LAKE WASHINGTON BOULEVARD PROMENADE

Final Report

March 2023

Prepared by

transpogroup

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Introduction

Lake Street South/Lake Washington Boulevard NE ("Lake Washington Boulevard") is a key multimodal corridor connecting downtown Kirkland south to Bellevue and SR-520, and to the King County Regional Leafline Trails system via the SR-520 Trail. It is part of the Lake Washington Loop, a signed 48-mile regional bicycle route, which connects Kirkland, Bellevue, Renton, Seattle, Lake Forest Park, Kenmore, and Bothell. The segment of the corridor between 2nd Avenue South and Lakeview Drive is particularly unique along the Lake Washington Shoreline as it connects downtown Kirkland, Carillon Point, and several City parks in a segment less than a mile, including David E. Brink Park, Marsh Park, Doris Cooper Houghton Beach Park, as well as smaller parks providing waterfront access including the 2nd Avenue South Dock, Street End Park, and Settler's Landing. Since 2014, there has been both public interest and Council discussion of a Promenade along Lake Washington Boulevard because of its popularity as a scenic walking and bicycling route for Kirkland residents and people throughout the region. The current 2035 Transportation Master Plan, adopted in 2015, explicitly identifies the need for a planning study of a potential lakefront promenade. Additionally, the June 2022 adopted Active Transportation Plan identifies Objective 1-12: Enhance pedestrian and bicycle facilities along Lake Washington Waterfront and downtown.

During the height of the COVID19 pandemic, there was renewed consideration of widening the pedestrian space of Lake Washington Boulevard for social distancing and to inform a potential permanent Promenade. The Transportation Commission unanimously approved a motion in support of implementing a pilot project in the March 2021 meeting. However, the pilot project was ultimately not pursued given the high cost of a temporary installation, and City Council expressed need for fuller understanding of the baseline safety concerns,

Map of the Lake Washington Boulevard Promenade project area

The City's Active Transportation Plan, adopted June 2022, identifies Objective 1-12: Enhance pedestrian and bicycle facilities along Lake Washington Waterfront and downtown

Existing sidewalk at David E Brink Park

On street parking is present on both sides of Lake Washington Boulevard

Regional cyclists on the Lake Washington Loop

Narrow sidewalk at 5th Ave S

bicycle and pedestrian use, and parking utilization of the corridor prior to conducting a pilot project.

In the June 2021 budget amendments ordinance the Council authorized funding for a two-step study process of baseline data-gathering and analysis, followed by development of design concepts that address the issues and needs in the corridor. This report is a summary of the findings and recommendations of this study process, which were presented to City Council at their February 2023 meeting. Council directed staff to advance analysis of traffic speeds and parking management strategies in the corridor, and to incorporate the preferred design concepts into the 2024 update of the Transportation Master Plan.

Existing Conditions

Following a competitive selection process, a study of existing parking usage and multimodal activity on the corridor from 2nd Ave South to NE 60th Street was conducted by Transpo Group from July—December 2021 (see ***Attachment C***). The objective of the existing conditions review was to understand the existing assets and identify opportunities for people walking, bicycling, rolling and driving through the corridor, as well as identify opportunities for parking and infrastructure supporting residences and businesses in the corridor. The existing conditions review also collected information on the existing lighting system, including a nighttime visit to assess lighting conditions after sundown, and a model of lighting levels to compare to standards and ideal conditions, given the desired target user in the corridor.

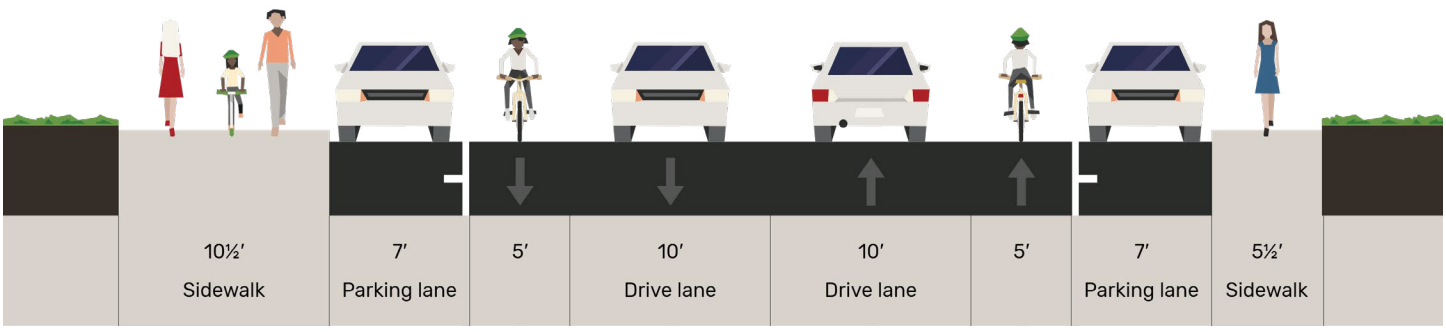
Site observations were photographed and correlated to maps utilizing data publicly available and data provided by the City. Maps of existing conditions are included in ***Attachment D.***

PHYSICAL CONDITIONS

Along the corridor, the land use is urbanized with a majority multifamily residential units and some commercial properties. There are three large waterfront public parks: David E. Brink Park, Marsh Park, and Doris Cooper Houghton Beach Park; and three smaller public parks providing waterfront access. Public off-street parking lots are available at Marsh Park and Doris Cooper Houghton Beach Park. Off-street parking for private properties accessed from Lake Washington Boulevard is a combination of driveways leading to private parking lots, head-in driveways, and some multi-stall carports fronting directly onto the corridor. Residential properties also utilize the curb space along Lake Washington Boulevard for parking, mailboxes, driveways, trash pickup, and delivery services.

The existing curb-to-curb pavement typically is 44-feet wide, with some widening at intersections. The road section consists of two parallel parking lanes, two vehicle travel lanes (one in each direction), and two bike lanes. The existing parking lanes are typically 7 feet wide, the bike lanes are 5 feet wide with no marked buffers, and the vehicle lanes vary between 10.5 and 9.5 feet, with most areas 10 feet in width. Behind the existing curbs, there are sidewalks present on both sides of the roadway.

The sidewalks on the west side are typically 10 feet wide between 2nd Ave S and 10th Ave S. Between 10th Ave S and NE 62nd St, west side sidewalks drop to an average of 6 feet in width, except for the recently widened sidewalks at David E Brink Park. South of NE 62nd Street, west side sidewalks widen back out to 10 feet in width to the signal with Lakeview Drive. The existing sidewalk on the east side of the road is 5 feet in width for the entirety of the corridor. Some of the existing curbs in the corridor are heavily damaged. Some street tree roots have cracked and lifted sidewalk panels, presenting mobility challenges, and an uneven walking surface.



Existing typical street section on Lake Washington Boulevard

Damaged sidewalk due to tree root uplifting

Existing street trees at the curb

Existing marked pedestrian crossing with flags

Variations in sidewalk width due to varying frontage requirements over time

Street trees are present in some locations, some near the curb line and others nearer the right of way line. Street trees are more plentiful, but in less regular configuration, between 2nd Ave S and 5th Ave S, having been installed as development occurred. Between David E Brink Park and 10th Ave S, there are more regularly spaced, mature trees at the curb line. South of 10th Ave S, street trees are present primarily at Marsh and Doris Cooper Houghton Beach Parks.

The right of way width in the project corridor varies slightly, but is no less than 60 feet. The variations in the right of way are due to changes in the timing and policies for frontage improvements and right of way dedication as the residences and commercial properties along the corridor have developed. The City's goal for the current study is for all modifications to occur within the existing right of way limits.

There are no transit routes or stops along the corridor. The speed limit is signed 30 miles per hour from Lakeview Drive to 7th Ave South, and 25 miles per hour from 7th Ave South north to Central Way. The July 2021 traffic study found no significant speeding issues along the corridor. There is one signalized intersection within the project limits, Lake Washington Boulevard and Lakeview Drive, which defines the southern limit of the project corridor.

Crosswalks

There are 10 existing unsignalized marked crossings of Lake Street S/Lake Washington Boulevard NE within the project limits including the crossing at 2nd Ave S, and an additional marked crossing on the north leg of the signalized intersection of Lake Washington Boulevard NE and Lakeview Drive. None of the existing marked crossings are considered midblock as each is marked at either the north or south legal crossing of an intersecting east-west street with the corridor. Three of the crossings, at 7th Ave S, NE 59th St and NE 60th St, are enhanced with rectangular rapid flashing beacons (RRFBs).The crossings at NE 59th St and NE 64th St have overhead pedestrian warning signs in addition to the roadside pedestrian warning signs. All of the crossings in the corridor have pedestrian-carried flags offered for visibility.

Utilities

Electrical power in the corridor is underground, with no power utility poles present on either side of the street. There are existing illumination poles, the analysis and details of which is covered under the “Illumination” section. Stormwater conveyance in the corridor has historically been a concern. The corridor is a fairly flat grade, and due to the fast-changing nature of the development along the lakefront, there have been some stormwater systems that have been “dead ended.”

Existing Land Use and Development

Along Lake Street S and Lake Washington Boulevard NE, the land use is urbanized. The Lake Washington shoreline is between 100 and 300 feet to the west of the roadway. Lake access, views, and proximity to Downtown Kirkland make the corridor a highly sought-after residential location. A mix of residence types, with a majority multifamily units, are present on both sides of the street. There are some assisted living facilities and commercial facilities, including restaurants and offices. Many of the residential buildings have mature landscaping, with well-developed aesthetic treatments including fountains, gardens, terraces and plazas.

Sign mounted RRFB at 7th Ave S

Overhead RRFB at NE 59th St

Residential building along the corridor with a decorative pergola

David E Brink Park

Public Parks

Several public parks are within the study limits. Doris Cooper Houghton Beach Park, Marsh Park and David E Brink Park are all heavily used public facilities with waterfront access, including docks for kayaking at Doris Cooper Houghton Beach Park, sports facilities, playgrounds and public art installations. Settler's Landing, Street End Park, and the 2nd Ave S Dock are all smaller parks providing waterfront access. The parks are an asset to the community and a significant driver of the active mode usage in the corridor by users of a wide range of ages and comfort levels at all times of the day.

In addition to the public parks, a public walkway exists along the waterfront through the otherwise private multifamily residential properties within the project corridor. The walkway does get restricted at night, via gates at the private property entrances, but is available during daylight hours as a walking alternative to the sidewalks along the roadway.

Residential Support Facilities

Along the corridor, day to day support facilities for residences, including mailboxes and locations for trash pickup, are significant considerations when looking to change the roadway section. Support facilities are more plentiful between 2nd Ave S and 5th Ave S on the north end of the corridor, and between 10th Ave S and Marsh Park. Maintaining access to existing mailboxes at the back of the sidewalk, dumpsters for multifamily units, and space for garbage and recycle cans near the curb are key functional requirements of the street. Additionally, the ubiquity of delivery services, especially after the COVID-19 pandemic, for everything from packages to meals to rideshare utilize curb access on both sides of Lake Washington Boulevard.

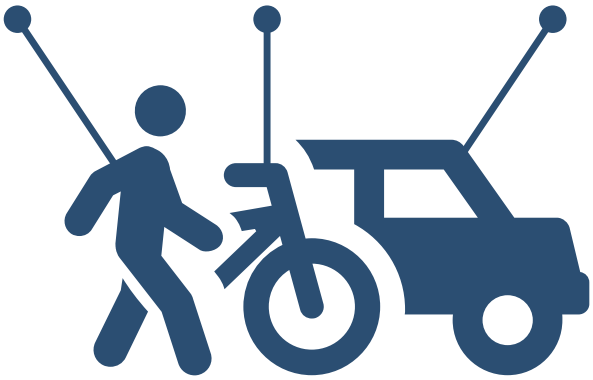
OPERATIONAL CONDITIONS

User Counts

Lake Washington Boulevard has a diverse mix of users of all modes. The project corridor has three major public parks with waterfront access, attracting many younger children, their families, pets, strollers, and casual cyclists. The parks also attract recreational use and exercise in the corridor by pedestrians and cyclists of all ages, abilities, and confidence levels. Many residences, including multifamily apartment complexes on Lake Street S/ Lake Washington Boulevard NE can easily access downtown Kirkland by foot or bike via the corridor. There are assisted living facilities that front onto the corridor which house individuals with mobility challenges who use the corridor for exercise and park access. The corridor is part of the Lake Washington Loop, so is frequented by both casual local riders and cyclists from throughout the region who enjoy elevated cycling speeds compared to the typical multigenerational user mix. There is regular use of the on-street parking lane for public parks access, long-term residential use, pickups and drop-offs, and business access. Twelve-hour pedestrian and bicycle counts on a Thursday and Saturday in July 2021 found an average of 1,612 pedestrians and 278 bicyclists on Thursday, and 2,332 pedestrians and 616 bicyclists on Saturday. Peak recorded volumes were 300 pedestrians per hour and 80 bicyclists per hour. Vehicle volumes average approximately 12,000 per day. Twenty-four-hour vehicle tube counts were also conducted in July 2021, which found an average daily volume of 12,726 vehicles on Thursday and 11,286 vehicles on Saturday. Assuming an average vehicle occupancy of 1.2, approximately 15,271 people traveled by vehicle on Thursday and 13,543 people on Saturday. Comparing these vehicle counts to the walking and bicycling counts, combined the walking and bicycling modes accounted for approximately 11% of the corridor mode share on Thursday and 18% on Saturday.

WHO IS USING THE CORRIDOR?

1,612	278	12,726
2,332	616	11,286



Thursday
Saturday

Counts done in July 2021
12 hour ped/bike counts, 24-hour vehicle count

*Number of people traveling by vehicle**

15,271 Thursday
11,286 Saturday

**based on average of 1.2 people per car*

Percent of all traffic in the corridor on walking, bicycling, or rolling

11% Thursday
18% Saturday

Resident Requests

Staff compiled a review of service requests received through Our Kirkland from users of the corridor since 2018, post completion of the Lakefront improvements project that installed new ADA compliant curb ramps, new pedestrian lighting, and added green bicycle lane treatments and new bike lane signage. Common resident complaints include overgrown vegetation on sidewalks, trees overhanging the sidewalk or bike lane, tree roots uplifting sidewalks, debris in bike lanes, high speeding traffic or noisy vehicles at night, high traffic volumes in the evening peak, and drivers not yielding to pedestrians at crosswalks. There are a few location-specific requests to improve lighting and add flashing beacons at several crosswalks in the corridor, including NE 62nd Street, NE 64th Street, and 10th Avenue South.

Parking Utilization

Currently, there is on-street parking on both sides of the corridor and on most side streets. There are time and loading restrictions at the north end of the corridor near downtown, overnight restrictions adjacent to David E. Brink and Marsh Parks, and time restrictions on NE 58th Street in proximity to Doris Cooper Houghton Beach Park. Otherwise, on-street parking is unregulated in the corridor.

Two hour off-street public parking is available in Marsh Park and Doris Cooper Houghton Beach Park for daytime park use. The remaining off-street parking in the corridor is private. The office

ON-STREET PARKING OCCUPANCY

33-57% of parking occupied on Thursday

28-62% of parking occupied on Saturday

Counts done on Lake Washington Blvd in July 2021

7PM on Thursday

4PM on Saturday

HOW FAR DID THEY TRAVEL TO PARK?

< 5 miles	< 1 mile
57% on weekdays	**15%** on weekdays
51% on weekends	**17%** on weekends

building 5808 Lake Washington Park located east of Doris Cooper Houghton Beach Park makes their off-street lot available for public parking in the evenings, which is indicated by signage. Off-street parking for residential single and multifamily properties is accessed both by combined driveways leading to parking lots, and head-in driveways in some locations, with multi-stall carports fronting directly onto Lake Street S/Lake Washington Boulevard NE. Several of the driveways on the west side of the corridor have steep approaches to the roadway.

Results from a Thursday and Saturday July 2021 parking study found on-street parking occupancy rates on Lake Washington Boulevard varied from 33-57% on Thursday and 28-62% on Saturday. The peak numbers of parked vehicles were 144 at 7:00 p.m. on Thursday and 171 at 4:00 p.m. on Saturday. Given average occupancy rates of 50%, and no peak values above 80%, the data on existing use indicates there is flexibility to remove on-street parking from one side of the corridor and still accommodate peak parking demand on the corridor or side streets.

Additionally, to understand trip characteristics of those who park in the area, GPS- and location-based data found that a large percentage of parking trips were from nearby origins: 57% of weekday and 51% of weekend parking trips originated from less than five miles away, a comfortable bicycling distance; and 15% of weekday and 17% of weekend parking trips originated from less than one mile away, a comfortable walking distance. Reviewing recorded license plate data across Thursday and Saturday, 750 unique values were noted on Lake Washington Boulevard, with 32 repeat vehicles parked on both days. The pattern of parking rates may indicate only a small percentage of on-street parking is used regularly by residents of the corridor. Additional data collection and analysis would be required to determine residential use accurately.

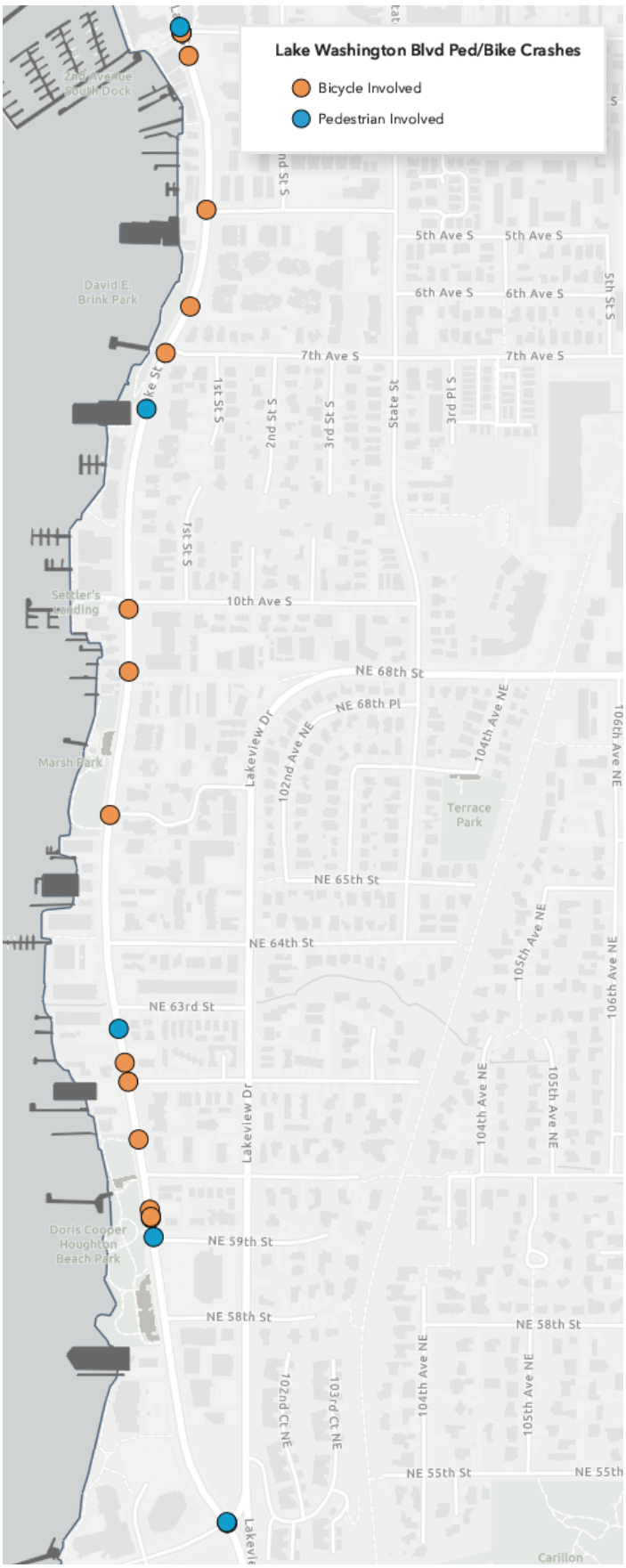
CRASH HISTORY

In the City's Vision Zero Action Plan, Lake Street South from Central Way to 7th Avenue South is a Priority 1 High Crash Corridor based on the rate of serious and fatal injury collisions, and the full corridor from Central Way to Northup Way also is identified as a Priority 1 High Crash Corridor because of the number of collisions specifically involving pedestrians and bicyclists.

In five years of recent crash history in the corridor (2016-2020), four serious injury crashes occurred, with two of those crashes at the Lakeview Drive intersection. Of the four serious injury crashes, two of those crashes involved serious injury to pedestrians, and one of those crashes involved serious injury to a bicyclist. The most significant risk factors for all pedestrian- and bicycle-involved crashes, with or without injuries, included:

- Crashes involving pedestrians happened more frequently in the dark, both with streetlights on and at dusk prior to streetlights coming on. The pattern of crashes indicates a need for improvements to the street lighting, especially at crosswalks.
- Bicycle-related crashes more frequently involved eastbound turns to the cross streets from both northbound and southbound traffic (8 of 12 total bike related crashes). There was one (1 of 12) bicycle-related crashes related to driveways.
- Speed of cyclists was cited in 2 of 12 bicycle related crashes as a contributing factor, and

The previous study of the Lake Washington Boulevard NE corridor, included as ***Attachment C***, conducted an analysis of speed in the corridor and a video analytics analysis of near misses at the intersection of Lake Street S and 7th Ave S. The previous study found that speeds in the corridor were aligned with posted limits, and the video analytics analysis of two 13-hour weekday videos during daylight hours found that overall safety ratings and the rate of near-miss crashes were very low. No safety concerns were identified from the video analysis. However, the lack of safety concerns identified in the data is not intended to discount the presence of safety risk factors in the corridor. The video study was conducted over two specific days



Bike and pedestrian crashes in the study corridor, 2015-2021

in favorable weather, and at only one intersection along the corridor. In addition, perceived safety risk and associated comfort can vary based on a users' comfort level with cycling, previous experiences, and day to day use of the corridor.

Comparison to the Local Road Safety Plan

The City of Kirkland maintains a Local Road Safety Plan (LRSP) that identifies risk factors for crashes citywide. In the LRSP, crashes that involve pedestrians and cyclists are top priority for the City to develop projects that mitigate risk to vulnerable users. The 2022 LRSP identifies the south end of the Lake Washington Boulevard corridor from NE 60th St to NE 52nd St as a Level 1 priority location for LRSP-identified projects, with 4 serious injury crashes in the 5-year crash data period (2016-2020). The primary identified physical risk factors (i.e. other than driver behavior) in the LRSP on Lake Washington Boulevard are a posted speed over 30 mph, uncontrolled marked crosswalks at intersections, and the turning movements across these same crossings.

Safety Priorities

The crosswalks and intersections in the project corridor present an opportunity to address historic crash risk factors. Addressing visibility of cyclists at intersections will help to address left turn and right hook crashes with cyclists. Consolidating bicycle movements to one facility to the west side of the roadway would addresses crash risk between northbound bicyclists and eastbound vehicle turns.

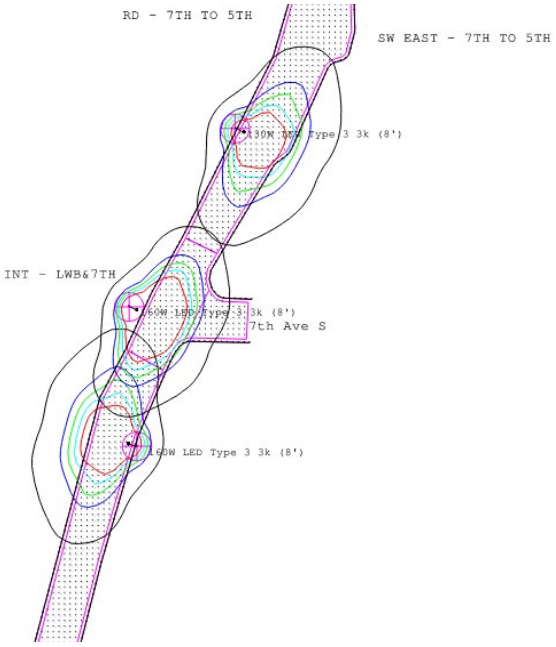
Northbound bike lane intersection at 10th Ave S is marked with green conflict markings for increased visibility of the bike lane for approaching drivers

ILLUMINATION

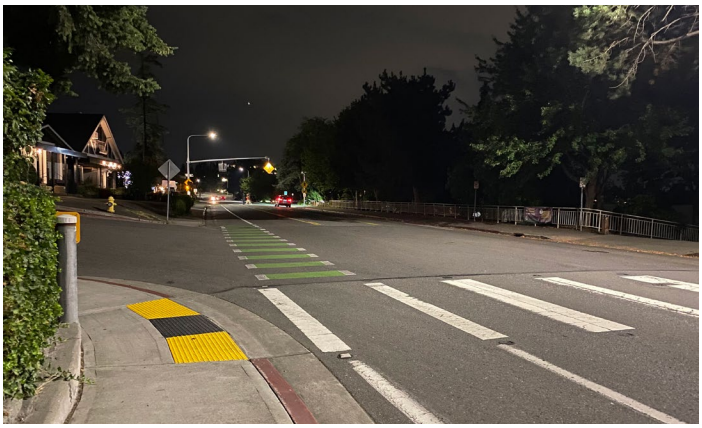
Street lighting is present on both sides of the roadway; however, pedestrian-scale lighting is not. The existing roadway lighting is not uniform along the corridor with some marked pedestrian crossings that do not have dedicated lighting.

