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Appendix A: Technical Advisory Committee Meeting Notes

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Technical Advisory Committee

Meeting 1
6/20/2017

Introductions Kathy Leotta, Sound Transit Maan Sidhu, WSDOT Mike Galizio, WSDOT Kris Overleese, City of Kenmore Public Works Dongho Chang, City of Seattle Jamas Gwilliam, Merlone Geier (Owner of Town Center) Kendra Dedinsky, City of Shoreline Pete Rose, City of Lake Forest Park Neil Jensen, City of Lake Forest Park Kendra Breiland, Fehr & Peers Carmen Kwan, Fehr & Peers Marcia Wagoner, 3 Square Blocks Anna Snyder Kelly, 3 Square Blocks	**All**
Opening Remarks City's top priorities: • Get people to light rail without a single occupancy vehicle. • Get people to the potential park & ride lot on SR 522. • Provide pedestrian access along SR 522. • Get ahead of and plan for the transportation funding that is coming to Lake Forest Park.	**Pete Rose**
Project Overview (see attached PowerPoint) • Goals: Complete & multi-modal connections, Supported by the community, Realistic and implementable. • Engineering considerations for SR 104 and SR5 22 include ROW constraints, sight distance issues, skewed intersections, maintenance, etc. • Identify non-motorized access to transit projects on local streets. • Need solutions for traffic congestion. Traffic 10% increase on local roads from toll avoidance. • Outcomes: Separate corridor plans with preferred cross sections, SR 522 / SR 523 intersection concept, and study intersection layouts along SR 104. Also identification of key non-motorized access to transit opportunities.	**Kendra Breiland** **Carmen Kwan**

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• Stakeholder interviews over the next 6 weeks to identify various interests and corridor challenges/opportunities.	
Role of Technical Advisory Committee (TAC) Provide guidance and technical review of concepts and options developed by the consultant team. **TAC Member Interests:** <u>Kendra Dedinsky, Shoreline</u> • Move people to access transit, especially future light rail stations. • Address cut through traffic concerns. • 523/522 - ROW constrained. Pedestrian facilities important. Multiple ownerships on 145th adds complications. • Refer to Shoreline 145th Corridor plan. Documents are online. <u>Dongho Chang, Seattle</u> • SR 522 / 523 area does not have great pedestrian connectivity; ped crossings are unpleasant. • Need to consider mobility needs of sensitive populations and local residents along with serving regional mobility needs. o Consider speaking to Lighthouse for the Blind organization. • Most important mode= people (walking), most efficient mode= transit. • Signal design and ITS are likely best opportunities to optimize complex transit/general purpose traffic operations. <u>Mike Galizio, WSDOT - Transportation Planner</u> • PSRC Transportation 2040 includes an unfunded project on Ballenger Way (SR 104 between SR 522 and 178th). The project is currently undefined with a generic project description. This study could help define the project. • Burke-Gilman trail is busy with people waiting in crowds to access it by crossing SR 522. Consider over or under crossing? • The title "Safe Highways" makes this sound like just a safety study. Consider project name or tagline that reflects a multi-modal corridor plan to avoid confusion and make this project more competitive for funding. <u>Jamas Gwilliam, Merlone Geier / Town Center</u> • Feels that people use town center parking lot as a park & ride already. • Interested in how future transit service can reinvigorate the Town Center. • Wants a potential park & ride in Town Center to be sized appropriately with forecasted BRT ridership in mind.	**Marcia Wagoner, all**

- Potentially explore alternative last-mile options to avoid drive alone such as local shuttle system. Explore KCM Community Connections pilot studies.
- Are there other motorized last-mile options available?

Kris Overleese, Kenmore

- Transit speed and reliability along the corridor and accessing light rail is the primary concern of Kenmore.
- Concerned about safety improvements (ped/bike, autos). Need to balance ped/bike safety while adding BAT lanes.
- Completing the BAT lanes in Kenmore resulted in large decrease in collisions on corridor.
- Kenmore has two potential locations for ST3 park & ride lots – expand existing lot at 73rd or at Lakepoint where a major redevelopment is planned.
- Some access to transit options with KCM is vanpool to park & ride. Piloting a school pool program as well.

Kathy Leotta, Sound Transit

- Impressed with how Northshore communities came together for ST3, this study will be helpful and informative for ST 522 BRT study starting early 2018. BRT should begin service in 2024.
- Tough to complete BAT lanes due to topography. Interested to hear preferred concept and layout from community.
- ST3 will add 3 parking garages along 522 corridor. Exact locations and BRT stations have not been finalized.
- There are some ST3 funds for non-motorized safe access to station projects.
- This project is a part of the ST3's larger BRT program, which will include I-405 BRT. BRT program includes common elements: branding, vehicle procurement, maintenance base, and a connection in Bothell.

Maan Sidhu, WSDOT

- There are a number of opportunities to benefit from low cost improvements, including signal timing, which could be implemented relatively quickly.
- WSDOT welcomes prioritized concepts for SR 104.
- Tolling has not changed travel patterns permanently: people return to tolled roads because it provides travel time & reliability.
- WSDOT encourages the holistic/multimodal approach to planning. A new active transportation division began.

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<u>King County Metro (not present but provided information during interview)</u> • Support completion of BAT lanes for transit speed and reliability. • SR 522/ SR 523 is a very complicated intersection. Regional travel and transit travel north/south and east/west to LRT station heavily influenced by operations here. • Concerned about safety – for transit operations and ped/bike connections to transit stops.	
Guiding Principles/notes Draft project guiding principles have been developed. Draft was sent out to committee. These will help prioritize potential improvements developed throughout project. • One comment is Safety & Mobility are interrelated. Consider including this in project title/language.	**Kendra Breiland**
Next Steps • Meeting information will be sent out one week prior to each TAC meeting. • Next two TAC meetings (early and mid-September) will focus on one corridor. • Another two TAC meetings (mid and late October) will focus on the other corridor. • A final wrap-up TAC meeting will occur in early December.	**Kendra Breiland**

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Technical Advisory Committee

Meeting 2
9/20/2017

Introductions *TAC Members:* Thomas Noyes, WSDOT John Vicente, City of Kenmore Jesse Birchman, City of Mountlake Terrace Jamas Gwilliam, Merlone Geier Kendra Dedinsky, City of Shoreline Luka Ukrainczyk, KC Metro Kathy Leotta, Sound Transit	*City Staff & Consulting Team:* Pete Rose, City of Lake Forest Park Neil Jensen, City of Lake Forest Park Kendra Breiland, Fehr & Peers Carmen Kwan, Fehr & Peers Don Samdahl, Fehr & Peers Kurt Ahrensfeld, Perteet Marcia Wagoner, 3 Square Blocks Rebecca Fornaby, 3 Square Blocks	**All**
Project background (see attached PowerPoint) • Goal: Corridor plans for SR 104 and SR 522 • Interview findings and Planning Context Report have both been shared with TAC members and are available on project website • Public Open Houses will be held on 10/18 (SR 104) and 11/14 (SR 522) • Focus of today's meeting is gathering feedback on SR 104 cross-section options; focus of next meeting on 10/4 will be on SR 104 intersection options		**Kendra Breiland**
Background on SR 104 (see attached PowerPoint) • Link between many communities • Generally a winding, tree-lined corridor with one lane in each direction • Highest traffic volume, congestion, and collisions are near SR 522 • Route is surrounded primarily by single family homes with some retail, and zoning is not expected to change • Single family homes have direct driveway access on SR 104; shoulder of SR 104 is used for garbage collection, mail delivery, and other similar uses • Pedestrian amenities are extremely limited along parts of SR 104; some transit stops only have a paved shoulder • Most transit boardings are at Town Center		**Carmen Kwan**

