Groups of five or more commuters share the ride to or from a public transit link or transit hub.

Water Taxi: Boat service running between West Seattle and Downtown Seattle and between Vashon Island and Downtown Seattle.

Service Network Design

Coordination with Other Agencies

The process to develop the service network for METRO CONNECTS began with dialogue with King County jurisdictions. A Technical Advisory Committee (TAC) comprising staff representatives from King County cities was established to provide a forum for input from jurisdictions, respond to inquiries, and facilitate communication among cities regarding their transit needs. City staff were asked to describe existing transit needs and identify areas for future growth, as outlined in their comprehensive plans. Because many Cities were in the process of updating their comprehensive plans during the service network development process, Metro also requested that Cities describe any changes between existing and updated plans. Representatives from Community Transit, Pierce Transit, and Sound Transit were also consulted to ensure the METRO CONNECTS 2040 service network was coordinated with their future service networks. Integration with the Washington State Ferries system and the King County Water Taxi system is also part of the METRO CONNECTS 2040 service network.

The Puget Sound Regional Council (PSRC) land use forecasts for population and employment within King County in 2040 provided the foundation for development of the METRO CONNECTS 2040 service network.[1] These distributions are based upon the comprehensive plans of King County jurisdictions, which identify the type and location for future growth within their respective boundaries. The data within these plans are consolidated by PSRC to forecast how and where growth will occur countywide. These forecasts identify varying concentrations of growth throughout King County, which were used by Metro as one factor for locating different types of transit service throughout the service network. The forecasts were used to measure potential proximity and access to the METRO CONNECTS 2040 service network for households and jobs.

Metro coordinated especially closely with Sound Transit during the service network development process. Sound Transit currently provides high-capacity transit service in King County in the form of light rail (Link), commuter rail (Sounder), and express bus (ST Express). Sound Transit has proposed to expand their high-capacity transit service in accordance with their adopted long range plan. The next phase of proposed improvements, known as the ST3 System Plan, would include an expansion of Link light rail, additional Sounder service, changes to ST Express service, as well as capital projects such as new park-and-rides.

The ST3 System Plan was developed at the same time as the METRO CONNECTS 2040 service network. Staff from both agencies coordinated to identify opportunities for service integration with existing and planned service for all transit modes and to minimize unnecessary duplication. The METRO CONNECTS plan incorporates all existing, planned, and proposed Sound Transit investments.

Funding for implementation of the ST3 System Plan must be approved by voters. This measure will be submitted for voter approval in November 2016. If approved, the improvements identified in the ST3 System Plan are anticipated to be completed by 2041. If the ST3 measure is not approved, the METRO CONNECTS 2025 service network would largely represent Metro's vision for transit service without ST3. Although several ST3 projects are assumed in the METRO CONNECTS 2025 network, these projects have relatively minimal impacts on Metro bus service. METRO CONNECTS will be updated every six years, at which point the 25-year vision will be updated with the latest available information regarding regional transit investments.

Different levels of bus service are proposed throughout King County in varying concentrations based upon a combination of future land uses and densities, identified community needs, and future available infrastructure.

Service Network Overview

The METRO CONNECTS 2040 service network would grow Metro service from a 2015 year base of 3.5 million hours a year to approximately 6 million hours by 2040, an increase of 2.5 million hours. This assumption was based on the need forecasted by the PSRC Vision 2040 plan.

The METRO CONNECTS 2040 service network comprises three types of bus service: frequent service, including RapidRide bus rapid transit service (BRT); express service; and local service. Within the category of local service, the METRO CONNECTS vision anticipates the provision of

[1] Land Use Vision Version 1, PSRC, 2015

flexible services in areas where fixed-route bus service is not productive or not the most useful service option. Because of the highly specialized nature of flexible services, how and where these services will be provided in the future is not known at this time, but will be identified through implementation and public outreach processes.

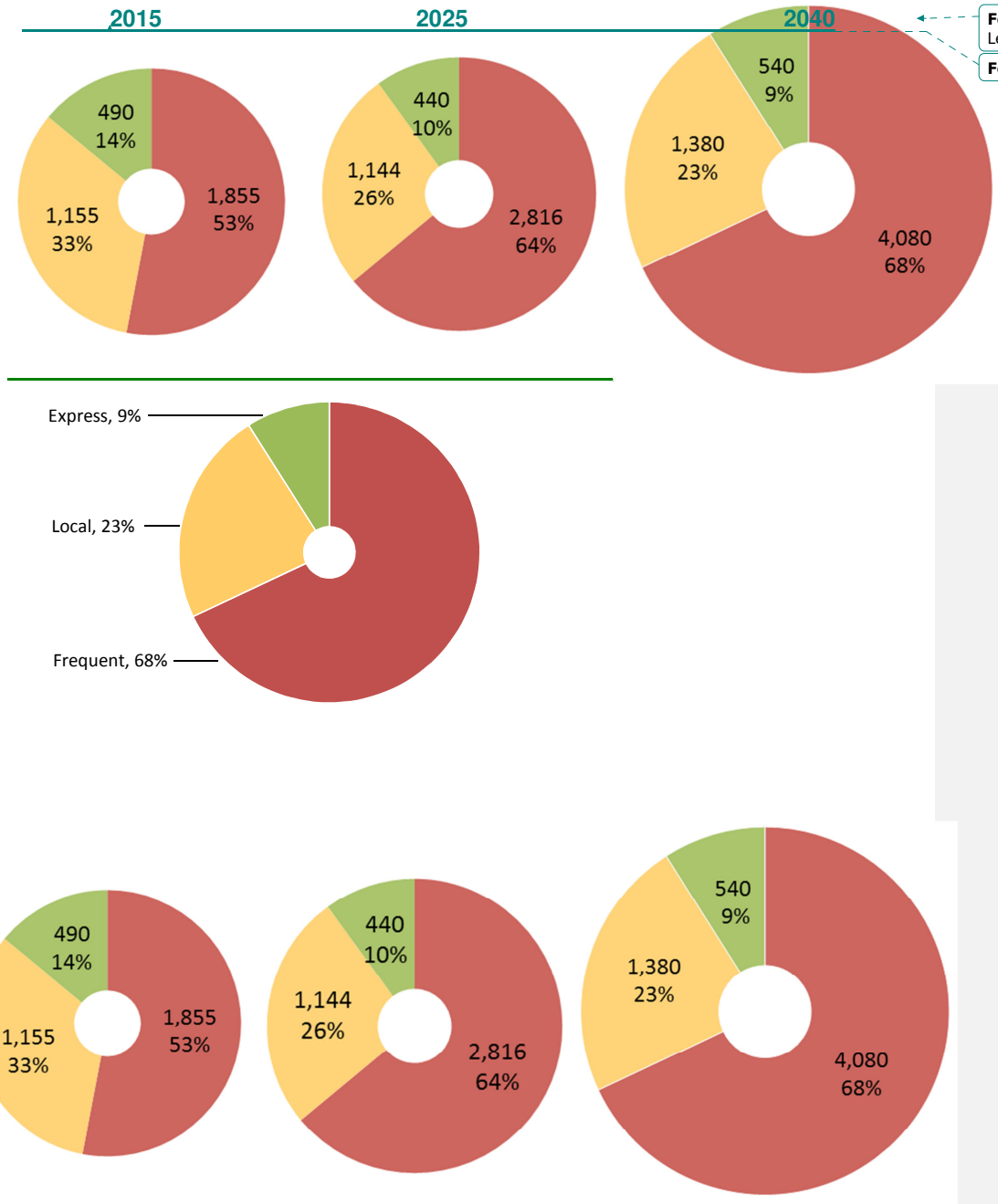
The METRO CONNECTS service network identifies the type of service that should be provided on corridors in the future. Because this is a vision, the exact level of service in different corridors and service design will be included in implementation planning, as described in the ~~Implementation~~ Development Program discussion in the METRO CONNECTS plan. Peak service will still be needed where, for example, it provides a significant travel time advantage, but METRO CONNECTS does not provide this level of detail in service designs for 2025 and 2040.

Comment [SH1]: RL3 language updated to reflect the development program concept

The METRO CONNECTS 2040 service network was developed through an extensive analysis process[2] and public outreach process[3]. Based on the findings of both technical and outreach work, the final service network included in METRO CONNECTS places a strong emphasis on frequent service, which makes up 68 percent of the total service network hours. Local service is 23 percent and express service is 9 percent of the 2040 service hours. The distribution of fixed-route transit service by total hours in the METRO CONNECTS 2040 service network is shown in Figure A-1. Operational characteristics for each service type are described in Table A-1. Each of these fixed-route service types are described in the following section, as are other types of service Metro provides such as Access paratransit.

[2] More information on technical analysis used in development of the service network can be found in Supplemental Network Performance Report, available online at www.metro.kingcounty.gov.
[3] More information on the public outreach conducted to inform development of the service network can be found in the METRO CONNECTS Public Engagement Report.

Figure A-1 Distribution of Fixed-Route Service Types



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■ Frequent Service ■ Local Serivce (Includes Alternative Services) ■ Express Service (includes peak-only)

Comment [SH2]: RL2: Updated to show inclusion of peak only-service

Table A-1 Operational Characteristics of Service Types

	Average headway (minutes)				Operation inputs daily	
Service Category	Peak	Off-Peak	Night	Average Speed	Service Hours	Average Stop Spacing
Frequent Service	5-15	5-15	15	16	20	½ mile
Express Service*	15	30	30	22	15	1-2 miles
Local Service**	30	30	60	12	18	¼ mile

*Some express service may operate on frequent headways where demand warrants. Express service also includes peak-only service as shown in the 2015 and 2025 service network.

Comment [SH3]: RL2: Updated to show inclusion of peak-only service

**Note that local service operational characteristics apply only to fixed-route service. Flexible services will be designed to meet community needs and may have a wide variety of operational designs.

Detailed Description of Service Types

Frequent Service

Frequent service is defined as service with a frequency of every five to 15 minutes during weekdays, with a minimum frequency of every 15 minutes on weekends. In areas of highest demand, frequent service headways could be as low as every five minutes or better. Frequent service is most efficient and effective in corridors with dense residential and commercial uses serving multiple trip types throughout the day. Frequent routes are generally oriented along a grid street network, with stops along the route spaced one-quarter to a half-mile apart. In addition to bus service, frequent service also includes Link light rail service. Frequent routes that serve light rail stations may operate at similar headways to light rail, allowing buses to "meet every train," and minimize the wait time associated with transfers between bus and rail. Extensive integration of frequent service and Link light rail service provides a comprehensive network throughout the densest areas that are forecast to be in King County.

Studies of rider behavior associated with frequent transit service show that riders are willing to walk farther to frequent and reliable service.[4] The frequency also minimizes or eliminates the need for a schedule. This allows riders to "show up and go" when they have access to frequent service. In addition, because high frequency minimizes the wait time for transfers, riders can more easily take advantage of the entire transit network.

Because key features of frequent service are speed and reliability, capital improvements that complement these features the best are those that facilitate fast service along corridors (transit signal priority, bus bulbs that allow for in-line stops) and keep buses out of congestion (dedicated transit lanes, business access and transit [BAT] lanes). Speed and reliability improvements are further discussed in Appendix C. Off-board fare collection and low-floor buses would further reduce overall travel times by reducing the amount of time buses spend at stops. The combined service and capital investments envisioned for the future would result in an improved quality of frequent service, including faster operational speeds and longer spans of service. Additional passenger amenities, such as real time bus arrival signs, would help to inform riders about travel options and improve customer experience.

The current service network includes very little service that operates in accordance with the future vision for frequent service. Outside of RapidRide, only a few routes currently in operation have midday service with headways less than 15 minutes. Additionally, there are very few routes that operate on roadways with the type of speed and reliability investments envisioned in 2025 and 2040.

RapidRide

RapidRide is the name for Metro Transit's Bus Rapid Transit (BRT) service. RapidRide service operates at least every 10 minutes during the busiest morning and evening travel hours and every 15-minutes during off-peak periods. Service is provided seven days a week, including late nights and early mornings.

[4] "Defining Transit Areas of Influence", American Public Transportation Association, 2007; "TCRP Report 95. Transit Oriented Development: Traveler Response to Transportation System Changes", Transportation Research Board, 2007.

Many aspects of RapidRide service are designed to make trips fast. RapidRide buses are designed to speed boarding and deboarding with:

- Low-floor buses with three doors so that riders can get on and off quickly
- Passive wheelchair restraint system that allows users to roll into place without assistance from the driver
- ORCA card readers at stations that allow riders with ORCA cards to pay before they board and get on the bus at any door

RapidRide lines are located on roadways with infrastructure improvements that help keep buses moving, even along congested corridors. Continuous fiber-optic connections running along the length of a route allow for the use of transit signal priority that helps synchronize traffic lights with an approaching RapidRide bus. See Appendix C for additional information about speed and reliability improvements for transit.

RapidRide buses and stations provide customer information to help make the trip easier for riders. Inside the bus, the next stop is displayed on illuminated overhead signs and automatically announced. RapidRide stations have electronic signs that indicate how many minutes it will be until the next bus arrives, as well as large maps showing all the stops and destinations along a route. The RapidRide system currently has six lines (Lines A to F). Started in 2010, the RapidRide program has been very successful. Ridership on these lines combined has grown over 50 percent above the bus routes they replaced. They account for 14 percent of Metro Transit's total ridership.

The 2040 service network includes a significant expansion of the RapidRide network. By 2025, METRO CONNECTS envisions RapidRide service in place along 13 new corridors. These corridors represent a combination of high ridership route segments that provide more direct connections between popular destinations and centers throughout the region. They represent an initial effort to establish an interconnected and frequent RapidRide network between urban centers and transit hubs within King County and the greater Puget Sound Region. Funding for capital improvements and service investments along seven of these routes will be provided, in part, by the City of Seattle as part of the Levy to Move Seattle and the City of Seattle 2014 service funding measure.

METRO CONNECTS envisions that by 2040 service on seven additional routes will be provided. With 20 new lines and an estimated total of 300 miles of service, the enhanced and expanded RapidRide network would "complete the alphabet," resulting in an extensive system of fast, frequent, and reliable services throughout the county. Additional information about the METRO CONNECTS envisioned expansion of the RapidRide system can be found in the King County Metro Transit Future RapidRide Expansion report (Appendix G).

Metro works closely with communities to identify the best locations for stations and plans for infrastructure investments. Levels of congestion, "bottlenecks", and other factors that impact transit speed and reliability would influence decisions about the type of future infrastructure improvements. Any roadway widening would be planned in close coordination with cities. Stations would be placed where most riders gather, within easy walking distance along the corridor. Passenger facilities would be located along the corridors at all stops.

In addition to expanding the RapidRide network, METRO CONNECTS calls for upgrades to existing RapidRide lines such as:

- Off-board fare payment, including ticket vending machines as well as ORCA card readers, at all stops and stations.

- Raised platforms that allow for level boarding without use of a ramp
- Additional bus-only right-of-way and/or BAT lanes, including center-lane running buses (this may require buses with left-side doors)
- Greater stop spacing (a half-mile to a mile), with underlying local service allowing longer stop spacing and faster travel.
- Passenger information, such as real time arrival signs and route information, at all stops and stations

Express Service

Express service connects large population and employment centers with all-day, limited stop service. It is generally provided along major corridors such as state highways or major urban arterials, allowing for a wide network of fast and reliable connections between places with concentrations of jobs and people. This network primarily serves riders that travel longer distances. Service generally has 15 minute headways or better during the peak periods[5] and 30-minute off-peak headways during weekdays. Express service will operate during weekends in general, however service frequency and span could be reduced in areas of lower weekend travel demand. On the highest demand corridors, express services may operate at the same headways as frequent service, providing a "frequent express" service in these areas. Stops along the route are spaced 1 to 2 miles apart along corridors, with more closely spaced stops in areas with a high density of destinations and boarding activity. In the METRO CONNECTS service network, express service is identified along several major corridors where light rail service is not planned. Approximately 9 percent of total service hours in the METRO CONNECTS 2040 service network are anticipated to be express service.

Comment [SH4]: RL2: Corrected peak period reference in footnote

Express service is often associated with transit trips taken during the peak commuting periods in the morning and evening. Because of this, existing peak-only service is grouped together within the Express service category. Our long term vision, ~~H~~however, is an all-day network of express service allows riders to take advantage of this service outside of traditional commuting periods. Commuting patterns have changed over the past few years, as more employees work flexible schedules or telecommute, and the region has seen the peak periods get longer. Additionally, not all riders work or need to utilize transit during traditional peak periods. Students can also use an all-day express network to reach universities, community colleges, and technical schools throughout the county.

Comment [SH5]: RL2: Language added to show explicit inclusion of peak only in express service category.

Sound Transit currently provides express transit service along major corridors in King County. Light rail service will be provided along many of these corridors (I-5, I-90) as part of the ST2 and proposed ST3 system expansions. The express service included as part of the METRO CONNECTS 2040 service network includes future service to be provided by Metro and Sound Transit. Development of the envisioned express service network was highly coordinated with Sound Transit to minimize duplication along corridors and expand the reach of this service category. Express service would be provided along corridors or between markets where it could provide a shorter travel time than light rail or where an excessive number of transfers is needed to access destinations.

Local Service & Flexible Service

[5] The morning peak period is currently defined as ~~6~~5:00 am to 9:00 am. The evening peak period is currently defined as 3:00 pm to ~~6~~7:00 pm.

Local service includes fixed-route service, as well as more flexible services such as vanpools or those services operated by Metro's Alternative Services program. For fixed-route service, local is defined as service with a frequency of every 30 to 60 minutes during weekdays, with increased frequency during the peak periods. In general, local service during weekends will have reduced frequency and span compared to weekday service; however areas of higher demand could operate at weekday service levels. Stops along the route are spaced one-quarter to a half-mile mile apart. With more corridors served and closely spaced stops, the walk distance to access transit is shorter where this service is present. It often provides more point-to-point connections and is slower than other categories of service due to the greater number of stops and less direct routing between destinations.

Local service of either fixed-route or flexible design is planned for neighborhoods with lower density, that are difficult to serve or where other categories of service are not productive. Local service provides first- and last-mile connections to frequent and express service, providing riders with a connection with the larger transit network, including the light rail system. Because of the lower frequency of local service, riders may need to plan their trips to minimize waiting time. Approximately 23 percent of total service hours in the METRO CONNECTS 2040 service network are anticipated to be local service. This allocation of local service hours includes alternative transportation services (described in the following section).

Local service would benefit from capital investments that improve transit speed and reliability or the ability for riders to access the system. However, local service often does not travel in highly congested areas that are the focus of these types of investments. The primary intent of local service is to expand access to the service. Investments that improve the ability for pedestrians and bicyclists to access the system would be the greatest complement to this category of service. Non-motorized access improvements are further discussed in Appendix D.

Alternative Services

Alternative services are a broad range of transportation services provided by Metro or as a partnership between Metro and an outside entity. The purpose of the alternative services program is to expand the transit options for people throughout the county beyond fixed-route service. Alternative services allow for flexibility in providing transportation services, innovation in piloting new ways for people to travel, greater partnerships with the private sector, and highly customized services for a given geographic area, need, or user group. One of the primary functions of the program is to bring transit to parts of King County that do not have the density or land use patterns to support traditional fixed-route bus service. In these areas, alternative services may be a better and more cost-effective way to provide for community transportation needs.

Metro collaborates with stakeholders to design the appropriate services and partners with communities to market them.

Alternative services currently provided by Metro include the following:

- Rideshare (VanPool/Vanshare, MetroPool)
- Dial-a-Ride (DART) Transit
- Custom Bus
- Community Shuttle
- Taxi Scrip

Service Integration with the Private Sector Findings

There are opportunities for Metro to integrate with private companies and businesses to help provide new services in the county. Integration with other alternative service providers could help Metro take advantage of other efficient strategies and, in particular, provide improved first/last mile connections to transit in areas that are difficult to serve. This section summarizes a high level analysis of the potential challenges and opportunities around integration with private providers.

Transportation Network Companies (TNCs), such as Uber or Lyft, are a growing part of the transportation industry. TNCs provide prearranged transportation services for compensation using an online-enabled application or platform to connect drivers with passengers. TNC drivers use their personal vehicles to provide this service. This type of "shared mobility" can serve as a complement to transit by providing first- and last-mile services in areas that are not efficiently served by transit. TNCs allow a person to easily obtain point-to-point rides through smartphone interfaces with integrated payment systems.

While much of the growth of TNC services has been centered on trips that have one origin and one destination, the companies have recently deployed UberPool and LyftLine to combine multiple trips into one vehicle. The term "Transportation Network Company" was defined by the California Public Utilities Commission in 2013 to describe the wide array of companies and organizations that "provide prearranged transportation services for compensation using an online-enabled application or platform to connect drivers using their personal vehicles with passengers."

Microtransit, which is privately operated, has a high degree of flexibility in their scheduling and operating practices. Similar to TNCs, microtransit can provide service in less dense areas for which fixed-route transit is not the most efficient. Partnerships with TNC and microtransit agencies can be an effective way to expand Metro Transit's service. In many cases, microtransit mirrors the operations of public transit agencies along select routes. Current microtransit providers include, Bridj, Loup, Chariot, and others. The service provided falls somewhere between automobile ride-sharing and full-scale transit service by providing on-demand service between fixed points in vehicles capable of holding 12 to 20 people.

Metro is currently integrating with a bikeshare company, called Pronto! Cycle Share in Seattle, which provides stations in the University District, South Lake Union, Capitol Hill, Uptown, Downtown, and Pioneer Square. Pronto! encourages bicycling as a means of access to transit hubs. Bikeshare also provides alternative ways to link to transit in all types of geographic areas. Future expansion of bikeshare to other areas in Seattle and King County, potentially including Redmond, Bellevue, Kirkland, and Issaquah, could provide new first/last mile connections to transit service.

TNCs and bikeshare are both alternative service programs that could supplement and/or complement Metro's fixed-route service. Table A-2 highlights the opportunities and challenges associated with TNC partnerships.

Table A-2 Advantages and Disadvantages of TNCs

Opportunities/complement	Challenges/substitute
• TNCs can serve as the first/last mile connection in high-frequency corridors to serve those riders not within the walkshed • Integration of trip planning and payment systems allows for fares to apply between TNCs and transit	• Private operators may have to compete for curb/stop space with current public transit right-of-way. TNCs may compete by offering more one-seat ride connections as opposed to a transfer-based frequency network • TNCs may operate primarily along the most cost-efficient (highest productivity) public transit routes,

- TNCs may provide interim capacity on overcrowded corridors until other funding or resources can be allocated
- By providing the flexibility and mobility of a personal vehicle, TNCs may reduce automobile ownership, resulting in more overall transit use
- TNCs may supplement infrequent late night public transit service to help reduce drunk driving incidents
- Overall, TNCs may provide a range of cost, convenience, and travel time options, with public transit offering lower-cost mainline service

thereby decreasing farebox recovery

- "Ridepooling" through options such as Lyftline and Uberpool may continue to adapt towards fixed-route service, competing with transit in both price, convenience, and travel time along the major corridors
- Data sharing between TNCs and public transit may not be consistent with the TNC business model
- Potential accessibility concerns if areas become reliant solely on TNC-provided services * Potential regulatory conflicts between public transit and TNCs
- Workforce and safety issues can be challenging with TNCs.

Paratransit

In accordance with ADA requirements, Metro provides paratransit service for persons whose disabilities prevent them from using accessible, non-commuter, fixed-route bus service. Paratransit service provides next-day shared rides within three-quarters of a mile on either side of non-commuter fixed-route bus service during the time and on the days those routes are operating.

In 2015, almost 995,000 ADA paratransit trips were provided by Metro's Access services. Access transportation ridership has experienced an average reduction rate of 3 percent since 2012, with a 6 percent reduction from 2014 to 2015. However, demands on ADA paratransit are expected to increase in the future with an aging and growing King County population.

Access service is the most expensive service Metro operates on a per-trip basis. The 2015 average cost per paratransit trip was approximately $52, compared to $4.27 per fixed-route trips.

Approximately 29 percent of current paratransit customers are able to use fixed-route transit for at least some of their trips. However, they are often prevented from using the bus because of difficulties reaching the nearest bus stop and boarding the buses (e.g., non-kneeling buses). A lack of sidewalks to transit stops, stops where a wheelchair lift or ramp cannot be deployed, and other infrastructure deficiencies can restrict the use of fixed-route service. The process to qualify for and use paratransit service presents impediments to users that are not associated with fixed-route transit service and the need for scheduling prohibits spontaneous, unplanned transit use.

Metro seeks to improve the accessibility of its vehicles and facilities to enhance the customer experience for people with disabilities. Improving the accessibility of the transit system also benefits many riders not specifically protected by the ADA, including parents with small children and the elderly. Vehicles and facilities that allow for easy boarding and exiting by people with disabilities create a faster and more pleasant ride for all passengers.

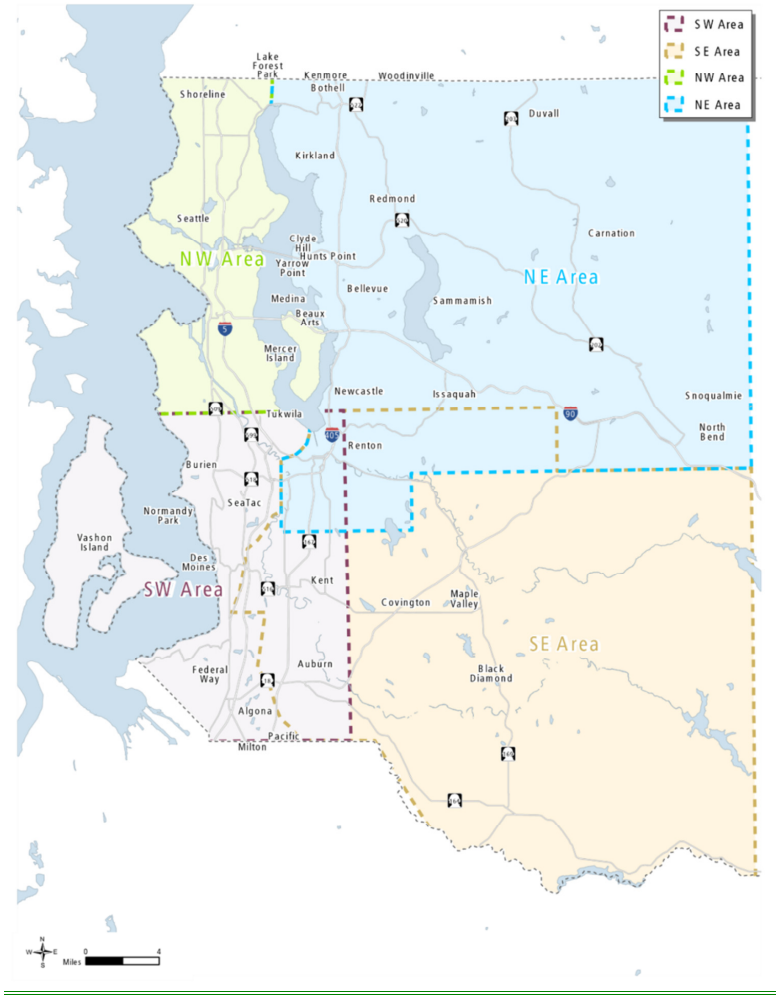
Service Network Performance Evaluation

During the METRO CONNECTS development process ~~The d~~draft performance metrics were presented to the TAC, the Community Advisory Group, and the Regional Transit Committee for review and comment and were amended in response to the feedback received. Once finalized, the performance metrics were used to ~~evaluate the network.~~ compare the performance of the original conceptual networks and inform the correct balance of services. These metrics were also used to evaluate the final METRO CONNECTS plan and to assess how well the plan distributed transit benefits across King County.

These metrics were based upon the goals, objectives and strategies outline in the King County Metro Strategic plan for Public Transportation. The measures were developed to ensure that METRO CONNETS made progress on as many priorities as possible. ~~METRO CONNECTS 2040 service network based upon the goals, objectives, and strategies outlined in the King County Metro Transit Strategic Plan for Public Transportation.~~ The ~~draft~~ performance metrics were assigned to three broad categories: 1) Transit Access, 2) Transit Connections, and 3) Transit Use and Efficiency. To get a better understanding of how the network performance across the whole county, most measures were also reported out at the quadrant level. See Figure A-2 for a map of the quadrants. ~~The draft performance metrics were presented to the TAC, the Community Advisory Group, and the Regional Transit Committee for review and comment and were amended in response to the feedback received. Once finalized, the performance metrics were used to evaluate the network.~~

Each of these evaluation categories and the methodology are described in the following sections.

Figure A-2 King County Quadrants



Transit Access

Transit access measures proximity to transit by different service types. These measures are important because they help us understand what percent of King County residents live close to which type of service and what percent of the county's population could potentially reach the different service types within a 5 to 10 minute walk. This is an important high level measure of the extent of the transit network.

The analysis of access to different types of services was based on access definitions shown in Table A-3. The distance used varies by service type, as research has shown that transit customers are

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willing to walk further to services that are fast, frequent, and reliable.[6] ~~shows the measures used to evaluate transit access and the methodology for calculating each.~~

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Table ~~s A-3 and~~ A-4 describes methodology for each transit access performance metric. ~~describe each transit access measure in more detail. Tables A-8, A-9, and A-10 report out on transit access by different demographics both countywide and by quadrant.~~

Table A-3 Definition of access for different service types

Proximity Category	Includes*					
	Metro Frequent	Metro Express	Metro Local	ST Link Light Rail	ST Express bus	ST BRT
Frequent service	½ mile to stops			½ mile to stops		½ mile to stops
Express service		½ mile to stops		½ mile to stops	½ mile to stops	½ mile to stops
All service	½ mile to stops	½ mile to stops	¼ mile to stops	½ mile to stops	½ mile to stops	½ mile to stops

* ¼ mile is equivalent to a 5 minute walk. ½ mile is equivalent to a 10 minute walk.

