Bellevue Transit Master Plan

DATE: January 9, 2014

TO: Members of the Transportation Commission

CC: Members of the Planning Commission
Members of the Human Services Commission
Members of the Parks and Community Services Board
Members of the Arts Commission

FROM: Franz Loewenherz, Senior Transportation Planner
floewenherz@bellevuewa.gov 425-452-4077

SUBJECT: Bellevue Transit Master Plan Status Report

INTRODUCTION

The Transit Master Plan (TMP) is a comprehensive look ahead to the type of system that will be required to meet Bellevue's transit needs through 2030. The TMP is being overseen by the City's Transportation Commission whose work is guided by Council approved project principles and input from members of the Planning, Arts, and Human Services Commissions and the Parks and Community Services Board.

On January 9, 2014 staff will provide Transportation Commission members - and members of other boards and commissions - a status report on the Transit Master Plan. Staff will invite Commissioners and Board members to review and discuss the following two topics:

1. **Bellevue Transit Master Plan Measures of Effectiveness Report:** One of the Bellevue City Council's project principles for the Transit Master Plan (TMP) is that staff should: "Develop measures of effectiveness to evaluate transit investments and to track plan progress." In response to this direction, the Transportation Commission prepared four measures of effectiveness (MOE) on October 17, 2013 for monitoring progress in achieving Bellevue's Transit Service Vision. Attached to this memo is a draft report that reflects the Transportation Department's proposed approach to monitoring these MOEs. On January 9, 2014 staff will seek the Transportation Commission's concurrence on this proposed approach outlined in this draft report.

2. **Bellevue Transit Master Plan Commuter Parking Needs Analysis Report:** Commuter parking facilities play an important role in lower-density areas that are unable to support frequent transit service. These facilities provide convenient access to transit via auto or

bicycle for those persons who do not live within convenient walking distance of a bus line. Park-&-Ride facilities also serve as a meeting place for carpool and vanpool partners. Attached to this memo is a draft report reflecting projected 2030 commuter parking needs in the I-90 and I-405 corridors. On January 9, 2014 staff seeks the Transportation Commission's feedback on this draft report.

Attachment 1: Draft Measures of Effectiveness Report
Attachment 2: Draft Commuter Parking Needs Analysis Report

MEASURES OF EFFECTIVENESS REPORT

Draft

Bellevue Transit Master Plan

CITY OF BELLEVUE

December 2013

Transportation Department

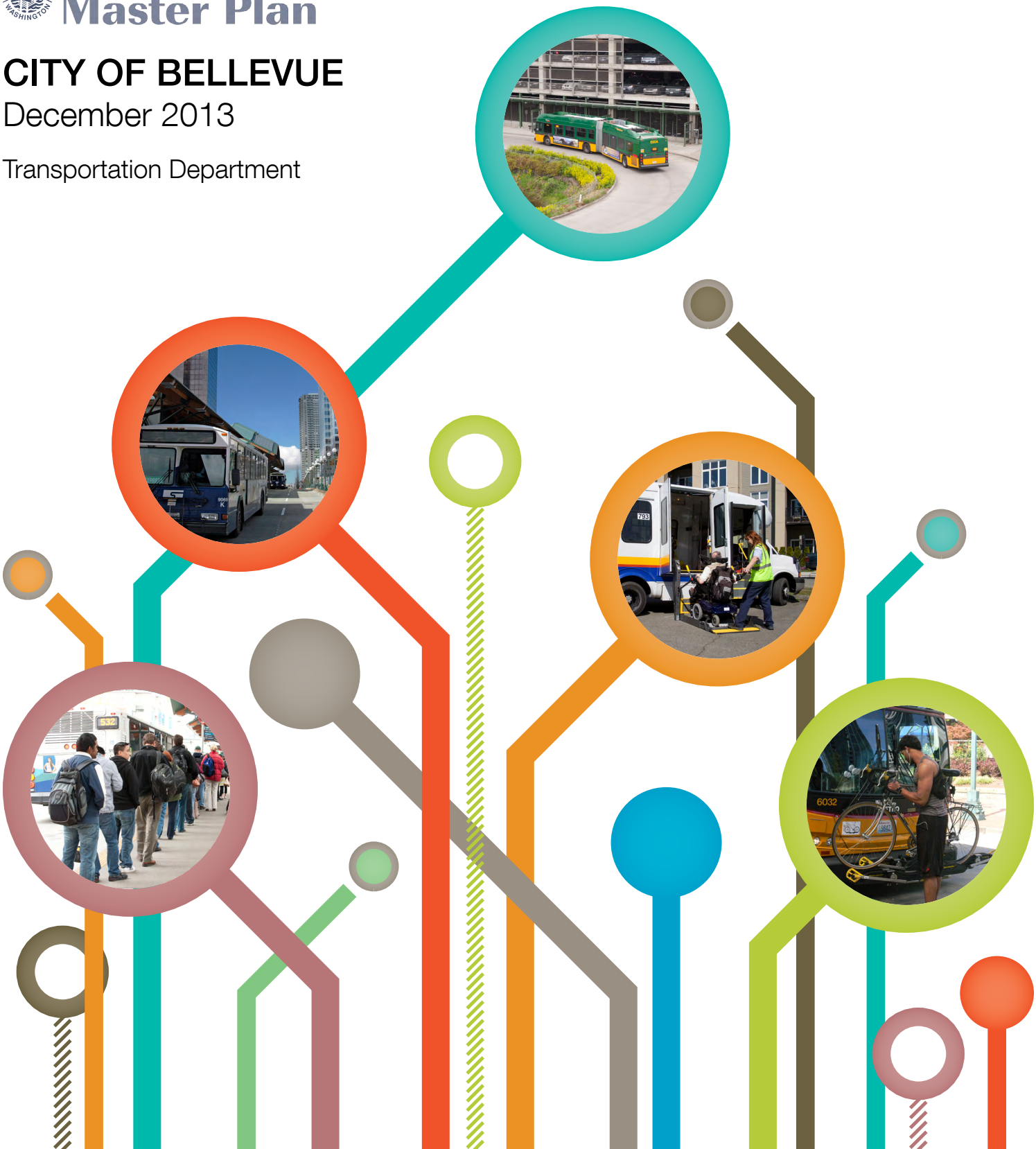


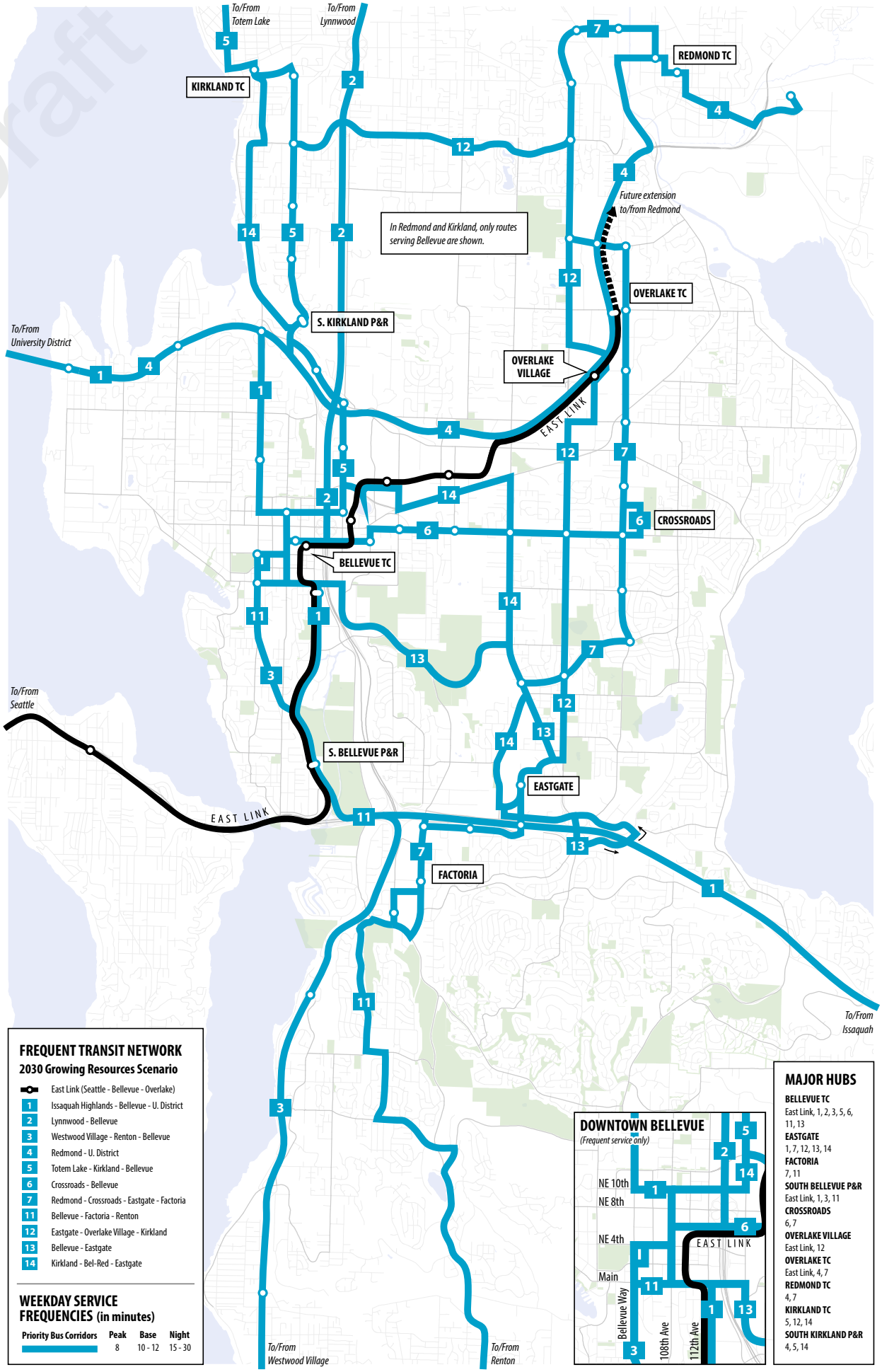
PHOTO BY John Tiscornia

INTRODUCTION

Measures of Effectiveness (MOEs) help track the impacts of transportation system investments and gauge the quality of services delivered by an agency. Some of the useful benefits provided by MOEs include:

- Greater accountability to policy-makers, the agency's customers, and other stakeholders;
- Improved communication of information about the transportation system to customers, political leaders, the public, and other stakeholders;
- Increased organizational efficiency in keeping agency staff focused on priorities and enabling managers to make decisions and adjustments in programs with greater confidence that their actions will have the desired effect;
- Greater effectiveness in achieving meaningful objectives that have been identified through long-range planning and policy formulation; and
- Ongoing improvement of business processes and associated information through feedback.

This report proposes four measures of effectiveness that will be used by the City of Bellevue Transportation Department to track the progress of implementation of the Transit Master Plan.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Future extension to/from Redmond
OVERLAKE TC
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EASTGATE
FACTORIA
To/From Issaquah
To/From Westwood Village
To/From Renton
FREQUENT TRANSIT NETWORK
2030 Growing Resources Scenario
East Link (Seattle - Bellevue - Overlake)
1 Issaquah Highlands - Bellevue - U. District
2 Lynnwood - Bellevue
3 Westwood Village - Renton - Bellevue
4 Redmond - U. District
5 Totem Lake - Kirkland - Bellevue
6 Crossroads - Bellevue
7 Redmond - Crossroads - Eastgate - Factoria
11 Bellevue - Factoria - Renton
12 Eastgate - Overlake Village - Kirkland
13 Bellevue - Eastgate
14 Kirkland - Bel-Red - Eastgate
WEEKDAY SERVICE FREQUENCIES (in minutes)
Priority Bus Corridors
Peak 8
Base 10 - 12
Night 15 - 30
DOWNTOWN BELLEVUE
(Frequent service only)
NE 10th
NE 8th
NE 4th
Main
Bellevue Way
108th Ave
112th Ave
EAST LINK
MAJOR HUBS
BELLEVUE TC
East Link, 1, 2, 3, 5, 6, 11, 13
EASTGATE
1, 7, 12, 13, 14
FACTORIA
7, 11
SOUTH BELLEVUE P&R
East Link, 1, 3, 11
CROSSROADS
6, 7
OVERLAKE VILLAGE
East Link, 12
OVERLAKE TC
East Link, 4, 7
REDMOND TC
4, 7
KIRKLAND TC
5, 12, 14
SOUTH KIRKLAND P&R
4, 5, 14

BACKGROUND

One of the Bellevue City Council's *project principles* for the Transit Master Plan (TMP) is that staff should: "Develop measures of effectiveness to evaluate transit investments and to track plan progress." In response to this direction, the Transportation Commission (October 17, 2013) prepared the following four measures of effectiveness (MOE) for monitoring progress in achieving Bellevue's Transit Service Vision.

1. Measure service availability on Bellevue's Frequent Transit Network corridors.
2. Measure transit usage in Bellevue's Mobility Management Areas.
3. Measure person throughput by mode on Bellevue's Frequent Transit Network corridors.
4. Measure travel time savings resulting from speed and reliability improvements on Bellevue's Frequent Transit Network corridors.

This report outlines the Transportation Department's proposed approach to monitoring these MOEs, which build on both Bellevue's existing framework for transportation assessment and national best practices.

- **Bellevue Framework:** One of the MOEs considers Bellevue's Mobility Management Areas (MMAs), an analysis framework used by Bellevue for concurrency assessment. Three of the MOEs reference Bellevue's Frequent Transit Network (FTN), which is detailed in the *Bellevue TMP Transit Service Vision Report* (see Figure 1).
- **Best Practices:** Consideration was given to identifying MOE protocols that are consistent with guidance found in the *Transit Capacity and Quality of Service Manual Third Edition*

Figure 1 (opposite) The Frequent Transit Network (FTN) is where transit service and capital investments need to be focused to serve the most riders and provide the highest quality of service. The FTN supports Downtown growth, Bel-Red corridor redevelopment, and Bellevue's other activity centers with well-connected bus routes that seamlessly interface with East Link light rail. People traveling along FTN corridors can expect convenient, reliable, easy-to-use services that are frequent enough that they never need to refer to a schedule. The core characteristic of the FTN is that it provides all-day, frequent service, wherein the headway (the time between successive buses) of individual constituent routes is 8 minutes or better in peak hours, 10-12 minutes mid-day, and 15-30 minutes at night.

(TCQSM). The TCQSM, published by the Transportation Research Board in September 2013, provides the latest research results on estimating and assessing the capacity, speed, reliability, and quality of transit services, facilities, and systems (see Figure 2).

