CITY OF KIRKLAND

6th Street Corridor

HE6th
• HOUGHTON / EVEREST NEIGHBORHOOD CENTER
• 6TH STREET CORRIDOR

Prepared for The City of Kirkland
Prepared by Transpo Group | www.transpogroup.com

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EXECUTIVE SUMMARY

Current Corridor Context

The City of Kirkland's natural north-south orientation relies heavily on north-south corridors including 6th Street S/108th Avenue NE, Interstate - 405, and Lake Washington Boulevard. The 6th Street corridor extending from Central Way to the South Kirkland Park-and-Ride, and parallel corridors, are subject to significant recurring peak congestion. This congestion impacts the livability of the community and ability to address and accommodate future growth.

Growth and Land Use

The City of Kirkland anticipates both population and employment growth in the next decade. Consistent with the state Growth Management Act, the City has developed Kirkland 2035 and the Transportation Master Plan to address growth and plan for the mobility of people and goods. These plans define the importance of the 6th Street Corridor for all modes of transportation and convey core City values to create a walkable, vibrant, livable, connected, and green community. This corridor study identifies strategies and potential solutions for meeting current and future mobility needs for this essential City corridor.

Developing Solutions

Key tasks for this study included data collection, public outreach, analysis of current and future conditions, analysis of land use options within the Houghton Everest Neighborhood Center, development of potential solutions, and description of recommended solutions with implementation plans. The study included an evaluation of different transportation solutions to meet current and future transportation needs, from education and policies to capital improvements.

Conclusion

As a key regional north-south corridor in the City, this corridor is an important element for meeting current and future growth throughout the City. Peak congestion including long queues and delays are frustrating for auto and transit commuters. For the neighborhoods adjacent to the corridor, the corridor is central to their community and impacts their quality of life. With investments, largely in transit, to help improve regional mobility, the corridor can move people and start to address growth. Investing in pedestrian, and bicycle improvements can also further improve the quality and livability of the corridor.

CURRENT CORRIDOR CONTEXT

Addressing potential improvements to meet City-wide and regional growth needs for mobility requires an in-depth review of the corridor operations including all modes, collecting data and engaging with the community for their perspectives.

By the numbers:

Only 5% of all north/south regional traffic uses the 6th Street Corridor. I-405 carries most regional traffic.

Of the north-south Kirkland local traffic, one third uses the 6th Street Corridor

During the peak period, 74-82% of vehicles using the 6th Street corridor in the peak are accessing homes or jobs in Kirkland

In 20 Years daily traffic has varied little between 10-13,000 vehicles per day

The 6th Street Corridor study area includes 6th Street South/108th Avenue NE (6th Street / 108th Avenue) from Central Way in downtown to Northup Way and the South Kirkland Park-and-Ride.

The study area for the Houghton – Everest Neighborhood Center is located within two designated neighborhoods in the City of Kirkland – the Everest Neighborhood on the north side of NE 68th Street and the Central Houghton Neighborhood on the south side. The commercial area or business district at the NE 68th Street/6th Street S – 108th Avenue NE intersection is designated a Neighborhood Center in the City's Comprehensive Plan. NE 68th Street /NE 70th Street and 6th Street /108th Avenue are two minor arterials that serve the commercial area and the two neighborhoods. They also provide connections to downtown Kirkland (through the Moss Bay Neighborhood), Lake View Neighborhood, I-405 and SR 520. The Cross Kirkland Corridor (CKC) is directly adjacent to the neighborhood center on the western boundary.

The 6th Street Corridor Study was conducted with the Houghton Everest Neighborhood Center land use study to take advantage of the opportunity to coordinate public outreach regarding transportation improvements. As part of Kirkland 2035 (the City Comprehensive Plan update), a Transportation Master Plan was developed and its goals and objectives were incorporated into the Transportation Element of the Comprehensive Plan. The goals and objectives of the Transportation Master Plan were used to guide the outcomes of the 6th Street Corridor Study.

Study Limits and Function

Error! Reference source not found. illustrates the project corridor, surrounding vicinity, and the parallel corridors. **Figure 2** highlights the 6th Street / 108th Avenue corridor and key traffic control. A broad range of data was readily available through the City and other transportation providers. Transpo aimed to maximize this as much as possible. Transpo leveraged existing turning movement count data, bicycle and pedestrian counts on the Cross Kirkland Corridor, and daily volumes on the 6th Street corridor. Where data did not exist, Transpo collected parking and travel time data, and used StreetLight to obtain origin-destination data and better understand travel patterns and behavior. Streetlight combines a variety of data sources such as in vehicle GPS sources to better understand travel patterns.

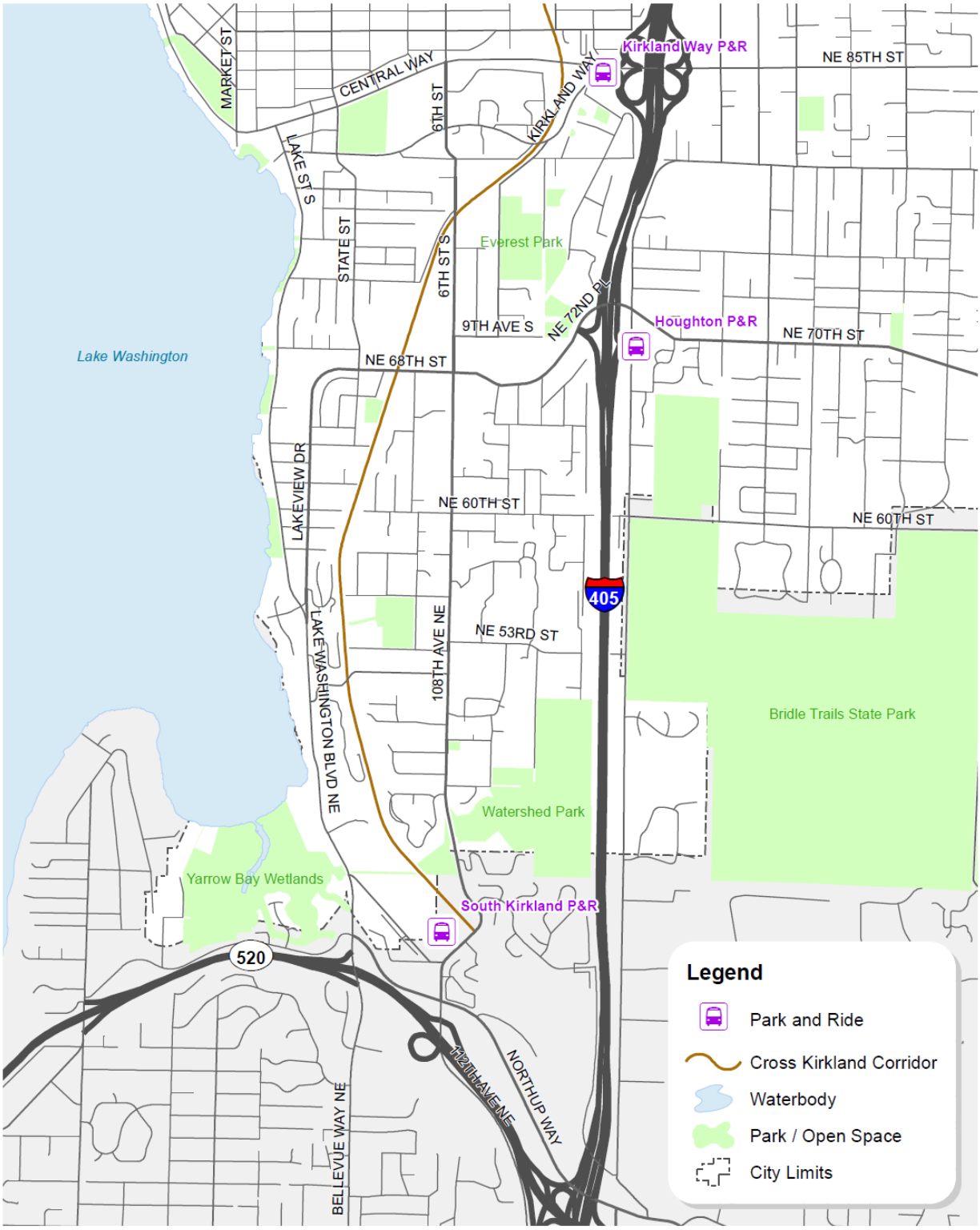


Figure 1 - Study Area

Corridor Characteristics

Within the 2.5 Miles of the corridor today, there are 4 traffic signals (or almost 1.5 per mile) and 20 crosswalks (or over 7 per mile). Of these 20 crosswalks, 8 are protected with Rectangular Rapid Flashing Beacons (RRFBs). There are transit stops every ¼ mile.

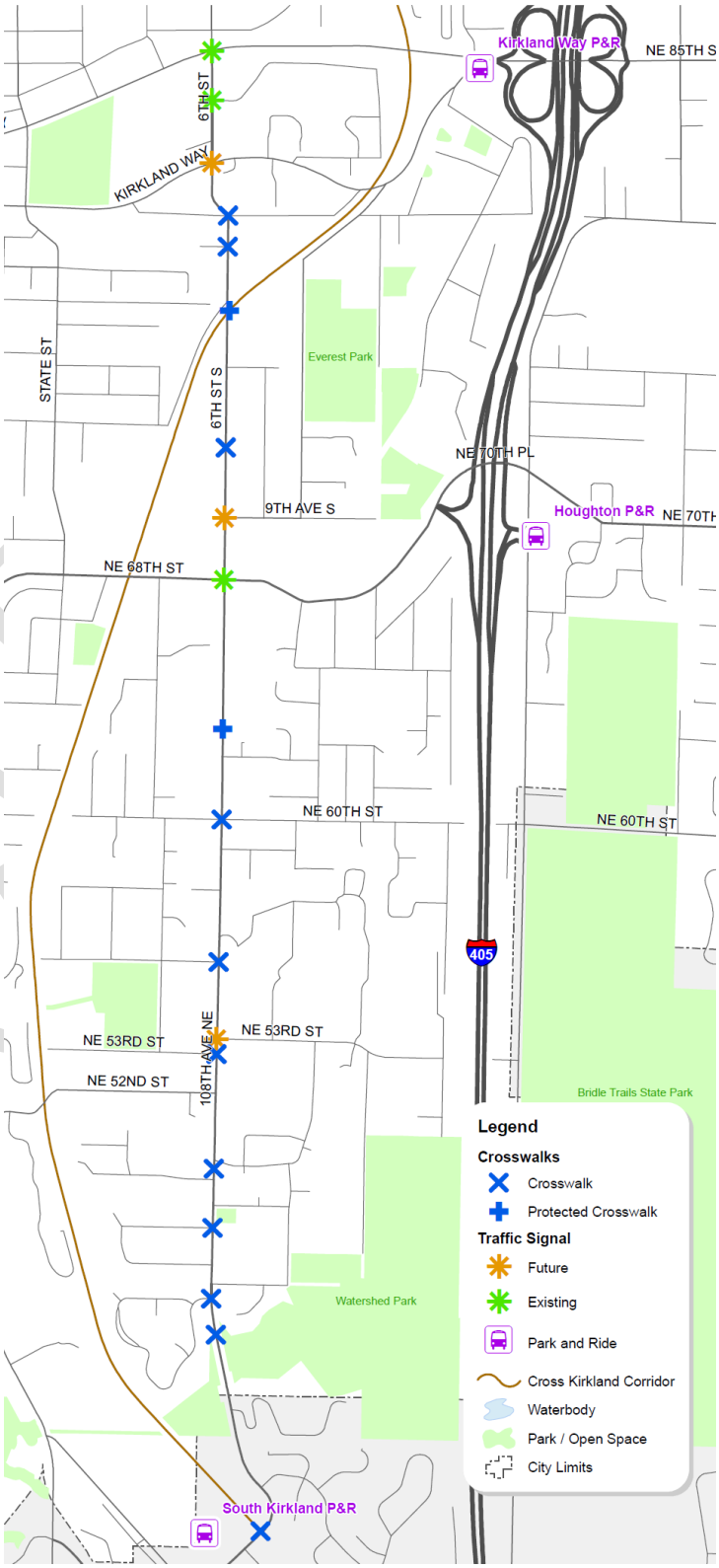


Figure 2 – 6th Street Corridor

Study Limits and Parallel Corridors

For the purposes of the study Transpo cast a broad net to collect data for the study area generally bounded by NE 85th Street/Central way to the north, 116th Avenue to the east, Lake Washington Boulevard/Lake Street to the west and SR 520 to the south. The primary focus was on 6th Street /108th Avenue and to a lesser degree the parallel facilities that make up this transportation corridor including:

- 116th Street: 85th to Northup Way
- Lake Washington Boulevard: SR 520 to Northern Terminus
- Lake Street: Southern Terminus to Kirkland Ave
- State Street: 68th Street to Kirkland Ave,
- Interstate 405: SR 520 to NE 85th
- CKC: 108th Avenue to 85th

Facilities between Kirkland Way and Northup Way were studied but greater attention and depth of analysis was provided on 6th Street/108th Avenue.

Study Analysis Years and Time Periods

For the purposes of this study the focus was on PM peak period (identified as the most congested). Analysis was focused on 2016 (existing), and 2035 (long term). The 2035 horizon year aligns with travel demand analysis in the City Transportation Master Plan.

Data Collection

In defining the type and expanse of data to be used for the study, data was collected to support expected performance measures that align with the goals of this study.

These goals included

- developing a short- and long-term multimodal transportation project and programs,
- strategies to improve transportation conditions
- align with the goals of the Transportation Master Plan.

Additionally, feedback from the neighborhoods defined perceived transportation problems in the corridor. Data was collected to substantiate and address these comments including:

- movement of people
- operations and access of all modes
- growth
- access
- travel times
- travel patterns
- queues
- delays
- parking utilization
- auto volumes
- bike volumes
- transit travel times
- transit ridership
- Park-and-Ride utilization

Other data and information used for the corridor study included information and forecasted growth from the Comprehensive Plan travel demand model, Inrix fused data of vehicle speeds, and vehicle origin-destination data from StreetLight.