A planning level lighting study was performed to calculate the existing roadway and sidewalk light levels based on publicly available aerial imagery, Google Street View, and photos/documentation from field visits. Two metrics were considered for the lighting study: average maintained illuminance, which is a measure of how brightly an area is lit, and uniformity ratio, which is a measure of how evenly an area is lit. Calculation areas were delineated separately throughout the corridor for street segments, intersections, mid-block crossings, and sidewalks. Findings indicate that there are several areas that could be improved for the safety and comfort of all roadway users.

Active mode facility enhancements along the corridor will present opportunities to improve both street- and pedestrian-level lighting.



Photometric Analysis Model



Nighttime illumination

LWB Planning Level Existing Photometric Analysis					
Label	Target Avg (FC)	Calculated Avg (FC)	Min (FC)	Target Uniformity (Avg/Min)	Calculated Uniformity (Avg/Min)
INT - LWB&10TH	1.9	1.52	0.2	3.0	7.60
INT - LWB&2ND	2.0	1.96	0.2	3.0	9.80
INT - LWB&58TH	1.9	1.95	0.5	3.0	3.90
INT - LWB&59TH	1.9	1.03	0.3	3.0	3.43
INT - LWB&5TH	1.9	0.78	0.0	3.0	N.A.
INT - LWB&60TH	1.9	0.40	0.0	3.0	N.A.
INT - LWB&62ND	1.9	0.84	0.1	3.0	8.40
INT - LWB&63RD	1.9	0.52	0.1	3.0	5.20
INT - LWB&64TH	1.9	0.78	0.0	3.0	N.A.
INT - LWB&7TH	1.9	1.11	0.1	3.0	11.10
INT - LWB&CENTRAL	2.4	0.99	0.2	3.0	4.95
INT - LWB&KIRKLAND	2.0	2.75	0.2	3.0	13.75
INT - LWB&LAKEVIEW	2.0	0.96	0.1	3.0	9.60
INT - LWB&PARK	1.9	1.74	0.0	3.0	N.A.
MBC - 2ND TO KIRKLAND	1.25	3.05	0.8	3.0	3.81
MBC - 64TH TO 10TH	1.25	1.64	0.9	3.0	1.82
RD - 10TH TO 7TH	1.25	0.60	0.0	3.0	N.A.
RD - 2ND TO KIRKLAND (MBC - N)	1.25	1.59	0.3	3.0	5.30
RD - 2ND TO KIRKLAND (MBC - S)	1.25	1.16	0.3	3.0	3.87
RD - 58TH TO 59TH	1.25	0.99	0.1	3.0	9.90
RD - 59TH TO 60TH	1.25	0.18	0.0	3.0	N.A.
RD - 5TH TO 2ND	1.25	0.77	0.0	3.0	N.A.
RD - 60TH TO 62ND	1.25	0.65	0.1	3.0	6.50
RD - 62ND TO 63RD	1.25	0.55	0.1	3.0	5.50
RD - 63RD TO 64TH	1.25	0.29	0.0	3.0	N.A.
RD - 64TH TO 10TH (MBC - N)	1.25	0.89	0.0	3.0	N.A.
RD - 64TH TO 10TH (MBC - S)	1.25	0.57	0.1	3.0	5.70
RD - 7TH TO 5TH	1.25	0.78	0.0	3.0	N.A.
RD - KIRKLAND TO PARK	1.25	0.56	0.1	3.0	5.60
RD - LAKEVIEW TO 58TH	1.25	0.96	0.1	3.0	9.60
RD - PARK TO CENTRAL	1.25	1.72	0.2	3.0	8.60
SW EAST - 10TH TO 7TH	0.5	0.48	0.0	4.0	N.A.
SW EAST - 2ND TO KIRKLAND	0.5	1.80	0.2	4.0	9.00
SW EAST - 58TH TO 59TH	0.5	0.87	0.1	4.0	8.70
SW EAST - 59TH TO 60TH	0.5	0.28	0.0	4.0	N.A.
SW EAST - 5TH TO 2ND	0.5	0.37	0.0	4.0	N.A.
SW EAST - 60TH TO 62ND	0.5	0.54	0.1	4.0	5.40
SW EAST - 62ND TO 63RD	0.5	0.45	0.0	4.0	N.A.
SW EAST - 63RD TO 64TH	0.5	0.29	0.0	4.0	N.A.
SW EAST - 64TH TO 10TH	0.5	0.57	0.0	4.0	N.A.
SW EAST - 7TH TO 5TH	0.5	0.63	0.0	4.0	N.A.
SW EAST - KIRKLAND TO PARK	0.5	2.00	0.0	4.0	N.A.
SW EAST - LAKEVIEW TO 58TH	0.5	0.71	0.1	4.0	7.10
SW EAST - PARK TO CENTRAL	0.5	4.94	0.0	4.0	N.A.
SW WEST - KIRKLAND TO CENTRAL	0.5	0.81	0.2	4.0	4.05
SW WEST - LAKEVIEW TO KIRKLAND	0.5	0.66	0.0	4.0	N.A.
Note: INT = Intersection MBC = Mid-block crossing RD = Roadway SW = Sidewalk FC = Footcandles					
	Blue Cell Shading = levels outside of target value				

Existing lighting levels table

Corridor Improvements

CROSS SECTION CONCEPTS

Given the existing condition findings, there was deemed an opportunity to re-allocate the existing right-of-way to improve the comfort of walking, cycling, and rolling in the Lake Washington Boulevard corridor for users of all ages and abilities. A wide range of feasible sections were considered, removal of on-street parking on one side of the corridor was the baseline assumption for all the section options in order to reallocate roadway space for active mode improvements. In all configurations, it was assumed the existing lane assignments and number of lanes at the Lakeview Drive intersection will not change, nor will the configuration of lanes north of 2nd Avenue. City standard widths of 10-foot travel lanes and 5-foot bike lanes were used for section development. The cross-section options are divided into five categories based on the general configuration of the position of the bike facility, the additional treatments provided for pedestrians, the physical protection of the bike facility, and the position of on-street parking retained in the corridor. Existing sidewalk widths were maintained, at a minimum.

Multi-Use Path

The first category of cross-section options would repurpose the existing west side on-street parking lane and both existing on-street bike lanes as a raised multi-use path on the west side. The resulting section would be a very wide promenade dedicated entirely to mixed active mode traffic. The multi-use path would require removal of some existing street trees, to be replaced with new street trees adjacent to the new curb location. The multi-use path would require more significant construction and investment of resources as compared to other options but would meet the overall goal of a new promenade facility.

Protected Bike Lanes - West Side Parking

The second category of modifications to the corridor would combine both bike lanes into a single two-way protected bike lane facility. The two existing bike lanes would be moved to the west curb of Lake Washington Boulevard, and on-street parking would be maintained on the west side of the street. The on-street parking would “float” off the west side curb, providing additional physical separation and space between active travel lanes and the two-way protected bike lanes. Because on-street parking would be next to the protected lanes, a buffer is required to prevent the threat from “dooring,” when parked vehicles open a door into a bicycle facility. The protected lanes could be at roadway level or elevated at sidewalk level. In both cases, there could be opportunities to widen the existing west side sidewalk, while still holding the eastern curb line where it is today.

One consideration with the west side parking protected bike lanes is the lower amount of potential on-street parking spaces as compared to maintaining parking on the east side due to a higher number of conflicting driveways and mailboxes and on the west side of the corridor.

Protected Bike Lanes - East Side Parking

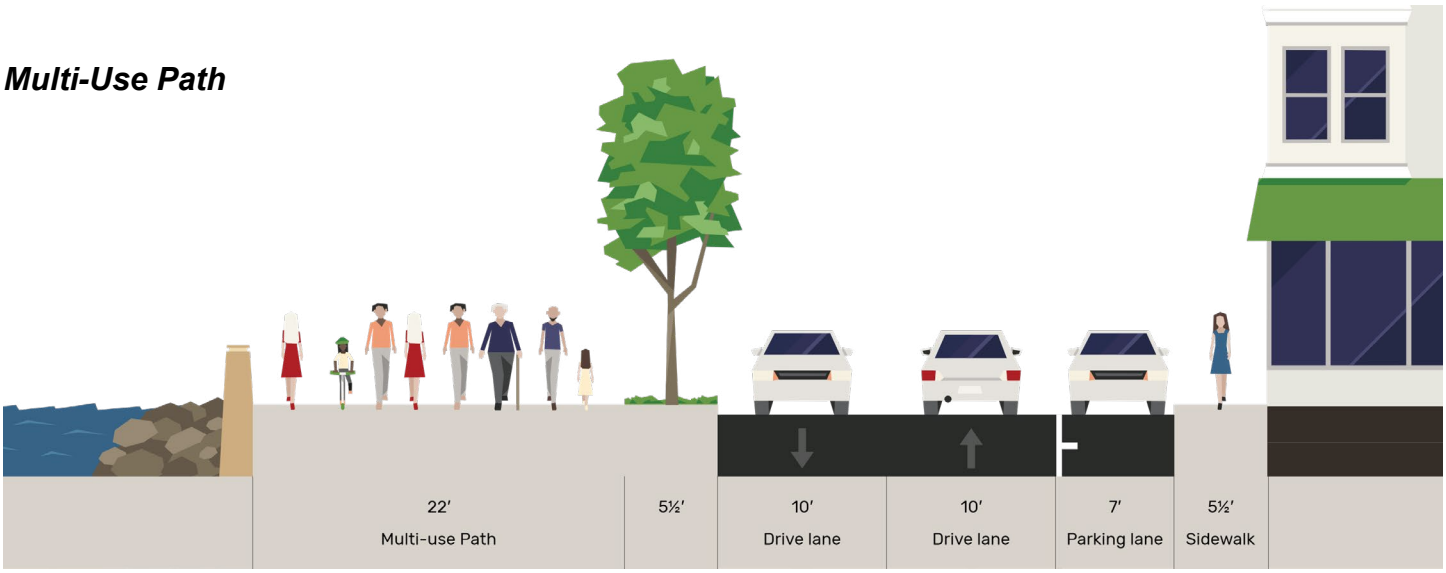
The third category also combines the two bike lanes into a single two-way protected bike lane facility on the west side of the corridor. On-street parking is provided on the east side. While a buffer is still necessary between the protected bike lanes and the roadway lanes, the buffer is providing physical barrier and separation between cyclists and vehicle lanes, instead of the dooring threat from parked vehicles.

Several variations of roadway-level or sidewalk-level protected lanes, and different buffer configurations were developed, along with sections that minimized disturbance to the existing curbs. Sections with minimal disturbance were developed as “proof of concept” configurations that minimize investment of resources and could represent an early stage of implementing the promenade while funding for a widened, sidewalk-level facility are identified.

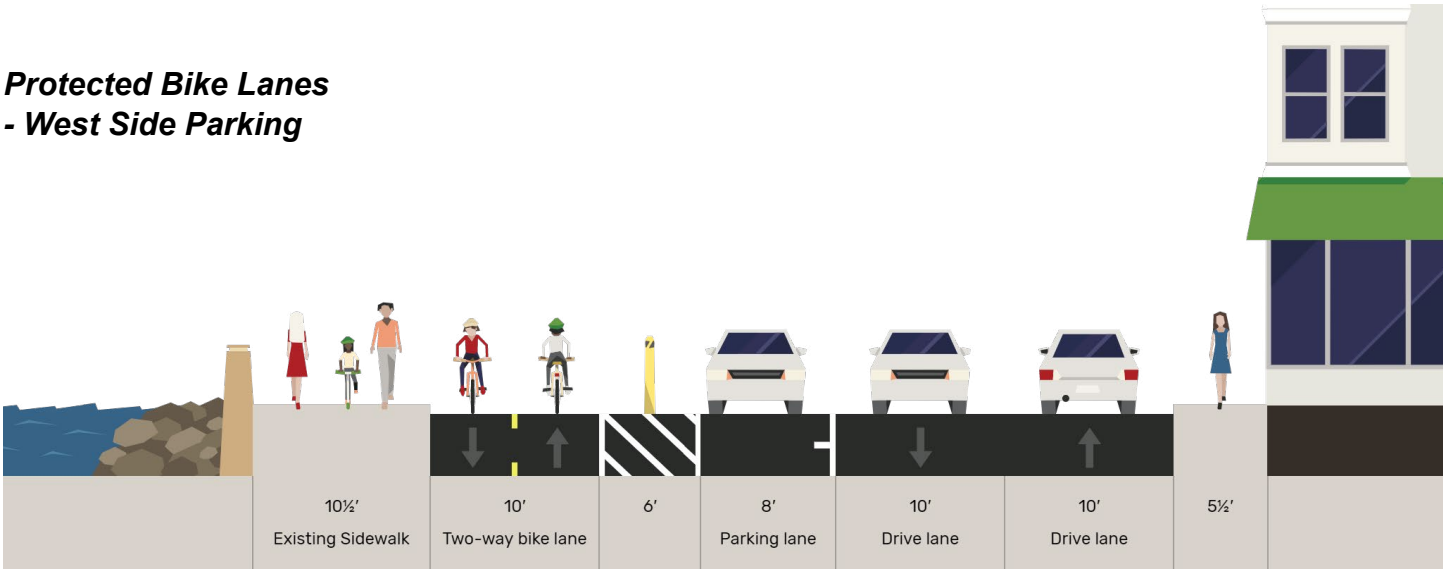
Median Separated Protected Bike Lanes

The fourth category of section maintains on-street parking on the east side of the corridor and combines the existing bike lanes into a two-way protected bike lane facility on the west side, but places the bike

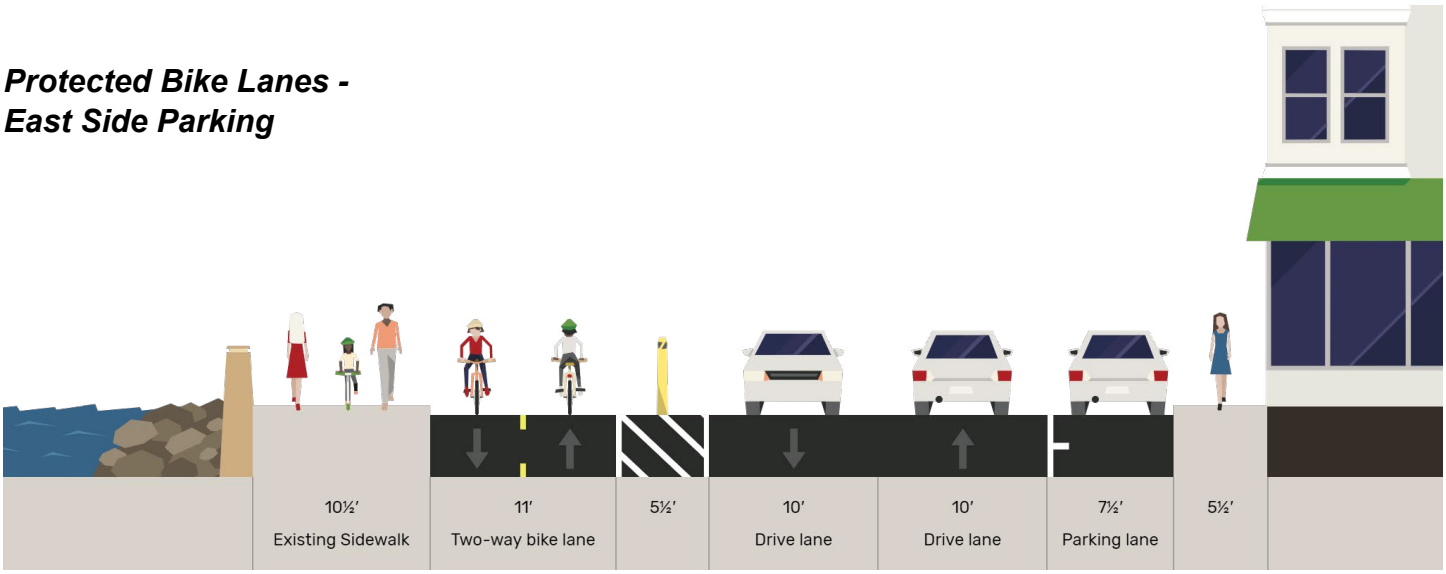
Multi-Use Path



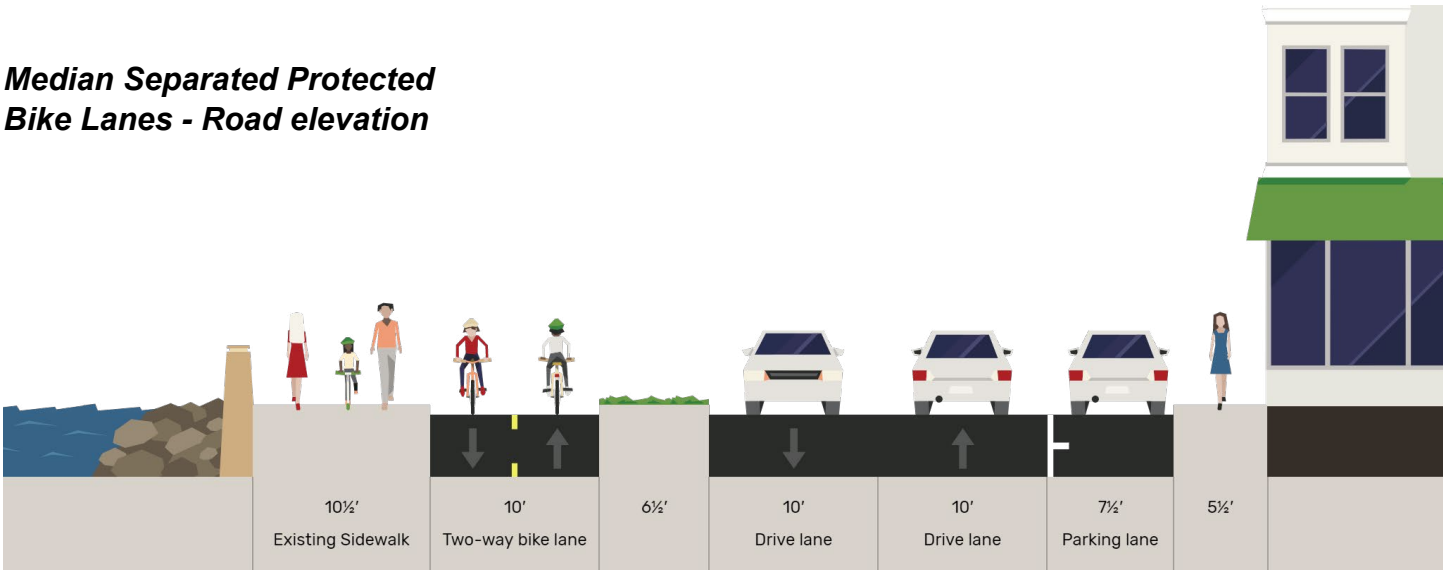
Protected Bike Lanes - West Side Parking



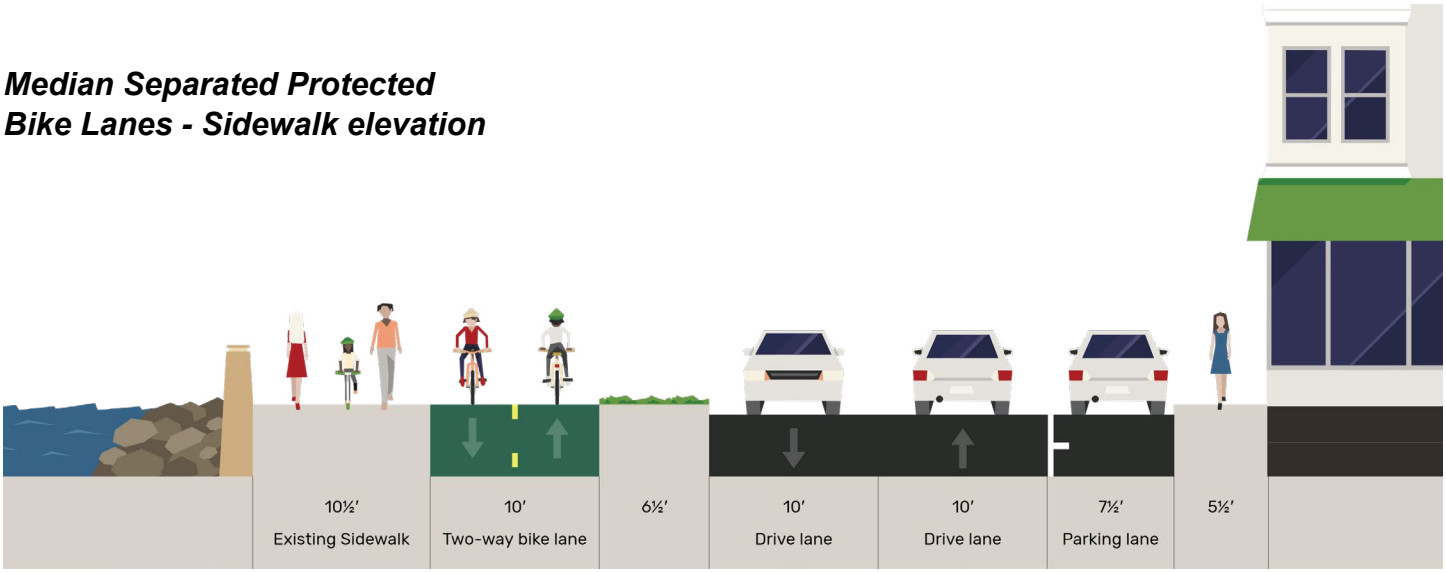
Protected Bike Lanes - East Side Parking



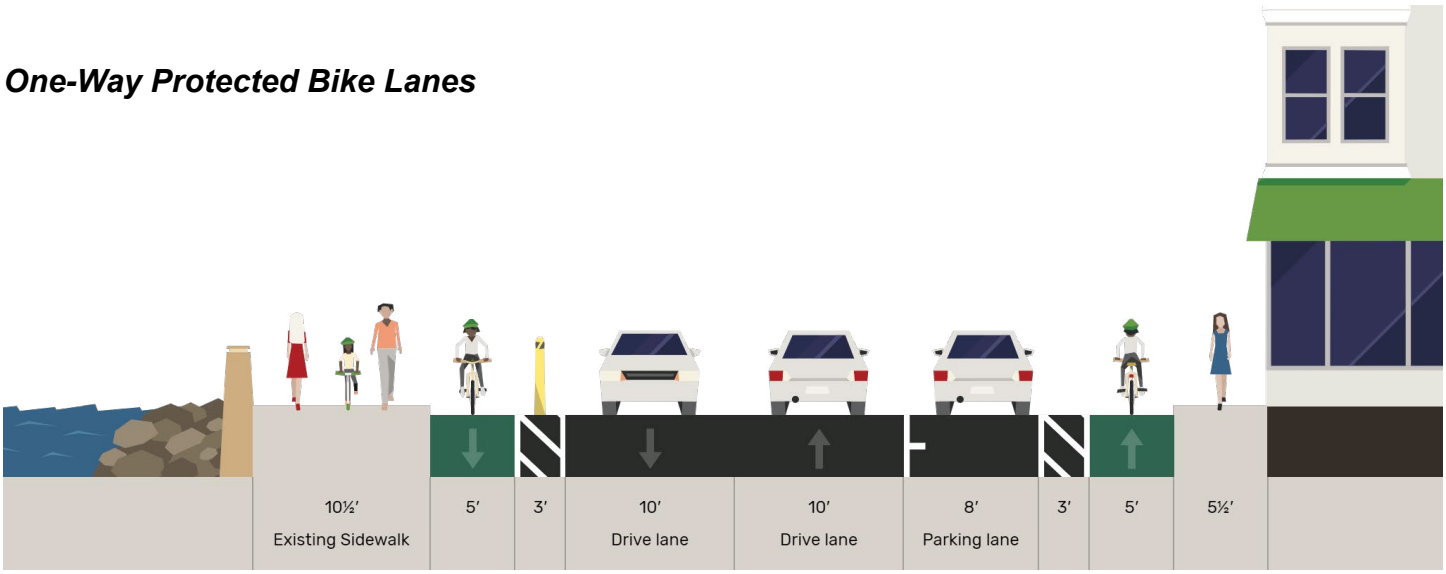
Median Separated Protected Bike Lanes - Road elevation



Median Separated Protected Bike Lanes - Sidewalk elevation



One-Way Protected Bike Lanes



lanes behind a minimum 5-foot wide median that is intended to be planted with vegetation that could be used to assist in managing stormwater in the corridor.