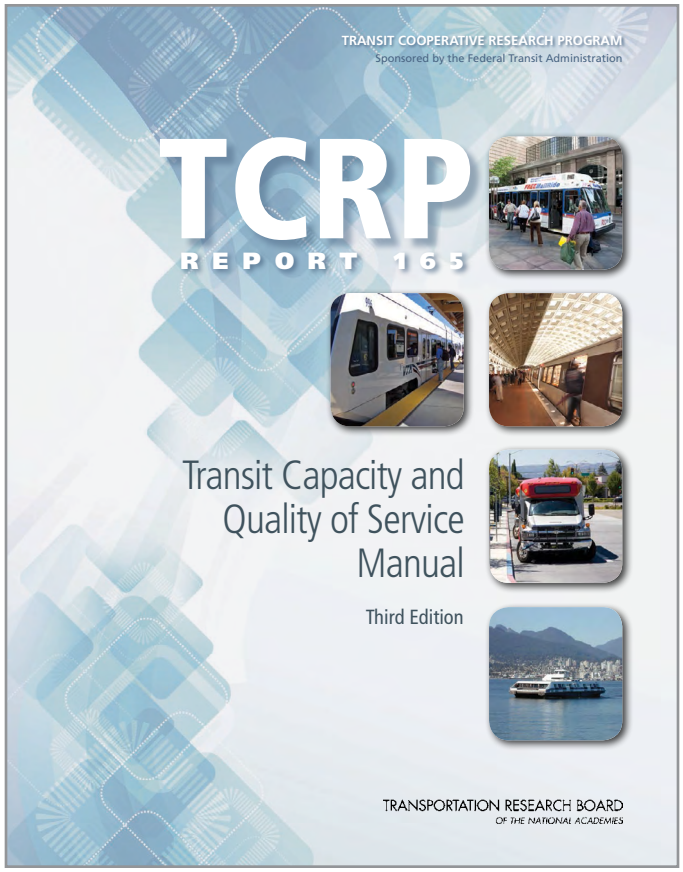


Figure 2 The Transit Capacity and Quality of Service Manual, Third Edition provides guidance on transit capacity and quality of service issues and the factors influencing both. The manual contains background, statistics, and graphics on the various types of public transportation, and it provides a framework for measuring transit availability, comfort, and convenience from the passenger and transit provider points of view. In addition, the manual includes quantitative techniques for calculating the capacity and other operational characteristics of bus, rail, demand-responsive, and ferry transit services, as well as transit stops, stations, and terminals.

By providing a sense of the quality of transit service in Bellevue, these metrics can serve as a tool for communicating the City's need for transit service delivery and capital improvements to the public, King County Metro, Sound Transit, and other elected leaders. These measures can be organized into the following performance categories:

- **Service Availability:** ease of use for various kinds of transit trips;
- **Transit Usage:** passenger satisfaction with the quality of transit service provided;
- **Person Throughput:** transit's role in increasing roadway capacity and improving operations; and,
- **Travel Time:** how long it takes to make a trip by transit in comparison with another mode.

With the exception of the transit usage MOE, which will be reported twice annually, the other metrics will be produced on a five-year reporting cycle. More frequent tracking is not warranted as we are not likely to see significant variations in performance without changes in the level of transit service and capital investment. In the intervening years, Bellevue staff will monitor King County Metro's *Strategic Plan and Service Guidelines*, which has established a network evaluation and operations performance standards system based on measures of productivity, social equity, and geographic value.

SERVICE AVAILABILITY

The first MOE—"measure service availability on Bellevue's Frequent Transit Network corridors"—will help the Transportation Department determine whether or not transit service is a viable option for a given trip in Bellevue. Where, how often, and when transit service is provided are all important factors in one's decision to use transit. In transit planning terms, these qualities are known as accessibility (or service coverage), service frequency, and service span, respectively. From the user's perspective, service frequency determines how many times per hour a user has access to transit at a given location, assuming that location is within an acceptable walking distance (measured by service coverage) and service is provided at the times the user wishes to travel (measured by service span). The following spatial and temporal attributes—when considered together—provide an actionable assessment of transit service availability.

Route Frequency

Transit frequency is the number of transit vehicles scheduled to serve a given stop during one hour. Frequency was reported as the top factor influencing overall trip satisfaction in the *Bellevue Transit Improvement Survey*. The more frequent the transit service, the shorter the wait time when a bus is missed or when the exact schedule is not known before arriving at a bus stop, and the greater the flexibility that customers have in selecting travel times. The longer the service headway (the time between successive buses), the more inconvenient transit becomes, both because passengers have to plan their trip around bus schedules and because they incur more unproductive time during their trip.

Research suggests that 30-minute service frequency is considered to be unattractive to

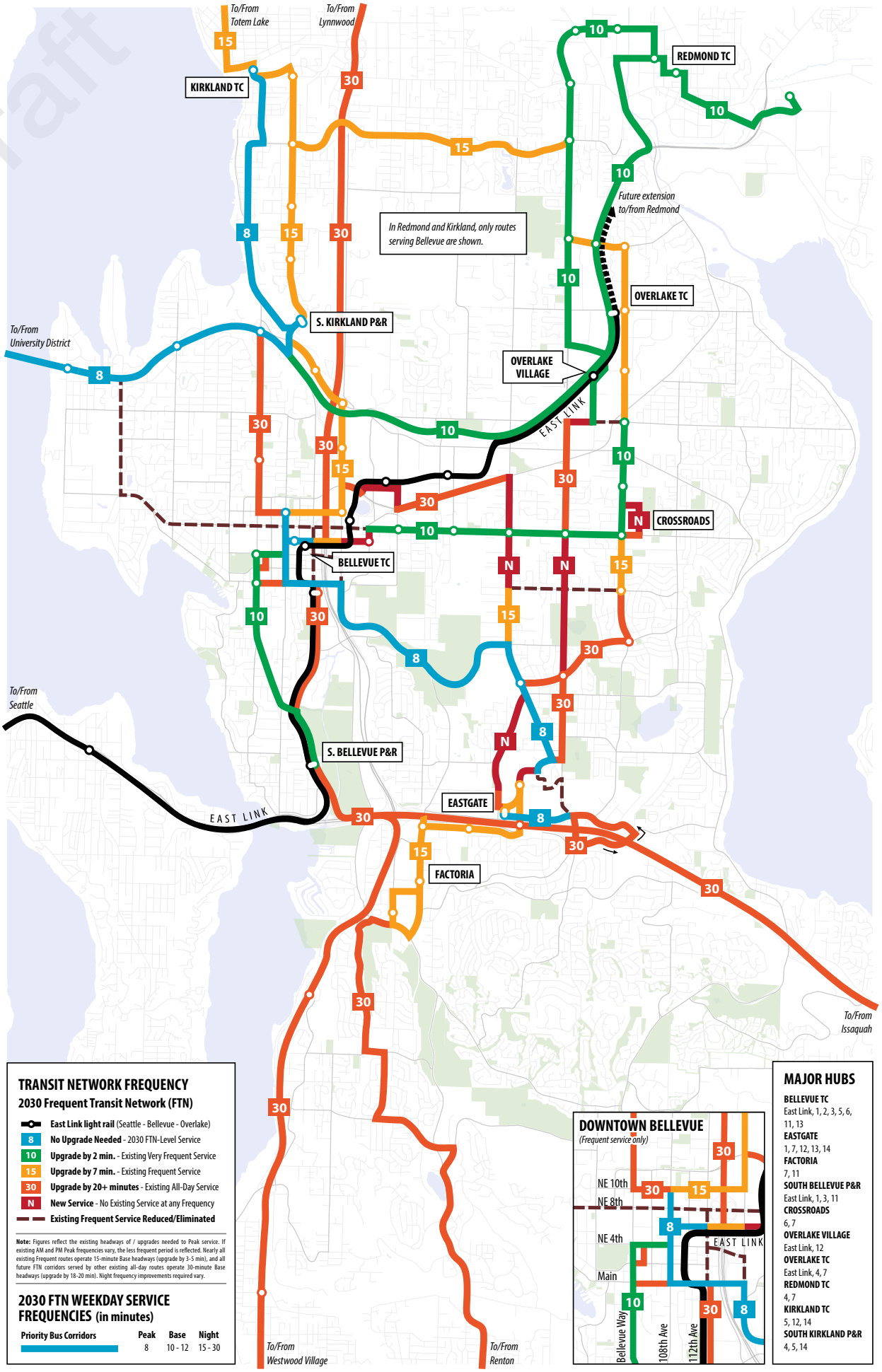
"[I]f your frequency decreases, timed connections become more important. What really matters is the time I have to wait. [I]f I have a well-timed connection but have to wait 30 minutes because my late bus just missed it, it's not much help. In order to encourage transfers you need frequency."

-Christian, All-Around Transit Rider
Resident of Seattle[1]

"Speed and frequency of service goes a long way to make up for schedule reliablility and connection timing."

-Anonymous Former Rider
Resident of Kirkland[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).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EASTGATE
FACTORIA
To/From Issaquah
To/From Westwood Village
To/From Renton
TRANSIT NETWORK FREQUENCY
2030 Frequent Transit Network (FTN)
East Link light rail (Seattle - Bellevue - Overlake)
8 No Upgrade Needed - 2030 FTN-Level Service
10 Upgrade by 2 min. - Existing Very Frequent Service
15 Upgrade by 7 min. - Existing Frequent Service
30 Upgrade by 20+ minutes - Existing All-Day Service
N New Service - No Existing Service at any Frequency
Existing Frequent Service Reduced/Eliminated
Note: Figures reflect the existing headways of / upgrades needed to Peak service. If existing AM and PM Peak frequencies vary, the less frequent period is reflected. Nearly all existing Frequent routes operate 15-minute Base headways (upgrade by 3-5 min), and all future FTN corridors served by other existing all-day routes operate 30-minute Base headways (upgrade by 18-20 min). Night frequency improvements required vary.
2030 FTN WEEKDAY SERVICE FREQUENCIES (in minutes)
Priority Bus Corridors
Peak 8
Base 10 - 12
Night 15 - 30
DOWNTOWN BELLEVUE
(Frequent service only)
NE 10th
NE 8th
NE 4th
Main
Bellevue Way
108th Ave
112th Ave
EAST LINK
MAJOR HUBS
BELLEVUE TC
East Link, 1, 2, 3, 5, 6, 11, 13
EASTGATE
1, 7, 12, 13, 14
FACTORIA
7, 11
SOUTH BELLEVUE P&R
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East Link, 4, 7
REDMOND TC
4, 7
KIRKLAND TC
5, 12, 14
SOUTH KIRKLAND P&R
4, 5, 14

discretionary riders—those with access to an automobile who choose to use transit—while 15-minute service in the peak periods is considered a significant threshold to making transit a competitive alternative to driving. This threshold mainly relates to the amount of time people are willing to wait if they just miss a bus. With a 30-minute wait until the next bus, most people with a car available will not risk having to wait that long and will thus not attempt to take the bus at all.

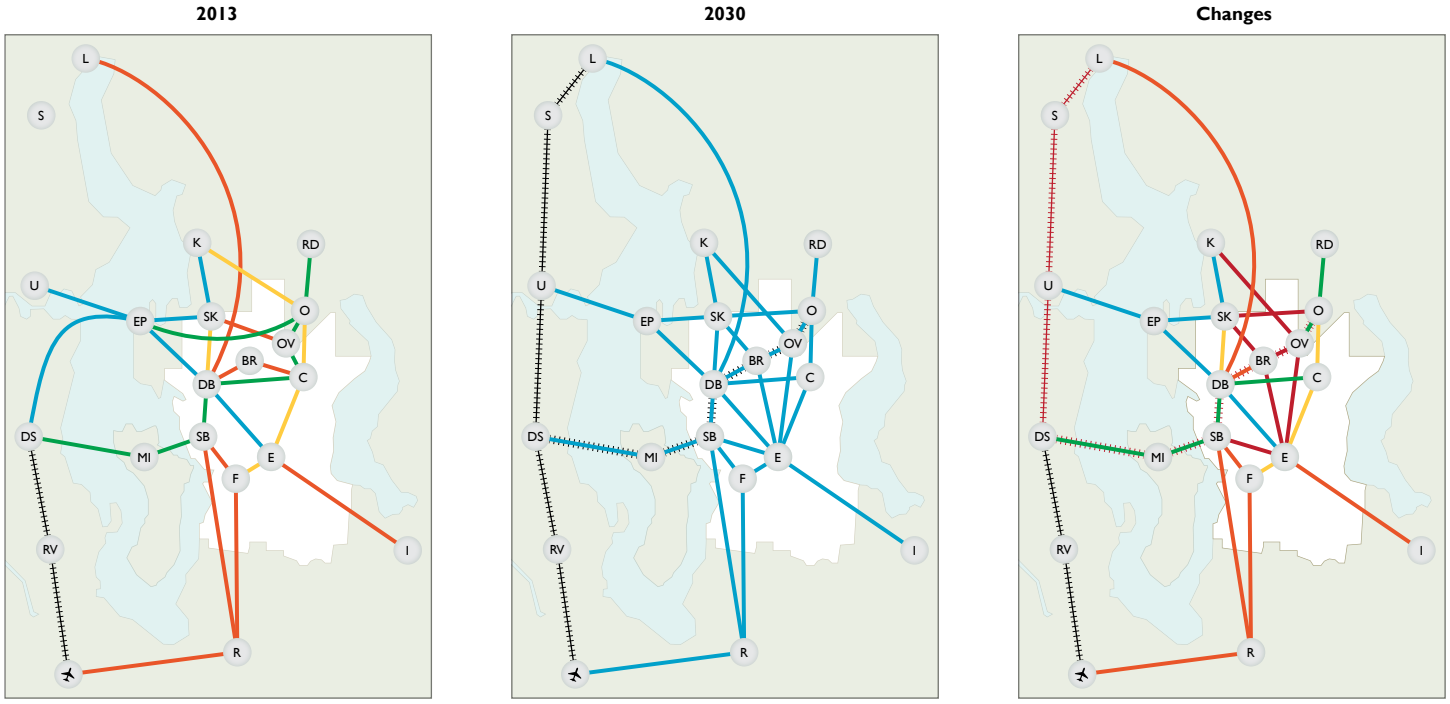
Assessing route frequency involves determining whether each portion of the FTN achieves the headway thresholds for frequent service defined in the *Transit Service Vision Report*. Staff will develop a table and map reflecting the percentage of FTN corridor segments operating at these target headways. Figure 3 reflects the route segments along 2030 FTN corridors and the upgrades in service headways required to achieve 2030 target frequencies. *Route segment* refers to a portion of an FTN route that is bounded by

"For the most part there is just not enough frequency to make it reliable and time management effective."

-Doug, Non-Commute Transit User
Resident of Bellevue[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

Figure 3 (opposite) Progress toward 2030 FTN by frequency of service on route segments.
Figure 4 (below) Progress toward 2030 FTN by frequency of service connections between major centers.



Legend

BELLEVUE
- **BR** Bel-Red
- **C** Crossroads
- **DB** Downtown Bellevue
- **E** Eastgate
- **F** Factoria
- **SB** S. Bellevue Park & Ride

REGION
- **DS** Downtown Seattle
- **EP** Evergreen Point
- **I** Issaquah Transit Center
- **K** Kirkland Transit Center
- **L** Lynnwood
- **MI** Mercer Island
- **O** Overlake Transit Center
- **OV** Overlake Village
- **R** Renton
- **RD** Redmond Transit Center
- **RV** Rainier Valley
- **S** Shoreline
- **SK** S. Kirkland Park & Ride
- **U** University District
- SeaTac

	Peak	Midday	Night
Very Frequent (every train connection)	≤8	≤12	15-30
Infrequent	30	15-30	30-60
LRT			

Note: numbers reflect approximate peak/midday/night frequencies.