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Option 1: Buffered bike lanes with sidewalks • Need to know which type of cyclists we want to serve; informs the type of facility proposed, i.e. recreational or commuter cyclist. • Consider cyclists' access to Town Center, Burke-Gilman Trail, and regional connectivity (Mountlake Terrace Transit Center, Interurban Trail, etc.) • Maybe bicycle lanes connect with Mountlake Terrace to the north rather than Shoreline? • Lack of two-way left turn lane could affect transit operations and access to single family homes • Width of roadway could present safety issues for cyclists around blind turns when cars may try to pass stopped busses • Transit will need to cross into bike lane at bus stops • 11-foot lane may not be sufficient when driving around curves • Balance needs as bike lanes increase crossing distance for pedestrians, increases pedestrian exposure to vehicle conflicts, and lowers signal efficiency • Should a lower speed limit be implemented? • Consider latent demand for bike lanes • Funding will make it difficult to construct bicycle facilities all at once • Consider off-corridor cycling routes and elevation challenges, i.e. today use Perkins to Lago • Consider applying hybrid of options along the corridor • Possible resources o Barb Chamberlain at WSDOT Active Transportation Department o Kimberly Scribner, PSRC Bike Regional Plan Update o Funding through Complete Streets (use collision data when applying for funding) o Statewide bike counts **Option 2: Higher quality sidewalks with landscaped buffers** • KC Metro supports two-way left turn lane; in-lane stops are preferred • This could be a candidate for an HOV/bus-only lane—southbound SR 104 to northbound SR 522 (331, 342) • Shoreline coordinating with WSDOT to lower SR 104 speed limit in Shoreline **Option 3: Multi-use trail on one side** • 40th to 178th—access management, i.e. what's the re-route when the left turn lane is removed? What are the U-turn opportunities? • Design for all ages and abilities, especially near Town Center • On SR 522, 10-foot lanes may not be adequate	**Carmen Kwan & Marcia Wagoner**

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• Multiuse trail
  o Conflict at driveways
  o Better cyclist visibility in bike lanes than on multi-use trail. Need to balance visibility with landscape buffers.
  o Can use pavement treatments to push cyclists onto more visible side of trail
• Support for multiuse trail near Town Center and elementary school
• Consider utilities relocation
• Community has strong environmental values. Anticipates community support of a little more widening if it will provide better stormwater treatment systems
• In locations with limited right-of-way, consider removing landscape buffer. Especially if the more attractive trail is on the other side of road.
• Will this plan create new crossings? If so, crossings should be near transit stops
• Establish hierarchy of needs
• Crossing treatments should allow people to get to the wider more attractive multi-use trail facility
• WSDOT would support a hybrid between options 2 and 3; access management is a key consideration
• Possible resources
  o Martin Dedinsky, WSDOT Signal Operations Engineer
  o Shoreline-King County presentation on stormwater treatments
 	
Miscellaneous Q&A
• What does "high quality sidewalks" mean? What's the difference between 1 and 3? *Only pedestrians are being served, not cyclists.*
• What's "lesser" about sidewalks not called "high quality"? *It's not "lesser," it's just a sidewalk-only option. Option is re-titled to "Complete Sidewalks."*
• What's the most constrained right of way along the corridor? *From 35th Ave to just north of Town Center area, where it's 60 feet.*	

Next Steps • Next TAC on 10/4 • Public workshop on 10/18	**Kendra Breiland**

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Meeting 3
10/3/2017

Introductions TAC Members Maan Sidhu, WSDOT Thomas Noyes, WSDOT Jesse Birchman, City of Mountlake Terrace Tod McBryan, Merlone Geier Kendra Dedinsky, City of Shoreline Luka Ukrainczyk, KC Metro Kathy Leotta, Sound Transit Martin Dedinsky, WSDOT Staff Pete Rose, City of Lake Forest Park Neil Jensen, City of Lake Forest Park Kendra Breiland, Fehr & Peers Carmen Kwan, Fehr & Peers Marcia Wagoner, 3 Square Blocks Rebecca Fornaby, 3 Square Blocks Amanda Ruksznis, Perteet Kurt Ahrensfeld, Perteet	**All**
Meeting 2 Recap • Review of SR 104 guiding principles generated based on discussions with staff, TAC, and LFP City Council • Review of SR 104 cross-section options. What we heard: o Buffered Bicycle Lanes not desirable for KCM operations. Vehicles attempting to pull around a stopped bus is a concern from transit operations perspective. o Interest in hybrid of option 2 (complete sidewalks) and 3 (multi-use trail) o Support for multiuse trail adjacent to Town Center segment o Committee of the Whole (COW) was generally supportive, but looking to provide a cohesive bicycle network—would have to be mindful of this goal if implementing a hybrid of options 2 and 3	**Kendra Breiland**
Intersection Options **SR 104 & NE 195th Street** • Signal option o Buildable option for near term	**Amanda Ruksznis**

- Has potential to make intersection a little smaller by moving up stop bars.
- WSDOT has planned improvements for this intersection—flashing yellows

- Roundabout option
  - Walls will be expensive—if affordable, roundabout is preferable from an operations & maintenance perspective
  - Metro needs to see that this roundabout option will work well with bikes and busses
  - Additional pedestrian crossing safety needed
  - Few access impacts, but spatially a large roundabout.
  - WSDOT has resources for compact roundabouts that can be shared, however there are limitations to compact roundabouts
  - With a steady stream of traffic northbound on SR 104, will other legs experience long delays?
  - Driving speeds are a concern
  - Funding is a concern
- Other comments
  - This intersection could serve as a gateway to the City
- Summary
  - Both treatments are still being considered
  - Project Team will refine and make both designs more compact for presentation to public

SR 104 & 35th Ave NE

- Signal option
  - Lots of support for eliminating the cul-de-sac concept (in original draft) and replacing it with a SB right turn only lane
  - Channelized right has a large turning radius, should be tightened or made safer via other means
  - "Square it up" to avoid diagonal pedestrian crossings
  - Opportunity for planting, public space, art, etc.
  - Note bus stop where right turn is removed—if moved, preference is for the southeast corner
- Roundabout option
  - Parking for Lake Forest Park Market is almost completely

compromised—will that constitute a total take? There are some examples in Woodinville on SR 202 of how to use rolled curb to create parking in similar situations ○ Is there a way to eliminate a leg? ○ Explore compact roundabout option to narrow scope, cost, and impacts to business access—particularly if this intersection has lower approach speeds ○ Lifetime cost of roundabout is shorter—lower maintenance cost • Summary ○ Reduce footprint for both concepts ○ Consider four-legged roundabout ○ Consider removing cul-de-sac **SR 104 & 40th Pl NE** • Non-roundabout option ○ Metro would like to see a pedestrian crossing here due to distance from other signalized intersections; however, given the bend in the roadway sight distance could be a concern under this option. ○ Q: How many people actually use 184th? Could 184th tie into 40th Pl NE (would require a take) • Roundabout option ○ Q: What is the likelihood that drivers on eastbound SR 104 will fail to yield? Adding consecutive roundabouts through the corridor at other study intersections would help with driver familiarity with rules in roundabouts. ○ Q: Could roundabout be realigned to improve navigation? A: Due to property impacts, signage would probably be best solution ○ Would overhead signage work at a roundabout? ○ This is preferred from perspective of speed control ○ TIB would like City to apply for funding for roundabout at this intersection • Other comments ○ Q: How do bikes use intersections? A: Either claim the lane or take the sidewalk; we don't want bikes riding next to cars • Summary	