As in other category options, the protected lanes could be at roadway level, or could be raised to sidewalk level. At sidewalk level, linear cane detectable raised markings would be used to delineate the pedestrian- and bike-dedicated spaces. A differentiation in pavement type and/or pavement markings could also be used to visually distinguish the protected bike lanes from the sidewalk. With sidewalk-elevation protected lanes, the section closely resembles the multi-use path.

One-Way Protected Bike Lanes

A fifth category of section keeps the existing one-way bike lanes and repurposes one parking lane for additional buffer space for the cyclists. Section concepts include protected bike lanes at roadway grade, and elevated bike lanes with the curbs moved from their existing positions. Placing the northbound bike lane between the curb and parked vehicles provides additional protection for the northbound cyclists, but the risk of dooring from parked vehicles would require wider buffer space.

TRANSPORTATION COMMISSION FEEDBACK ON CONCEPTS

Transportation Commissioners commented on the existing sidewalks being so narrow at points that they are uncomfortable. Commissioners also noted the need for a bicycle facility with more protection than the current painted bike lanes in order to encourage more people of all ages and abilities to walk and bike to the waterfront. Further, Commissioners flagged the need to accommodate residential driveway access ramps, and provide dedicated curb space for delivery vehicles in order to prevent conflicts resulting from vehicles parking in the bike lane. Commissioners agreed that potential parking spillover on side streets was an appropriate tradeoff for improving the safety and comfort of existing walking and bicycling facilities. They requested consideration of lowering the posted speed limit, and that special attention be given to the transitions at each end of the corridor for safe and intuitive use by all roadway users.

CORRIDOR DESIGN ALTERNATIVES

Using the feedback from the Transportation Commission, the cross-section concepts were applied to the corridor to understand transitions and potential conflict points. This resulted in four corridor-length alternatives (see ***Attachment A***). The options, as described, could largely be realized as both near term interim striping projects, as well as through longer term full reconstruction projects. Each alternative achieves the study purpose to improve the safety and comfort of walking, cycling and rolling along the Lake Washington Boulevard corridor for people of all ages and abilities.

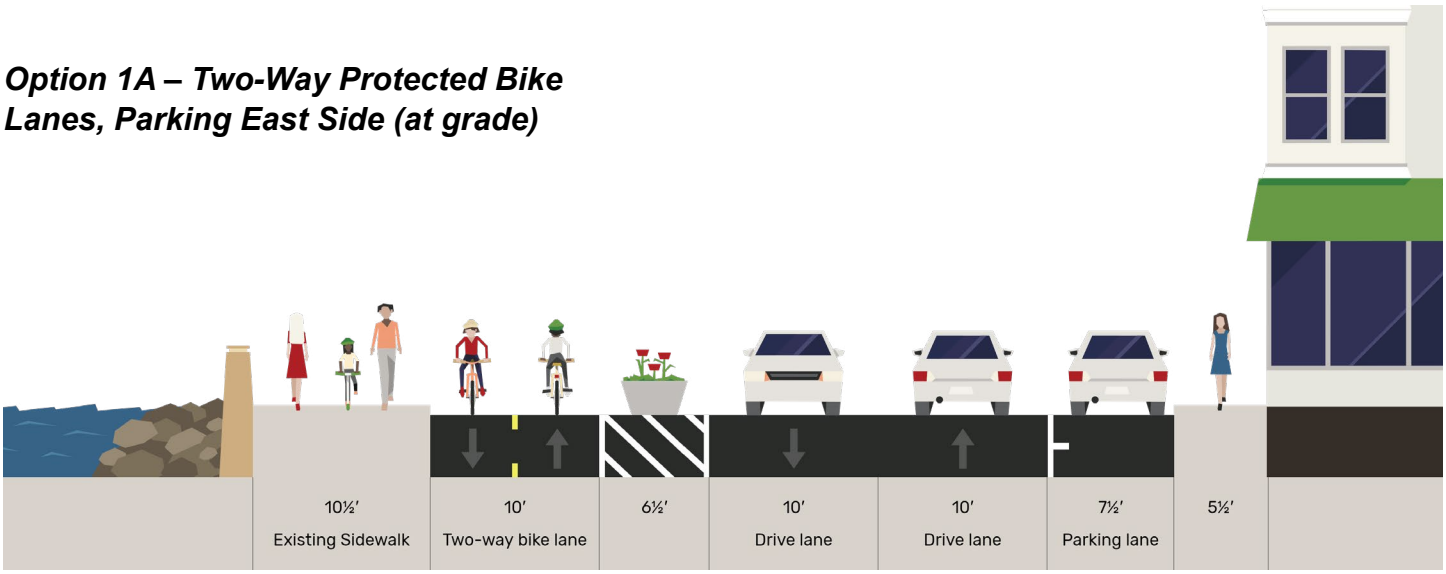
Option 1 – Two-Way Protected Bike Lanes, Parking East Side

The first option applies a two-way protected bike lane to the west side of the roadway and retains on-street parking on the east side of the corridor. A protective buffer, a minimum of 5 feet wide, would be provided between vehicle spaces and active mode spaces. The two-way protected bike lane would be 10 feet wide (5 feet in each direction).

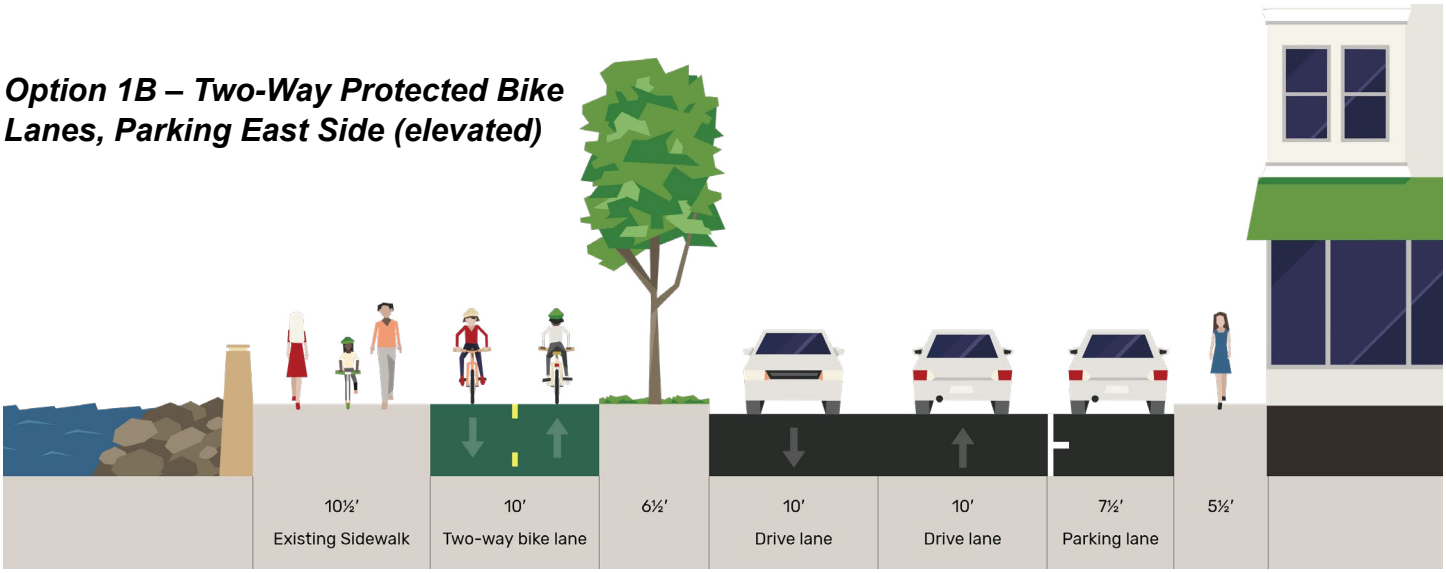
The two-way protected bike lanes would extend from the future “scramble” intersection at Lake Street South and Kirkland Avenue to the intersection of Lake Washington Boulevard and NE 59th Street. At NE 59th Street, the two-way protected bike lanes would transition to one-way buffered bike lanes at the existing RRFB crossing. For northbound cyclists, a curb extension with a bike ramp would allow cyclists who are not comfortable with occupying the northbound vehicle travel lane to use the RRFB crossing. Transitioning at NE 59th Street allows the two-way vehicle left turn access to be maintained to Doris Cooper Houghton Beach Park and the 5808 Lake Washington Park office building.

Each option achieves the study purpose to improve the safety and comfort of walking, cycling and rolling along the Lake Washington Boulevard corridor for people of all ages and abilities.

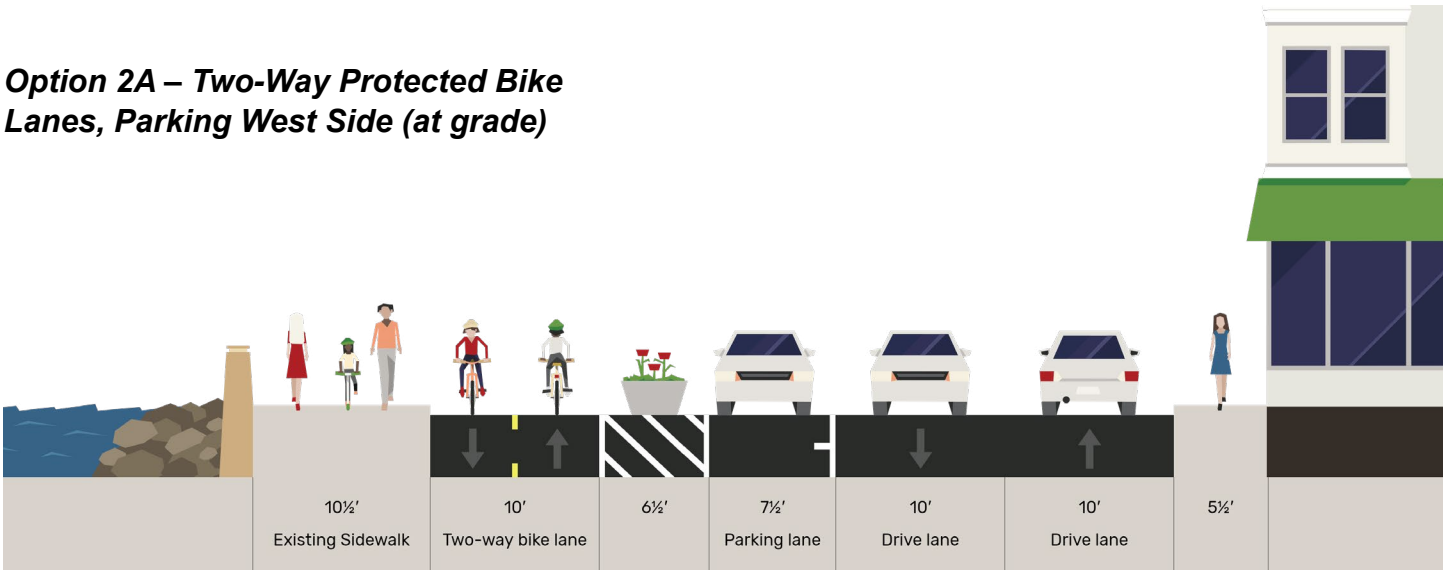
Option 1A – Two-Way Protected Bike Lanes, Parking East Side (at grade)



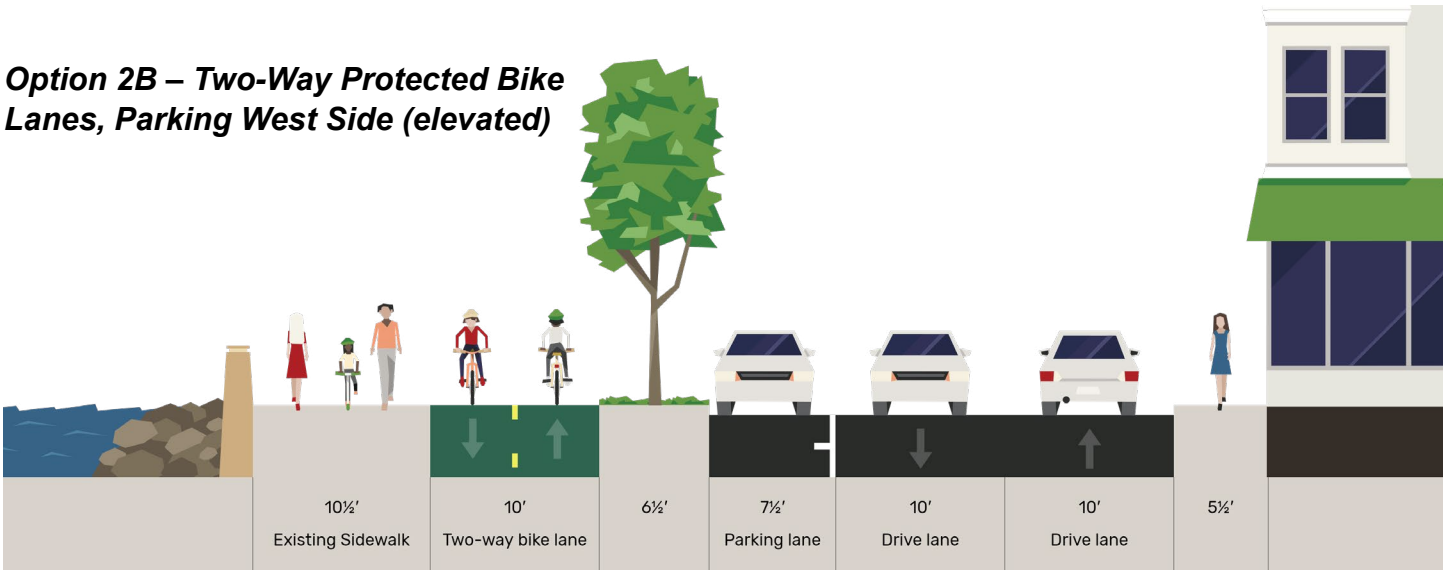
Option 1B – Two-Way Protected Bike Lanes, Parking East Side (elevated)



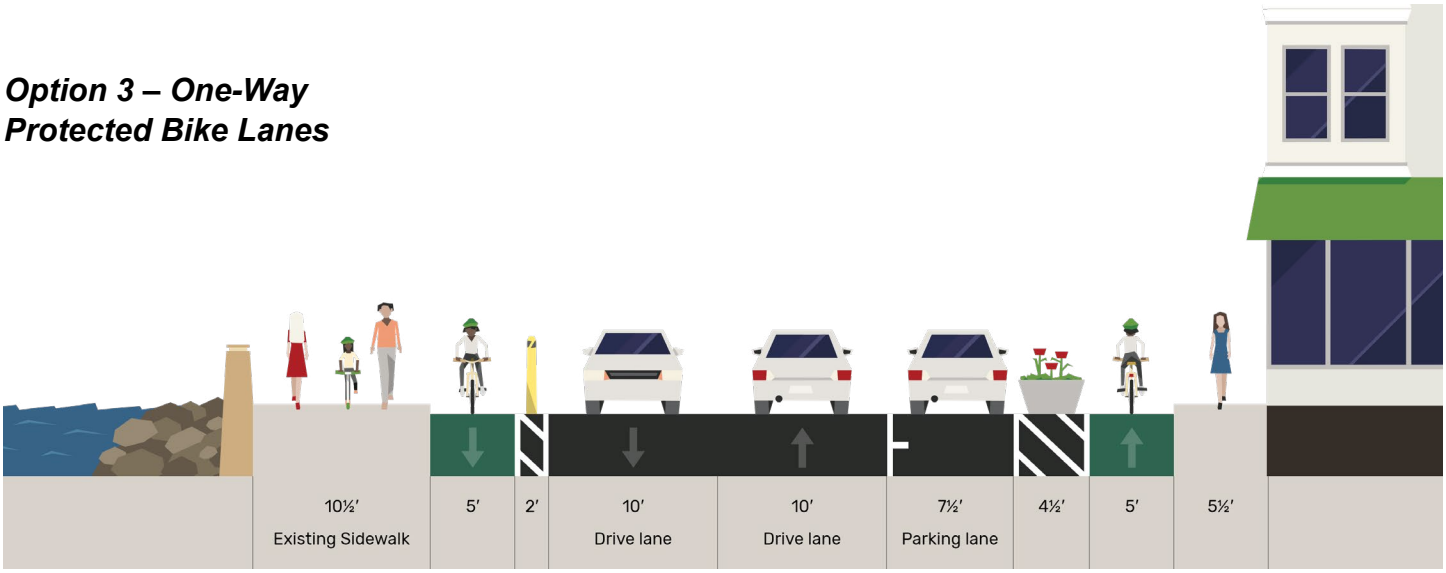
Option 2A – Two-Way Protected Bike Lanes, Parking West Side (at grade)



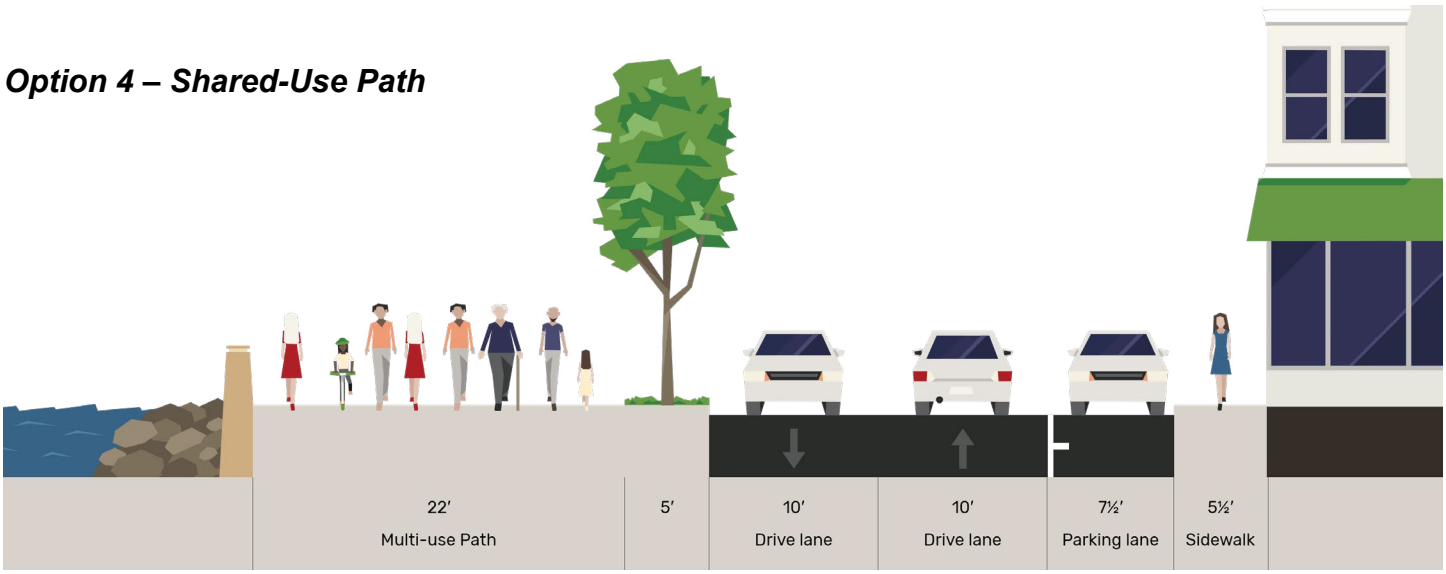
Option 2B – Two-Way Protected Bike Lanes, Parking West Side (elevated)



Option 3 – One-Way Protected Bike Lanes



Option 4 – Shared-Use Path



For near-term implementation, Option 1A could be striped at roadway grade, and with a physical barrier—such as extruded curb, bollard, or planter box—placed between the bike lanes and travel lanes. An interim striped design would allow the existing street trees to remain in their current locations, and no extensive changes would be required to the existing curb lines. A full build out of Option 1B would widen the sidewalk, and either elevate the bike lanes to sidewalk level or construct concrete medians to separate the bike facility from the travel lanes. Either of these design configurations would require construction of new curb, removal and replanting of street trees, a new storm water system, and relocation of other utilities.

Option 2 – Two-Way Protected Bike Lanes, Parking West Side

The second option also applies a two-way protected bike lane to the west side of the roadway but retains on-street parking on the west side of the corridor. As with the first option, Option 2 would provide a protective buffer of a minimum of 5 feet wide between vehicle spaces and active mode spaces, and the two-way protected bike lane would be 10 feet wide (5 feet in each direction).

The extents, transitions, and implementation details of Option 2 would be the same as Option 1 described above.

Option 3 – One-Way Protected Bike Lanes

The third option adds protective buffers to the existing one-way bike lanes and switches the location of the northbound bike lane and the parking lane so that the bike lane is adjacent to the curb. A 2-foot-wide buffer would be provided between the southbound bike lane and the travel lane, and a 4-½-foot-wide buffer would be provided between the northbound bike lane and on-street parking lane. The wider buffer adjacent to parking allows passenger side loading and door opening from vehicles parked on Lake Washington Boulevard.

Option 3 would provide one-way protected bike lanes from 2nd Avenue South to Lakeview Drive. The new facilities would transition to the existing shared lane at 2nd Avenue South and existing bike lanes at Lakeview Drive.

For near term implementation, Option 3 has the least changes to corridor configuration and largely could be achieved by restriping the roadway and maintaining existing curb lines. For full build out, concrete median islands for pedestrian crossings or concrete barriers between the bike lanes and parking or travel lanes would be implemented.

Option 4 – Shared-Use Path

Option 4 would relocate the entire western curb line of Lake Washington Boulevard to the east by over 16 feet, allowing up to 22 feet of shared use path with a 5-foot buffer. Parking is retained on the east side.

Option 4 would be the most expensive of all the options and would require full roadway reconstruction. A near term, interim implementation would not be practical given safety and accessibility limitations of a partial curb line and existing sidewalks that are too narrow for two-way walking and bicycling travel. Several other considerations about Option 4 include:

- All existing street trees would need to be removed to accommodate the new section. New street trees could be planted, but the existing mature trees all would need to be removed.
- The existing stormwater lines and utilities in the corridor would need to be relocated.
- Option 4 is evaluated as a shared-use path. Walking and bicycling spaces would not be separately delineated because that would be similar to Options 1 or 2, with an elevated rather than a section at roadway grade. For evaluation purposes, a widened facility with separated, delineated spaces along the full length is considered a future, long-term phase of Options 1 or 2.

PROTECTED BIKE LANE BUFFER OPTIONS

In the near-term implementation of Options 1, 2, or 3, the buffer space adjacent to the bike facility can accommodate any one of a number of physical barriers at roadway grade to provide not only reinforcement of the roadway channelization and delineation of the bike facility, but improve the safety, comfort and reduced stress level of both the bike and adjacent pedestrian facilities along Lake Washington Boulevard. Options for the physical barrier in the roadway-grade buffer include:

Vertical Posts

18- to 42-inch-high plastic posts that are anchored to the ground with either epoxy or mechanically fastened bases. The posts are typically colored white or yellow based on the directionality of traffic and are reflective on one or both sides for enhanced low light and nighttime visibility. The posts can be dirtied and damaged over time, particularly by street cleaning and snow clearing equipment. Thus the posts require replacement for both function and aesthetics. 18-inch vertical posts protecting active mode facilities on arterials with similar vehicle volumes in neighboring cities have typically required replacement every 18-24 months. The width of the buffer could extend the lifespan of the posts by limiting interactions with adjacent traffic.

Wave Delineator or Similar Freeform Buffer

An extension of the concept of the vertical posts, Wave Delineators are a product that is designed to mimic the function of physically separating and reinforcing buffer widths, but with a more visually appealing design. A collaboration with the local arts community could yield other similar approaches to improving the concept of the vertical posts as a way to reinforce the buffer between the protected bike lanes and the vehicle lanes. The durability of wave delineators, as a newer product, is less well established. The delineators are expected to be somewhat more durable than vertical posts, possibly requiring replacement every 2-3 years.

Planter Boxes

Any one of a variety of plastic, concrete, fiberglass and other material planter boxes are available that can be placed in the buffer to provide a physical separation from traffic. Planter boxes provide space for additional vegetation, although the long-term maintenance of vegetation is a long-term cost and staff resource consideration. Planter boxes can be selected to be compliant with clear zone requirements. Planters can be fitted with reflective panels to enhance low light and nighttime visibility. Planters are also flexible to allow for responsive adjustment of the design during the pilot phase, and are reusable in other contexts, both in the corridor and around the City, if future phases of the project construct more permanent buffer types. Planter boxes, if maintained with vegetation and flowers, can last many years as a buffer treatment.