2013 - 2030 FTN Upgrades Required
- 8 **No Upgrade Needed** - 2030 FTN-Level Service
- 10 **Upgrade by 2 min.** - Existing Very Frequent Service
- 15 **Upgrade by 7 min.** - Existing Frequent Service
- 30 **Upgrade by 20+ minutes** - Existing All-Day Service
- N **New Service** - No Existing Service at any Frequency
- **Existing Frequent Service Reduced/Eliminated**

"I would like for my children to start using a bus to get home from school, but there is no bus stop close enough to home and no safe pedestrian connection from existing bus stops for them to be able to walk home alone."

-Lana, Non-Rider
Resident of Bellevue[1]

"Make bus routes more accessible during the late evening. Most Bellevue bus routes end at around 10pm or 11pm. [This] makes it difficult for people to go to social gatherings in the late evening. Also some people have graveyard shifts."

-Juan, Non-Commute Transit User
Resident of Bellevue[1]

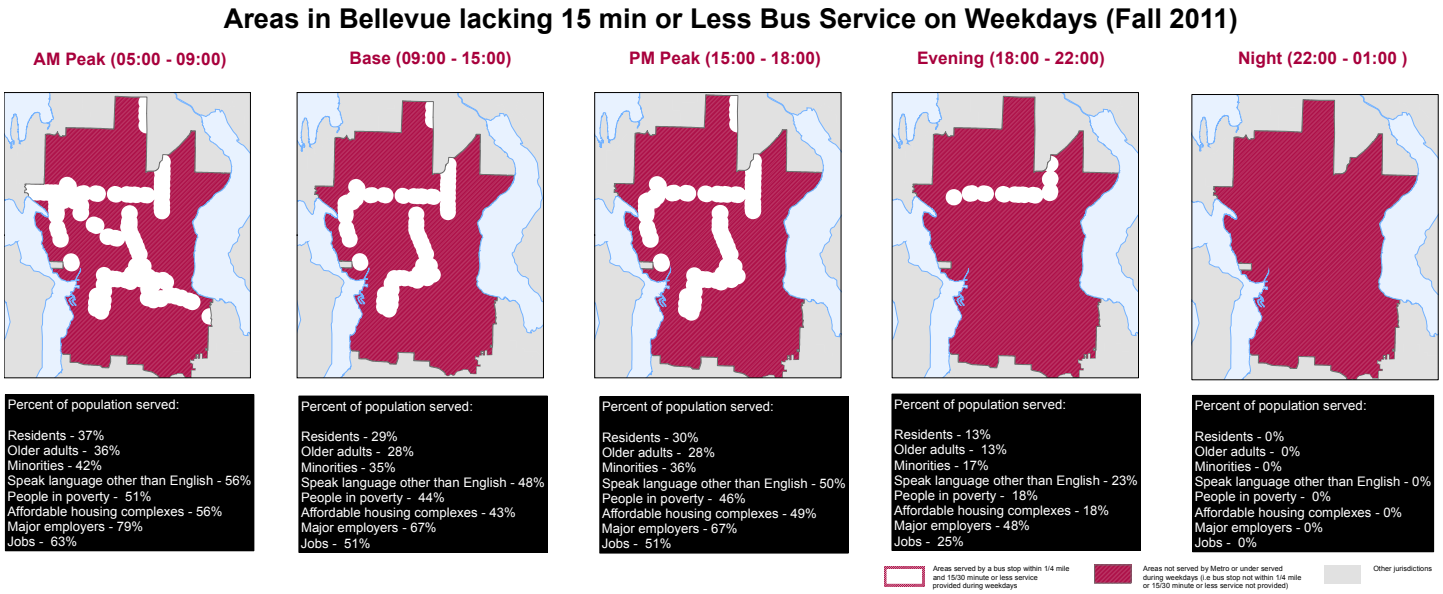
an intersection with another route on both sides. This method avoids consideration of the transit network in terms of the block-by-block approach promoted by the *Highway Capacity Manual*. Figure 4 on page 9 reflects the connections between major local and regional centers served by FTN routes and indicates which require upgrades to achieve 2030 FTN-level service. Both figures depict only those segments and connections operated by FTN routes—infrequent all-day services are not shown.

Route Coverage

The presence or absence of transit service near one's origin and destination is a key factor in one's choice to use transit. Route coverage is a measure of the area within a reasonable walking distance of transit service. When combined with service frequency and span data, route coverage helps identify the number of opportunities people have to access transit from different locations.

The calculation of the transit route coverage area is performed through the use of a geographic information system (GIS) using the following data: (i) bus stop locations from King County Metro's GIS database, and (ii) demographic data (population and jobs) from the U.S. Census Bureau. Bellevue's GIS software buffering feature is then used to outline on a

Figure 5 Weekday level of service coverage, Fall 2011.



map all of the area within one-quarter mile of an FTN bus stop. The one-quarter mile buffer is consistent with industry literature that most passengers (75 to 80% on average) walk one-quarter mile or less to bus stops. At an average walking speed of 3 mph, this is equivalent to a maximum walking time of 5 minutes.

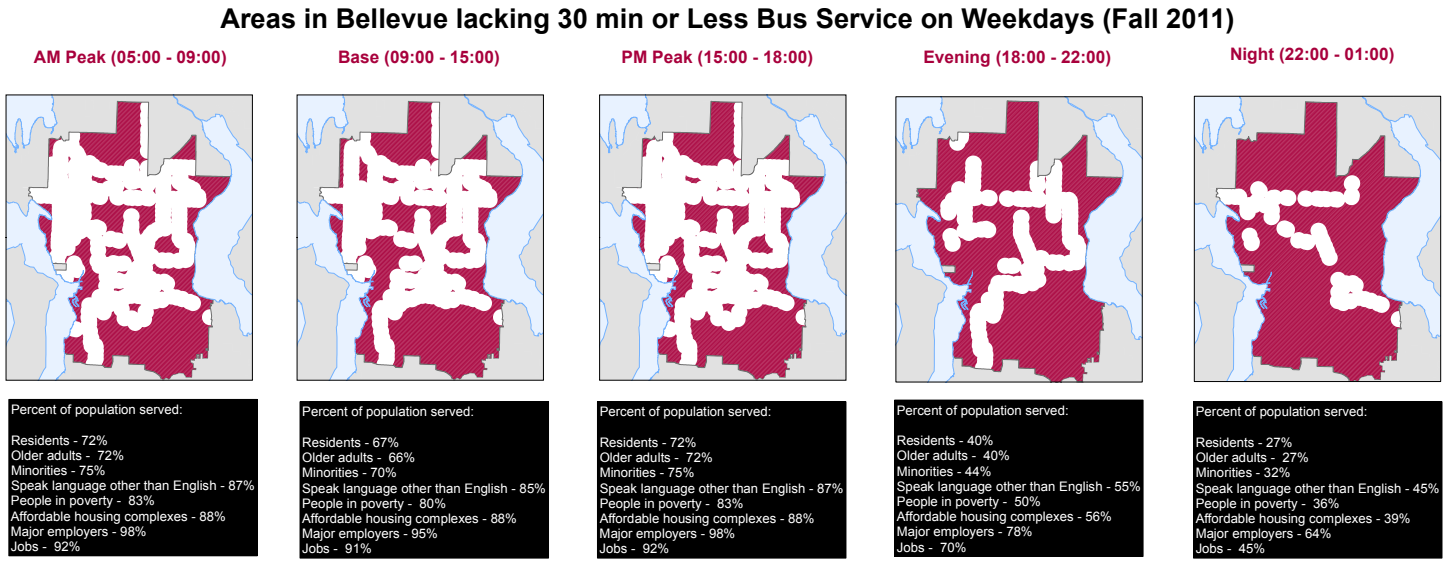
In conducting this analysis, Transportation Department staff will assess how many Bellevue residents and employees are provided frequent bus service by day of week (weekday and weekend) and time of day (AM peak, base, PM peak, evening, and night). Broadening the route coverage analysis to consider service span helps to refine this assessment of service availability to potential users. If transit service is not provided at the time of day a potential passenger needs to take a trip, it does not matter where (coverage) or how often (frequency) transit service is provided to the rest of the day. Some potential transit riders choose not to use transit services because particular services are unavailable for their anticipated return trips or because they cannot be certain about the time of their return trips and need to be certain that they do not get stranded. Figure 5 and 6 reflect areas in Bellevue lacking 15-minute bus service on weekdays and weekends, respectively, based on Fall 2011 data.

"Proximity to my house is very important, or otherwise it's too easy to not take. Proximity to my destination is less important, especially for places I don't visit frequently."

-Anonymous All-Around Transit User
Residence Unknown[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

Figure 6 Weekend level of service coverage, Fall 2011.



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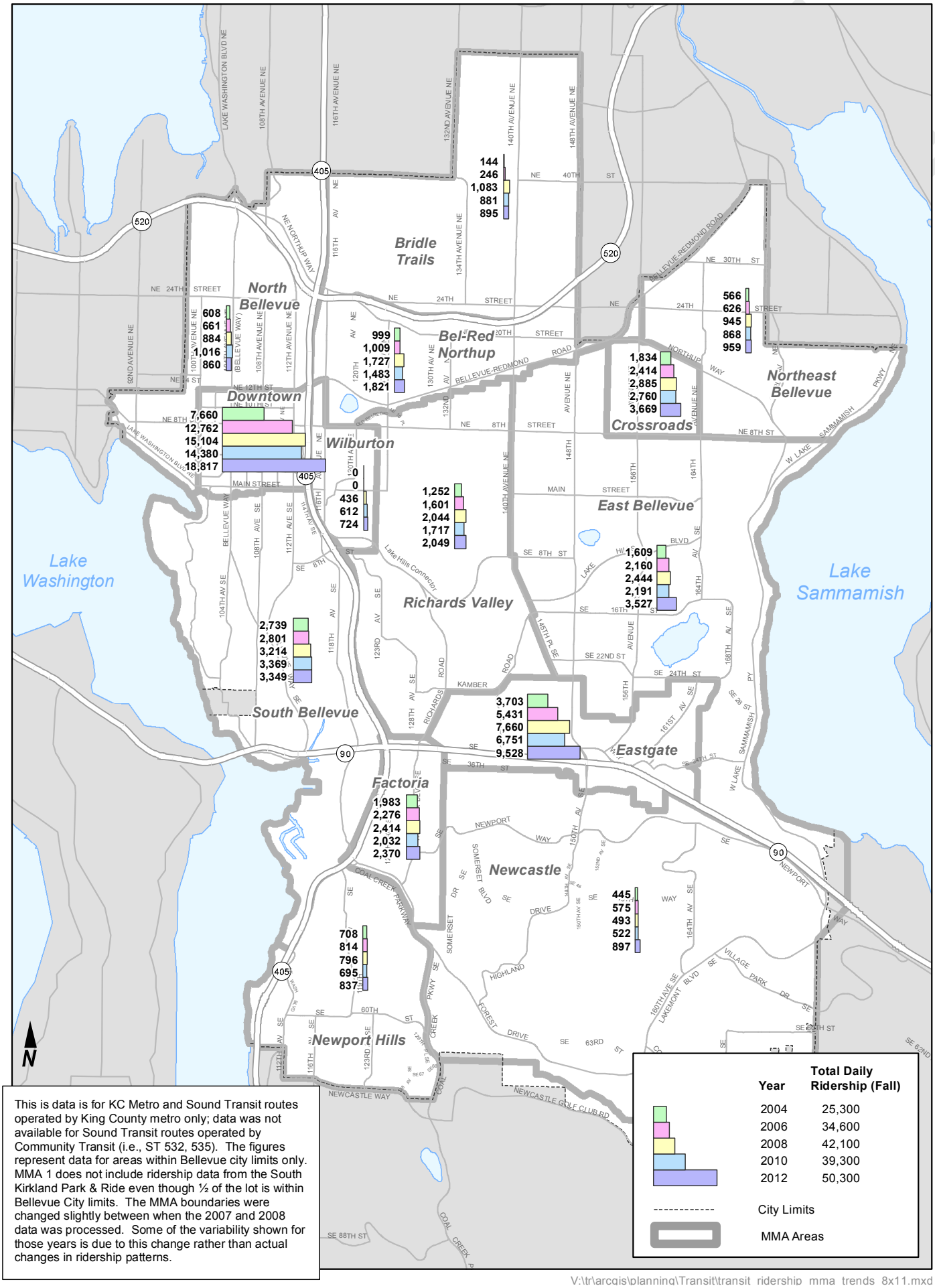
Sources: U.S. Census Bureau, 2006-2010 American Community Survey, Puget Sound Regional Council 2011 Covered Employment, City of Bellevue's Commute Trip Reduction Program list of Major Employers, City of Bellevue Housing Affordability and Housing Choice Report, King County Assessor.

TRANSIT USAGE

The second MOE—"measure transit usage in Bellevue's Mobility Management Areas"—will help the Transportation Department track passenger satisfaction with the quality of transit service provided in Bellevue. The transit usage calculation is performed with a geographic information system (GIS) using the following data: (i) average weekday stop-level usage data (ons/offs) on bus routes operating in Bellevue, and (ii) Bellevue's GIS shapefile of the 14 Mobility Management Areas (MMA) of the city. Tracking transit usage occurs twice annually, reflecting average weekday stop-level on/off data from the Spring and Fall service changes.

Figure 7 reflects daily transit usage by Bellevue MMA for Fall 2004, 2006, 2008, 2010, and 2012. Increased usage of transit is correlated to the numerous service and capital investments that have been made over this period to improve travel options in Bellevue. Public transportation ridership in Bellevue has grown steadily since the adoption of the 2003 Transit Plan; average weekday transit ridership in Bellevue rose from 25,300 (in 2004) to 50,300 (in 2012)—a 99 percent increase.

Figure 7 (opposite) Total daily ridership by Mobility Management Area (MMA), 2004-2012.



This is data is for KC Metro and Sound Transit routes operated by King County metro only; data was not available for Sound Transit routes operated by Community Transit (i.e., ST 532, 535). The figures represent data for areas within Bellevue city limits only. MMA 1 does not include ridership data from the South Kirkland Park & Ride even though ½ of the lot is within Bellevue City limits. The MMA boundaries were changed slightly between when the 2007 and 2008 data was processed. Some of the variability shown for those years is due to this change rather than actual changes in ridership patterns.

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PERSON THROUGHPUT

The third MOE—"measure person throughput by mode on Bellevue's Frequent Transit Network corridors"—will assist the Transportation Department in tracking transit's contributions to improved mobility on Bellevue's street network. Historically, arterial street performance has been based mostly on outcomes for vehicles rather than people. In classical highway engineering, the goal is "vehicle throughput", expressed by letter grades that reflect an intersection's level of service (LOS). Vehicle throughput is based on the volume-to-capacity (V/C) ratio, which divides the total number of vehicles at a given intersection by the capacity of that intersection to handle cars. The V/C ratio regards each vehicle as equally important regardless of how many people it carries.