Table A-4 Transit access performance metrics

What it measures	Performance metrics
How close are transit stops to where people live	Population within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½-mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½-mile walk (~10 minutes) from express transit stop and Link light rail stations
How close are transit stops to where people work	Jobs within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½-mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½-mile walk (~10 minutes) from express transit stop and Link stations
How close are transit stops to where low-income and minority populations, persons age 65 and older, and persons with disabilities live*	Percentage of households in minority, low-income, and persons-with-disabilities census tracts within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½-mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½-mile walk (~10 minutes) from express transit stop and Link stations
How people access transit stops (car, walking, bicycle, etc.)	• Percentage of people accessing transit by non-motorized modes at peak hour.

[6] Defining Transit Areas of Influence, American Public Transportation Association, 2007; TCRP Report 95, Transit Oriented Development: Traveler Response to Transportation System Changes, Transportation Research Board, 2007

Transit Connections ~~Measures~~Metrics

METRO CONNECTS expands on the ~~ground-breaking~~ accessibility performance measures integrated into the 2015 Update of the Strategic Plan for Public Transportation. The Transit Connections metrics ~~was~~are used to evaluate the ability for riders to access jobs, education, people, and the regional transit system using the proposed METRO CONNECTS service network. The purpose of this analysis ~~was~~is to demonstrate how well the service network connects people to the opportunities around them. The Transit Connections calculations included estimated travel time to reach the transit stop, initial wait time, and transfer wait time (if applicable) averaged over the peak and midday periods. The general methodology is described in this section, although additional detail can be found in the Supplemental Network Performance Report.

Metro analyzed both the average number of jobs and the average number of residents that an individual could reach within 30 minutes on transit. The greater the number of jobs an individual could access within 30 minutes the more likely that individual's job is within that transit travel shed, and the more likely that individual could find employment within that transit travel shed. The greater the number of residents that an individual could reach within 30 minutes on transit the more likely that individual's friends and support network would be within that transit travel shed. In other words the more residents and jobs that are within an individual's transit travel shed, the better transit connects that individual to the rich opportunities available across King County.

This analysis was done at traffic analysis zone level (TAZ) to better understand where residents could reach employment centers and which employment centers were well connected to the residents of King County. Metro also summarized this by quadrants and countywide.

~~A similar accessibility analysis was performed to determine the percentage of the population with at least 30,000 jobs or people accessible within a 30-minute transit trip. The 30,000 threshold was chosen because it represents an upper bound of the average job accessibility within the Seattle area. This analysis was performed for each quadrant as well as countywide.~~

Metro evaluated integration with Link light rail by measuring the percentage of the population that would be able to access light rail within a 30 minute bus trip, a 15 minute bus trip, and a 10 minute (half-mile) walk using the existing service network as well as the METRO CONNECTS 2040 service network. Bus travel time calculations included estimated travel time to reach the transit stop, initial wait time, and transfer wait time (if applicable) averaged over the peak and midday periods.

In addition, a similar accessibility analysis was performed to determine the percentage of the population with at least 30,000 jobs or other households totaling 30,000 other people within a 30-minute transit trip. The 30,000 threshold was chosen because it represents an upper bound of the average job accessibility within the Seattle area. This analysis was performed for each quadrant as well as countywide.

~~Table A-5~~ Table A-5 shows the performance measures used to evaluate transit connections. ~~and table A-11 reports on the transit connections performance countywide and by quadrant.~~

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Table ~~A-5~~ Transit Connections Performance Metrics

What it measures	Performance metrics
Population with 30-minute access to jobs and school via transit	• Population within a 30-minute transit commute • Jobs within a 30-minute transit commute
Integration with Light Rail	• Proximity to light rail stations Within 30 minutes via bus • Proximity to light rail stations Within 15 minutes via bus • Proximity to light rail stations Within a 10 minute (1/2 mile) Walkshed

Transit Use and Efficiency Measures

In addition to the Transit Access and Transit Connection performance metrics, Metro worked with stakeholders to develop Use and Efficiency performance metrics. These metrics were used to evaluate how ~~much~~often people would use the future transit network. Metro developed four broad categories of transit use and efficiency metrics: ridership, mode share, economic and environmental efficiciency measures and variation of transit throughout the day. Below we have described each measure***, and ensure that the future network would be more efficient than our current network.***

~~Within Transit Use and Efficiency, Metro developed four broad categories of metrics: ridership, mode share, economic and environmental efficiency measures and variation of transit throughout the day. Below we have described each measure.~~

Total ridership measures the number of boardings in King County on any transit service. This is a useful measure to help understand how much people are using transit services. A growth in ridership shows that more people are getting on and off the transit service provided. Assuming population growth, and no decline in service, transit ridership should grow as more people are in the area to use transit.

Transit mode share measures the percent of all trips in the county that were done on transit. ~~A shift in transit mode share means that transit is attracting a larger share of the travel market.~~ An increase in transit mode share means that transit is attracting a larger share of the travel market. This also means that ~~ridership growth will outpace population, employment growth when there is a shift in mode share.~~transit ridership will grow faster than it would as a result of population and employment growth alone.

There are six economic and environmental efficiency measures to ensure that we are making progress in all areas of efficiency. For these calculations, the existing cost per hour associated with operating the various types of buses was used as a baseline. A mix of coach types was assumed, including 30-foot coaches, 40-foot diesel/hybrid and trolley coaches, and 60-foot diesel/hybrid coaches, RapidRide coaches, and trolleys. The operating cost per hour varies between fleet types based on differences in fuel efficiency, higher maintenance and fuel costs for larger coaches, and variations in parts and component costs. The 2015 budget costs for various coaches are shown in Table A-6.

Table A-6 2015 Budget Costs for Coach Operations

Vehicle Type	Hourly operation rate (fully allocated)
30'	$138.09
40' Diesel/Hybrid	$141.66
60' Diesel	$168.42
60' Diesel/Hybrid	$160.82
60' RapidRide	$160.91
40' Trolley	$145.09
60' Trolley	$171.32
DART	$127.26

Local and express service was assumed to operate with 40-foot diesel/hybrid coaches and 60-foot hybrid coaches, respectively. Frequent service includes the use of 60-foot trolley buses and 60-foot hybrid coaches, and reflects the current mix of approximately 20 percent trolley buses and 60-foot

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hybrid coaches on corridors with frequent service. The assumed baseline operating costs per hour were[7]:

- Frequent Service: $163
- Express Service: $161
- Local Service: $142

The economic efficiency measures were calculated as follows:

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1. Operating Cost/Boarding compares the operating costs to how many people are using transit. The lower this number is, the more financially efficient the system is.

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2. Operating cost per hour blends the hourly costs associated with the different service types to get an aggregate cost per hour. This was calculated as follows: ((Frequent service hours X $163) + (Express service hours X $161) + (Local service hours X $142))/Daily revenue hours
3. Boardings/Hour measures the number of people getting on a bus for every hour of service. This measure should have a positive correlation with operating cost/boarding but it is a direct measurement of service efficiency.

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4. British Thermal Units (BTU)/Passenger Mile compares the energy efficiency of service provision. By measuring BTU you can compare the relative efficiency of gas and electric powered service. The lower the BTU/Passenger Mile, the greater the environmental impact transit will have. This should also have a positive correlation with boardings/hour.
5. Green House Gas Emissions (GHG)/Passenger Mile compares the number of pounds of GHG emitted for each passenger mile. By reducing the GHG/passenger mile transit can have a greater environmental impact. For this plan we did not explicitly measure the impact of switching to an electric fleet. This measurement assumes the use of hybrids and coaches with existing technology. This also will have a positive correlation with boardings/hour.
6. The variation of transit service throughout the day was evaluated to provide an understanding of the availability of service at peak and non-peak times. For this metric, the amount of service provided at 9 pm was compared to the amount provided at 6 pm. Figure A-4 shows the countywide distribution of service hours throughout the day for the existing and METRO CONNECTS 2040 service networks.

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~~Table A-7~~ Table A-7 shows the transit use and efficiency and performance measures included in the METRO CONNECTS analysis. ~~Table A-12 reports out on the transit use and efficiency metrics countywide and by quadrant.~~

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Table A-7 Transit Use and Efficiency Performance Metrics

What it measures	Performance metrics
Total transit ridership by bus and rail	• Total ridership and ridership increase by bus and rail • Ridership across screenlines
Percent of trips by transit	• Percentage of all trips made on transit all-day

[7] Costs were kept in 2015 constant-dollar terms to facilitate a convenient comparison to current operating costs.

	• Percentage of all trips made on transit peak-only
Economic and environmental efficiency measures	• Operating cost/boarding • Boardings/hour • Operating cost/hour • British Thermal Unit (BTU)/passenger mile • Greenhouse gas emissions—gross and emissions/ passenger mile
Variation of transit service throughout the day	• Ratio of trips provided in the 9 pm hour compared to the trips provided in the 6 pm hour • Distribution of transit service hours throughout daily service period

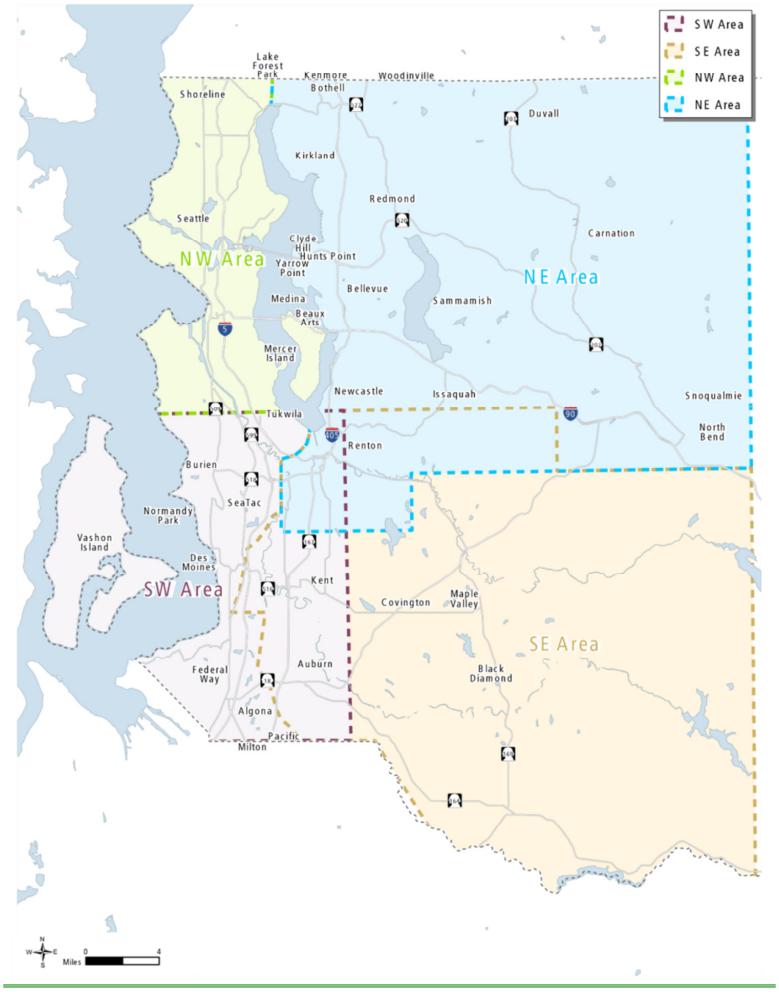
In addition to the performance metrics, Metro used two methods to evaluate travel times and competitiveness with driving for the METRO CONNECTS 2040 service network. The findings of this analysis and full description of methodology can be found in the Supplemental Network Performance Report, available online.

Methodology

Several assumptions apply throughout the analysis:

- Where comparisons to the existing network service or performance are made in this appendix, they are based on the spring 2015 configuration and operation of the network with no modifications.
- The METRO CONNECTS 2040 service network assumes that service would grow by 3.5 million annual service hours ~~annually~~, a 70 percent increase over 2015. The METRO CONNECTS 2025 service network assumes service would grow to 4.4 million service hours annually, a 25 percent increase compared to 2015.
- Metro performed a limited analysis of the METRO CONNECTS 2025 service network, which illustrates how the service network would grow and change over time. Where applicable, those results are included in the summary below.
- The PSRC projected distributions were used to for analysis of 2040 households and jobs. Because the future distribution of different demographic populations is unknown, the 2013 American Community Survey Data were used as a proxy for the future distribution of low-income populations, minority populations, persons age 65 and older, and persons with disabilities.
- Quadrant-level analysis is based on the geographies shown in Figure A-2.

~~*Figure A-2 King County Quadrants*~~



Transit Access Measures

~~The first set of performance measures assess access to transit. The analysis of access to different types of services was based on access definitions shown in Table A-3. The distance used varies by service type, as research has shown that transit customers are willing to walk further to services that are fast, frequent, and reliable.[8] Table A-4 shows the measures used to evaluate transit access and the methodology for calculating each.~~

[8] ~~Defining Transit Areas of Influence, American Public Transportation Association, 2007; TCRP Report 95. Transit Oriented Development: Traveler Response to Transportation System Changes, Transportation Research Board, 2007~~

Table A-3 Definition of access for different service types

Proximity Category	Includes*					
	Metro Frequent	Metro Express	Metro Local	ST Link Light Rail	ST Express bus	ST BRT
Frequent service	½ mile to stops		-	½ mile to stops	-	½ mile to stops
Express service	-	½ mile to stops	-	½ mile to stops	½ mile to stops	½ mile to stops
All service	½ mile to stops	½ mile to stops	¼ mile to stops	½ mile to stops	½ mile to stops	½ mile to stops

* ¼ mile is equivalent to a 5 minute walk. ½ mile is equivalent to a 10 minute walk.

Table A-4 Transit access performance metrics

What it measures	Performance metrics
How close are transit stops to where people live	Population within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½ mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½ mile walk (~10 minutes) from express transit stop and Link light rail stations
How close are transit stops to where people work	Jobs within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½ mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½ mile walk (~10 minutes) from express transit stop and Link stations
How close are transit stops to where low-income and minority populations, persons age 65 and older, and persons with disabilities live*	Percentage of households in minority, low-income, and persons with disabilities census tracts within: • ½ mile walk (~10 minutes) from transit stops with service every 15 minutes or better, including Link light rail stations, or ½ mile walk (~10 minutes) from transit stops with limited stop service or ¼ mile walk (~5 minutes) from any transit stop, including all Link stations • ½ mile walk (~10 minutes) from frequent transit stops (<15minute service, all day) and Link stations • ½ mile walk (~10 minutes) from express transit stop and Link stations
How people access transit stops (car, walking, bicycle, etc.)	• Percentage of people accessing transit by non-motorized modes at peak hour.

Transit Connections Measures

The Transit Connections metric was used to evaluate the ability for riders to access jobs, education, people, and the regional transit system using the proposed METRO CONNECTS service network. The purpose of this analysis was to demonstrate how well the service network connects people to the opportunities around them. The Transit Connections calculations included estimated travel time to reach the transit stop, initial wait time, and transfer wait time (if applicable) averaged over the peak and midday periods. The general methodology is described in this section, although additional detail can be found in the Supplemental Network Performance Report.

Metro analyzed both the average number of jobs and the average number of residents that an individual could reach within 30 minutes on transit. This was done at traffic analysis zone level (TAZ) to better understand where residents could reach employment centers and which employment centers were well connected to the residents of King County. Metro also summarized this by quadrants and countywide.

A similar accessibility analysis was performed to determine the percentage of the population with at least 30,000 jobs or people accessible within a 30-minute transit trip. The 30,000 threshold was chosen because it represents an upper bound of the average job accessibility within the Seattle area. This analysis was performed for each quadrant as well as countywide.

Metro evaluated integration with Link light rail by measuring the percentage of the population that would be able to access light rail within a 30-minute bus trip, a 15-minute bus trip, and a 10-minute (half-mile) walk using the existing service network as well as the METRO CONNECTS 2040 service network. Bus travel time calculations included estimated travel time to reach the transit stop, initial wait time, and transfer wait time (if applicable) averaged over the peak and midday periods.

Table A-5 shows the performance measures used to evaluate transit connections.

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Table A-5 Transit Connections Performance Metrics

What it measures	Performance metrics
Population with 30-minute access to jobs and school via transit	• Population within a 30-minute transit commute • Jobs within a 30-minute transit commute
Integration with Light Rail	• Proximity to light rail stations Within 30-minutes via bus • Proximity to light rail stations Within 15-minutes via bus • Proximity to light rail stations Within a 10-minute (1/2 mile) Walkshed

Transit Use and Efficiency Measures

Several economic efficiency metrics were evaluated to determine the costs associated with operation of the METRO CONNECTS 2040 service network. For this calculation, the existing cost per hour associated with operating the various types of buses was used as a baseline. A mix of coach types was assumed, including 30-foot coaches, 40-foot diesel/hybrid and trolley coaches, and 60-foot diesel/hybrid coaches, RapidRide coaches, and trolleys. The 2015 budget costs for various coaches are shown in Table A-6.

Table A-6 2015 Budget Costs for Coach Operations

Vehicle Type	Hourly operation rate (fully allocated)
30'	$138.09
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60' Diesel	$168.42
60' Diesel/Hybrid	$160.82
60' RapidRide	$160.91
40' Trolley	$145.09
60' Trolley	$171.32
DART	$127.26

Local and express service was assumed to operate with 40-foot diesel/hybrid coaches and 60-foot hybrid coaches, respectively. Frequent service includes the use of 60-foot trolley buses and 60-foot

hybrid coaches, and reflects the current mix of approximately 20 percent trolley buses and 60 foot hybrid coaches on corridors with frequent service. The assumed baseline operating costs per hour were[9]:

- Frequent Service: $163
- Express Service: $161
- Local Service: $142

The economic efficiency measures were calculated as follows:

- Operating cost per boarding = Total operating cost for the 2040 service network/Total Metro boardings projected within that network
- Boardings per service hour = Total projected Metro boardings for the 2040 service network/Daily revenue hours
- Operating cost per hour = ((Frequent service hours X $163) + (Express service hours X $161) + (Local service hours X $142))/Daily revenue hours

The existing service network has approximately 8,400 daily revenue hours and the 2040 service network was assumed to have approximately 14,000 daily revenue hours.

Peak period and total daily transit ridership by bus and rail were calculated for the existing, METRO CONNECTS 2025, and METRO CONNECTS 2040 service networks by quadrant as well as countywide. Daily and peak period ridership was also compared to existing ridership. To demonstrate transit travel patterns, transit trip volumes were calculated for 10 screenlines throughout the county. The ridership numbers include trips into and out of Snohomish and Pierce counties.

Transit mode share was calculated for the existing, METRO CONNECTS 2025, and METRO CONNECTS 2040 service networks during the peak period and all-day and was compared to existing mode share by quadrant and countywide.

The performance metrics included two environmental efficiency measures. British thermal units (BTUs) per passenger mile were calculated to evaluate the energy consumption associated with operation of the METRO CONNECTS 2040 service network. This number was calculated as follows:

- BTUs per passenger mile = Total BTUs expended by bus operations/passenger mile

Greenhouse gas (GHG) emissions per passenger mile was also evaluated as an environmental efficiency measure. This metric compared the GHGs emitted due to bus operations to passenger miles to determine the relative impact of the 2040 service network. This number was calculated as follows:

- GHGs per passenger mile = Total pounds of carbon dioxide (CO_2) emissions from bus operations/passenger mile

The variation of transit service throughout the day was evaluated to provide an understanding of the availability of service at peak and non-peak times. For this metric, the amount of service provided at 9 pm was compared to the amount provided at 6 pm. Figure A-4 shows the countywide distribution

[9] Costs were kept in 2015 constant-dollar terms to facilitate a convenient comparison to current operating costs.

of service hours throughout the day for the existing and METRO CONNECTS 2040 service networks.

Table A-7 shows the transit use and efficiency and performance measures included in the METRO CONNECTS analysis.

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Table A-7 Transit Use and Efficiency Performance Metrics

What it measures	Performance metrics
Total transit ridership by bus and rail	• Total ridership and ridership increase by bus and rail • Ridership across screenlines
Percent of trips by transit	• Percentage of all trips made on transit all day • Percentage of all trips made on transit peak only
Economic and environmental efficiency measures	• Operating cost/boarding • Boardings/hour • Operating cost/hour • British Thermal Unit (BTU)/passenger mile • Greenhouse gas emissions – gross and emissions/ passenger mile
Variation of transit service throughout the day	• Ratio of trips provided in the 9 pm hour compared to the trips provided in the 6 pm hour • Distribution of transit service hours throughout daily service period

Service Network Performance Results and Baseline

Tables A-8, A-9, A-10, A-11, and A-12 show baseline 2015 figures and findings from the performance analysis for each evaluation category. These tables illustrate not only how METRO CONNECTS will result in improvements in countywide, but how those benefits accrue across the four different quadrants of the county. ~~Table A-8, Table A-9 and Table A-10 show findings from the performance analysis for each evaluation category.~~ See the METRO CONNECTS Supplemental Network Performance Report for additional findings including ~~proximity to different demographics,~~ midday ~~performance~~performance; ~~performance of the METRO CONNECTS 2025 network~~, select measures by PSRC designated center ~~Regional Growth Center and Manufacturing and Industrial Centers~~s and Colleges and Universities as well as maps~~, example trips and travel time matrices~~.

Table A-8 Transit Access Total Population and Employment

What it measures	Performance Metric	Region	2015	2025	2040	% Change
How close are transit stops to where people live	**Frequent** Percent of Population with frequent service access	NE Area	20%	35%	42%	110%
		NW Area	66%	84%	88%	33%
		SW Area	26%	55%	68%	162%
		SE Area	7%	36%	38%	443%
		Countywide	**43%**	**64%**	**73%**	**70%**
	Express Percent of Population with express service access	NE Area	13%	21%	20%	54%
		NW Area	23%	30%	35%	52%
		SW Area	11%	22%	20%	82%
		SE Area	6%	19%	13%	117%
		Countywide	**15%**	**25%**	**28%**	**87%**
	All Percent of Population with all service access	NE Area	55%	60%	67%	22%
		NW Area	85%	90%	91%	7%
		SW Area	66%	80%	89%	35%
		SE Area	47%	61%	61%	30%
		Countywide	**69%**	**76%**	**81%**	**17%**
How close are transit stops to where people work	**Frequent** Percent of jobs with frequent service access	NE Area	45%	60%	69%	53%
		NW Area	78%	88%	91%	17%
		SW Area	44%	60%	70%	59%
		SE Area	29%	50%	53%	83%
		Countywide	**63%**	**78%**	**87%**	**38%**
	Express Percent of jobs with express service access	NE Area	26%	36%	46%	77%
		NW Area	40%	52%	66%	65%
		SW Area	16%	27%	32%	100%
		SE Area	11%	25%	28%	155%
		Countywide	**38%**	**42%**	**54%**	**42%**
	All Percent of jobs with all service access	NE Area	75%	78%	85%	13%
		NW Area	89%	94%	93%	4%
		SW Area	70%	77%	86%	23%

	SE Area	56%	67%	71%	27%
	Countywide	**82%**	**84%**	**90%**	**10%**

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Table A-9 Transit Access Minority and Low Income Populations

What it measures	Performance Metric	Region	2015	2025	2040	% Change
How close are transit stops to where low income persons live*	**Frequent** Percent of low-income population with frequent service access	NE Area	46%	49%	56%	22%
		NW Area	97%	100%	100%	3%
		SW Area	47%	60%	77%	64%
		SE Area	28%	53%	55%	96%
		Countywide	**72%**	**79%**	**87%**	**21%**
	Express Percent of low-income population with express service access	NE Area	20%	35%	21%	5%
		NW Area	39%	45%	48%	23%
		SW Area	11%	23%	14%	27%
		SE Area	7%	24%	12%	71%
		Countywide	**26%**	**35%**	**32%**	**23%**
	All Percent of low-income population with all service access	NE Area	69%	77%	80%	16%
		NW Area	100%	100%	100%	0%
		SW Area	75%	88%	95%	27%
		SE Area	63%	77%	75%	19%
		Countywide	**88%**	**90%**	**93%**	**6%**
How close are transit stops to where minority populations live*	**Frequent** Percent of households in minority census tracts with frequent service access	NE Area	39%	44%	50%	28%
		NW Area	93%	98%	100%	8%
		SW Area	40%	59%	74%	85%
		SE Area	19%	48%	50%	163%
		Countywide	**61%**	**70%**	**77%**	**26%**
	Express Percent of households in minority census tracts with express service access	NE Area	15%	28%	16%	7%
		NW Area	28%	35%	39%	39%
		SW Area	9%	21%	12%	33%
		SE Area	5%	28%	9%	80%
		Countywide	**18%**	**28%**	**24%**	**33%**
	All Percent of households in minority census tracts with all service access	NE Area	64%	72%	77%	20%
		NW Area	97%	100%	100%	3%
		SW Area	69%	84%	92%	33%
		SE Area	57%	76%	73%	28%
		Countywide	**79%**	**82%**	**87%**	**10%**

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* The proximity analysis for low income, and minority population along with persons age 65 and older and persons with disabilities is based on current distributions as there are no forecasts of where these populations will in the future.

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Table A-10 Transit Access Disability and Senior Populations

What it measures	Performance Metric	Region	2015	2025	2040	% Change
How close are transit stops to where people with disabilities live*	**Frequent** Percent of people with disabilities with frequent service access	NE Area	42%	44%	51%	21%
		NW Area	83%	87%	89%	7%
		SW Area	38%	52%	70%	84%
		SE Area	18%	40%	42%	133%
		Countywide	**55%**	**62%**	**70%**	**27%**
	Express Percent of people with disabilities with express service access	NE Area	16%	30%	17%	6%
		NW Area	25%	37%	34%	36%
		SW Area	11%	25%	14%	27%
		SE Area	6%	25%	12%	100%
		Countywide	**17%**	**29%**	**23%**	**35%**
	All Percent of people with disabilities with all service access	NE Area	64%	74%	77%	20%
		NW Area	90%	95%	95%	6%
		SW Area	66%	83%	91%	38%
		SE Area	49%	67%	64%	31%
		Countywide	**72%**	**76%**	**79%**	**10%**
How close are transit stops to where people over 65 live*	**Frequent** Percent of people over 65 with frequent service access	NE Area	46%	42%	50%	9%
		NW Area	77%	84%	87%	13%
		SW Area	35%	53%	72%	106%
		SE Area	15%	39%	40%	167%
		Countywide	**56%**	**62%**	**70%**	**25%**
	Express Percent of people over 65 with express service access	NE Area	19%	28%	20%	5%
		NW Area	20%	33%	28%	40%
		SW Area	12%	29%	15%	25%
		SE Area	6%	26%	11%	83%
		Countywide	**17%**	**28%**	**22%**	**29%**
	All Percent of people over 65 with all service access	NE Area	68%	75%	80%	18%
		NW Area	89%	94%	94%	6%
		SW Area	69%	86%	93%	35%
		SE Area	50%	66%	63%	26%
		Countywide	**76%**	**78%**	**81%**	**7%**
How people access transit stops (car, walking, bicycle etc.)	Percent of people accessing transit by non-motorized modes at peak hours	NE Area	71%	N/A	81%	14%
		NW Area	88%	N/A	94%	7%
		SW Area	70%	N/A	85%	21%
		SE Area	68%	N/A	83%	22%
		Countywide	**74%**	**N/A**	**84%**	**14%**

* The proximity analysis for Low income, and minority population along with persons age 65 and older and persons with disabilities is based on current distributions as there are no forecasts of where these populations will in the future.

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What it measures	Performance metrics	Countywide	NE	NW	SW	SE
How close are transit stops to where people live	Percent of population with frequent service access	73%	42%	88%	68%	38%
	Percent of population with express service access	28%	20%	35%	20%	13%
	Percent of population with all service access	81%	67%	91%	89%	61%
How close are transit stops to where people work	Percent of jobs with frequent service access	87%	69%	91%	70%	53%
	Percent of jobs with express service access	54%	46%	66%	32%	28%
	Percent of jobs with all service access	90%	85%	93%	86%	71%
How close are transit stops to where low-income and minority populations, persons age 65 and older, and persons with disabilities live*	Percent of households in low-income census tracts with access to frequent service	87%	56%	100%	77%	55%
	Percent of households in minority census tracts with access to frequent service	77%	50%	100%	74%	50%
	Percent of households with persons with disabilities with access to frequent service access	70%	51%	89%	70%	42%
	Percent of households with persons age 65 or Older with access to frequent service	70%	50%	87%	72%	40%
	Percent of households in low-income census tracts with access to express service	32%	21%	48%	14%	12%
	Percent of households in minority census tracts with access to express service	24%	16%	39%	12%	9%
	Percent of households with persons with disabilities with access to express service	23%	17%	34%	14%	12%
	Percent of households with persons age 65 or Older with access to express service	22%	20%	28%	15%	11%
	Percent of households in low-income census tracts with access to all service	93%	80%	100%	95%	75%
	Percent of households in minority census tracts with access to all service	87%	77%	100%	92%	73%
	Percent of households with persons with disabilities with access to all service access	79%	77%	95%	91%	64%
	Percent of households with persons age 65 or Older with access to all service	81%	80%	94%	93%	63%
How people access transit stops (car, walking, bicycle, etc.)	Percent of people accessing transit by non-motorized modes at peak hour.	84%	81%	94%	85%	83%

* The proximity analysis for Low income, and minority population along with persons age 65 and older and persons with disabilities is based on current distributions as there are no forecasts of where these populations will in the future.