Current Corridor Characteristics

There are pedestrian, bicycle, transit and vehicle transportation systems operating in the corridor today.

Pedestrians & Bikes

Since the opening in 2015 of the interim trail on the CKC, pedestrian and bicycle activity has increased not only along the trail but along the corridors connecting to the trail.

Pedestrian facilities including sidewalks are present along all major, minor and collector streets along with many neighborhood streets. Sidewalks provide an important system for school children and their caregivers while walking to the many schools in the corridor. Sidewalks adjacent to the retail center along NE 68th Street carry high volumes of pedestrians yet are of minimum width and cannot accommodate walking more than two abreast. Some linkages for pedestrians are provided through or between residential and commercial parcels not along roadways and provide additional pedestrian connections. These include connections to or across the CKC, the Northwest University Campus, the five parks in the study area (Everest Park, Terrace Park,

Phyllis A. Needy Park, Carillon Woods and Watershed Park), the pedestrian crossing of I-405 at NE 60th Street and adjacent to the fire station linking to NE 66th Place.

Bicycle use within the study area is growing. This could be due, in part, to the opening of the interim trail on the CKC in 2015, and increasing overall bicycle demand. Automatic bicycle counters were installed along the corridor and counts of pedestrian and bicycles are shown in **Figure 3**.

Cross Kirkland Corridor

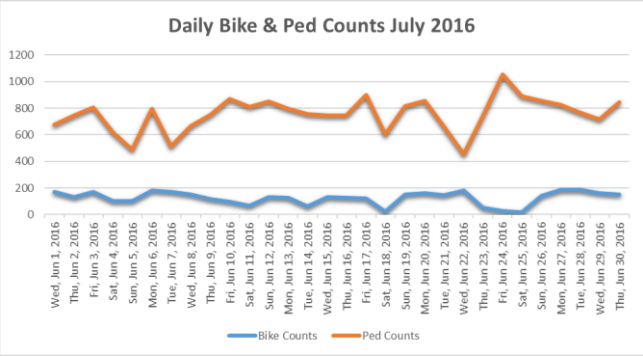


Figure 3 - July 2016 Ped & Bike Counts

The Transportation Master Plan includes the CKC as a regional trail with an existing interim trail. It is envisioned to serve as a multimodal transportation corridor connecting with other segments of the Eastside Rail Corridor and eventually with segments of the regional transportation network. The CKC Master Plan defines objectives for the corridor including potential high capacity transit. The CKC Master Plan defines existing and planned locations for access to the CKC.

Bicycle Network

To support bicycling in the city the TMP defines a Bicycle Network noting existing bike lanes, recommended bike lanes and recommended greenways. Greenways are lower volume, lower speed roadways that may be more ideal for bicycling for the broader community including those that are not as comfortable biking.
A list of each type of facility in the study area is listed below:

Existing Bike Lanes

- 6th Street S
- 108th Avenue NE (missing northbound segment near NE 53rd/52nd)
- Lake Washington Boulevard
- Lakeview Drive
- NE 68th Street/NE 70th Street
- Kirkland Way (West of 6th Street)
- Central Way (westbound)
- NE 85th Street/Central Way (eastbound)
- Kirkland Way (East of 6th Street)

Recommended Greenways

- NE 60th Street
- NE 52nd Street
- NE 53rd Street

The CKC is an important element of the regional bicycle network. An important connection between the CKC and the SR 520 bike lanes was recently completed along Northup Way in Bellevue.

Transit Service and System

Transit service is an important use for providing mobility along the corridor with Metro and Sound Transit service connecting the City and South Kirkland Park-and-Ride with regional destinations including University of Washington, Downtown Seattle and Redmond.

Transit Routes

Transit routes using the corridor serve Kirkland with connections to Downtown Seattle, University of Washington, and Factoria via Overlake/Redmond Eastgate/Bellevue College. In addition to these routes the South Kirkland Park-and-Ride provides additional connections to Bothell Kenmore, Overlake/Microsoft and Downtown Bellevue.

Routes are listed below

Metro 234/235 – Kenmore/Bothell to downtown Bellevue via Lake Washington Boulevard with all day service

Metro 245 – Downtown Kirkland to Overlake/Crossroads/Eastgate/Factoria via 6th Street with all day frequent service

Metro 255 - Totem Lake/Juanita to Downtown Seattle via 6th Street/108th Avenue with all day frequent service

Metro 249 – Microsoft/Overlake/North Bellevue

College to Downtown Bellevue via South Kirkland Park-and-Ride with all day service

Sound Transit 540 – Downtown Kirkland to University of Washington via 6th Street/108th Avenue with all day frequent service

Transit Network

The TMP defines a transit network including a Primary Transit Network, Secondary Transit Network and Other Services. Within the Study area, these routes are classified as part of the Transit Network:

Primary Transit Network

- 6th Street S
- 108th Avenue NE
- NE 85th Street/Central Way
- Kirkland Way
- NE 70th Street (East of 108th Avenue NE)
- 3rd Street

Secondary Transit Network

- Lake Street S
- NE 68th Street (State Street to 108th Avenue NE)
- Lakeview Drive
- Lake Washington Boulevard

Transit stops are located every ¼ mile along the corridor; however, almost half of the riders using regional service in the corridor board the bus at the South Kirkland Park-and-Ride. While this park-and-ride was expanded from 596 spaces to 785 spaces in 2015, it remains at capacity (see **Figure 4**). Transit including private shuttles, Sound Transit's route 540 and Metro's route 255 and 245 all use the corridor and are also subject to this congestion. King County Metro (and ST) provided Automatic Vehicle Location (AVL) data for the transit routes serving the corridor from an average week in the Spring of 2016, which can be used to analyze transit system performance including delay.
Figure 5 provides a visual display noting where delays occur for all the routes using the corridor. Automated Vehicle Location data were provided by King County Metro and Sound Transit for routes in the corridor. Most of the delay is related to passenger boarding and alighting and stopped delay at intersections. As shown, the Route 255 accumulates the most delay including delay in the

Figure 4 - S Kirkland Park-and-Ride Use

City of Seattle. The route 540 operated by Sound Transit connects Downtown Kirkland and the University of Washington with less frequent peak service. Finally, Metro's route 245 connects Kirkland and Factoria with all day service and half hour headways.

Automatic Passenger Count data from the Spring of 2016 suggests that nearly half of the bus volumes board and alight at the South Kirkland Park-and-Ride. Private, employer funded, shuttles also use this corridor serving employers in Seattle as well as Google in Kirkland. Google which is a Commute Trip Reduction (CTR) affected site operates shuttles north for commuters (two in the morning and two in the evening) and south every hour between the Google offices in Kirkland and Seattle.

Figure 6 shows the home locations of license plates observed at the South Kirkland Park-and-Ride for a day in Spring of 2015. Transit routes serving that park-and-ride are overlaid on the map and suggest that Metro's Route 255 and Sound Transit's Route 540 pass by many of the homes of people using the park-and-ride. Because transit is delayed on City arterial streets at intersections and during boarding, transit customers choose to drive to the park-and-ride, adding to arterial congestion, rather than take a bus closer to home. Throughout the corridor buses stop in-lane to serve bus stops blocking general traffic. Private company shuttles from Google and Facebook also travel the corridor providing service for their employees.

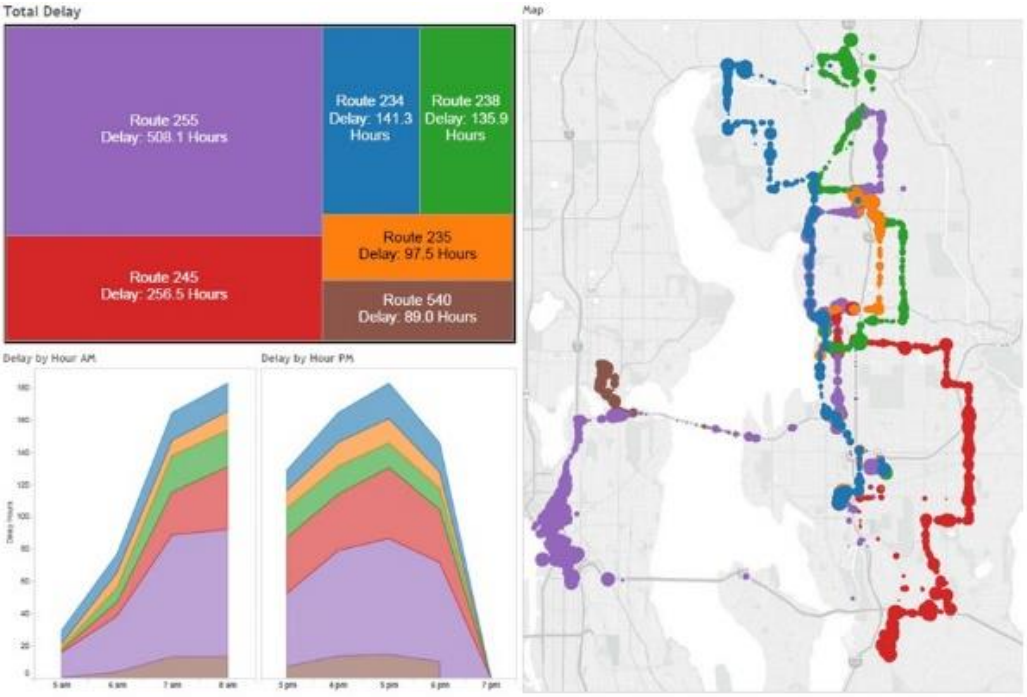


Figure 5 - Transit Delay (Spring 2016)

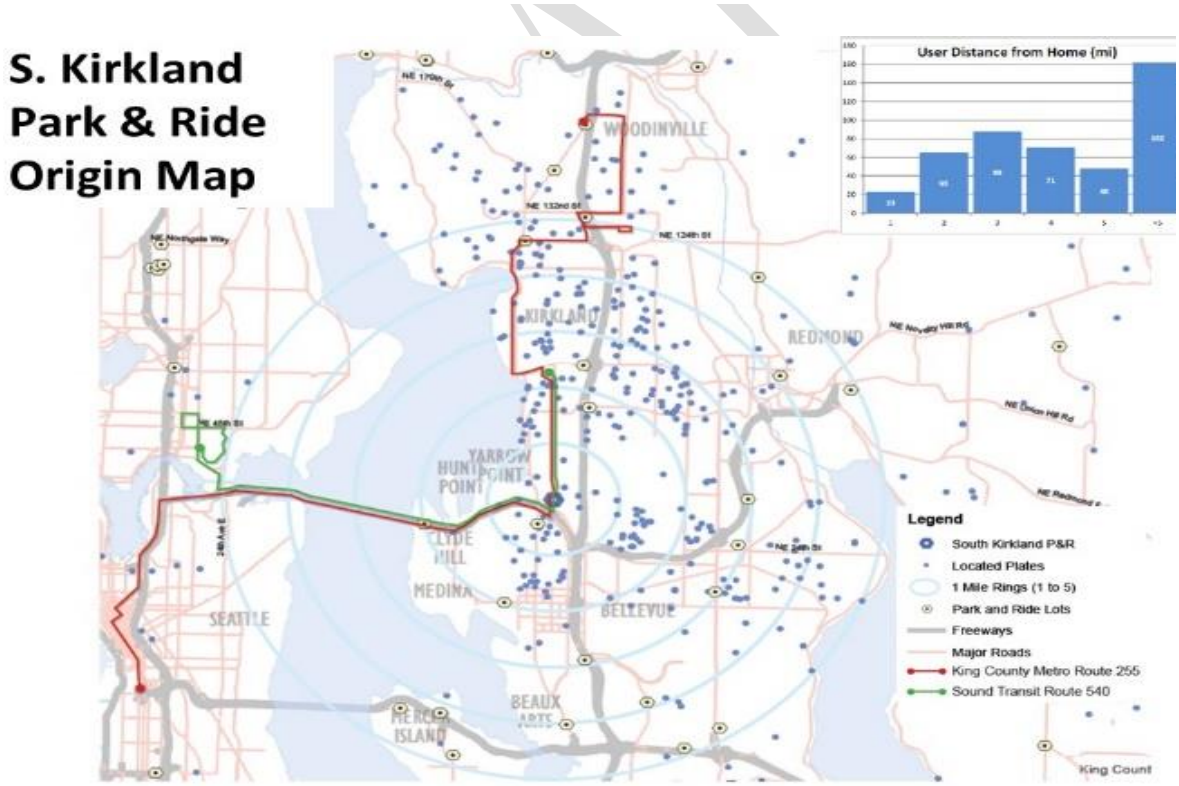


Figure 6 - S Kirkland Park-and-Ride License Plate Origins and Routes (2015)

Vehicle Network

Currently the 6th Street S and 108th Avenue corridor is a key arterial for the City of Kirkland connecting many neighborhoods and an important link to the regional transportation system. For much of its roughly 2.5-mile length the corridor provides 2 travel lanes, sidewalks and bicycle lanes. South of NE 68th Street, the corridor includes a two-way center left-turn lane. North of 68th Street the corridor includes some segments with on-street parking and some two-way center left-turn lanes. Mid-block crosswalks are located throughout the corridor with raised center medians. Many crossings as protected with Rectangular Rapid Flashing Beacons. This type of protection is provided at the CKC interim trail crossing near 5th Place S.

Parallel arterial roadway corridors to the 6th Street Corridor include I-405 and Lake Washington Boulevard/Lakeview Drive/State Street. I-405 is a multi-lane interstate with two express toll lanes and three through lanes in each direction. Lake Washington Boulevard is a principal arterial with two lanes in each direction between the southerly city limit and Lakeview Drive, and one lane in each direction and bike lanes and on-street parking north of Lakeview Drive. A relative comparison of volumes for the parallel corridors is provided below in **Figure 7** reflecting the proportion of daily traffic on the three corridors. Only 5 percent of the over 222,500 daily trips use 6th Street /108th Avenue corridor.