There is a *growing recognition* in the transportation industry that metrics that focus solely on vehicle throughput are unable to adequately capture the human and social costs of lost time and money. That is, vehicles do not lose time, but people do. In order to improve automobile LOS at a given intersection, for example, traffic engineers may inadvertently favor a reliance on vehicle-oriented solutions that unintentionally limit other investment choices. The result of these actions may be that the intersection can handle more vehicles but fewer people. In the long-term, as the city grows, managing the transportation system with an exclusive focus on auto congestion paradoxically results in more auto congestion than an approach that considers all modes.

The *Transit Capacity and Quality of Service Manual Third Edition* defines person capacity as: "The maximum number of people that can be carried past a given location during a given time period under specified operating conditions; without unreasonable delay, hazard, or restriction; and with reasonable certainty." Person throughput—a function of the mix of vehicles in the traffic stream, including the number

"If you advocate for ANYTHING, PLEASE make this city less accommodating to cars and MORE accommodating to PEOPLE!"

-Matthew, All-Around Transit User
Resident of Bellevue[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

and occupancy of each type of vehicle—recognizes the difference between a single bus containing 40 people and a pair of cars that occupy the same space but contain only 2 people.

As reflected in the following policy statements, a commitment to measure person throughput is found at every level of government in Washington State.

- *WSDOT HOV Policy* states: "The goals of this system are: (i) To maximize the people-carrying capacity of the freeway system by providing incentives to use buses, vanpools, and carpools; (ii) To provide capacity for future travel growth; and, (iii) To help reduce transportation-related pollution and dependency on fossil fuels. Through HOV programs and policies we strive to make the best use of existing facilities by increasing freeway efficiency and promoting programs to move more people in fewer vehicles." WSDOT's commitment to the person throughput metric is reflected in its annual monitoring of this indicator (see page 48 of the WSDOT *2012 Congestion Report*).
- *Vision 2040*, the Puget Sound Regional Council's adopted regional growth plan, policy MPP-DP-54 states: "Develop concurrency programs and methods that fully consider growth targets, service needs, and level-of-service standards. Focus level-of-service standards for transportation on the movement of people and goods instead of only on the movement of vehicles."
- The context-setting narrative of the Mobility Management section of the *Bellevue Comprehensive Plan* states: "The primary modes of transportation in the city include private vehicles, carpools and vanpools, transit, walking, and bicycling. The city must provide

services and facilities to support all modes, balancing resources to ensure that all are viable and provide reasonable travel choices. *This maximizes the people-carrying capacity of the system and encourages use of alternatives to the single-occupant vehicle.*" [Italics added for emphasis]

Bellevue's person throughput calculation is performed with the Bellevue-Kirkland-Redmond (BKR) travel demand model. Inputs to the four-step model used in travel demand forecasting are current land use, the current transportation system, forecast changes in households, employment, and transportation system improvements, and the fraction of trips made during the peak period. The travel demand model compares demand for travel to the supply of the roadway system within the project area. Travel demand is derived from population and employment, while the supply side of the equation is the roadway system on which travel occurs.

The BKR model produces Peak-Period Person Throughput (PPPT) by mode for the corridor segments that comprise the Frequent Transit Network (FTN) defined in the *Transit Service Vision Report*. The PPPT metric takes into account average vehicle occupancy of personal vehicles and public transportation. By measuring performance during peak periods, PPPT focuses attention on the time period when the transportation system is most stressed. The public easily understands peak-period performance, as it impacts many travelers through the daily commute, and improvements to system performance during peak periods are visible and appreciated.

As reflected in Figure 8, BKR model data facilitates a comparison of PPPT values for both transit and personal vehicles along FTN corridor segments. In the case of Bellevue Way SE between SE 8th Street and 113th Avenue SE, the 2030 projected PPPT on transit is 44 percent of all person trips. When

considered from a vehicle throughput perspective, transit represents only 1.1 percent of all vehicle trips along this FTN corridor segment. Clearly, bus service is projected to make efficient use of the roadway capacity in this corridor.

Although the example provided is for projected 2030 conditions, BKR travel demand model outputs can also be generated for current conditions. Bellevue is able to aggregate prior year annual bus ridership data for each of the FTN corridors. This data is then compared to auto volume and person trips found in the base year model.

Figure 8 (opposite) Total daily ridership by Mobility Management Area (MMA), 2004-2012.

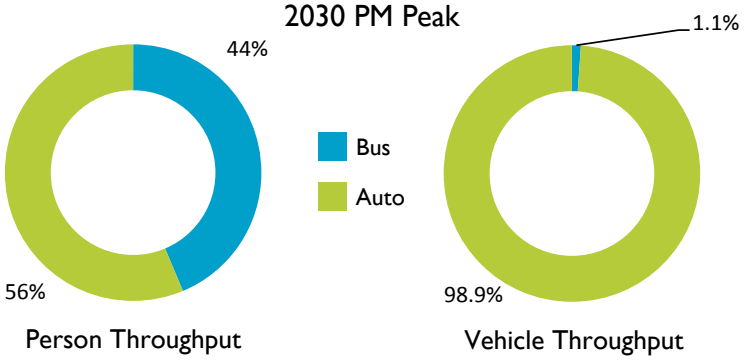
Bellevue Way SE

SE 8th St to 113th Ave SE

Buses[1]	36
Total Vehicles[1]	3,230
Percent Transit[1]	1.1%
Person Trips – Transit[1]	3,363
Person Trips – Total[1]	7,705
Percent Transit[1]	44%

Projected Travel Demand

2030 PM Peak



TRAVEL TIME

The fourth MOE—"measure travel time savings resulting from speed and reliability improvements on Bellevue's Frequent Transit Network corridors"—will assist the Transportation Department in tracking the improvements realized by transit priority investments and help identify FTN service connections where ridership gains and operating cost savings might be realized from proposed transit priority measures. The *Transit Capacity and Quality of Service Manual Third Edition* notes that travel time is a useful metric for assessing transit performance because "travel time directly impacts the number of transit vehicles needed to operate on a route at a given headway and the impact of location-specific transit preferential treatments and operational strategies will typically be expressed as a travel time saved per location," and also because "ridership elasticity factors... exist for average speed, allowing the impact of speed improvements on ridership to be estimated."

According to respondents of the *Bellevue Transit Improvement Survey*, improving bus speed and reliability by investing in roadway and traffic signal infrastructure is the highest priority for municipal investment in transit. Attracting ridership is of course important to transit operators, but speed also impacts the cost of operating a route. The number of transit vehicles required to operate a service at a given frequency depends on the route's cycle time (the time required to make a round-trip on the route), plus driver layover time, and any additional schedule recovery time required beyond layover time. The cycle time (in minutes) divided by the headway (in minutes per vehicle) gives the required number of vehicles to serve the route. If a route's cycle time can be reduced sufficiently to reduce the required number of vehicles, cost savings result. Alternatively, the saved vehicle can be used to increase frequency on this or another route with no net change in operating costs.

"If there was a stop walking distance from my house and walking distance to work, and the time it took wasn't too much longer than driving, I would take the bus to save gas and money."

-Stacey, Non-Rider
Resident of Kenmore[1]

"If it takes me an hour to commute with my car, and 1.5 to 2.5 hours with public transporation, I will choose the most convenient mode of transportation that also provides the least amount of commuting time -- the car."

-Anonymous Non-Rider
Resident of Maple Valley[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

Bellevue's travel time MOE is considered in terms of two metrics: one assesses operating speeds in absolute terms and compares observed speeds to Service Vision targets, and the other expresses transit travel time in relative terms compared to automobile travel time. Together, these two measures provide a comprehensive understanding of the degree of mobility offered by transit service as it relates both to operations and users. The first metric calculates the average operating speed of all routes comprising each FTN service type—Frequent Express (FX), Frequent Rapid (FR), and Frequent Local (FL)—for each period of the day. These values are then compared to the target operating speeds established in the *Transit Service Vision Report* for 2022 and 2030 (see Table 1). Congestion on local roads is projected to worsen as time progresses, hence the estimated operating speeds for FR and FL services are expected to decline between 2022 and 2030. By contrast, the average speeds of Express services increase by 2030 because Route 550—currently the slowest of the Express services—will be discontinued after it is replaced by East Link light rail. Although the general trend is toward declining speeds over time, observed operating speeds in 2012 are not uniformly faster than the estimated speeds for future years. For example, Rapid service is estimated to be 10% faster than Local service in future years per guidance received from Metro, but Bellevue's only existing Rapid route (B Line) does not presently achieve such a speed premium over the average of all local all-day services. If observed speeds in 2022 and 2030 are ultimately found to be slower than the estimated targets, this may have implications for the amount of transit service operated in Bellevue.

Stated simply: time is money. Slower service means less service unless Bellevue can secure additional resources (in terms of annual platform hours operated

Table 1 Estimated current, long- and mid-term operating speeds of FTN service by time of day.

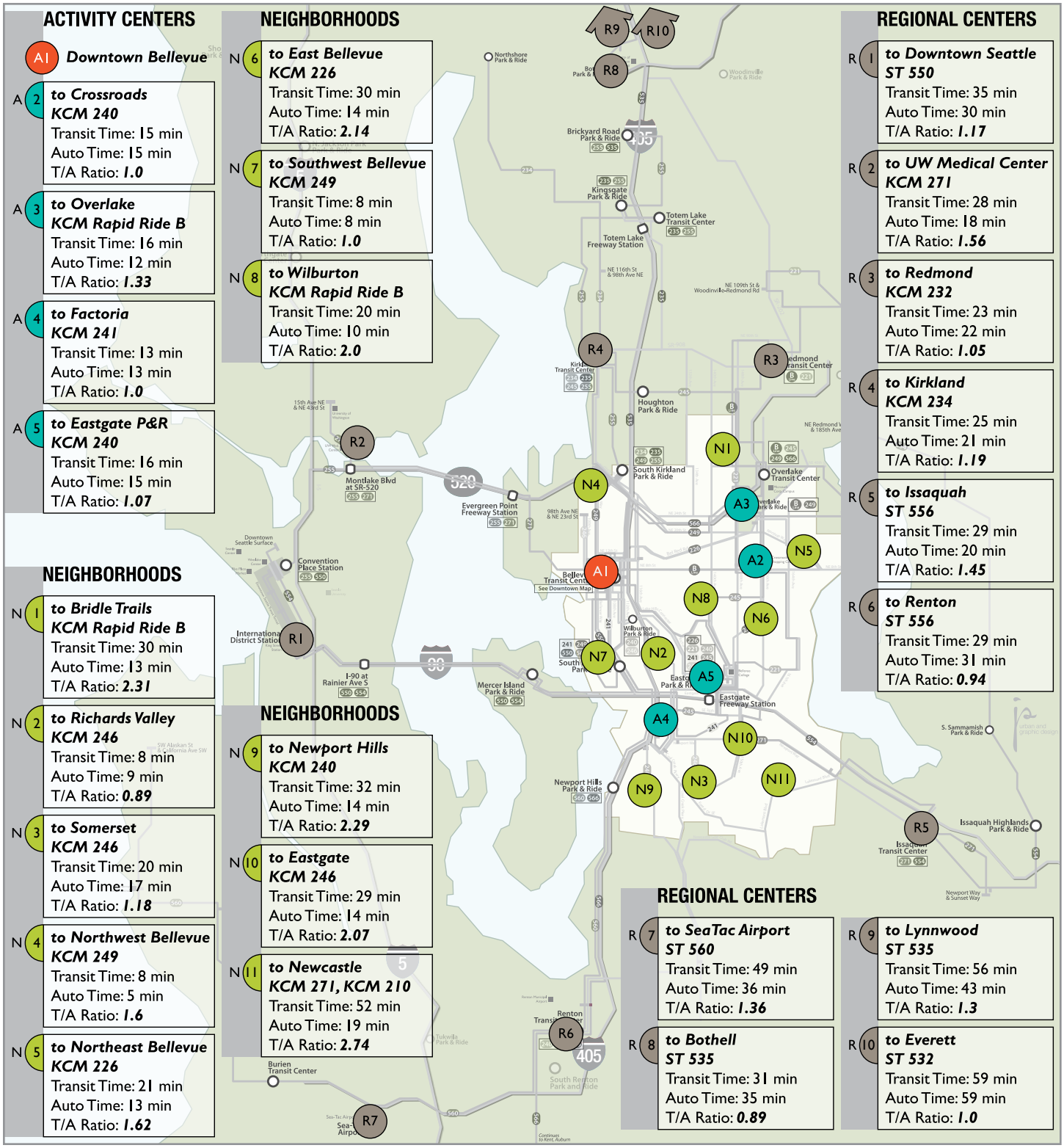
Year	Service	AAM	AM	MD	PM	EVE	NITE
2012	Express	24.81	23.14	23.07	20.62	24.15	25.85
	Rapid	18.14	15.63	13.74	13.03	16.72	19.03
	Local	20.52	16.34	15.76	14.48	16.95	18.71
	Local*	20.52	16.41	15.89	14.54	17.00	18.75
2022	Express	24.85	21.59	23.19	20.00	23.77	24.91
	Rapid	20.16	16.88	16.78	15.25	17.87	19.60
	Local	18.32	15.35	15.25	13.86	16.24	17.82
2030	Express	26.28	24.26	24.51	21.58	25.24	26.77
	Rapid	19.56	16.38	16.28	14.80	17.34	19.02
	Local	17.78	14.89	14.80	13.45	15.76	17.29

* Route 271 includes Local and Express segments. For the 2012 observed figures shown here, revenue miles and hours cannot be extracted for only a single segment. Two figures are therefore provided for Local speeds—the first without Route 271 factored in, and the second (*) with Route 271 included. Express speeds include only Sound Transit Express routes.

Note: Estimated speeds for 2022 and 2030 are calculated by dividing the distance between route timepoints by the scheduled travel time. Observed operating speeds for 2012 are calculated by dividing daily weekday revenue miles by revenue hours. All figures in miles per hour.

within the city) from local transit agencies. This is because slower operating speeds result in longer cycle times, which if sufficiently longer than planned will require additional vehicles to provide the same level of service. If additional resources cannot be secured to offset the difference, service frequency or span may need to be reduced to remain within the annual platform hour budget. The importance of achieving the targeted operating speeds therefore cannot be overstated, as these estimates play a central role in determining how much service can be operated given a particular budget.

Figure 9 Weekday level of service coverage, Fall 2011.



The second measure assessing travel time is a ratio obtained by dividing transit travel time by auto travel time. A Transit/Auto (T/A) ratio greater than 1.0 reflects transit travel times that exceed auto travel times. As a general rule of thumb, T/A ratios of 2.0 or above are considered not competitive to trips by auto and are therefore less likely to attract ridership. Figure 9 reflects PM peak transit travel times, auto times, and T/A ratios from Downtown Bellevue to various local and regional destinations. Additional details about this methodology—derived from manually tabulating travel times using Google Maps—are reflected in the *Bellevue Transit/Auto Travel Time Analysis Report*, in which transit travel times were compared to the time it would take to reach the same destination at the same time of day by car.

