

MEMORANDUM

To: Transportation Commission

From: Joel Pfundt, AICP CTP, Transportation Manager

Victoria Kovacs, AICP, Transportation Planner Brett Schock, PE, AICP, RSP2i, Transpo Group

Date: December 8, 2022

Subject: Lake Street S/Lake Washington Boulevard NE Promenade Analysis and Concept

Development Study Update

I. **RECOMMENDATION:**

It is recommended the Transportation Commission receive a second update on the Lake Street S/Lake Washington Boulevard NE Promenade Analysis and Concept Development Study. Staff and Consultant Transpo Group seek input from the Commission on the evaluation of design options, and any other design commentary prior to presenting to City Council in early 2023.

II. BACKGROUND AND EXISTING CONDITIONS:

Detailed background and information on existing conditions were presented to Transportation Commission at the <u>September 28, 2022 meeting</u>. The following is a brief summary for context of the evaluation of alternatives.

A. Background

Lake Street South/Lake Washington Boulevard NE is a key multimodal corridor connecting downtown Kirkland south to Bellevue and SR 520. Since 2014 there has been expressed public interest and Council discussion of a Promenade along Lake Washington Boulevard given its popularity as a scenic walk and bicycle route for people from Kirkland and throughout the region. The current 2035 Transportation Master Plan, adopted in 2015, explicitly identifies the need for a planning study of a potential lake front Promenade.

During the height of the COVID-19 pandemic, there was renewed consideration of widening the pedestrian space on the corridor by means of a pilot parking lane closure to provide added walking space for both social distancing and to inform a potential permanent Promenade. However, given the cost of the temporary installation and Council need for fuller understanding of baseline safety concerns, bicycle and pedestrian use, and parking utilization, the pilot was not pursued. Instead, in June 2021 Council authorized 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. Information developed through this study will inform a Council decision of how to proceed with the Promenade concept along the Lake Washington waterfront.

B. Existing Conditions

Lake Street S/Lake Washington Boulevard NE has a diverse mix of users of all modes. The corridor is frequented by pedestrians and cyclists ranging among all ages, abilities, and confidence levels for both local and regional trips. 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. Vehicle volumes vary from an average 5,000 vehicles per day on the north end of the corridor to 15,000 vehicles per day near the intersection with Lakeview Drive.

The existing curb to curb pavement is typically 44 feet wide, with two parking lanes, two vehicle lanes (one in each direction) and two bike lanes. Sidewalks are present on both sides of the roadway. There are 10 unsignalized marked crossings in the corridor, three with RRFBs and all others with warning signs and pedestrian carried flags offered for visibility. Street trees are present in varied locations, some near the curb line and others nearer the back of walkway at the property line. The right of way in the project corridor varies, but is no less than 60 feet.

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 with public parking lots available in Marsh Park and Houghton Beach Park. Off-street parking for private properties is accessed by a combination of driveways leading to parking lots, head-in driveways, and some multi-stall carports fronting directly onto Lake Street S/Lake Washington Boulevard NE. Residential properties also utilize the curb space along Lake Washington Blvd NE for mailboxes, driveways, trash pickup, and delivery services for packages, meals, rideshare, etc.

C. Existing Illumination

Street lighting is present on both sides of the roadway; however, the existing lighting is not uniform along the corridor. A lighting study was performed to calculate the existing light levels. Two metrics were measured for this 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 safety and comfort.

Pedestrian-scale lighting is not currently present along the study portion of Lake Street S/Lake Washington Boulevard NE. Active mode facility enhancements along the corridor will present opportunities to improve both street- and pedestrian-level lighting.

Four alternatives were considered to partially or fully remedy the street and pedestrian lighting along the corridor. The first option was to bring the light levels up to current standards by removing and/or replacing luminaire poles along the corridor. This is the most costly option and is presented to baseline the number of poles that effort would require along with a planning-level conceptual cost estimate.

Additionally, three more alternatives are provided in <u>Section VII. QUICK WIN PROJECTS</u> below. These improvement opportunities can be used as a menu of options based on what funding the City may have available at the time. The details of number of poles, a graphical layout, and a planning-level conceptual cost estimate will be included in future documentation.

D. Safety Analysis

In reviewing five years of crash history in the corridor (2016-2020), the most significant risk factors for active mode crashes included:

- Crashes involving pedestrians in the dark, both with streetlights on and at dusk prior to streetlights coming on.
- Bicycle-related crashes involving eastbound vehicle turns across the bike lane from both northbound and southbound traffic.

The City has also received *Our Kirkland* service requests to improve lighting and add flashing beacons at several crosswalks in the corridor, including NE 62nd St, NE 64th St, and 10th Ave S.