The Cross Kirkland Corridor (CKC) is also a parallel transportation corridor that currently consists of the interim trail. The CKC Master Plan envisions a multimodal corridor with a regional trail and high capacity transit. It utilizes a former rail corridor and is part of a regional trail system. It runs parallel to the 6th Corridor, crossing it at 5th Place S in the north and crossing 108th Avenue NE near the South Kirkland Park-and-Ride.

Currently, the 6th Street and 108th Avenue corridor roadway carries between 10,000 and 13,000 vehicles per day. **Figure 8** shows that in the last 17 years, daily volumes have remained relatively constant. The corridor is highly directional with peak traffic southbound in the morning and northbound in the afternoon.

Street Network

The TMP defines a hierarchy of the roadway network that prioritizes movement of vehicles in contrast to access. It also identifies facilities emphasizing other modes.

Arterial roadways are shown in **Figure 1**. The Functional Classification of Streets within the TMP defines the following classifications within the study area:

State Routes

- I-405 – Interstate

Principal Arterial

- Lake Washington Boulevard
- NE 85th Street/Central Way

Minor Arterial

- 6th Street S.
- 108th Avenue NE
- Lakeview Drive
- NE 68th Street/NE 70th Street
- Kirkland Way/Kirkland Avenue
- State Street S

Collector

- 9th Avenue S
- 8th Street S/Railroad Avenue
- NE 52nd Street
- NE 53rd Street

Arterials that cross the corridor include NE 68th Street/NE 70th Street, Kirkland Way and Central Way/NE 85th Street. These arterials include sidewalks, and serve transit. Sidewalks and bike lanes are provided or planned on these arterials and provide connections to other trails. The arterials crossing the corridor have a single travel lane in each direction with some medians, except for Central Way/NE 85th Street, which is a five-lane arterial.

Two large land uses in the study area are the Northwest College, which is updating their Master Plan, and Google, who opened their second campus building in early 2016. Downtown Kirkland is located at the north end of the corridor, and continues to grow into a dynamic mixed-use center as a result of projects such as Kirkland Urban, an 11.5 acre mixed use development with 650,000 Square Feet (SF) of office 225,000 SF of commercial and 300,00 SF of residential. Fire Station 22 is located on 108th Avenue just south of the NE 68th Street intersection.

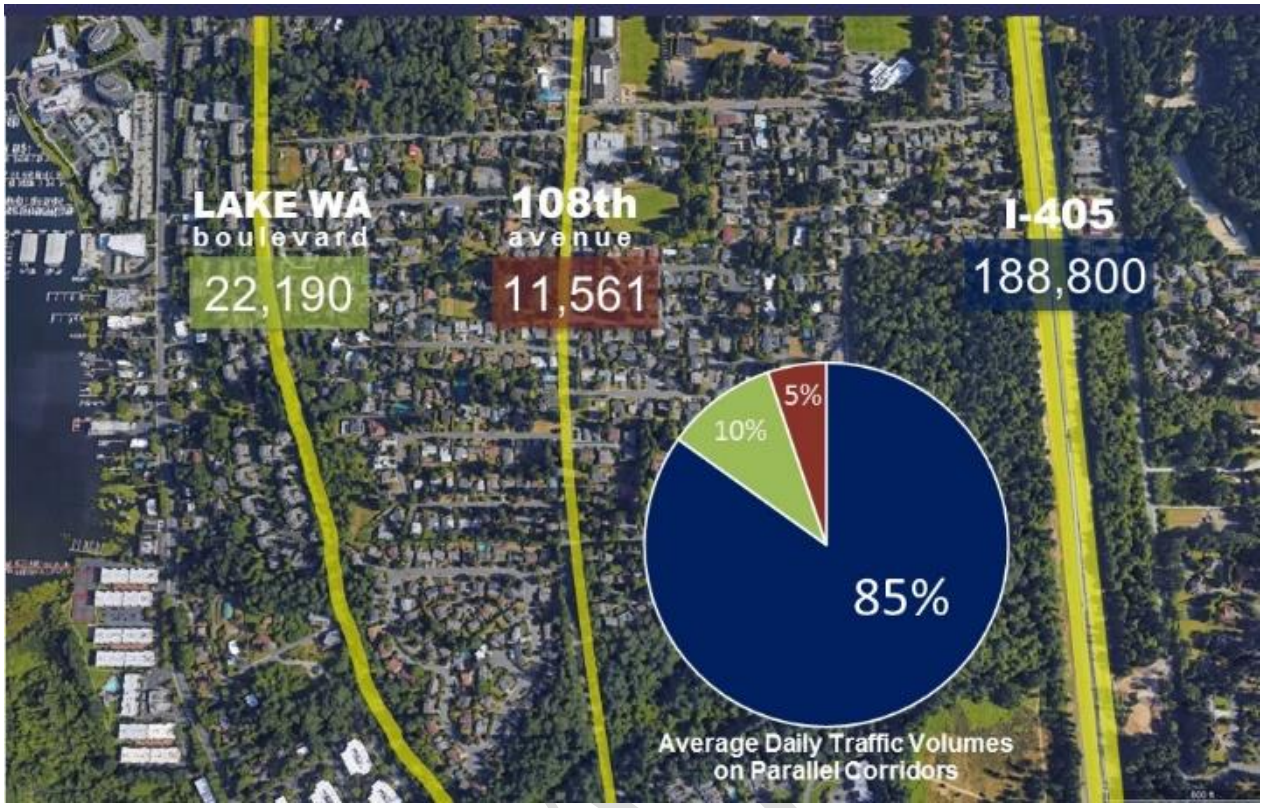


Figure 7 - Parallel Corridor Roadway Volumes

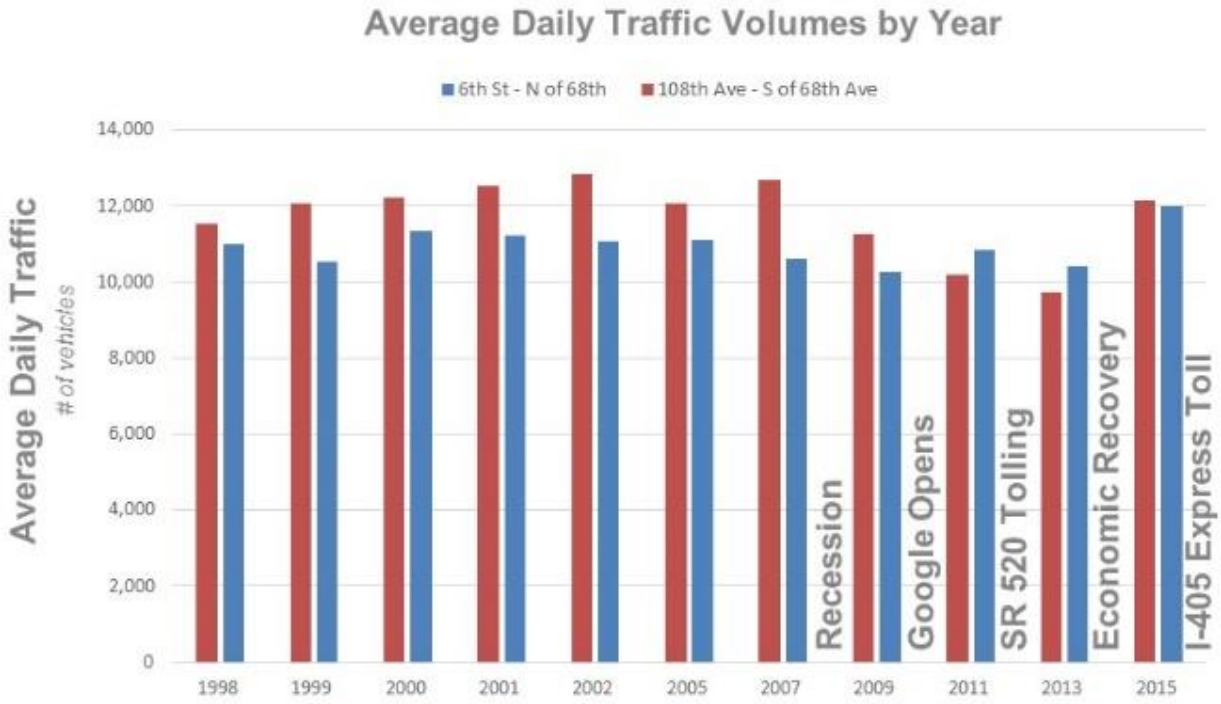


Figure 8 - Daily Volumes Historic Trend

The land use around the corridor is integral to the effectiveness of the transportation system. The land use surrounding the corridor is single family residential neighborhoods with supporting retail. Small amounts of commercial and industrial uses and schools and a university. Notably, the study area also includes several schools (Emerson, International Community School. Community Elementary School, Lakeview Elementary School, Puget Sound Adventist Academy, Kirkland Children's School and Northwest University) and the corridor provides important access and circulation for students walking and biking to schools.

These neighborhoods lack a grid of connected local streets. Roadways that do provide secondary circulation and connectivity, specifically 8th Street S in Everest and 106th Avenue in Houghton have complaints from neighbors of speeding and high volumes. A neighborhood traffic control program works to protect these types of streets from cut-through traffic with traffic calming strategies like speed humps and traffic circles and these strategies have been implemented on both routes and continue to be monitored. Data from the Streetlight did not indicate high use of these two corridors.

The Houghton Everest Neighborhood Center (consisting largely of retail with some office and high density residential) occupies the land surrounding the intersection of NE 68th Street/108th Avenue/6th Street. Access into and out of this center is unorganized and poorly managed. Driveways are close to the intersection creating confusion for drivers with too many decision points. Multiple driveways are provided onto the arterials with a midblock crosswalk on NE 68th Street that creates potential conflicts with pedestrians. The excessive number of conflict points are noted in **Figure 9** and suggest the potential for collisions.

This 2.5-mile long corridor is unique in that there are very few traffic signals to introduce delay. Congestion typically clears in the peak period but increases travel time by 15 to 20 minutes as compared to off peak time.

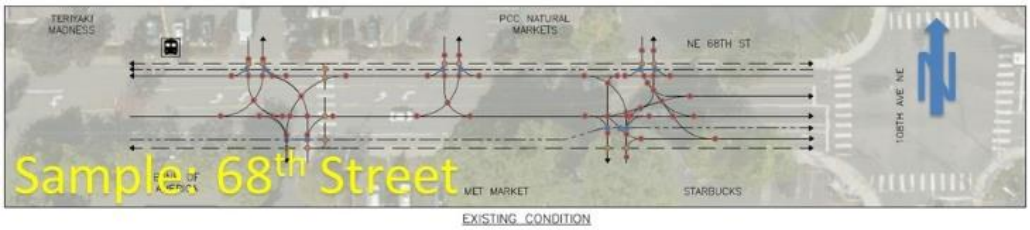
Afternoon peak northbound queues on the corridor were measured on 108th Avenue NE south of NE 68th Street as 1.25 miles or roughly 250 cars long. Northbound PM Peak period queues on 6th Street, south of Kirkland Way queuing has been increasing and has been observed to extend as much as 4,000 feet or 160 cars. Extensive queueing lasts for no more than

Conflicts NE 68th Street

- **55 Vehicle - Vehicle**
- **25 Vehicle - Ped/Bike**

Conflicts 108th Ave NE

- **69 Vehicle - Vehicle**
- **24 Vehicle Ped/Bike Conflicts**



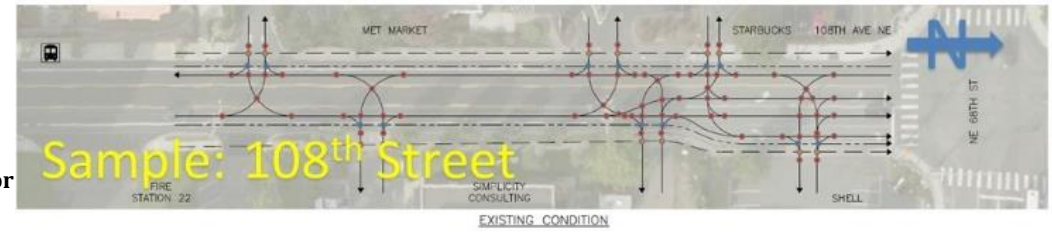


Figure 9 - Corridor Conflict Points

two hours but during that period, travel times can increase by as much as 15 minutes.

Afternoon peak hour intersection operations were calculated applying methods in the most recent (2010) Highway Capacity Manual. Level of service is described in **Appendix B. Figure 10** provides a summary of intersection level of service. Level of service is quantitative measure reflecting the relationship of demand to capacity and delays encountered. Level of service A reflects free flow conditions, while F reflects congested operations. As noted in the figure most signal controlled intersections operate poorly LOS D-E. The side-street stop-controlled intersection of 9th Avenue S at 6th Street S currently operates at LOS F due to delays on the side street.

Typical Congestion with Transit

Existing travel behavior was captured using data from a data vendor, Streetlight. The Streetlight data is fused from a variety of sources and connects signals from vehicles and geolocates them on roadway networks. While this data does not capture every vehicle it does begin to define patterns in travel by fusing all of the data from several months. In looking at PM peak period data for trips using the corridor the following pattern emerged. Of the PM peak trips using the corridor coming from SR 520 (eastbound form Seattle) and 112th Avenue (Northbound from Bellevue), 26-38 % are heading east of I-405, 33-48 % are heading north of the corridor and 18-26 % are accessing I-405. This excludes those trips that have one of their trip ends in the study area. It suggests that much of the traffic using the corridor is destined for Kirkland neighborhoods east and north of the corridor.

Figure 10 – PM Peak Intersection Level of Service

Parking

Parking complaints were identified by community members including neighborhood community organizations. These complaints were identified in four areas:

- Parking at the retail center was described as over capacity with parking spilling over to the streets.
- People complained that on street spaces are used for retail employees.
- Neighbors complained of people parking on neighborhood streets to access transit (due to crowding at the park-and-ride)
- Neighbors complained of people parking on neighborhood streets to access office jobs.