Travel times used to calculate the T/A ratio on Bellevue's FTN corridors can be obtained from a variety of sources, including:

- Field data, from auto travel time runs and transit automatic vehicle location (AVL) data;
- Estimates of auto and transit speeds from the Highway Capacity Manual or simulation;
- Online mapping tools like Google Maps, that can provide estimates of auto and transit travel times, including the effects of recurring traffic congestion; or
- BKR travel demand model, for origin-destination trips.

Whichever source is selected, it should be used as the basis for both transit and auto travel times. When travel times are estimated, rather than measured directly, a sample of estimates should be compared against existing conditions to verify the reasonableness of the estimates and, if necessary, develop correction factors for them.

COMMUTER PARKING NEEDS ANALYSIS REPORT

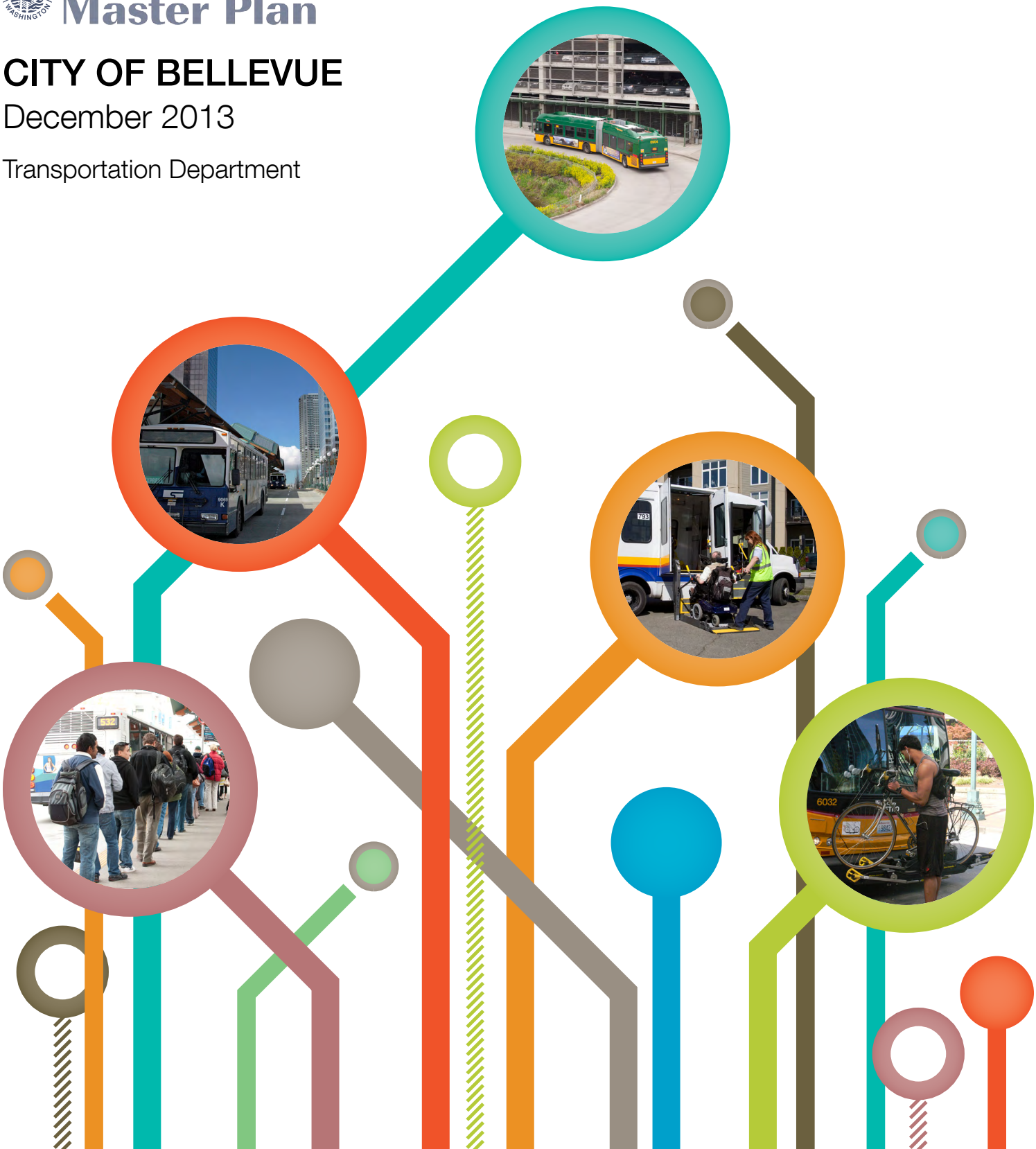
Draft

Bellevue Transit Master Plan

CITY OF BELLEVUE

December 2013

Transportation Department



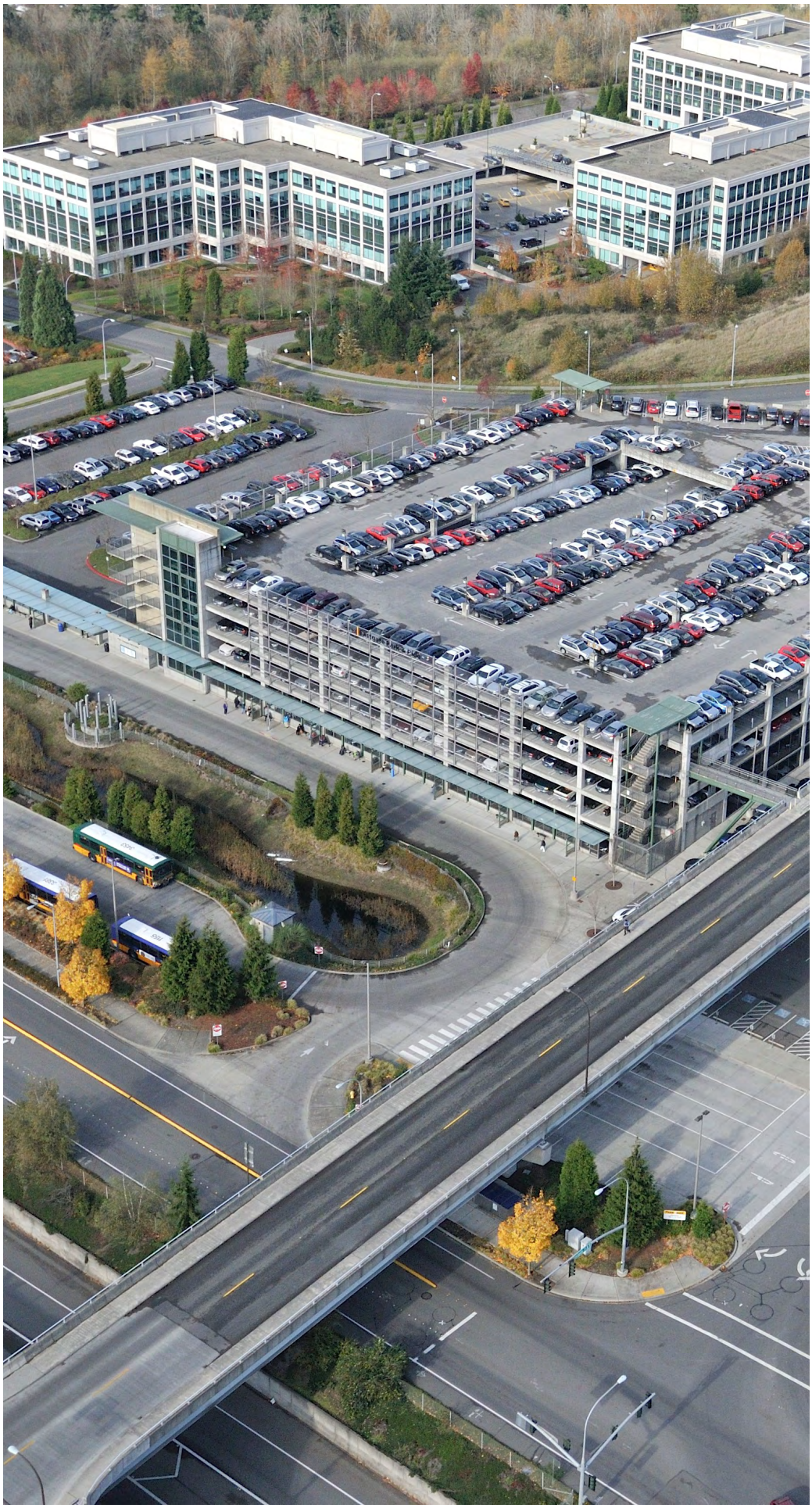


PHOTO BY WSDOT

CONTENTS

PHOTO BY John Tiscornia

INTRODUCTION

Commuter parking facilities play an important role in concentrating transit rider demand, often in lower-density areas that would otherwise be unable to support frequent services. These facilities provide convenient access to transit via automobile or bicycle for people who do not live within convenient walking distance of a standard bus stop. Park-and-ride facilities also serve as a meeting place for carpool and vanpool partners.

As the regional inventory of housing and employment grows, the demand for roadway capacity increases. Because roadway capacity and the ability to expand roadways is limited, park-and-ride lots provide an important amenity that supports the use of alternatives to the single-occupant vehicle, thereby requiring less overall roadway capacity. Further, by concentrating transit boardings at a single point, a more frequent level of service can be supported. This report reviews commuter parking demand assessments for the greater Bellevue area and considers this demand in light of existing parking facilities.

Purpose

It is commonly observed that not every park-and-ride lot has the necessary capacity to meet its current demand. It will be important, moving forward, to determine the level of demand for park-and-ride lots in Bellevue in order to better plan for future system-wide parking needs. The purpose of this study is to assess the unmet park-and-ride needs in Bellevue in order to plan for expansion or other alternatives. One such alternative under consideration is expanding the use of leased lots, which are owned by other entities (e.g. churches) but contracted for use for park-and-ride purposes during off hours.

An updated assessment of commuter parking facility needs is long overdue. Although King County Metro publishes *annual reports* detailing the utilization of all 131 park-and-ride facilities operating in the Metro service area, regional needs were last studied in 2001 when the Washington State Department of Transportation (WSDOT) conducted a study of park-and-ride lots in King, Pierce, Snohomish, and Kitsap Counties (Parsons Brinckerhoff 2001). The *Puget Sound Park & Ride System Update* recommended that the study should be updated every five to ten years in order to maintain its usefulness as a planning tool. The Puget Sound Regional Council (PSRC) also stated in *Transportation 2040* that transit agencies, WSDOT, and PSRC themselves all recognize the need to re-examine the region's park-and-ride strategy.

This report analyzes capacity, use, and projected demand data for park-and-ride lots that lie along two corridors: I-405 and I-90, as defined by the 2001 WSDOT study. Consistent with the *Transit Master Plan*, the planning horizon for this study is through 2030, and projected demand is based on the transit network proposed by the 2030 Growing Resources scenario. This assumes an increase in transit service of about 47 percent from Spring 2012 to accommodate the projected near tripling of transit demand by 2030.

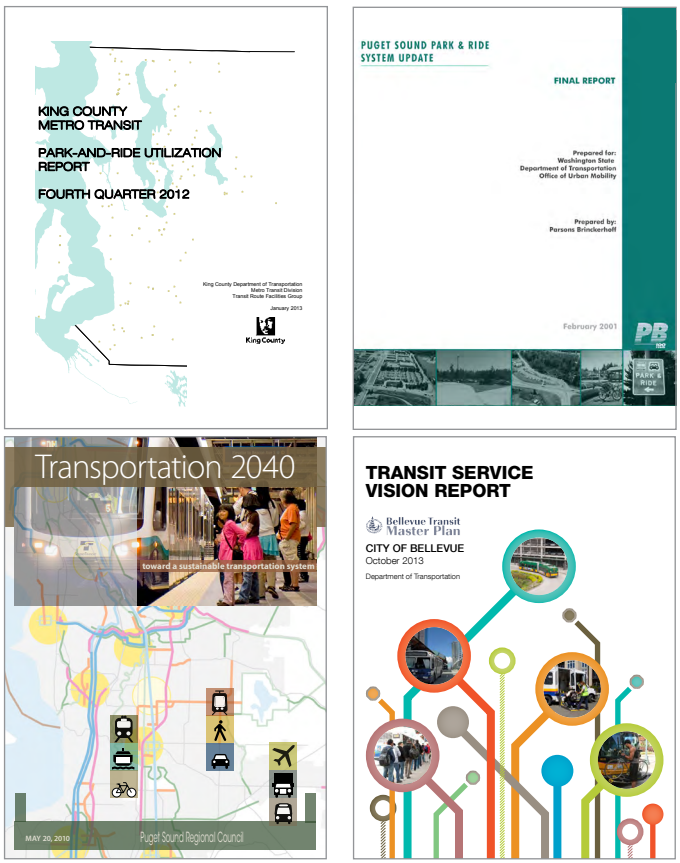


Figure 1 King County Metro publishes *Park-and-Ride Utilization Reports* (top left) annually in the fourth quarter, while the *Puget Sound Park & Ride System Update* (top right) by WSDOT is the last study reporting on the regional demand for park-and-ride capacity. PSRC's *Transportation 2040* (bottom left) and the TMP's *Transit Service Vision Report* (bottom right) also provide context for this report's assessment of park-and-ride capacity in Bellevue.

Comprehensive Plan Policies

In recognition of the important role of commuter parking facilities in providing local and regional access to transit, consolidating demand for service, and reducing vehicle trips and traffic congestion, the City of Bellevue *Comprehensive Plan* includes several policies related to park-and-rides. The City is dedicated to providing effective commuter parking options and to working in partnership with transit providers and the State to increase capacity as needed by expanding existing facilities, developing additional facilities, and pursuing lot lease agreements with other local entities.

POLICY TR-53. Work with transit providers to maintain and improve public transportation services to meet employer and employee needs. Develop and implement attractive transit commuter options, such as park and ride facilities and local shuttle systems with sufficient frequencies to increase use of transit for commuting and reduce reliance on private automobiles.

POLICY TR-62. Work to ensure that the regional transit system includes park and ride lots to serve activity centers in the region and on the Eastside to:

1. Intercept trips by single occupant vehicles closer to the trip origins;
2. Reduce traffic congestion; and
3. Reduce total vehicle miles traveled.

POLICY TR-64. Encourage transit providers and the state to provide new and expanded park and ride lots to adequately serve city residents and to develop additional capacity outside Bellevue at other strategic Eastside locations to serve outlying residents.

Figure 2 With more than 1,600 stalls, Eastgate Park-and-Ride concentrates ridership, thereby facilitating service by multiple transit routes that provide more frequent service than would otherwise be possible in the surrounding area.

POLICY TR-65. Work with transit providers and local property owners to develop new leased park and ride lots.

POLICY TR-75.27. Provide reliable access to the system for Bellevue residents in cooperation with local and regional transit providers, by ensuring that adequate existing and new park and ride lot capacity, neighborhood bus connections and local and regional express bus services are available.