E. Parking

Currently there is on-street parking on both sides of the corridor. Results from a July 2021 parking utilization study completed as part of the baseline data collection and analysis indicate there is flexibility to remove parking from one side of the corridor and still accommodate parking demand on the corridor or side streets.

III. CROSS-SECTION OPTIONS

The project team considered a wide range of feasible sections to improve the comfort of walking, cycling, and rolling in the Lake Washington Boulevard corridor. 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. Five categories of cross section were considered and presented to the Transportation Commission at their September 28, 2022 meeting. The five categories of cross section were:

- 1. Multi-Use Path
- 2. West Side Parking, Protected Bike Lanes
- 3. East Side Parking, Protected Bike Lanes
- 4. Median Separated Protected Bike Lanes
- 5. One-Way Protected Bike Lanes

IV. CORRIDOR ALTERNATIVES

Using the feedback from Transportation Commission, the cross-section options were advanced to four corridor-length alternatives. The options, as described, could largely be realized as both near term interim projects, as well as through longer term full reconstruction projects. 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.

A. Options 1 and 2 – Two-Way Protected Bike Lanes

The first two options apply a two-way protected bike lane to the west side of the roadway with a protective buffer between vehicle spaces and active mode spaces. Option 1, see Figure 1, retains on-street parking on the <u>east side</u> of the corridor. Option 2, see Figure 2, retains on-street parking on the <u>west side</u> of the corridor. The width of the buffer is a minimum of 5 feet, which allows a 10ft wide two-way protected bike lane (5ft in each direction).

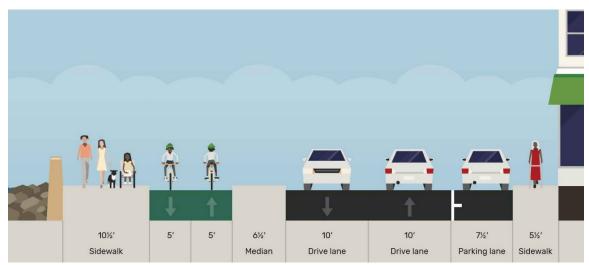


Figure 1 Typical Option 1 Cross Section – Two-Way Protected Bike Lane, <u>East Side</u>

<u>Parking</u>



Figure 2 Typical Option 2 Cross Section – Two-Way Protected Bike Lane, <u>West Side</u>
Parking

The two-way protected bike lanes would extend from the scramble intersection of Lake Street S 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 by enhancing the existing crossing with an RRFB with pavement markings and signage to highlight the presence of bikes. In Option 1, a curb extension with a bike ramp would allow northbound cyclists who are not comfortable with occupying the vehicle travel lane to use the RRFB crossing to enter the two way protected bike lane facility on the west side.

For near-term implementation, the buffer and bike lanes for Options 1 and 2 could be striped at roadway grade, and no extensive changes would be required to the existing curb lines. One curb bulb out in the northern part of the corridor, just north of 2nd Avenue S, would need to be

removed in Option 1 to accommodate a continuous two-way protected bike facility. Also, some spot repairs of damaged curb could be completed. The buffer would need to be reinforced with physical barriers, and there are several options that could be selected based on the City's preferences and available resources, see Appendix B. Options 1 and 2 would allow the existing street trees to remain in their current locations, and do not preclude repairs to the existing sidewalks.

B. Option 3 – One-Way Protected Bike Lanes

The third option adds buffers to the existing bike lanes, and relocates the northbound bike lane behind a "floating" parking lane on the east side of the roadway. Option 3, see Figure 3, would not make any changes to the existing curb lines or sidewalks. The removal of the west side parking lane provides space for a 2 foot buffer between the southbound bike lane and the southbound vehicle lane, and a $4 \frac{1}{2}$ foot buffer on the east side between the on-street parking and the northbound bike lane. The wider buffer on the northbound bike lane is to allow passenger side loading and door opening from vehicles parked on Lake Washington Boulevard.

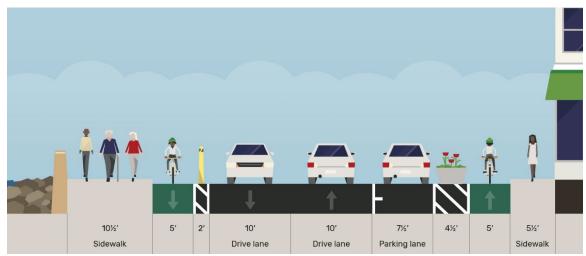


Figure 3 Typical Option 3 Cross Section – One-Way Protected Bike Lanes

Option 3 also has an added benefit of improving pedestrian crossings in the corridor, as the onstreet parking space allows for a refuge island to be added to existing crossings. The refuge island would shorten the roadway crossing and allow pedestrians to cross the northbound bike lane and wait on the island separately from crossing the vehicle travel lanes and southbound bike lane.