Vertical Posts

Wave Delineator

Planter boxes

Concrete Curbing

Curbing that can either be cast-in-place (extruded curb) or anchored to the existing road surface with grout and dowels (precast curb) can be used to reinforce the buffer. The City has used a similar approach to the development of on-street walkways in the Finn Hill neighborhood. Concrete curbing is typically low to the ground, less than 6 inches in height, and would have more limited vertical protection and therefore may be less comfortable for some cyclists compared with other buffer options. Concrete curbing can also be used to create dual-sided median islands, with a concrete or asphalt fill. Creating an island using concrete curbing within the buffer offers an additional level of protection, and a protected platform for vertical elements such as posts or planter boxes. Curbing, especially in a wider buffer, can last many years without required maintenance.

Concrete curbing

Plastic Curbing with Posts

Plastic curbing mimics the function of the concrete curbing but is created of preformed, lightweight material. The plastic curbing is fitted with reflective panels and has a port to place a vertical post integrated into the curbing. Plastic curbing can last several years, and the curbing's protection for vertical posts can extend the posts' lifetimes to 2-3 years before replacement.

Plastic curbing with posts

In the future, as resources allow, it is anticipated that the City would upgrade any on-street buffer barriers with raised curbs, a landscape buffer, and raise the protected bike facility to sidewalk level. The implementation of wide sidewalk-grade buffers, such as those in Options 1 or 2, would allow the City to implement, in a context sensitive and phased manner, any one of the following treatments within the buffer:

- Stormwater treatment and detention through the use of filterra biofilters and rain gardens. Stormwater treatment in the buffer can also offer educational opportunities to the public about the impact of stormwater on Lake Washington.
- Relocation of water, sewer and stormwater trunk lines to the buffer, moving utility lids out of the active mode facility to limit slip and trip hazards, as well as long term maintenance and improve the ease of access to the utility lids by City maintenance crews.
- Planting of street trees to enhance or replace existing urban forest canopy in the corridor. A five foot minimum width of planted areas is considered current best practice for maintaining the health of street trees. Replacing existing mature street trees with new trees in the buffer would not be able to replace the volume of canopy from the mature trees, but locating trees in the buffer, with the use of structural soils and root barriers would allow for repair of sidewalks that have been damaged by tree roots, and limit future root-caused maintenance and damage to pedestrian or bike facilities.
- The transition between sidewalk-grade and road grade at residential and commercial driveways in areas where the protected bike lanes are raised to sidewalk level.
- Pedestrian refuges at crossing locations to create two-stage crossings where pedestrians can navigate the crossing of the two-way bike facility, pause, and then navigate the crossing of the two-way roadway facility.

Evaluation of Sections

The four proposed alternatives, as well as the existing conditions, were evaluated against the final criteria using a system of scoring that assigns one point for an advantage and two points for a significant advantage in each criterion. Because of the purpose of the study is to develop design alternatives that improve the safety and comfort of walking, cycling and rolling for people of all ages and abilities, the first five criteria related to mitigation of crash risk factors and improved comfort and stress for active modes were give double weight in the final scoring.

The evaluative criteria were:

- Mitigation of crash risk factors for cyclists
- Mitigation of crash risk factors for pedestrians
- Mitigation of crash risk factors for vehicles
- Improved level of traffic stress for cyclists
- Improved comfort for pedestrians
- Intuitive facility for drivers to use
- Intuitive facility for active modes to use
- Active mode facility can be reasonably maintained
- Phasing potential for “quick win” project elements
- Accommodation of mailboxes, trash pickup, and short driveways
- Impact to existing street trees
- Minimized reduction in on-street parking
- Potential for stormwater improvements
- Relative implementation cost

Several additional evaluation criteria were considered but did not provide a meaningful differentiation between the alternatives. These criteria that were met by all alternatives, and were therefore considered screening criteria, rather than evaluation criteria:

- Traffic calming via visual narrowing
- Physical separation between active modes and travel lanes
- Addressing existing hardscape damage
- Accommodation of existing and reasonably anticipated utilities

DETAILS OF EVALUATION CRITERIA

Detailed descriptions of the factors to be evaluated for each criteria and the rationale for the ratings for each alternative are listed below. In the evaluation, the scores for factors related to mitigation of crash risk factors and for addressing the comfort and stress for active modes are given additional weight.

Mitigation of crash risk factors for cyclists, pedestrians, and drivers

The crash history in the corridor demonstrates that there is an elevated risk to cyclists from three primary scenarios: turns to and from the east side connecting roadways across the existing bike lanes, “dooring” from the on-street parking adjacent to the bike lanes, and vehicle turns into driveways to residential and commercial properties across the bike lane. Additional potential risk is present when bikes and pedestrians mix on a single facility due to the range of abilities and speeds. Mitigating crash risk to cyclists in each of these scenarios can be achieved with wider buffers between the bike facility and the vehicle lanes, separation of modes to eliminate conflicts.

For pedestrians, the primary crash risk was identified at crosswalks. Mitigating factors include improvement of the visibility and enhancement of crosswalks, and addressing street lighting to ensure pedestrians can be seen at dusk, in the rain, and at night.

For drivers, excluding crashes with active modes that are addressed in other criteria, safety factors to mitigate would primarily be related to parked vehicles, and the position of parked vehicles limiting sight distance to those entering from driveways or east side crossing streets. There are too few fixed object crashes that do not involve parked vehicles and/or the influence of alcohol and drugs to consider fixed objects to be an engineering/geometric risk factor in the corridor.

Options 1, 2 and 4 that move all bike facilities to the west side of the corridor and provide a physical barrier to traffic represent an advantage over existing

conditions to mitigate cyclist risk factors. Because of the delineated and separated bike and pedestrian facilities, reducing the risk of bike-pedestrian conflicts, the two protected bike lane options, 1 and 2, have a more significant advantage for bike crash risk factors, addressing historical and potential risks. The one-way protected bike lanes (option 3) do not address the historical crash risk from bike facilities being present on the east side of the corridor where vehicles must turn across them to access side streets and east side driveways. But, Option 3 does provide additional separation from traffic lanes compared to the existing conditions, so has some advantage in mitigating bike crash risk factors.

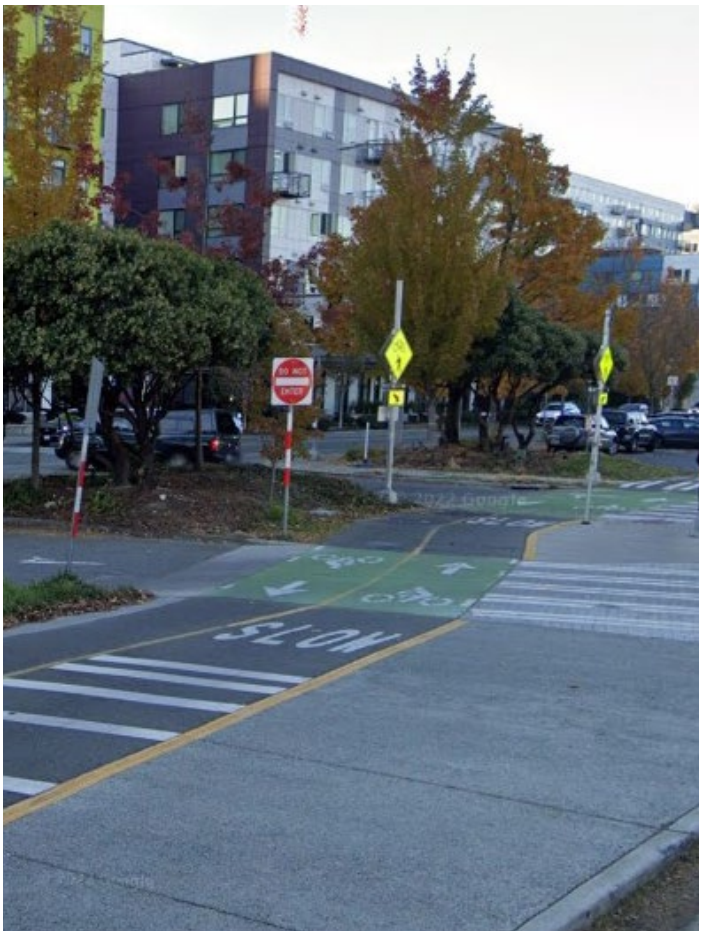
Each option would allow for improvements to the existing crossings, adding curb extensions across on-street parking lanes to reduce crossing distance, and addressing street lighting. The protected bike lane options have an advantage of allowing for a pedestrian refuge in the buffer between crossings of the bike facilities and crossings of the roadway lanes. The multi-use path option would remove a delineated crossing of a bike facility, although crossing pedestrians would be in a mixed traffic environment before entering the crossing of roadway lanes.

Because of the pattern of vehicle-vehicle crashes in the corridor, only the option that moves all parking to the west side of the corridor, away from the side streets, has an advantage for mitigating vehicle crashes. The west side parking would improve sight distance to vehicles turning to and from the side streets, compared to the existing condition. The higher volume of traffic to and from the east side streets, compared to the traffic to and from the driveways on the west side, which would see a benefit from improved sight distance without on-street parking is the reason for the advantage of option 2.

Improve level of traffic stress for cyclists and pedestrians

Level of traffic stress and comfort experienced by cyclists and pedestrians is another evaluation criteria.

For the basic level of traffic stress, as identified in WSDOT Design Bulletin 2022-01, each of the alternatives with a physical barrier between the new bike facility and the travel lanes has a similar improvement on level of traffic stress for both active modes.



Side by side active mode facilities, marked

Because of the stress to cyclists and pedestrians of a wider range of abilities from more mixed active mode traffic, options 1, 2, and 3 were assessed to have more advantage over the multi-use path for cyclists. For pedestrians, the increased width of the multi-use path provides an additional advantage over the increased buffer and separation of options 1, 2, and 3.

Intuitive facility to use for drivers and active modes

The new facility should be easy for all modes to understand the spaces that are dedicated to each use, and how to transition into and out of those spaces at the limits of the proposed improvements. Local drivers and active mode users, as well as those who are new to the corridor should be able to understand parking availability and restrictions, not confuse parking and curb access space with bike facilities, and understand any two-way facilities for pedestrians and/or cyclists.

For drivers, the biggest advantage would be Option 4, the shared use path, which fully separates uses, creates an intuitive two-lane facility for drivers and eliminates any confusion about available curb space. The no build and one-way protected bike lane Option 3 also has advantages for intuitive function for drivers, as the bike lane configuration is similar to the current layout of the corridor.

For active mode users of all modes and abilities, options 1 and 2, with designated spaces for bikes and pedestrians, compared to option 4, are more intuitive to use. Similarly, option 3 and the no build have an advantage of delineated directional spaces for each active mode, creating a more intuitive facility.

Active mode facility can be reasonably maintained

The City of Kirkland currently owns a 4' wide automated sweeper vehicle that could be employed to maintain active mode facilities. Current City code requires adjacent property owners to maintain sidewalk-level facilities, but the special nature of an improved Lake Washington Boulevard project, and the frontage of City-owned parks along 1/4 to 1/3 of the project could result in an exception to the maintenance in the corridor. Maintaining one-way protected bike lanes (option 3) would have the most narrow space between physical barriers for maintenance, creating challenges for sweeping and clearing debris.

Phasing potential for "quick win" project elements

Quick win projects are improvements that can be made with minimal engineering design and lower cost. Quick win projects will allow for incremental improvement to the level of traffic stress for active modes in the corridor, and also increase momentum for the full corridor buildout of the preferred alternative.

With the least changes to the corridor configuration, Option 3 has the most advantages for being a quick delivery of modifications in the corridor. Options 1 and 2 also have advantages, as they do not require significant utilities or hardscape modifications for interim implementation. Option 4 requires significant construction to implement.

Accommodation of mailboxes, trash pickup and short driveways

Residential properties on both sides of the corridor will require continued curbside access for individual trash and recycle can pick up, mail delivery, and on-demand delivery of food, packages and rideshares. Short driveways, such as carports at the back of the existing sidewalk, will need to be accommodated to maintain access.

Only Option 1 has an advantage in the accommodation of residential services. The orientation of the buffer space relative to both the properties in need of services, and the lanes where trash pickup, mail delivery and other services are occurring, creates the most opportunity for space that can accommodate these uses and services with minimal disruption to other active and vehicular modes.

Impact to existing street trees

The criteria evaluates if the alternative would require the removal of existing street trees due to geometric changes. Impact to street trees from maintenance activity to repair lifted sidewalk panels will be similar across all alternatives.

The no build and Option 3 do not propose significant modifications outside the curbs of the existing roadway, so would not have an impact on existing street trees. The two protected bike lane options, 1 and 2, would allow existing street trees to stay in place in the short term, although a phased, long-term modification of buffers and/or the elevation of the lanes to sidewalk level could necessitate the removal or replacement of the street trees.

Minimize reduction in on-street parking

The project team evaluated the availability of on-street parking between 2nd Avenue S and Lakeview Drive as the number of 22' long spaces that could fit entirely within available on-street parking lanes. On-street parking was considered to be unavailable within 5' of any driveway, within 20' of any marked crossing, and within 30' of any stop-controlled intersecting roadway. Further parking restrictions may be identified during the detailed engineering design of any alternative.

The on-street parking availability between the options differs because of the higher number of driveways on the west side of Lake Washington Boulevard. Additionally, Option 3 would preserve the parking north of 2nd Ave while Options 1, 2, and 4 would extend to Kirkland Ave. Option 1 has an estimated total of 160 retained parking spaces within the project limits, while Option 2 has an estimated total of 140 parking spaces. No evaluation was performed to differentiate between loading zones, general use on-street parking and residence-specific on-street parking. The details of the designation of parking would be addressed during detailed engineering design of the selected option.

Potential for stormwater improvements

The long-term buildout of the Lake Washington Boulevard promenade is an opportunity to replace the existing catch basins with treatment-included structures, filterras, buffer strip rain gardens and stormwater conveyance trunk lines.

Option 1, 2 and 4, which include bike facilities and wider buffer on the west side of the corridor, present opportunities for using the medians separating the promenade from vehicle traffic on Lake Washington Boulevard for stormwater benefits. Medians of sufficient width can be crowned or valleyed to help convey stormwater and separate runoffs of pollution generating surfaces from active mode facilities. The medians could be directly used for filterra treatment systems or rain gardens which also present educational opportunities to the public regarding stormwater runoff to Lake Washington. The educational opportunities and modern treatment methods can be incorporated into the streetscaping of the corridor to add to the aesthetic benefit and sense of place. The medians also offer opportunities to place new underground stormwater conveyance access covers in more easily accessed locations that are outside of both travel lanes and active mode facilities where they can be slip or trip hazards.

Option 3, which includes one-way bike facilities and narrower medians, would have more limited stormwater treatment enhancement opportunities. Improvements would be limited to existing trunk lines and more traditional underground systems.

Relative implementation cost

The relative planning level cost of each alternative was based on the amount of hardscape (new curbing, new concrete sidewalk, etc.) and associated construction costs. The final cost of the project will be highly dependent on the construction year, the use of pilot, interim and quick-wins projects that could be incorporated into the final version, and detailed engineering design.

The no build and Option 3 which includes primarily signing and striping modifications, would be the lowest cost alternatives. Options 1 and 2 also have an advantage in implementation cost compared to Option 4. Option 4 would have the highest cost not only for the new Promenade facility, but for the associated utility and stormwater modifications that would be needed.

EVALUATION RESULTS

The results of the evaluation are attached (see ***Attachment B***). Scoring evenly across criteria, Option 1 has an advantage over the other options, including the no action alternative. However, considering the purpose is to develop design alternatives that improve the safety and comfort of walking, cycling, and rolling for people of all ages and abilities, the first five criteria related to mitigation of crash risk factors and improved comfort and stress for active modes were give double weight in the final scoring. When safety and comfort factors are given additional weight, the benefits of Options 1 and 2 over the other options are much more apparent. Because of the advantages of Option 1 in terms of parking availability, which is expected to be a concern for those living along the project corridor, Option 1 is the leading candidate.

Below is a summary of the evaluation of each alternative against each of the criteria:

- Options 1 and 2 have greater advantages for mitigation of crash risk factors among all the transportation modes, because each removes bikes from the east curb line avoiding conflicts with side streets, and each maintains separate pedestrian and bike spaces.
- Options 1 and 2 have greater advantages for reducing cyclist traffic stress, while Option 4 has the most advantage for increased pedestrian comfort.
- Option 4 is the most intuitive facility for drivers, while all other options are more intuitive for active mode users.
- Maintenance of Option 3 would be the most difficult because the 5-foot bike lanes between the curb and barriers would be too narrow for current street sweeping equipment, but Option 3 has the most “quick wins” advantages.
- Option 1 allows for the best accommodation of streetside services to residences including garbage pickup, mail delivery and driveways.
- Option 3 has the least impact to existing street trees and the lowest cost but offers the least advantages to address existing drainage and utility concerns in the corridor.

EVALUATION CRITERIA	CORRIDOR OPTIONS				
	NO BUILD	OPTION 1 *Protected Two-Way Bike Lanes: East Parking*	OPTION 2 *Protected Two-Way Bike Lanes: West Parking*	OPTION 3 *Protected One-Way Bike Lanes*	OPTION 4 *Shared-Use Path*
Safety & Comfort*					
Mitigation of crash risk factors for cyclists		◉	◉	●	●
Mitigation of crash risk factors for pedestrians		◉	◉	●	●
Mitigation of crash risk factors for vehicles			●		
Improved level of traffic stress for cyclists		◉	◉	●	●
Improved comfort for pedestrians		●	●		◉
Physical & Operational					
Intuitive facility for drivers to use	●			●	◉
Intuitive facility for active modes to use	●	●	●	●	
Active mode facility can be reasonably maintained	◉	●	●		●
Phasing potential for “quick win” project elements		●	●	◉	
Accommodation of mailboxes, trash pickup and short driveways		●			●
Impact to existing street trees	◉	●	●	◉	
Minimize reduction in on-street parking	◉	●		●	●
Potential for stormwater improvements		●	●		●
Relative implementation cost	◉	●	●	◉	
ADVANTAGES SCORE	10	15	14	12	11
ADVANTAGES SCORE PRIORITIZING SAFETY & COMFORT *(Safety & Comfort count double)*	10	22	22	15	16

● Advantage (1 point) ◉ Significant Advantage (2 point)

Choose by Advantages evaluation, also included as Attachment B.

- Option 2 has the most impact to existing parking supply. The estimated number of parking spaces for each design option is: Option 1, 153 spaces; Option 2, 134 spaces; Option 3, 158 spaces; Option 4, 157 spaces.
- Options 1, 2, and 4 would have more opportunity for stormwater improvements with a wider buffer between active modes and vehicle traffic for filtration systems.
- Option 4 has the highest relative implementation cost. Options 1, 2, and 3 have similar costs and could be implemented in a lower cost near-term configuration. Planning level cost estimates will be presented at the study session on February 7.

TRANSPORTATION COMMISSION FEEDBACK

When presented with the design alternatives and evaluation results at its December 14, 2022, meeting, Commissioners expressed preference for Option 1 and supported evaluating reduction of the speed limit along the corridor.

Commissioners expressed preference for Option 1 and supported evaluating reduction of the speed limit along the corridor.

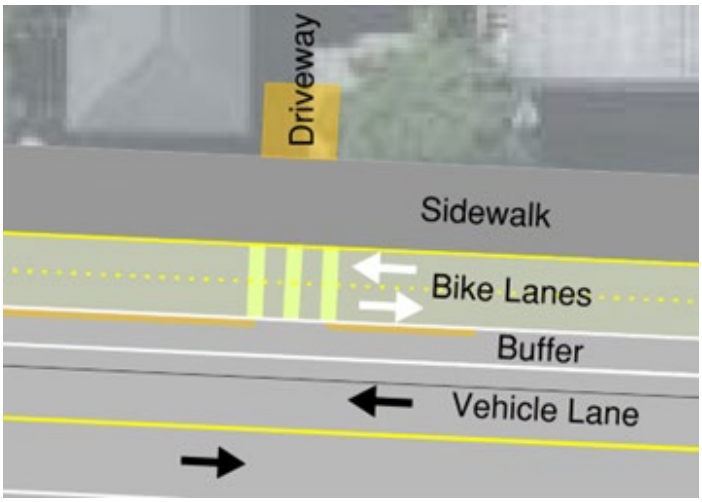
Other Recommendations

Through the process of developing and evaluating options, several important elements of the corridor were specifically investigated. The following sections describe approaches to specific aspects of the Promenade corridor which will be important components of future improvements.

DRIVEWAYS AND PARKING

In two sections of the corridor, because of the presence of several single-family driveways, and off-street parking at sidewalk level just beyond the western right of way line, the treatment of the buffer space will need to be context specific to minimize conflicts between active modes and drivers.

Carport along the corridor



Schematic drawing of "auxiliary lane" configuration of protected bike lane buffer

The two areas are:

- Between 200 feet south of 2nd Avenue S and 5th Avenue S
- Between 10th Avenue S and the entrance to the Marsh Park parking lot

In both segments, the driveways present a risk factor for crashes with both active modes and vehicles using Lake Washington Boulevard. Drivers entering and exiting driveways must navigate the pedestrian traffic on the sidewalks, bicycle traffic in the bike lane(s), and then the vehicle traffic on Lake Washington Boulevard. Placing green conflict markings in the bike facility through the driveways also alerts drivers and cyclists of the potential for a mixed traffic condition in the driveway spaces. For Options 1 and 2 with wider buffers, in the areas of driveways, placing physical barriers near the western edge of the buffer will allow the use of the buffer by those entering and exiting driveways as an "auxiliary lane" outside of the through lanes of Lake Washington Boulevard. The extra space will allow driveway users to navigate the sidewalks, bike facility and then the roadway in three separate movements. Separating the movements and allowing users of all modes time and space to see, recognize and avoid conflict with each other will limit the risk of a crash.

CROSSING IMPROVEMENTS

Based on a combination of the crash history and adjacent land uses, the crossings at 2nd Avenue South and 10th Avenue South are a higher priority to receive improvements. Other crossing improvements at the remaining 7 existing unsignalized marked crossings can be phased in as resources allow. The following treatments are recommended:

Rectangular Rapid Flashing Beacons (RRFBs)

Several of the crossings in the corridor already have RRFBs installed, but not all. Standardization of the RRFB as a treatment for all crossings in the corridor, including the physical placement of the RRFB flashing beacons, is recommended. The

The crossings at 2nd Avenue South and 10th Avenue South are a higher priority to receive improvements

standardization of the equipment placement will improve the accessibility for pedestrians, maintain compliance with the latest ADA standards, and improve predictability for drivers. Standardization of placement and equipment will also benefit maintenance access and inventory management for City crews. The flashing beacon and pedestrian crossing sign should be placed as close to the roadside as possible, on clear zone compliant breakaway pole foundations, even if the pushbutton must be located on a separate pole for ADA reach compliance.

Crosswalk Illumination

Relocating existing illumination to provide “positive” lighting of each crossing, which places luminaire poles “ahead” of the crossing in the direction of approaching traffic, will improve safety and comfort for all roadway users.

High Visibility Markings Renewal

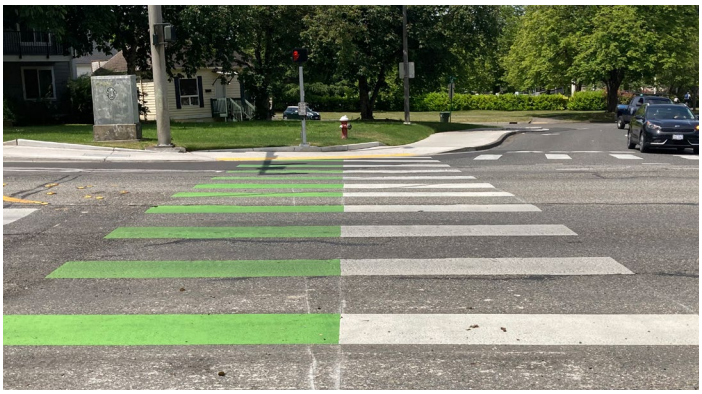
Refreshing of all existing crossing markings in accordance with City standards, will ensure visibility of crossing locations to active mode users and drivers.

For the crossing at NE 59th Street, Options 1 and 2 would also include green conflict markings to delineate the increased presence of cyclists in the crossing as NE 59th Street is the location that northbound cyclists would shift from the east curb to the west curb two-way bike facility. The green markings would be parallel to the white, increasing the width of the crossing to accommodate both cyclists and pedestrians.

Curb Extensions

Curb extensions can be provided at all crossings to shorten crossing distances and reduce exposure time to traffic. Curb extensions also can reinforce parking restrictions near crossings.