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○ Preference for roundabout with reservations regarding bikes and yielding behavior ○ Need for enhanced crossing if adding a new pedestrian crossing across SR 104. **SR 104 & NE 178th St** • Signal option ○ Q: Northbound left turn to have protection? A: Yes, protected left ○ No benefit to third crosswalk—if northerly crosswalk is removed, could then move island south to tighten intersection ○ Add a lane on north side of intersection in SB direction for a bus queue jump • Other comments ○ WSDOT/ICA will want to see documentation of evaluation of single lane roundabout options • Summary ○ Be transparent about process ○ Queue jump ○ Potentially remove a crosswalk. Need to identify if the north of south would be better with signal phasing.	
Next Steps • Open House on 10/18—focus on SR 104 • COW on 10/23—share what we hear about SR 104 and where we're headed with 522 • TAC 5 on 11/1 will focus on SR 522 – calendar invite coming	**Kendra Breiland**

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Meeting 4
10/17/2017

Introductions TAC Members Thomas Noyes, WSDOT Jesse Birchman, City of Mountlake Terrace Tod McBryan, Merlone Geier Kendra Dedinsky, City of Shoreline Luka Ukrainczyk, KC Metro Kathy Leotta, Sound Transit Martin Dedinsky, WSDOT Dongho Chang, City of Seattle John Vicente, City of Kenmore Staff Pete Rose, City of Lake Forest Park Neil Jensen, City of Lake Forest Park Kendra Breiland, Fehr & Peers Chris Grgich, Fehr & Peers Carmen Kwan, Fehr & Peers Marcia Wagoner, 3 Square Blocks Rebecca Fornaby, 3 Square Blocks Kurt Ahrensfeld, Perteet	**All**
SR 522 Guiding Principles • *See presentation*	**Kendra Breiland**
SR 522 Today • Wide corridor • Important to region as it carries 20% of all cross-Lake Washington traffic • BAT lane is completed in one direction throughout the corridor • Corridor has two-way center turn lanes and left-turn pockets • Carries 50,000 vehicles a day • Driveways and garbage collection adjacent to shoulder of corridor • Steep residential driveways immediately adjacent to corridor • Sidewalks and planted medians along portions of the corridor • Three signalized intersections • City interested in putting power lines that run along corridor underground • Express transit access runs through corridor	**Carmen Kwan**
ST3 Project(s) • Complete BAT lanes throughout SR 522 • Start a bus rapid transit route, scheduled to open in 2024 • ST is in the process of developing partnerships	**Kathy Leotta**

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• Challenging section because of topography **King County Metro Projects** • Future RapidRide line in 2025 Plan will connect to future U District light rail station • Will use BAT lanes, and will likely use ST BRT stops. **Right-of-Way** • Two options: 1) Center turn lane that goes throughout the entire corridor that preserves access to residential units, or 2) limit where left turns can be made • These options apply depending on corridor section because of ROW constraints. Generally we assume complete BAT lanes and sidewalks throughout the entire corridor	**Luka Ukrainczyk** **Carmen Kwan**

Cross-Section Options
 	
Option 1: Provide continuous center turn lane to maintain left turn access through the corridor. Options 1A and 1B differ in the level of sidewalk buffering provided in recognition of right-of-way constraints throughout the corridor.
• Option 1A: Center turn lane + 6' sidewalks with 4' landscape buffer (96' wide).
• Option 1B: Center turn lane + 6' sidewalk with narrower 2' buffer (92' wide).
 	
Option 2: The center turn lane would be removed and turn movements would be limited to select locations. Throughout the corridor, driveway access may be revised to right-in, right-out only. This means that u-turn opportunities need to be provided.
• Option 2A: 8' planted median + 6' sidewalks with 4' planted buffer (92' wide)
• Option 2B: No median treatment provided, but includes 6' sidewalk with 4' planted buffer (84' wide)
• Option 2C: No median treatment, but provides 6' sidewalks with 2' buffer (80' wide)
 	
Discussion of Cross-Section Options
 	
• Segment 1 (near 145th Street)
  ○ High turn volumes because of retail and multifamily homes
  ○ Support for keeping existing access management near 145th; if the goal is safety, reversing the access management might be counterintuitive to the safety goals of the project
  ○ Sound Transit unlikely to undo any access control from WSDOT
	Chris Grgich

- U-turn bays should be strategically placed outside expected queue lengths at signals
- Consider 11-foot travel lanes because of roadway curves, 10-foot lanes ok near the more dense Town Center
- Consider needs of delivery trucks, particularly where there is commercial activity
- Consider reducing planted median where the ROW is constrained. Median typically at least 4' wide to provide space for roadway signs.
- Consider setback requirements as buildings turn over and redevelop from 145th – 155th

- Segment 2 (153rd to the north)
  - Keep transit stop at 153rd
  - Support for sidewalks along both sides of corridor. Under limited ROW conditions, consider wider sidewalks on the west side, as transit ridership to downtown Seattle more likely than to the east side.
  - What's the target speed? Lane widths can be narrower if speeds are lower
  - Consider alternative ways to maintain access management and corridor character. Consider targeted opportunities for non-peak hour parking in BAT lane.
  - Consider future zoning when locating transit stops. Metro may consider transit stop consolidation.
  - Consider opportunities for new midblock crossings near future transit stops
  - Consider asking the community where they would like to see transit stops
  - TIB grants require minimum 4' planter strips.
  - Consider space needed for underground utility vaults—typically need a 10-foot cross section. This aligns with 6' sidewalk + 4' landscaping.
  - Consider improving community's ability to interact with both sides of the road—special attention to crossings
  - Consider narrowing the cross-section to provide BAT lane in one direction only in narrowest section – aided by queue jumps
  - Consolidate access points
  - Align midblock crossings with transit stops
  - Consider using center lane for transit (see Seattle project at Dearborn

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and Rainier)	
Next Steps • Next TAC meeting will be held on 11/1 • Next Open House will be held on 11/14	**Kendra Breiland**

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Meeting 5
11/1/2017

Introductions TAC Members Thomas Noyes, WSDOT Tod McBryan, Heffron Transportation (Transportation engineer for Merlone Geier) Kendra Dedinsky, City of Shoreline Luka Ukrainczyk, KC Metro Lacy Jane Wolfe, KC Metro Kathy Leotta, Sound Transit Maan Sidhu, WSDOT Staff Pete Rose, City of Lake Forest Park Neil Jensen, City of Lake Forest Park Kendra Breiland, Fehr & Peers Chris Grgich, Fehr & Peers Carmen Kwan, Fehr & Peers Marcia Wagoner, 3 Square Blocks Rebecca Fornaby, 3 Square Blocks Kurt Ahrensfeld, Perteet	**All**
Recap of TAC 4 – What We Heard & Further Thoughts on Access Control on SR 522 Corridor (including potential new signals) • Highlights from TAC meeting 4 ○ Maintain and enhance access control throughout the corridor ○ Consider inclusion of medians wherever possible ○ Ensure sidewalk and amenity zone is a minimum of 10 feet ○ Consider lane widths (10 or 11 feet) ○ Evaluate if BAT lane is necessary in narrow section between 160th and 153rd in favor of pedestrian amenities and ROW preservation • Group discussion ○ Brookside and SR 522 intersection: Maintain left-in access ○ 39th Ave NE ▪ Consultant Team to provide City list of locations currently	**Kendra Breiland & Chris Grgich**