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

Option 3 was evaluated with on-street parking retained on the east side of the corridor, as only the number of available spaces would differ with parking on the west, resulting in minimal change in the final evaluation scoring. It is estimated that maintaining parking on the east side results in about 20 more spaces being available than providing parking on the west side.

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C. Option 4 – Shared-Use Path

Option 4, see Figure 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. 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 feasible given safety and accessibility limitations.

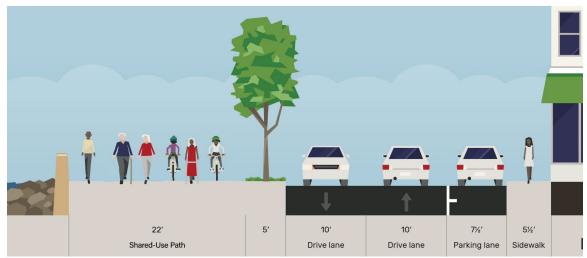


Figure 4 Option 4 Typical Cross Section – Shared-Use Path

Several other considerations for Option 4 include:

- All existing street trees would need to be removed to accommodate the new section.
 Street trees could be replanted and replaced, but the existing mature trees would all 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
 delineated as this would be similar to options 1 or 2 with an elevated, rather than
 roadway grade section. 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.

Option 4 was only evaluated with on-street parking retained on the east side of the corridor, as only the number of available spaces would differ with parking on the west, resulting in minimal change in the final evaluation scoring.

V. CROSSING IMPROVEMENTS

Improving the existing crossings is a measure that can be implemented with any of the four corridor-length options. The following treatments are recommended at all of the 10 existing unsignalized marked crossings:

- 2nd Avenue S (north side)
- 5th Avenue S (south side)
- 7th Avenue S (south side)

- 10th Avenue S (south side)
- Marsh Park midblock
- NE 64th Street (south side)
- NE 62nd Street (south side)
- NE 60th Street (north side)
- NE 59th Street (north side)
- NE 58th Street (south side)

Of the ten crossings in the corridor, based on a combination of the crash history and adjacent land uses, the crossings at 2nd Avenue S, 10th Avenue S and NE 59th Street are a higher priority to receive improvements. Other crossing improvements can be phased in as resources allow.

A. 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 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.

B. 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, is recommended at all crossings in the corridor.

C. High Visibility Markings Renewal

Refreshing of all existing crossing markings with high visibility, high reflectivity thermoplastic 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 markings, increasing the width of the crossing to accommodate both cyclists and pedestrians.

D. Curb Extensions

Curb extensions can be provided at all crossings to shorten crossing distances and reduce exposure time to traffic lanes. Curb extensions provide pedestrian refuge in between crossing bike facilities and crossing vehicle lanes, and reinforce parking restrictions near to crossings.

Curb extensions can be created using 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 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.

At NE 59th Street, Option 1 and 2 include a curb extension with a bike access ramp designed to prompt northbound cyclists to slow speeds and use the crossing if they intend on continuing north in the designated bike facility. The curb extension would not prevent cyclists from moving into the travel lane and sharing the space with vehicles, if a confident cyclists chose to not use the protected bike lanes.

VI. <u>EVALUATION OF SECTION OPTIONS</u>

Based on feedback from the Transportation Commission on September 28, 2022, and discussion with City staff, each of the concepts were evaluated for advantages in the following categories:

- 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
- Minimize reduction in on-street parking
- Potential for stormwater improvements
- Relative implementation cost

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 this 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 results of the evaluation in the choose by advantages matrix format are included in Attachment A. A detailed explanation the criteria and the rationale for the scoring of each alternative are included in Attachment D.

A. Screening Criteria

Several evaluation criteria did not provide a meaningful differentiation between the alternatives, but were important factors that would be required of any alternative prior to being advanced to the final evaluation stage. The criteria that were met by all alternatives are therefore considered screening criteria, rather than evaluation criteria. The screening criteria include:

• **Traffic calming via visual narrowing** – all of the alternatives will perform similarly for this criterion, therefore it does not provide a differentiating evaluation

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- Physical separation between active modes and travel lanes all of the
 alternatives will have some physical separation between active modes and traffic. The
 effects of this criterion can also be wrapped into the safety and comfort rating of the
 facility.
- Addressing existing hardscape damage all of the alternatives will offer equal opportunities to address existing damage to sidewalk panels and curbing throughout the corridor.
- Accommodation of existing and reasonably anticipated utilities all of the alternatives accommodate existing electrical, water and sewer utilities. The replacement of any aging infrastructure, including potential relocation of lines for maintenance purposes, would be addressed during the engineering design phase.