Parking utilization counts were collected on a weekday and indicated parking was adequate. Through a field survey of parking utilization, less than 50 percent of available spaces were occupied in on-street spaces and less than 80 percent in the retail areas with the larger market lots under 60 percent. These are shown in **Figure 11**.

Collisions and Safety

Collision data from the City were evaluated for the period from 2012 through 2015. **Figure 12** provides a summary of collisions along the corridor. Over the last three years there were 97 collisions on 6th Street / 108th Avenue between Central Way/ NE 85th and the southern City Limits. Of these 6 (or 6 percent) involved pedestrians and 2 (or 2 percent) involved bicycles. On NE 68th Street between Lakeview Drive and I-405 there were 46 collisions of which, one involved a pedestrian (or two percent) and two involved bicycles (or four percent). One of the pedestrian related collisions occurred in the NE 68th Street mid-block area noted for high number of conflict points including a mid-block crosswalk. Of the 23 collisions at the intersection of NE 68th Street/108th Avenue NE 4 collisions involved bicycles or pedestrians. Also at this intersection, 10 collisions or almost half were rear ends, typically associated with congestion.

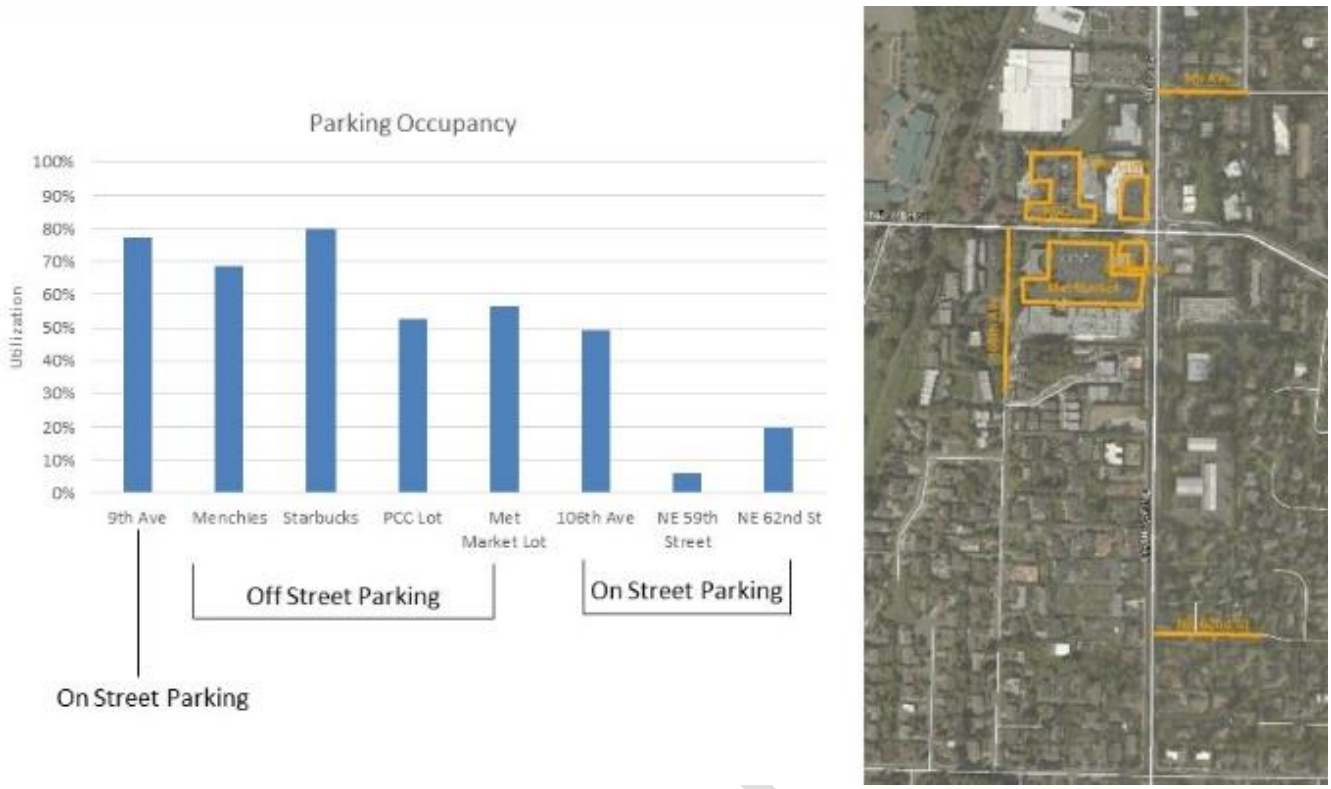


Figure 11 - Parking Utilization (2016)

68th St / 108th Ave intersection

- 23 total collisions
- 12 injuries
- 4 involving a bicycle or pedestrian
- 10 rear-ends

On 6th / 108th Corridor

- 97 total collisions
- 6 pedestrian collisions
- 2 bicycle collisions

NE 68th St

- 46 total collisions
- 1 pedestrian collision
- 2 bicycle collisions

Figure 12 - Safety Data Collection

Public Outreach

The City of Kirkland encourages broad and creative opportunities to engage with the community. The outreach for this corridor study covered the Houghton Everest Neighborhood Center land use study. Outreach for this effort consisted of the following:

Outreach at Everest Neighborhood Picnic

- Key stakeholder interviews with neighborhood community organizations

- Outreach at events like the community picnics (see image)

- Providing information to businesses

- A broad public survey including outreach at fairs, neighborhood meetings and through City media.

- Outreach with transportation partners including Metro and City of Bellevue

- A community workshop that defined issues, key values and potential solutions on November 2, 2016


Status of the project was posted in many places including the CKC

- Signs were placed throughout the corridor with information and status updates (see right)

- Staff workshops to develop ideas

- Review and guidance by the Transportation Commission, Planning Commission and Council

Results of the survey, prior to the Community Workshop were summarized in a survey report (see Appendix C). They suggested that the community was most interested in addressing and "fixing" regional congestion but not expanding the corridor and adding lanes. There was interest in creating livable and walkable community solutions, specifically to address pedestrian circulation.

Observations and Issues Summary

Review of the corridor through data collection and outreach helped frame the overall issues within the 6th Street S Corridor as follows:

Peak Periods Traffic Impacts the City and Neighborhood

Peak period/peak direction congestion is a growing problem that is influenced by regional congestion and exacerbated by the lack of a connected grid network. The corridor is constrained by its current capacity specifically during the PM peak period. Long queues and congestion increases travel times, blocks access to neighborhoods and impacts emergency response times.

Because roadway widening would be very costly and extremely disruptive to property owners for vehicle travel lanes, it is not considered to be feasible, at this time, for addressing peak period congestion. As a priority for ***moving more people, regional transit connections were considered a priority***. More cars could be removed from the corridor if more people stayed on the bus north of the South Kirkland Park-and-Ride to get to their homes. For example, moving transit more efficiently to improve speed and reliability is a priority.

The CKC, with the interim trail, is an underutilized regional transportation asset. There are substantial obstacles to expanding the CKC as a transportation corridor including cost and the concerns from some members of the community.


The CKC and 6th St / 108th Ave are parallel transportation corridors

Protecting the accessibility and enhancing connectivity of the neighborhoods is key to preserving livability of the community.

Arterials adjacent to the retail center have poorly defined and managed access/driveways that contribute to congestion and increase conflict-points, particularly with pedestrians.

There is very ***high interest by the community to improve the walkability of the area***, especially for walking school children. The TMP does not identify large gaps in sidewalks in this area but some missing sidewalk segments remain that would enhance the walkability of the corridor. There is a desire for improved protected pedestrian connections, protected cross-walks, wider sidewalks, fewer conflicts and removal of barriers, and safety enhancements for bicycling.

The interim CKC trail has resulted in increased bicycle use on the corridor as well as on arterial streets connected to the trail. Most arterials include bike lanes; however, there are gaps and lanes don't extend through signal controlled intersections.

Parking data does not suggest parking is currently a problem on-street or in the retail center; however, ***improving education and management related to parking could improve understanding*** and reduce conflicts

While cut-through traffic was noted from the public, data fused from vehicles using the area (Streetlight) suggested very low use of these routes.

GROWTH AND CHANGES

This section describes growth and future conditions within the identified study area. This includes the adjacent roadway network, planned improvements, and future traffic volumes, traffic operations, traffic safety, non-motorized facilities, and transit.

Forecasted Growth

The City's Comprehensive Plan and Transportation Master Plan imagines a future horizon year of 2035 guided by the vision of a walkable, vibrant, livable, connected, and green community. The Puget Sound Region is experiencing tremendous growth. Between 2010 and 2040 the region's population will increase by 35 percent and employment will increase by 57 percent. Within the City of Kirkland, population is anticipated to grow by 13 percent and employment doubling by growing over 117 percent between the years 2010 and 2035. Regionally, investments such as ST 2, and ST 3 are being made to expand transit as opposed to widening roads. This aligns with the regions and City goals to promote sustainable transportation choices.

Planned and Programmed Improvements

This study defined data collection and methods in **Appendix A**. Specifically, it defined a future design horizon year of 2035 that aligns with the Comprehensive and Transportation Master Plan. Improvements are identified and planned in the corridor including future traffic signals at the intersections of 9th Avenue at 6th Street S, Kirkland Way at 6th Street S, and NE 53rd Street at 108th Avenue NE. Other infrastructure improvements in the area include completion of the SR 520 Bridge Replacement and modifications in transit service assumed to be in place with regional investments identified and assumed to be in place by 2035 from the Sound Transit 2 and 3 plans. Most notably these include extension of Light Rail to Bellevue, Overlake and downtown Redmond by 2024 and BRT on I-405. The transit service, largely provided by King County Metro is defined in the 2025 and 2040 METRO CONNECTS service plan that identifies RapidRide Service though Kirkland. Beyond 2035, the ST 3 plan includes a light rail line from Kirkland to Issaquah.

While the CKC Master Plan includes expansion with a fully developed regional trail and some form of high capacity transit, there is no current funding identified that would advance these plans. It was assumed in the future that the Interim trail remained in place as a base case. Additionally, King County has developed the Eastside Rail Corridor Master Plan, of which the CKC is a central segment. The County will continue to develop trail segments as funding becomes available.

Land use changes will be consistent with the Comprehensive Plans for Kirkland; however, this study also addressed potential land use options related to the Houghton Everest Neighborhood Center. This analysis is provided in the last section of this report. The City is growing with several new dense, mixed-use commercial, office, and residential developments. Examples of this include Kirkland Urban and development of the Antique mall site in Downtown Kirkland. The large Totem Lake re-development is underway in the north half of the City, outside the study area. Northwest University has also proposed a Master Plan for their Campus along the corridor. This 20- year Master Plan is not approved and is still in review so it was, therefore, not included in the future development baseline. It identifies expansions with a net new number of parking spaces of up to 350.

Land Use in Houghton Everest Neighborhood

As part of the corridor study the analysis will also be applied to an area within the corridor to assess potential land use changes in the Houghton Everest Neighborhood Center. These land use changes slightly increase travel demand on the corridor.

The neighborhood center area is shown in **Figure 19** and analyzed in the last section of this report.

The full memo analysis is provided in **Appendix E**.

Traffic Volumes

Comparative PM peak hour growth on the 6th Street/ 108th Avenue NE corridor is provided in

Figure 13. Constraints on the corridor capacity result in limited growth on the corridor with the most notable peak hour growth on the segment near Northup Way.

Bicycle and Pedestrian Changes

In addition to further development of the CKC to the Master Plan, future expansion of regional trails includes implementing elements of the Eastside Rail Corridor (ERC) and completion of the SR 520 Bridge Replacement with a bike and pedestrian trail connection across Lake Washington from the University of Washington to Redmond.

Transit Service Changes

One of the most dramatic changes that may occur in the region is the investment in transit infrastructure and service. Sound Transit long range plans ST2 and ST 3 are funded regional transit expansions. In Kirkland, investments include the I-405 Bus Rapid Transit System, and elsewhere Light Rail expansions to Redmond, Federal Way, and Lynnwood will be in place by 2035. Beyond the 6th Street Corridor Study Plan year of 2035, the ST 3 Plan includes extension of light rail between Issaquah and the South Kirkland Park-and-Ride as well as High Capacity Transit studies along the CKC/ERC and SR 520.

METRO CONNECTS is a long-range vision of service for the years 2025 and 2040 to meet future transit needs in King County and to integrate with planned and programmed light rail as it expands throughout the region. In Kirkland, METRO CONNECTS includes expansion of RapidRide with frequent service connections for Kirkland from Kingsgate to Eastgate by way of Downtown Bellevue. METRO CONNECTS will require additional resources beyond current King County Metro revenue sources to implement. As such, the service network depicted does not represent a revenue-backed service plan, and refinements to this vision through plan updates and service processes are expected.

Capital Improvements

Recent improvements in the corridor have included new sidewalks on the west side of 6th Street south of 5th Place to provide an important missing link, and on-street parking. Capital infrastructure investments that are planned or programmed for the corridor include installation of traffic signals at three locations (6th Street S at Kirkland Way, 6th Street S at 9th Avenue S, and 108th Avenue NE at NE 53rd Street), a left-turn pocket on Kirkland Way to Railroad Avenue and ITS improvements throughout the City. King County Metro has also discussed the potential need to provide traffic signals at the entrance to the South Kirkland Park-and-Ride on 108th Avenue. These new signals will reduce signal spacing along the corridor (currently there are 4 signal controlled intersections and in the future, there could be 7). With increased signals, it will be important to coordinate the signals to make sure they are optimized and efficient.

In addition to Sound Transit investments, Regional improvements to be completed in the corridor include completion of the SR 520 Bridge Replacement and eventual completion of the I-405 Corridor Master Plan.