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using HAWK beacons ▪ Consider motorist education about HAWK to avoid confusion ▪ Move forward with signal and HAWK option ○ "Narrow section" ▪ If BAT lane were removed, start with a queue jump at bus stop ▪ Keeping BAT lane would be ideal ▪ Keep in mind that inbound trips (to Seattle) are probably more time-sensitive than outbound trips for commuters ▪ Consider number of busses per hour	
Group discussion of 145th intersection • Northbound bus stop needs to be moved north, away from the intersection • Is 60' x 15' feet wide enough for two busses? • Does the east leg of 145th need three lanes? Fewer lanes could return ROW to Taco Time • Consider adding bulb-outs to curb at northeast corner—challenging because of u-turns on SR 522 at 145th southbound • Locating inbound bus stop on the 145th side could benefit transit with an in-lane stop • As an alternative, consider keeping existing plan and current KC Metro stop, as bus volumes would be lower • What is the optimal solution for traffic operations? ROW needed? Dual right turn lanes?	**Chris Grgich**
Group discussion of potential non-motorized access to transit improvements • Overview ○ Enhance access to SR 522 transit stops from the neighborhood ○ Assumed that non-motorized improvements are made along the SR 522 corridor ○ 11 draft projects developed (below) • Project 1: Multi-use path along SR 104 (west side only) ○ This item was not discussed at length, as it was already a part of the SR 104 cross-section options and discussed in TAC 2 and 3. • Project 2: Town Center pedestrian connections ○ Area near Starbucks is hard to navigate ○ How can wayfinding be standardized and streamlined? Look at Seattle's wayfinding standardization study • Project 3a: SR 522/SR 104 Crossing improvements ○ In the near term, consider revising slip lane to improve pedestrian conditions	**Carmen Kwan**

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• Project 3b: SR 522/SR 104 Crossing improvements
  ○ Consider utility clean up as a part of the grade-separated crossing project
• Project 4: SR 522/NE 170th St crossing improvements
  ○ In future, consider undercrossing for Burke Gilman Trail
• Project 5: Brookside Elementary Safe Routes to School
  ○ No comments
• Project 6: 37th Avenue NE traffic calming
  ○ More data needed to ensure that traffic calming is needed (speed and/or safety data)
• Project 7: Briarcrest Safe Routes to School sidewalks
  ○ Partner with Shoreline
• Project 8: Briarcrest Safe Routes to School walking paths
  ○ Coordinate with Chief Sutton to confirm actual speeds
• Project 9: NE 155th Street trail connection
  ○ No comments
• Project 10: Burke-Gilman Trail wayfinding
  ○ Consistent wayfinding since this is a regional trail
  ○ Consider stairs as way to enhance pedestrian experience (look at Seattle's successful neighborhood stairways)
• Project 11: Improve street connectivity
  ○ Map unopened right of way—City has done some preliminary work
  ○ Reduce walking distance to Town Center by completing walkways
  ○ Look to the language in Shoreline's code, which requires pedestrian cut-throughs with new multifamily development	

Next Steps • Second Open House will be held on 11/14 and be focused on SR 522 • Third Open House will be held on 12/4 and be focused on demonstrating how community feedback has been incorporated into options for both SR 104 and SR 522 • Next TAC meeting will be held on 12/12	**Kendra Breiland**

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Meeting 6
12/12/2017

Introductions TAC Members Tod McBryan, Heffron Transportation (Transportation engineer for Merlone Geier) Kendra Dedinsky, City of Shoreline Maan Sidhu, WSDOT Kathy Leotta, Sound Transit Thomas Noyes, WSDOT Luka Ukrainczyk, KC Metro Dongho Chang, SDOT Staff Kurt Ahrensfeld, Perteet Kendra Breiland, Fehr and Peers Rebecca Fornaby, 3 Square Blocks Neil Jensen, City of Lake Forest Park Carmen Kwan, Fehr and Peers	**All**
SR 104 Cross-sections *Fehr and Peers provided an overview of community feedback and the resulting recommendations for cross-section concepts for SR 104.* Option 1: Buffered bike lanes and sidewalks (PREFERRED) • From KC Metro's perspective, buffered bike lanes were not originally preferred • Given strong community support for separated, buffered bike lanes, Fehr and Peers worked with KC Metro to develop two transit stop concepts that could be implemented alongside buffered bike lanes will accommodating safe transit operations. • Pros: Reduces conflicts between bicyclists and transit; keeps transit vehicles in-lane, which prevent cars from passing buses while stopped (an unsafe condition). • Cons: Stops would be more costly than transitional stops (since they are more capital intensive). Potentially reduces flexibility of moving bus stop	**Kendra Breiland**

locations. • Q: What kind of signage will be needed? A: Possibly a sign for cyclists to yield to pedestrians. • Q: Do people wait for bus on the raised portion? A: Only when boarding the bus, so the only cyclist-pedestrian conflict is when people are getting on/off a stopped bus • Q: Are you going to show photos to Council? If so, the Children's Hospital campus or Roosevelt might be a good example. Option 2: Complete sidewalks with amenity strip throughout the corridor (not preferred) Option 3: Multiuse trail (not preferred) Option 4: Hybrid with shared use trails in parts, just sidewalks in parts (not preferred)	
Community feedback on 104 Intersection Concepts *Fehr and Peers provided an overview of community feedback and the resulting recommendations for intersection concepts for SR 104.* SR 104 / 195th • Signalized (PREFERRED) • Roundabout (not preferred): The community had strong reservations about the shape and size of the roundabout and how those would negatively affect the pedestrian environment. SR 104 / 35th • Signalized (PREFERRED) • Roundabout option (not preferred): The community was concerned about the right-of-way that would need to be acquired. There was also concern about the pedestrian environment/walking distances, especially given the proximity of a school. The Consultant Team explored the option of removing the 185th leg of the roundabout, but that would require the acquisition of additional property. SR 104 / 40th Pl • Roundabout option (PREFERRED): There was a great deal of community support for this treatment, though there was some concern about drivers' yielding behavior and the need for signage.	

○ Q: Eastbound movement may not be conducive to yielding. A: Perteet/Fehr and Peers will assess this. • Re-channelization/non-roundabout option (not preferred) SR 104 / 178th • Signalized with Bus Queue Jump ○ Graphic will be updated with longer southbound left turn pocket. ○ This treatment is characterized by adding a right-turn lane onto 178th with a bus queue jump ○ The community was appreciative of need to accommodate transit ○ Q: How long are southbound right turn queues? The bus queue jump is not useful if queues blocks right-turn lane. This would increase crossing distances and decrease signal efficiency. • Signalized without Bus Queue Jump ○ Graphic will be updated with longer southbound left turn pocket. • Q: Will the roundabout options be included in the report? While a multilane roundabout wouldn't work, a three-legged roundabout should be considered: it may not increase service during peak hours, but could increase safety throughout the day. Roundabouts are getting favored over signals for grant money because of safety reasons. A: Biggest concern is that roundabout could overflow into adjacent signals. We will show roundabout as a considered option in the report. The appendix will detail justification for why the roundabout was not preferred.	
SR 522 Cross-section Concepts *Fehr and Peers provided an overview of community feedback and the resulting recommendations for cross-section concepts for SR 522.* Concept 1: Characterized by a 10-foot sidewalk and amenity zone on both sides of the street, completed BAT lane and two general purpose travel lanes in each direction, and a turn lane in the middle Concept 2: Same as Concept 1 but with an 8-foot median in place of a turn lane Concept 3: Characterized by a narrow (4 to 6foot) median. This option uses less right-of-way to allow for other potential elements such as green space, sound mitigation, and retaining walls • Comment: Sound Transit's project currently does not anticipate noise mitigation, but it may include retaining walls. Sound Transit will be looking at	**Kendra Breiland**

alternative fleet vehicles that may be quieter. Sound Transit would conduct a noise analysis. For sound mitigation to be considered it would need to be determined that noise impacts are identified due to the BRT project. Sound Transit doesn't want residents supporting the project based on assumptions that ST will provide noise mitigation.

- Comment: Adding BAT lanes pushes general purpose traffic lanes farther from homes. May not necessarily increase noise for residents. Also, reducing speed limits to 35 mph could reduce traffic noise.
- Comment: Consider enlisting a bike/ped organization to help educate the community about the importance of sidewalks.