VII. EVALUATION RESULTS

The results of the evaluation are included in Attachment A. Scoring without an increased focus on the safety and comfort factors showed **Option 1** with an advantage over the other options, including the no build. 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, and the advantage in the unweighted scoring, Option 1 is the leading candidate. Option 1 represents the best balance of improvements to comfort and safety for all modes of travel, the need to maintain the corridor as an important vehicle arterial, and implementation feasibility.

VIII. QUICK WIN PROJECTS

Versions of Corridor Alternative Options 1, 2, or 3 could be implemented as part of a relatively low-cost project and would take one to two years to implement once funding is allocated and available. This type of quick win project would include:

- Restripe the corridor to allocate more space to people walking, biking and rolling by removing on-street parking from one side of the corridor
- 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:
 - o 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.

IX. FUTURE PHASING

The design of the quick win options is intended to be compatible with future conversion to a more upgraded facility as City 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.

X. NEXT STEPS:

The feedback from the Transportation Commission will be incorporated into the final analysis and evaluation of options prior to presentation to City Council in early 2023.

Attachments:

- A. Choose By Advantages: Corridor Options
- B. Promenade Concept Detailed Descriptions
- C. Promenade Concept Rollplots
- D. Evaluation Criteria Details

LAKE WASHINGTON BOULEVARD PROMENADE CHOOSE BY ADVANTAGES: CORRIDOR OPTIONS

	CORRIDOR OPTIONS				
EVALUATION CRITERIA	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

Attachment B Promenade Concept Detailed Descriptions

I. 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, see Figure B-1, the treatment of the buffer space will need to be context specific to minimize conflicts between active modes and drivers.



Figure B-1 Off-street parking at right of way line near 5th Avenue S

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 two-way pedestrian traffic on the sidewalks, bicycle traffic in the bike lanes, and then the vehicle traffic on Lake Washington Boulevard. 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. 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. 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. By separating the movements, and delineating the conflict zones, the risk for crashes is reduced. Figure B-2, illustrates this concept for the two-way protected bike lane configuration.

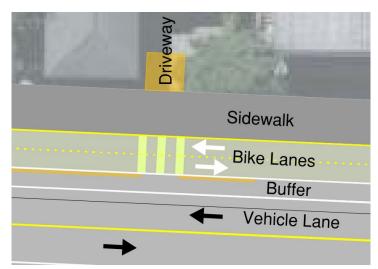


Figure B-2 Schematic Diagram of Driveway Conflict Zone

II. 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 damaged 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.



Figure B-3 Vertical Posts

• 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.



Figure B-4 Wave Delineators

• 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 additional resources would need to be identified to maintain new planter boxes. Planter boxes can be selected to be compliant with clear zone requirements for breakaway. 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 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.



Figure B-5 Planter Boxes

• Concrete curbing – curbing can be used to reinforce the buffer. The City uses 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. Curbing, especially in a wider buffer, can last many years with minimal maintenance outside of regular paint refreshing.



Figure B-6 Concrete Curbing

In the future, as resources allow, it is anticipated that the City would upgrade any onstreet 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.

III. 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.



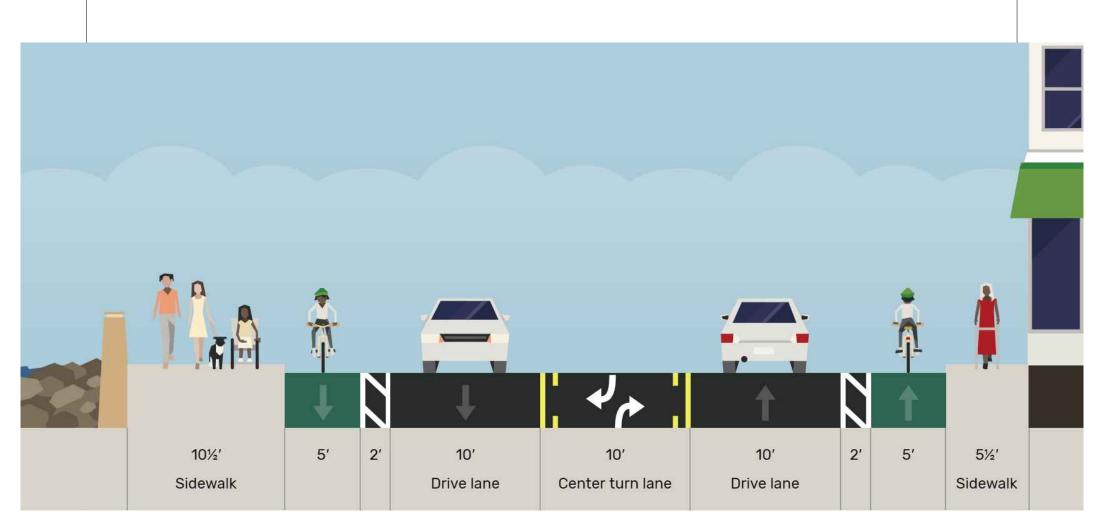
Figure B-8 Buffer Physical Barrier for Turn Lane

IV. 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 Lake Washington Boulevard extends further north to the intersection with Kirkland Avenue. This approach was also applied to Options 2 and 4. 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 spring 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 streets Lakeshore Plaza and Kirkland Avenue. This route would allow cyclists of all ability and comfort levels to avoid mixed traffic with heavy vehicle volumes through downtown Kirkland.