As noted in the last section of this report, with development and land use changes in the Houghton Everest Neighborhood Center there are opportunities for infrastructure investments as part of development approvals. These improvements include but are not limited to:

- Consolidate or close driveways to better manage access as parcels develop
- Combine parcels and improve internal site circulation to help better manage traffic
- Contribute right-of-way to consolidate driveways, widen sidewalks, remove mid-block crosswalks, provide medians to better manage access.
- Install traffic control that accommodates safe signal controlled pedestrian access across NE 68th Street.
- A new planned signal at 6th Street S at 9th Avenue S could provide additional access to other parcels north of the center.
- Combine parcels and improve internal site circulation

Emerging Trends

The way transportation and mobility is delivered in the United States is destined to change dramatically due to new trends and technologies. These emerging trends may modify future transportation in ways that are currently not fully understood. These trends and technologies are described below:

Changing travel behavior – Changing travel behavior among millennials (defined as those reaching adulthood in the early 21st century) suggests this generation may be choosing alternatives to driving alone for travel. A study by the University of Michigan Transportation Research Institute indicates that driver licensing for teens and young adults is declining. For example, the number of 19-year-olds with drivers' licenses dropped from 87% in 1983 to 69% today.[1] Availability of a range of travel choices will support this trend.

Smart Signal Technology – Traffic signal operations and control are being improved through better real-time information, data fusion that improves understanding of travel patterns, and improved operations of traffic signals to better respond to actual traffic patterns and vehicle types. The City of Kirkland has developed an Intelligent Transportation System strategy and owns, manages, and operates traffic signals around the City. The City is implementing ITS with traffic signals throughout the city to reduce delays and meet other objectives.

Shared-Use Mobility and Auto Transportation Network Companies – While rideshare programs through transportation network companies (TNCs) like Lyft and Uber and carshare programs like Car2Go, Zipcar, and ReachNow are popular and gaining in popularity, there are limited data related to these programs' impact or effectiveness in reducing drive-alone behavior. Ride hail services like Lyft and Uber are currently available in the City of Kirkland to enhance mobility.

Bike Share – A cycle-share program, Pronto, was implemented in the City of Seattle in 2015 with mixed success. The program, which included memberships for short- and long-term bicycle rental, ended in March 2017. The future of bikeshare is uncertain; however, there is on-going interest in developing bikeshare programs in the future as the technology improves. Funding has been identified in the Connecting Washington Partners program for additional bike share. A bike share program could be expanded with development of other bike and trail investments such as the CKC an Eastside Rail Corridor.

Autonomous and Semi-Autonomous Vehicles
There are projections that in the next 20 years, autonomous vehicles may broadly replace the automobile fleet. Semi- autonomous vehicles are already on the market, assisting drivers and helping avoid crashes. In the future, these vehicles could be completely autonomous and potentially reduce congestion (vehicles are expected to operate safely with reduced distance between vehicles and potentially higher speeds). Autonomous vehicles have been proposed to operate cleanly (potentially electrically), for a variety of vehicle types—buses, trucks, and passenger vehicles—and potentially for shared use, thus further reducing the need for automobile ownership. As the technology evolves, autonomous vehicles may become part of fleets such as transit that deliver people and goods. Space may be needed to accommodate drop-offs and storage.

These emerging trends suggest that transportation resources will become more fluid and while it is important to preserve facilities for different transportation modes as assets, their use and operation may evolve over time. For example autonomous vehicles may reduce park-and-ride demand; however, the space may be better used for shared-use and transfers.

Summary

In the corridor, regional and localized land use will increase travel demand; however, there is limited expansion of roadway capacity. Delays and congestion are likely to increase or extend the peak period. There is significant planned increased investment in transit. This investment in transit aligns with the Comprehensive Plan vision for a more green and sustainable community. Moving transit efficiently, encouraging transit service and

[1] http://www.umtri.umich.edu/what-were-doing/news/more-americans-all-ages-spurning-**drivers**-licenses, 2016.

flexibility and maintaining investments in transit service will be important for regional mobility.

Within the corridor there are some planned changes to increase local access to the corridor through installation of traffic signals. While new signals create safe and controlled crossings of 6th Street, there could be more improvements to increase the connectedness and livability within and parallel to the corridor.

Within the 2.5 Miles of the corridor, today there are 4 traffic signals (or <1.5 per mile) in the future this could increase to 7 signals with new signals proposed in the corridor at Kirkland Way, 9th Avenue S, and NE 53rd Street

The corridor has 20 crosswalks (or >7 per mile) today and of these 8 are protected with signals of Rectangular Rapid Flashing Beacons (RRFBs). There are no current plans to increase the number of crosswalks.

There are transit stops every ¼ mile along the corridor. Buses like the Sound Transit Route 540 are express type service and don't serve each stop. In the future this corridor is anticipated to be served by frequent Metros RapidRide service. The standard stop spacing for Rapid Ride is ½ mile. It is possible that in the future with RapidRide stop frequency could be reduced.

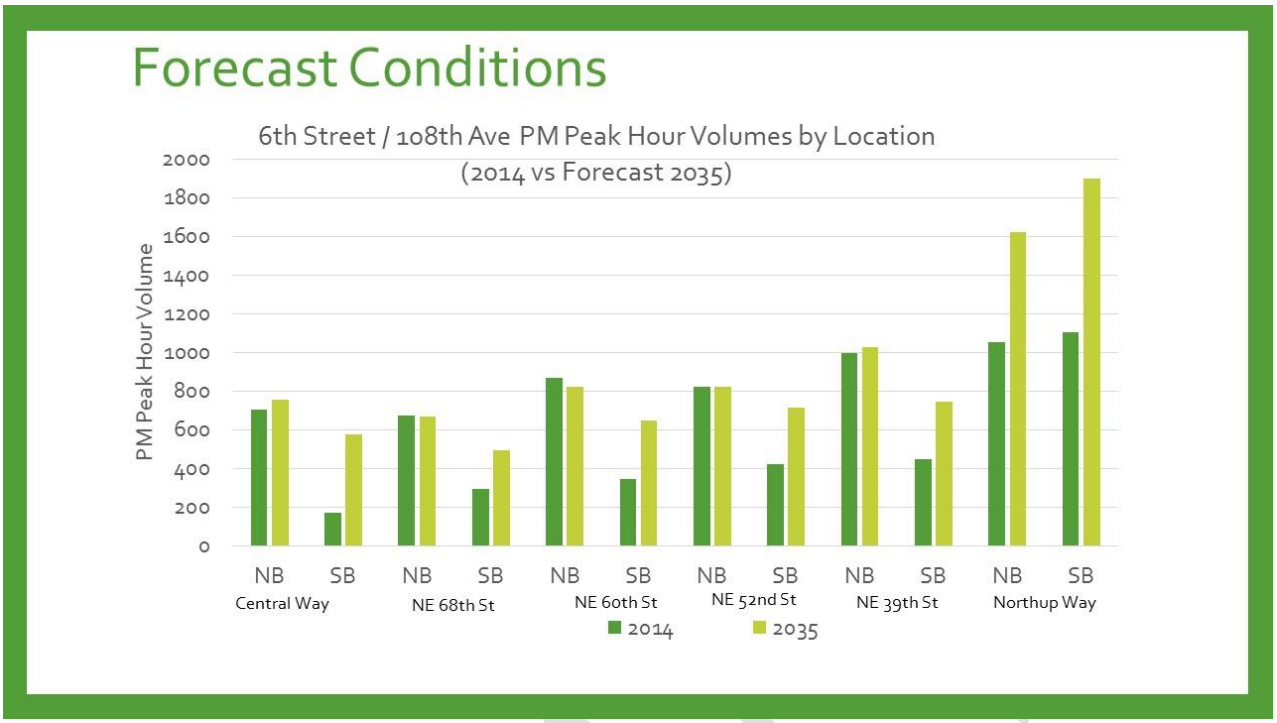


Figure 13 – 2014 and 2035 PM Peak Volumes 6th Street / 108th Ave at Various Locations

POTENTIAL SOLUTIONS

This section describes the development of solutions to address needs in the corridor. Solutions were developed to meet needs according to community values.

Workshop Feedback

Community Workshop November 2, 2016

The corridor study offered numerous opportunities to provide feedback and help define potential solutions. Solutions were developed to address issues and challenges defined in the corridor context setting and review of growth.

Solutions were defined to address bottlenecks throughout the corridor, move transit more efficiently, and improve community connections for all modes.

An initial set of ideas and solutions was developed as part of the November 2, 2016 Community Workshop held at Northwest College. The workshop reviewed initial survey results (as summarized in Appendix C), and reviewed the initial baseline and future conditions. While regional congestion was identified as a major challenge, ***most constituents were opposed to widening the corridor beyond its current three-lane configuration***. Roadway capacity recommendations included improving I-405 and connecting NE 60th Street across I-405 for vehicles. Community members worked in small groups to define potential solutions. The workshop also gained feedback about community values and priorities. When asked, the group agreed that the 6th Street/108th Corridor must:

- be designed to reduce congestion

- move people (not just vehicles) efficiently throughout the entire corridor now and into the future

- connect community and neighborhood destinations, safely

Potential Improvements

The solutions raised by community members included improvements to reduce bottlenecks, improve transit, improve connections for pedestrians and bicycles. The initial list of improvements identified at the workshop are listed in **Table 1** on the next page and keyed to **Figure 14** in the map.

Potential Solutions

Through stakeholder outreach, data collection and analysis, a set of solutions was developed and shown below in **Table 2** and **Figure 14**. These investments are located throughout the corridor. This list of solutions is intended to be practical and achievable and emphasizes community interest. Solutions were identified to promote use of transit as a way to increase the capacity of this corridor, better connect the community especially for pedestrians and bicyclists and improve/enhance safety through better management of access, specifically in the neighborhood center.

Feedback

Solutions were discussed with City staff and agency partners to further refine solutions. Solutions were discussed with the Transportation Commission and City Council and adjusted to best meet values of the community and needs of the City.

Appendix D provides a summary of a draft evaluation of solutions with recommendations on solutions to be carried forward and for discussion with the Transportation Commission.

These solutions were further refined and adjusted to best meet values of the community.

Connection to Values

Solutions were evaluated for their ability to meet the values of the community specifically to

- address regional congestion and move people,
- improve the livability of the community by improving connections within and between the neighborhoods and
- addressing the needs of the future.

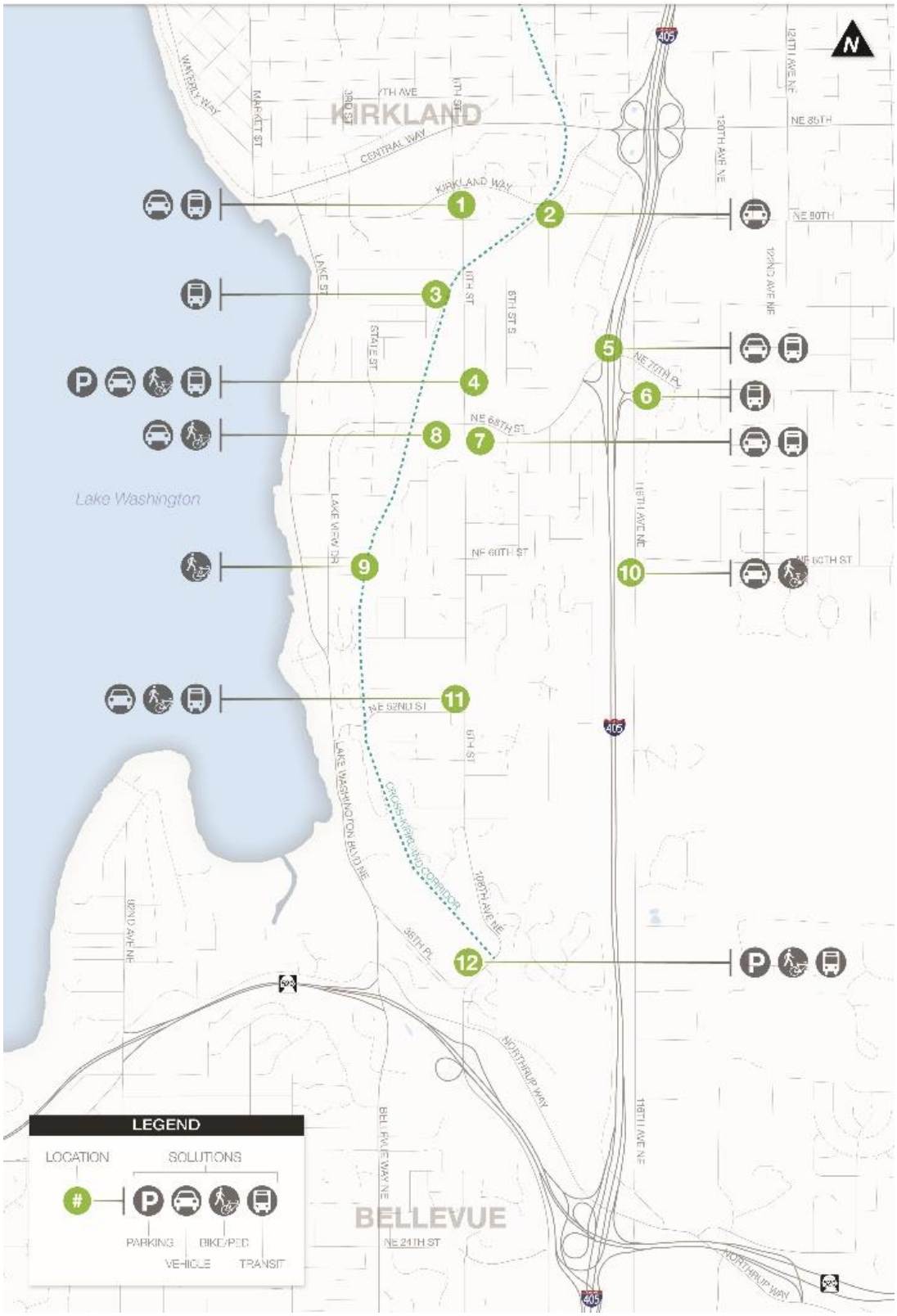


Figure 14 - Improvement Locations

Table 1. Suggested Corridor Improvements

Numbers	Potential Solution Ideas	Type
1A	Transit Signal Priority northbound on 6th Street S at Kirkland Way - Peak Hour - Left-turn lead lag	Transit
1B	Signal Coordination (Intelligent Transportation System) along S 6th Street between Central Way and Kirkland Way	Operations
2	9th and Railroad at Kirkland Way Intersection Safety - Radar Speed - Westbound Left-Turn Pocket	Safety
3A	Bus Rapid Transit on CKC bypass 108th to S Kirkland Park-and-Ride	Transit
3B	Bus Intersection with queue jump at 6th Street and CKC	Transit
4	Reassess the installation of traffic signals at 6th Street S at 9th	Operations
5A	Improve / expand 70th Overpass to widen and rechannelize for bikes/peds/vehicles	All modes
5B	Bus Rapid Transit Planning near 70th with Park-and-Ride	Transit
6A	Lease Houghton Park-and-Ride for private shuttles	Transit
7A	Transit Signal Priority and queue jump (108th Avenue NE) - Left turn lane for transit only - Overhead signs time of day - C-Curb to restrict driveways	Transit
7B	Transit Signal Priority for left turns - combines bus and lefts	Transit
8A	Access Management and Multimodal Access on NE 68th Street and 108th. - Median Control - Driveway Consolidation - Wider sidewalks	Roadway Vehicular Pedestrians and Bikes
8B	Access Management and Multimodal Access on NE 68th Street and 108th - New full access signals at 106th Avenue - Consolidate Driveways - Wider Sidewalks and Roadway with Bike Lanes	Roadway Vehicular Pedestrians and Bikes
8C	Access Management NE 68th Street - Selectively close driveways	Roadway Vehicular Pedestrians and Bikes