Table A-911 Transit Connections

What it measures	Performance Metric	Region	2015	2025	2040	% Change
Populations with 30-minute access to jobs and school via transit	Population within a 30-minute transit commute peak only for the average resident	NE Area	12,000	16,000	26,000	117%
		NW Area	78,000	123,000	177,000	127%
		SW Area	16,000	18,000	27,000	69%
		SE Area	12,000	17,000	22,000	83%
		Countywide	**37,000**	**60,000**	**86,000**	**132%**
	Jobs within a 30-minute transit commute peak only for the average resident	NE Area	11,000	21,000	38,000	245%
		NW Area	92,000	161,000	236,000	157%
		SW Area	8,000	11,000	19,000	138%
		SE Area	5,000	9,000	13,000	160%
		Countywide	**40,000**	**75,000**	**112,000**	**180%**
Integration with Light Rail	Proximity to light rail stations within 30 minutes via bus	Countywide	18%	N/A	64%	256%
	Proximity to light rail stations within 15 minutes via bus	Countywide	3%	N/A	32%	967%
	Proximity to light rail stations within a 10 minute (1/2 mile walkshed)	Countywide	7%	N/A	14%	100%

What it measures	Performance metrics	Countywide	NE	NW	SW	SE
Population with 30-minute access to jobs and school via transit	Population within a 30-minute transit commute peak only	112,000	38,000	236,000	19,000	13,000
	Jobs within a 30-minute transit commute peak only	86,000	26,000	177,000	27,000	22,000
Integration with Light Rail	Proximity to light rail stations Within 30 minutes via bus	64%	N/A	N/A	N/A	N/A
	Proximity to light rail stations Within 15 minutes via bus	32%	N/A	N/A	N/A	N/A
	Proximity to light rail stations Within a 10 minute (1/2 mile) Walkshed	14%	N/A	N/A	N/A	N/A

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Table A-~~99910~~2 Transit Use and Efficiency

~~What it measures~~	~~Performance metrics~~	~~Countywide~~	~~NE~~	~~NW~~	~~SW~~	~~SE~~
~~Total transit ridership by bus and rail~~	~~Total ridership by bus and rail~~	~~1,026,000~~	~~251,000~~	~~568,000~~	~~270,000~~	~~139,000~~
~~Percentage of Trips by transit~~	~~Percentage of all trips made on transit all-day~~	~~12%~~	~~8%~~	~~16%~~	~~11%~~	~~7%~~
	~~Percentage of all trips made on transit peak-only~~	~~23%~~	~~21%~~	~~35%~~	~~26%~~	~~23%~~
~~Economic and environmental efficiency measures~~	~~Operating cost/boarding~~	~~$3.95~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
	~~Boardings/hour~~	~~36.7~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
	~~British Thermal Unit (BTU) passenger mile~~	~~2610~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
	~~Greenhouse gas emissions per passenger mile~~	~~0.39~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
~~Variation of transit service throughout the day~~	~~Ratio of trips provided in the 9 PM hour to trips provided in the 6 PM hour~~	~~53%~~	~~51%~~	~~56%~~	~~49%~~	~~53%~~
	~~Distribution of transit service hours throughout daily service period~~	~~See Figure A-3 and Figure A-4~~				

What it measures	Performance metrics	Region	2015	2025	2040	% Change
Total transit ridership	Total daily transit ridership	NE Area	109,000	189,000	251,000	130%
		NW Area	272,000	428,000	568,000	109%
		SW Area	90,000	175,000	270,000	200%
		SE Area	50,000	101,000	139,000	178%
		Countywide	**446,000**	**746,000**	**1,026,000**	**130%**
Mode Share: Percent of all travel made by transit	All-Day transit mode share	NE Area	5%	7%	8%	60%
		NW Area	10%	14%	16%	60%
		SW Area	5%	9%	11%	120%
		SE Area	4%	6%	7%	75%
		Countywide	**7%**	**11%**	**12%**	**71%**
	Peak-Only Transit Mode Share	NE Area	14%	20%	21%	50%
		NW Area	25%	33%	35%	40%
		SW Area	12%	19%	26%	117%
		SE Area	10%	16%	23%	130%
		Countywide	**14%**	**20%**	**23%**	**64%**
Economic and environmental efficiency measures	Operating cost/boarding	Countywide	$4.27	N/A	$3.95	-7%
	Boardings/ hour	Countywide	34.8	N/A	36.7	5%
	BTU/ passenger-mile	Countywide	3,261	N/A	2,610	-20%
	GHG/ passenger mile	Countywide	0.49	N/A	0.39	-20%

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Variation of transit throughout the day	Ratio of trips provided in the 9 pm hour to trips provided in the 6 pm hour	NE Area	37%	N/A	51%	38%
		NW Area	50%	N/A	56%	12%
		SW Area	30%	N/A	49%	63%
		SE Area	39%	N/A	53%	36%
		Countywide	**41%**	**N/A**	**53%**	**29%**

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Figure A-3 Change in Ratio of Night Service to Peak Service

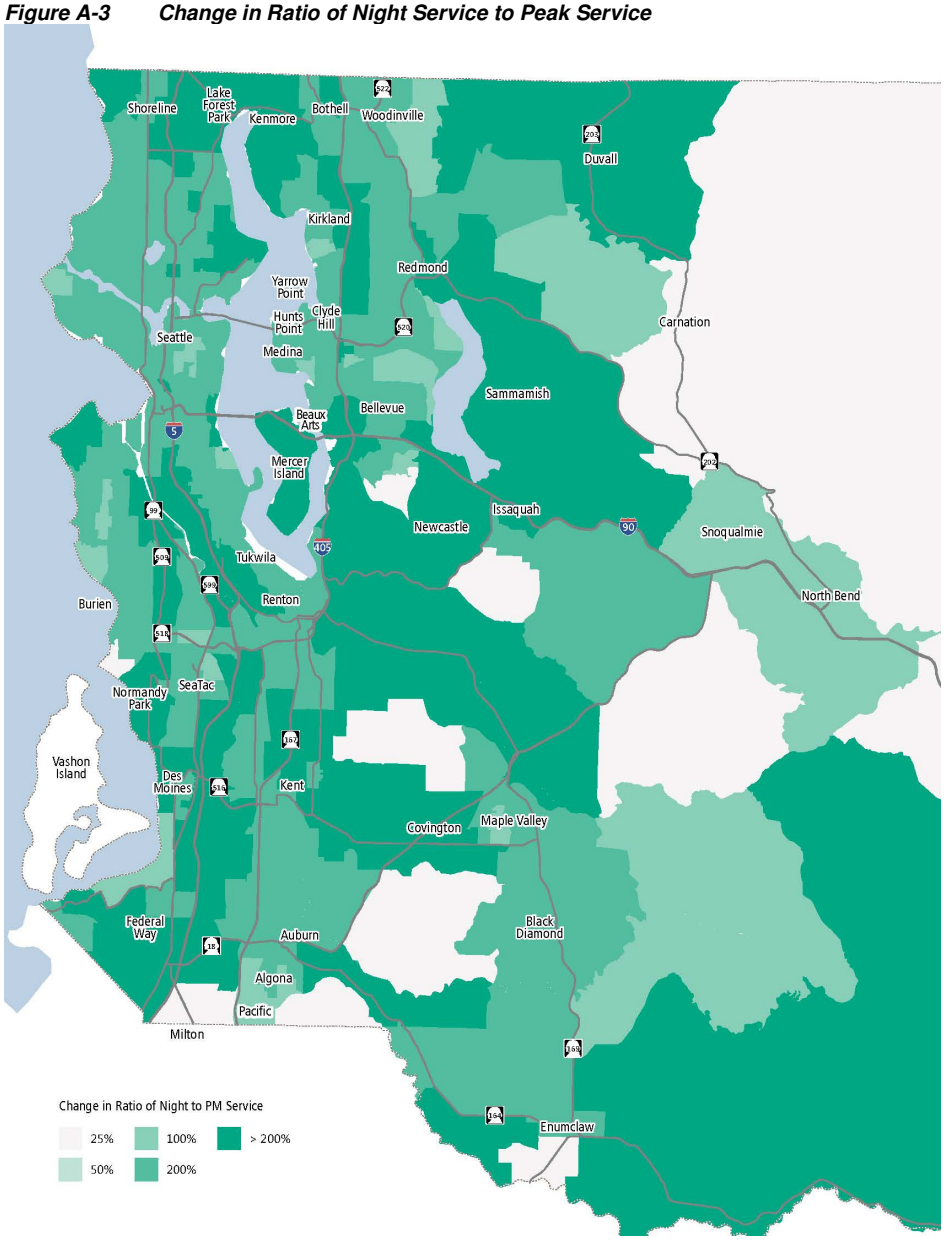
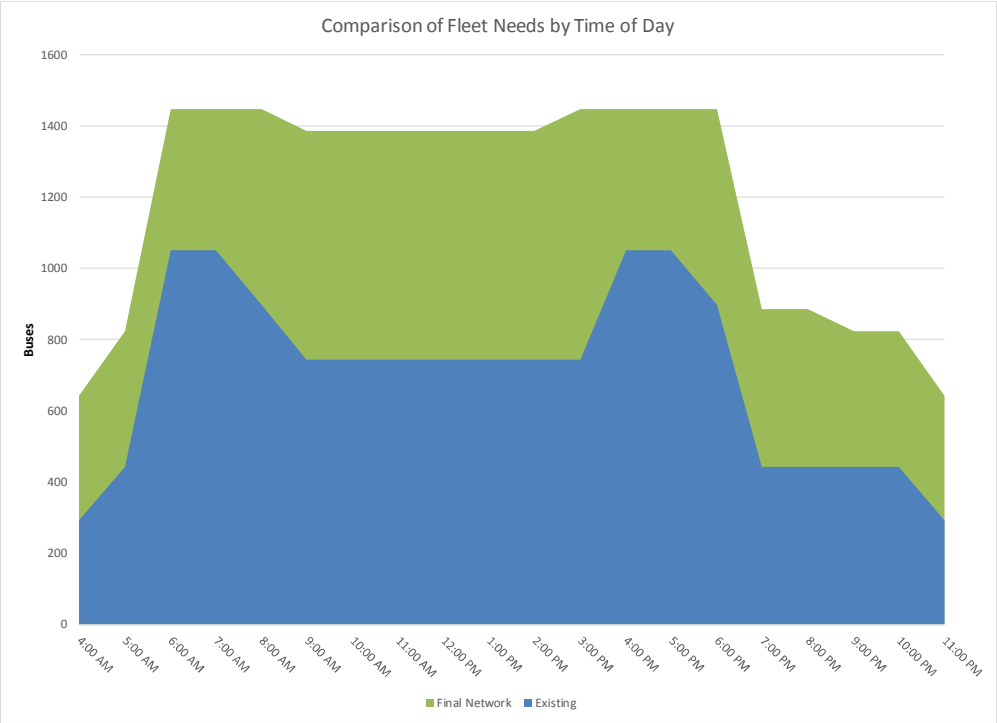


Figure A-4 Variation in Transit Service Hours by Time of Day: Existing and METRO CONNECTS 2040 Service Networks



Travel Time Matrices

Tables A-10 through A-13 show the modeled transit travel times between all Regional Growth and Manufacturing and Industrial Centers (RGCs and MICs) for the year 2040. Travel times are averages for the peak period and include walk time, average wait time and transfer time. Origin and destination points are based on TAZ centroids within each RGC. While the minimum time between each point may be less, the average takes into account the frequency of service.

Table A-10 Peak Period Current Travel Time Averages between Regional Growth Centers and Manufacturing/Industrial Centers (MIC)

	Seattle Northgate	Seattle University Community	Seattle South Lake Union	Seattle Uptown	Seattle First Hill/Capitol Hill	Seattle Downtown	Tukwila	Federal Way	Kirkland Totem Lake	SeaTac	Burien	Auburn	Bellevue	Kent	Redmond-Overlake	Redmond Downtown	Renton	Issaquah	Ballard-Interbay	Duwamish	North Tukwila	Kent MIC
Seattle Northgate		45	54	50	48	42	93	100+	84	92	91	100+	67	91	78	80	87	75	48	82	96	96
Seattle University Community	45		43	52	38	44	89	92	61	87	95	85	46	86	50	57	66	70	50	84	96	94
Seattle South Lake Union	39	42		19	25	17	65	76	69	68	65	73	58	66	52	64	61	70	36	55	75	77
Seattle Uptown	45	51	19		30	17	65	74	74	64	61	74	57	66	63	67	60	60	31	52	73	80
Seattle First Hill/Capitol Hill	41	35	27	33		21	67	79	64	69	71	79	48	71	54	58	65	60	49	59	80	83
Seattle Downtown	30	33	19	17	21		54	75	65	53	59	65	42	50	48	51	47	65	30	40	59	63
Tukwila	83	80	65	62	67	58		70	100+	29	35	68	66	57	100+	100+	40	100+	77	65	56	55
Federal Way	89	92	79	74	78	75	66		100+	53	84	55	89	68	100+	100+	72	100+	86	94	100+	77
Kirkland Totem Lake	82	68	75	83	78	69	100+	100+		84	100+	100+	39	88	60	62	68	77	97	97	100+	100+
SeaTac	85	87	75	72	76	60	29	53	100+		39	75	53	48	90	89	36	100+	88	73	64	50
Burien	94	95	85	81	87	70	34	79	100+	44		87	79	74	100+	100+	52	100+	96	76	67	73
Auburn	91	85	80	80	83	76	68	59	100+	75	91		100+	53	100+	100+	54	100+	100+	95	100+	63
Bellevue	60	40	59	57	54	52	69	100+	59	56	75	100+		67	47	46	37	66	69	84	96	85
Kent	89	83	80	79	86	64	54	69	89	42	72	41	67		76	89	40	100+	93	86	88	34
Redmond-Overlake	69	50	53	69	63	54	94	100+	58	83	100+	100+	47	81		36	67	87	78	92	100+	92
Redmond Downtown	81	58	70	78	70	64	94	100+	56	83	100+	100+	50	81	36		88	85	85	95	100+	92
Renton	78	66	70	66	74	56	41	79	72	36	48	54	37	37	62	80		82	83	69	71	49
Issaquah	75	70	70	60	60	74	100+	100+	77	100+	100+	100+	72	100+	79	80	85		97	100+	100+	100+
Ballard-Interbay	49	56	37	31	47	31	80	93	86	83	90	100+	70	84	82	80	75	93		67	86	93
Duwamish	70	79	61	56	65	45	62	87	96	67	62	92	83	85	94	94	71	100+	70		59	87
North Tukwila	85	92	77	75	79	59	52	87	100+	55	69	93	89	86	100+	100+	63	100+	88	64		82
Kent MIC	100+	100+	94	89	96	74	45	82	100+	47	63	62	85	34	97	100+	49	100+	98	85	77	

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Table A-11 Peak Period Forecast 2040 Travel Time Averages between Regional Growth Centers and Manufacturing/Industrial Centers (MIC): METRO CONNECTS 2040 Service Network

	Seattle Northgate	Seattle University Community	Seattle South Lake Union	Seattle Uptown	Seattle First Hill/Capitol Hill	Seattle Downtown	Tukwila	Federal Way	Kirkland Totem Lake	SeaTac	Burien	Auburn	Bellevue	Kent	Redmond-Overlake	Redmond Downtown	Renton	Issaquah	Ballard-Interbay	Duwamish	North Tukwila	Kent MIC
Seattle Northgate		17	31	33	23	25	76	87	58	73	76	73	42	67	56	58	66	67	38	58	78	83
Seattle University Community	17		19	23	14	16	71	85	47	66	67	70	20	64	38	39	58	63	26	49	69	79
Seattle South Lake Union	33	21		11	16	14	62	76	67	59	55	65	30	58	37	42	54	54	27	47	65	74
Seattle Uptown	35	24	11		16	10	57	71	70	62	60	65	33	58	45	47	49	54	22	44	61	74
Seattle First Hill/Capitol Hill	24	14	17	16		12	66	79	64	63	61	63	39	58	50	52	54	51	31	44	61	74
Seattle Downtown	26	16	15	10	12		52	65	63	53	56	54	32	48	46	48	44	53	23	38	56	64
Tukwila	76	69	64	61	63	55		48	78	28	33	63	59	54	76	78	39	92	74	60	53	53
Federal Way	87	80	76	72	76	66	49		100 +	38	62	46	76	51	95	100 +	60	100 +	84	67	70	64
Kirkland Totem Lake	61	45	59	63	61	60	76	100 +		72	100 +	100 +	39	84	57	59	59	70	76	76	100 +	100 +
SeaTac	73	65	63	57	61	51	26	43	76		37	61	51	43	74	78	34	100 +	69	61	52	43
Burien	75	67	55	54	63	51	32	61	88	42		83	69	71	91	93	48	100 +	82	62	62	69
Auburn	91	82	76	75	78	72	64	47	100 +	67	87		82	50	95	100 +	49	97	100 +	87	85	60
Bellevue	44	29	31	34	38	33	58	79	39	54	69	80		63	32	35	38	56	53	59	75	76
Kent	82	68	62	62	69	58	54	48	87	40	68	38	61		77	81	38	76	85	75	67	30
Redmond-Overlake	54	40	42	46	52	46	75	100 +	55	69	90	90	29	73		15	51	53	62	70	83	86
Redmond Downtown	56	42	44	49	55	48	77	100 +	42	71	85	85	31	75	15		52	56	60	68	83	86
Renton	67	57	55	52	53	46	38	62	59	35	49	49	35	37	49	48		55	65	67	60	48
Issaquah	64	61	51	52	50	51	91	100 +	68	100 +	100 +	100 +	56	77	66	63	56		79	100 +	100 +	100 +
Ballard-Interbay	39	29	27	23	34	24	72	81	80	74	85	70	55	65	62	62	69	87		58	73	87
Duwamish	58	49	47	44	44	38	59	66	83	63	59	73	59	66	71	69	68	86	59		57	83
North Tukwila	77	68	66	62	62	55	52	59	95	54	62	81	77	72	85	87	62	100 +	75	58		77
Kent MIC	82	73	67	66	69	62	44	63	90	48	63	53	72	31	84	85	44	100 +	95	82	74	

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Table A-12 Midday Period Current Travel Time Averages between Regional Growth Centers and Manufacturing/Industrial Centers (MIC)

	Seattle Northgate	Seattle University Community	Seattle South Lake Union	Seattle Uptown	Seattle First Hill/Capitol Hill	Seattle Downtown	Tukwila	Federal Way	Kirkland Totem Lake	SeaTac	Burien	Auburn	Bellevue	Kent	Redmond-Overlake	Redmond Downtown	Renton	Issaquah	Ballard-Interbay	Duwamish	North Tukwila	Kent MIC
Seattle Northgate		45	56	51	55	44	98	100+	89	96	100+	100+	79	100+	100+	85	88	75	49	89	96	100+
Seattle University Community	45		44	53	39	45	93	97	65	92	100+	100+	50	87	58	60	82	70	52	92	100+	100+
Seattle South Lake Union	44	43		19	25	18	73	80	87	71	83	81	59	91	60	67	65	70	37	63	79	80
Seattle Uptown	46	54	19		31	18	66	80	83	67	82	81	60	92	68	70	65	68	32	62	78	81
Seattle First Hill/Capitol Hill	45	36	28	35		23	79	86	65	70	89	81	50	86	71	58	68	60	51	65	82	87
Seattle Downtown	30	35	19	17	22		57	75	68	60	71	68	44	70	57	54	48	69	31	47	62	68
Tukwila	87	86	76	68	72	61		74	100+	30	37	77	69	60	100+	100+	48	100+	80	75	59	58
Federal Way	97	100+	83	75	85	75	73		100+	62	89	63	100+	81	100+	100+	85	100+	95	100+	100+	91
Kirkland Totem Lake	88	71	79	87	82	72	100+	100+		89	100+	100+	41	92	63	65	72	92	100+	100+	100+	100+
SeaTac	100+	100+	78	79	78	63	30	58	100+		41	79	54	50	94	100+	38	100+	91	79	65	53
Burien	100+	100+	86	87	94	73	36	92	100+	46		100+	80	78	100+	100+	52	100+	98	81	76	77
Auburn	100+	100+	100+	100+	100+	96	71	64	100+	75	96		100+	53	100+	100+	71	100+	100+	100+	100+	63
Bellevue	74	49	62	60	58	55	72	100+	62	59	81	100+		100+	49	61	39	67	72	88	100+	100+
Kent	100+	91	87	90	93	73	57	73	90	42	76	50	100+		77	94	47	100+	100+	92	89	36
Redmond-Overlake	80	60	56	72	66	57	100+	100+	61	89	100+	100+	49	87		42	75	92	82	97	100+	100+
Redmond Downtown	85	65	73	82	71	67	100+	100+	62	100+	100+	100+	66	100+	38		92	90	86	100+	100+	100+
Renton	80	77	73	69	78	58	43	83	84	38	50	55	39	38	64	100+		100+	87	73	72	51
Issaquah	75	70	70	60	60	78	100+	100+	100+	100+	100+	100+	76	100+	90	95	92		100+	100+	100+	100+
Ballard-Interbay	52	59	39	32	50	33	82	100+	90	85	100+	100+	72	98	92	84	82	100+		72	88	95
Duwamish	78	81	68	66	69	51	69	100+	100+	72	82	100+	88	93	100+	99	72	100+	80		66	87
North Tukwila	95	95	84	84	85	65	60	100+	100+	62	76	100+	97	92	100+	100+	83	100+	94	69		86
Kent MIC	100+	100+	98	93	100+	77	45	87	100+	54	66	70	100+	37	100+	100+	56	100+	100+	89	78	

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Table A-13 Midday Period 2040 Travel Time Averages between Regional Growth Centers and Manufacturing/Industrial Centers (MIC): METRO CONNECTS 2040 Service Network

	Seattle Northgate	Seattle University Community	Seattle South Lake Union	Seattle Uptown	Seattle First Hill/Capitol Hill	Seattle Downtown	Tukwila	Federal Way	Kirkland Totem Lake	SeaTac	Burien	Auburn	Bellevue	Kent	Redmond-Overlake	Redmond Downtown	Renton	Issaquah	Ballard-Interbay	Duwamish	North Tukwila	Kent MIC
Seattle Northgate		17	34	34	23	25	83	100 ±	58	80	83	73	50	67	56	61	76	67	37	59	78	83
Seattle University Community	17		23	25	14	16	79	90	51	75	72	70	29	64	40	49	78	66	26	50	70	79
Seattle South Lake Union	38	25		11	20	14	69	81	83	66	67	65	43	58	49	56	64	65	28	48	67	75
Seattle Uptown	39	26	12		19	10	59	71	79	66	68	65	41	58	52	55	50	64	23	45	63	75
Seattle First Hill/Capitol Hill	24	14	18	17		12	75	82	64	68	69	63	39	58	50	52	54	56	32	45	61	75
Seattle Downtown	26	16	17	10	12		55	67	63	57	64	54	32	48	46	48	46	56	23	39	56	65
Tukwila	83	76	72	66	68	59		48	82	31	34	66	68	57	76	80	46	100 ±	74	60	53	53
Federal Way	93	86	82	74	81	70	49		100 ±	38	62	46	76	51	100 ±	100 ±	60	100 ±	84	73	70	65
Kirkland Totem Lake	61	45	68	68	61	60	76	100 ±		72	100 ±	100 ±	39	84	57	59	59	70	78	78	100 ±	100 ±
SeaTac	77	70	68	59	65	53	27	43	77		37	66	51	43	74	78	35	100 ±	69	61	54	43
Burien	79	72	59	58	67	59	32	61	88	42		84	69	71	91	93	48	100 ±	82	61	62	69
Auburn	100 ±	100 ±	100 ±	100 ±	100 ±	92	67	47	100 ±	75	91		100 ±	54	100 ±	100 ±	68	97	100 ±	88	86	47
Bellevue	47	34	41	39	39	34	59	79	39	54	69	80		63	32	35	39	56	50	60	75	76
Kent	100 ±	76	77	73	80	69	56	48	89	40	69	38	64		77	82	45	79	87	76	72	30
Redmond-Overlake	55	40	50	49	52	46	75	100 ±	55	69	100 ±	100 ±	29	73		15	51	53	62	70	84	86
Redmond Downtown	63	49	60	56	55	51	80	100 ±	44	73	87	100 ±	31	75	15		55	56	62	68	84	86
Renton	67	57	63	56	55	49	41	62	59	35	49	55	37	39	49	48		57	66	67	62	48
Issaquah	66	63	59	58	53	56	100 ±	100 ±	68	100 ±	100 ±	100 ±	56	80	66	63	58		80	100 ±	100 ±	100 ±
Ballard-Interbay	40	29	28	23	34	24	75	100 ±	80	78	100 ±	73	54	70	63	67	81	100 ±		60	76	87
Duwamish	60	50	47	45	45	38	59	72	85	65	60	73	61	68	73	71	72	90	61		60	86
North Tukwila	79	70	66	62	63	56	52	60	100 ±	55	62	83	77	76	90	88	79	100 ±	77	61		79
Kent MIC	100 ±	84	79	75	81	71	46	65	93	51	64	53	80	31	84	89	47	100 ±	95	84	75	

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Complete Route Lists

Table A–141 and A–152 identify the routes included in the METRO CONNECTS 2025 and 2040 service network, respectively. All alignments are in draft form. Final routes and their alignments are subject to more detailed planning and public outreach processes.