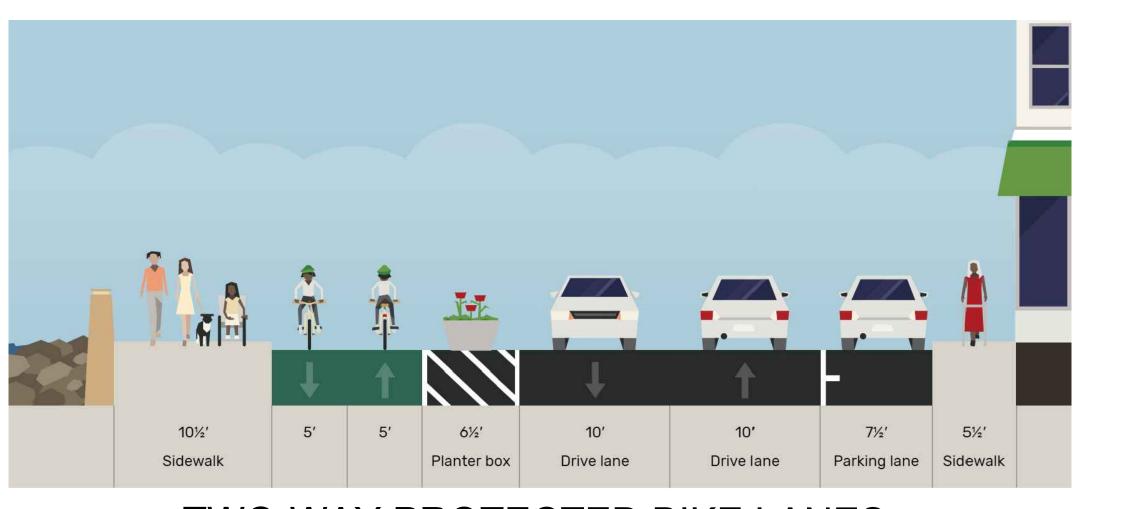
Extending the northern tie in of the two-way bike facility to Kirkland Avenue will require removal of on-street parking along Lake Street between 2nd Avenue S and Kirkland Avenue, and modification of the existing curb extensions. The removal of parking and continuation of the presence of loading zones 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 is beyond the scope of the Promenade study.