Table 1. Suggested Corridor Improvements

Numbers	Potential Solution Ideas	Type
8D	Full Bicycle Intersection at 6th Street /108th Avenue NE	Pedestrians and Bikes
8E	Green Bike Boxes 6th Street S / 108th Avenue NE	Bikes
9A	Improved CKC access / connection for Bikes (at NE 60th Street)	Bike/Ped
10A	Enhanced Vehicle Access crossing I-405 at NE 60th Street - Grade separation of 114th - new signal 60th/108th	Vehicles
10B	Enhanced pedestrian and bike access for NE 60th Street creating a Greenway	Peds and bikes
11A	Signal at NE 53rd Street (proposed by Northwest University) Relocate and improve bus stop with and adjust crosswalk with Metro	Peds Transit
12A	Park-and-Ride permitting for transit users (Metro)	Transit
12B	Improve Access/Egress from Park-and-Ride for Buses (City of Bellevue) - Speed/Radar - Pavement Marking	Transit
12C	Signal control at S. Kirkland Park-and-Ride Access (City of Bellevue)	Transit
12D	Improve CKC access to S. Kirkland Park-and-Ride and increase bike parking at Park-and-Ride	Transit and Bikes
P1	Residential Parking Zones to eliminate casual and long-term parking by retail employees	Parking
P2	On-Street parking time limits or management to reduce park-and-ride	Transit / Parking
E1	Education campaign on the value of transit in Kirkland's Mobility Future	Transit
E2	Monitor person movement speed/efficiency	Transit Vehicles
E3	Greenway promotion of NE 60th Street and other connections	Peds and Bikes
E4	Continue to monitor speeding and cut-through traffic	Vehicles

CORRIDOR IMPROVEMENTS

Through community and City feedback solutions were further refined and adjusted. Some more complex ideas were developed further and are summarized in Appendix F as project pages

Capital Improvements

Concepts were further developed to test their feasibility and effectiveness using traffic operations analysis for some and developing them as concepts for others.

Moving people more effectively through the corridor with transit was an important proposal. Several options for moving transit past long peak period queues in the afternoon were suggested.

108th Avenue Typical Queue

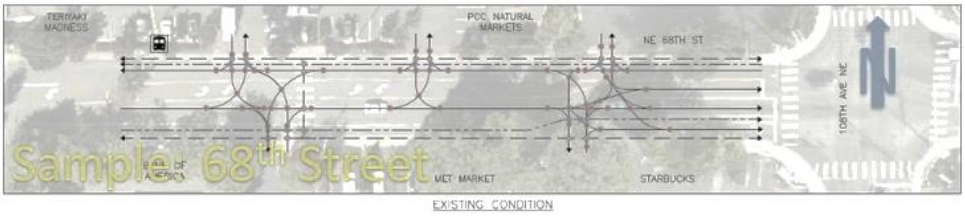
These transit priority treatments were evaluated using VISSIM a micro-simulation analysis that can measure comparative transit travel time advantages for transit vehicles as compared other automobiles.

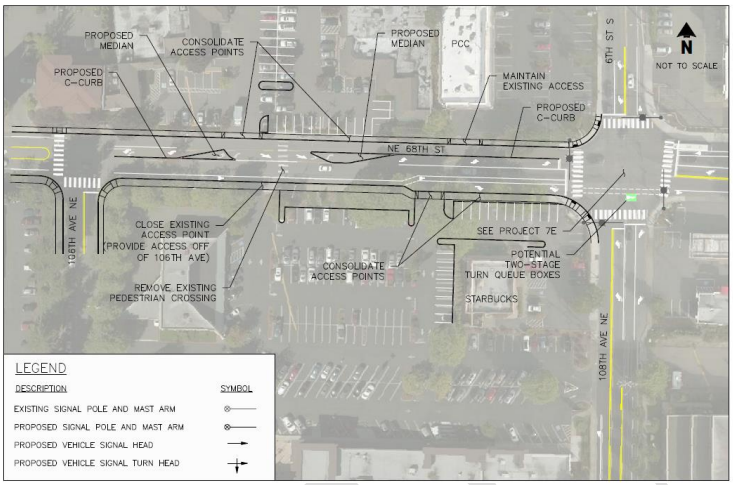
The proposed solution would create two queue jumps at NE 60th Street and NE 68th Street, advancing transit past long queues. Two 1,000' long jumps would result in over 2 minutes of travel time advantage for northbound buses as compared to other vehicles. This is a significant savings especially considering the number of people on each bus. (**See Table 5**)

Potential Transit Queue Jump on the Corridor at NE 60th Street

These queue jumps shown left, would include a new traffic signal at NR 60th Street and would relocate bike lanes adjacent to the sidewalk for safety. This solution (7E) is further described in **Appendix F**.

Access management solutions were developed to address potential vehicle and pedestrian conflicts on NE 68th Street. Developing concepts to improve access included considering medians, driveway consolidation and turn restrictions.





For NE 68th Street, extending medians and c-curbs can reduce potential vehicle and pedestrian conflicts. Consolidating driveways could also reduce conflicts; however, this would require willing participation by the property owners. **Appendix F** includes the option below (8A) as well as an option that envisions redevelopment, potential dedication of right of way to extend bike lanes and increase sidewalks with greater reduction in potential conflicts (8C).

This list of recommended corridor improvements builds on feedback through stakeholder outreach to the community and public, an evaluation of data from a wide range of sources, a workshop with City staff, and reviews by the Transportation Commission and Council. The resulting solutions that were agreed to are listed below and are also shown as part of modal (transit, bike and pedestrian) and total transportation systems on the following maps. These solutions were evaluated against values defined by the community. More detailed explanation of capital projects recommended as part of this effort are provided in **Appendix D**.

Policies

Two policy/strategies were recommended.

P3. Parking management strategies (shared parking and joint parking) to maximize use. Look for opportunities for shared parking where parking is available for example at Seventh Day Adventist Church where parking is generally used only on the weekends. A suggested example included shared parking of church for market employees.

P4. Trail oriented development which includes development of land use and regulatory policies that support lower parking use through access to regional trails. This includes promotion and prioritization of shared use mobility strategies – Car share (car to go), bike share and Transportation Networking Companies (TNCs)

Education

Three education strategies were recommended including:

E1. Developing a campaign to help convey the value of transit in moving people in Kirkland.

E2. Consider performance monitoring and develop a performance monitoring system and promote the results to educate the value and benefits of transit in moving people. Develop performance measures, such as person travel times.

E3. Education campaign to promote the use and benefits of the Greenways program including working with neighborhoods, schools, and youth organizations to promote the connectivity and benefits of Greenways using maps, brochures, school education program and other promotions.

E4. Monitor speeding on secondary cut-through streets 8th Street and 106th Avenue. Potential traffic calming strategies are posted on the City website. (http://www.kirklandwa.gov/depart/Public_Works/Transportation_and_Traffic/Traffic_Calming_Devices.htm). New traffic calming strategies continue to emerge

Next Steps

Implementation of these recommended corridor solutions will require additional design, cost estimates, an assessment of right-of-way needs or other impacts, and continued outreach to communities with environmental review. Coordination with agency partners would be required for transit investments and investments affecting state facilities.

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
1. 6th Street at Kirkland Way			
1A	Transit Signal Priority Northbound - Peak Hour - Left turn lead lag	Transit	The City is in the process of designing and implementing traffic signals at the intersection of 6th Street and Kirkland Way. Metro's heavily used route 255 turns northbound left at this intersection and eastbound right. Transit signal priority at this intersection for the Northbound Lefts could provide a short travel time advantage for transit.
1B	Signal Coordination along 6th Street with future increased demand	Vehicles	To better and more efficiently travel along the 6th Street corridor between Central Way and Kirkland Way. Interconnecting the signals (including the signal at 4th) could improve the efficiency, reduce stops and delays.
1C	Crosswalk improvements at Kirkland Avenue	Ped	To improve access across 6th Street for pedestrians, put in place Rectangular Reflecting Flashing Beacon crossing.
2. 9th and Railroad Avenue			
2A	9th and Railroad at Kirkland Way Intersection Safety - Radar Speed - Left turn lane (**See concept in Appendix F**)	Vehicles	A safety concern for neighborhoods include sight distance near the existing CKC trestle over Kirkland Way at Railroad Avenue and 9th Street. Radar speed signs may help reduce speeds and improve safety for accessing Kirkland Way. There may be the opportunity to add a westbound left turn pocket at railroad Avenue to improve turning movements. Project is included in the City CIP.
3. CKC for Transit			
3A	BRT on CKC bypass 108th to S Kirkland Park-and-Ride	Transit	To reduce transit delays incurred on 6th Street and 108th Avenue, especially northbound during PM peak periods, constructing transit lanes within the CKC, similar to the CKC Master Plan. Transit on the CKC, especially in the segment between the South Kirkland Park-and-Ride and 6th Street could still connect to local neighborhoods but would dramatically increase overall transit travel times. Construction of this facility would be expensive and include structures over NE 68th Street and development of stations/stops, and take years to implement and permit.

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
3B	Bus Intersection at 6th Street/5th Place and the CKC **(See Concept in Appendix F)**	Transit	Transit signal priority at the CKC trail intersection on 6th Street. This would require a new signal, removal of on-street parking, and existing crosswalk with a signal controlled crossing to give transit priority in both north and southbound directions. Realign the 5th Place leg of the intersection to be consistent with future plans for the CKC.
4. 6th Street at 9th Avenue S			
4A	Install traffic signals at 6th Street and 9th	Vehicles / Peds / Bikes / Transit	The City is in the process of designing and constructing a new traffic signal at the intersection of 6th Street and 9th. This signal will improve neighborhood access to and from the 6th Street corridor. This signal could support redevelopment of adjacent land uses. Project is included in City CIP
5. **70th Street over I-405**			
5A	Improve and expand 70th Overpass	Vehicular	The existing NE 70th Street Corridor and structure over I-405 is curved, steep and constrained. Better organization and improvements in this corridor, could provide better and protected space for pedestrians and add space for cyclists which does not exist today. There is also a need to improve operations and access for transit and reduce delay for vehicles in the vicinity of I-405.
5B	BRT Planning near 85th/70th and Park-and-Ride	Transit	Passage of ST 3 includes development of Bus Rapid Transit on I-405 and potential station development within the freeway right of way near 85th. City transit planning would support coordination and integration with the local street system to most effectively connect these new stations to the local communities and other transit sources.
6. Houghton Park-and-Ride			
6A	Houghton Park-and-Ride lease for private shuttles	Transit	Private shuttles are operated in Kirkland by large employers including Google, Microsoft Connector and most recently Facebook and Amazon. Parking for employees meeting the shuttles currently use the S Kirkland Park-and-Ride and other leased space. With underutilization at the Houghton (7th) Park-and-Ride, this space could be leased to these private shuttle operators leaving spaces in South Kirkland Park-and-Ride to meet Public transit demands.
7. 108th Avenue at NE 68th Street			

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
7C	Continue and complete bike lanes	Bikes	Complete the bike lanes along 108th Avenue NE. - From Bellevue City Limits to NE 41st Street - NB Near NE 53rd/52nd Streets - Through NE 68th Street intersection
7D	Install "Don't Block the Box' pavement markings at Fire Station Driveway	Vehicles	Install pavement markings that keep the fire station driveway clear of vehicle queues. (Will be included in the City Annual Striping Program) This was recently completed
7E	Widen to provide curbside Northbound Transit only lanes **(See Concept in Appendix F)**	Transit	Widen 108th Avenue to create extensive segments of transit lanes to bypass queues. One segment provides a long northbound queue jump lane for transit at NE 68th Street and one segment provides a long northbound queue jump lane for transit at NE 60th Street. At NE 60th Street a new signal would be required.
8. NE 68th Street at 108th Avenue NE (Access)			
8A	Access Management - extend curbs - selectively close driveways (Assumes no redevelopment) **(See Concept in Appendix F)**	Vehicles / Peds / Bikes	Closely spaced driveways and intersections, bike lanes, as well as crosswalks on NE 68th Street results in numerous conflict points between vehicles, pedestrians and bicycles. As part of development review with redevelopment, access management strategies could include closing all driveways on NE 68th Street and consolidating driveways, using medians to separate conflicting movements and reorganizing adjacent development sites to better circulate and organize traffic off arterial streets. An initial set of strategies could include consolidation of driveways on NE 68th Street, removal of crosswalks, medians for the left turn pocket and wider sidewalks. Without any redevelopment or widening, there could be some access management strategies implemented including extending medians to restrict lefts from driveways, closing or consolidating driveways and potentially removing the pedestrian crossing.
8C	Access Management and Multimodal improvements on NE 68th Street at 108th Avenue. (Assumes Re-Development) - Median Control	Vehicles / Peds / Bikes	With redevelopment driveways could be reduced reducing potential conflicts. New traffic control for crosswalks could improve access. A southbound right- turn pocket on 6th Street could improve overall intersection operations. With redevelopment of the adjacent land uses this option could be developed with widened sidewalks, extending and completing bike lanes, adding green bike boxes