POLICY TR-75.30. Evaluate proposed new park and ride facilities and expansion of existing park and ride facilities to serve light rail transit, for their effectiveness to serve the community and the light rail system, and for their potential environmental and community impacts. New or expanded park and ride facilities should be consistent with the Comprehensive Plan vision for each specific location.

"...[M]ore parking needs to be made available at Park-and-Ride lots to enable more users to ride the buses. I would utilize bus service more if there was a safe place and convenient place for me to park my car!"

-Michelle, Non-Rider
Resident of Snohomish[1]

Transit Master Plan

The Transit Master Plan provides insight into the value of commuter parking facilities in relation to other components of Bellevue's transit system. In particular, the Bellevue *Transit Improvement Survey*, completed in October 2012, and the *Existing and Future Conditions Report*, completed in August 2013, provide context about the issue of commuter parking in Bellevue in terms of their use and perceived value.

"For those of us who commute into Downtown Seattle, it isn't very realistic to catch the bus from our neighborhoods and transfer. So we depend upon the Park and Rides. It is therefore crucial that adequate parking spaces be provided at the Park and Rides in order for Bellevue residents to use transit for commuting."

-Sarah, Work and Special Event Transit User
Resident of Bellevue[1]

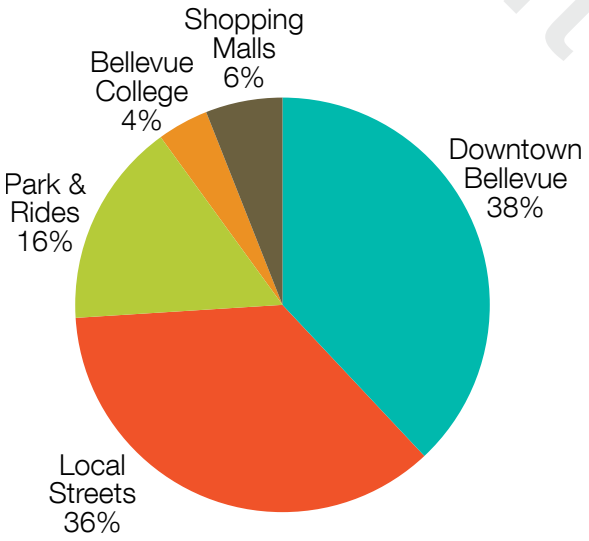
According to the Bellevue Transit Improvement Survey, about 14% (264/1,886) of all survey respondents prefer investment in park-and-ride facilities over seven other alternative areas for municipal investment (see Figure 4). However, investment in park-and-ride facilities is favored less than investment in speed and reliability infrastructure and the provision of real-time information. Older survey respondents were more likely to support investment in park-and-ride facilities than younger riders, and

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

those whose destinations whose destinations include Downtown Bellevue and/or Downtown Seattle favor park-and-ride investments more than those traveling to other areas.

While park-and-ride lots are clearly an important amenity supporting transit use in Bellevue, the *Existing and Future Conditions Report* indicates that the majority of people riding transit in Bellevue access transit at other types of facilities (Figure 3). In Fall 2011, about 38% (15,408/27,889) of daily ons/offs took place in Downtown Bellevue, including at the transit center; about 36% (14,523/27,889) occurred on local streets outside of Downtown Bellevue; and Park & Ride facilities, including Eastgate (2,166), South Bellevue (1,588), Newport Hills (281), Wilburton (51), and the Eastgate Direct Access Ramp (2,270), collectively accounted for about 16% of all daily boardings and alightings.

Figure 3 Transit usage patterns in Bellevue based on Fall 2011 boarding and alighting (ons/offs) data.



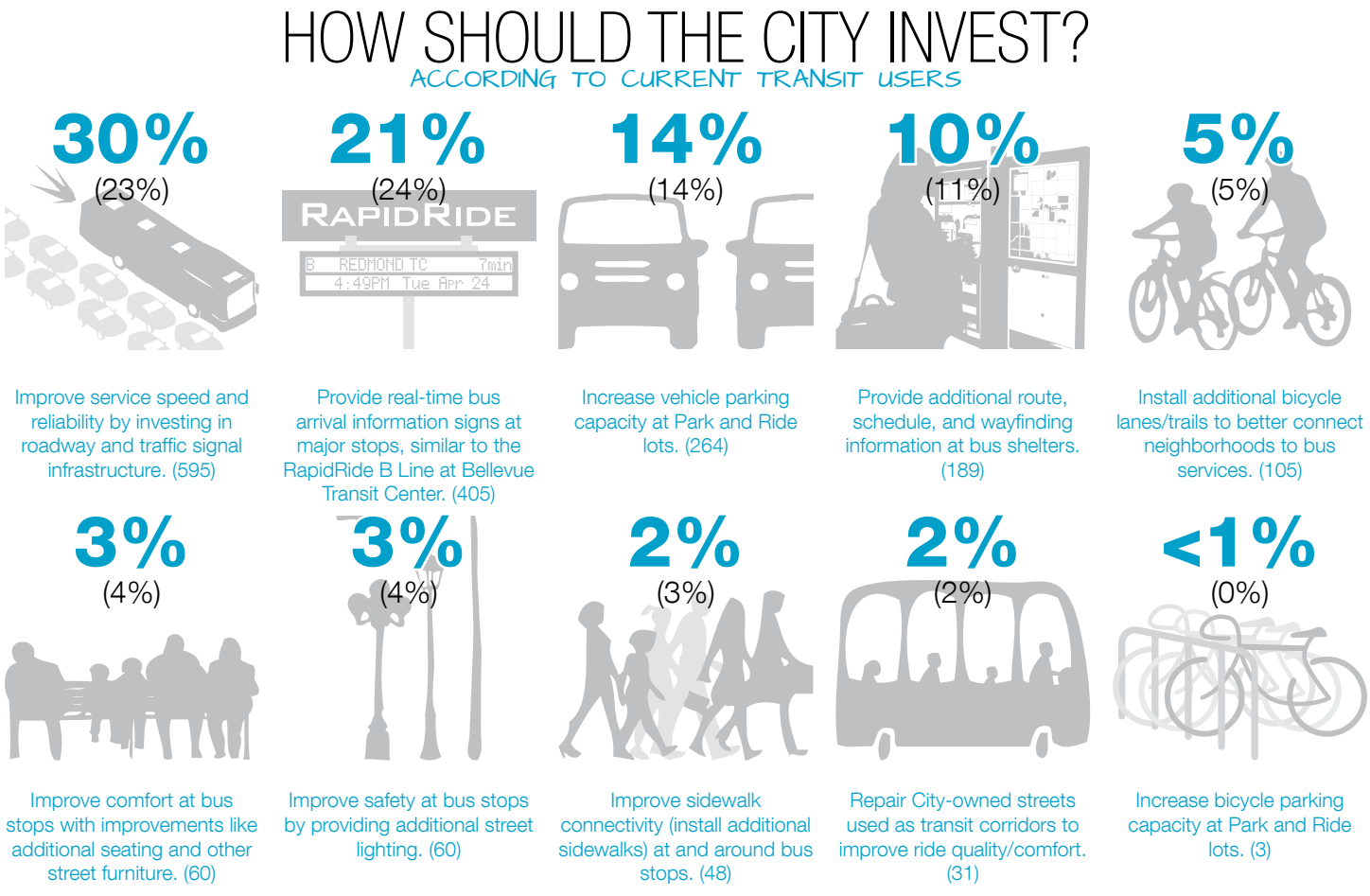


Figure 4 The third most common way current transit users think the City should invest municipal resources to improve transit service in Bellevue is by "increasing vehicle parking capacity at Park and Ride lots" (14%; 264/1,962 respondents). In addition to the options listed above, 9.9% (194/1,962 respondents) chose "other." Percentages for current transit users who live in Bellevue are shown in parenthesis (661 respondents).

METHODOLOGY

Transit Corridors

This report uses the transit corridors that were established by WSDOT's 2001 *Puget Sound Park & Ride System Update* to provide organizational structure to the existing park-and-ride lots. Capacity needs for park-and-ride lots are intended to be considered in general—not in a lot-specific sense—allowing for more flexibility in analyzing the findings and in developing solutions.

The use of corridors allows for a high-level analysis of needs that aligns with demand projection methodology from the BKR Travel Demand Model (MP30r6.2). Corridor-level analysis allows for the capture of both local park-and-ride demand and demand that may be shifting between facilities within the corridor. Shifts between facilities, called "lot substitutions", are caused when a transit rider travels further to reach a lot with more favorable conditions, such as higher frequency services, a wider range of destinations, or more parking lot capacity. Lot substitution is observed in Bellevue where transit riders pass park-and-ride lots closer to their homes in favor of parking at the South Bellevue Park-and-Ride, where service that is both faster and more frequent is available.

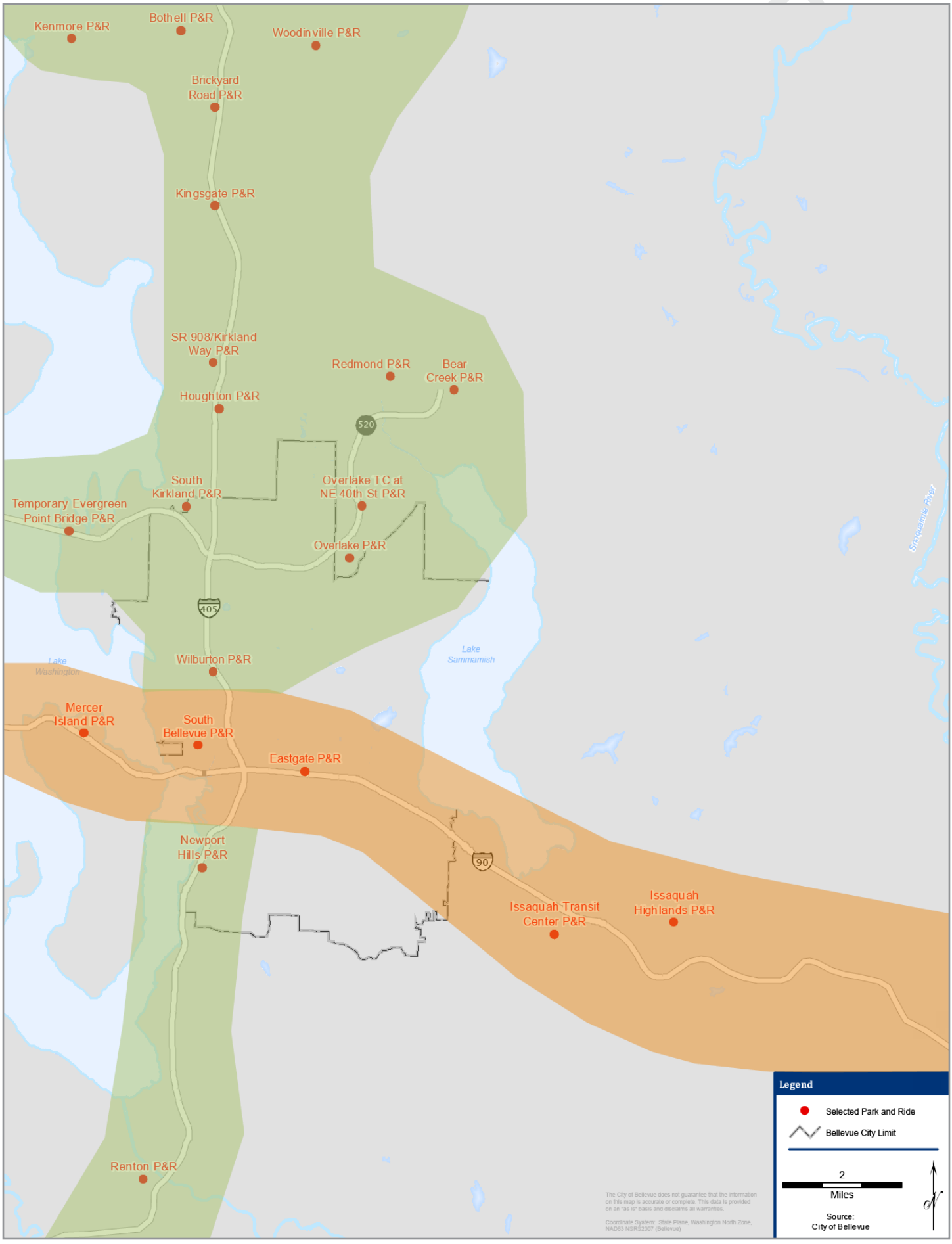
The WSDOT study established transit corridors based on a list of primary transit commuting corridors and subareas, together with input from local transit agencies. Within the City of Bellevue, the transit corridors are broadly defined by two freeways: I-90 and I-405. Figure 5 shows a map of Bellevue and its surroundings with selected park-and-ride lots located within the identified corridors.

"If the bus route came closer to where I live I wouldn't need to drive to the Park and Ride. So either the city should have a lot more Park and Ride spaces or have more bus routes in unserved parts of Bellevue."

-Pat, Shopping and Social Transit User
Resident of Bellevue[1]

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

Figure 5 Park-and-ride lots in the I-405 (green) and I-90 (orange) corridors.



"I sometimes have to pass two Park-&-Ride lots on my route before finding a parking space. By that time, I've driven half-way to work."

-Don, All-Around Transit User
Resident of Kirkland[1]

Travel Demand Modeling

In order to quantify corridor-level park-and-ride demand, estimates for 2013 and forecasts for 2030 were developed. Demand projections used the BKR Travel Demand Model (MP0r12), which has been developed to reflect conditions in Bellevue, Kirkland, and Redmond. The demand for park-and-ride use in the City of Bellevue is estimated using all standard assumptions and sources from the model, except that the unconstrained demand estimates remove capacity as a constraint for all park-and-ride lots.

The following are standard assumptions and sources from the BKR Travel Demand Model. Baseline data is derived primarily from regional survey conducted by the Puget Sound Regional Council (PSRC). This is validated by census data and data from the PSRC regional household travel survey. According to the BKR Model Report (City of Bellevue 2011), "the base-year model platform is updated annually to reflect changes in land use and roadway network. The model is validated with observed traffic counts and transit ridership on an annual basis. As travel survey data becomes available, enhancements are made to the BKR base model to more accurately project travel demand." It is assumed that trip assignments constrain transit capacity, and park-and-ride capacity typically constrains the mode split process. The same park-and-ride attractiveness factors are carried forward from the constrained demand projection to the unconstrained demand projection. Attractiveness factors include size and ratio of lot size to average lot size in the system, and these are represented by a proxy figure in the model. Characteristics of transit service quality, such as frequency of service at a given park-and-ride facility, are not specifically considered by the model.

In order to develop the two scenarios—constrained and unconstrained—parking demand for the I-90 and I-405 corridors are modeled for the year 2030 based

[1] Write-in comment from the *Transit Improvement Survey Summary Report* (2012).

on the Growing Resources scenario presented in the *Service Vision Report*. The constrained scenario keeps parking lot capacity consistent with 2030 projections based on approved and funded projects. The unconstrained scenario sets the model's capacity to 10,000 stalls for every lot to represent an unlimited capacity of parking stalls at each facility. WSDOT's *Puget Sound Park & Ride System Update* similarly uses unconstrained demand projections to determine demand under ideal circumstances. That study provided park-and-ride capacity for the year 2000 and unconstrained demand for the year 2020.