RRFB flashing lights increase crossing visibility



Green and white multimodal crossing paint

Curb extension

Curb extensions can be created using surface-mounted precast or extruded/cast-in-place curbing with asphalt or concrete fills for a rapid deployment in an interim design phase. The curb extensions can be designed with a narrow, less than 24 inch, gap at the existing curb line to preserve existing stormwater systems and flow patterns while still providing protection and improvements for pedestrians using the crossing. Future phases and updates to the corridor that also include stormwater system improvements would be opportunities to replace the existing curb and include the curb extension.

ILLUMINATION IMPROVEMENTS

Short of a comprehensive relocation and/or replacement of streetlight poles along the corridor, street and pedestrian lighting could be improved through smaller scope projects. Lighting improvements are recommended to focus on lighting deficiencies in the corridor, projects may include elements from any of the following:

- Install new pedestrian-scale lighting along park frontages
- Fill in “zero illuminance” gaps along the corridor to address the darkest and least uniform areas
- Analyze all marked crosswalks and replace/relocate poles to bring up to standards for light levels and pole placement

SOUTH CORRIDOR TIE-IN

The southern limit of the Promenade study, and all options developed for the corridor, is the signalized intersection with Lakeview Drive. The number of lanes for all modes and in all directions remains unchanged in all Options at the Lakeview Drive intersection. Because of the adjustments to the section, additional buffer space is provided for the northbound bike lane, and on either side of the southbound bike lane as it approaches the signal. As an option, the City may elect to place a physical barrier in one or both of the buffers on the southbound bike lane to provide additional protection and comfort for cyclists waiting for the signal to proceed south on Lake Washington Boulevard. The placement of a physical barrier in the buffer would help to avoid vehicles crossing the bike lane to make right turns across the bike facility, limiting a potential conflict.

South study limit at Lakeview Drive

NORTH CORRIDOR TIE-IN

The original northern limit of the Lake Washington Boulevard Promenade study was 2nd Avenue S. Through the development of Option 1, the logical northern tie-in point for a two-way bike facility on the western curb of Lake Washington Boulevard extends further north to the intersection with Kirkland Avenue. A raised “scramble” intersection, intended to improve crossing conditions for all active modes, at the Lake Street S and Kirkland Avenue intersection is expected to be in construction in the summer of 2023. The Lake Washington Loop, a 48-mile regional bicycle route of which Lake Washington Boulevard is a critical link, has a gap in bike lanes between the intersection of Central Way and Market Street, and the intersection of 2nd Avenue S and Lake Street. By extending the two-way protected bike lane from the Promenade concept north to Kirkland Avenue, the gap in the Lake Washington Loop can be bridged using the lower volume Lakeshore Plaza. The use of Lakeshore Plaza would allow cyclists of all ability and comfort levels to avoid mixed traffic with heavy vehicle volumes through downtown Kirkland.

Extending the northern tie in of the two-way bike facility to Kirkland Avenue will require removal of on-street parking along Lake Street between 2nd Avenue S and Kirkland Avenue, and modification of the existing curb extensions. The removal of parking and continuation of the presence of loading zones would need to be coordinated with business owners on the affected block. Outreach to businesses regarding the proposal to extend the promenade to Kirkland Avenue was beyond the scope of the Promenade study.

ON-STREET PARKING MANAGEMENT

To address the reduction of on-street parking that the promenade concept would require, several parking management strategies were identified that could help to mitigate the impact of the change in parking supply, while maintaining local access to parks, residences, and businesses. In general, it is assumed that the side streets connecting to Lake St S/Lake Washington Boulevard NE have adequate on-street parking to absorb the total demand for on-street parking. Tables documenting observed parking compared to the available spaces on and adjacent to the corridor are included in the 2021 parking study, ***Attachment C***.

Note that as part of a separate initiative, the City is evaluating technologies to monitor the use of on-street and off-street public parking Downtown that could be applied to the Lake St S/Lake Washington Blvd NE corridor.

Wayfinding Signage

The lowest cost and simplest parking management strategy would be placement of wayfinding signage along Lake Street and Lake Washington Boulevard, directing those looking for parking to the side streets where parking is available similar to recently implemented wayfinding for Downtown.

General advantages of wayfinding signage as a parking management strategy are the low cost, low impact on corridor design, and ease of maintenance. A disadvantage of wayfinding signage could be sign “clutter” and that signage may not be readily visible to those looking for parking in a very localized and specific spot, such as in front of a residence where a delivery or rideshare drop-off is being conducted.

Wayfinding signage can be used as a parking management strategy on its own, or in combination with the other strategies listed below.

Time-Restricted Parking

Changing or implementing time-restrictions for the on-street parking along Lake Street and Lake Washington Boulevard would help to manage the availability of spaces by encouraging short term use and greater turn over at the parks and businesses in the corridor. Time-restricted parking does affect the usefulness to residents who typically have longer parking requirements for guests or for their own vehicles, in excess of typical time restrictions. Time-restricted parking requires enforcement, in addition to regularly spaced signage to ensure awareness of the limitations. Enforcement and sign maintenance are a long-term cost to the City of time-restricted parking. Some time-restricted parking is already present in the corridor. A balance of time-restricted parking in areas more likely to generate public parking requirements, such as near parks, with unrestricted parking intended for residents near residential areas, such as between 2nd and 7th Avenues, is a potential parking management strategy to consider.

Permit Zones

City does not have a permit parking zone policy to restrict public parking. Generally, restricted parking zones may result in spill over parking problems on adjacent streets, and the City does not have the resources to manage and enforce restricted parking zones.

While permitted parking could be a management technique to help guarantee availability of on-street parking for residents and/or businesses who apply for permits, there are a number of secondary implications. A permit zone system would require comprehensive application of clear signage on the corridor and may even require signage on side streets. Long-term costs for additional parking enforcement officers of a permit zone, and well as required resources to manage application review, distribution, and monitoring system by the City would be incurred to maintain a permit system.

Moreover, a permit parking system would likely reduce the availability of public parking for park access, trail access, and general business access from on-street parking. Permits may present equity concerns given reduced public availability of spaces or costs associated with obtaining a permit. Turnover among residents and/or redevelopment of residential properties could introduce further complications with a permit parking system. Wait times for permit processing among new residents could lead to parking violations and frustration among residents.

Wayfinding signage

Time-restricted parking signage

Time-restricted off-street lot signage

Time-Restricted Off-Street Lot

Changing existing parking time restrictions on the off-street lots for the parks and/or investigating the possibility of an additional off-street public lot with time-restricted parking could be options to provide additional public parking. There would be similar ongoing costs for enforcement and maintenance to the corridor-wide time restricted parking option. Obtaining City ownership of an off-street lot would be a significant capital expense and unlikely near-term possibility given the desirability of property near the lakefront. Partnerships for public use of existing private lots, such as the Life Community Church north of 5th Avenue, or for commercial buildings near the south end of the corridor could be more practical opportunities for additional off-street parking.

The existing commercial building lot between 58th and 59th Streets, across from Doris Cooper Houghton Beach Park is a private lot that operates as a time-restricted lot. Signage in the lot indicates that the spaces are available on evenings and weekends for public park access but are restricted during daytime business hour use.

Combined Time-Restricted and Permit Zones

One context specific parking management strategy would be to combine time restricted and permit zones along the corridor. Time-restrictions would be put in place more on the south half of the corridor, between Marsh Park and Doris Cooper Houghton Beach Park, while north of 10th Avenue, permit zones would be in place. The permit zones would allow additional parking in the areas where residences are more of the land use, while the time-restricted zones are matched to the more public uses of the two larger parks.

The disadvantage of a combined time-restricted and permit zones approach, although it does provide for a good context-sensitive match to the on-street parking needs, is that the long-term costs to the City may be the highest of all the approaches. The City would need to maintain enforcement for both time-restricted parking and permit use, as well as maintain a permitting department and internal permit management.

Next Steps

When presented with the study findings and evaluation results, Council supported Option 1 as a leading recommendation and asked that further community input on the project would be gathered as part of the 2024 updated of the Transportation Master Plan. Additionally, Council supported the following next steps for advancing safety in the corridor:

- Evaluating the posted speed limit in the corridor, as part of citywide evaluation of speed limits planned for 2023, to determine if lowering the speed limit would be warranted for a further benefit to safety and comfort for active mode users
- Evaluate one-way circulation at the Doris Cooper Houghton Beach Park parking lot to reduce the number of conflict points between vehicles and active transportation modes as well as simplify traffic circulation in the parking lot
- Identify a preferred parking management strategy for the corridor in coordination with broader evaluation of downtown parking

FUTURE PHASING

The design of the leading candidate option is intended to be compatible with future conversion to a more upgraded facility as funds allow. The location of the bike facilities and the buffer in the section of Option 1 would allow the City to construct necessary utility upgrades and relocations within the buffer while maintaining both the two-way bike facility and two vehicle lanes, with the temporary restriction of on-street parking to be able to shift lanes.

The future construction of a sidewalk-level protected bike facility and buffer would allow, through the relocation of the existing west curb of Lake Washington Boulevard, a widening of the pedestrian facility to a typical width of twelve feet, compared to the existing ten feet. Raising of the facilities to sidewalk level would require the removal and/or replacement of existing street trees.

QUICK WINS

Quick win elements of the option with the highest evaluation score are those that can be implemented in the next 1-2 years and would likely not require identification and securing of competitive grant funding to supplement local funds. The quick wins include:

- Restriping of the corridor and stripe buffer(s)
- Install physical barriers in the buffer(s) to enhance the protection and comfort of the bike facility
- Improve the priority crossings at 2nd Avenue S, 10th Avenue S and NE 59th Street in the corridor with:
  - *Standardized and updated RRFBs*
  - *Relocated and updated lighting*
  - *Curb extensions using surface-mounted curbing, asphalt fills and rapid deployment physical barriers to limit crossing distances*
- Improve street and pedestrian lighting along the corridor by choosing from the following menu of options:
  - *Install new pedestrian-scale lighting along park frontages*
  - *Fill in "zero illuminance" gaps along the corridor to address the darkest and least uniform areas*
  - *Analyze all marked crosswalks and replace/relocate poles to bring up to standards for light levels and pole placement*

The ***ability of the improvements included in Option 1 to be implemented as quick win projects contributed to the selection*** of Option 1 as the leading candidate for the corridor.

ATTACHMENT A

Corridor Layout Options

ONE-WAY BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

TWO-WAY PROTECTED BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

TWO-WAY PROTECTED BIKE LANES AT DRIVEWAYS
2ND AVENUE S TO 5TH AVENUE S
10TH AVENUE TO MARSH PARK

CORRIDOR LAYOUT - OPTION 1 - TWO-WAY PROTECTED BIKE LANES, EAST PARKING

1.22175.00 - Kirkland LWB Promenade Concepts

January 16, 2022

transpogroup
WHAT TRANSPORTATION CAN BE.

HORIZ. 0 50 100 200
Scale: 1in Feet

FIGURE
1

ONE-WAY BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

TWO-WAY PROTECTED BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

LEGEND:
- BICYCLE LANE
- PARKING LANE
- DRIVEWAY
- CARPORT
- EXISTING TREE
- PROPOSED RRFB
- BUFFER BARRIER
- NARROW BUFFER BARRIER
- EXISTING LUMINAIRE
- PROPOSED LUMINAIRE

CORRIDOR LAYOUT - OPTION 2 - TWO-WAY PROTECTED BIKE LANES, WEST PARKING

1.22175.00 - Kirkland LWB Promenade Concepts

January 16, 2022

transpogroup
WHAT TRANSPORTATION CAN BE.

HORIZ. 0 100 200
Scale: In Feet

FIGURE
1

ONE-WAY BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

ONE-WAY PROTECTED BIKE LANES
KIRKLAND AVENUE S TO NE 59TH STREET

CORRIDOR LAYOUT - OPTION 3 - ONE-WAY PROTECTED BIKE LANES, EAST PARKING

1.22175.00 - Kirkland LWB Promenade Concepts

January 16, 2022

transpogroup
WHAT TRANSPORTATION CAN BE.

HORIZ. 0 100 200
Scale: 1" = Feet

FIGURE
1

ONE-WAY BIKE LANES
NE 59TH STREET TO LAKEVIEW DRIVE

SHARED USE PATH
KIRKLAND AVENUE S TO NE 59TH STREET

CORRIDOR LAYOUT - OPTION 4 - SHARED USE PATH, EAST PARKING

1.22175.00 - Kirkland LWB Promenade Concepts

January 16, 2022

transpogroup
WHAT TRANSPORTATION CAN BE.

HORIZ. 0 50 100
Scale: In Feet

FIGURE
1

ATTACHMENT B

Evaluation Matrix

LAKE WASHINGTON BOULEVARD PROMENADE
CHOOSE BY ADVANTAGES: CORRIDOR OPTIONS

EVALUATION CRITERIA	CORRIDOR OPTIONS				
	NO BUILD	OPTION 1 *Protected Two-Way Bike Lanes: East Parking*	OPTION 2 *Protected Two-Way Bike Lanes: West Parking*	OPTION 3 *Protected One-Way Bike Lanes*	OPTION 4 *Shared-Use Path*
Safety & Comfort*					
Mitigation of crash risk factors for cyclists		◉	◉	●	●
Mitigation of crash risk factors for pedestrians		◉	◉	●	●
Mitigation of crash risk factors for vehicles			●		
Improved level of traffic stress for cyclists		◉	◉	●	●
Improved comfort for pedestrians		●	●		◉
Physical & Operational					
Intuitive facility for drivers to use	●			●	◉
Intuitive facility for active modes to use	●	●	●	●	
Active mode facility can be reasonably maintained	◉	●	●		●
Phasing potential for “quick win” project elements		●	●	◉	
Accommodation of mailboxes, trash pickup and short driveways		●			●
Impact to existing street trees	◉	●	●	◉	
Minimize reduction in on-street parking	◉	●		●	●
Potential for stormwater improvements		●	●		●
Relative implementation cost	◉	●	●	◉	
ADVANTAGES SCORE	10	15	14	12	11
ADVANTAGES SCORE PRIORITIZING SAFETY & COMFORT **(Safety & Comfort count double)*	10	22	22	15	16

● Advantage (1 point) ◉ Significant Advantage (2 point)

ATTACHMENT C

Kirkland Parking Data Collection Memo

transpogroup
WHAT TRANSPORTATION CAN BE.

MEMORANDUM

Date:	December 2, 2021	**TG:**	21184.00
To:	Joel Pfundt, AICP		
From:	Paul Sharman, PE Patrick Lynch, AICP		
cc:	Iris Cabrera, Sierra Ohlsen		
Subject:	Kirkland Parking Data Collection		

The City of Kirkland is evaluating creation of a pedestrian walkway/promenade along Lake Street S/Lake Washington Boulevard between 2nd Ave S and NE 60th Street. This would require the elimination of existing on-street parking spaces along one side of the roadway. To better understand the impacts of this proposal, the city is seeking to:

- Evaluate the safety benefits and impacts,
- Evaluate vehicle parking impacts, and
- Evaluate changes in how people use the waterfront

To accomplish these goals, parking and multimodal activity data along the Lake Street S/Lake Washington Boulevard corridor were collected. In addition, Streetlight Data was used to understand the travel patterns for those who park within the study area. The study area is shown in Figure 1. The purpose of this memorandum is to summarize the parking, vehicle and multimodal data collected and highlight how potential removal of on-street parking along Lake Washington Blvd may impact travel within the study area.

Figure 1 - Study Area

Study Area Characteristics

The study area is generally bounded by 2nd Avenue South on the north, and NE 60th Street on the south and State Street / NE 68th Avenue to the east. Lake Street / Lake Washington Boulevard is the primary corridor of interest, a 0.9 mile segment whose speed limit is 30 mph south of approximately 7th Avenue South, and 25 mph to the north. The study area included 8 'side-streets' where parking spillover from Lake Washington Boulevard / Lake Street was likely and three additional off-street parking lots (Marsh Park, Houghton Beach Lot, and 58th Street Lot). The side streets included NE 62nd Street, NE 63rd Street, NE 64th Street, 10th Avenue S, 7th Avenue S, 5th Avenue South, 2nd Avenue S and 2nd Street S. Many of these side streets running perpendicular to Lake Washington Boulevard / Lake Street have steep inclines that may prove difficult to navigate for those with mobility challenges. Based on City of

Kirkland estimates, the study area includes approximately 645 parking spaces, 295 of which are located on Lake Washington Boulevard / Lake Street.

The following sections summarize the traffic data collected.

Pneumatic Tube Count Data Collection

72-hour tube data was collected at three locations along Lake Street / Lake Washington Boulevard. The first, at Lake Street south of the 7th Avenue crossing, another at Lake Washington Boulevard south of the Marsh Park crossing, and lastly at Lake Washington Boulevard north of the NE 60th Street crossing. The data was collected continuously from Thursday, July 22nd to the end of the day Sunday, July 25th, 2021. Speed and volume data are summarized in the following sections below.

Speed Observations

The following section summarizes the speed for vehicles travelling along Lake Street / Lake Washington Boulevard at the three study locations. The speeds are broken out into speed bins and averaged across the three days of data collection (Thursday, Friday, Saturday). Raw speed data can be found along with other traffic count data in Appendix B.

Lake Street South of 7th Avenue Crossing

Figure *2* summarizes the average speeds just south of 7th Avenue on Lake Street.

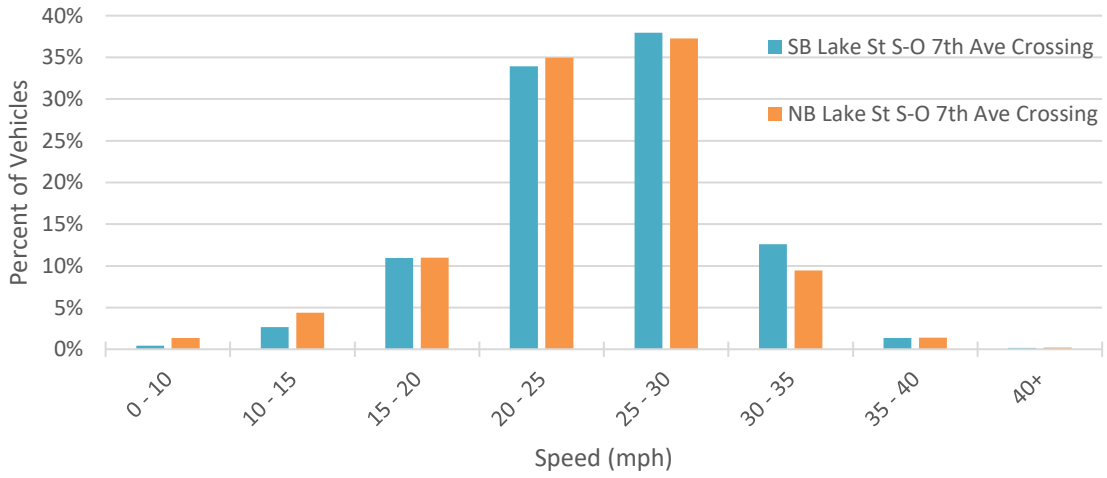


Figure 2. 7th Avenue Distribution of Vehicle Speeds (Avg Thur-Sat)

As shown in Figure 2, most vehicles traveled at speeds between 20-30 miles per hour. The average speed was 24.7 miles per hour, with an 85th percentile speed of 29.6 miles per hour. The speed limit on this section of roadway transitions from 30 miles per hour south of the crossing to 25 miles per hour north of the crossing.

Lake Washington Boulevard South of Marsh Park Crossing

Figure 3 summarizes the average speeds on Lake Washington Boulevard just south of Marsh Park.

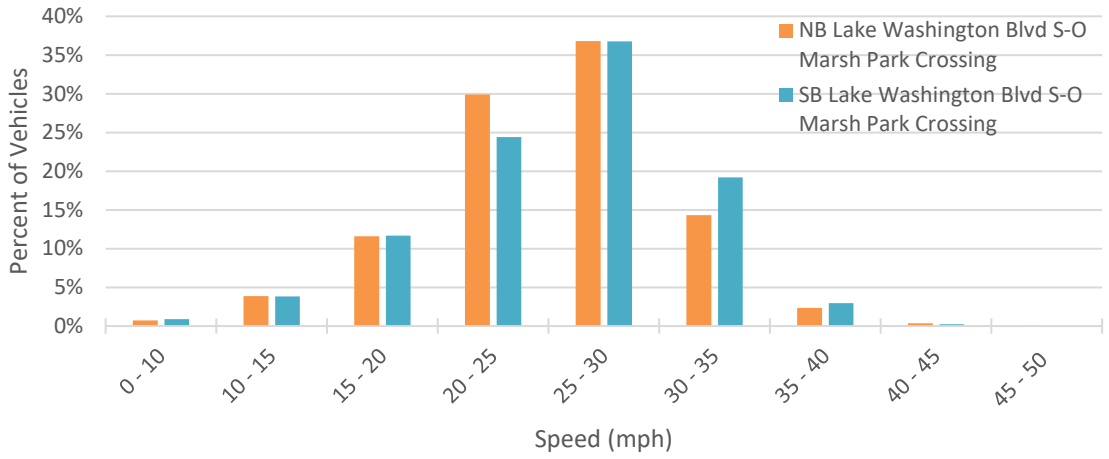


Figure 3. Marsh Park Distribution of Vehicle Speeds (Avg Thur-Sat)

As shown in Figure 4, most vehicles traveled at speeds between 20-30 miles per hour. The average speed was 25.5 miles per hour, with an 85th percentile speed of 30.8 miles per hour. The speed limit on this section of roadway is 30 miles per hour throughout.

Lake Washington Boulevard North of NE 60th Street Crossing

Figure 4 summarizes the three-day average speeds on Lake Washington Boulevard north of NE 60th Street.

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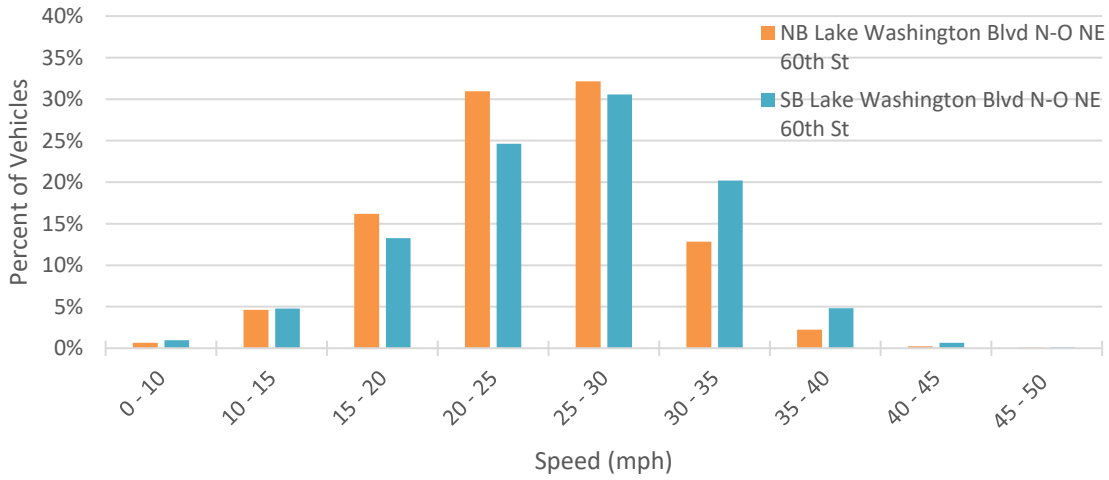


Figure 4. NE 60th Street Distribution of Vehicle Speeds (Avg Thur-Sat)

As shown in Figure 4, most vehicles traveled at speeds between 20-30 miles per hour. The average speed was 25.1 miles per hour, with an 85th percentile speed of 31.1 miles per hour. The speed limit on this section of roadway is 30 miles per hour throughout.

Speed Data Summary

The collected data suggests that the average measured speeds meet the speed limits along all segments of roadway. Speeds gradually increase from north to south, and the 85th percentile speed hovers around 30-31 miles per hour for the studied segments. Table 1 summarizes the average and 85th percentile speeds for each location.

Table 1. Speed Data Summary

Location	Average Speed (mph)	85th Percentile Speed (mph)
Lake St South of 7th Ave Crossing	24.7	29.6
Lake Washington Blvd South of Marsh Park Crossing	25.5	30.8
Lake Washington Blvd North of NE 60th St Crossing	25.1	31.1
Average	**25.1**	**30.5**

Volume Data

This section summarizes the hourly average volume data taken at the three study locations for Thursday, Friday, and Saturday. Directional volumes can be found for all days and locations in Appendix A.

Lake Street South of 7th Avenue Crossing

Figure *5* summarizes the hourly traffic volumes on Lake Street south of 7th Avenue.