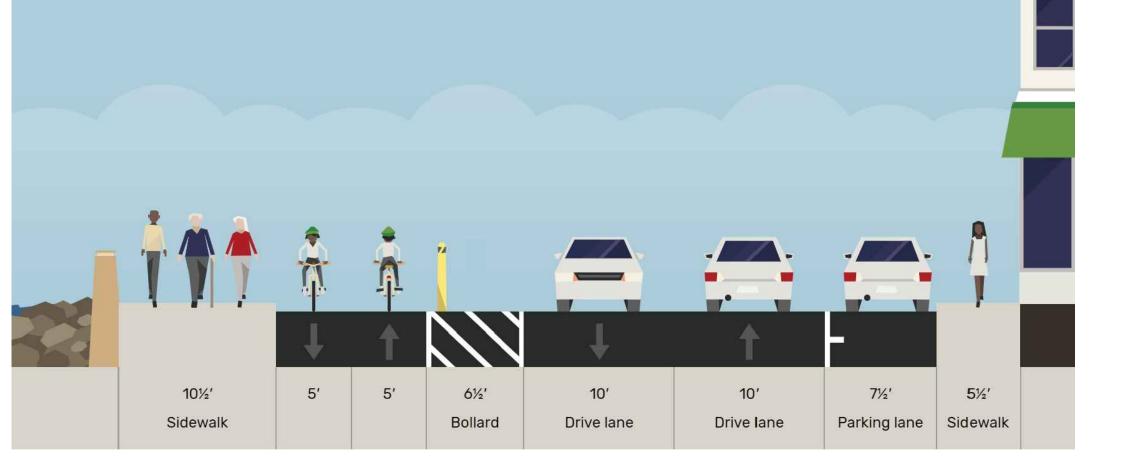
ONE-WAY BIKE LANES

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

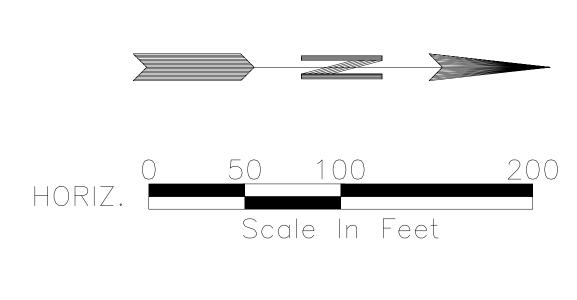
10TH AVENUE TO MARSH PARK

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

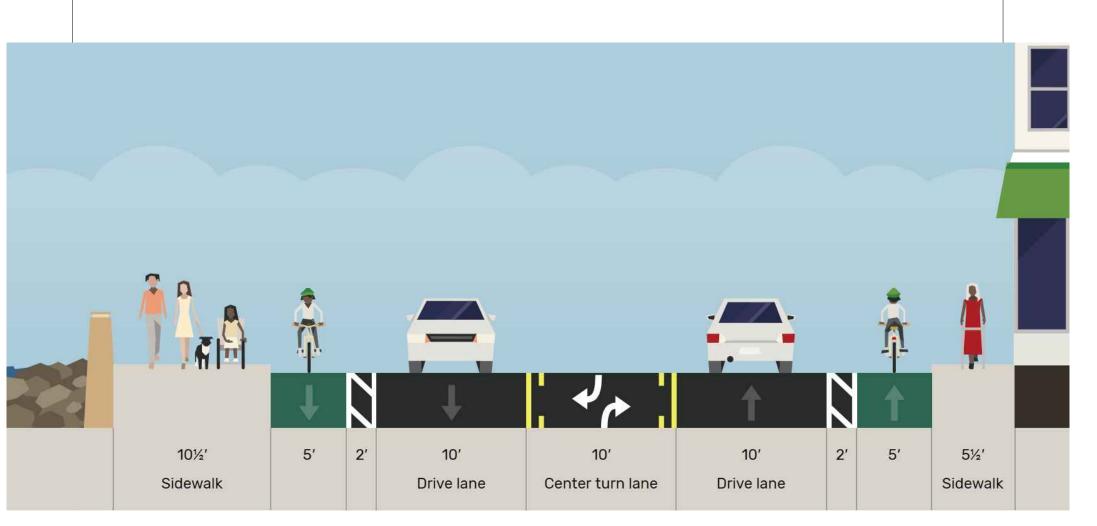
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WHAT TRANSPORTATION CAN BE.