Primary Concerns of Sheridan Beach Residents

- Right of Way: "Do not need sidewalks on both sides of the street. Between 39th and Vet hospital, want it on east/lakeside only"-- While there's 100 feet of public right-of-way available, residents are concerned that the project will encroach on property that has historically been used for uses like parking, etc. Residents recognize the inevitability of bus access transit (BAT) lanes but would prefer for sidewalks to only be added on one side of SR 522.
- Access: "maintain two-way-left-turn lane access wherever possible"-- Residents are concerned about the loss of two-way-left-turn lane, so plans include additional signals to provide additional opportunities for turning
    - Comment: Consider illustrating that a two-way-left-turn lane takes up more right-of-way than the median would
- Noise: "sound walls"
- Speeds: "reduce speed limit on SR 522 to 35 MPH"
- Residents would like to see
    - Studies proving that medians increase safety
        - Comment: FHWA has documentation on this
    - Collision history for that stretch of SR 522

General Community Concerns

- Safety
    - "Do not include two-way-left-turn lane as it is dangerous and serves a limited number of residences"
    - "Close off 47th Avenue NE as it isn't safe or visible"
- Sidewalks
    - No sidewalks at all –DANGER, NOISE
    - Would like to see better sidewalks between the Vet and the Town Center
    - "Sidewalks on the west side of the street would be utilized by people

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who don't have a car"
• Medians
  ○ Cross-sections should be low impact development (LID) –draining to center with vegetated medians and using pervious pavements for sidewalks
  ○ Trees in medians should be applied with caution – sight distance for vehicles and also concerns about maintenance and visual blight
  ○ Desire to maintain parking and access over medians
• How much change is wanted?
  ○ No changes should be a choice
  ○ "Build a lid over SR 522 with a park on top!"
  ○ Separate through traffic from local traffic – tunnels and/or flyover lanes?
 	
Recommendations
• Neighborhood impacts: recommended cross-section treatment changed to as narrow as possible in locations to limit right-of-way needs and provide space for potential mitigation, if warranted.
• Safety: Maintain and enhance access control throughout the corridor
• Regional transit mobility: Completion of the business access transit (BAT) lanes through Lake Forest Park
• Local access: Provision of a basic sidewalk facility on both sides of the street corridor-wide –critical for ADA
• Vehicle mobility: Consider existing and future traffic demands to maintain reasonable travel times along the corridor	

145th intersection *Fehr and Peers provided an overview of community feedback and the resulting recommendations for improvement options for the SR 522/145th intersection. The Consultant Team came to the November 14th Open House with a single option and received feedback that people wanted to see more done to enhance capacity and reduce bus/car conflicts.* Option 1: Widen SR 522 all the way to the 145th intersection to provide a separate transit-only lane. The transit-only lane would be outside of the general purpose southbound right-turn lane. This option performs best from the vehicle operations standpoint, transit operations, and pedestrian environment, but would require purchase of at least a portion of McDonald's property. • Q: Would it be possible to put the southbound bus stop on the far-side after the intersection? A: This would require two separate stops; one on 145th	**Kendra Breiland**

and the other south of the intersection. The near-side stop is proposed to prevent buses from backing up traffic on southbound SR 522 like under current conditions.

- Comment: Near side stop is feasible, but would require more complex signal phasing and operations.
- Q: How far back do you need to extend your right turn lane? A: Fehr & Peers will look into that.
- Q: Are there examples of this configuration? A: Yes, on Spring / 6th Ave in Seattle. There's a separate bus only lane and general purpose right-turn lane. A bus signal phase/queue jump is added.
- Comment: On Spring/6th Ave transit vehicles use the general purpose lanes through the intersection during the off-peak. Only when there are queues do buses use the bus only lane and queue jump. You'd want to try and incorporate this in your concept so signal timing is as efficient as possible. Response: this is a good point. Currently since bus stop is upstream of intersection, this may not be possible. We will further investigate how to refine this option.
- Q: Would you allow right turn on red? A: No. A right-turn sign could be added, which can turn on/off when right-turns are allowed/prohibited.
- Q: Can Vissim results be shared with Kendra D/Shoreline? A: Yes.

Option 2: Similar to original option presented at previous TAC meeting. Buses share right-turn only lane. Performs well from the perspective of pedestrian environment, but Vissim analysis shows substantial conflicts between right turning vehicles and southbound busses (through and right turn) on north leg.

Comment: Shoreline 145th Plan shows BRT stop on NE 145th (after the intersection). Response: We show a shared stop up-stream to avoid the southbound queueing that occurs when a bus stops south of the intersection today.

Option 3: Same as Option 2 except for southbound bus stop placed further south of intersection.

- Purpose of this option is to have buses stop farther south of intersection to reduce the queuing of general purpose traffic when a bus stops in-lane.
- This is worse for transit transfers as people have to walk farther to reach the other bus stops.
- Comment: moving the stop further south creates a worse pedestrian environment. It may entice transit riders to cross mid-block because the signalized crosswalk is further away now and perceived as inconvenient.

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Non-motorized access
• 5 projects got the most support
  ○ SR 522 crossing improvements at Ballinger Way & NE 170th St.
  ○ Better-defined pedestrian paths within TC
  ○ Sidewalks and traffic calming along 37th Ave NE
• An additional eight projects were proposed by the community including:
  ○ Street connections for more direct routes between Town Center, SR 522, and local neighborhoods
  ○ Desire to add pedestrian lead time to the NE 165th St signal
• Additional project details will be added to the more highly supported projects in the final report.	

Thank-you *Mayor Jeff Johnson stopped by the TAC meeting to briefly thank the TAC members for participating in the Safe Highways project. He emphasized the critical role of mass transit in the City's future and the importance of this project to the City's residents.*	**Mayor Jeff Johnson**
Next Steps • A draft document will go to City Council on February 8th • Consultant Team will attend an upcoming meeting of Sheridan Beach Club • Thank you, TAC members!	

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Appendix B: Interview Findings Summary

FEHR PEERS

MEMORANDUM

Date: August 8, 2017 (Updated)

To: Neil Jensen and Pete Rose, Lake Forest Park

From: Carmen Kwan, Kendra Breiland, Fehr & Peers

Subject: Safe Highways - Stakeholder Outreach Findings

SE17-0540

The Safe Highways Study will propose conceptual corridor cross sections and intersection layouts to improve local and regional mobility on SR 104 and SR 522 within City limits. Project goals include creating equitable corridors that provide safe and inviting travel for all people regardless of modes, age, or ability. An important component of this study is to engage the community. Part of the initial community engagement to evaluate existing conditions was through interviews of stakeholders and representatives of the project's technical advisory committee. The full list of representatives that responded to the initial outreach are below:

Technical Advisory Committee Members

- City of Shoreline
- City of Kenmore
- City of Mountlake Terrace
- City of Seattle
- WSDOT
- Merlone Geier (Town Center Owner)
- Sound Transit
- King County Metro

Community & Stakeholder Groups

- Lake Forest Park Elementary
- Third Place Commons
- NW Kidney Center
- Residents (3)
- Lake Forest Park Stewardship Foundation
- Sheridan Beach Club
- Presbyterian Church
- Peruvian Consulate
- Third Place Books
- Windermere Realty
- Acacia Cemetery

Stakeholders included residents, local business owners, and local community group representatives. Technical advisory committee representatives consisted of specialists from neighboring jurisdictions and relevant agencies that could provide technical review and comments throughout the project.

TECHNICAL ADVISORY COMMITTEE MEMBER INTERVIEW HIGHLIGHTS

Fehr & Peers staff generally interviewed technical advisory committee members in person. The key highlights gathered from each interview is below.