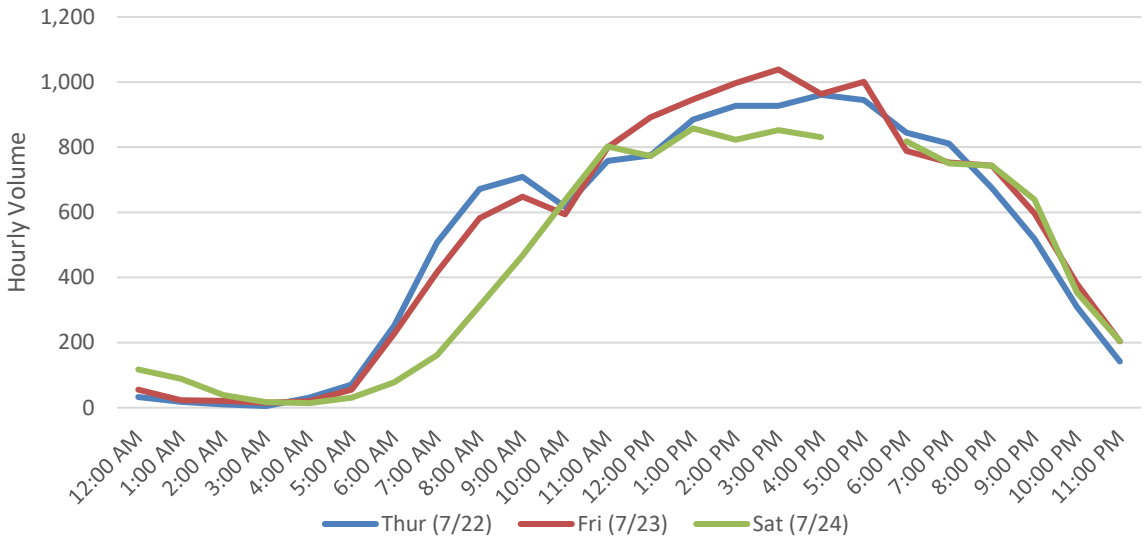


Figure 5. 7th Avenue Hourly Volumes by Day

Hourly traffic volumes trends on Thursday and Friday are generally comparable. Volumes start increasing at 6:00 AM and peak midafternoon (~3:00-4:00 PM) before steadily decreasing as the day goes on. Generally, similar trends are seen on Saturday and Sunday, but weekend volumes tend to at 1:00 PM. Volumes throughout the day on the weekend tend to be lower than during the week. Evening volumes on Saturday and Sunday are comparably to weekday volumes.

Lake Washington Boulevard South of Marsh Park Crossing

Figure *6* summarizes the data collected at this location.

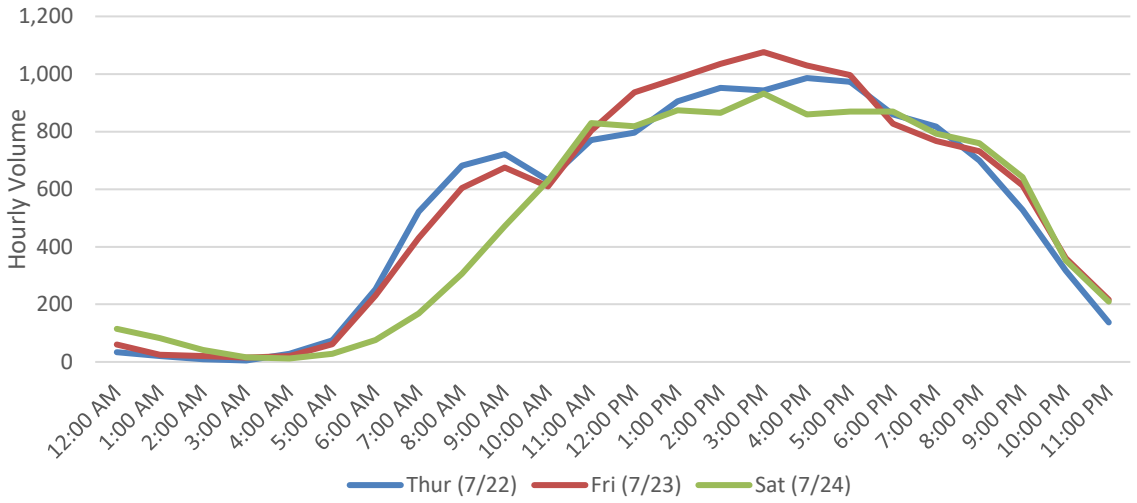


Figure 6. Marsh Park Hourly Volumes by Day

Volumes for Thursday and Friday are comparable for most of the day, excluding the early afternoon when Thursday volumes peaked higher than Friday volumes from 12:00-3:00 PM. The Saturday volumes begin increasing at a much slower rate in the morning but are generally comparable for the rest of the day. The different days follow similar trends throughout the day in terms of when they increase, peak, and decrease.

Lake Washington Boulevard North of NE 60th Street Crossing

Figure *7* summarizes the data collected at this location.

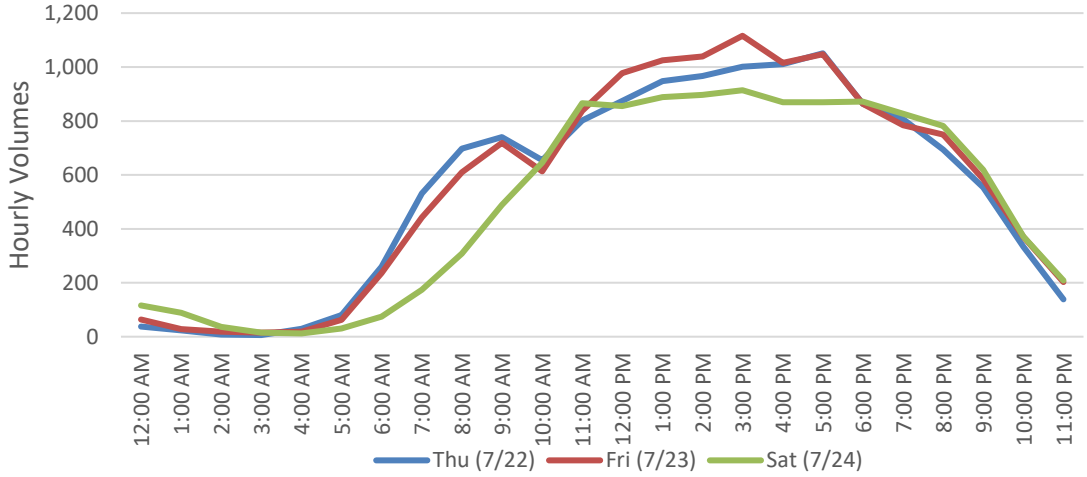


Figure 7. NE 60th Street Hourly Volumes by Day

The data collected at this location is similar to the data near the Marsh Park crossing. Each of the days follow the same trends described for the Marsh Park data. One minor exception is that the Friday data near Marsh Park gradually increases to a peak at 3:00 PM, then gradually decreases throughout the rest of the day. At NE 60th Street, the volumes are relatively similar from 12:00 PM to 5:00 PM, then there is a significant drop at 6:00 PM before gradually decreasing for the rest of the evening.

Volume Data Summary

For most of the Thursday and Friday counts, the peak occurs between 3:00-4:00 PM, whereas the Saturday and Sunday counts typically peak earlier in the day between 1:00-3:00 PM. Before the peak period, the greatest volumes generally occurred on Thursday. During the peak period, the greatest volumes generally occurred on Friday. After the peak period, volumes for Friday and Saturday were typically similar and greater than Thursday volumes. Graphs for each of the individual days at each location showing the northbound, southbound, and total splits are shown in Appendix A. Average daily volumes for each location are summarized below in Table 2.

Table 2. Average Daily Volumes

	Average Weekday Daily Volume			Average Saturday Daily Volume		
Location	**Northbound**	**Southbound**	**Total**	**Northbound**	**Southbound**	**Total**
Lake St South of 7th Ave Crossing	5,935	6,670	12,405	5,110	5,300	10,410
Lake Washington Blvd South of Marsh Park Crossing	6,215	6,450	12,665	5,915	5,705	11,620
Lake Washington Blvd North of NE 60th St Crossing	6,310	6,800	13,110	5,910	5,920	11,830
Average	**6,155**	**6,640**	**12,725**	**5,645**	**5,640**	**11,285**

Pedestrian and Bicycle Data Collection

Pedestrian and bicycle counts were collected at three locations along Lake Street and Lake Washington Boulevard. The first, at the Lake Street/7th Avenue South crossing, another at the Lake Washington Boulevard/Marsh Park crossing, and lastly at the Lake Washington Boulevard NE/NE 60th Street crossing. The collection areas are shown on Figure 7. At each crossing, the number of pedestrians and bicyclists who traveled northbound, southbound, eastbound, and westbound were counted. The data was collected continuously on Thursday, July 22nd and Saturday, July 24th, 2021, from 9:00 AM until 9:00 PM. Weather during both days was warm and sunny, with highs of 75 and 82 on Thursday and Saturday, respectively. The count data is summarized in the following sections below.

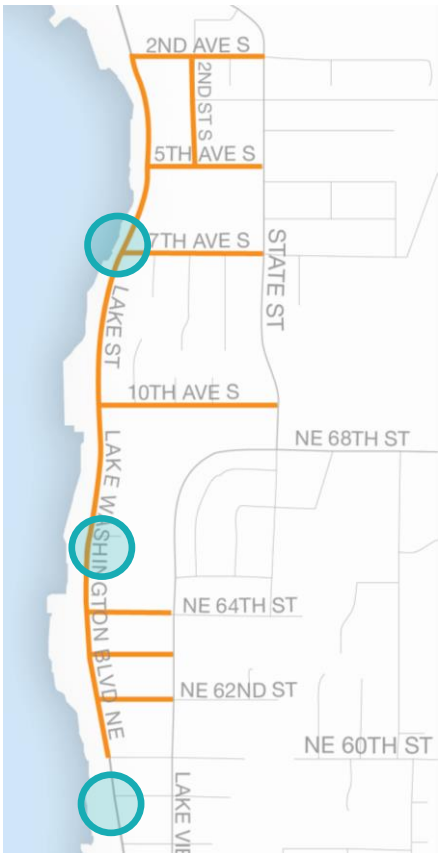


Figure 8. Pedestrian and Bicycle Count Locations

Lake Street & 7th Avenue South

On Thursday, the number of pedestrians counted varied between 20 and 40 per 15-minute increment while cyclist counts fluctuate between 0 and 20 throughout most of the day. However, pedestrian activity began increasing around 4:30 PM, with pedestrian counts peaking at 6:45 PM when 95 pedestrians were counted within 15 minutes. Bicycle counts did not increase in the evening. On Thursday, 47 percent of pedestrians travelled northbound, while 53 percent of bicyclists travelled southbound. On Saturday, the volume of pedestrian and bicycle counts peaked several times throughout the day. Between 11:30 and 11:45 AM, 88 pedestrians and 31 cyclists were counted while 112 pedestrians and 6 bicyclists were counted between 8:00 and 8:15 PM. Most pedestrians and cyclists travelled northbound at 48 and 51 percent, respectively. The bicycle and pedestrian counts for Thursday and Saturday are shown on Figure 9 and Figure 10.

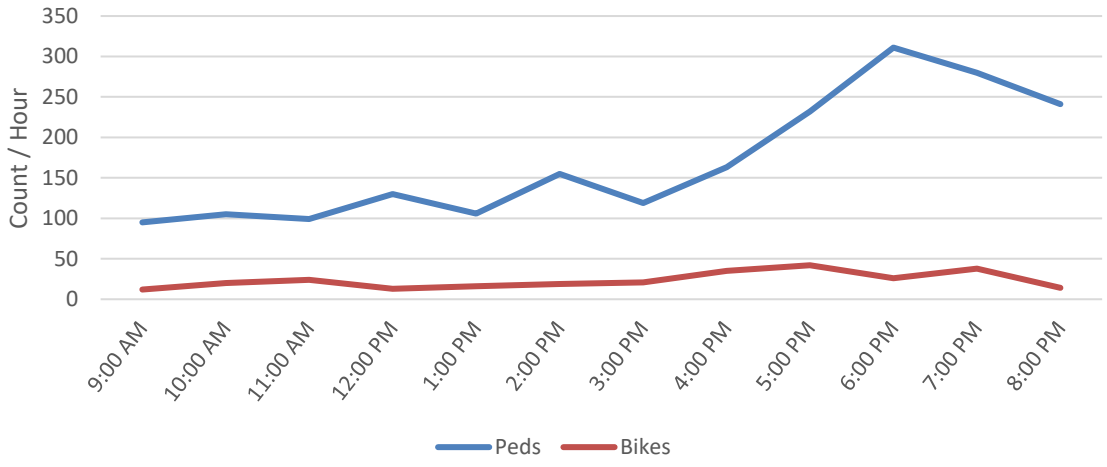


Figure 9. Lake Street & 7th Avenue South Thursday (7/22) Collection Data

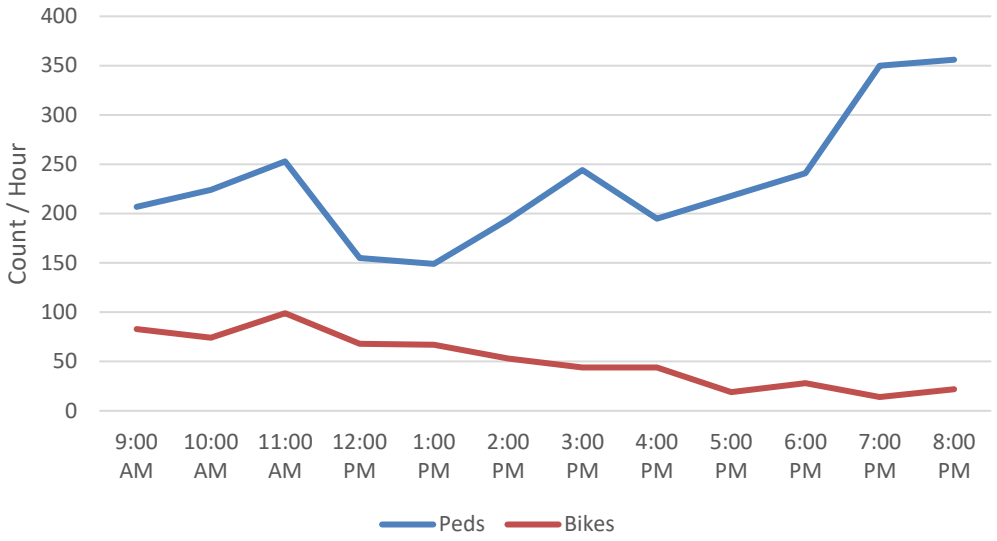


Figure 10. Lake Street & 7th Avenue South Saturday (7/24) Collection Data

Lake Washington Boulevard & Marsh Park

Similar to the counts on 7th Avenue, on Thursday, the pedestrian and bicycle counts remains steady between 20 and 40 pedestrians and 0 and 20 cyclists throughout most of the day until 7:00 PM with 62 pedestrians and 10 cyclists counted. Of the data collected on Thursday, most pedestrians travelled northbound, at 47 percent, and most bicyclists travelled southbound, at 52 percent. On Saturday, there are several peaks throughout the day with volumes ranging from a low of 25 people to the AM peak which counted 61 pedestrians and 26 cyclists at 11:15 AM. The PM peak counted 63 pedestrians and 3 bicyclists and occurred at 8:45 PM. Most pedestrians and cyclists travelled southbound at 46 percent and 50 percent respectively. The data are shown on Figure 11 and Figure 12.

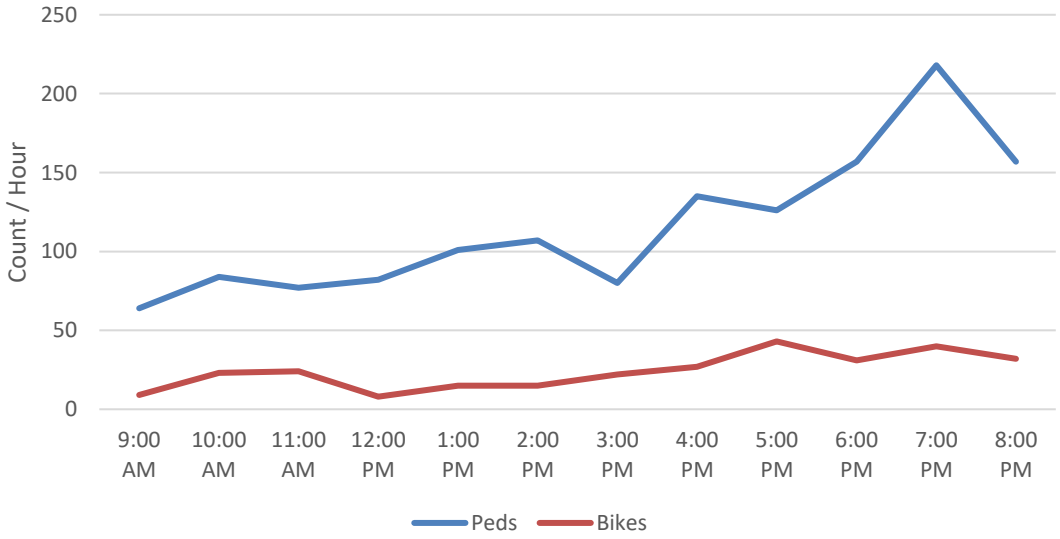


Figure 11. Lake Washington Boulevard & Marsh Park Thursday (7/22) Collection Data

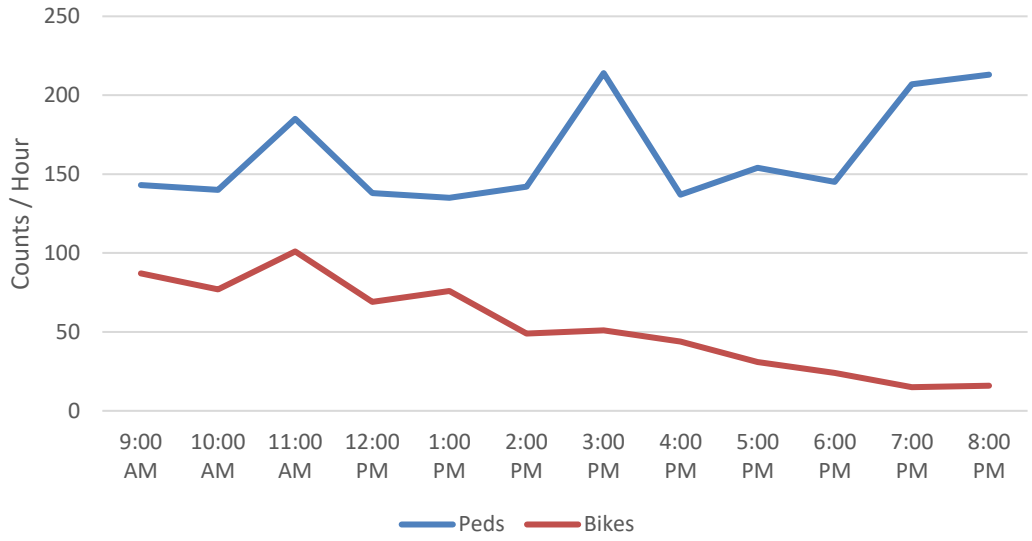


Figure 12. Lake Washington Boulevard & Marsh Park Saturday (7/24) Collection Data

Lake Washington Boulevard NE & NE 60th Street

On Thursday, the data remains steady between 15 and 40 pedestrians and 0 and 15 cyclists until it peaks at 7:15 PM with 61 pedestrians and 8 cyclists counted. Of the data collected on Thursday, the most pedestrians were split traveling northbound and southbound at 44 percent each, and most bicyclists travelled southbound, at 55 percent. On Saturday, there are several peaks throughout the day with volumes ranging from a low of 35 people to the AM peak which counted 71 pedestrians and 27 cyclists at 11:00 AM. The PM peak counted 67 pedestrians and 10 bicyclists and occurred at 8:15 PM. Most pedestrians and cyclists travelled southbound at 42 percent and 51 percent respectively. The data is shown on Figures 12 and 13.

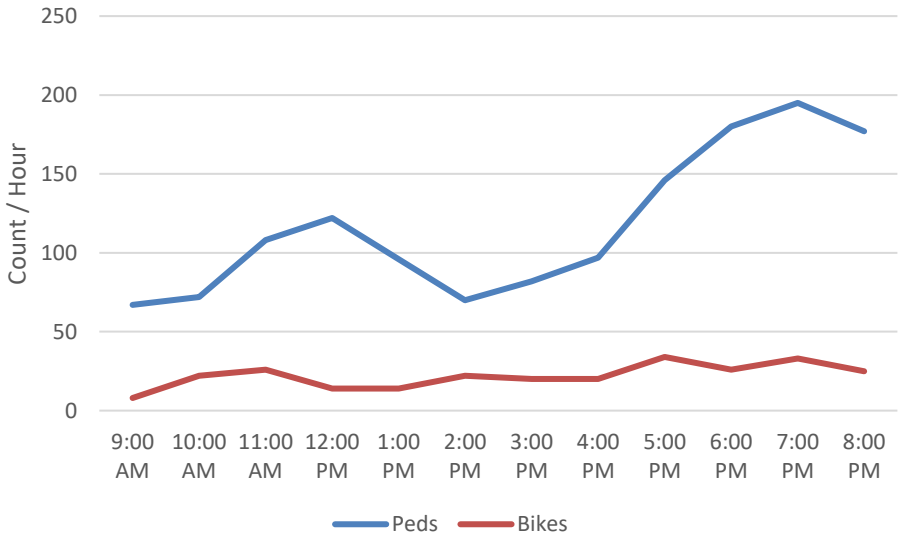


Figure 13. Lake Washington Boulevard NE & NE 60th Street Thursday (7/22) Collection Data

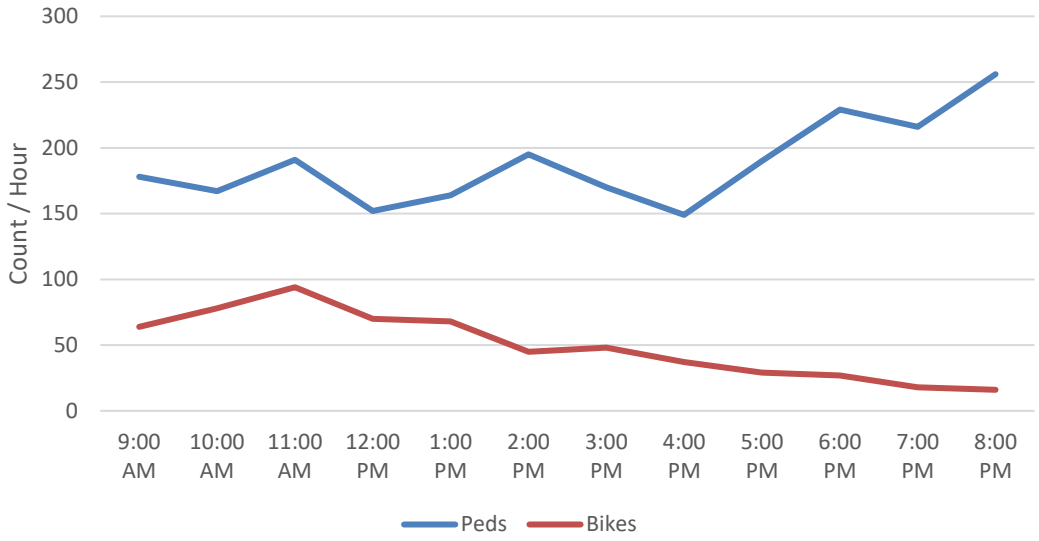


Figure 14. Lake Washington Boulevard NE & NE 60th Street Saturday (7/24) Collection Data

Generally, pedestrian and bicycle volumes tend to be higher on Saturday than on Thursday, with volumes slightly higher at the north end of the study area (at 7th Avenue) than at the other count locations. Bicycle and pedestrian volumes primarily travel north-south along the corridor, with few people crossing the street at the three study locations.

Table 3 summarizes the nonmotorized volumes on Thursday and Saturday at each of the data collection locations. On average, the corridor sees approximately 1,890 nonmotorized users on Thursday and 2,950 users on Saturday.