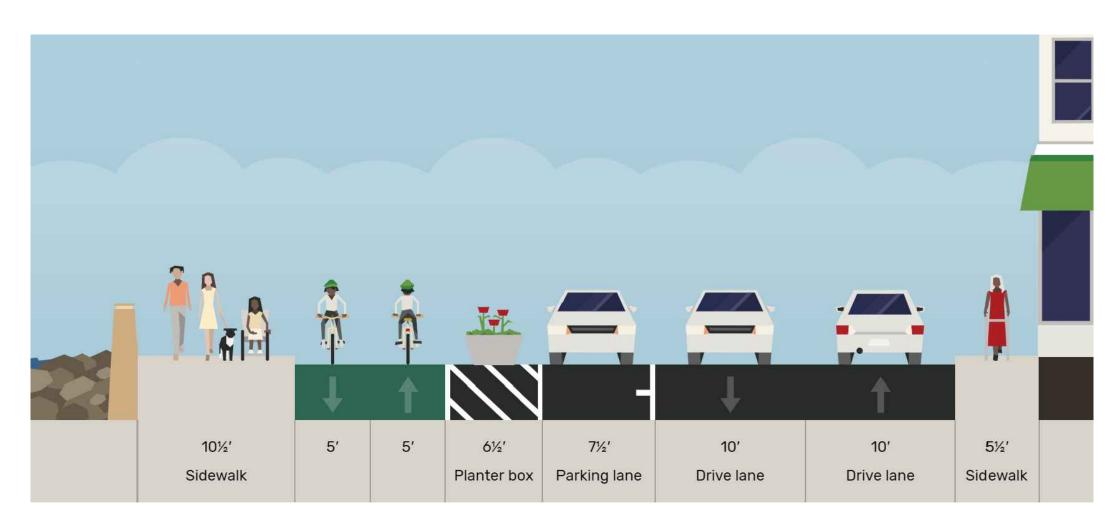






ONE-WAY BIKE LANES

NE 59TH STREET TO LAKEVIEW DRIVE



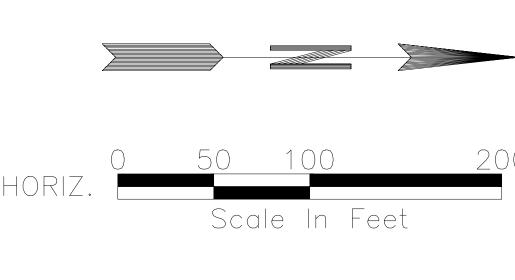
TWO-WAY PROTECTED BIKE LANES

NE 59TH STREET TO LAKEVIEW DRIVE

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

December 14, 2022

transpogroup 77

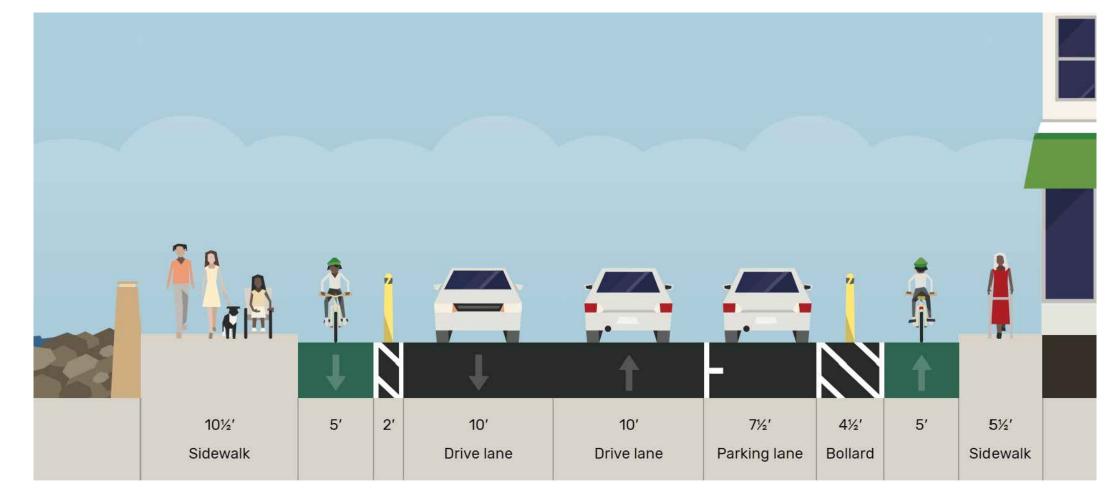






ONE-WAY BIKE LANES

NE 59TH STREET TO LAKEVIEW DRIVE



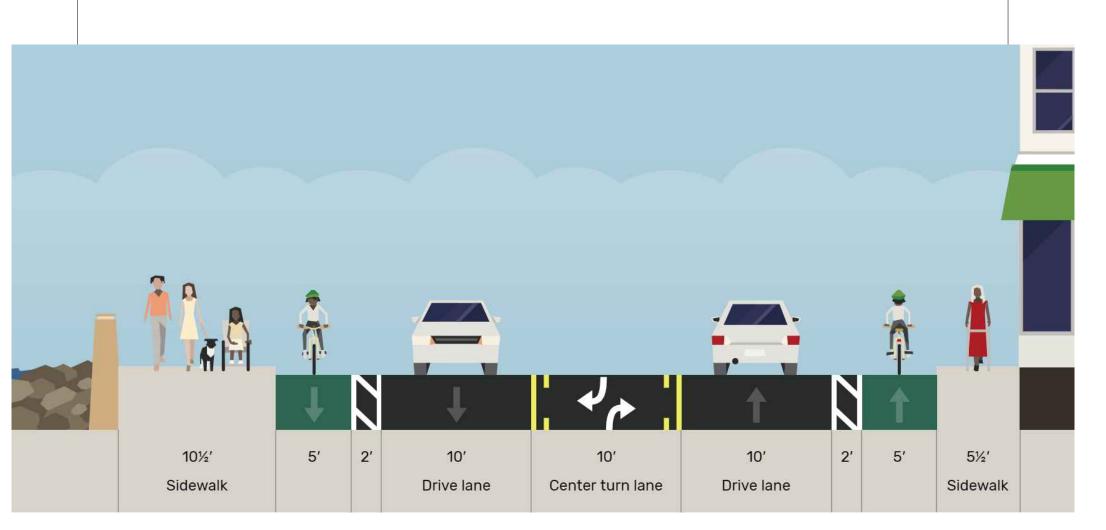
ONE-WAY PROTECTED BIKE LANES
KIRKLAND AVENUE S TO NE 59TH STREET

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

December 14, 2022

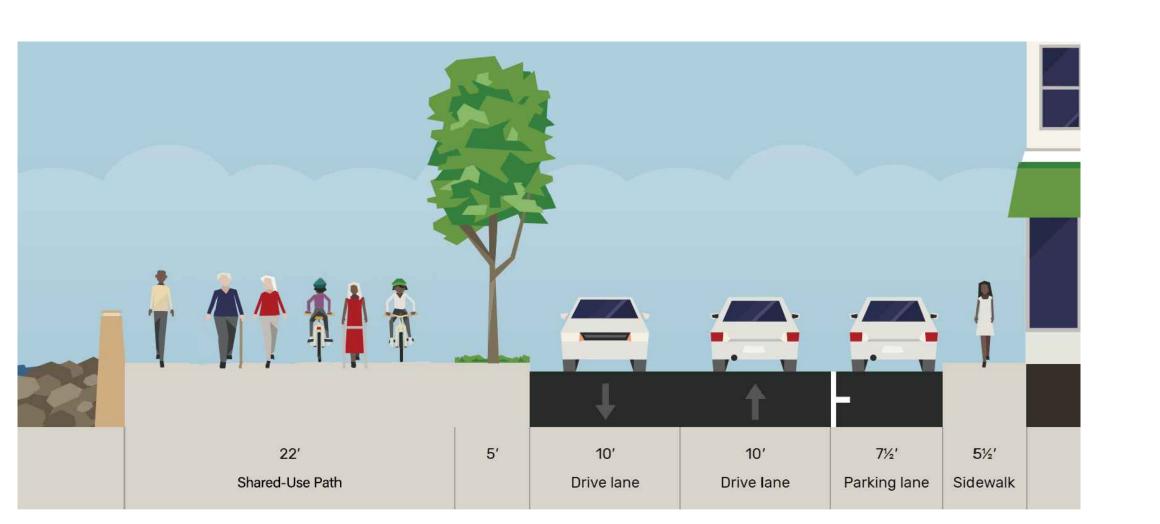
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ONE-WAY BIKE LANES

NE 59TH STREET TO LAKEVIEW DRIVE

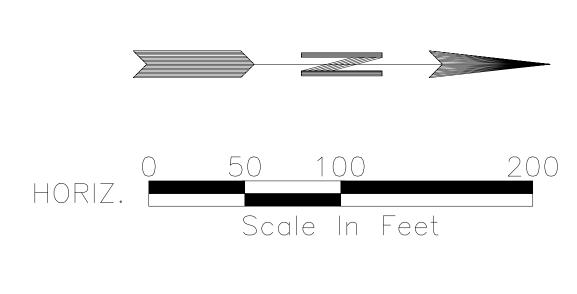


KIRKLAND AVENUE S TO NE 59TH STREET

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

December 14, 2022

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Attachment D Evaluation Criteria Details

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.

1. 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 and physical relocation that eliminates 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.

2. Improve level of traffic stress for cyclists/pedestrians

Evaluating how the widening of existing active mode facilities and increasing the separation distance to vehicle travel lanes will reduce the level of traffic stress experienced by cyclists and by pedestrians, as separate 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. A detailed level of traffic stress needs to be identified to differentiate between the alternatives, which is more difficult to quantify.

The detailed level of stress includes considerations such as consideration of driveways, crosswalks and other mixed traffic. 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.

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 for the shared use path, which fully separates uses, creates an intuitive two-lane facility for drivers and eliminates any confusion about available curb space, designated parking areas compared to bike or buffer areas, etc. The no build and one-way protected bike lane options also have 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.