Figure 6 Historic utilization of park-and-ride lots for the I-405 and I-90 corridors.

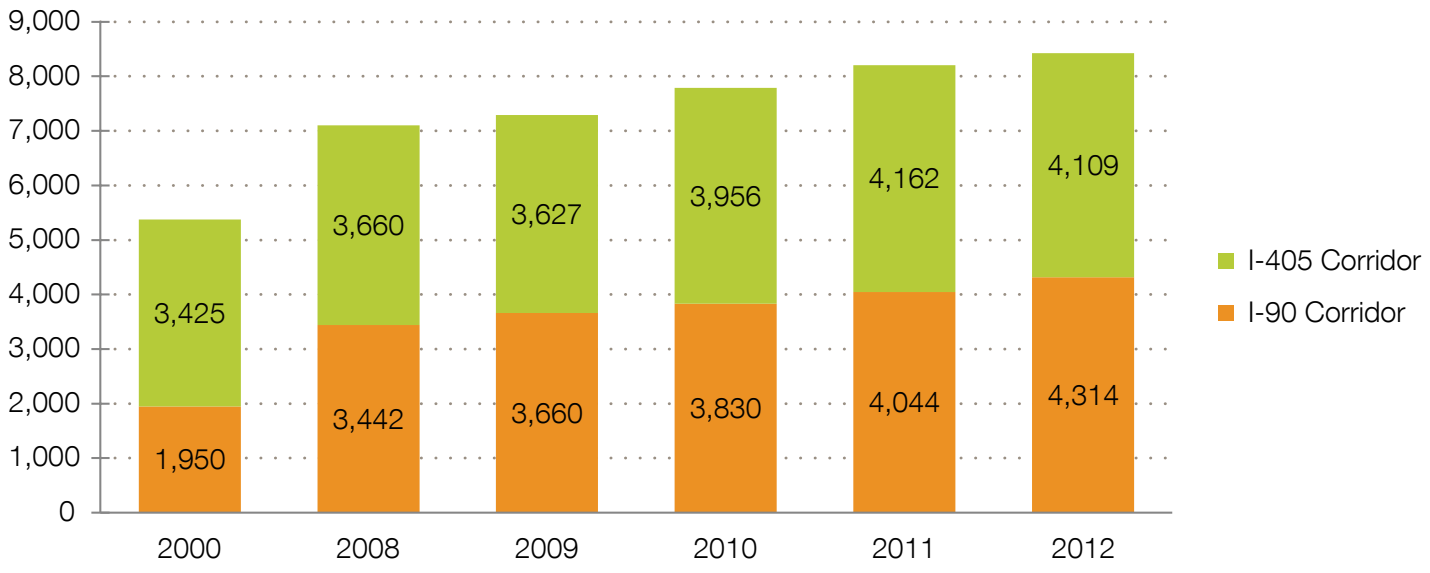


Figure 7 Constrained and unconstrained demand for park-and-ride lots along the I-90 corridor.

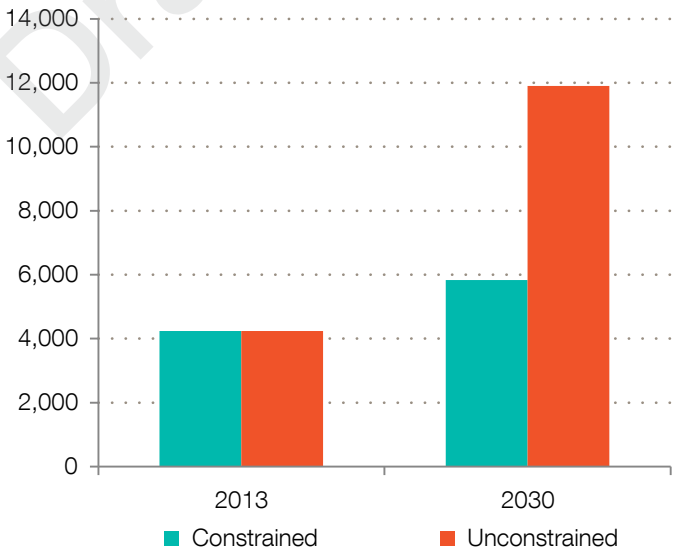
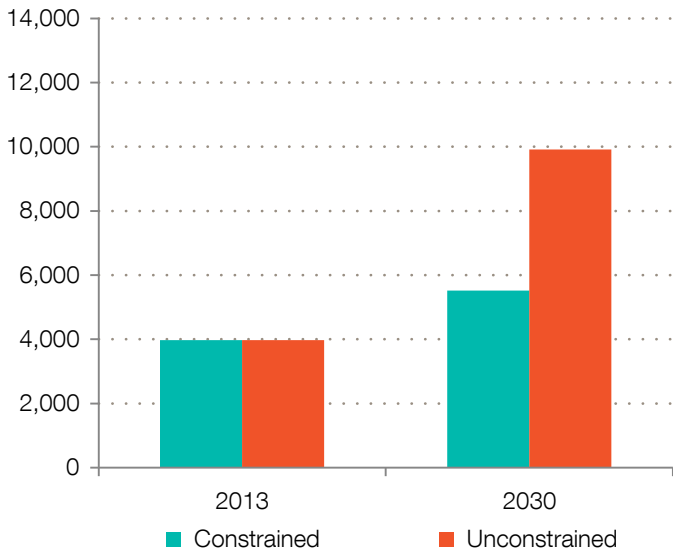


Figure 8 Constrained and unconstrained demand for park-and-ride lots along the I-405 corridor.



PARK-AND-RIDE USE

Figure 6 on page 9 presents fourth quarter park-and-ride utilization data from the past five years (King County Metro 2013) plus the utilization reported by WSDOT for 2000 (Parsons Brinckerhoff 2001). This chart reveals that park-and-ride usage rose by 121% (2,364 vehicles) for the I-90 corridor between the years 2000 and 2012, and usage in the I-405 corridor rose by 19% (684 vehicles). Refer to Appendix 1 on page 18 for the complete associated data. Likely causes of this increased use include the construction of the new 1,600-stall Eastgate Park-and-Ride facility in 2005 and the expansion of the South Kirkland Park-and-Ride. Utilization of I-90 corridor park-and-ride lots increased by 1,492 vehicles (76%) between 2000–2008. The I-405 corridor experienced an increase in utilization of 449 vehicles (12%) between 2008–2012.

Modeling Results

Demand for park-and-ride lots are shown for the I-90 and I-405 corridors in Figure 7 and Figure 8, respectively, based on the modeling methodology outlined in the previous section. Refer to Appendix 2 and Appendix 3 on page 18 for the complete associated data. These charts show that for the year 2030, both constrained and unconstrained demand for each of the two corridors exceed the projected lot capacity. The projected lot capacity is exceeded most in the unconstrained scenarios, particularly for the I-90 corridor. If an unlimited supply of parking were available at both the Eastgate Park-and-Ride and the South Bellevue Park-and-Ride, the model predicts that almost 3,000 additional parking stalls for each lot would be required to satisfy the demand in 2030. Model results show that unconstrained demand is approximately 200% greater than constrained demand, suggesting that new riders will likely begin using the system given increased parking availability.

Yet when existing 2013 parking utilization rates are averaged along the I-90 and the I-405 corridors, there is an oversupply of parking for each corridor. The combined I-90 lots have an oversupply of 290 stalls, with an overall average occupancy of 93 percent. The combined I-405 lots have an oversupply of 629 stalls, with an overall average occupancy of 86.4 percent. Unfortunately, this oversupply is not evenly distributed, representing unmet need for lots such as the South Bellevue and Mercer Island Park-and-Rides along the I-90 corridor.

Park-and-ride usage in Bellevue varies by the size and location of the lot. Two of the most popular lots are profiled in this report: South Bellevue Park-and-Ride and Eastgate Park-and-Ride.

South Bellevue Park-and-Ride

The South Bellevue Park-and-Ride is a surface parking lot with a 519-stall capacity. It is heavily utilized, especially by users originating a great distance from the lot. As indicated by the photos shown in Figure 9, vehicles often park along the unpaved and sloping shoulder and in other places where parking is not allowed after the lot fills. According to a license plate survey conducted by Sound Transit in August 2013, 44% of the lot's demand is generated from further than five miles from the lot. Demand calculations used in this were based on the total number of vehicles registered in Washington with addresses that are able to be recognized by Sound Transit's geographic information system (GIS), of which there were 484 vehicles. The pie chart in Figure 10 shows the distribution of park-and-ride users with origins of less than five miles from the lot. (Refer to Appendix 4 on page 19 for the complete associated data.) Only 6% of South Bellevue Park-and-Ride users commute less than one mile, 78% of

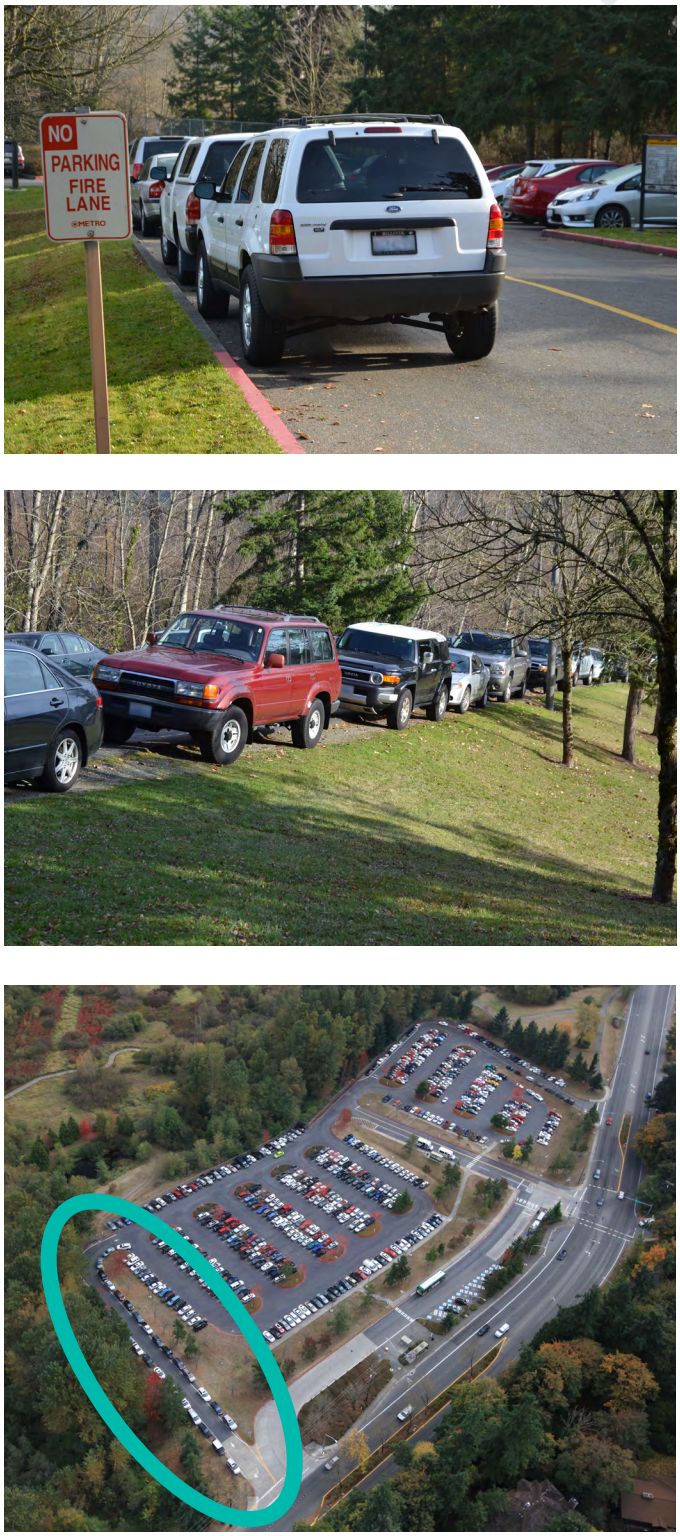


Figure 9 The South Bellevue Park-and-Ride is often over capacity, with vehicles parked along the shoulders of the driveway (circled).

Figure 10 Distances traveled by users to reach the South Bellevue Park-and-Ride.

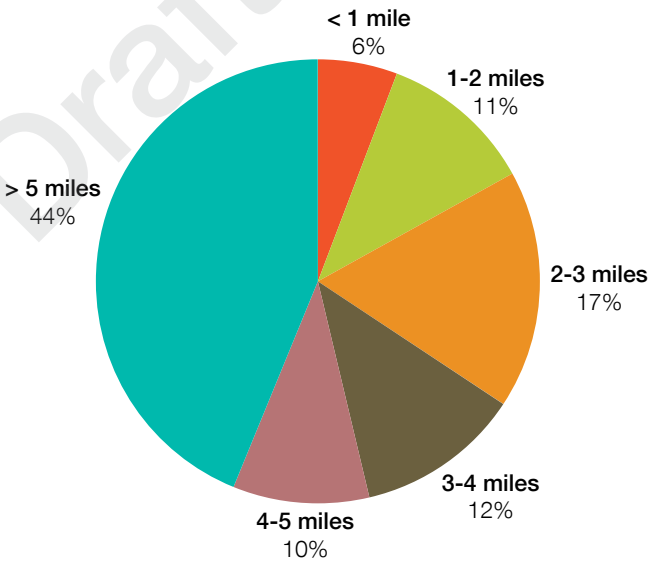
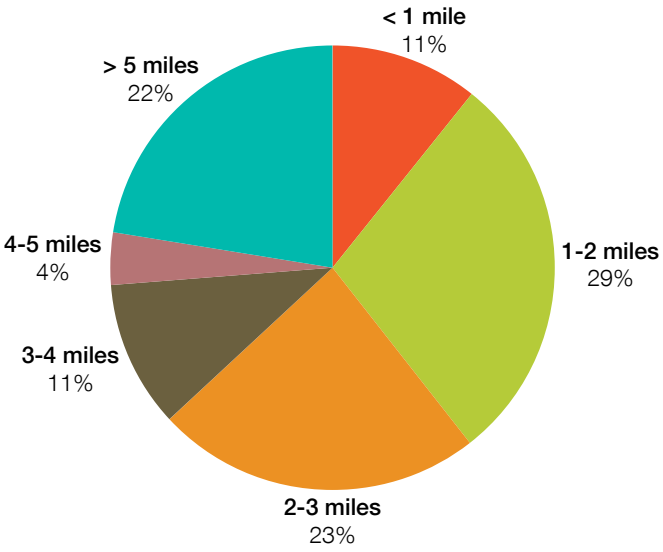


Figure 11 Distances traveled by users to reach the Eastgate Park-and-Ride.



the demand is from East King County, and only 6.8% of the demand comes from Seattle. Within East King County, the demand is generally evenly distributed, but south of Bellevue city limits, the I-5 corridor from the edge of Lake Washington to the east 2.5 miles to the east contains 30% of all users, with origins from the two cities of Renton and Newcastle. The South Bellevue Park-and-Ride's market area, as determined by Sound Transit's license plate surve, is illustrated in Figure 12.