Table 3. Nonmotorized Volume Summary

	Average Weekday Daily Volume			Average Saturday Daily Volume		
Location	**Pedestrians**	**Bicycles**	**Total**	**Pedestrians**	**Bicycles**	**Total**
Lake St South of 7th Ave Crossing	2036	280	2316	2786	615	3401
Lake Washington Blvd South of Marsh Park Crossing	1388	289	1677	1953	640	2593
Lake Washington Blvd North of NE 60th St Crossing	1412	264	1676	2257	594	2851
Average	1612	278	1890	2332	616	2948

Comparing the number of multimodal users in Table 3 to the vehicle volumes shown in Table 2 show that a relatively large portion of the roadway users are pedestrian and bicyclists. Assuming an average vehicle occupancy of 1.2, there are approximately 15,270 and 13,540 people traveling along the corridor in cars on Thursday and Saturday, respectively. **This would translate to a multimodal mode share of approximately 11 percent on Thursday and 18 percent on the weekend.**

Parking Data Collection

Parking data was collected at both the on-street (Lake Street and Lake Washington Boulevard) and off-street locations within the study area on Thursday and Saturday at regularly spaced three- to four-hour increments. On Thursday, parking counts were conducted at 9AM, 12PM, 4PM and 7PM, while the Saturday counts were conducted at 10AM, 1PM, 4PM and 7PM. The study area is shown in Figure 15. Parking was collected along 45 blocks and three off-street parking lots. The on-street parking supply was provided by City of Kirkland staff and estimated as one parking space per 20 linear feet, totaling approximately 576 parking spaces within the study area. Across the three off-street lots, a total of 69 parking stalls were surveyed.

Hourly total volumes of parked cars across the study area are shown on Figure 16 and Figure 17 for Thursday and Saturday, respectively.

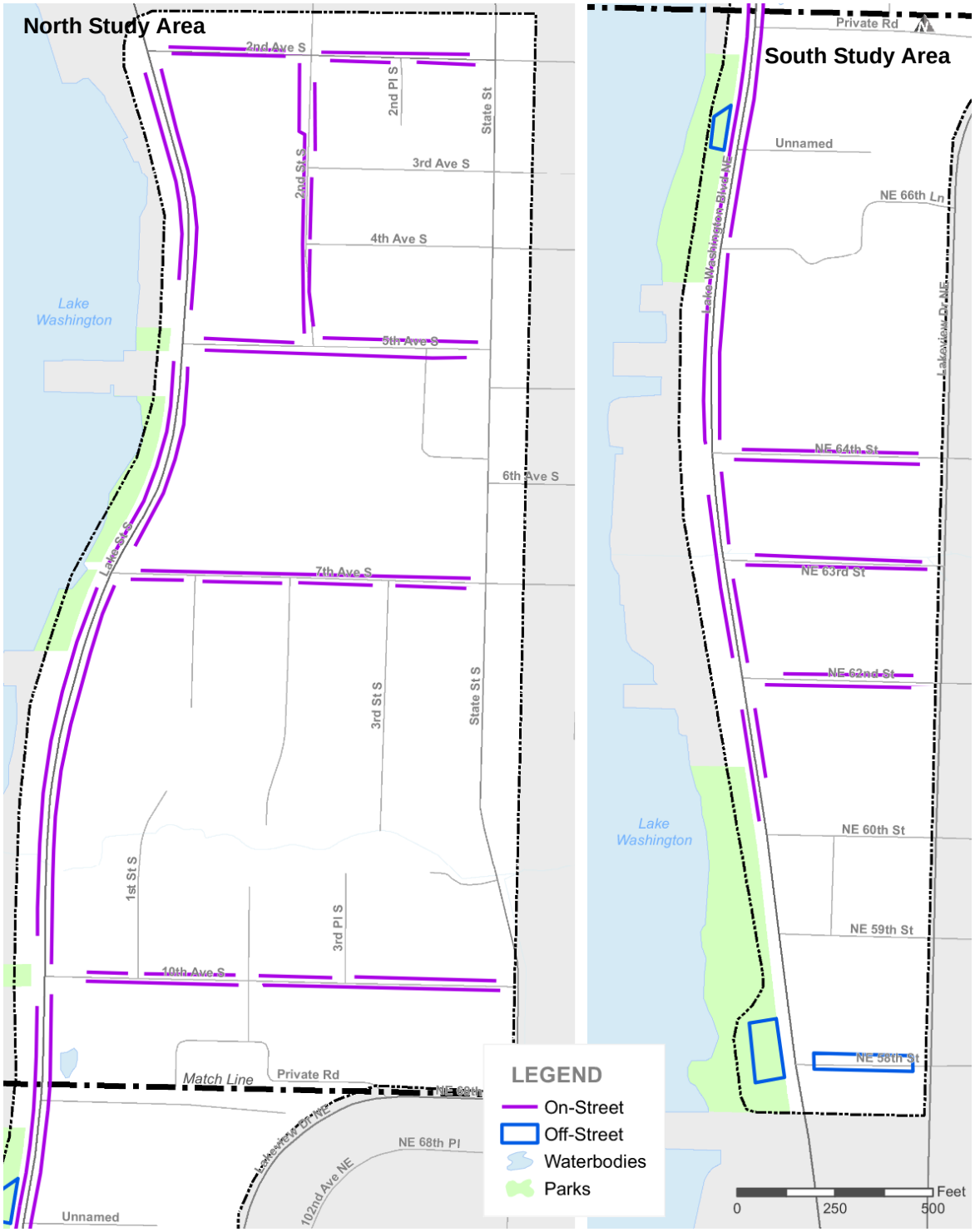


Figure 15 - Parking Data Collection Locations

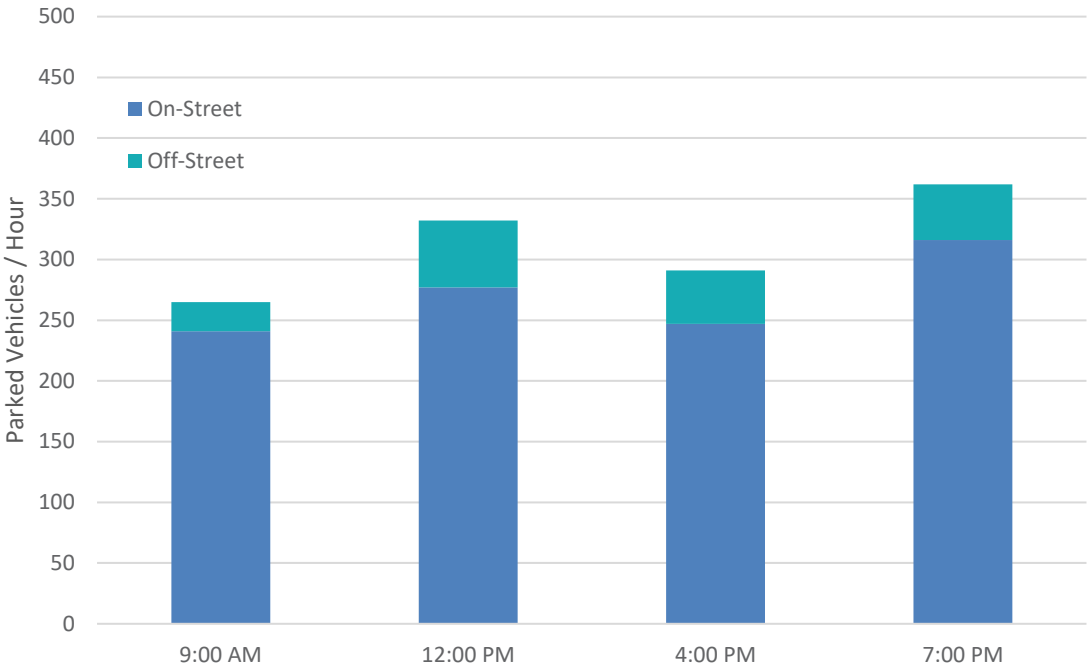


Figure 16 – Thursday (7/22) Parking Occupancy

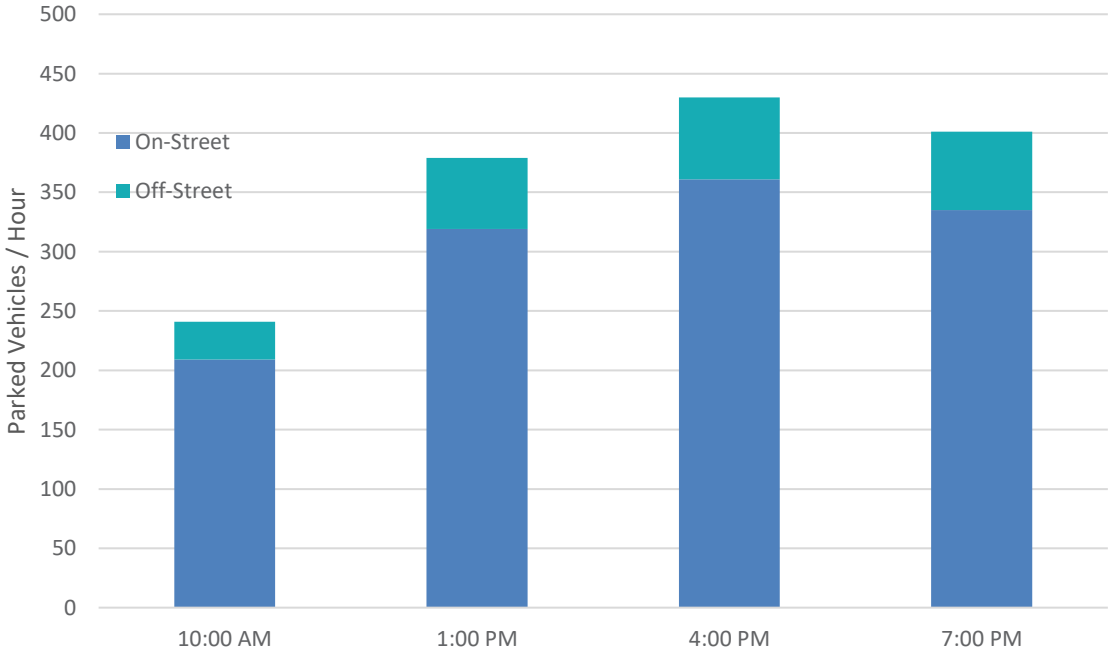


Figure 17 - Saturday (7/24) Parking Occupancy

As shown in Figure 16, the number of parked vehicles fluctuated throughout the day, with peaks at noon and at 7PM. At noon there were 277 on-street and 55 off-street vehicles while at 7:00 PM there were 316 on-street and 46 off-street vehicles. The on-street parking data shows an overall study area occupancy of 42 percent and 56 percent for the midday and evening peaks respectively.

On Saturday (as shown in Figure 17) the number of parked vehicles peaked at 4:00 PM. At this time, there were 361 on-street and 69 off-street vehicles counted – both the largest numbers seen in the duration of this this study. This is representative of an on-street parking occupancy of 60 percent and an off-street occupancy of 100 percent, totaling 67 percent of all spaces.

Table 4 shows the estimated parking occupancy for the total study area during all data collection periods.

Table 4. Total Study Area Parking Occupancy

Day	9:00 AM	10:00 AM	12:00 PM	1:00 PM	4:00 PM	7:00 PM
Thursday	41%	-	52%	-	45%	56%
Saturday	-	37%	-	59%	67%	62%

To understand the implications of potential removal of on-street parking along Lake Washington Boulevard / Lake Street, the total on-street parking occupancy along Lake Street / Lake Washington Boulevard is summarized in Table 5.

Table 5. Lake WA Blvd / Lake St On-Street Parking Occupancy

Day	9:00 AM	10:00 AM	12:00 PM	1:00 PM	4:00 PM	7:00 PM
Thursday	33%	-	43%	-	41%	57%
Saturday	-	28%	-	54%	62%	56%

Occupancy levels along Lake Washington Boulevard / Lake Street would need to be below 50 percent to avoid parking spillback into the rest of the study area. On-street parking occupancy crosses 50 percent along the corridor during four of the eight periods of data collection, indicating that removal of half the on-street parking supply would likely result in parking spillback onto other neighboring side streets on both weekdays and weekends.

The overall study area occupancy assuming half the on-street parking spaces (approximately 143) were removed from the Lake Washington Boulevard / Lake Street Corridor is summarized in Table 6.

Table 6. Study Area Occupancy Assuming Removal of half on-street spaces along Lake WA Blvd						
Day	**9:00 AM**	**10:00 AM**	**12:00 PM**	**1:00 PM**	**4:00 PM**	**7:00 PM**
Thursday	53%	-	67%	-	59%	73%
Saturday	-	48%	-	76%	87%	81%

This indicates that there would be adequate supply to accommodate existing parking demand if half the spaces along the Lake Washington Boulevard / Lake Street corridor were removed. However, during the afternoon and evening on Saturdays, parking may be difficult to find when occupancy reaches over 80 percent. While the total demand could be accommodated, there would likely be specific locations where parking demand would exceed supply.

To understand the distribution of parking demand on a block-by-block basis, a map was created for each of the time periods of data collection. All eight maps can be found in Appendix C. These maps highlight both when and where existing parking occupancy is constrained. During the week, the northern section of Lake Street and the southern section of Lake Washington Boulevard generally experience the highest occupancy levels, of which some blocks are fully occupied. The section of on-street parking along Lake Street and Lake Washington Boulevard from 7th Avenue South to NE 62nd Street is at less than 55 percent occupancy for most of the day.

The Saturday counts showed that the northern section of Lake Street and the southern section of Lake Washington Boulevard follow similar trends as the data collected on Thursday. The section between 7th Avenue South and NE 62nd Street, however, showed much higher levels of occupancy on Saturday than Thursday.

Parking Origin Destination

To better understand parking behavior within the study area, the project team sought to understand trip characteristics of those who park within the study area. To accomplish this, data was purchased from *Streetlight Data,* a company who collects GPS and location-based services (LBS) data from a variety of sources to understand travel behavior. The study area was broken out into 10 'zones' for which origin and destination data was collected. However, because *Streetlight Data* relies on a small subset of the overall vehicle volumes and some of the zones were small, the zones were aggregated up to three larger zones, as shown in Figure 18. For each of the three zones (northern, central, and southern) average trip length was measured within the *Streetlight Data* platform. Trip length was used to estimate the number of trips made by Kirkland residents as compared to visitors.

The trip length data for each section was sorted in data ranges of less than one mile, one to two miles, two to five miles, or more than five miles. The percent distribution of trip lengths is shown in Table 7.

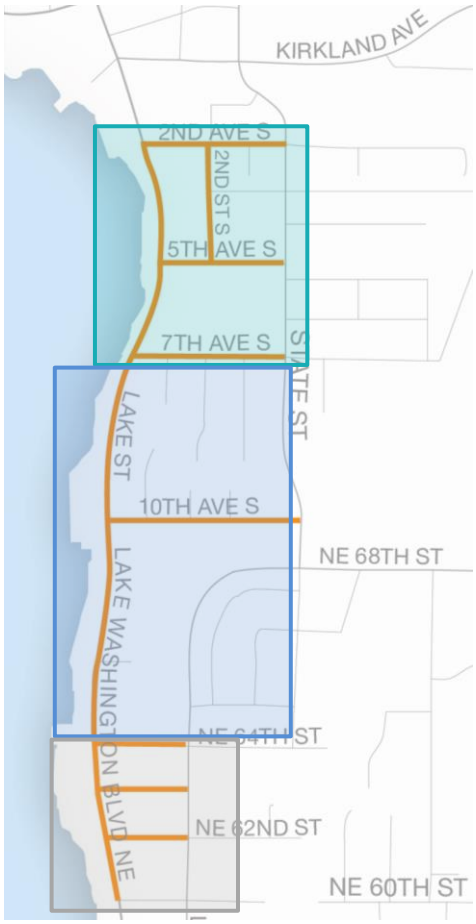


Figure 18. Streetlight Data Zone Configuration

Table 7. Percentage of Trips by Trip Length

	Weekday Trip Length Percentage				Saturday Trip Length Percentage			
Location	**<1 Mile**	**1-2 Miles**	**2-5 Miles**	**5+ Miles**	**<1 Mile**	**1-2 Miles**	**2-5 Miles**	**5+ Miles**
Northern Zone	23%	11%	25%	41%	16%	16%	19%	49%
Central Zone	14%	13%	31%	42%	21%	12%	21%	46%
Southern Zone	8%	9%	35%	48%	11%	16%	18%	55%
Entire Study Area	15%	11%	30%	44%	17%	14%	20%	49%

Northern Zone

The northern zone sees most of its trips originating from less than five miles away during the weekdays (59 percent), whereas the distribution is more evenly split on Saturday at 51 percent of trips being less than five miles in length. On weekdays, nearly a quarter of all trips are less than a mile in length, and a quarter are in the range of two to five miles which indicates that many of the vehicles that park in the northern zone may be local residents. On Saturday, more trips come from more than five miles away, indicating more visitors to the downtown area on Saturdays than during the week.

Central Zone

During the weekdays, most trips originate from less than five miles away (58 percent), but the distribution is more evenly split on Saturday at 54 percent, much like the northern zone. On weekdays, the trip length is weighted to further distances, with only 27 percent of trips originating from less than two miles away. On Saturday, 21 percent of trips are less than one mile, indicating that Kirkland residents may be travelling down to the waterfront and parking.

Southern Zone

Trips to the southern zone on weekdays are mostly split between less than or greater than five miles in length at 52 percent and 48 percent respectively. Breaking down into the smaller bins, however, shows that 82 percent of trips originated from more than two miles away. The Saturday data is more evenly split, however, with 11 percent, 16 percent, and 18 percent for the less than one mile, one to two mile, and two to five mile categories respectively.

Full Study Area

For the weekdays, 57 percent of trips originated from less than five miles away, 15 percent of which were less than a mile in length. 12 percent of trips were in the one to two mile range, and 30 percent were in the two to five mile range. The Saturday data is more evenly split, however, with 17 percent, 15 percent, and 19 percent for the less than one mile, one to two mile, and two to five mile categories respectively.

Safety and Near Miss Video Analysis

To better understand the impacts of increased multimodal activity along the Lake Washington Boulevard / Lake Street corridor, the project team sought to conduct a review of the existing conditions. The project team contacted *Transoft Solutions*, the maker of video analytics software that analyzes both collision and near-miss incidents to establish a safety profile of the site. *Transoft* was willing to do a pilot analysis of one of the video feeds, and the city staff selected the video footage of the Lake Washington Boulevard / 7th Avenue intersection for analysis. The project team uploaded 26 hours of video footage (13 hours on Thursday and 13 hours on Saturday) that was processed through *Transoft's* online video analysis platform.

The software uses machine-learning to analyze near misses, by categorizing all roadway users and calculating when they occupied the same space. The system analyzes both vehicle-vehicle interactions as well as vehicle-multimodal user interactions as long as they are within the video frame. This process is shown for a sample conflict between a pedestrian and vehicle below in Figure 19.

Figure 19 - Sample Conflict in Transoft Video Analytics

Figure 20 provides an overall summary of the safety results generated from the *Transoft* video analytics software.

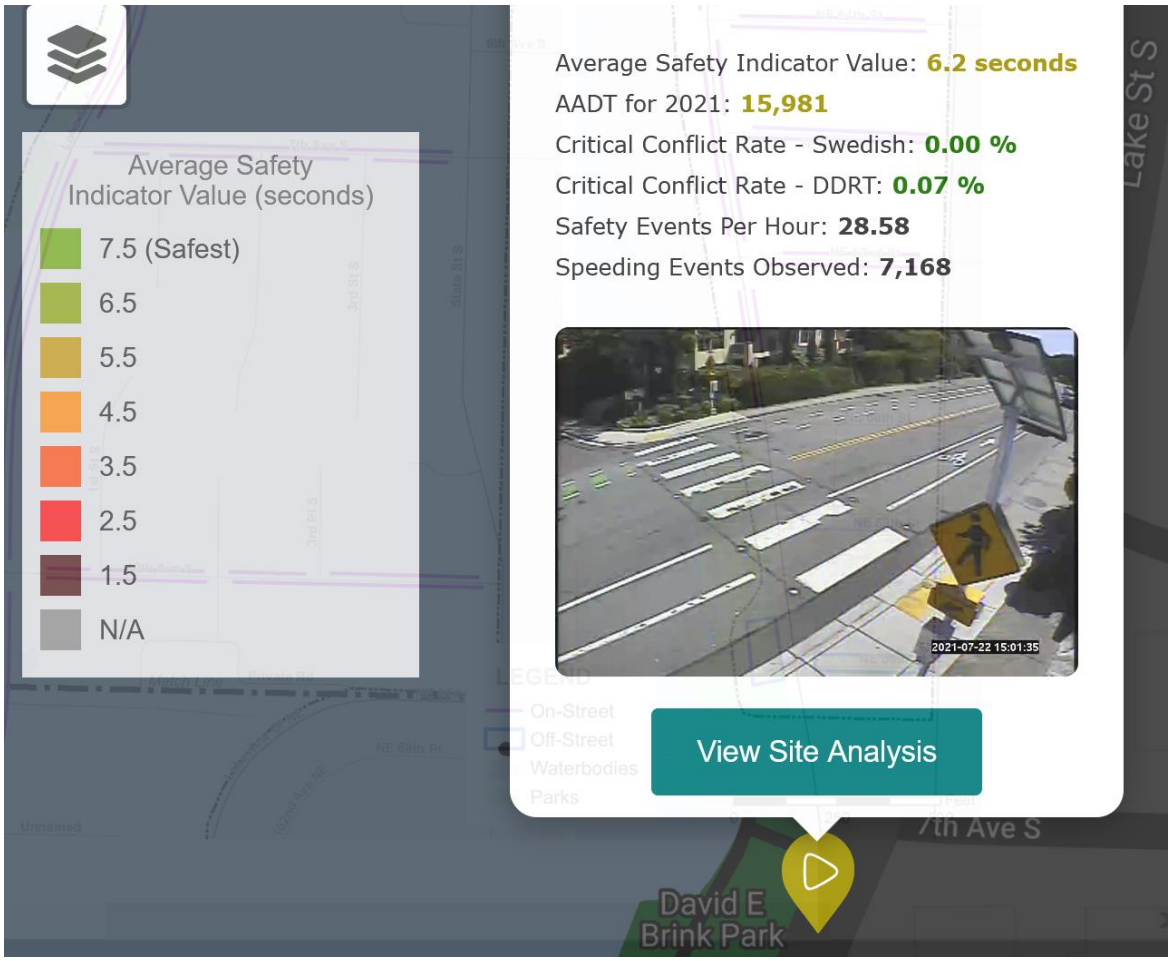


Figure 20 - Safety Analysis Overview of 7th Avenue

Overall safety indicator was categories as relatively safe, as the average safety indicated value was 6.2 (on a 0 to 7.5 scale). This indicates the average time between two roadway users making conflicting movements (i.e., pedestrian in the crosswalk and a vehicle) occupying the same space and a higher value equates to a safer location. The video footage estimated approximately 28 'safety events' per hour, which means that two roadway users occupied the same space within 7.5 seconds of one another. However, the critical conflict rates were well below 1 percent with the nearest miss occurring during a harsh braking event when two vehicles occupied the same space within 0.9 seconds. The nearest-miss conflict between vehicle and pedestrian was 2.3 seconds (shown in Figure *19*) and does not score as a critical event within the software analysis.

Both the Swedish and DDRT Critical Conflict Rate calculations are methods of estimating the likelihood of a roadway user getting into a conflict. The DDRT (Desired Design Reaction Time) methodology uses the time between conflict points and design reaction times to measure risk. The Swedish Methodology uses a causal relationship between conflicts and crashes to estimate the likelihood of a collision.

The video analytics software also identified approximately 7,100 speeding events (any vehicle traveling more than 25 MPH). The breakdown of those speeds is summarized in Figure 21.

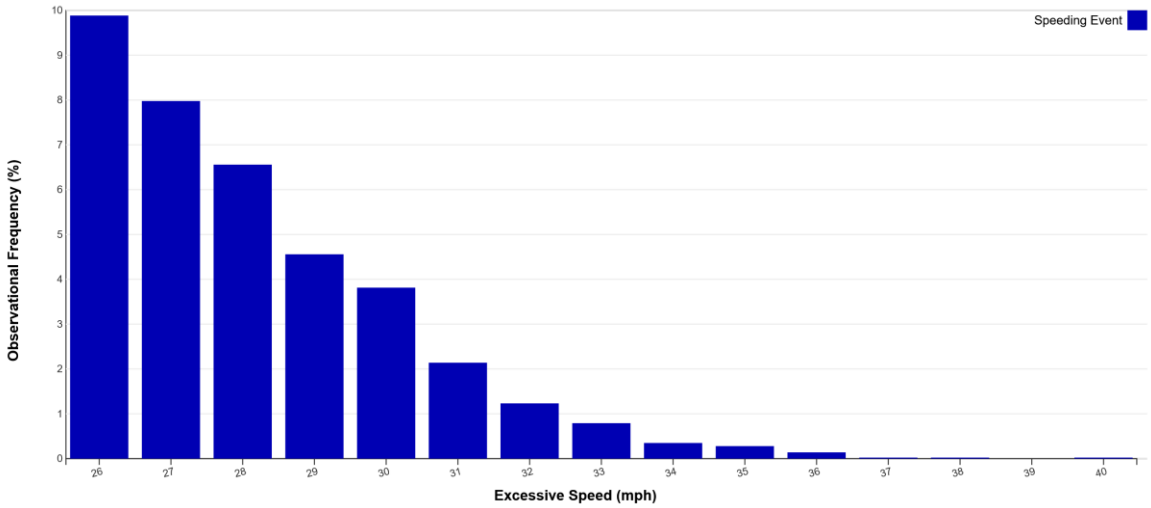


Figure 21 - Speeding Event Summary

The distribution of speeding events captured by the video analytics platform shows that approximately 33 percent of vehicles travel between 26 and 33 MPH, while only approximately 5 percent of vehicles travel more than 30 MPH. While the raw number of speeding events seems high, the distribution shows that there is not a speeding problem (as previously shown in Table 1).