4. 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 ½ 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.

5. Phasing potential for "quick win" project elements

Quick win projects are improvements that can be made with minimal engineering design and typically within existing City funds. 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.

6. Accommodation of mailboxes, trash pickup and short driveways

Residential properties on both sides of the corridor, especially single-family, but some multi-family as well, will require continued curbside access for individual trash and recycle can pickup, 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, to ensure visibility for active modes and drivers and to, as much as possible, limit conflicts for active modes and drivers accessing short driveways.

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.

7. 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 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.

8. 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 in the throat of driveways or intersecting roadways, 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 between 2nd Avenue S and Lakeview Drive 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.

9. Potential for stormwater improvements

Feedback gathered from the City of Kirkland's stormwater staff have identified the long-term buildout of the Lake Washington Boulevard promenade as an opportunity to replace the existing catch basins with treatment-included structures, filterras, buffer strip rain gardens and stormwater conveyance trunk lines. Recent changes and updates to water quality permitting requirements will necessitate the upgrading and updating of the treatment of all paved surfaces in the Lake Washington Boulevard corridor, including those dedicated to bikes.

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.

10. Relative implementation cost

The project team determined, at a planning level, the relative cost of each alternative based on the amount of hardscape (new curbing, new concrete sidewalk, etc.) and associated construction costs would be required to implement. 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.