Eastgate Park-and-Ride

The Eastgate Park-and-Ride is a five story parking structure with a capacity of 1,614 vehicles. Sound Transit also conducted a license plate survey of this facility in August 2013. When the survey was conducted, 1,078 Washington-registered vehicles were present. Of these, 89% were registered in East King County, and 52% of the users commuted between one and three miles to reach the lot. Figure 11 shows the distribution of lot usage by distance traveled. (Refer to Appendix 5 on page 19 for the complete associated data.) The pattern of distribution shows a concentration of use that forms a vertical rectangle bounded by Lake Sammamish to the east, a line extending north and south of the lot to the west, and extending three miles in both directions as shown in Figure 13 on page 14.

Figure 12 The South Bellevue Park-&-Ride user origins.

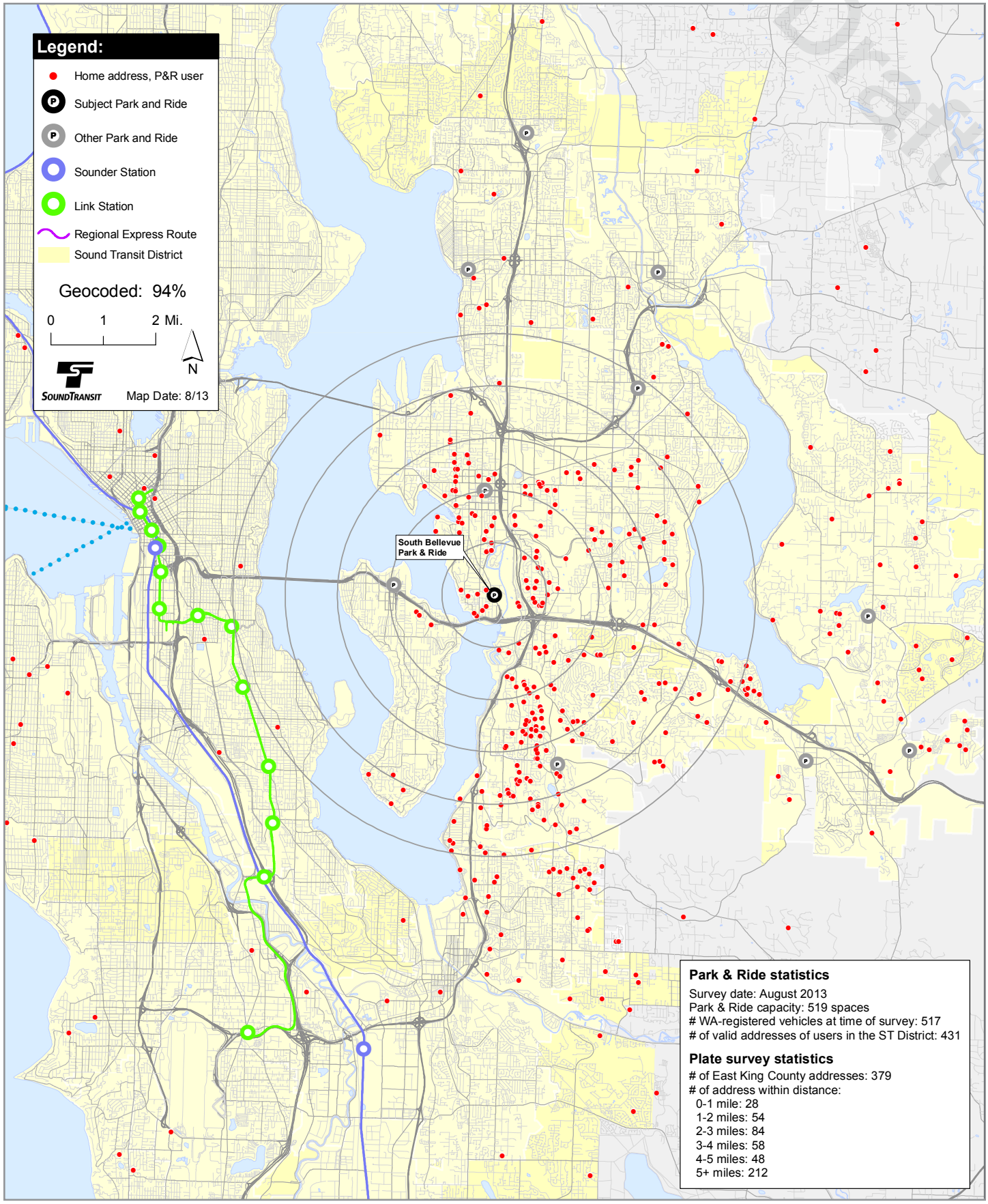
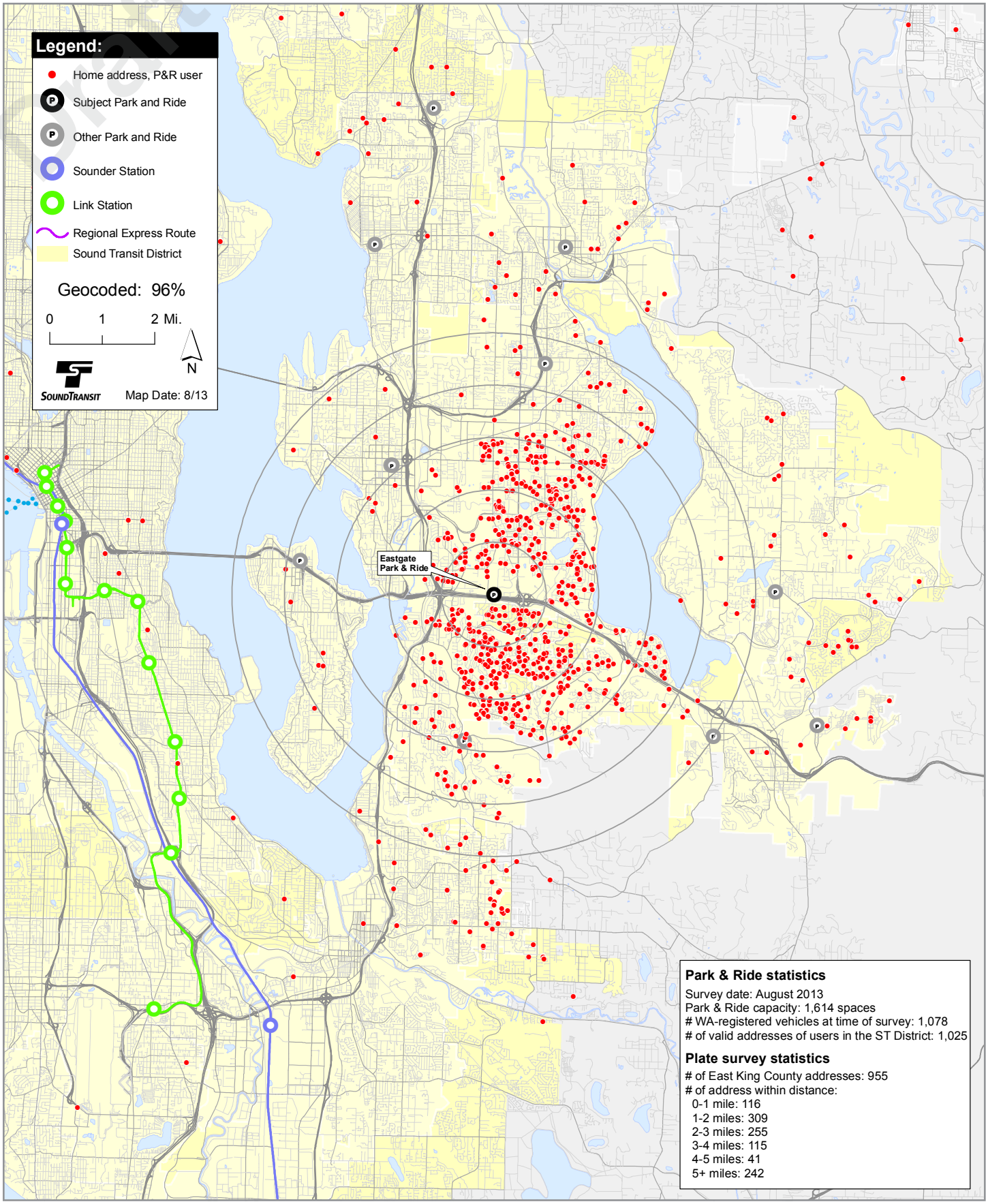


Figure 13 Eastgate Park-and-Ride user origins.



CONCLUSIONS

This assessment suggests that there is a significant shortage of commuter parking in Bellevue. As the park-and-ride usage trends indicate, commuter parking expansions have occurred in high-utility areas due to their locations in proximity to I-405 and I-90 and their central to western location within the City of Bellevue. Indeed, past experience shows that lots are quickly filled shortly after new park-and-ride facilities are built.

The constrained travel demand model indicates that there are approximately 200 stalls for each corridor that are required beyond those provided. When an unlimited supply of stalls is provided in the model— the unconstrained scenario—there is a shortage of over 6,000 stalls along the I-90 corridor and a shortage of approximately 4,600 stalls along the I-405 corridor. Thus, each corridor would need to have twice the number of stalls to keep up with the projected unconstrained demand.

Recommendations

In order to meet the needs of doubling the commuter parking system in Bellevue by 2030, it will be necessary to undertake a multiple-pronged approach involving new construction, re-use of existing facilities, and building greater efficiency into the system. It may also be possible to mitigate for unmet need through the development of leased lots. These shared lots are privately-owned by institutions that make only partial use of their parking infrastructure, such as churches. Several such lots exist in the area surrounding the most heavily-utilized park-and-ride lots. Where new construction is necessary, the cost of construction may be offset by the potential to charge fees for park-and ride use. King County Metro is undertaking a pilot study to explore the potential for charging at park-and-ride lots.

Greater efficiency could be realized with the use and design of park-and-ride facilities by looking to technology to indicate the number of stalls available at each facility. This technology could help inform drivers of the availability of parking at sometimes hard to see leased lots or some of the smaller lots with less capacity. One such technology provides updated parking locations to handheld devices. This application is currently being used by the City of Los Angeles. Also, better bicycle and pedestrian connections could be provided to Park-and-ride lots to reduce the number of automobile passengers, and ride sharing could be encouraged.

These recommendations can help ensure that commuter parking facilities more effectively and efficiently support transit than they do today, which will be increasinly important as the region continues to grow. Respondents to Bellevue's *Transit Improvement Survey* have indicated the importance of park-and-rides to support transit; together with its regional partners, the City should strive to respond to this demand.

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APPENDICES

Appendix 1 Historic utilization of park-and-ride lots for the I-405 and I-90 corridors.

	2000	2008	2009	2010	2011	2012
I-90 Corridor Park-and-Rides	1,950	3,442	3,660	3,830	4,044	4,314
I-405 Corridor Park-and-Rides	3,425	3,660	3,627	3,956	4,162	4,109
Total Number of P&R spaces used daily	5,375	7,102	7,287	7,786	8,206	8,423

Appendix 2 Constrained and unconstrained demand for park-and-ride lots along the I-90 corridor.

	2013	2030
Constrained Model	4,236	5,838
Unconstrained Model	4,236	11,901

Appendix 3 Constrained and unconstrained demand for park-and-ride lots along the I-405 corridor.

	2013	2030
Constrained Model	3,977	5,516
Unconstrained Model	3,977	9,914

Appendix 4 Distances traveled by users to reach the South Bellevue Park-and-Ride.

Place of Residence	
Survey Date: August 2013	
Park-and-Ride Capacity	519
# of Washington registered vehicles	517
< 1 mile	28
1-2 miles	54
2-3 miles	84
3-4 miles	58
4-5 miles	48
> 5 miles	212
Total	484

Note: Of the 517 Washington-registered vehicles, 6% could not be geocoded.

Appendix 5 Distances traveled by users to reach the Eastgate Park-and-Ride.

Place of Residence	
Survey Date: August 2013	
Park-and-Ride Capacity	1,614
# of Washington registered vehicles	1,078
< 1 mile	116
1-2 miles	309
2-3 miles	255
3-4 miles	115
4-5 miles	41
> 5 miles	242
Total	1078

Note: Of the 1,078 Washington-registered vehicles, 4% could not be geocoded.

Appendix 6 Summary of parking demand and capacity for park-and-ride lots in 2013 and 2030.

Park-and-Ride Facility	BKR SAZ	2013 Capacity and Use[1]		Oversupply or Shortage in 2013	2030 Capacity and Demand[2]			Oversupply or Shortage in 2030	
		Lot Capacity	Use		Projected Capacity	Constrained Demand[3]	Unconstrained Demand[3,4]	Based on Constrained Demand	Based on Unconstrained Demand
I-90 Lots									
Mercer Island	681	447	447	0	498	520	888	-22	-390
South Bellevue	686	519	555	-36	1,400	1,461	4,291	-61	-2,891
Eastgate	688	1,614	1,452	162	1,614	1,686	4,457	-72	-2,843
Issaquah	680	819	776	43	1,016	1,061	1,504	-45	-488
Issaquah Highlands	779	1,010	968	42	1,010	1,055	719	-45	291
Preston	789	53	38	15	53	55	42	-2	11
Total		**4,462**	**4,236**	**226**	**5,591**	**5,838**	**11,901**	**-247**	**-6,310**
I-405 Lots									
Kenmore	703	603	601	2	618	642	1,227	-24	-609
Bothell	705	220	215	5	220	229	409	-9	-189
Woodinville	706	438	240	198	438	456	493	-18	-55
Brickyard	701	443	362	81	443	462	993	-19	-550
Kingsgate	700	502	507	-5	502	524	1,029	-22	-527
SR 908 / Kirkland Way	813	20	17	3	20	21	18	-1	2
Houghton	694	470	203	267	470	491	406	-21	64
Redmond	696	377	375	2	385	403	814	-18	-429
Bear Creek	699	283	308	-25	283	296	609	-13	-326
Evergreen Point	690	31	38	-7	51	53	26	-2	25
S Kirkland	692	783	304	479	727	760	1,756	-33	-1,029
NE 40th / Overlake TC	832	222	222	0	369	386	1,186	-17	-817
Overlake	693	203	76	127	203	212	546	-9	-343
Wilburton	687	186	143	43	186	194	303	-8	-117
Newport Hills	683	275	218	57	275	254	53	21	222
Renton	679	150	148	2	128	133	46	-5	82
Total		**5,206**	**3,977**	**1,229**	**5,318**	**5,516**	**9,914**	**-198**	**-4,596**

1. 2013 Capacity and Use are from the King County Metro Transit, Park-and-Ride Utilization Report, Third Quarter 2013.
2. Capacity and Demand figures for 2030 are projected from Bellevue's BKR model (MP30r6.2).
3. 2030 Demand assumes TMP "Growing Resources Scenario". Demand forecast is based on future service assumptions and BKR model transit ridership growth rates.
4. In addition to the above assumptions, the 2030 Unconstrained Demand places no limitations on the total number of parking stalls available.

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