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
	- Driveway Consolidation - Wider sidewalks - Extend Bike Lanes including Intersection - Consolidate and Protect crosswalks - Southbound right-turn lane **(See Concept in Appendix F)**		or other features like a full bike intersection through the NE 68th Street/108th Avenue intersection and adding a southbound right-turn lane.
9. CKC Connectivity			
9A	Improved trail access and connection for Bikes	Peds / Bikes	As part of the Interim Trail development of the CKC, the City has developed key connections to the local street system from the trail to neighborhoods. Continuing to enhance some of these facilities as better bike connections would be desirable, for example similar to the NE 60th Street Corridor connects with the CKC.
10. NE 60th Street Connections			
10A	Enhanced ped and bike access for 60th Neighborhood Greenway at 108th Avenue NE	Peds / Bikes	The City of Kirkland Transportation Master Plan includes designation of a system of Neighborhood Greenways. These greenways promote safe, low volume, slow speed roadways to promote use by pedestrians and bicycles. One of these connections is NE 60th Street. This connection could be enhanced for bicycles and promote places for less confident bike riders. NE 60th Street as a greenway can be a key connection across I-405 connecting Lake Washington Boulevard to Overlake. A signal controlled intersection at 108th Avenue is proposed as part of 7E.
11. Signal at NE 53rd (access to NU)			
11A	Signal at NE 53rd Street (proposed by Northwest University) Relocate and improve bus stop.	Peds / Transit	As part of expansion and permitting for new development at Northwest University, the University has proposed installation of a traffic signal on 108th Avenue at NE 53rd Street. Design and development of signals at this location is complicated with an offset alignment of NE 53rd and NE 52nd Streets, a protected crosswalk, and a busy transit stop serving the University, Emerson High

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
	Coordinate and adjust crosswalk with Metro		School and the neighborhood. Installation of traffic signals would be implemented when engineering standards (per MUTCD signal warrants) are met.
12. South Kirkland Park-and-Ride			
12A	Park-and-Ride permitting for transit users	Transit / Parking	The South Kirkland Park-and-Ride is often full. Prioritize Park-and-Ride spaces for carpoolers through permitting. This could be the simplest strategy to promote transit. Metro is piloting a carpool reservation program at park and rides today.
12B	Improve Access/Egress from Park-and-Ride at NE 38th Place for Buses - Speed/Radar - Pavement Marking	Transit / Parking	Improve site operations by improving egress from the Park-and-Ride for buses. Metro has studied this and are working with the Cities. A potential solution includes using speed radar and pavement markings to improve sight distance for exiting buses.
12C	New signal control access Park-and-Ride Access (City of Bellevue)	Transit / Parking	As congestion increases and it becomes increasingly challenging to access the Park-and-Ride on 108th Avenue, traffic signals should be considered at the access. This signal would be within the jurisdiction of the City of Bellevue and would be most effective to be interconnected with the adjacent signals on 108th that are part of Bellevue's adaptive signal system. Could be annexed into City of Kirkland.
12D	Improve trail access to Park-and-Ride	Transit / Bike / Peds	The Cross Kirkland Corridor (CKC) runs adjacent to the South Kirkland Park-and-Ride, however there is a grade change and gap that limits access for bikes and peds along the Corridor to using the sidewalks and bike lane on 108th Avenue. As this volume increases, access to the adjacent park-and-ride structured garage would be desirable to more easily access transit. With the passage of Sound Transit 3, there is a planned light rail station at South Kirkland Park-and-Ride that may include amenities such as bike parking and an elevator. This connection from the CKC to the park-and-ride should be considered in the planning and development of a future rail station.
12E	Bike Share/Bike Racks at Park-and-Ride	Transit / Bikes	With the close proximity of the CKC to park-and-ride, increased use of bikes to access transit will result in the need for bike parking/racks and the potential desire for shared use bike, especially with an improved connection (12D).

Table 2. Recommended Corridor Improvements

Numbers	Solution Ideas	Type	Description
12F	Park-and-Ride management strategies with real time information	Transit / Bikes	Advances in technology and pilot studies with Sound Transit and Metro to expand real time information on parking occupancy. There are opportunities with transit partners to look for improved management strategies. These strategies can increase efficiency of the facility for moving people through strategies such as permit parking, premium/reservation parking, improved access to park-and-rides using shared use resources such as Bike Share and Car Share or Transportation Network Companies.
Policies (P) and Education (E)			
P3	Parking management strategies (shared parking and joint parking) to maximize use.	Parking	Look for opportunities for shared parking where private or public parking is available and consider management strategies.
P4	Trail Oriented Development	Land Use	Development of land use and regulatory policies that support lower parking use through access to regional trails. Including promotion and prioritization of shared use mobility strategies – Car share (car to go), bike share and Transportation Networking Companies (TNCs)
E1	Education Campaign on the value of transit in Kirkland's Mobility Future	Transit	Develop an education campaign to help convey the value of transit in moving people in Kirkland.
E2	Monitor person movement speed/efficiency	Transit	Develop a performance monitoring system and promote the results to educate the value and benefits of transit in moving people. Develop performance measures, such as person travel times.
E3	Greenway promotion of 60th and other connections	Peds / Bikes	Education campaign to promote the use and benefits of the Greenways program including working with neighborhoods, schools, and youth organizations to promote the connectivity and benefits of Greenways using maps, brochures, school education program and other promotions

Organizing these solutions by investment type, below are the investments that support **vehicular travel**.

1B. Signal Coordination along 6th Street

2A. Kirkland Way and Railroad Ave Intersection Improvements

5A. Improve and expand 70th Street Overpass

7D. Install "don't block the box" pavement markings at Fire Station Exit on 108th

8A. Driveway consolidation around 68th St / 108th Ave businesses

8C. Reduce business access on 68th & 108th to signalized intersections and install new signal at 106th.

P3. Citywide Parking Management strategies such as shared parking and joint parking use.

Below and in **Figure 15** are the investments supporting connectivity for **pedestrians.**

1C. Crosswalk Improvements at 6th Street & Kirkland Way Intersection

9A. Improve CKC trail access (also for bikes), especially at 60th St.

12D. Connect the CKC trail to the north end of the S Kirkland P&R

P4. Develop land use policies promoting "trail oriented development"

E3. Greenway promotion of 60th Street as well as other corridors across the city.

Below and in **Figure 16** are the investments supporting connectivity for **biking.**

7C. Continue and complete Bike Network connections along 108th Ave.

8D. Full Bicycle Intersection at 68th St & 108th Ave Ne

8E. Install green bike boxes in intersection to allow safer bike left turns

10A. Designate 60th St as Neighborhood Greenway

12E. Install bike racks or bike share at S Kirkland P&R

Finally, below and in **Figure 17** are the investments supporting regional mobility and **transit**.

1A. Transit Signal Priority at 6th Street and Kirkland Way

3A. Bus Rapid Transit on the Cross Kirkland Corridor (CKC)

3B. Bus Intersection at 6th Street & CKC

5B. Houghton Park-and-Ride lease for Private Shuttle Use

7E. Widen 108th to provide the maximum level of queue jump & install new signal at 60th

11A. Install new signal at 53rd and relocate & improve existing bus stop

12A. Park-and-Ride permitting for transit users at S Kirkland Park-and-Ride

12B. Improve Access / Egress from S Kirkland P&R

12C. New signal controlled access to S Kirkland P&R

12F. Install real time parking occupancy at S Kirkland P&R

E1. Education Campaign promoting the value of Transit in Kirkland

E2. Monitor Performance (in person throughput) along 6th Street to understand need for transit investment

The cumulative map of solutions is provided in **Figure 18**.