City of Kenmore:

- Make sure the study engages the following groups at WSDOT: local programs & development services.
- Ask for what you want, but be flexible.
- In terms of rules of engagement, look at Shoreline's 32 point plan, which was developed over years of public engagement.

Sound Transit

- Sound Transit would like any info the study can share on Park & Ride locations as soon as possible.
- Sound Transit would prefer that Park & Rides be as close as possible to BRT stations (e.g. ideally within 1/8 mile), although this can be addressed on a case-by-case basis.
- Cost is a major concern – Sound Transit wants the study to provide multiple cross-section options to provide flexibility.

- Crossing of SR 522 at Transit Center may be initially at-grade, but a grade-separation could be funded with outside sources (legislature, etc.).

King County Metro

- Supportive of completing the Business Access Transit (BAT) lanes on SR 522.
- Major concerns are transit speed and reliability, and safety. Safety includes conflicts with transit vehicle operations and safety of transit riders' access to transit stops (pedestrian/bicyclists).

Lake Forest Park Town Center Owner

- Current access to the Center is challenging – there's full access at Starbucks, SR 104, and a right-in/right-out halfway between – they are very interested in ideas of how to make access better.
- Don't want to give up existing right-of-way.
- Parking garage location is very important – they appreciate the need to make it close to transit, but at the same time, want to make sure people walking between the garage and the station have a good experience, with some retail opportunities. Town Center wayfinding needs improvement.
- Overspill parking is a particular concern – concerns about the prospect of paid parking arrangements for commuters and how it will impact other parking use at the center.
- Merlone Geier is leading a separate Town Center visioning process – make sure the study leverages this or at least is not competing with it.

City of Seattle

- Improved pedestrian and bicycle connections to light rail station are important. This is important at NE 145th Street intersection where pedestrians will be accessing new Bus Rapid Transit (BRT) route to light rail station.
- Improvements for mobility of local community are important.
- Excessive speeding occurs on SR 522 near 145th Street.

City of Shoreline

- The 145th Corridor Study and Interchange design directly and indirectly interface with this project.
- Non-motorized safety, convenience and quality – connections between the corridor and attractions. This probably has the most opportunity for improvement along the corridor.
- Transit benefits – providing frequent, reliable service to/from Shoreline and the new light rail station.

City of Mountlake Terrace

- Concerned about regional connections for vehicles and pedestrian/bicyclists.
- Non-motorized connections to 185th light rail station are also important.

WSDOT

- Phasing/funding plan is important because it can be challenging to obtain grants. It's good that the study is identifying short term, quick-win projects. During prioritization, it should be important to consider what projects are "packaged" deals (should be completed together, or which projects need to be completed first).
- Interested in what can improve throughput (as both are regional connectors).

- Interested in any safety improvements that can be made.

STAKEHOLDER INTERVIEW HIGHLIGHTS

Most stakeholder interviews were conducted by 3 Square Blocks, either in person or over the phone. Highlights of the stakeholder interviews are noted below.

Lake Forest Park Elementary School Principal

- Concerned about safety for people reaching the school on busy Ballinger Way.
- Concerned about safety for getting pedestrians and cyclists across SR 104.
- Signage should communicate presence of the school.

Third Place Commons

- Has an e-serve list and Shoreline News and area postings for community engagement.
- Third Place Commons is available for public meetings.
- Concerned about congestion on SR 522 heading into Kenmore, and the pedestrian crossing at SR 522 / SR 104 is uncomfortable.

NW Kidney Center

- Problems with cut through traffic in their parking lot that impact patients – cars coming from 145th, through NW Kidney Center parking lot and turning onto SR 522 – creates a dangerous situation. Coordinated with the police and are implementing a solution now.
- Concern about lack of infrastructure maintenance in the city – notes poor condition of roads in front of facility.
- Don't put cycle tracks on SR 522 as it creates impossible situation for Access vans loading and unloading people.

Resident #1

- Critical to enable public transit to function on the highways.
- Parking Garage at town center is a benefit.

Resident #2

- Need to balance slowing traffic to build better community spaces while moving traffic as efficiently as possible.
- Consider future light rail in the planning.
- Step up traffic enforcement.

Resident #3

- Commuter parking, conveniently located at Town Center and served by a transit circulator from the neighborhoods, including something similar in Kenmore would help ease traffic congestion.

- SR 522/SR 104 intersection is the largest problem – referenced WSDOTs past project that would have created 2 left turn lanes and the congestion challenges of its current configuration.
- SR 104 and 40th Place NE intersection with left turn lane is dangerous because through traffic drifts into the turn lanes to ease out the curve.

Lake Forest Park Stewardship Foundation

- Concerned about damage to the environment – protection of trees, water quality, salmon habitat, etc.
- Need to have a more representative sample of LFP residents – talk to Phillippa Kassover, City Council member who is attuned to service agencies.
- Reach broadly to community members throughout process.

Sheridan Beach Club

- Fear loss of character of LFP along SR 522, which is characterized by trees and vegetation.
- Don't want to increase the traffic, air and water pollution, noise pollution.
- Pedestrian safety needed:
    - Crossing SR 522
    - In areas with traffic going to or avoiding the highway
    - For accessing Town Center
- Don't think there should be sidewalks on SR 522 – do not feel it is safe.

Presbyterian Church

- One small challenge is for drivers coming from 178th onto Ballinger Way. Very dangerous for anyone who tries to turn left there as it's near impossible.
- Would hate to see extra bike lanes added to Bothell Way that would decrease car throughput.
- Homeowners were irate about bikes on Burke-Gilman Trail at 165th – concerned that bikes don't observe the stop signs and race through the intersections.

Peruvian Embassy

- No plans for change in facilities for operation.
- New consulate signage on SR 522 when coming from the north would assist visitors (already exists when approaching from the south).
- Have positive relationship with Lake Forest Park.

Third Place Books

- Regular cyclist – knowledgeable on complexities of connections between Burke-Gilman Trail, Town Center, the Interurban trail and other locations within Lake Forest Park.
- Adding wayfinding signage from trail to common destinations (Interurban trail, Town Center, etc.) and safe crossings/best connecting routes would improve safety.
- Public meetings held in the Commons have a better turnout then those in City Hall.

Windermere Realty

- Concerned about pedestrian and bike safety, particularly on Ballinger Way.
- Ballinger Way and 40th Place is a dangerous intersection.
- Shoreline School District property at 195th and 25th is slated for redevelopment, possibly a sports field, which may increase traffic at the intersection.

Acacia Cemetery

- Concerned about safe pedestrian crossings on SR 522 – noted success of flashing light pedestrian crossings at Lake City.
- Think ahead to plan for future transit – light rail or streetcar.
- Improved maintenance on highway medians.

The full list of questions asked during each interview are in **Attachment A**, and a full list of persons contacted for interviews is in **Attachment B**.

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Stakeholder Interview Form

06.07.17

Interview Information

Date:

Name of Interviewer:

Name of Interviewee:

Interviewee Interest in Project:
(i.e. agency, business, school, group, resident)

Corridor(s) Discussed: ☐SR 522 ☐ SR 104

Introductory Script

Hi, this is _____ from _____ calling to do the interview about the City of Lake Forest Park's Safe Highways project. How are you doing today? Are you ready to get started?

Great! As a reminder, the Safe Highways project is looking at the two state highways within city limits – Bothell Way NE (SR 522) and Ballinger Way NE (SR 104) – and exploring ways to make them safer, more accommodating to transit, and more walkable and bikeable. As an early step in the process we are conducting stakeholder interviews to gain insights on issues and opportunities to study during the project. We will be preparing a summary of the interviews that will be available to the public.

Do you have any questions before we begin the interview?