Table A-14141411 2025 METRO CONNECTS Route List

2025 Route	To/From/via	Comparable existing routes	Service Type
A Line	SeaTac - Federal Way - Des Moines	A Line	RapidRide
~~**B Line**~~	~~Redmond - Bellevue - Overlake~~	~~B Line~~	~~RapidRide~~
C Line	SLU - Westwood - West Seattle	C Line	RapidRide
D Line	Crown Hill - Seattle CBD - Ballard	D Line	RapidRide
E Line	Aurora Village - Seattle CBD - SR-99	E Line	RapidRide
F Line	Renton - Burien - Tukwila	F Line	RapidRide
40	Northgate TC - Ballard - Seattle CBD via Leary Av NW	40	RapidRide
120	Burien TC - Westwood Village - Seattle CBD	120	RapidRide
1009	Bothell - UW - Lake City	372	RapidRide
1012	Ballard - Children's Hospital - Wallingford	44	RapidRide
1013	Northgate - Mount Baker - Seattle CBD	63, 67, 70	RapidRide
1027	Totem Lake - Eastgate - Kirkland	255, 271	RapidRide
1028	Crossroads - Bellevue - NE 8th St	B South	RapidRide
1030	Overlake - Renton - Newcastle	240, 245	RapidRide
1033	Renton - Auburn - Kent	169, 180	RapidRide
1052	Twin Lakes - Green River CC - Federal Way	181	RapidRide
1056	Highline CC - Green River CC - Kent	164, 166	RapidRide
1059	Madison Valley - Seattle CBD - E Madison St	11, 12	RapidRide
1063	University District - Rainier Beach - Mount Baker	7s, 48	RapidRide
1071	University District - Mount Baker - Seattle CBD	7n	RapidRide
5	Shoreline CC - Seattle CBD	5	Frequent
21	Arbor Heights - Westwood Village - Seattle CBD	21	Frequent
150	Kent Station - Southcenter - Seattle CBD	150	Frequent
1002	Richmond Beach - UW - 15th Ave NE	373	Frequent
1010	Ballard - Lake City - Northgate	D Line, 45, 75	Frequent
1014	Loyal Heights - University District - Green Lake	45	Frequent
1515	Kent - Twin Lakes - Star Lakes	183, 901	Frequent
1019	Shoreline - UW - Lake City	65	Frequent
1025	Kenmore - Overlake - Totem Lake	244	Frequent
1026	Southeast Redmond - Kirkland - NE 85th St	248	Frequent
1037	Kirkland - Eastgate - Overlake	221, 245	Frequent
1061	Uptown - Madison Park - Capitol Hill	8, 11	Frequent
1064	University District - Othello - Beacon Hill	36, 49	Frequent
1068	DT Seattle - Madrona Park - E Union St	2	Frequent
1074	Uptown - Rainier Beach - Yesler Terrace	106, 8	Frequent
1075	Renton Highlands - Rainier Beach - Renton	105, 106	Frequent
1202	Sand Point - Seattle CBD - Green Lake	62	Frequent
1213	Seattle CBD - Volunteer Park - Capitol Hill	10	Frequent
1214	Queen Anne - Mount Baker - Seattle CBD	3, 4	Frequent
1215	Kenmore - Shoreline - North City	331	Frequent

2025 Route	To/From/via	Comparable existing routes	Service Type
1220	SPU - Seattle CBD - Queen Anne	13	Frequent
1505	SPU - Madrona - Seattle CBD	3, 4	Frequent
1514	Covington - SeaTac - Kent	180, 168	Frequent
1994	University District - Northgate - Greenlake	26, 32, 62, 67	Frequent
1995	Shoreline - Roosevelt -Haller Lake	26, 346	Frequent
1996	University District - Northgate - Lake City	75	Frequent
1997	Shoreline - Lake City - Haller Lake	41, 345	Frequent
1999	Redmond - Eastgate - Overlake	B-Line	Frequent
15	Blue Ridge - Ballard - Seattle CBD	15	Peak Only Express
17	Sunset Hill - Ballard - Seattle CBD	17	Peak Only Express
18	North Beach - Ballard - Seattle CBD	18	Peak Only Express
37	Alaska Junction - Alki - Seattle CBD	37	Peak Only Express
55	Admiral District - Alaska Junction - Seattle CBD	55	Peak Only Express
56	Alki - Seattle CBD	56	Peak Only Express
57	Alaska Junction - Seattle CBD	57	Peak Only Express
102	Fairwood - Renton TC - Seattle CBD	102	Peak Only Express
116	Fauntleroy Ferry - Seattle CBD	116	Peak Only Express
118	Tahlequah - Vashon	118	Peak Only Express
119	Dockton - Seattle CBD via ferry	119	Peak Only Express
121	Highline CC -Burien TC - Seattle CBD via 1st Av S	121	Peak Only Express
122	Highline CC -Burien TC - Seattle CBD via Des Moines Memorial Dr S	122	Peak Only Express
123	Burien - Seattle CBD	123	Peak Only Express
143	Black Diamond - Renton TC - Seattle CBD	143	Peak Only Express
~~**532**~~	~~Everett - Bellevue~~	~~532~~	~~Sound Transit Express~~
~~**540**~~	~~Kirkland - University District~~	~~540~~	~~Sound Transit Express~~
~~**566**~~	~~Auburn - Overlake~~	~~566~~	~~Sound Transit Express~~
~~**567**~~	~~Kent - Overlake~~	~~567~~	~~Sound Transit Express~~
~~**590**~~	~~Tacoma - Seattle~~	~~590~~	~~Sound Transit Express~~
~~**542**~~	~~Green Lake - Redmond~~	~~542~~	~~Sound Transit Express~~
~~**554**~~	~~Issaquah - Seattle~~	~~554~~	~~Sound Transit Express~~
~~**574**~~	~~Lakewood - SeaTac~~	~~574~~	~~Sound Transit Express~~
~~**578**~~	~~Puyallup - Seattle~~	~~578~~	~~Sound Transit Express~~
~~**594**~~	~~Lakewood - Seattle~~	~~594~~	~~Sound Transit Express~~
2012	North Bend - Mercer Island Station - Issaquah Highlands	208	Express
2022	Issaquah - Renton Village - Renton TC	(-)	Express
2204	Duvall - Bothell - Cottage Lake	232, 931	Express
2206	Redmond - Mercer Island Station - Issaquah Highlands	216, 269	Express
2207	Federal Way TC - Seattle CBD - S 272nd St	177	Express
2402	Seattle CBD - Auburn - SR 167	(-)	Express
2515	Woodinville - First Hill - South Lake Union	309	Express
2516	Kirkland - Lower Queen Anne - UW/South Lake Union	540, 255	Express
2998	University District - Woodinville - I-405	311	Express
22	Arbor Heights - Westwood Village - Alaska Junction	22	Local
24	Magnolia - Seattle CBD	24	Local
28	Whittier Heights - Ballard - Seattle CBD via Leary Av NW	28	Local
31	University District - Fremont - Magnolia	31	Local
32	University District - Fremont - Seattle Center	32	Local

2025 Route	To/From/via	Comparable existing routes	Service Type
33	Discovery Park - Seattle CBD	33	Local
50	Alki - Columbia City - Othello Station	50	Local
60	International District - Westwood Village - Beacon Hill	60	Local
101	Renton TC - Seattle CBD	101	Local
107	Renton TC - Rainier Beach	107	Local
111	Lake Kathleen - Seattle CBD	111	Local
124	Tukwila - Georgetown - Seattle CBD	124	Local
125	Westwood Village - Seattle CBD	125	Local
128	Southcenter - Westwood Village - Admiral District	128	Local
131	Burien TC - Highland Park - Seattle CBD	131	Local
132	Burien TC - South Park - Seattle CBD	132	Local
182	NE Tacoma - Federal Way TC	182	Local
224	Duvall - Redmond TC	224	Local
630	Mercer Island - Downtown Seattle	630	Local
631	Gregory Heights - Burien TC	631	Local
773	Seacrest Marina - West Seattle Junction	773	Local
775	Seacrest Marina - Alki	775	Local
907	Enumclaw - Renton TC	907	Local
915	Enumclaw - Auburn Station	915	Local
930	Bothell - Redmond Town Center - Willows Rd	930	Local
3006	Shoreline - Mountlake Terrace - Echo Lake	331	Local
3007	Aurora Village - Northgate - Meridian Ave N	346	Local
3028	Queen Anne - Capitol Hill - South Lake Union	(-)	Local
3033	Eastlake - Mount Baker - First Hill/Leschi	(-)	Local
3047	Mercer Island - S Mercer Island - Island Crest Way	204	Local
3054	Kent - Tukwila - Southcenter Pkwy	180	Local
3055	East Hill/Meridian - Seatac Airport - Kent	906	Local
3060	Black Diamond - Kent Station - Maple Valley	168	Local
3061	Green River CC - Renton Highlands - 132nd Ave SE	169	Local
3064	Federal Way TC - Kent/Des Moines Station - Military Road S	183	Local
3067	Twin Lakes - Federal Way TC - Mirror Lake	187	Local
3068	Auburn Station - Sunset Park - Stuck	180	Local
3069	Auburn Station - Angle Lake Station - Des Moines	(-)	Local
3073	Renton - Newcastle - NE 44th St BRT Station	(-)	Local
3080	Factoria - Bellevue TC - Bellevue College/Crossroads	226	Local
3085	Tibbetts Valley Park - Issaquah High School - Mt Olympus Dr SW	271	Local
3090	Woodinville - Redmond - SR 202	(-)	Local
3091	Overlake - Cottage Lake - Redmond	931, 248	Local
3092	Overlake - S Kirkland P&R - Highland Park	249	Local
3096	Overlake - Eastgate - Crossroads	221	Local
3101	Bellevue TC - UW - Medina	271	Local
3103	Eastgate - Clyde Hill - Bellevue TC	246	Local
3112	UW Bothell - Kirkland - Juanita	238, 236	Local
3114	Redmond Town Center - Kenmore - Totem Lake	234, 244	Local
3116	Eastgate - Bothell - Totem Lake	(-)	Local
3122	Laurelhurst - Seattle CBD - Eastlake	47, 25	Local
3123	University District - Seattle CBD - Boyer Ave E	10	Local

2025 Route	To/From/via	Comparable existing routes	Service Type
3162	Green River CC - Renton TC - Kent East Hill	164, 169	Local
3168	Pacific - Auburn Station - Algona	917	Local
3183	Issaquah Highlands - Eastgate - Cougar Hills	271	Local
3205	Aurora Village - Northgate - Jackson Park	347	Local
3208	Roosevelt - University District - Sand Point	75	Local
3213	Woodinville - Kirkland - Totem Lake	255	Local
3214	Mercer Island Station - Mercer Island High School - West Mercer Elementary	(-)	Local
3220	North Bend - Duvall - Carnation	629	Local
3221	Kent Station - The Landing - 84th Ave S/Lind Ave SW	(-)	Local
3403	Federal Way TC - Star Lake Station - S 288th St	183	Local
3988	Twin Lakes - Federal Way TC - Celebration Park	903	Local
3989	Factoria - Kirkland - Bellevue TC	234, 234, 240	Local
3990	Kent/Des Moines Station - Burien TC - Normandy Park	166	Local
3991	Fairwood - Kent/Des Moines Station - Seatac Airport	(-)	Local
3992	Issaquah Highlands - Eastgate - West Lake Sammamish Pkwy	271	Local
3996	Rainier Beach - Mount Baker - Genesee	50	Local
3997	Madison Valley - Beacon Hill - Central District	8	Local
3998	Renton TC - Seatac Airport - Tukwila Station	156, F-Line	Local

Table A-~~15151512 ***2040 METRO CONNECTS Route List***

2040 Route	To/From/Via	Comparable existing routes	Service Type
1001	Shoreline – Downtown Seattle via SR 99	E	RapidRide
1009	Bothell - UW - Kenmore	372	RapidRide
1010	Ballard - Lake City - Northgate	D Line, 45, 75	RapidRide
1012	Ballard - Children's Hospital - Wallingford	44	RapidRide
1013	Northgate - Mount Baker - U. District	7n ,67, 70	RapidRide
1014	Loyal Heights - U. District - Green Lake	45	RapidRide
1025	Kenmore - Overlake - Totem Lake	234, 235	RapidRide
1026	Southeast Redmond - Kirkland - NE 85th St	248	RapidRide
1027	Totem Lake - Eastgate - Kirkland	255, 271	RapidRide
1028	Crossroads - Bellevue - NE 8th St	B South	RapidRide
1030	Overlake - Renton - Eastgate	240, 245	RapidRide
1033	Renton - Auburn - Kent	169, 180	RapidRide
1041	SODO - Burien - Delridge	120	RapidRide
1043	Alki - Burien - West Seattle	128, 131	RapidRide
1047	Rainier Beach - Federal Way - SeaTac	A, 124	RapidRide
1048	Renton - Burien - Tukwila	F	RapidRide
1052	Twin Lakes - Green River CC - Federal Way	181	RapidRide
1056	Highline CC - Green River CC - Kent	164, 166	RapidRide
1059	Madison Valley - Seattle CBD - E Madison St	11, 12	RapidRide
1061	Interbay - Madison Park - Capitol Hill	8, 11	RapidRide
1063	U. District - Rainier Beach - Mount Baker	7s, 48	RapidRide
1064	U. District - Othello - Capitol Hill	36, 49	RapidRide
1075	Renton Highlands - Rainier Beach - Renton	105, 106	RapidRide
1202	Seattle CBD - Sand Point - Green Lake	62	RapidRide
1515	Kent - Twin Lakes - Star Lakes	183, 901	RapidRide
1993	Northgate TC - Ballard - Seattle CBD via Leary Av NW	40	RapidRide
1002	Richmond Beach - UW - 15th Ave NE	373	Frequent
1005	Seattle CBD - Shoreline CC - Fremont	5	Frequent
1006	Loyal Heights - Northgate - Ballard	(-)	Frequent
1007	Shoreline CC - UW - Lake City	75	Frequent
1018	Laurelhurst - Magnolia - Wallingford	31	Frequent
1019	U. District - Shoreline - Lake City	65	Frequent
1031	Issaquah Highlands - Eastgate - West Lake Sammamish Pkwy	271	Frequent
1037	Kirkland - Eastgate - Overlake	221, 245	Frequent
1039	Rainier Valley - Westwood - Georgetown	60	Frequent
1040	West Seattle - Burien - White Center	128	Frequent
1042	Alki - Tukwila - White Center	125	Frequent
1046	Fairwood - Des Moines - SeaTac	156, 906	Frequent
1049	Kent - Rainier Beach - Tukwila	150	Frequent
1068	Madrona - Seattle CBD - Capitol Hill	2	Frequent
1074	Rainier Beach - Uptown - First Hill	38	Frequent
1083	Beacon Hill - Burien - Georgetown	60, 132	Frequent
1085	Burien - Des Moines - Normandy Park	166	Frequent
1088	Seattle CBD - Renton - Georgetown	124	Frequent
1213	Seattle SBD - Volunteer Park - Capitol Hill	10	Frequent
1214	Queen Anne - Mount Baker - Seattle CBD	3, 4, 14	Frequent

2040 Route	To/From/Via	Comparable existing routes	Service Type
1215	Kenmore - Shoreline CC - North City	331	Frequent
1220	SPU - Seattle CBD - Queen Anne	3, 4	Frequent
1501	Factoria - Kirkland - Bellevue TC	234, 234, 240	Frequent
1505	SPU - Madrona - Seattle CBD	3, 4	Frequent
1511	Redmond - Cottage Lake - Avondale	232, 931	Frequent
1512	Jackson Park - Magnolia - Ballard	28, 24	Frequent
1513	NE Tacoma - Federal Way - Twin Lakes	903	Frequent
1514	Covington - SeaTac - Kent	180, 168	Frequent
1994	University District - Northgate - Greenlake	26, 32, 62, 67	Frequent
1997	Madison Valley - Beacon Hill - Central District	8	Frequent
1998	Mountlake Terrace - Northgate - Shoreline	346	Frequent
1999	Redmond - Eastgate - Overlake	B-Line	Frequent
2003	Westwood Village - South Lake Union - Alaska Junction	116	Express
2012	North Bend - Mercer Island Station - Issaquah Highlands	208	Express
2016	Burien TC - First Hill - International District	121, 122, 123	Express
2020	Snoqualmie - Auburn Station - Maple Valley	(-)	Express
2021	Kent Station - Alaska Junction - Burien TC	180	Express
2022	Issaquah - Renton Village - Renton TC	(-)	Express
2028	Enumclaw - Auburn Station - SR164	915	Express
2203	Duvall - Redmond - Redmond Ridge	224	Express
2204	Duvall - Bothell - Cottage Lake	232, 931	Express
2205	North Bend - Redmond - Fall City	(-)	Express
2206	Redmond - Mercer Island Station - Issaquah Highlands	216, 269	Express
2207	Federal Way TC - Seattle CBD - S 272nd St	177	Express
2402	Seattle CBD - Auburn - SR 167	(-)	Express
2515	Woodinville - First Hill - South Lake Union	309	Express
2516	Totem Lake - Lower Queen Anne - UW/South Lake Union	540, 255	Express
2518	Edmonds - Redmond - Lake Forest Park	342	Express
2614	Renton - Lower Queen Anne - Uptown	143	Express
2615	Enumclaw - Renton Village - Maple Valley	907	Express
2998	University District - Woodinville - I-405	311	Express
2999	Maple Valley - Overlake - Issaquah	(-)	Express
3006	Shoreline - Mountlake Terrace - Echo Lake	331	Local
3007	Aurora Village - Northgate - Meridian Ave N	346	Local
3025	Magnolia - South Lake Union - 28th Ave W	31, 33, 24	Local
3028	Queen Anne - Capitol Hill - South Lake Union	(-)	Local
3033	Eastlake - Mount Baker - First Hill/Leschi	(-)	Local
3034	Alki - Mount Baker - SODO	50	Local
3040	Burien TC - SODO - SR99	131	Local
3047	Mercer Island - S Mercer Island - Island Crest Way	204	Local
3050	Highline CC - Burien - Des Moines Memorial Dr	631, 166	Local
3053	Normandy Park - Rainier Beach - Tukwila Int'l Blvd Station	156	Local
3054	Kent - Tukwila - Southcenter Pkwy	180	Local
3055	East Hill/Meridian - Seatac Airport - Kent	906	Local
3060	Black Diamond - Kent Station - Maple Valley	168	Local
3061	Green River CC - Renton Highlands - 132nd Ave SE	169	Local
3062	Black Diamond - Kent Station - Wilderness Village	168, 907	Local

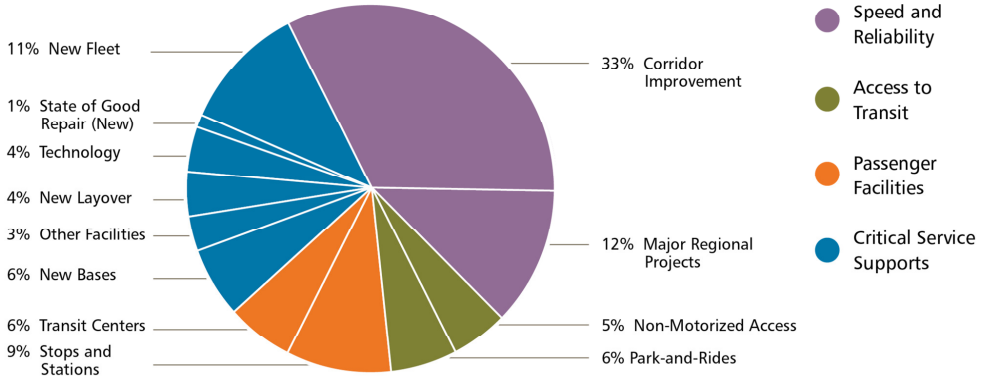
2040 Route	To/From/Via	Comparable existing routes	Service Type
3064	Twin Lakes - Des Moines - Federal Way TC	183	Local
3067	Twin Lakes - Federal Way TC - Mirror Lake	187	Local
3068	Auburn Station - Sunset Park - Stuck	180	Local
3069	Auburn Station - Angle Lake Station - Des Moines	(-)	Local
3073	Fairwood - Newcastle - Renton TC	(-)	Local
3080	Factoria - Bellevue TC - Bellevue College/Crossroads	226	Local
3085	Tibbetts Valley Park - Issaquah High School - Mt Olympus Dr SW	271	Local
3090	Sammamish - Woodinville - Redmond	(-)	Local
3091	Overlake - Cottage Lake - Redmond	931, 248	Local
3092	Overlake - S Kirkland P&R - Highland Park	249	Local
3096	Overlake - Eastgate - Crossroads	221	Local
3099	Federal Way TC - Kent Station - Lakeland North	(-)	Local
3101	Beaux Arts Village - UW - Bellevue TC	271	Local
3103	Eastgate - Clyde Hill - Bellevue TC	246	Local
3104	Capitol Hill - Discovery Park - South Lake Union	19, 24	Local
3112	UW Bothell - Kirkland - Juanita	238, 236	Local
3114	Bear Creek P&R - Kenmore - Totem Lake	234, 244	Local
3116	Eastgate - Kenmore - Snyders Corner	(-)	Local
3122	Laurelhurst - Seattle CBD - Eastlake	47, 25	Local
3123	University District - Seattle CBD - Boyer Ave E	10	Local
3162	Green River CC - Renton TC - Kent East Hill	164, 169	Local
3164	Seattle Children's South - Federal Way TC - Lake Geneva	(-)	Local
3168	Pacific - Auburn Station - Algona	917	Local
3183	Issaquah Highlands - Eastgate - Cougar Hills	271	Local
3184	Sammamish - Cougar Mountain - Issaquah Highlands	(-)	Local
3185	Preston - Issaquah - Fall City	(-)	Local
3205	Aurora Village - Northgate - Jackson Park	347	Local
3208	Roosevelt - University District - Sand Point	75	Local
3213	Woodinville - Kirkland - Totem Lake	255	Local
3214	Mercer Island Station - Mercer Island High School - West Mercer Elementary	(-)	Local
3216	Bothell - Kingsgate - 132nd Ave NE	236, 238	Local
3218	Tukwila Int'l Blvd Station - Kennydale - Renton TC	(-)	Local
3220	North Bend - Duvall - Carnation	629	Local
3221	Kent Station - The Landing - 84th Ave S/Lind Ave SW	(-)	Local
3224	Woodinville - Kenmore - UW Bothell	931	Local
3225	Issaquah Highlands - Redmond - Sammamish	269	Local
3230	Kenmore - Mountlake Terrace - Brier	(-)	Local
3400	Rainier Beach - Alaska Junction - Georgetown	36, 131	Local
3401	Tukwila Int'l Blvd Station - SODO - Georgetown	124	Local
3403	Federal Way TC - Kent/Des Moines Station - Military Rd S / Pacific Hwy S	183	Local
3405	S Vashon - N Vashon - Valley Center	118	Local
3406	Dockton - N Vashon - Ellisport	119	Local
3994	Carnation - Redmond - NE Redmond Fall City Rd	(-)	Local
3995	Puyallup - Federal Way TC - Edgewood	402	Local
3996	Rainier Beach - Mount Baker - Genesee	50	Local
3998	Renton TC - Seatac Airport - Tukwila Station	156, F-Line	Local
3999	East Renton Highlands - Rainier Beach - Renton TC	105	Local

Appendix B. Capital Costing Methodology

Introduction

In conjunction with the expansion of transit service envisioned in METRO CONNECTS, approximately $11 billion in incremental capital investments would be needed to ensure adequate roadway facilities, storage and maintenance facilities, and passenger facilities are in place to support the METRO CONNECTS 2040 transit service network for King County Metro Transit (Metro). The capital costs in these appendices are reported in Year of Expenditure Dollars (YOE $). This takes into consideration the effect of inflation and creates a better benchmark when comparing actual costs to planned costs. The breakdown of costs by investment type is shown in Figure B-1~~Figure B-1~~~~Figure B-1~~~~Figure B-1~~.

Figure B-1 Allocation of proposed $11 Billion in Capital Investment 2018-2040



METRO CONNECTS provides a vision for the future of public transit in the region. In estimating costs, standard costing methodologies have been used. While estimates have been used to describe the potential financial requirements, implementation planning is required before there are detailed project lists and service assumptions to fully inform a financial plan. The type and size of investments described here and along with associated costs are intended to provide jurisdictions and stakeholders a sense of scale for the program needed to optimize transit service. Costs should be viewed as order of magnitude estimates.

METRO CONNECTS represents a 25-year vision for Metro's future. METRO CONNECTS envisions expanding the transit system incrementally through 2040, in collaboration with local governments. The precise timeline for investment will be affected by local development, changes to the street network, and the buildout of Sound Transit's regional transit network. Attaining the vision requires investment beyond Metro's existing funding sources and Metro will continue to update financial projections, support regional solutions, and develop detailed ~~implementation plans~~planning ~~through the period of the plan~~. METRO CONNECTS will be regularly updated to reflect changes over time, including detailing service expansions and capital investments as more information is known.

Comment [SH6]: RL3 language updated to reflect the development program concept

The successful operation of fast and reliable service, passenger facilities that allow for safe, comfortable, and efficient transfers, and the ability to access transit and for customers to move seamlessly throughout the region are all dependent upon building a network of capital facilities. Some of the major capital investments, such as

construction of new bases and the acquisition of vehicles, will be made primarily by Metro. Other investments, particularly those that require the acquisition of right-of-way and modifications to roadways, require a high degree of coordination and financial partnerships with jurisdictions, other transit agencies, Washington State Department of Transportation (WSDOT), and other potential partners. This appendix describes the type of needed capital facilities and outlines the current assumptions for locations, quantities, and costs associated with these investments. The cost estimating assumptions, unit cost determination, and typical elements for each type of improvement are also detailed. The assumptions made regarding partnerships are meant to be broad for planning purposes and are not project specific. The exact partnership contribution will be determined by the ultimate system design, financial need, policy considerations, and available resources.

Because all costs shown in these appendices are in year of expenditure dollars (YOE $) the timing of investments does have an impact on the cost estimates. The appendices that follow detail the capital costs shown in Figure B-1~~Figure B-1~~~~Figure B-1~~~~Figure B-1~~.

Costing Approach

The cost estimates are rough order of magnitude amounts. Because METRO CONNECTS is a high level vision that does not yet have all potential projects identified, Metro has included resources for unidentified investments within each category (roughly 10 percent of the estimated costs). As ~~implementation program~~Development Programs are developed, Metro will develop specific project lists and refine cost estimates further. Additional capital investments that support the service network envisioned in METRO CONNECTS could be developed by partner agencies and/or local jurisdictions, either independently or in partnership with Metro.

Comment [SH7]: RL3 language updated to reflect the development program concept

Estimates include elements such as planning, design and construction costs, labor, soft costs, and other related project costs as well as project contingency. The planning, design and construction costs were developed using historical total project costs, and either a bid-based methodology, or industry standards methodology.

Partnership Contributions

To deliver the service network envisioned in METRO CONNECTS, additional investment by partnering transit providers, state and local agencies, and local jurisdictions would be needed. Investment would be required for speed and reliability improvements such as revised signal timing, bus bulbs, removing parking and providing dedicated transit lanes; passenger facility improvements such as sidewalks and non-motorized features; and assistance with permitting and right-of- way acquisitions.

In developing METRO CONNECTS, we made high-level assumptions about potential partnership contributions so we could estimate what Metro's costs might be if METRO CONNECTS were implemented. These assumptions were not intended to suggest any policy about partners' contribution levels, they are intended to serve as examples. Our experience implementing RapidRide suggests that the details of any specific project may vary substantially. We will work through the Development Program to refine partnership contribution levels.

Figure B-2 shows our broad assumptions for local financial contributions and partnerships; these are for planning purposes and are not project-specific. The exact contribution will be determined by the identified investment, financial need, policy considerations, and available resources. As we move toward implementation, we will continue working with our partners to find appropriate resources, whether those are local funds, grants, or Metro resources, to advance transit throughout King County.

Figure B-2 Assumed Partnership Contributions

Category	Contributions (%)	Amount
Speed and Reliability		
Frequent, Express, Local	10%	$50 M
Frequent (RapidRide)	10%	$18 M
RapidRide (Speed & Reliability Component)	10%	$77 M
Frequent (RapidRide) ROW	80%	$1,766 M
Major Regional Projects	80%	$1,010 M
Total		**$2,922 M**
Passenger Facilities		
Shelters (High Transfers)	20%	$46 M
Off-street Transit Centers	20%	$138 M
On-street Transit Centers	20%	$3 M
Total		**$187 M**
Critical Service Supports		
New Trolley Wire	50%	$30 M
Total		**$30 M**
Total		**$3,139 M**

Our broad-brush assumption is that the highest level of partner contribution would be for speed and reliability investments—specifically, for right-of-way acquisition or on major regional projects where Metro would not be a lead agency. In both cases METRO CONNECTS assumes an 80 percent partner contribution. We would work with partners to refine the actual level.

Comment [SH8]: RL2: Language added to show better describe partnership contributions.

Comment [WE9]: RL3 language clarifying that these assumptions are only examples

Comment [SH10]: RL3 language updated to reflect the development program concept

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METRO CONNECTS assumes that RapidRide service will be supported with exclusive right-of-way for up to 12.5 percent of new RapidRide lane miles. To develop a conservative, high-level budget, METRO CONNECTS assumed this exclusive right-of-way would require widening and the acquisition of new property. Metro assumed a much higher level of local contribution for RapidRide right-of-way needs for these reasons:

- Jurisdictions would likely maintain ownership and maintenance of any new right-of-way.
- In some cases, transit or BAT lanes could be created by reprioritizing right-of-way.
- Historically, Metro has not purchased right-of-way as part of our RapidRide program.

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Major regional projects across the county could substantially reduce travel time for transit riders and other travelers. These projects typically involve freeway or state highway interchanges/overpasses. METRO CONNECTS envisions Metro playing a larger role in helping to realize these projects. This commitment is shown by assuming Metro could contribute 20 percent of the total costs for regional projects where Metro is not a lead agency but transit would benefit.

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METRO CONNECTS also assumes a 10 percent partner contribution on speed and reliability improvements on corridors providing frequent (including RapidRide), express, and local services. Metro would also rely on local jurisdictions to partner with transit providers to build transit centers and other passenger amenities that meet the needs of both agencies.

The envisioned METRO CONNECTS 2040 service net- work relies on a significantly higher level of bus-to-bus and bus-to-rail transfers than the existing network has. METRO CONNECTS assumes a 20 percent partner contribution to shelters at transfer locations and new transit centers. With the anticipated increase in activity, the location and design of transfer centers—both on- street and off-street—would become more important to create an efficient and effective transit network and a comfortable, safe, and easy-to-navigate environment for passengers.

Trolley wire supports quiet, electric transit. METRO CONNECTS assumes some expansion of the trolley wire network, but given the local benefits and nature of the wire, METRO CONNECTS assumes a 50 percent partner contribution for new trolley wire.

~~Partnership Contributions~~

~~In order to deliver the service network envisioned in METRO CONNECTS, additional investment by partnering transit providers, state and local agencies, and local jurisdictions is needed. Specifically investment will be required in the following areas: speed and reliability investments such as revised signal timing, bus bulbs, removing parking and providing dedicated transit lanes, passenger facility improvements such as sidewalks and non-motorized improvements, in addition to assistance with permitting and right of way acquisitions. Metro will also rely on local jurisdictions to partner with transit providers in the implementation of transit centers and other passenger amenities that meet the needs of both agencies, and with the City of Seattle where trolley wire extensions may be needed to support the transit network. Figure B-2 identifies the current assumptions for local financial contributions and partnerships. The assumptions for these contributions and partnerships are meant to be broad for planning purposes and are not project specific. The exact contribution will be determined by the identified investment, financial need, policy considerations, and available resources.~~

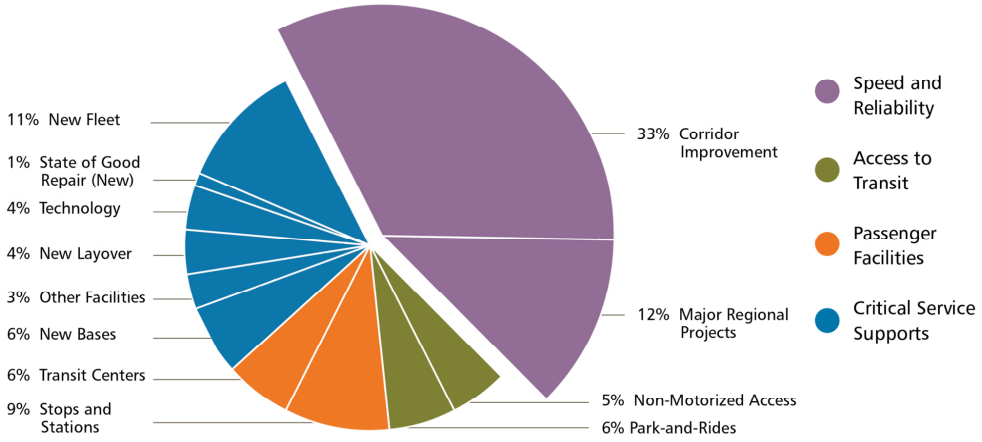
~~Figure B-2 Assumed Partnership Contributions~~

~~Category~~	~~Contributions (in millions)~~
~~Speed and Reliability~~	~~$2,922 M~~
~~Passenger Facilities~~	~~$187 M~~
~~Critical Service Supports~~	~~$30 M~~
~~**Total**~~	~~**$3,139 M**~~

Appendix C. Speed and Reliability

For purposes of costing, speed and reliability investments have been categorized into two types: Corridor Improvements and Major Regional Projects. Together, these speed and reliability investments make up 45 percent of the capital investment identified to support the METRO CONNECTS vision.

Figure C-1 Speed and Reliability Portion of Capital Costs



Corridor Improvements

Speed and Reliability Toolbox

Metro has a long history of effectively making the "right" speed and reliability investment to improve bus operations along a corridor. This toolbox of improvements, along with the benefit that can be expected from the different improvements, is shown in Table C-1.