Figure 15 - Pedestrian and Trail Recommendations

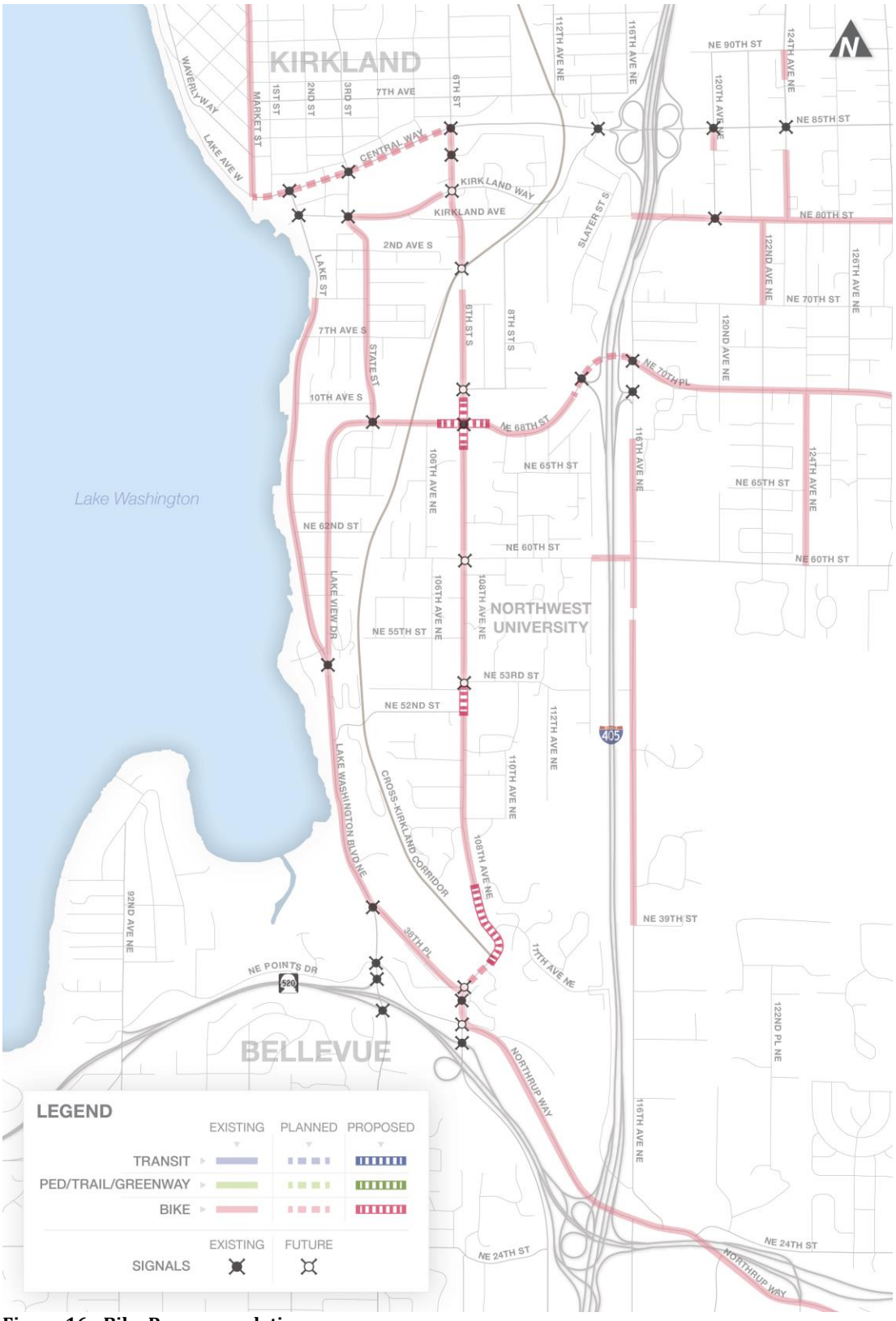


Figure 16 - Bike Recommendations

Figure 17 - Transit System Recommendations

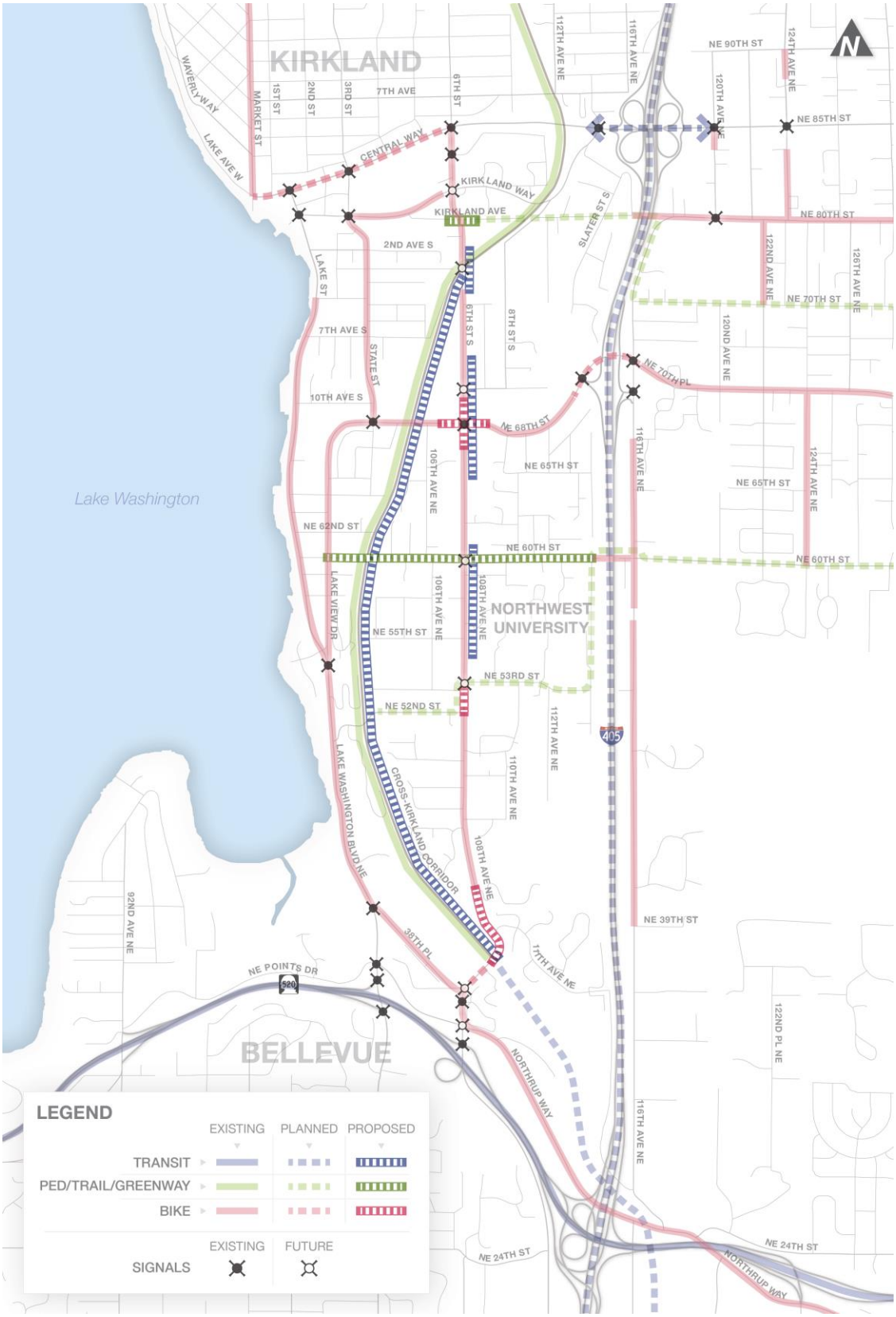


Figure 18 - Transportation System Recommendations

RELATIONSHIP TO LAND USE

HOUGHTON EVEREST NEIGHBORHOOD CENTER

This last section addresses the transportation effects of changes in land use at the Houghton Everest Neighborhood Center.

Houghton Everest Land Use

This last section of the report summarizes the baseline scenario development and potential investments against comparative growth scenarios in vehicle trips resulting from proposed land use options in the Houghton / Everest Neighborhood Center. The Houghton / Everest Neighborhood Center is located adjacent to 6th St S/108th Ave NE & NE 68th St intersection in Kirkland, WA (see **Figure 19**). As part of the Houghton / Everest Neighborhood Center and 6th Street Corridor Study, the City of Kirkland is evaluating land use alternatives for the center while evaluating transportation alternatives in the area to serve anticipated growth in vehicle, transit, pedestrian, and bicycle trips.

Two land use scenarios were studied in comparison to the current 'maximum' land use allowed under the comprehensive plan (2035 Comp Plan Scenario) with maximum height of 30 feet. The two other scenarios are: a modest development scenario with a maximum development height of 35 feet (Modest Change Scenario), and a greater development scenario with a maximum development height of 55 feet (Greater Change Scenario).

These conditions of an assumed 2035 timeframe with and without growth in the Center are also compared with potential investments in the corridor that could be in place. memo describing the trip generation and intersection level of service results is attached. This section summarizes the results and impact of different corridor investments.

Trip growth was calculated for four land use scenarios provided by BERK Consulting for the proposed development. These scenarios include existing "Existing 2016" conditions, "2035 Current Comp Plan," "2035 Modest Change," and "2035 Greater Change," which represent increases in development building height. The land uses contain a combination of apartments, office space, retail, supermarket, convenience store, and coffee shop land uses. Commercial land uses are consistent between the "Comp Plan," "Modest," and "Greater" scenarios, with the difference being the number of total residential dwelling units. Land use by scenario is shown in **Table 3** and reflects changes in the number of dwelling units. These are assumed to be multi-family housing above ground level office and retail.

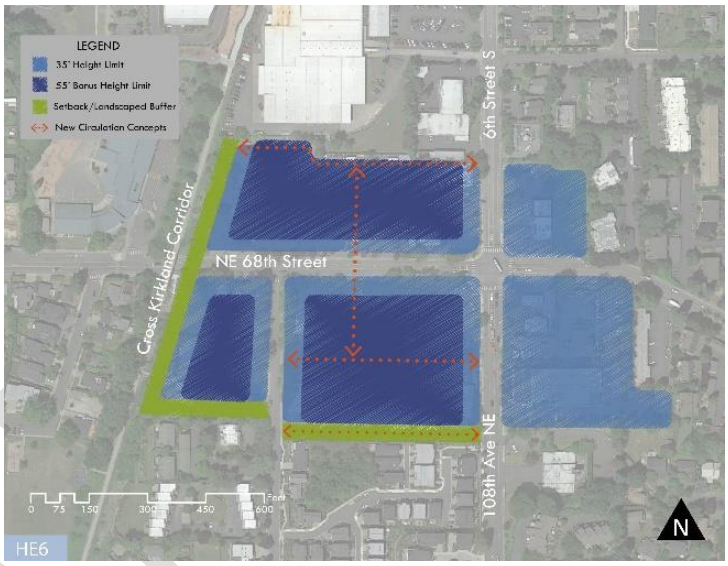


Figure 19 - Houghton Everest Neighborhood Center

Table 3. Land Use Comparison

Use	Existing	Comp Plan	Modest Change (35')	Greater Change (55')
Residential (Dwelling Units)	*39*	*360*	*574*	*862*
Retail (Square Feet)	*105,092*	*113,480*	*113,480*	*113,480*
Office (Square Feet)	*73,150*	*122,476*	*122,476*	*122,476*

Trip generation was calculated for the PM peak hour and Daily for each of the development scenarios using the ITE Trip Generation manual assuming the different land use types. As noted in the graphs below in **Figure 20** and **Figure 21**, trips for the daily and PM peak are highest with the Greater Change scenario with the least trips for existing conditions.

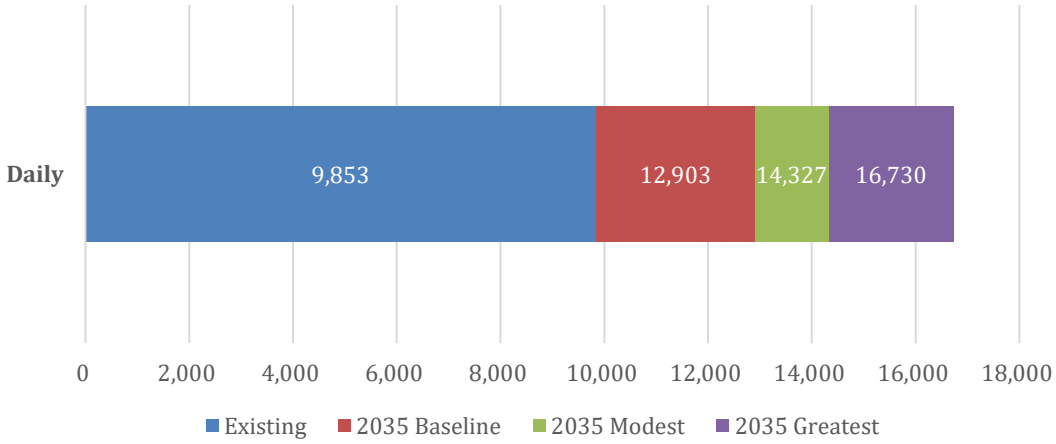


Figure 20 - Daily Trips to/from Development

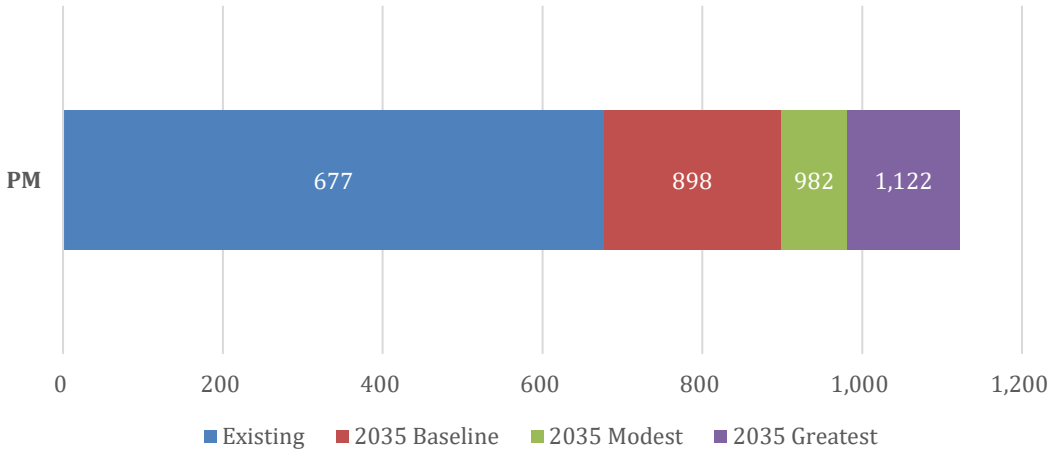


Figure 21 - PM Peak Trips to/from Development

Development Impact

In order to understand the relative impact of the trip generated by the development scenarios as compared to the future Comprehensive Plan, impacts of these development scenarios were analyzed assuming future infrastructure investments along the 6th / 108th corridor. A portion of the trips were distributed from future development on to existing operations. It is important to note not all development related trips use this central intersection as other routes are available for trips. It should also be noted that the baseline growth in 2035 assumes development on the site consistent with what is currently approved in the comprehensive plan.

Table 4 compares intersection operations at NE 68th Street & 108th Avenue for Existing, Baseline 2035, Modest Development Scenario and Greatest Development Scenario. Existing intersection level of service is at LOS E, which will grow to LOS F in the future baseline scenario. Future development will further increase the average delay per vehicle to well beyond reasonable intersection operations in all future cases. The Greater Change development assumes an added southbound right-turn lane. This could be added to the intersection in any scenario that assumes redevelopment of the Northwest Corner parcel, as right of way is needed for this lane.

Table 4. Operations NE 68th Street /108th Intersection

Scenario	Level of Service	Average Delay in seconds per vehicle	Worst Movement	Total Entering Vehicles
Existing – 2016	E	62	SB	2,520
Baseline – 2035	**F**	**142**	*SB*	***3,855***
Modest - 2035	**F**	**148**	*SB*	***3,920***
Greater Change Development - 2035	**F**	**119***	*SB*	***4,025***

Notes: * Assumes added southbound right turn lane as part of Greater Change option

It is expected that new development in the Houghton Everest Neighborhood Center would also provide an opportunity to improve NE 68th Street Corridor which currently has many conflicting movements and poorly controlled access points. As part of the corridor study improving safety by reducing conflicts was studied. Without any major changes or new development, the most that could be done would be to install medians, close driveways and reduce crosswalks. It was assumed that with the "Greater Change" option, additional roadway right of way (up to 80 feet) could be dedicated and would accommodate extending full bike lanes, adding a median, widening sidewalks and closing driveways while adding a new signal at 106th Avenue NE. One of the largest operational benefits for vehicular traffic in the corridor would come from a southbound right-turn lane which could be implemented as part of the redevelopment in the "Greater Change" option. This is reflected in the operations noted in **Table 4** above. **Appendix E** provides details on the Corridor travel times were also simulated for future (2035) operations with and without the proposed transit investments in the corridor including transit queue jumps northbound on 108th Avenue (the corridor) at NE 68th Street and at NE 60th Street. Details of these queue jumps are provided as option 7E in Appendix F. Travel times with these investments are note in **Table 5** indicating a travel time benefit for vehicles and transit with these added lanes.

Table 5. 2035 PM Peak Travel Times on the Corridor with Transit Queue jumps at NE 60th Street and NE 68th Street

Scenario	GP Northbound Travel Time (minutes)	Transit Northbound Transit Travel Time
Future Baseline	11:32	11:59
Future With Improvements	8:57	9:37
Delta (reduction)	**-2:35 (-22%)**	**-2:22 (-23%)**

APPENDICES

The following Appendices contain supporting information and memos referenced throughout the Corridor Study. The memos served as interim products and supported in the development of this final report.

- A: Data Collection and Methods Memo
- B: Level of Service Descriptions
- C: Survey Summary
- D: Solutions Memo
- E: HENC Analysis Results
- F: Project Detail Pages

APPENDIX A: DATA COLLECTION AND METHODS MEMO

APPENDIX B: LOS DEFINITIONS & WORKSHEETS

LOS DEFINITIONS

Signalized Intersections

Signalized Intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle in experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table B1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board).

Unsignalized Intersections

LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table B2 shows LOS criteria for unsignalized intersections as described in the *Highway Capacity Manual 2010* (Transportation Research Board).

Table B1. Level of Service Criteria for Signalized Intersections

LOS	Avg. Control Delay (sec/veh)	General Description
A	≤10	Free Flow
B	>10-20	Stable Flow (slight delays)
C	>20-35	Stable Flow (acceptable delays)
D	>35-55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55-80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual* 2010, Transportation Research Board (TRB)

1. If the volume-to-capacity ratio for a lane group exceeds 1.0 LOS F is as-signed to the individual lane group. LOS for overall approach or intersection is determined by the control delay.

APPENDIX C: SURVEY SUMMARY

APPENDIX D: SOLUTIONS MEMO

APPENDIX E: HENC ANALYSIS RESULTS MEMO

APPENDIX F: PROJECT PAGES