Interview Questions

1. What is your history and relationship to Bothell Way NE (SR 522)/ Ballinger Way NE (SR 104)?

2. What do you see as the critical issues, opportunities or challenges to be addressed by the project? Do they change along different segments or points along the highway corridor(s)?

3. From your agency's/_____'s perspective, what would be beneficial to get out of this project?

4. Does your agency/_____ have any plans or projects that should be taken into account during the project?

5. What other factors are you aware of that may affect the outcomes of the project?

6. In your opinion, what other key stakeholders should we consult about the project?

7. What would be some of the most effective ways to engage your agency/_____ in the project?

8. What is the best way to keep you informed during the project?

1-3 Key Takeaways from Interview

Attachment B - List of Individuals and Businesses contacted for interviews

Category	Name	Company
Sound Transit	Kathy Leotta	Sound Transit
King County Metro	Irin Limargo	King County Metro
WSDOT	Maan Sidhu	WSDOT-Area Assistant Traffic Engineer
WSDOT	Mike Galizio	WSDOT - Transportatioin Planner
Kenmore	Kris Overleese	Kenmore Public Works
Shoreline	Kendra Dedinsky	Shoreline
Mountlake Terrace	Jesse Birchman	Mountlake Terrace
Seattle	Dongho Chang	Seattle DOT
Town Center Owners	Jamas Gwilliam	Merlone Geier
Business Owner 1	Ron Sher/ Robert Sindelar	Third Place Books
Business Owner 2	Austin Ross	NW Kidney Center
Business Owner 3		McDonald's
Business Owner 4	Vince Larkin	Cemetery (Acacia)
Business Owner 5		Taco Bell
Business Owner 6	Greg Combs	LFP Animal Hospital
Resident 1	name withheld	
Resident 2	name withheld	
Resident 3	name withheld	
LFP Elementary	Aimee Minor	
LFP Stewardship Foundation	Julian Andersen	
Other Business Owner 1	Nick Wecker	Starbucks
Other Business Owner 2		Arco
Other Business Owner 3	Ryan Francescutti	Windermere
Other Resident 1	name withheld	
Other Resident 2	name withheld	
Other Resident 3	name withheld	
Other Resident 4	name withheld	
Friends of Third Place Commons	Amy Wittenberg	
Rotary Club of LFP	Ed Pearson (transitioning to Clair Conway 1 mo.)	
Bike Community	Blake Trask	Cascade Bike Coalition
LFP Youth Council	Cory Roche	
LFP Presbyterian Church	Pastor Mike Young	
Civic Club	Doug Gochanour	
Sheridan Beach Club	Julie Wheatley	
Peruvian Consulate	Miguel Velasquez	Consul General, Republic of Peru

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Appendix C: City Council Presentations

Lake Forest Park SAFE HIGHWAYS

Presented to:

Lake Forest Park City Council

June 8, 2017

What is the Project?

Comprehensive Corridor Study

Complete connections for all modes	**Supported by the** community	**Realistic &** implementable
✓ Inviting connections for walking & biking	✓ Distinct corridor visions	✓ Sound operations analysis and modeling
✓ Completion of the BAT lanes and consideration of P&R	✓ Integration with Safe Streets project	✓ Right of way considerations known
✓ Access control & intersection treatments to maintain mobility	✓ Public support for recommended improvements recognizing years of construction	✓ Project phases considered
		✓ Recommendations have to work

Lake Forest Park SAFE HIGHWAYS

3 SQUARE CONNECTED BLOCKS PERTEET FEHR PEERS

Technical Advisory Committee

Coordination on Solutions with:

Washington State Department of Transportation

SoundTransit

King County METRO
We'll Get You There

City of Mountlake Terrace

MerloneGeier Partners

Kenmore

City of Shoreline

Lake Forest Park SAFE HIGHWAYS

Stakeholder Interviews

Conducted over next six weeks

Will Include

- Members of the TAC *plus*
- Business owners
- Residents
- Interest groups (Cascade Bike Club, Friends of Third Place Books)

Lake Forest Park SAFE HIGHWAYS

3 SQUARE CONNECTED BLOCKS PERTEET FEHR PEERS

Website & Public Face

Will go live June 12 www.lfpsafehighways.com

Safer Streets for Pedestrians & Bicyclists

The Safe Streets Project

The City of Lake Forest Park is hoping to make its streets safer for pedestrians and cyclists and to increase safe connections to transit and amenities like the Burke-Gilman Trail, Interurban Trail, parks, and schools, so the City is leading a public outreach process to identify community priorities. Through this process, we hope to accomplish four goals:

1. Address key conflicts between pedestrians, cyclists, and motorists.
2. Develop an enhanced Capital Improvements Program (CIP) that includes specific projects ranked according to priority.
3. Conduct a robust public engagement process to ensure the community has ownership in the solutions identified.
4. Increase safe connections to transit and amenities.

Engineering Considerations

SR 104

- Geometrics and channelization
- Non-motorized safety
- Connectivity to transit
- Sight distance
- Site constraints
- Utilities, mail delivery, garbage collection
- Substandard lighting
- Maintenance concerns

Engineering Considerations

SR 522

- Transit access / Northbound BAT lane
- Business/residential access
- Driveway sight distance
- Non-motorized connectivity & pedestrian environment
- Intersection operations
- Site constraints
- Utility impacts
- Maintenance concerns

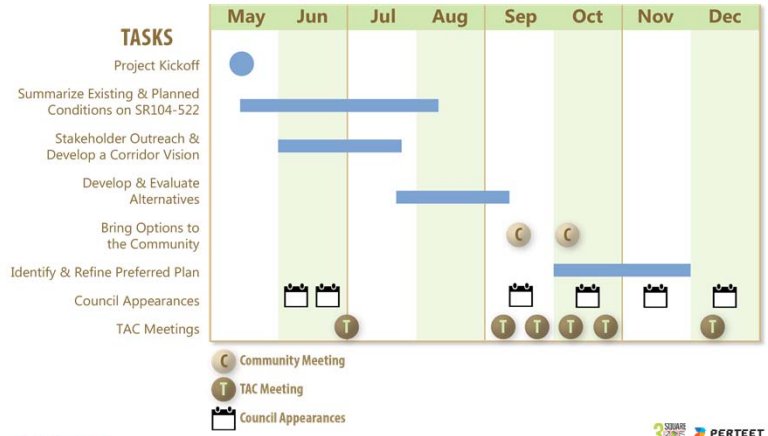
Non-Motorized Access to Transit

Continue the Work on Safe Streets

- Identify most competitive projects
- Develop cost estimates and materials to make them competitive

Lake Forest Park SAFE HIGHWAYS

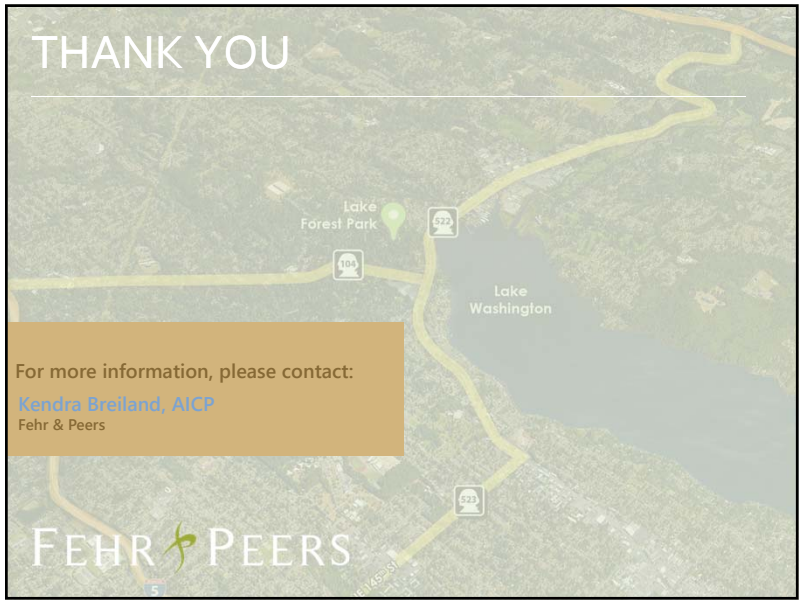
Project Schedule



Lake Forest Park SAFE HIGHWAYS

3 SQUARE BLOCKS PERTEET FEHR PEERS

THANK YOU



For more information, please contact:

Kendra Breiland, AICP
Fehr & Peers

FEHR PEERS

Lake Forest Park
SAFE HIGHWAYS
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Presented to:

Committee of the Whole (COW)

September 25, 2017

Agenda

- Project Overview and Progress Summary
- SR 104 Corridor Today
- Draft Concepts
- Next Steps



3 SQUARE MILES PERTEET
FEHR PEERS

What is the Project?