Table C-1 Speed and Reliability Toolbox

Treatment	Description	Potential benefit
Queue jumps that let buses stopped at intersections get a head start	Buses are given a short lane at signalized intersections, often shared with right-turning vehicles in order to bypass queues of general traffic. Buses get an exclusive green light before other traffic so that they travel through the intersection ahead of general traffic.	Example: Queue jump signal at W Mercer Street & Third Avenue reduced travel times through the intersection by 21 seconds.[10] TCRP* reports reductions in travel time of 5% to 15%.[11]
Bus-only/Business Access Transit (BAT) lanes	By widening the roadway or dedicating an existing lane, buses are given a lane exclusive to transit use. Dedicated lanes may allow for right-turning vehicles to access local business and side streets. They may be used during peak periods only or all day.	Example: BAT lanes along with new signal timings on Aurora Avenue N resulted in a 14% to 19% reduction in median travel times.[12]
Transit signal priority (TSP)	Through active communication with traffic management/control systems, buses are given early or extended green times at intersections to reduce delay and significantly improve travel times.	Example: The sum of average intersection delays were reduced by 1 to 1.6 minutes after TSP was implemented on the RapidRide E Line corridor.[13]
Bus bulbs or curb extensions that let buses pick up and drop off passengers without pulling over	Curb extensions extend the existing sidewalk into the curb lane (typically a parking lane) to allow buses to serve a stop within the travel lane. This treatment allows buses to avoid moving into the curb lane, which typically incurs delay as buses attempt to re-enter traffic.	TCRP Report 165 reports that implementation of bus bulbs along a transit corridor in San Francisco lead to a 7% increase in bus speeds.[14] Other benefits include shorter intersection crossing distances for pedestrians and an increase in overall sidewalk width.
Turn restrictions at certain times of day to improve traffic flow	Heavy traffic volumes on transit corridors can be mitigated by restricting movements onto congested corridors to buses only. Restrictions can be all day or during peak periods only.	Improves access to bus lanes and bus stops. Resulting transit- only turning movements also set up the possibility for queue jumps.
On-street parking management	As an alternative to bus bulbs, parking may be managed along bus routes to mitigate delay when buses must re-enter traffic. Parking may be restricted for several hundred feet after a bus zone all day or during peak periods. This creates an extended travel lane for buses, allowing them to gradually merge back into traffic.	Improvements to travel times are similar to bus bulbs and curb extensions, and bus operations are made possible or improved at tight turns.
Spacing stops so the bus travels more quickly to stops where most people get on and off	Closely spaced bus stops with low ridership may be removed or combined into new stops. Reducing the number of stops along a corridor improves speeds in two ways: First, by reducing the time spent decelerating, accelerating and serving a stop. Second, with fewer stops, buses are better able to take advantage of traffic signal progression.	Studies estimate a time savings of 10 seconds per stop removed. A study by TriMet showed a 5.7% reduction in travel time when the distance between stops is increased by an average of 6%.[15]

* Transportation Cooperative Research Program

[10] "Evaluation Summary of W Mercer Street and 3rd Avenue W Signal Queue Jump", King County Metro, 2014.
[11] "Transit Cooperative Research Program Report 165: Transit Capacity and Quality of Service Manual Transit," 3rd Edition, Transportation Research Board, 2013.
[12] "Rapid Ride E Line, Before and After Travel Time Studies", King County Metro, 2014.
[13] Ibid.
[14] "Transit Cooperative Research Program Report 165: Transit Capacity and Quality of Service Manual Transit," 3rd Edition, Transportation Research Board, 2013.
[15] "Transportation Research Record: Journal of the Transportation Research Board, No. 1971", Transportation Research Board of the National Academies, 2006.

Corridor Improvement Evaluation Methodology

Metro developed a tiered series of investments for speed and reliability improvements. The range of investment levels in speed and reliability improvements are defined by corridor as High, Medium, Low, and no Investment. These are the classifications used in the METRO CONNECTS document. For costing purposes, the High category was further refined by the amount of right-of-way that would be needed to provide exclusive transit lanes on portions of a corridor. The High levels of investment focus heavily on providing transit lanes, assuming exclusive business access transit (BAT) lanes or BRT, and transit signal priority (TSP) throughout corridors. Right-of-way acquisition was assumed for some of the High levels of investment to allow for roadway widening. The Medium level of investment provides transit priority, queue jumps, signal modifications, and bus bulbs. The Low level of investment focuses on spot improvements at key locations. Improvements to existing RapidRide corridors were also assumed, including investments at the High, Medium, and Low levels. Table C-2 shows the percentage of lane miles for each service type that would receive different levels of capital investment.

All these investments would be made in close coordination with local jurisdictional partners. In particular, METRO CONNECTS relies heavily on local jurisdiction to make necessary right of way decisions and acquisitions, although METRO CONNECTS does propose some resources to support critical right-of-way acquisition.

Table C-2 Levels of Speed and Reliability Investment by Service Type

Service	High (ROW + Roadway)	High (Roadway)	High (Channelization)	Medium	Low	None	Total
Local	0	0	0	0	40%	60%	100%
Express	0	0	0	25%	50%	25%	100%
Frequent	0	0	10%	50%	30%	10%	100%
Existing RapidRide	0	10%	0	30%	60%	0	100%
New RapidRide	12.5%	12.5%	25%	40%	10%	0	100%

Metro calculated the need for future speed and reliability improvements based upon the METRO CONNECTS 2040 service network using the following methodology:

- Calculated total centerline miles for each service category
- Prepared per mile costs for various categories of investment (High x 3, Medium, Low)
- Developed a proportionate distribution for level of investment
- Applied costs and proportions to mileage

It is important to note that Metro did not evaluate individual corridors for a specific level of investment, but instead used proportional investment levels across the corridor types to determine investment. Because local jurisdictions have ownership and/or management of the right-of-way, coordination would be needed to ensure that the speed and reliability improvements implemented on identified corridors are consistent with their transportation infrastructure plans. It is anticipated that Metro would contribute partial funding to these projects in partnership with local agencies.

Corridor Improvement Costing Assumptions

This portion of the program captures a level of investment to promote transit speed and reliability along frequent, express, and local corridors. These investments were determined on a per centerline mile basis and in accordance with the identified level of investment per corridor: High, Medium, or Low. When calculating the costs, only the highest-level of investment was assumed where there were overlapping corridors. For example, if a roadway

included both a RapidRide and Express route, then the highest level of investment (associated with the RapidRide line) was used to estimate the cost. In the example, the medium level of investment identified for the Express route was not included in estimated the cost as it would result in double-counting the corridor investment.

Project costs for the High, Medium, and Low investment corridors were developed based on Metro's historical bid information. The High investment corridor was further defined by the degree to which right-of-way was assumed to be acquired. For frequent and new RapidRide corridors, the associated civil work and ROW costs were broken out and defined independently from the speed and reliability investment.

Typical elements for High, Medium, and Low levels of investment are shown in Table C-3.

Table C-3 Typical Elements for Speed and Reliability Corridor Investments

Investment Level	Features
High Investment – Great amount of right-of-way necessary	Exclusive right-of-way (24 feet of widening) Rebuild sidewalks Illumination New signals Stormwater Site preparation/Civil work Widen roadway for bus lanes
High Investment – Lesser amount of right-of-way necessary	Same as above, except: Exclusive right-of-way (12 feet of widening)
High Investment – No right-of-way necessary	No widening required (use existing lanes) 75 percent roadway rechannelization Up to 6 transit signal priority per mile Up to 2 queue jumps per mile Up to 6 signal modifications per mile Up to 1 bus bulb per mile
Medium Investment	No widening required 25 percent roadway rechannelization Up to 3 transit signal priority per mile Up to 1 queue jump per mile Up to 2 signal modifications per mile Up to 6 signal synchronizations per mile Up to 0.5 bus bulb per mile
Low Investment	No widening required 10 percent roadway rechannelization Up to 4 signal synchronizations per mile Up to 1 queue jump per mile Up to 2 signal modifications per mile

Major Regional Projects

In addition to corridor level speed and reliability improvements, there are a number of major regional projects that could provide a benefit to transit service, and in some cases, a benefit to general purpose traffic. For purposes of this plan, major regional projects constitute large, multi-jurisdictional projects that are currently being planned in key, specific locations in which a targeted improvement would increase transit speed and reliability. For METRO CONNECTS, Metro has identified several of these types of projects exist today and which could alleviate existing congestion problems and benefit transit by providing cross-city connections, address overcapacity roadways and bottlenecks, and/or improve access to the regional network. METRO CONNECTS envisions Metro playing a larger role in facilitating the delivery of major regional projects that would benefit transit service and proposes more than

$230 million dollars towards these projects in King County, although the largest portion of the costs would come from others.

Speed and Reliability Cost Estimates

Table C-4~~Table C-4~~Table C-4~~Table C-4~~ shows the estimated costs for the speed and reliability improvements included in METRO CONNECTS.

Table C-4 Speed and Reliability Estimated Costs

Speed and Reliability Improvements – Corridor Level of Investment	Unit	Total Units	Estimated Metro Cost (in millions YOE $)
Frequent (existing RapidRide)*	Per mile	45	$151
Frequent (RapidRide) – Speed and reliability Component Only*	Per mile	220	$629
Frequent (RapidRide) – Right-of-way and associated civil*	Per mile	55	$403
Frequent (non-RapidRide)*	Per mile	245	$281
Express*	Per mile	125	$67
Local*	Per mile	445	$64
Major Regional Projects	---	**---**	$231
Unidentified Investments	---	**---**	**$180**
		Total	**$2,005**

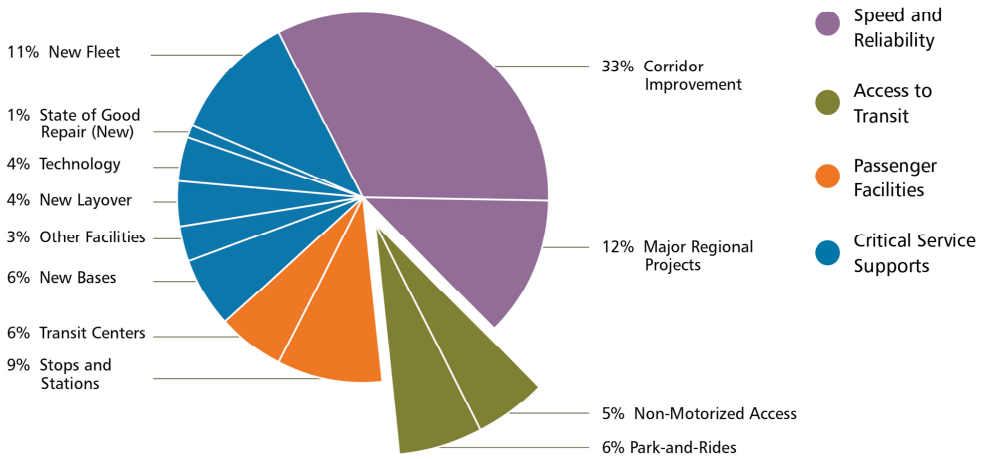
* Metro assumes these investments would be developed in partnership with local jurisdictions, state agencies, and/or other transit providers. In particular Metro would rely heavily on local jurisdictions to make right-of-way decisions and acquisitions.

Appendix D. Access to Transit

METRO CONNECTS defines transit access zones, which are described in the full plan, to identify specific types of improvements for different areas of the county. Pedestrian, bicycle, and auto access to transit are all important to support a robust and diverse transit network. The METRO CONNECTS vision includes investments that promote access to transit by all modes. Due to a significant capital investment and stakeholder interest in this topic, the full plan document goes into significant detail on how access to transit was evaluated in METRO CONNECTS.

As shown in Figure D-1, METRO CONNECTS proposes significant investments in both non-motorized and auto access to transit. Access to transit investments make up 11 percent of the METRO CONNECTS capital investment.

Figure D-1 Access to Transit Portion of Capital Costs



Bicycle and Pedestrian Improvements

In the METRO CONNECTS 2040 network, 73% of all King County residents and 87% of all county businesses would be within a half-mile of a frequent transit route. With more people within walking or bicycling distance to transit in the future, Metro would work with local jurisdictions to fund and implement non-motorized transit access improvements that provide customers with safe and easy to use pathways to transit.

The total need, countywide, to complete the non-motorized (sidewalk and bicycling) network far exceeds the resources of any single organization or jurisdiction. In Metro's Non-motorized Connectivity Study[16] non-motorized access improvement projects that were within one mile of approximately 500 major transit bus stops were identified

[16] "2014. Non-motorized Connectivity Study", King County Metro and Sound Transit, 2014. Available at: http://metro.kingcounty.gov/programs-projects/nmcs/.

by local jurisdictions. This study determined that an investment of about $1.8 billion would be needed to complete the non-motorized access projects associated with all 500 of the major stops (equaling about $3.2 million per stop) and that $450 million would be needed to improve access to transit at the top 25 percent of the bus stops with the worst connectivity. This analysis provides a sense of scale for the need associated with non-motorized improvements.

Considering that there are more than 8,000 transit stops across the county, comprehensive non-motorized access would far outstrip Metro's available resources. METRO CONNECTS proposes to work with jurisdictions to partially fund such improvements.

METRO CONNECTS includes potential funding for non-motorized investment which is intended to leverage funding from local jurisdictions and grants.

Additional non-motorized investments that support the service network envisioned in METRO CONNECTS could be developed by partner agencies and/or local jurisdictions, either independently or in partnership with Metro. At this time, locations have not been identified or prioritized. For cost estimating purposes, a representative investment, roughly equivalent to the proposed investment in park and ride facilities has been used. Note because these costs are in year of expenditure dollars, the differences in total costs between tables D-5 and D-6 are due to the different assumptions in the timing of the parkand-ride and non-motorized investments. The total non-motorized costs are smaller than the Park-and-Ride investments because they are assumed to occur earlier in the program. This is, in part, due to the typically long lead time in identifying and procuring the property needed for structured parking and the construction.

As mentioned Metro would contribute to non-motorized transit access improvements in coordination with local jurisdictions. Typical elements to be considered include:

- Sidewalks at major transit hubs
- Bicycle parking at major transit hubs
- Bicycle lanes providing a direct connection to major transit hubs. These include defined portions of the roadway that have been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Improvements could also include cycle tracks, which are exclusive bike facilities that are physically separated from motor traffic and distinct from the sidewalk via a curb, median, bollards, and/or pavement treatments.

Bicycle and Pedestrian Costing Assumptions

The type and number of facilities described in the plan represent a sample of possible non-motorized improvements that could be constructed. As ~~implementation plans proceed~~we move toward implementation, additional facilities or improvements may be identified. For cost estimating purposes, the representative total amount of investment for non-motorized access improvements is equivalent to the amount identified for park-and-ride facilities.

Comment [SH11]: RL3 language updated to reflect the development program concept

Project costs were estimated for quantities of bicycle parking at major transit hubs, sidewalks, and bicycle lanes and/or cycle tracks by using Metro historical costs, and considering recent engineer's estimates for constructed projects. The engineer's estimates represent the current industry standard for typical unit bid-based costs for known elements such as cement concrete sidewalk, asphalt, concrete curb and gutter, ADA ramp, demolition, and pavement restoration. Typical elements for non-motorized improvements are shown in Table D-1.

~~***Table D-1***~~

~~***Table D-1.***~~

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Table D-1 Bicycle and Pedestrian Facility Typical Elements

Project Type	Typical Elements
Sidewalks	Site preparation 8-foot new sidewalk (one direction) Curb and gutter Associated stormwater improvements Illumination Americans with Disabilities Act (ADA) compliant ramps
Bicycle parking at major transit hubs	High capacity bike parking in cages with secure access On-demand bicycle lockers
Bicycle Lanes and/or cycle tracks	Site preparation 5-foot bicycle lane (one direction) or 8-foot cycle track (one direction) 8-foot new sidewalk (one direction) Curb and gutter Associated stormwater improvements Illumination ADA ramps

Park-and-Ride Expansion

Table D-2~~Table D-2~~Table D-2~~Table D-2~~ shows the relative share current of transit access provided by park-and-ride lots in the four transit access zones defined in the plan. These results are based on current park-and-ride utilization data from Metro and travel model data from the Puget Sound Regional Council (PSRC). It is important to recognize that the results in Table D-2~~Table D-2~~Table D-2~~Table D-2~~ reflect the "home" location of where park-and-ride demand originates, and not the location of the park-and-ride lot itself. As an example, park-and-ride users from Zone 4 areas can and do park at park-and-ride lots located in Zone 2 and 3 areas, where most of the county's park-and-ride lots are located. It is also important to note that there is no currently available data on the number of people who park on-street and walk to an adjacent transit stop (often referred to as "hide-and-ride"). These types of riders are not considered to be park-and-ride users since they do not park at a lot where they can be counted.

Table D-2 Existing Conditions: Park-and-Ride Access Mode Share

Transit Access Zone	Park-and-Ride Stalls Used	Proportion of Transit Riders that use Park-and-Ride
Zone 1	3,920	8%
Zone 2	6,780	41%
Zone 3	7,300	64%
Zone 4	1,600	84%
Total	**19,600**	**N/A**

As shown in Table D-2~~Table D-2~~Table D-2~~Table D-2~~, park-and-ride lots provide access to more than half of all transit riders in Zone 3 and 4, meaning that most people who use transit in these areas access it via a park-and-ride lot). On the other hand, in Zone 1, more than 90 percent of transit users walk, bicycle, or get dropped off at a bus stop. In Zone 2 , which include a large portion of suburban King County, just over 40 percent of transit users park at a park-and-ride lot to access transit. It is important to note that this data reflects current conditions and not the extensive 2040 transit network envisioned in METRO CONNECTS.

To determine the number of future park-and-ride spaces that Metro could partner to construct, the agency considered several factors:

- Population within walking distance to frequent transit service
- Future local/express service expansion

- Proposed park-and-ride capacity identified to be provided by Sound Transit
- Future park-and-ride access mode shares reasonably assumed for each access zone

With the above considerations in mind, the following assumptions were used:

- Metro's existing owned and leased lots will be actively managed in the future to provide maximum capacity for transit riders, including pricing to incentivize more efficient use of lots. Metro will continue and expand its leased lot program as a way to add capacity without the significant expense of construction, particularly in areas where long term service expansions would mitigate or reduce the need for auto parking.
- Sound Transit has proposed to construct more than 10,320 new park-and-ride stalls in King County as it expands the regional light rail and bus rapid transit system as part of the planned ST2 and proposed ST3 investments
- People who live in Zone 1 and 2 will be within a half-mile walking-distance to RapidRide and frequent transit and it is proposed that they receive no additional park-and-ride capacity.
- The envisioned expansion of the local/express network, assumes that Zone 3 park-and-ride access mode share could drop from 64 percent in 2015 to 50 percent by 2040. This would represent a 22 percent drop in park-and-ride mode access, which would be mitigated by a 26 percent increase in the amount of transit service in the Zone 3 area. Additionally, it is important to note that a 50 percent park-and-ride access mode share is substantially higher than existing park-and-ride access shares in Zone 1 and 2 in 2015.
- For Zone 4, park-and-ride access mode share is assumed to remain unchanged. Park-and-ride lots would continue to be the predominant means of accessing transit in these low-density areas in the future and additional capacity is proposed to address the growth in ridership in this zone.

Based on these assumptions, Table D-3 summarizes the future park-and-ride capacity envisioned as part of METRO CONNECTS. As shown, both Metro and Sound Transit have identified new park-and-ride supply, with Sound Transit potentially adding more than 10,320 spaces and Metro adding 3,300.

Table D-3 METRO CONNECTS Future Conditions: Park-and-Ride New Capacity

Transit Access Zone	Metro and Sound Transit Planned or Proposed New Park-and-Ride Stalls Provided by 2040	Estimated Proportion of 2040 Transit Riders that use Park-and-Ride
Zone 1	0	4%*
Zone 2	0	33%*
Zone 3	2,900	56%
Zone 4	400	84%
Sound Transit (not assigned to access zones)	10,320	N/A
Total	**13,620 (3,300 from Metro, 10,320 from Sound Transit)**	**N/A**

* These proportions could be higher if transit riders in these areas use the new Sound Transit lots.

To identify the most effective locations for Metro to add the 3,300 new park-and-ride spaces, the following factors were considered:

- Transit ridership and population growth along major transit corridors
- Currently utilized locations along the major transit corridors
- Future Sound Transit park-and-ride investments

The results of the location analysis are summarized in Table D-4.

Table D-4 Location of METRO CONNECTS Envisioned New Park-and-Ride Capacity

Major Transit Corridor	Current Usage (parking stalls)	Sound Transit Planned and Proposed Future Growth	Envisioned Metro Future Growth	Total Sound Transit and Metro Growth (percent change from existing)
I-5 North King County	1,850	930	400	1,330 (72%)
SR 522	1,300	900	0	900 (69%)
I-405	2,400	930	900	1,830 (76%)
SR 520	1,500	2,080	0	2,080 (139%)
I-90	4,600	1,380*	600	1,980 (43%)
SR 167 / Southeast County	2,600	950	600	1,550 (60%)
I-5 South King County	3,700	3,150	800	3,950 (107%)
Non-Major Corridors	1,650	0	0	0 (0%)
Total**	**19,600**	**10,320**	**3,300**	**13,620 (69%)*****

* Sound Transit will expand South Bellevue Park-and-Ride by 881 stalls as part of East Link. This analysis attributes these stalls to the I-90 corridor. The proposed light rail extension to Issaquah would include a 500 space garage.

**Reflects total demand, per Metro's travel demand model. Actual park and ride utilization at all lots in King County, including those owned or leased by Metro, Sound Transit, WSDOT, and others during the first quarter of 2015 is approximately 20,000. Note that total supply of owned lots within the county is approximately 25,000 stalls.

***This analysis does not include the leased lot program.

Table D-4 indicates that all major transit corridors would receive additional park-and-ride spaces, with the largest percentage increases in the I-405, SR 520, and I-5 South King County corridors. In terms of total number of new stalls, the I-5 South King County and SR 520 corridors would increase the most. In total, the park-and-ride system would increase by 69 percent.

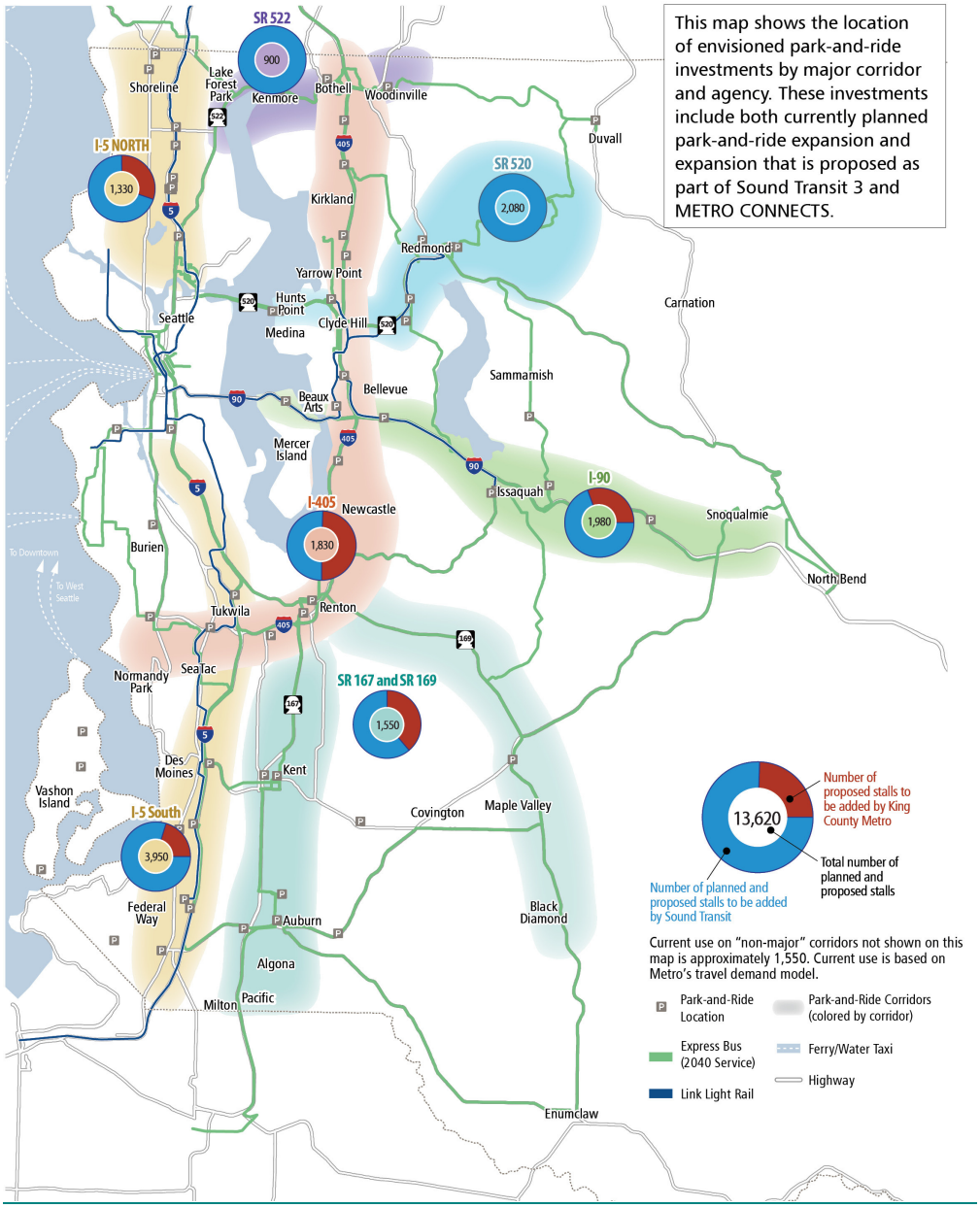
Figure D-2

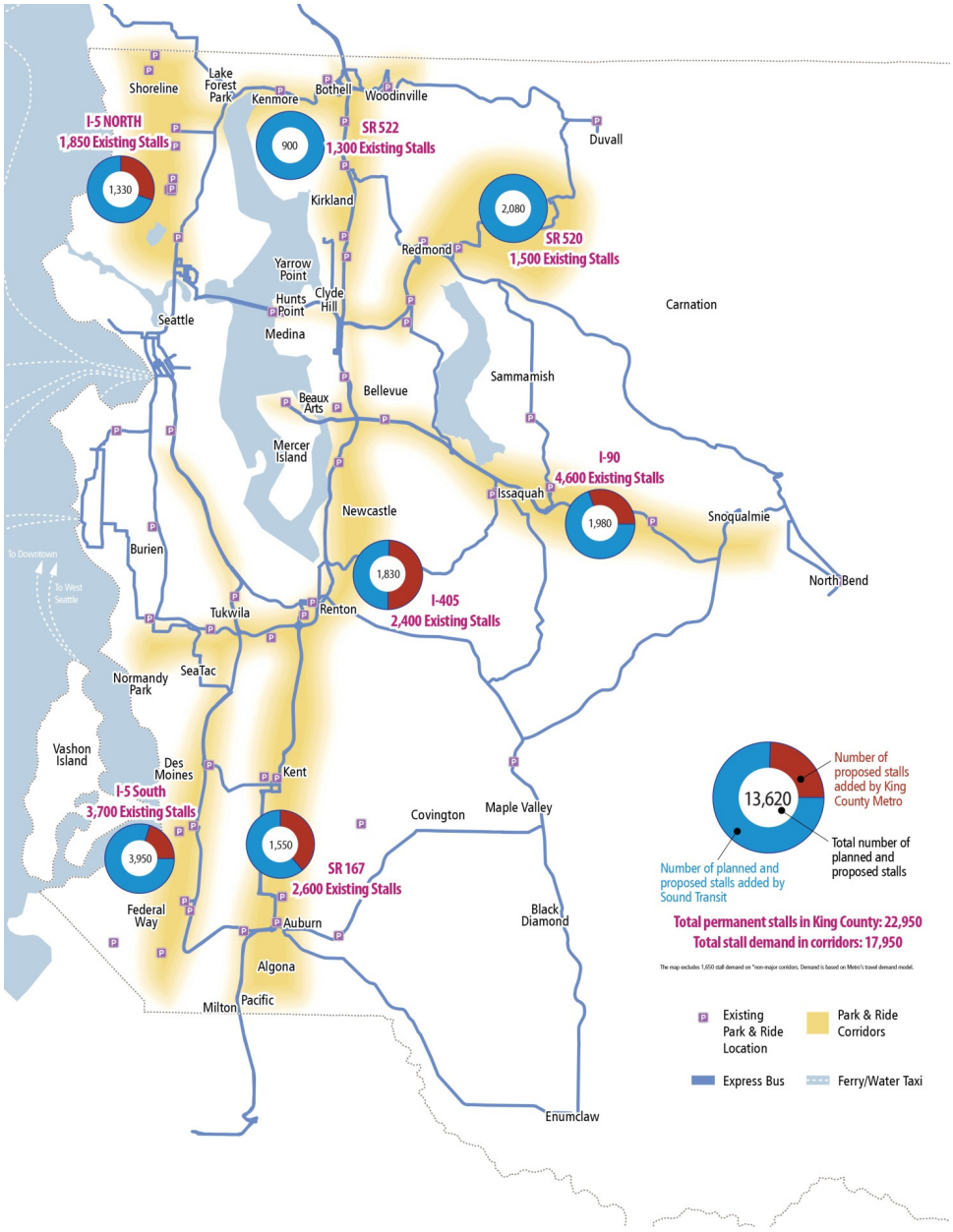
~~Figure D-2~~

~~Figure D-2~~

~~Figure D-2~~ shows the location of envisioned park-and-ride investments by corridor.