The *Transoft* video analytics platform showed that most near misses were vehicle-vehicle conflicts when a quick breaking event occurred. The platform did not identify any major safety issues at this site.

Summary and Next Steps

The purpose of this memorandum was to summarize the data collected to understand the parking demands within the Lake Washington Boulevard / Lake Street corridor and on the adjacent side streets as well as the level of vehicle and multimodal activity along the corridor. The following summarizes the primary findings of the parking and multimodal data analysis.

- The Lake Washington Boulevard / Lake Street Corridor has high pedestrian and bicycle activity.
    - Nonmotorized activity is highest on Saturdays, but Thursday evenings see times of high activity as well
    - There are multiple periods of time on both Thursdays and Saturdays where 200 to 300 pedestrians use the corridor each hour.
    - Bicycle volumes peak at approximately 80 per hour on Saturday mornings.
- Traffic speed data shows that there are no major speeding issues along the corridor
- Traffic counts show an average weekday daily traffic of approximately 12,700 vehicles per day, with approximately 11,300 vehicles on Saturday
- Assuming an average vehicle occupancy of 1.2, this would translate to a multimodal mode share of approximately 11 percent on Thursday and 18 percent on the weekend.
- Overall parking demand in the study area was highest on Saturdays, with a peak overall occupancy of approximately 67 percent.
    - While overall supply was able to accommodate demand, the north end of the study area is much busier, with some blocks consistently fully occupied.
- Elimination of parking along one side of the Lake Washington Boulevard / Lake Street corridor would likely cause increased parking spillback into neighboring side streets, but the parking supply within the study area is expected to accommodate the demand.

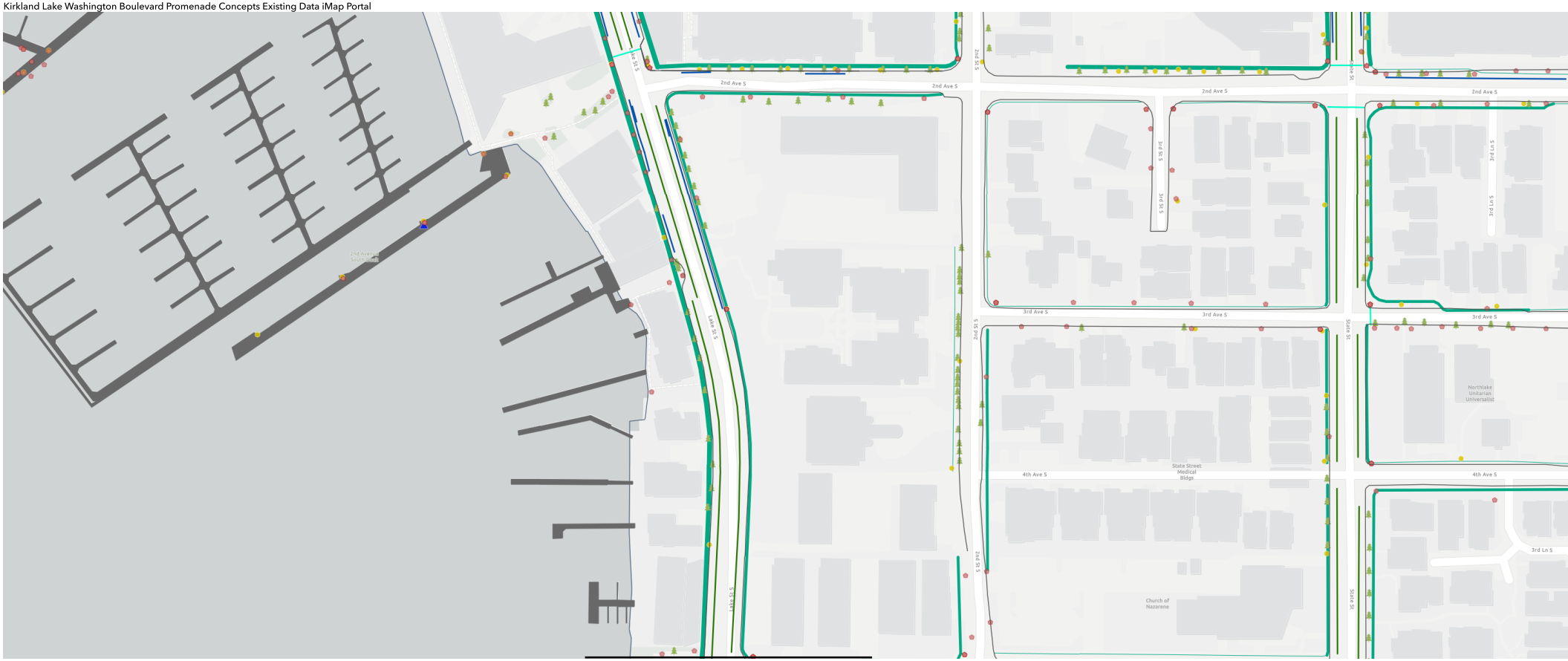
    - Both the north and south end of the study area would likely be fully occupied and would require users to park further away from their destination
- The *Streetlight Data* showed that a sizeable percentage of trips to the waterfront are less than one mile in length, and thus likely taken by Kirkland residents, especially on Thursdays.
    - This is especially true for the Northern Zone, just south of the Kirkland downtown area.
    - Given the high number of short trips, it is likely that if parking within the study area was further constrained, some of these trips may switch to walking or biking.

- The video safety analysis conducted by *Transoft Solutions* showed no collisions and few reoccurring safety issues. Most near-misses were identified as harsh breaking events and overall site safety was relatively high.

Based on the results of the data analysis presented within this memorandum, Kirkland staff will work to evaluate whether removal of on-street parking along the Lake Washington Boulevard / Lake Street corridor is warranted to install enhanced non-motorized facilities.

ATTACHMENT D

Existing Conditions Maps



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See Page 2

Street attributes

Regulated Street Parking

Pavement Edges Clip

Lights and Signs

Traffic Signals

Street Signs

Street Lights

Environment

Trees

Park Amenities

Ped / Bike Network

Bike / Shared Use Inventory

Crosswalks

Sidewalks

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15

10

5

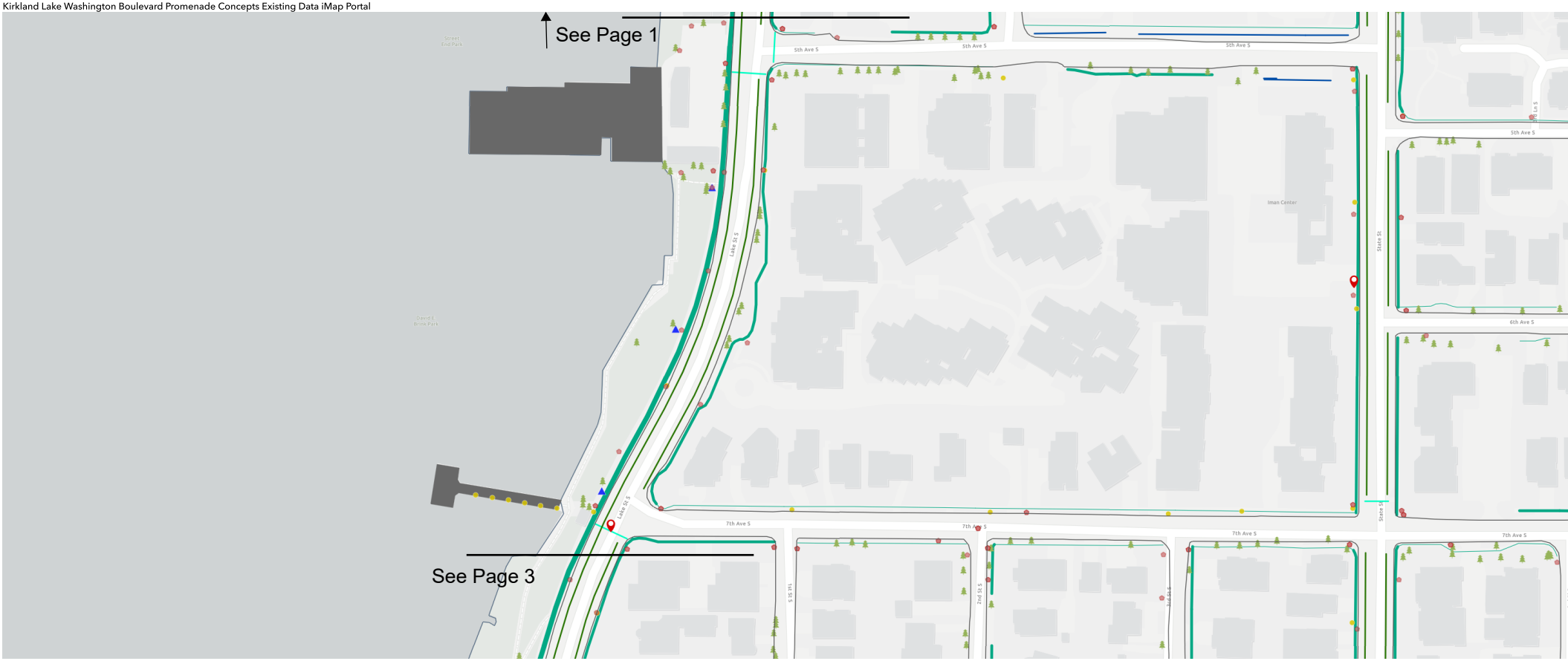
< 0

Base Data

Docks

Parking Lots

Shoreline



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- Pavement Edges Clip

Lights and Signs
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- Street Signs
- Street Lights

Environment
- Trees
- Park Amenities

Ped / Bike Network
- Bike / Shared Use Inventory
- Crosswalks
- Sidewalks

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Base Data
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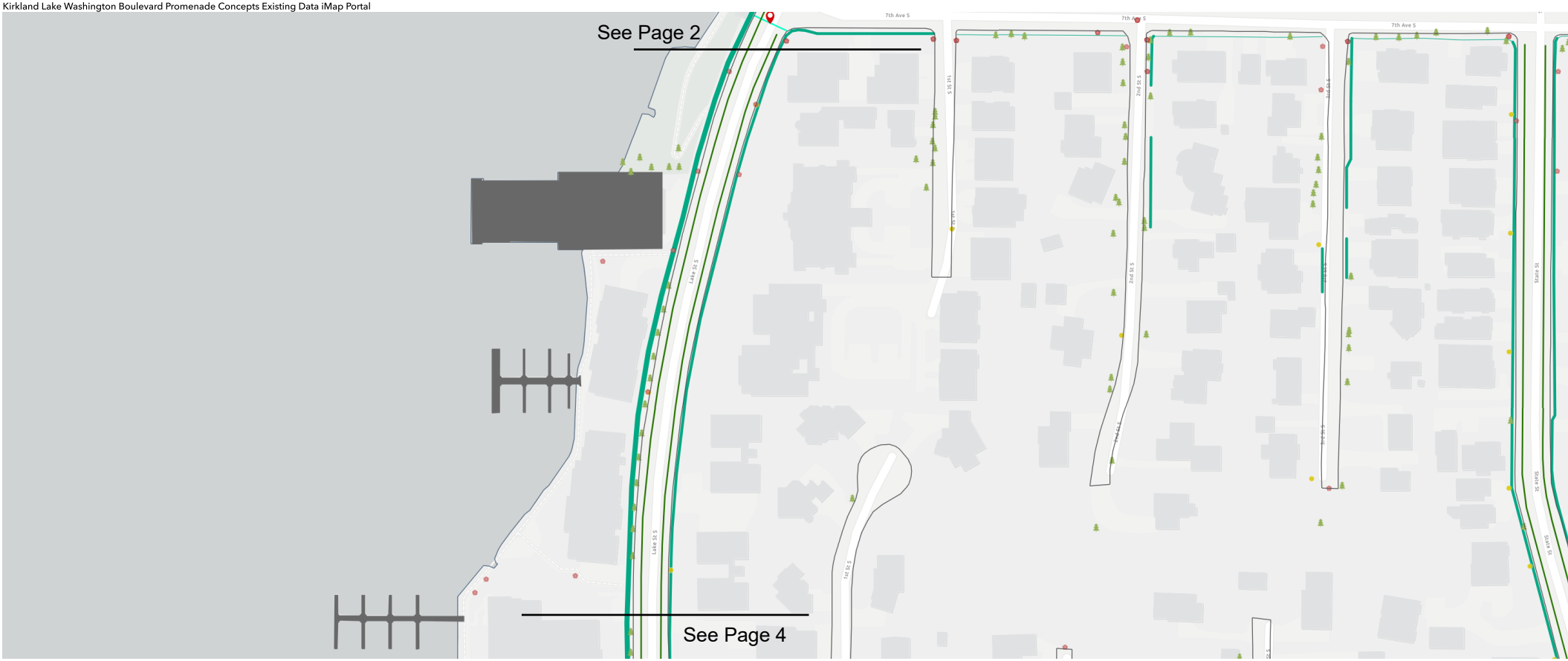
- Parking Lots
- Shoreline



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Street attributes

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Pavement Edges Clip

Lights and Signs

Traffic Signals

Street Signs

Street Lights

Environment

Trees

Park Amenities

Ped / Bike Network

Bike / Shared Use Inventory

Crosswalks

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Base Data

Docks

Parking Lots

Shoreline

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Street attributes
- Regulated Street Parking
- Pavement Edges Clip

Lights and Signs
- Traffic Signals
- Street Signs
- Street Lights

Environment
- Trees
- Park Amenities

Ped / Bike Network
- Bike / Shared Use Inventory
- Crosswalks
- Sidewalks

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Base Data
- Docks
- Parking Lots
- Shoreline

See Page 4

See Page 6

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Street attributes

Regulated Street Parking

Pavement Edges Clip

Lights and Signs

Traffic Signals

Street Signs

Street Lights

Environment

Trees

Park Amenities

Ped / Bike Network

Bike / Shared Use Inventory

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Sidewalks

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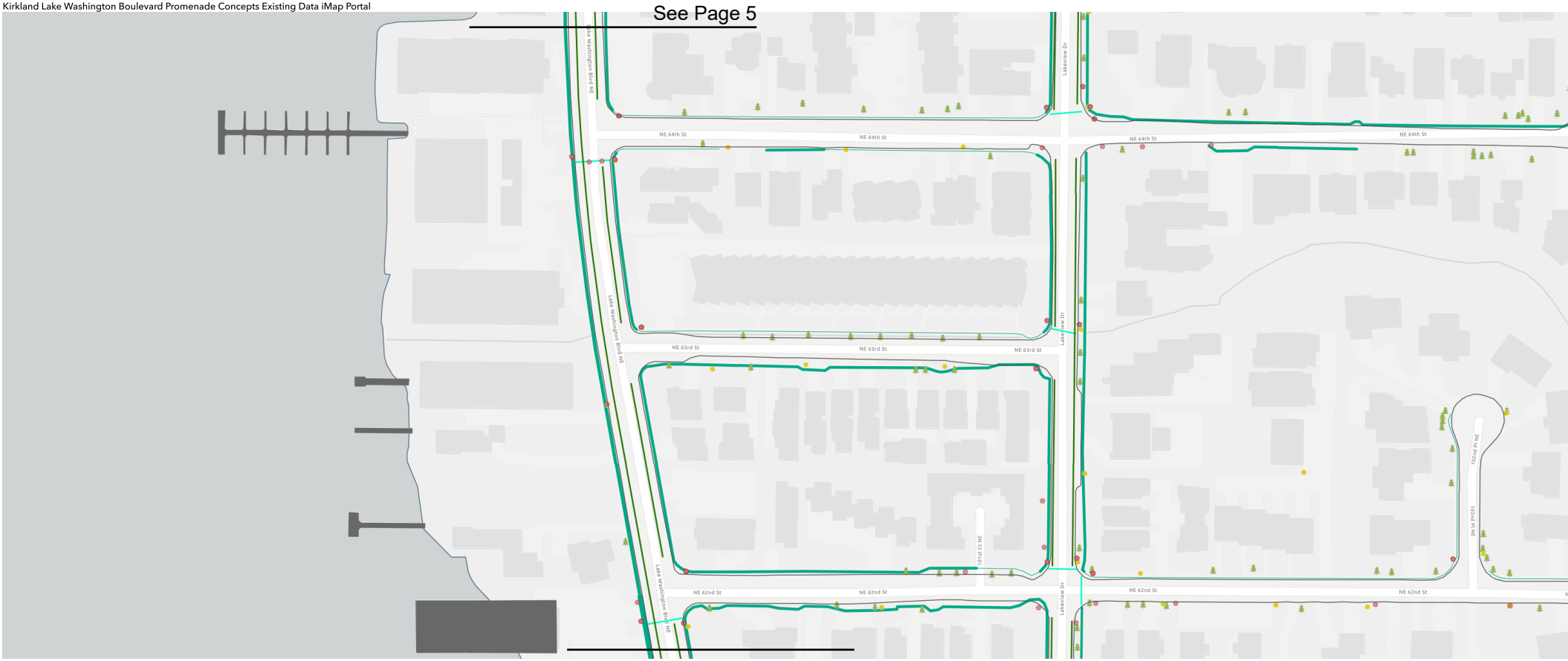
Base Data

Docks

Parking Lots

Shoreline

See Page 5



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- Street Signs
- Street Lights

Environment
- Trees
- Park Amenities

Ped / Bike Network
- Bike / Shared Use Inventory
- Crosswalks
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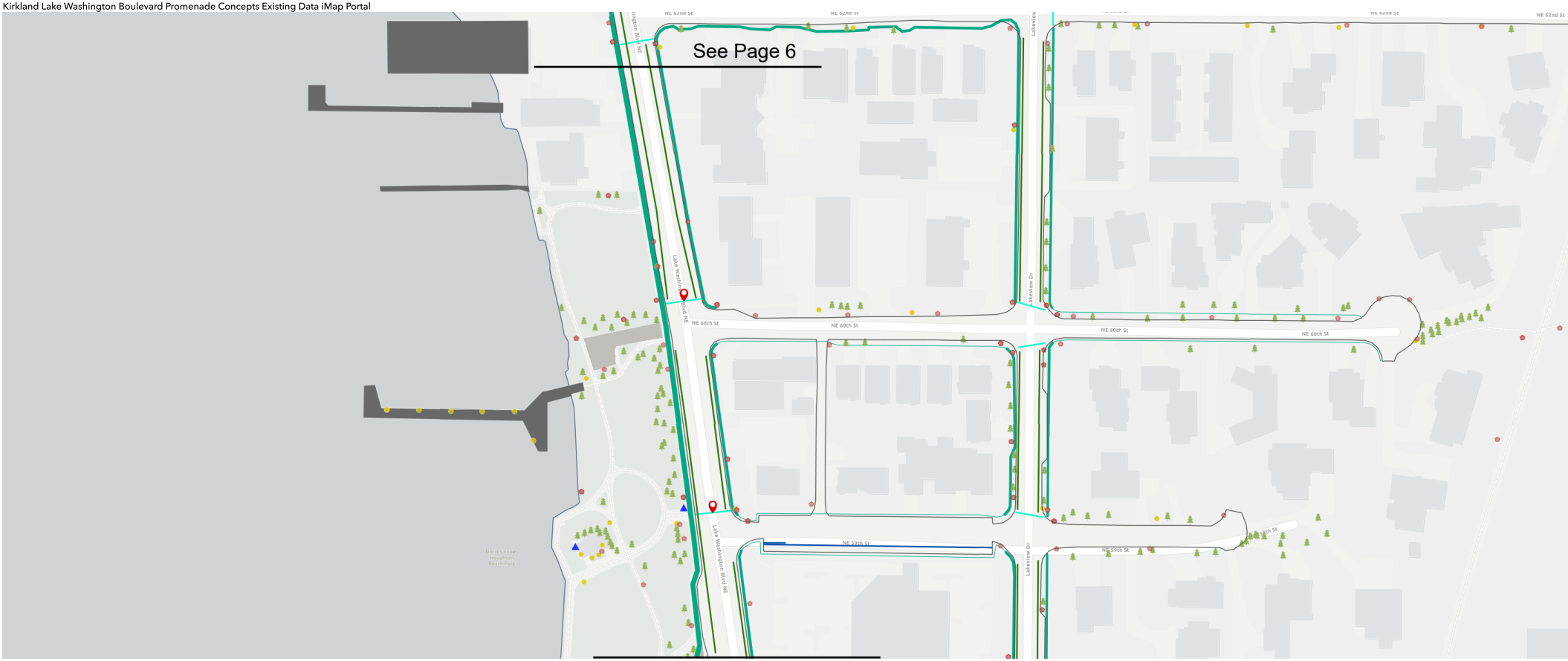
Base Data
- Docks
- Parking Lots
- Shoreline



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Lights and Signs

Traffic Signals

Street Signs

Street Lights

Environment

Trees

Park Amenities

Ped / Bike Network

Bike / Shared Use Inventory

Crosswalks

Sidewalks

WIDTH

> 20

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Base Data

Docks

Parking Lots

Shoreline

60 ft

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Street Signs

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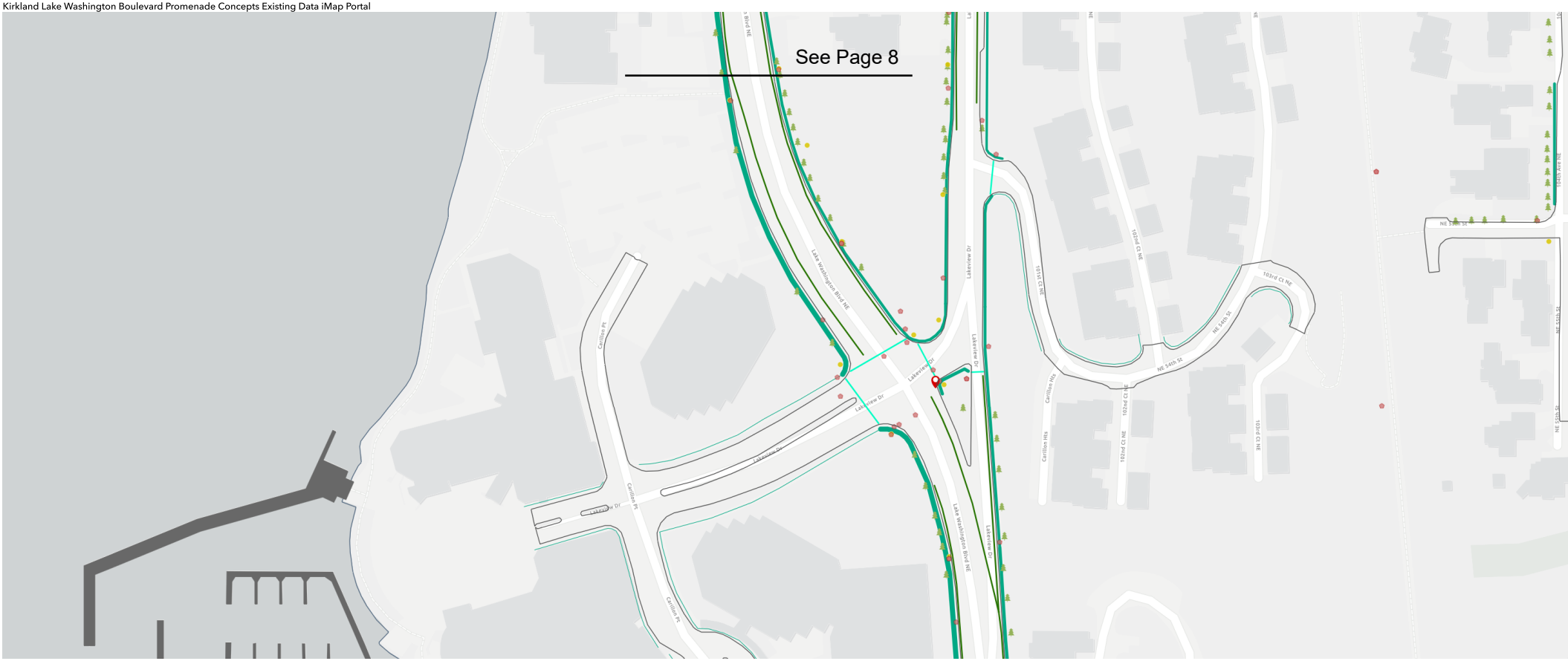
Base Data

Docks

Parking Lots

Shoreline



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Street attributes

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Lights and Signs

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Shoreline