Figure D-2 Planned and Proposed Park-and-Ride ~~Expansion~~ Investments~~by Agency and~~ by Corridor


This map shows the location of envisioned park-and-ride investments by major corridor and agency. These investments include both currently planned park-and-ride expansion and expansion that is proposed as part of Sound Transit 3 and METRO CONNECTS.
SR 522
900
Kenmore
Lake Forest Park
Shoreline
Bothell
Woodinville
Duvall
I-5 NORTH
1,330
SR 520
2,080
Kirkland
Redmond
Yarrow Point
Hunts Point
Clyde Hill
Medina
Seattle
Carnation
Sammamish
Bellevue
Beaux Arts
Mercer Island
I-90
1,980
Issaquah
Snoqualmie
North Bend
I-405
1,830
Newcastle
Burien
To Downtown
To West Seattle
Renton
Tukwila
Sea-Tac
Normandy Park
SR 167 and SR 169
1,550
Des Moines
Kent
Vashon Island
Covington
Maple Valley
I-5 South
3,950
Federal Way
Auburn
Black Diamond
Algona
Milton
Pacific
Enumclaw
13,620
Number of proposed stalls to be added by King County Metro
Total number of planned and proposed stalls
Number of planned and proposed stalls to be added by Sound Transit
Current use on "non-major" corridors not shown on this map is approximately 1,550. Current use is based on Metro's travel demand model.
Park-and-Ride Location
Park-and-Ride Corridors (colored by corridor)
Express Bus (2040 Service)
Ferry/Water Taxi
Highway
Link Light Rail


I-5 NORTH
1,850 Existing Stalls
1,330
900
SR 522
1,300 Existing Stalls
2,080
SR 520
1,500 Existing Stalls
I-90
4,600 Existing Stalls
1,980
1,830
I-405
2,400 Existing Stalls
I-5 South
3,700 Existing Stalls
3,950
1,550
SR 167
2,600 Existing Stalls
Shoreline
Lake Forest Park
Kenmore
Bothell
Woodinville
Duvall
Kirkland
Redmond
Carnation
Yarrow Point
Hunts Point
Clyde Hill
Seattle
Medina
Sammamish
Beaux Arts
Bellevue
Mercer Island
Issaquah
Snoqualmie
Newcastle
Burien
North Bend
To Downtown
To West Seattle
Tukwila
Renton
SeaTac
Normandy Park
Vashon Island
Des Moines
Kent
Covington
Maple Valley
Federal Way
Auburn
Black Diamond
Algona
Pacific
Milton
Enumclaw
13,620
Number of proposed stalls added by King County Metro
Total number of planned and proposed stalls
Number of planned and proposed stalls added by Sound Transit
Total permanent stalls in King County: 22,950
Total stall demand in corridors: 17,950
The map excludes 1,650 stall demand on *non-major corridors. Demand is based on Metro's travel demand model.
Existing Park & Ride Location
Park & Ride Corridors
Express Bus
Ferry/Water Taxi

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Park-and-Ride Expansion Cost Estimating Assumptions

Park-and-rides traditionally have been constructed as structured parking garages or surface parking lots. The cost analysis assumed structured parking, which at a higher cost provides a conservative cost estimate. This was also used as an assumption because many locations are spatially constrained and a surface lot is prohibitive. This costing assumption is also consistent with ST3 planning for typical light rail transit garages.

Costs were estimated based on historical construction information from Metro's most recently completed projects in Burien and Redmond Park-and-Ride structured parking facilities. These projects were adjusted using Construction Cost Index (CCI) inflation rates, and then divided to determine a unit price per structured stall which was then applied to the number of stalls.

Typical elements of a structured parking facility include the following:

- Structured parking garage and foundation
- Pedestrian plaza/sidewalk
- Stairs/elevators
- Electrical components
- Illumination
- Utilities
- Site civil work to access garage entrance
- Right-of-way (based on typical structured garages in King County)

Access to Transit Parking Cost Estimates

Table D-5 and Table D-6 summarize the estimated costs for access to transit improvements included in METRO CONNECTS.

Table D-5 Bicycle and Pedestrian Cost Estimates

Non-motorized Access Improvements	Unit	Total Units	Estimated Metro Cost (in millions YOE $)
Sidewalks	Per mile (one way)	50	$218
Bicycle Parking at Major Transit Hubs	Per each	55	$34
Bicycle Lanes	Per mile (one way)	40	$245
Unidentified Investments	---	**---**	$49
		Total	**$546**

Table D-6 Park-and-Ride Expansion Cost Estimates

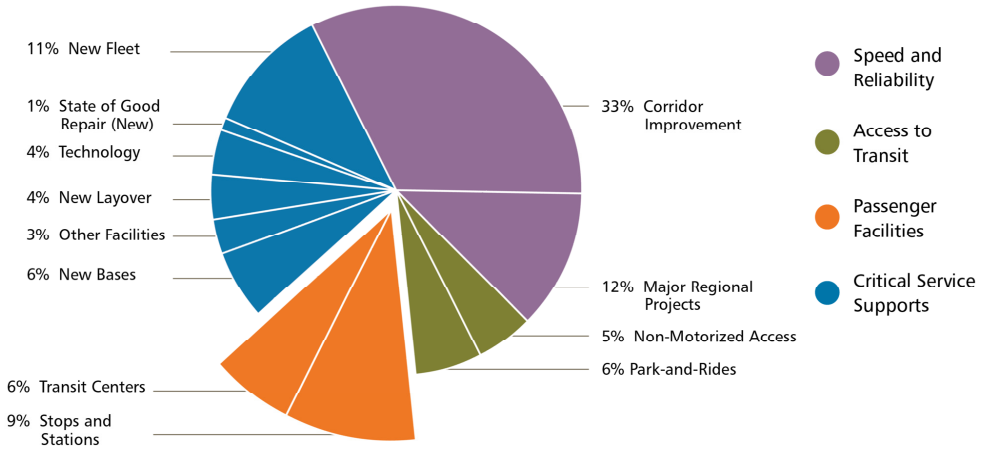
Vehicular Access to Transit Investments	Unit	Total Units	Estimated Metro Cost (in millions YOE $)
Park-and-Ride Garage Structure	Stall	3,300	$552
Unidentified Investments	---	**---**	$54
		Total	**$606**

Appendix E. Passenger Facilities

Improving the passenger experience is a key part of METRO CONNECTS and represents a significant element of Metro's proposed capital investment. There are two major categories of passenger facilities: transit centers and bus stops and shelters.

As shown in Figure E-1, passenger facility investments make up 15 percent of the METRO CONNECTS capital investment.

Figure E-1 Passenger Facilities Portion of Capital Costs



Transit Centers

Metro has tentatively identified the locations of major transit centers or transfer facilities that would be needed to support the envisioned future service network in 2040. By 2040, total transit boardings in King County would double compared to 2015. This growth in ridership would be shared between Sound Transit, with new riders on expanded rail and bus rapid transit (BRT) service, King County Metro, and to a lesser extent Pierce Transit. To achieve this level of transit ridership growth, the envisioned METRO CONNECTS 2040 service network relies on a significantly higher level of bus-to-bus and bus-to rail transfers than the existing network. The facilities necessary to effectively meet customer needs in this future system are very different from what is provided by current facilities. For one, there will be greater passenger activity, including boardings, alightings, and transfers than exists today. Through Metro's integration with Sound Transit, full busloads of passengers would be expected to transfer to light rail trains to complete their commute, especially during the peak periods. With the anticipated increase in activity, the location and design of transfer facilities would become more important in order to create an efficient and effective transit network and a comfortable, safe, and easy-to-navigate environment for passengers.

Metro calculated the need for future transit centers based upon the envisioned 2040 service network using the following methodology:

- Identified locations of high boarding and transfer activity (more than 2,500 daily boardings/transfers) and high bus volumes (more than 40 buses per hour during the peak period)
- Evaluated existing facilities at each location
- Identified areas that Sound Transit (ST) is planning and proposing investments in bus/rail integration facilities (ST2 or ST3), at which ST plans to include:
    - 2 off-street bus bays
    - 5 off-street bus layovers
    - 2 on-street bus bays
    - An area of approximately one acre at each site
    - A canopy, wind screen, benches, trash cans, information pylon, etc.
- Determined net future investment needed

The locations of major facilities in the METRO CONNECTS 2040 service network and their anticipated boarding and transfer levels are shown in Figure E-2 and Figure E-3. These figures illustrate the anticipated passenger volumes and activities at these locations.

Several of the envisioned future transfer points are existing or planned light rail stations that will be designed and constructed by Sound Transit. In addition to being located at light rail stations, major transit centers and transfer points would be located where bus boardings are high and transfers are anticipated.

Metro would contribute to investments in transit centers and bus stop projects to support the METRO CONNECTS 2040 service network but assumes that these investments would be built in partnership with local jurisdictions, state agencies, and other transit providers to ensure they meet the jurisdictional character and needs. Transit centers will include both on- and off-street facilities. Approximately 85 transit centers would be needed to support the 2040 service network. The type of investments and design of transit will be based upon a number of factors, including bus volumes and location. Consistent design elements, such as wayfinding signage and passenger information, can help to provide consistency across all sites. Coordination among Metro and other transit providers would be required to create standard features at major transit centers.

Transit Center and Transfer Point Costing Assumptions

The estimated cost for off-street facilities was based on historical construction cost information from Metro's most recently completed facilities: Burien and Redmond Transit Centers. The costs were adjusted using CCI inflation rates and then divided to determine a unit price per bus bay. The estimated costs for on-street facilities were based on a recent engineer's estimate for a minor roadway widening/bus bulb plan. The estimates represent the current industry standard for typical unit bid-based costs for known elements such as cement concrete sidewalk, asphalt, concrete curb and gutter, ADA ramp, and pavement restoration. Typical elements are shown in Table E-1.

Table E-1 On- and Off-Street Facility Typical Elements

Project Type	Typical Elements
Off-street transit center facility	Right-of-way (based on right-of-way required for Burien/Redmond Transit Centers) 6 active bus bays 6 to 8 layover spaces Emergency call stations Security Driver comfort station Minor roadway work Sidewalk modifications Driveways Access road paving
On-street transit center facility	Roadway paving Sidewalk Concrete pad Additional signage

Figure E-2 Transit Centers – METRO CONNECTS Anticipated Boarding and Transfer Levels

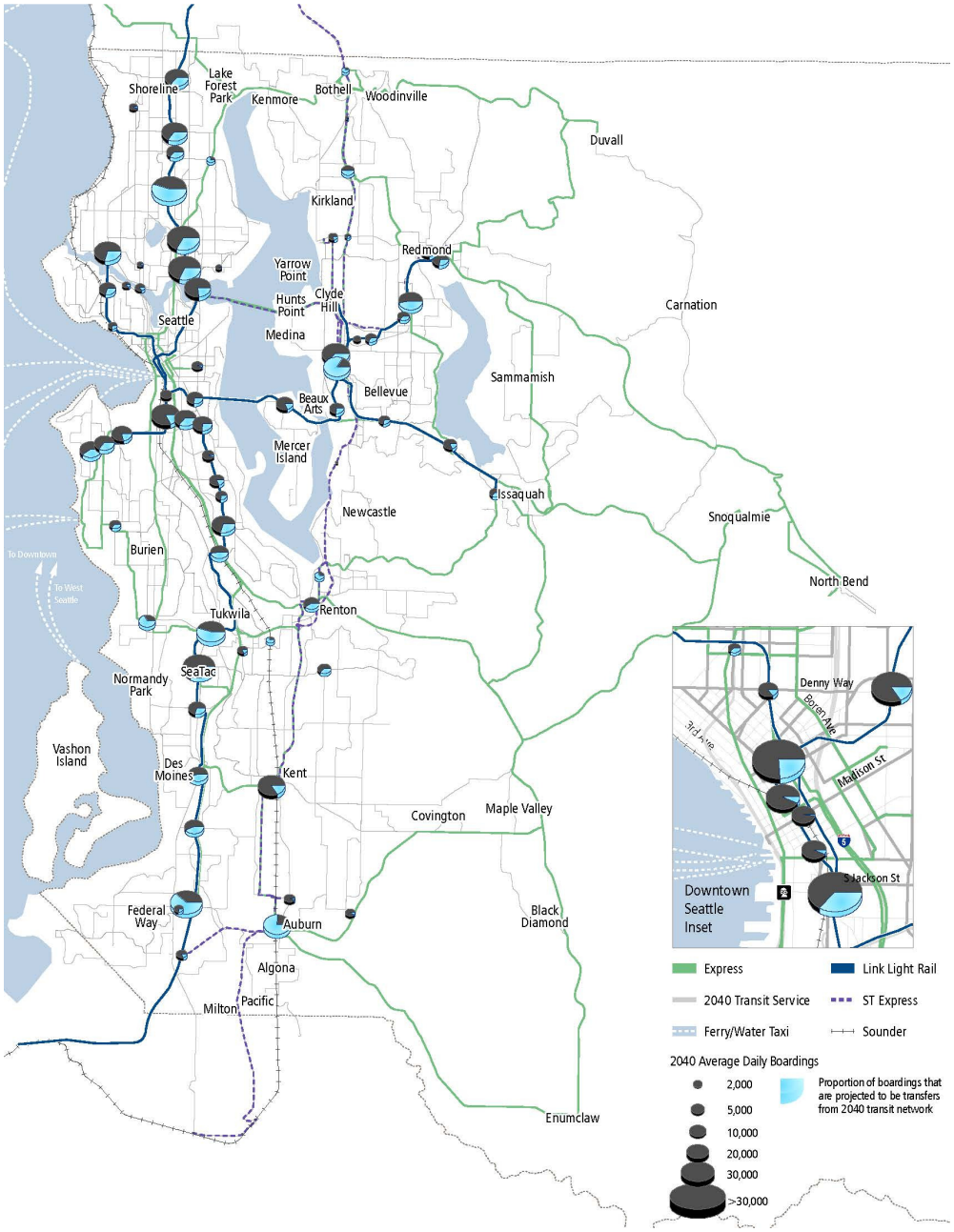
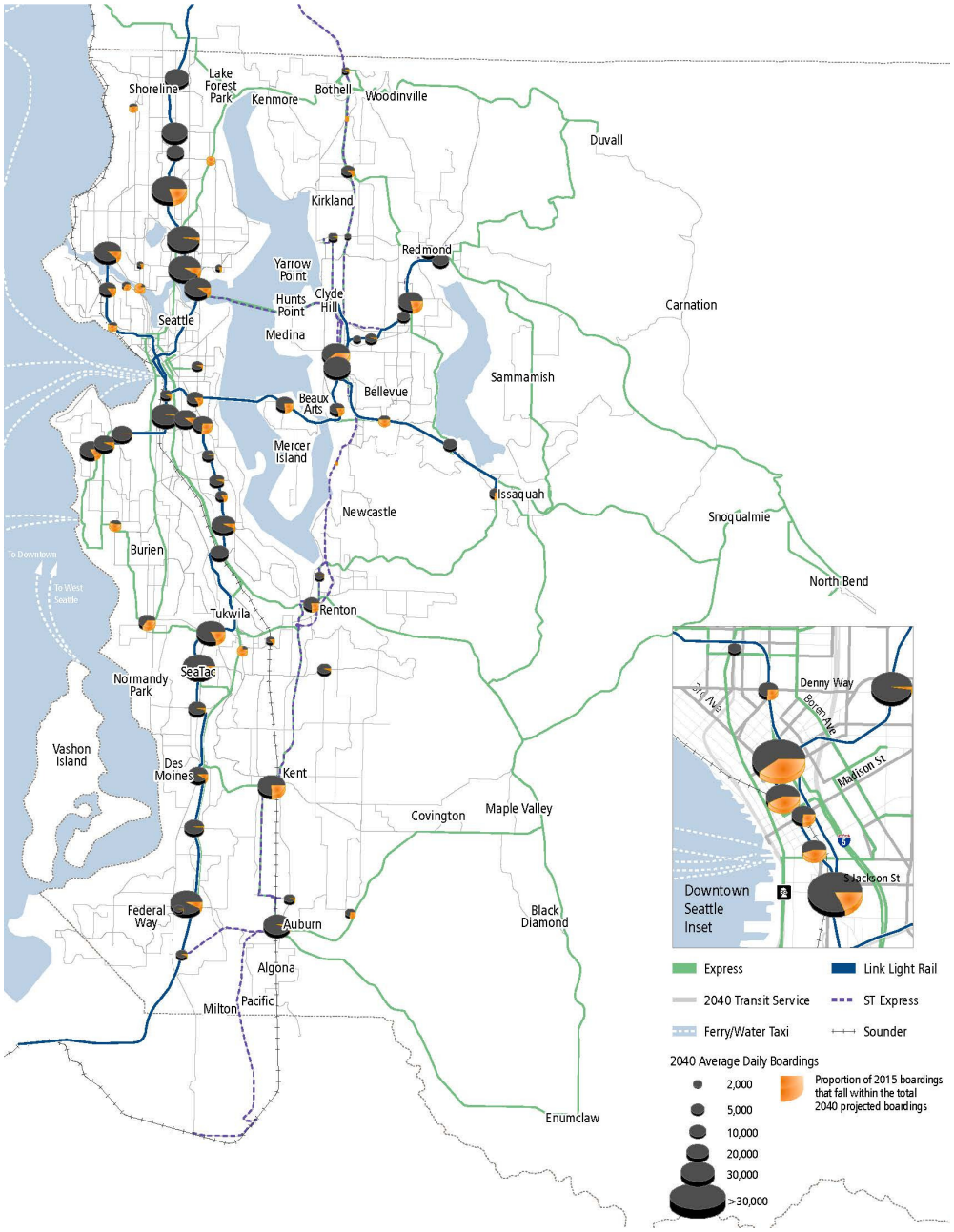


Figure E-3 Current and METRO CONNECTS 2040 Boarding Levels



Bus Stops and Shelters

Bus stops and shelters are some of the most important places where customers interact with the agency. Annually, Metro makes an investment in these facilities and also ensures that they are maintained in a state of good repair. Metro serves a variety of bus stops and shelters containing different amenities, based on ridership and service levels. As the agency grows and modifies its service network to meet future needs consistent with the METRO CONNECTS vision, it will need to provide new and expanded passenger facilities. As with transit centers, the envisioned increase in ridership and the increased level of transfer activity will merit an increased investment in passenger facilities, creating a more comfortable and safe environment for passengers.

Metro assumes these facilities would be developed in partnership with local jurisdictions, state agencies, and/or other transit providers. In particular high ridership and transfer facilities will be built with close coordination and partnership with jurisdictions to ensure they meet local needs and character.

Metro currently serves standard bus stops (unsheltered or sheltered) and RapidRide bus stops (standard, enhanced, and stations). Metro owns and maintains approximately 8,400 bus stops with nearly 1,700 of these having shelters. Each type of facility includes different programmatic elements based on passenger needs.

Standard Bus stops (non-RapidRide)

At bus stops with lower ridership, Metro provides a bus stop sign, which indicates to passengers where and which buses will stop to pick them up. Metro provides bus shelters at bus stops based on ridership. Metro's current threshold for installation of a bus shelter at a bus stop is 50 or more riders per day within the city of Seattle and 25 or more riders per day in areas outside of Seattle (Metro 2013). The anticipated increase in ridership associated with the METRO CONNECTS 2040 service network means that the number of facilities will grow.

Metro calculated the need for future standard bus stop improvements based upon the envisioned 2040 service network using the following methodology:

- Calculated number of bus stops with fewer than 1000 daily boardings
    - Assumed that all existing shelters remain in place
    - Assumed that the proportion of stops that meet the daily shelter requirements increases proportionally with ridership on non-RapidRide lines
    - For newly identified shelters:
        - Assumed half will receive standard shelter investment (bus shelter, shelter footing, litter receptacle, bench)
        - Assumed half will receive twice the standard shelter investment.
- Calculated number of bus stops with more than 1,000 daily boardings, low transfer activity (fewer than 500 daily transfers)
    - Assumed four times the standard shelter investment at these locations
- Calculated number of bus stops with more than 1,000 daily boardings, high transfer activity
    - Assumed an investment comparable to a RapidRide station
- Assumed that half of existing sheltered bus stops will need an additional investment equal to the standard shelter investment as ridership grows

RapidRide Bus Stops

Metro's BRT system, known as RapidRide, currently has six limited-stop bus routes. These routes have three classes of bus stops: standard, enhanced, and station. All bus stops have unique design and branding that identifies them as RapidRide stops. RapidRide standard and enhanced bus stops have features that are similar, respectively, to non-sheltered and sheltered bus stops that are not part of the RapidRide system. RapidRide stations are the largest in size and have the highest level of passenger amenities:

- Shelters that are well-lit so people can see around themselves and be seen.
- Shelters with more weather protection overhead than typical shelters.
- Lights on top of station shelters help identify them from a distance.
- ORCA card readers at stations that allow riders with ORCA cards to pay before they board a RapidRide bus and get on at any door.
- Electronic signs that display how many minutes it will be until the next bus will arrive. When a RapidRide station is served by additional routes, the signs also display the arrival time for them.
- Large, illuminated maps of the RapidRide line showing all the bus stops and destinations.
- Request signals at the bus stop that trigger a light at night to indicate to the driver that they are waiting.
- Accessible boarding platforms which also have, benches, trash receptacles, and bicycle racks.
- Amenities for the sight and hearing impaired, including tactile paving, different colored/textured pathways, braille signage, and audio announcement buttons.

The scale of amenities provided at each RapidRide stop is based on several factors, including ridership. Generally, RapidRide stops with more than 150 daily boardings receive the station level of amenities, stops with 50 to 149 daily boardings receive a RapidRide enhanced bus stop, and stops with less than 50 daily boardings receive a standard RapidRide stop (Metro 2013).

The need for future RapidRide bus stops is based upon the METRO CONNECTS 2040 service network which identifies that the system will grow to 26 lines. The following methodology was used to determine the individual elements:

- Reviewed the existing percentage of bus stops with stations, enhanced, and standard amenities
- Determined the total number of RapidRide bus stops based on miles of envisioned 2040 RapidRide service and half-mile stop spacing
  - Estimated the growth in riders/mile from existing to the future (approximately 45 percent)
  - Applied a riders/mile growth rate to the existing station percentages
- Calculated the number of RapidRide stops by type by multiplying the new station percentages and the number of new RapidRide stops

Passenger Facility Cost Estimating Key Assumptions

Passenger facilities are assumed to include investments along existing and future RapidRide corridors, as well as non-RapidRide corridors. Estimated costs were based on historical construction cost information from Metro for passenger facilities, extrapolated into the future. Non-RapidRide corridors were broken down into categories according to the number of boardings/transfers and appropriate costs were applied. Additionally, costs were estimated to support expansion of the RapidRide network which will require more facilities of all types.

Typical elements are shown in Table E-2.

Table E-2 Bus Stop and Shelter Typical Elements

Project Type	Typical Elements	
Standard shelter (Non-RapidRide/fewer boardings)	50 percent of shelters identified include 1 shelter 50 percent of shelters identified include 2 shelters Litter receptacle Bench	
Standard shelter (Non-RapidRide/low transfers)	4 standard shelters Litter receptacle Bench	
Standard shelter (Non-RapidRide/high transfers)	Comparable elements to RapidRide station, including; • Shelter and foundation • Bench • Lit blade • Litter receptacle • Bicycle rack (optional) • iStop (optional) • Pedestrian lighting • Real-time bus information • Power supply	50 percent of existing sheltered bus stops receive additional improvements: • 1 additional standard shelter • Litter receptacle • Bench
RapidRide standard bus stop	Bench iStop (optional) Unlit blade marker (RapidRide branding sign)	
RapidRide enhanced bus stop	Shelter and foundation Bench iStop (optional) Litter receptacle	
RapidRide station	Shelter and foundation Bench Lit blade Litter receptacle Bicycle rack (optional) iStop (optional) Pedestrian lighting Real-time bus information Power supply	

Passenger Facility Cost Estimates

Table E-3 shows the level of investment in passenger facilities to accommodate future ridership at transfer centers. Table E-4 shows the estimated costs for bus stops and shelters.

Table E-3 METRO CONNECTS Transit Center Estimated Costs

Transit Center Investments	Unit	Total Units*	Estimated Metro Costs (in millions YOE $)
Off-street Transit Center	Bus Bay	80	$503
On-street Transit Center	Bus Bay	40	$11
Unidentified Investments	---	---	$50
		Total	**$564**

* A single transit center is comprised of multiple bays. This quantity allows for consistent cost estimation across locations, but does not specify the size of each facility.

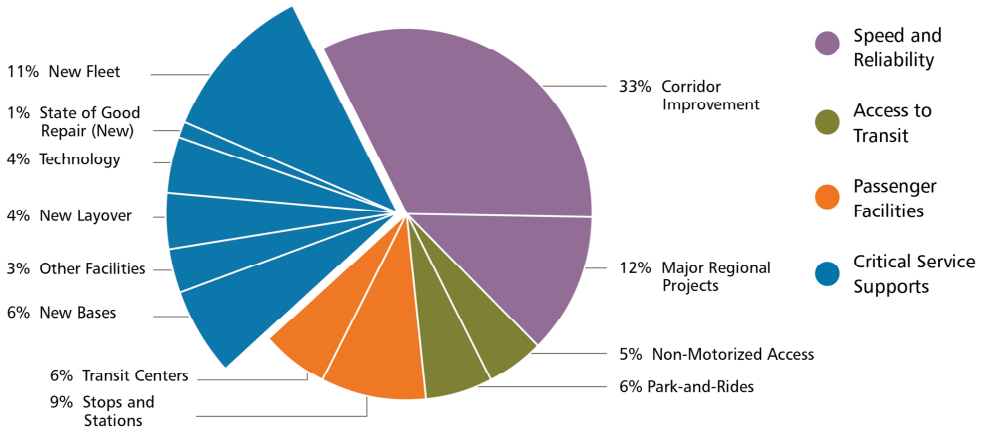
Table E-4 METRO CONNECTS Bus Stops and Shelters Estimated Costs

Bus Stops and Stations Investments	Unit	Total Units	Estimated Metro Costs (in millions YOE $)
Bus Stop Projects			
Shelters (low boarding activity)	Shelter	1,180	$132
Shelters (low transfers)	Shelter	350	$105
Shelters (high transfers)	Shelter	405	$169
Existing Bus stop Improvements	Bus Stop	1,615	$60
Standard Bus stop (RapidRide)	Bus Stop	110	$21
Enhanced Bus stop (RapidRide)	Bus Stop	240	$46
Station (RapidRide)	Station	720	$369
Unidentified Investments	---	---	$88
		Total	**$990**

Appendix F. Critical Service Supports

Critical Service Supports include technology, new fleet, new bases, new layover, other facilities, and keeping new facilities in a state of good repair. Together, these investments make up 29 percent of the METRO CONNECTS Capital Investment.

Figure F-1 Critical Service Supports Portion of Capital Costs



Technology

Over the last few years, technology investments have represented significant portions of Metro's budget. Improvements such as the ORCA system, a new radio system, real time arrival signs at RapidRide stations and elsewhere in the system, and next stop reader boards and audio announcements on all buses provide valuable information and benefits to Metro's customers and help to improve Metro's operations. Other technological investments help Metro collect customer and operational data, manage network operations, and provide improved customer information. Technology investments are expected to continue through the period of METRO CONNECTS as a means to continuously improve payment systems, bus operations, and customer information. METRO CONNECTS proposes an additional $448 million in technology investments to be able to take advantage of new technologies to improve the customer experience and to increase the efficiency of current operations. As with all of our assets, our technology investments will require continuous maintenance and upgrades. These costs are included under State of Good Repair, and will include maintenance and upgrades of physical technology components, such as real time arrival signs and ORCA card readers, as well as upgrades to ensure we have the most useful and effective software.

Technology investments make up 4 percent of the METRO CONNECTS capital investment.

New Fleet

In order to provide the service levels described in METRO CONNECTS Metro will need to expand its fleet. These costs represent 11 percent of the METRO CONNECTS capital investment. Through the network improvements, Metro anticipates that fleet utilization will improve and the doubling of ridership envisioned by 2040, does not require a doubling of the bus fleet.

New Fleet Costing Assumptions

Metro operates a bus fleet of approximately 1,400 vehicles. This fleet includes a mix of standard and articulated hybrid diesel-electric buses, electric trolley buses, and some remaining clean diesel buses which will be gradually phased out of the fleet. Metro currently operates a bus fleet mix of approximately 50 percent articulated buses and 50 percent standard buses (currently 40-foot buses). By 2018, 100 percent of the bus fleet will be hybrid or electric. This supports the King County Strategic Climate Action Plan which provides a goal for Metro to operate a zero emission bus fleet. The evaluation of emerging technologies will be integral to this transition. In 2016, Metro introduced its first all-battery powered bus into service. In addition to buses, Metro has an active paratransit fleet of over 300 vehicles and growing active vanpool fleet of almost 1,750 vehicles.

Metro will need to expand the size of its bus fleet in order to support the added service hours envisioned in METRO CONNECTS. The number of additional buses needed to support the METRO CONNECTS 2040 service network is calculated based on the amount of service hours needed to meet service levels. Metro calculated the need for additional bus fleet investment based upon the 2040 service network using the output from the Sound Transit Incremental Ridership Forecasting Model. This model (which is also used to forecast future transit ridership levels for all transit agencies in King County) directly outputs fleet estimates based on the route length and average speed. Metro's standard "reserve ratio" was applied to include the need for spare buses to ensure reliable service.

Based on the current service configuration and split between peak and non-peak service, Metro currently needs a bus for every 2,500 annual service hours provided. This assumption is based on historically high morning and evening peaks for bus service. In the envisioned 2040 service network, morning and evening service peaks would be less pronounced and service hours would be more evenly distributed throughout the day. The more even distribution of service throughout the day would shift the demand for new buses from one per every 2,500 hours upwards to one per every 3,200 service hours. A total of 2.5 million additional service hours would be required to support the METRO CONNECTS 2040 service network, which would require between 550 and 650 additional buses depending on the final distribution of services.

Consistent with the vision in METRO CONNECTS, Metro anticipates growth in both the paratransit and vanpool fleets. The paratransit fleet would be expected to grow by 170 vehicles and the vanpool fleet would be expected to more than double, growing by 1,750 vehicles.

Table F-1 shows the costing assumptions for new fleet vehicles.

Table F-1 Bus Fleet Costing Assumptions

Fleet Type	Assumptions	Unit Costs
Bus Fleet	New bus purchases split between: • 40' Bus - 50% of total • 60' Bus - 50% of total	Vehicle costs were developed using 2015 prices as follows: • 40' Bus - $700,000 • 60' Bus - $1,1000,000
Vanpool Fleet	1,800 new vans would be needed from 2015 to 2040 to support an estimated 3 % annual increase in passenger trips, up to a total of 8,100,000 trips per year.	Vehicle costs were developed using an average cost per van of $25,000
Paratransit Fleet	140 total new vans would be needed from 2015 to 2040 to support an anticipated 55% increase in ridership, up to a total of 1,400,000 passenger trips per year.	Vehicle costs were developed using the average cost per van of $89,000

Fleet Cost Estimates

Table F-2 summarizes the total fleet investment needed to support the envisioned 2040 service network. The estimates include cost for the initial purchase of incremental vehicles, as well as associated replacement vehicles.

Table F-2 METRO CONNECTS Fleet Investments Estimated Costs

Fleet Investments	Unit	Total Incremental Units	Estimated Metro Costs (in millions YOE $)
Bus Fleet	Vehicles	620	$950
Vanpool Fleet	Vehicles	1,750	$122
Paratransit Fleet	Vehicles	170	$80
		Total	**$1,152**

New Bases and Other Facilities

To support the provision of transit service in King County, Metro needs to ensure that it has sufficient capacity to dispatch and service its vehicles. In addition, facilities to support areas of growth such as vanpool and passenger facilities may be required. Such facilities represent a large capital investment. The following sections detail the investments needed for Metro to expand its network of supporting infrastructure, including layover, bus and vanpool base facilities, the trolley network, maintenance facilities consistent with the vision contained in METRO CONNECTS. Any such projects will be done in close coordination with partners to ensure that these facilities address local needs in addition to Metro's. Also, given the local considerations for the existing trolley system, it is expected that expansion of the trolley system will be done with financial contributions from partners.

New Bus Bases

Metro currently maintains and operates seven bus bases located around King County. Bus bases serve a variety of daily operational needs that are crucial to providing transit service, such as bus parking and vehicle maintenance. They provide for bus maintenance, repair, inspection, fueling, interior and exterior washing, and minor paint and body work. Bases also include facilities to support employees located at that facility, such as office space, transit operator lockers and luncheon rooms, and meeting rooms.

Adequate base facilities are essential to supporting the proposed METRO CONNECTS 2040 service network. Increasing the overall fleet requirements by between 550 and 650 buses will require additional base capacity (see Fleet section). Currently, Metro's bases vary in the number of buses they can support – from roughly 125 buses to about 270 buses; therefore Metro would need to provide capacity either through siting and constructing new operating bases or expanding capacity at existing facilities through renovation and modifying the footprint of the base. Availability of land and cost of potential sites will affect the location and size of bases that are built by 2040. In addition, new base facilities could be shared with other transit agencies as a way to reduce costs for all agencies. Reducing operations costs and deadheading is a key element in siting new facilities. With significant increases in service projected in south King County, a new bus base would likely be needed there. Metro may also need to make modifications to existing bases to be consistent with changes in fleet and propulsion technology, such as charging stations for battery-powered buses.

Vanpool Distribution Base

Metro currently manages a fleet of over 1,900 vans to support its vanpool and other programs. This fleet is expected to increase to nearly 2,900 vans by 2026 and almost 3,700 vans by 2040. Vanpool distribution bases require parking

for vans, van inspection and van wash bays, storage for van accessories, structures to support office space for staff while on-site, a sales office, and parking for customers coming to pick up and return vehicles. No maintenance or fueling is performed at these facilities. A planned expansion of an existing vanpool distribution base will support the next 10 years of growth. One additional new facility with approximately 300 spaces would be needed in 2027 and would support the program through the envisioned demand in 2040. Similar to bus maintenance bases, availability of land and cost of potential sites would affect the size and location of a future vanpool distribution base. Co-locating or developing the vanpool distribution base with a bus maintenance base could be considered.

Access Fleet Base

King County Metro currently has an active paratransit fleet of over 300 vans comprised of a variety of vehicle sizes and types. The Access program currently leases operating bases located in Bellevue, Kent, Shoreline, and Seattle to support this fleet. Access facility requirements include fenced, paved, secure and lighted lot for 100 – 135 vehicles, on-site fueling, onsite maintenance services, and general office space for employees. It is estimated that the program would need to add another base by 2030. Based upon the envisioned 2040 service network, an eastside location would be preferred. Similar to bus maintenance bases, availability of land and cost of potential sites would affect the size and location of a future vanpool distribution base. Co-locating or developing the Access fleet base with a bus maintenance base could be considered.

Facilities Maintenance Site

In addition to bases, Metro needs satellite facilities maintenance sites for the efficient report and dispatch of staff which support passenger facilities. These sites are used for fabrication, maintenance, and repair of Metro facilities, such as bus shelters. Major components of these sites include a fabrication/repair and carpentry shop; landscaping, sign, and constructor shops; covered materials shed(s); covered and heated storage; vehicle parking areas; security fencing; and office space for on-site staff. One additional facilities maintenance site will be needed to support the METRO CONNECTS 2040 service network. Availability of land and cost of potential sites would affect the size and location of a future facilities maintenance site.

New Trolley Wire

The METRO CONNECTS 2040 service network anticipates continued use of the existing trolley bus network as well as some minor modifications to the network. These modifications generally constitute fixing gaps in the existing network to allow for longer or more continuous routes. Metro anticipates a 10 percent increase in the total number of trolley overhead wire miles. Modifications to the trolley bus network includes construction of new two-way wire, including poles, switches, and wire.

New Bases and Other Facilities Costing Assumptions

New Bus Base Assumptions

The additional capacity was determined by the size of the future bus fleet. Estimated costs were developed from historical information from a 2008 estimate developed by King County Metro's Design and Construction section. This bus base estimate was developed using 2008 dollars and designed for 250 vehicles. In order to relate this estimate to current year dollars, a CCI inflation adjustment was included. The total planning, design and construction cost was divided by the number of vehicles to determine a unit cost of construction per vehicle.

Typical elements for bus bases are as follows:

- Site excavation and preparation
- Paving (12 acres)
- Landscaping and irrigation
- Storm water drainage and utilities
- Underground tank farm
- Security fencing and access

- Operations building (15,000 sq. feet)
- Fuel/wash building (10,000 sq. feet)
- Maintenance building (60,000 sq. feet)
- Major Equipment
- Building furniture
- Electrical lighting
- Off-site mitigation, including roadway development, intersection improvements, and traffic signals
- Right-of-way (based on average size needed per bus determined by the current size of the Metro bus base)

Vanpool Distribution Base Assumptions

One vanpool distribution facility would be required in the future to accommodate future fleet growth beyond the existing vanpool facility's capacity. The new facility must provide up to 100 parking spaces for vehicles by 2027. The new facility would need a building on-site to support office space for staff, a sales office, van inspection and van wash bays, storage for van accessories, and a training/multipurpose room. The existing vanpool facility maintains 50 percent of the site for landscaping, and the new facility would be built with a similar configuration.

Unit costs were developed using the existing Van Distribution facility located in Redmond to determine the approximate size and support facility requirements. The Redmond facility includes space for 530 vehicles, therefore unit costs were developed based on the unit of measure of per vehicle space. The ratio was applied to the total quantity of vehicle spaces required in the future. In addition, unit costs for the square footage cost of a building were based on the King County Metro bus base project cost per square foot. Equipment and furniture needs were also included at 15 percent, similar to the King County Metro bus base estimate.

Surface parking lot costs were determined by developing an average from other planning level projects, including Sound Transit's Lynnwood Link Extension, ST3 planning, and the Puyallup Sounder station. The average cost determined by these three projects was divided by the total number of stalls for each specific location to determine a unit price per stall. The facility lot size was based on a ratio determined by the existing Redmond facility. Similar to the Redmond facility, it was assumed that half the site would require landscaping. Unit costs for landscaping were included similar to ST3 planning level unit costs.

Typical Elements include:

- Surface parking for up to 700 vehicles
- Service building
- Landscaping
- Right-of-way

Access Fleet Base Assumptions

One new access fleet facility would be required in the future. This facility must be able to accommodate up to 100 to 135 vehicles. The site would need to be fenced, paved, secure, and lighted. The facility would also require on-site fueling with diesel, unleaded gasoline with liquid propane gas as an option. The facility would include on-site maintenance services, including nine maintenance bays, work area, parts room, tire storage, fluids distribution and waste, washing area, backup power supply, and space for employees such as lunch/meeting rooms, training room, dispatch office, and manager offices. The approximate space of the maintenance building would be 13,000 square feet. Similar to the vanpool distribution facility, it is assumed that 50 percent of the site would be landscaping.

Unit costs were developed consistent with the methodology used for the Van Distribution Base. Equipment and furniture needs were also included at 15 percent, similar to the King County Metro bus base estimate.

Typical elements include:

- Surface parking up to 135 vehicles
- Maintenance building (13,000 sq. feet)
- Landscaping
- Right-of-way

Facilities Maintenance Site Costing Assumptions

One additional facilities maintenance site will be required to support expanding passenger facilities. This facility would be required when either the operating base capacity is addressed or if three or more parking garages and/or transit centers were constructed. The facility would include common elements similar to the existing facility such as office spaces, lunchroom, mechanical room, sign shop, stores area with loading dock and secure area, fabrication/repair and carpentry shop, landscape shop, locker rooms, constructor shop, laundry room, and a data/computer room. In addition, the proposed facility would need to double the truck yard and provide the following amenities: covered sand and landscape material shed, covered and heated external storage, paint and sand blast room to accommodate shelter refurbishment, and full security fencing, door locks, and cameras. The site is assumed to include 10 percent landscaping.

Unit costs were developed using the existing North Facility site details to determine approximate size and support facility requirements. The number of parking stalls, support facility building size, and size of the site is expected to be 1.5 times the existing North Facility.

Unit costs for the building were based on the 2008 King County Metro bus base cost per square foot estimates. In addition, equipment and furniture needs were also included at 15 percent. Surface parking lot costs were determined by developing an average from other planning level projects, including Sound Transit's Lynnwood Link Extension, ST3 planning, and the Puyallup Sounder station. The average cost of these projects was used to develop a per stall estimate that was then applied to this facility. The facility lot size was based on increasing the existing North Facility site by 1.5 times. It was assumed that 10 percent of the site would require landscaping. Unit costs for landscaping were included similar to ST3 planning level unit costs. Typical elements include:

- Support buildings
- Employee Parking
- Landscaping
- Right-of-way

New Trolley Wire Costing Assumptions

New trolley wire would be added to fix gaps in the existing trolley wire network. The future new trolley wire is assumed to increase by at least 10 percent based on the existing total trolley overhead wire miles.

Costs for trolley wire investments were estimated by using historical construction information by King County Metro from the most recent trolley projects and then extrapolated into the future. The estimated costs include construction, design, project management, and construction administration. Because these efforts will be extension to existing trolley wire, as opposed to totally new wire, 65 percent of the historical costs were used for the estimates. These costs do not include the cost of new substations, or land acquisition. Typical elements include:

- New wires (two-way)
- New poles
- Switches

New Bases and Other Facilities Cost Estimates

Table F-3 shows the estimated costs for new bases and other facilities.

Table F-3 METRO CONNECTS New Bases and Other Facilities Cost Estimates

New Bases and Other Facilities Investments	Unit	Total Units	Estimated Metro Costs (in millions YOE $)
Bus Maintenance Base	Vehicles	620	$625
VanPool Distribution Base	Base	1	$105
Access Fleet Base	Base	1	$41
Facilities Maintenance Site	Site	1	$75
New Trolley Wire*	Miles	7	$28
Unidentified Investments	---	**---**	**$88**
		Total	**$962**

New Bus Layover

The ability to have buses in the right place to start and end their routes, results in a more efficient system as less time is spent getting the bus to the right location. This is known as bus layover. Time for layover is included in bus schedules and is the periods of time between trips when drivers can take a break, including using the restroom. Layover also provides a cushion of time that allows the driver to start the next trip on schedule if the preceding trip ran late. Current layover facilities include space at transit centers where buses can wait as well as street space reserved for transit use in a place that does not disrupt traffic and is located throughout the county. Street space layover is often used at trip ends that do not terminate at transit centers or other off-street facilities. Having dedicated locations for layover serves an important function by providing Metro with increased flexibility for route scheduling and operations.

METRO CONNECTS 2040 will rely on appropriately sized and located layover facilities. Use of on-street parking is becoming more difficult to locate. The need for future layover space was estimated using the following methodology:

- Calculated future layover need by subregion (see Figure F-2~~Figure F-2~~~~Figure F-2~~~~Figure F-2~~) based on demand by route category
- Identified existing layover spaces based on the current route end points
- Calculated future layover need by identifying the number of bus route ends within a subarea. Future layover demand was assumed at a number of layover spaces per every peak hour bus trip based on service that ends in the subarea – this is consistent with existing layover space demand per peak hour bus trip. The assumed layover demand for each route service type was the following:
    - Frequent – Four layover spaces
    - Express – Two layover spaces
    - Local – 1 layover space
- Calculated net new layover demand by subtracting existing layover supply against new demand within the subarea; planned layover spaces at Sound Transit and Metro transit centers were also considered in the calculations.
- Assumed all new layover spaces would be off-street; no low-cost on-street spaces were assumed for cost estimating purposes
    - The rationale for the all off-street assumption is an acknowledgement that some of the existing on-street layover spaces could be lost to development over time. There is no way of knowing which layover spaces might be lost or how developers would mitigate for lost spaces.

In addition to the layover space included in planned transit centers (See Transit Centers and Transfer Points), Metro would need to secure approximately 270 additional layover spaces throughout the county to support the METRO CONNECTS 2040 service network.

Specific siting of layover facilities would be identified in collaboration with local agencies and right-of-way owners to ensure the most efficient service network (e.g., layover should be selected near the termini of routes to reduce deadheading wherever possible). Additionally, layover facilities could be jointly maintained and operated with other transit providers.

Layover Costing Assumptions

For costing estimating all new layover spaces were assumed to be accommodated in off-street layover facilities. The cost estimates assumed off-street facilities in order to provide a conservative estimate as many locations are spatially constrained. There are also existing on-street facilities that may be converted into off-street facilities in the future. Before facilities are built, the availability of on-street facilities will be evaluated to determine if right-of-way space can be secured.

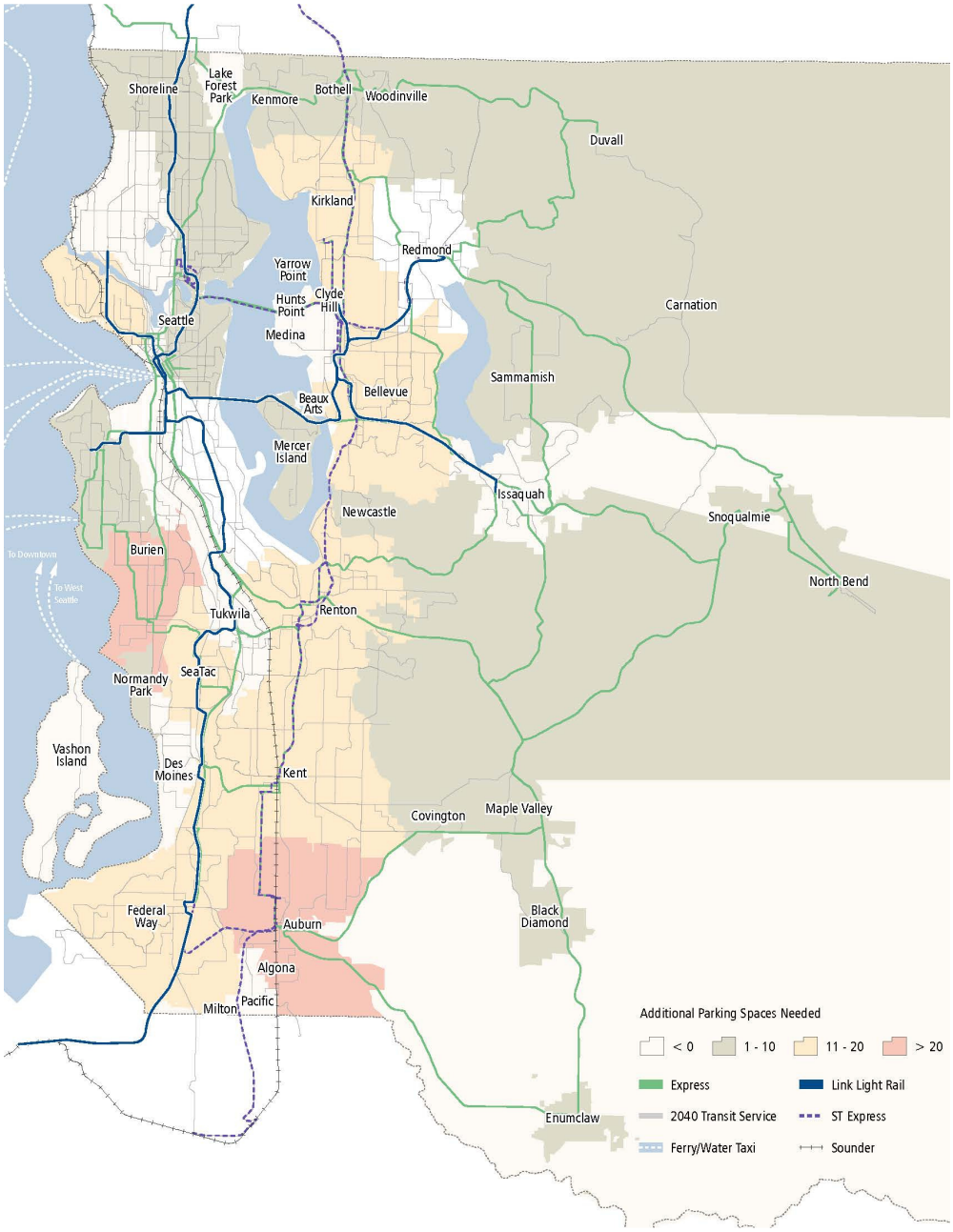
Project estimates were based on the layover element of the One Center City project currently being developed by King County and City of Seattle. The One Center City project evaluated multiple options to determine a unit cost range which was then converted to a per unit price per layover bay.

Typical elements for an off-street layover facility include:

- Site excavation and preparation
- Access
- Road paving
- Driveway(s)
- Sidewalk
- Restroom facilities for drivers
- Illumination
- Signal work
- Right-of-way (based on average size of layover space needed per bus determined by the City Center project)

Figure F-2~~Figure F-2~~~~Figure F-2~~~~Figure F-2~~ identifies potential locations for future layover space by subregion, not including planned transit centers.

Figure F-2 METRO CONNECTS Location of Future Layover Space by Subregion



Layover Cost Estimates

Table F-4 shows the estimated costs for new layover.

Table F-4 METRO CONNECTS Layover Cost Estimates

Layover Investments	Unit	Total Units	Estimated Metro Costs (in millions YOE $)
Layover Spaces	Bus Bay	270	$370
		Total	**$370**

State of Good Repair (New Infrastructure)

The number of assets owned by Metro is expected to grow as the METRO CONNECTS vision is implemented. As these new items are completed, they will be added to the inventories that are used to determine the investments needed to maintain them in a state of good repair. Newer buildings and facilities generally do not require infrastructure maintenance for the first several years that they are in operation. However, as facilities reach the five, 10 and 15 year marks, additional investment in state of good repair activities is anticipated. As a result, the budget for state of good repair is expected to increase $132 million between 2018 and 2040, representing another 1 percent of the total capital budget envisioned to implement METRO CONNECTS.

Appendix G. RapidRide Expansion Report

Background

RapidRide is Metro's Bus Rapid Transit (BRT) service program. This successful program provides frequent service and enhanced customer amenities in major travel corridors. Compared to the bus routes they replaced, the RapidRide A to F lines combined carry about 50 percent more riders – about 60,000 passenger trips per weekday. In addition, travel time is as much as 20 percent faster, with most lines saving one to five minutes per trip.

As part of the budget planning process for the 2017-2018 biennial budget, the Service Development and Strategy and Performance groups were asked to develop a preliminary proposal for expanding the RapidRide program beyond the City of Seattle's Move Seattle initiative.

The following factors were considered in identifying corridors that may be appropriate for RapidRide:

- Creating an interconnected network of bus rapid transit throughout the County
- Performance of underlying routes and/or route segments
- Geographic distribution
- Social Equity
- Designated Speed and Reliability Corridors
- Integration with ST2 and projected ST3 projects
- Integration with the Move Seattle Initiative
- Integration with Metro's Long Range Planning efforts

This report analyzes frequent corridors identified in METRO CONNECTS for potential RapidRide lines. More information on how the METRO CONNECTS 2040 service network was developed can be found in the METRO CONNECTS Appendix A. Candidate RapidRide lines are identified as either near-term (~2025) or long-term (~2040). Candidate RapidRide lines within the City of Seattle match those identified in the Seattle Transit Master Plan.

Assessing Candidate RapidRide Lines

Evaluation

To identify candidate RapidRide lines for the 2025 and 2040 network vision, a variety of factors were taken into account. The frequent service network in METRO CONNECTS, which has been coordinated with local jurisdiction transit plans, was considered the starting point for potential future RapidRide lines. In general, frequent service in METRO CONNECTS was selected for high ridership route segments connecting numerous destinations along a route, and where additional growth is planned in the future.

Measures of productivity, social equity, and geographic value were all used to determine which routes within METRO CONNECTS should be designated for future RapidRide investments. These measures expand on what is used in the Metro's Service Guidelines and the 2014 King County Metro RapidRide Performance Evaluation Report (Table G-1). Half-mile buffers were used instead of quarter-mile buffers when running many of the calculations. This

is consistent with the idea that high quality and very frequent transit is more capable of attracting riders from a larger catchment area. Each above measure was selected to provide insight into the productivity, social equity, and geographic value of each corridor.

Table G-1 RapidRide Evaluation Measures

Factor	Measure
Productivity	Existing Employment Density
	Existing Population Density
	Existing Boardings / Hour
	2040 Estimated Employment Density
	2040 Estimated Population Density
Social Equity	Population below Poverty
	Minority Population
Geographic Value	Number of centers connected
	Major transfer points and hubs connected

Each corridor is designated as "urban" or "suburban" as defined by Metro's service guidelines, and is identified as either a candidate RapidRide corridor or an existing RapidRide Route. For each measure, the corridors are ranked on a scale of high, medium or low performance. High indicates that a corridor scored in the top 25 percent of its Urban or Suburban designation. Medium indicates that a corridor scored less than the top 25 percent, but greater than the bottom 25 percent. Low means that a corridor scored in the bottom 25%.

The measures used to evaluate Candidate RapidRide routes are described on the next page.

Current Productivity

- Existing Employment Density
    - Current estimated population within a half-mile buffer of each corridor divided by the length of the corridor. Used 2012 Longitudinal Employer-Household Dynamics data.
- Existing Population Density
    - Current estimated jobs within a half-mile buffer of each corridor divided by the length of the corridor. Used 2013 American Community Survey data.
- Existing Boardings / Hour
    - The average number of daily boardings on weekdays in spring 2015 on the existing underlying route(s) – no truncation – for each METRO CONNECTS route. Average weekday daily boardings are divided by the daily revenue hours for each existing route to get Daily Boardings/Hour.

2040 Productivity

- 2040 Employment Density
    - 2040 estimated jobs within a half-mile buffer of each corridor divided by the length of the corridor.
- 2040 Population Density
    - 2040 estimated population within a half-mile buffer of each corridor divided by the length of the corridor.

Social Equity

- Population below Poverty
    - Used census data from the 2013 American Community Survey, based on a 5-year period from 2008 - 2013 to calculate people per square mile falling below the nationwide poverty level. A half-mile "as the crow flies" buffer is used to determine what percentage of a census block falls within a half-mile of the corridor. The percentage of each census block that is overlapped by the half-mile buffer is multiplied by the number of people in poverty in each census block. The result is an estimated total number of people in poverty within a half-mile of the corridor. This estimate is then divided by the total current estimated population within the half-mile buffer to get a percentage.
- Minority Population
    - Used census data from the 2013 American Community Survey, based on a 5-year period from 2008 - 2013 to calculate people per square mile who are non-white of Hispanic origin. A half -mile "as the crow flies" buffer is used to determine what percentage of each census block falls within a half mile of the corridor. The percent of each census block that is overlapped by the half mile buffer is multiplied by the total number of minorities in each census block. The result is an estimated total number of minorities within a half-mile of the corridor. This estimate is then divided by the total current estimated population within the half-mile buffer to get a percentage.

Geographic Value

- Centers Connected
    - Number of Urban, Manufacturing, Industrial, and Activity Centers within a half mile of a corridor.
- Major Transfer Points and Hubs Connected
    - Number of Park & Rides, Transit Centers, Sounder Stations, and Link Stations (current, planned and proposed) that are on a corridor.

Findings and Discussion

Table G-2 2025 RapidRide Candidate Lines

						Productivity			Equity		Geographic Value	
Urban or Suburan		LRP ID #	To / From / Via	Comparable Route(s)	One-Way Miles	Current Boardings /Hour	Current people /mile	Current jobs /mile	Percent Poverty	Percent Minority	Number of Centers	Transfer Points & Hubs
Urban	Candidate RapidRide Lines	RR 40	Lake City - Seattle CBD - Ballard	40	13.7	Low	Medium	Medium	Low	Medium	High	High
		RR 120	Burien TC - Seattle CBD - Westwood Village	120	13.0	Medium	Low	Medium	Medium	High	Medium	Medium
		1002	Richmond Beach - UW - 15th Ave NE	73, 373, 348	12.1	Low	Low	Low	Medium	Medium	Medium	Medium
		1009	Bothell - UW - Lake City	372	14.8	Low	Low	Low	Medium	Medium	Medium	Medium
		1012	Ballard - Children's Hospital - Wallingford	44	5.9	High	High	Medium	Medium	Low	Medium	Low
		1013	Northgate - Mount Baker - Seattle CBD	67, 70	7.1	Medium	High	High	Medium	Medium	Medium	Medium
		1014	Loyal Heights - U. District - Green Lake	45	6.5	High	Medium	Medium	Medium	Low	Medium	Medium
		1059	Madison Valley - Seattle CBD - E Madison St	11, 12	2.4	Medium	High	High	Medium	Medium	Low	Low
		1061	Uptown - Madison Park - Capitol Hill	8, 11	7.6	Medium	Medium	Medium	Low	Low	Low	Medium
		1063	U. District - Rainier Beach - Mount Baker	7s, 48	10.7	Medium	Medium	Low	High	High	Medium	Medium
		1064	U. District - Othello - Beacon Hill	36, 49	10.1	Medium	Medium	Medium	High	High	Medium	Medium
		1071	U. District - Mount Baker - Seattle CBD	7n, SLU	4.8	Medium	High	High	High	High	Medium	Medium
		1202	Sand Point - Seattle CBD - Green Lake	62	11.3	Low	Medium	Medium	Low	Low	Medium	High
		1996	U. District - Northgate - Lake City	75	10.1	Medium	Low	Low	High	Medium	Medium	Medium
	Current RapidRide	C Line	SLU - Westwood - West Seattle	C	10.8	Medium	Medium	Medium	Medium	Medium	Medium	Medium
		D Line	Crown Hill - Seattle CBD - Ballard	D	9.2	High	Medium	High	Low	Medium	Medium	Medium
		E Line	Shoreline - Seattle CBD - SR-99	E	13.1	High	Medium	Medium	Medium	Medium	Medium	High
Suburban	Candidate RapidRide Lines	1025	Kenmore - Overlake - Totem Lake	234, 235	15.7	Low	Medium	Medium	Low	Low	Low	Low
		1027	Totem Lake - Eastgate - Bellevue	234, 235, 271	14.6	Low	Medium	High	Low	Low	Medium	High
		1028	Crossroads - Bellevue - NE 8th St	B South	3.3	High	High	High	Medium	Medium	Low	Low
		1030	Overlake - Renton - Newcastle	240, 245	17.7	Medium	Low	Medium	Medium	Medium	High	Medium
		1033	Renton - Auburn - Kent	169, 180	16.5	Medium	Medium	Medium	Medium	High	Medium	High
		1037	Kirkland - Eastgate - Overlake	221, 245	10.8	Low	Medium	Medium	Low	Medium	Low	Medium
		1052	Twin Lakes - Green River CC - Federal Way	181	13.9	Medium	Low	Low	Medium	Medium	Medium	Medium
		1056	Highline CC - Green River CC - Kent	164, 166	11.9	Medium	Medium	Low	High	Medium	Low	Low
		1215	Kenmore - Shoreline - North City	331	8.9	Low	Medium	Low	Medium	Low	Medium	Low
		1514	Covington - SeaTac - Kent	180, 168	16.5	Medium	Low	Low	Medium	Medium	Medium	Medium
	Current RapidRide	A Line	SeaTac - Federal Way - Des Moines	A	12.0	High	High	Medium	High	High	Medium	High
		B Line	Redmond - Bellevue - Overlake	B	9.9	High	High	High	Low	Medium	Medium	Medium
		F Line	Renton - Burien - Tukwila	F	12.9	Medium	Low	Medium	High	High	Medium	Medium

						Productivity			Equity		Geographic Value	
Urban or Suburan		LRP ID #	To / From / Via	Comparable Route(s)	One-Way Miles	Current Boardings /Hour	Current people /mile	Current jobs /mile	Percent Poverty	Percent Minority	Number of Centers	Transfer Points & Hubs
Urban	Candidate RapidRide Lines	RR 40	DT Seattle - Fremont - Ballard - Northgate - Lake City	40	13.7	Medium	Medium	Medium	Low	Low	High	High
		RR 120	Seattle CBD - Delride - Burien	120	13.0	Medium	Low	Medium	Medium	Medium	Medium	Medium
		1002	U. District - Richmond Beach - 15th Ave NE	73, 373, 348	12.1	Medium	Low	Low	Medium	Medium	Medium	Medium
		1009	Bothell - Kenmore - Lake Forest Park - UW	372	14.8	Medium	Low	Low	Medium	Medium	Medium	Medium
		1012	Ballard - Wallingford - U. Distict - Children's Hospital	44	5.9	High	High	Medium	High	Low	Medium	Low
		1013	U. District - Seattle CBD - Eastlake	67, 70	7.1	Medium	High	High	Medium	Low	Medium	Medium
		1014	Loyal Heights - Greenwood - U. Distict	45	6.5	High	Medium	Medium	Medium	Low	Medium	Medium
		1059	Madison Valley - Seattle CBD	11, 12	2.4	Medium	High	High	High	Medium	Medium	Low
		1061	Uptown - SLU - Capitol Hill - Madison Park	8, 11	7.6	Low	Medium	Medium	Low	Medium	Medium	High
		1063	U. District - Central Dist - Mt Baker - Rainier Beach	7s, 48	10.7	Low	Medium	Low	Low	High	High	Medium
		1064	U. District - Capitol Hill - Beacon Hill - Othello	36, 49	10.1	Medium	Medium	Medium	Medium	High	Medium	High
		1071	Mount Baker - SLU - Seattle CBD	7n, SLU	4.8	Low	High	High	Low	Medium	Medium	Medium
		1202	Sand Point - Green Lake - Fremont - Seattle CBD	62	11.3	High	Medium	Medium	High	High	Medium	High
		1996	Northgate - UW - Sand Point	75	10.1	Medium	Low	Low	Medium	Medium	Medium	Low
	Current RapidRide	C Line	Seattle CBD - West Seattle - Fauntleroy - Westwood	C	10.8	Low	Medium	Medium	High	High	Medium	Medium
		D Line	Crown Hill - Ballard - Seattle CBD	D	9.2	High	Medium	High	Medium	Medium	Low	Low
		E Line	Aurora Village - Aurora - Seattle CBD	E	13.1	Medium	Medium	Medium	Low	Low	Low	Low
Suburban	Candidate RapidRide Lines	1025	Kenmore - Totem Lake - Overlake	234, 235	15.7	Low	Medium	Medium	Low	Medium	Low	Medium
		1027	Totem Lake - Kirkland - Bellevue - Eastgate	234, 235, 271	14.6	High	Medium	High	Medium	High	Low	Medium
		1030	Overlake - Eastgate - Newcastle - Renton	240, 245	17.7	Medium	Low	Medium	High	Medium	Medium	Medium
		1033	Renton - Kent East Hill - Kent - Auburn	169, 180	16.5	Medium	Medium	Medium	High	Medium	Medium	Medium
		1037	Kirkland - Overlake - Eastgate	221, 245	10.8	Medium	Medium	Medium	Medium	Low	High	High
		1052	Twin Lakes - Federal Way - Green River CC	181	13.9	Low	Medium	Low	Low	Medium	Medium	Low
		1056	Highline CC - Kent - Green River CC	164, 166	11.9	Medium	Medium	Low	Medium	High	Medium	Medium
		1215	Kenmore - North City - Shoreline CC	331	8.9	Low	Medium	Low	Medium	Medium	Medium	Medium
		1514	Covington - Kent - The Lakes - SeaTac	180, 168	16.5	Medium	Low	Medium	Low	Medium	Medium	Medium
	Current RapidRide	A Line	SeaTac - Federal Way	A	12.0	High	High	Medium	Medium	Low	Medium	Medium
		B Line	Redmond - Overlake - Bellevue	B	9.9	High	High	High	Medium	Medium	High	High
		F Line	Renton - Tukwila - SeaTac - Burien	F	12.9	Medium	Low	Medium	High	High	High	Medium

The 23 candidate RapidRide lines identified for this near-term analysis were drawn from the 2025 frequent service network in METRO CONNECTS. To compare and discuss the merits of each candidate, the productivity, social equity, and geographic value of each corridor were calculated (as shown in the above matrix with different shades of green).

There are 13 proposed new near-term 2025 RapidRide lines and six existing RapidRide routes in Table G-3. As Metro begins work on new RapidRide lines, Metro will work closely with cities and the public to plan alignments, stop and station locations, and connecting service. Sequencing of these lines will depend on when other large transportation projects are planned to be implemented within the region and when funding becomes available. The exact pathways of proposed lines may change in the design and implementation process, which includes Metro's regular service change process.

Table G-3 Proposed 2025 RapidRide Lines

LRP Route ID	Comparable Route(s)	To / From / Via	One-Way Miles	Urban (U) or Suburban (S)
1009	372	Bothell - UW - Lake City	15	U
RR 40	40	Lake City - Seattle CBD - Ballard	14	U
1012	44	Ballard - Children's Hospital - Wallingford	6	U
1013	67, 70	SLU - Northgate - Eastlake	7	U
1027	234, 235, 271	Totem Lake - Eastgate - Bellevue	15	S
***1028 (B Line)**	B South	Crossroads – Bellevue – NE 8th St	3	S
1030	240, 245	Overlake - Renton - Newcastle	18	S
1033	169, 180	Renton - Auburn - Kent	16	S
RR 120	120	Burien TC - Seattle CBD - Westwood Village	13	U
1056	164, 166	Highline CC - Green River CC - Kent	12	S
1059	11, 12	Madison Valley - Seattle CBD - E Madison St	2	U
1063	7s, 48s	U. District - Rainier Beach - Mount Baker	11	U
1071	7n, SLU	SLU- Mount Baker - Seattle CBD	5	U
1052	181	Twin Lakes - Green River CC - Federal Way	14	S
A Line	A	SeaTac - Federal Way - Des Moines	12	S
~~**B Line**~~	~~B~~	~~Redmond - Bellevue - Overlake~~	~~10~~	~~S~~
C Line	C	SLU - Westwood - West Seattle	11	U
D Line	D	Northgate - Seattle CBD - Ballard	9	U
E Line	E	Shoreline - Seattle CBD - SR-99	13	U
F Line	F	Renton - Burien - Tukwila	13	S

*Includes changes to a current RapidRide Lines

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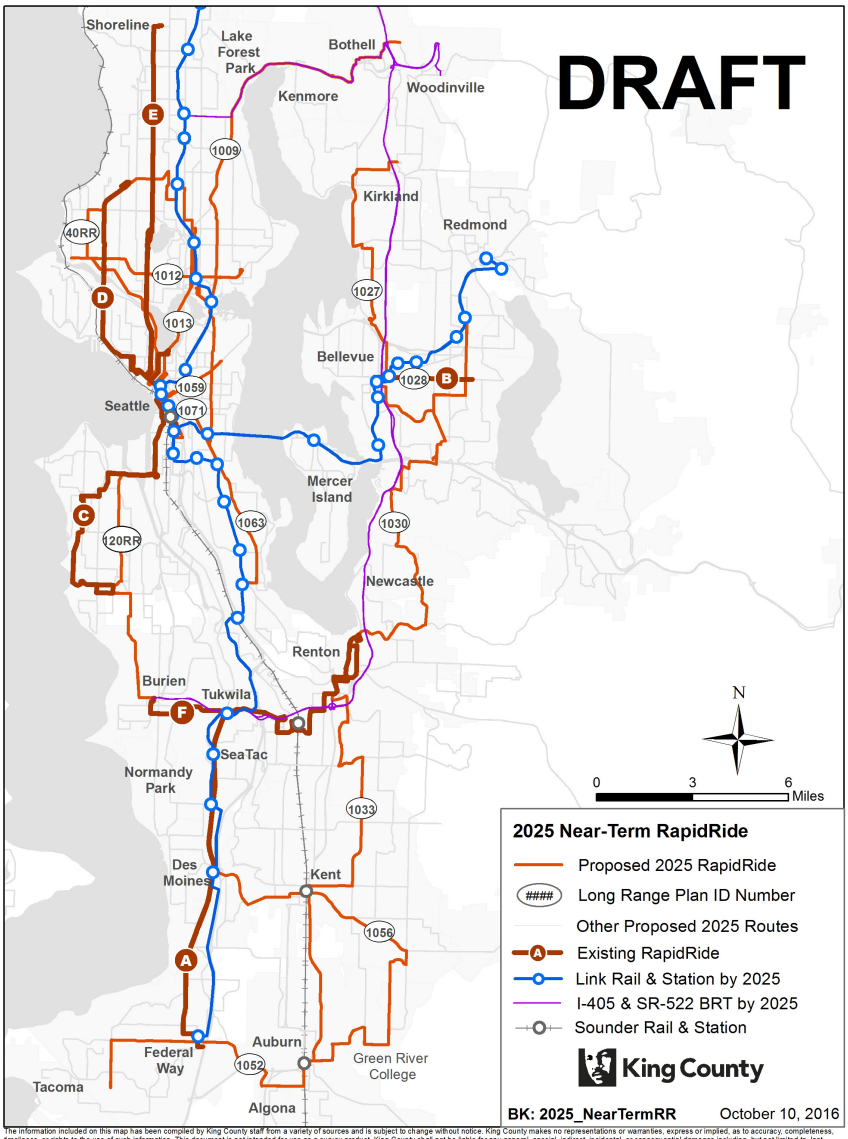
Figure G-1 Map of 2025 Proposed RapidRide Network



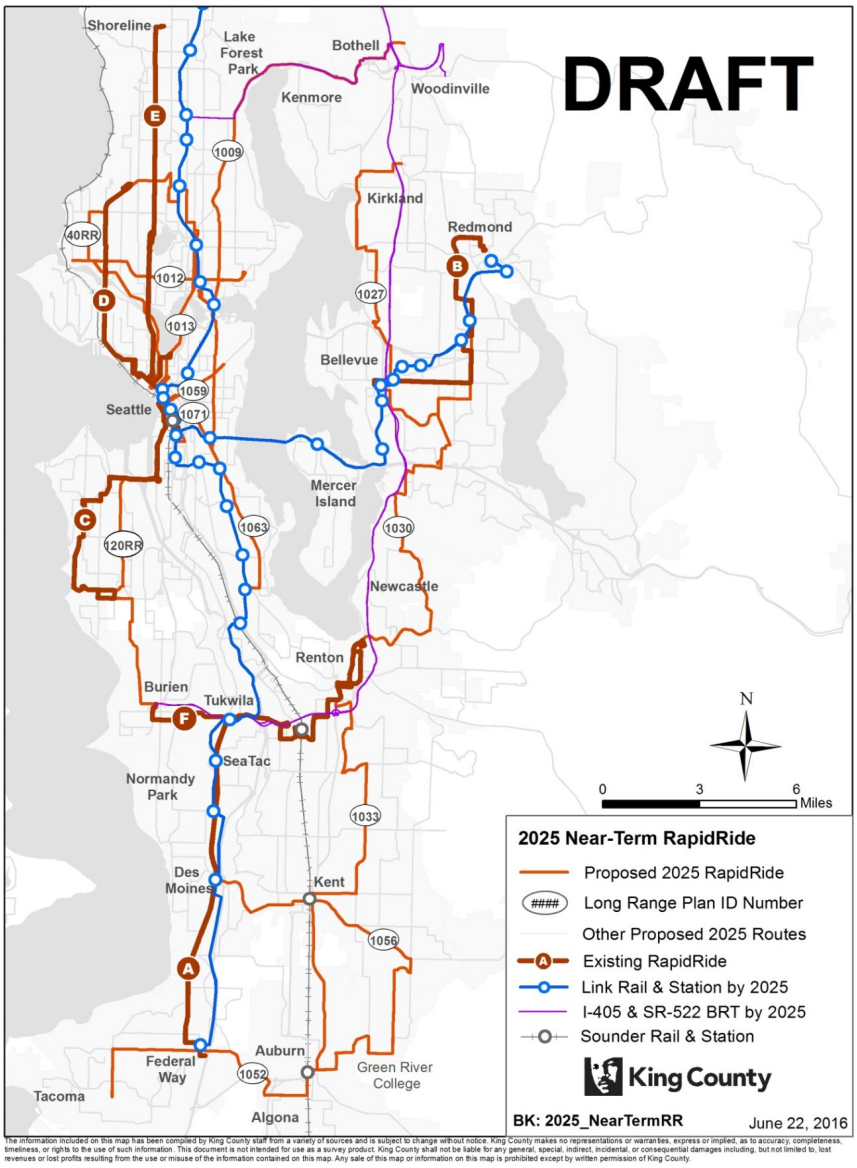


Table G-4 2040 RapidRide Candidate Lines

						Productivity			Equity		Geographic Value	
2025 Proposed & 2040 Candidates	Urban or Suburban	LRP ID #	To / From / Via	Comparable Route(s)	One-Way Miles	Current Boardings /Hour	2040 people /mile	2040 jobs /mile	Percent Poverty	Percent Minority	Number of Centers	Transfer Points & Hubs
By 2025 Propsed RapidRide Lines	Urban	1001	Shoreline - Seattle CBD - SR-99	E	12.8	High	Medium	High	Low	Medium	Medium	High
		1009	Bothell - UW - Kenmore	372	14.8	Low	Low	Low	Medium	Medium	Medium	Medium
		1012	Ballard - Children's Hospital - Wallingford	44	5.9	High	High	Medium	Medium	Low	Medium	Low
		1059	Madison Valley - Seattle CBD - E Madison St	11, 12	2.4	Medium	High	High	Medium	High	Low	Low
		1063	U. District - Rainier Beach - Mount Baker	7s, 48	10.7	Medium	Medium	Medium	High	High	Low	Medium
		1993	Northgate - Seattle SBD - Ballard	40	13.7	Low	Medium	High	Low	Medium	High	High
	Suburban	1027	Totem Lake - Eastgate - Kirkland	234, 235, 271	14.6	Medium	Medium	High	Low	Low	Medium	High
		1028	Crossroads - Bellevue - NE 8th St	B South	3.3	High	High	High	Medium	Medium	Low	Low
		1030	Overlake - Renton - Eastgate	240, 245	17.7	Medium	Medium	Medium	Medium	Medium	High	Medium
		1033	Renton - Auburn - Kent	169, 180	16.5	Medium	Medium	Medium	Medium	Medium	Medium	High
		1041	SODO - Burien - Delridge	120	11.7	High	High	High	High	High	Medium	Medium
		1048	Renton - Burien - Tukwila	F	11.3	Medium	Medium	High	High	High	Medium	High
		1052	Twin Lakes - Green River CC - Federal Way	181	13.9	Medium	Low	Low	Medium	Medium	Medium	Medium
		1056	Highline CC - Green River CC - Kent	164, 166	11.9	Medium	Medium	Low	High	Medium	Medium	Medium
By 2040 Candidate RapidRide Lines	Urban	1002	Richmond Beach - UW - 15th Ave NE	73, 373, 348	12.1	Low	Low	Low	Medium	Medium	Low	Medium
		1007	Shoreline CC - UW - Lake City	75	11.6	Medium	Low	Low	High	Medium	Medium	Low
		1010	Fremont - Lake City - Ballard	D, 41	8.1	High	Low	Low	Low	Low	High	Medium
		1013	Northgate - Mount Baker - U. District	67, 70	7.1	Medium	High	High	Medium	Medium	Medium	High
		1014	Loyal Heights - U. District - Green Lake	45	6.5	High	Medium	Medium	Medium	Low	Medium	Medium
		1061	Uptown - Madison Park - Capitol Hill	8, 11	7.6	Medium	Medium	Medium	Low	Low	Low	Low
		1064	U. District - Othello - Capitol Hill	36, 49	10.1	Medium	High	Medium	High	High	Medium	Medium
		1202	Seattle CBD - Sand Point - Green Lake	62	11.3	Low	Medium	High	Medium	Medium	Medium	High
	Suburban	1025	Kenmore - Overlake - Totem Lake	234, 235	15.7	Low	Medium	Medium	Low	Low	Medium	Medium
		1026	Campton - Kirkland - Redmond	248	7.4	Low	High	Medium	Low	Low	Low	Medium
		1031	Issaquah Highlands - Eastgate - West Lake Sammamish Pkwy	271	11.7	Medium	Low	Medium	Low	Low	Medium	Medium
		1037	Kirkland - Eastgate - Overlake	221, 245	10.8	Low	Medium	High	Low	Medium	Medium	Medium
		1042	Alki - Tukwila - White Center	125	16.1	Medium	Medium	Low	Medium	Medium	Medium	Medium
		1043	Alki - Burien - West Seattle	128, 131	11.6	Medium	High	Low	Medium	Low	Low	Low
		1047	Rainier Beach - Federal Way - SeaTac	A, 124	16.1	High	High	Medium	High	High	High	High
		1049	Kent - Rainier Beach - Tukwila	150	12.9	High	Low	Medium	High	High	Medium	Medium
		1075	Renton Highlands - Rainier Beach - Renton	105, 106	11.1	High	High	Medium	High	High	Medium	Low
		1083	Beacon Hill - Burien - Georgetown	60, 132	9.5	Medium	Low	Medium	Medium	High	Medium	Low
		1215	Kenmore - Shoreline CC - North City	331	8.9	Low	Low	Low	Medium	Low	Medium	Low
		1513	NE Tacoma - Federal Way - Twin Lakes	903	7.8	Low	Medium	Medium	Medium	Medium	Low	Low
		1514	Covington - SeaTac - Kent	180, 168	16.5	Medium	Low	Medium	Medium	Medium	Medium	Medium
		1515	Kent - Twin Lakes - Star Lakes	183, 901	11.7	Low	Medium	Low	Medium	Medium	Low	Medium
		1999	Redmond - Eastgate - Overlake	B, 245	10.6	High	Medium	High	Low	Medium	Medium	Medium

						Productivity			Equity		Geographic Value	
2025 Proposed & 2040 Candidates	Urban or Suburban	LRP ID #	To / From / Via	Comparable Route(s)	One-Way Miles	Current Boardings /Hour	2040 people /mile	2040 jobs /mile	Percent Poverty	Percent Minority	Number of Centers	Transfer Points & Hubs
By 2025 Propsed RapidRide Lines	Urban	1001	Shoreline - Seattle CBD - SR-99	E	12.8	High	Medium	Medium	Low	Medium	Medium	High
		1009	Bothell - UW - Kenmore	372	14.8	Low	Low	Low	Medium	Medium	Medium	Medium
		1012	Ballard - Children's Hospital - Wallingford	44	5.9	High	High	Medium	Medium	Low	Medium	Low
		1059	Madison Valley - Seattle CBD - E Madison St	11, 12	2.4	Medium	High	High	Medium	High	Low	Low
		1063	U. District - Rainier Beach - Mount Baker	7s, 48	10.7	Medium	Medium	Medium	High	High	Low	Medium
		1996	Northgate - Seattle SBD - Ballard	40	13.7	Low	Medium	High	Low	Medium	High	High
	Suburban	1027	Totem Lake - Eastgate - Kirkland	234, 235, 271	14.6	Medium	Medium	High	Low	Low	Medium	High
		1030	Overlake - Renton - Eastgate	240, 245	17.7	Medium	Medium	Medium	Medium	Medium	High	Medium
		1033	Renton - Auburn - Kent	169, 180	16.5	Medium	Medium	Medium	Medium	Medium	Medium	High
		1041	SODO - Burien - Delridge	120	11.7	High	High	High	High	High	Medium	Medium
		1048	Renton - Burien - Tukwila	F	11.3	Medium	Medium	High	High	High	Medium	High
		1052	Twin Lakes - Green River CC - Federal Way	181	13.9	Medium	Low	Low	Medium	Medium	Medium	Medium
		1056	Highline CC - Green River CC - Kent	164, 166	11.9	Medium	Medium	Low	High	Medium	Medium	Medium
By 2040 Candidate RapidRide Lines	Urban	1002	Richmond Beach - UW - 15th Ave NE	73, 373, 348	12.1	Low	Low	Low	Medium	Medium	Low	Medium
		1007	Shoreline CC - UW - Lake City	75	11.6	Medium	Low	Low	High	Medium	Medium	Low
		1010	Fremont - Lake City - Ballard	D, 41	8.1	High	Low	Low	Low	Low	High	Medium
		1013	Northgate - Mount Baker - U. District	7n, 70, 67	10.7	Medium	High	High	High	High	Medium	High
		1014	Loyal Heights - U. District - Green Lake	45	6.5	High	Medium	Medium	Medium	Low	Medium	Medium
		1061	Uptown - Madison Park - Capitol Hill	8, 11	7.6	Medium	Medium	Medium	Low	Low	Low	Low
		1064	U. District - Othello - Capitol Hill	36, 49	10.1	Medium	High	Medium	High	High	Medium	Medium
		1202	Seattle CBD - Sand Point - Green Lake	62	11.3	Low	Medium	High	Medium	Medium	Medium	High
	Suburban	1025	Kenmore - Overlake - Totem Lake	234, 235	15.7	Low	Medium	Medium	Low	Low	Medium	Medium
		1026	Campton - Kirkland - Redmond	248	7.4	Low	High	Medium	Low	Low	Low	Medium
		1028	Crossroads - Bellevue - NE 8th St	B South	3.3	High	High	High	Medium	Medium	Low	Low
		1031	Issaquah Highlands - Eastgate - West Lake Sammamish Pkwy	271	11.7	Medium	Low	Medium	Low	Low	Medium	Medium
		1037	Kirkland - Eastgate - Overlake	221, 245	10.8	Low	Medium	High	Low	Medium	Medium	Medium
		1042	Alki - Tukwila - White Center	125	16.1	Medium	Medium	Low	Medium	Medium	Medium	Medium
		1043	Alki - Burien - West Seattle	128, 131	11.6	Medium	High	Low	Medium	Low	Low	Low
		1047	Rainier Beach - Federal Way - SeaTac	A, 124	16.1	High	High	Medium	High	High	High	High
		1049	Kent - Rainier Beach - Tukwila	150	12.9	High	Low	Medium	High	High	Medium	Medium
		1075	Renton Highlands - Rainier Beach - Renton	105, 106	11.1	High	High	Medium	High	High	Medium	Low
		1083	Beacon Hill - Burien - Georgetown	60, 132	9.5	Medium	Low	Medium	Medium	High	Medium	Low
		1215	Kenmore - Shoreline CC - North City	331	8.9	Low	Low	Low	Medium	Low	Medium	Low
		1513	NE Tacoma - Federal Way - Twin Lakes	903	7.8	Low	Medium	Medium	Medium	Medium	Low	Low
		1514	Covington - SeaTac - Kent	180, 168	16.5	Medium	Low	Medium	Medium	Medium	Medium	Medium
		1515	Kent - Twin Lakes - Star Lakes	183, 901	11.7	Low	Medium	Low	Medium	Medium	Low	Medium
		1999	Redmond - Eastgate - Overlake	B, 245	10.6	High	Medium	High	Low	Medium	Medium	Medium

Candidate RapidRide lines for long-term investments – implementation between 2025 and 2040 – were drawn from the frequent service network in METRO CONNECTS. The lines selected for potential RapidRide service were determined using the evaluation criteria, including how well they connect to the proposed 2040 high capacity transit network and urban/manufacturing/activity centers, filling gaps within the existing, planned, and proposed high capacity transit network, and building strong connections to the regional and countywide transit network. In total, 36 candidate RapidRide lines were evaluated in the long-term 2040 candidate RapidRide analysis.

Table G-5 Propsoed 2040 RapidRide Lines

LRP Route ID	Comparable Route(s)	To / From / Via	Route Miles	Urban (U) or Suburban (S)
1001 (E Line)	E	Shoreline - Seattle CBD - SR-99	13	U
1009	372	Bothell - UW - Kenmore	15	U
***1010 (D Line)**	D, 41	Fremont - Lake City - Ballard	8	U
1012	44	Ballard - Children's Hospital - Wallingford	6	U
1013	7n, 70, 67	Northgate - Mount Baker - U. District	11	U
1014	45	Loyal Heights - U. District - Green Lake	6	U
1025	234, 235	Kenmore - Overlake - Totem Lake	16	S
1026	248	Campton - Kirkland - Redmond	7	U
1027	234, 235, 271	Totem Lake - Eastgate - Kirkland	15	S
***1028 (B Line)**	B South	Crossroads - Bellevue - NE 8th St	3	S
1030	240, 245	Overlake - Renton - Eastgate	18	S
1033	169, 180	Renton - Auburn - Kent	16	S
1041	120	SODO - Burien - Delridge	12	U
***1043 (C Line)**	128, 131	Alki - Burien - West Seattle	12	S
***1047 (A Line)**	A, 124	Rainier Beach - Federal Way - SeaTac	16	S
1048 (F Line)	F	Renton - Burien - Tukwila	11	S
1052	181	Twin Lakes - Green River CC - Federal Way	14	S
1056	164, 166	Highline CC - Green River CC - Kent	12	S
1059	11, 12	Madison Valley - Seattle CBD - E Madison St	2	U
1061	8, 11	Uptown - Madison Park - Capitol Hill	8	S
1063	7s, 48	U. District - Rainier Beach - Mount Baker	11	U
1064	36, 49	U. District - Othello - Capitol Hill	10	U
1075	105, 106	Renton Highlands - Rainier Beach - Renton	11	S
1202	62	Seattle CBD - Sand Point - Green Lake	11	U
1515	183, 901	Kent - Twin Lakes - Star Lakes	12	S
1993	40	Northgate - Seattle SBD - Ballard	14	U

*Includes changes to a current or 2025 RapidRide Lines

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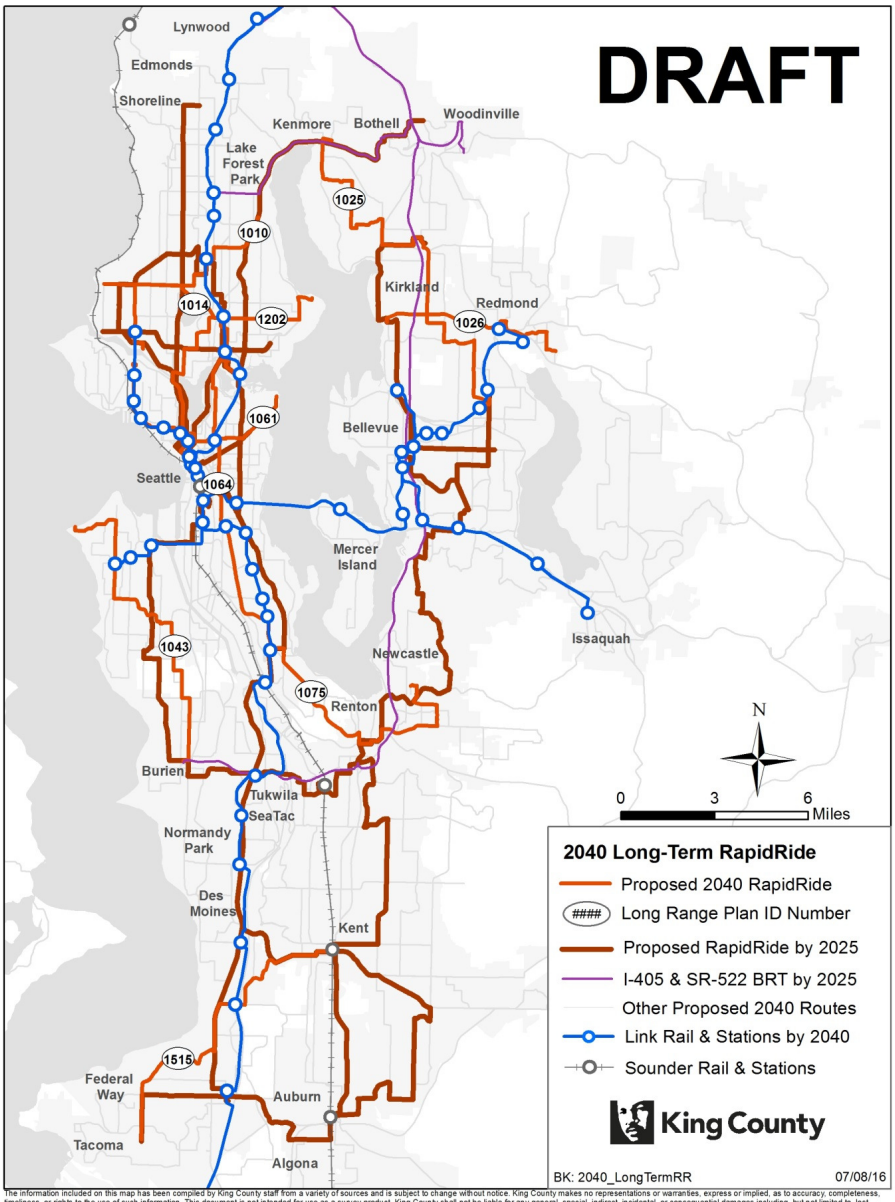
Figure G-2 Map of Proposed 2040 RapidRide Network



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