Comprehensive Corridor Study

Complete connections for all modes	Supported by the community	Realistic & implementable
✓ Inviting connections for walking & biking	✓ Distinct corridor visions	✓ Sound operations analysis and modeling
✓ Completion of the BAT lanes and consideration of P&R	✓ Integration with Safe Streets project	✓ Right of way considerations known
✓ Access control & intersection treatments to maintain mobility	✓ Public support for recommended improvements recognizing years of construction	✓ Project phases considered ✓ Recommendations have to work

Lake Forest Park SAFE HIGHWAYS Accessible Efficient Complete

3 SQUARE MILES PERTEET
FEHR PEERS

Stakeholder Interviews

- Completed interviews with key findings documented from
  - Members of the TAC *plus*
  - Business owners
  - Residents
  - Interest groups (Cascade Bicycle Club, Friends of Third Place Commons)

3 SQUARE MILES PERTEET
FEHR PEERS

SR 104 Guiding Principles

- Address **safety for all modes**
- Maintain the corridor's **unique identity and natural landscape**
- Take a **phased approach** that provides benefits over time
- Consider draw on **city's financial resources** in selecting design solutions; as well as positioning improvements well for regional, state and federal investment
- **Protect natural environment** and encourage low impact design approaches
- Plan corridor to **discourage neighborhood cut-through** traffic
- **Minimize impacts** on neighboring properties (e.g. right-of-way, access, noise, visibility)

Website & Public Face

www.lfpsafehighways.com

Lake Forest Park SAFE HIGHWAYS

HOME PROJECT FILES GET INVOLVED CONTACT

Updated with:

- **Project Guiding Principles**
- **Stakeholder Outreach Findings Memo**
- **Planning Context Report**

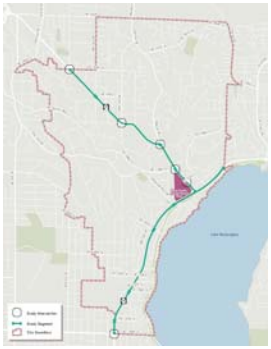
Making SR 104 and SR 522 Work for Lake Forest Park

The Safe Highways Project

Lake Forest Park SAFE HIGHWAYS Accessible. Efficient. Complete.

Planning Context Report

Documents existing conditions, opportunities, and challenges for each segment



- **Context & Land Use**
- **Ped/Bike Amenities**
- **Transit**
- **Vehicle Operations**
- **Safety**
- **Utilities/Stormwater/ROW**

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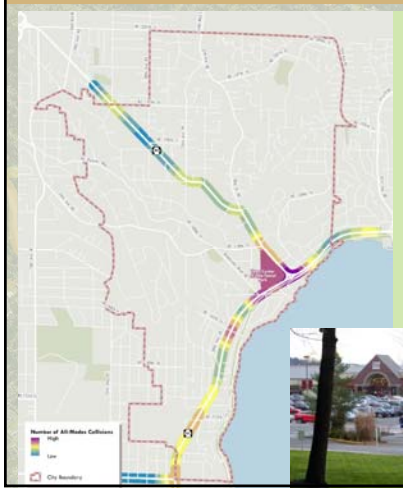
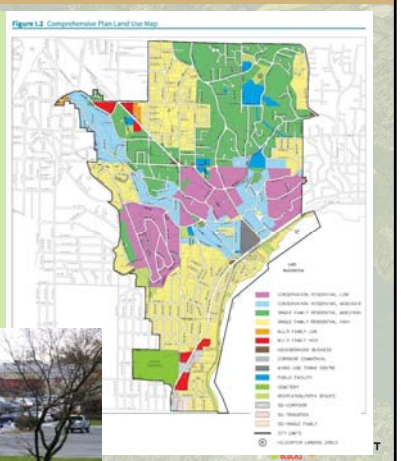
3 SQUARE BLOCKS PERTEET FEHR PEERS

SR 104 Today





FEHR PEERS

SR 104 Today




PERTEET
PEERS

SR 104 Today



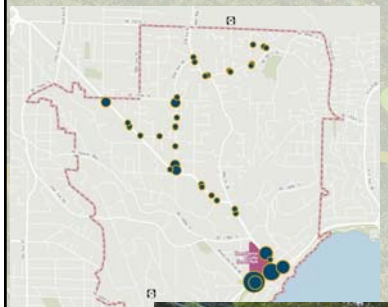
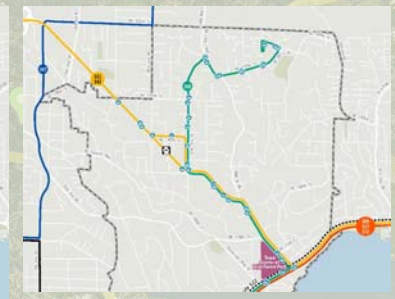

PERTEET
PEERS

SR 104 Today



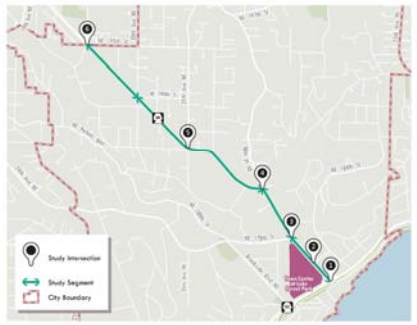
PERTEET
FEHR PEERS

SR 104 Today


PERTEET
FEHR PEERS

SR 104 Today



		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	delay	LOS	delay	LOS	delay	LOS	delay
SR 522 (Bothell Way)	Signal	D	43	E	59	E	65	F	86
NE 175th St	Signal	B	11	B	12	C	24	C	25
NE 178th Street (southern approach)	TWSC	E	49	F	>100	F	>100	F	>100
NE 178th Street (northern approach)	TWSC	B	13	B	13	C	19	C	22
40th Pl NE/NE 184th St	Side Street Stop*	F	>100	F	>100	F	85	F	>100
35th Ave NE/NE 185th St	Signal	D	42	D	48	C	34	D	42
NE 195th St	Signal	D	40	D	43	C	32	D	42

PERTEET
FEHR PEERS

Draft SR 104 Cross-section Options

- Option 1 - Buffered bike lanes and sidewalks
- Option 2 - High quality sidewalks with landscaped buffers
- Option 3 - Multi-use trail on one side

PERTEET
FEHR PEERS

Buffered Bike Lanes & Sidewalks

- One travel lane each direction
- Sidewalk with landscape buffer on both sides
- Buffered bicycle lanes in both directions
- Left turn lane or planted median where feasible
- Assumes bike lanes start around 178th St, just north of Town Center

Lake Forest Park SAFE HIGHWAYS
PERTEET
FEHR PEERS

Sidewalks

- One travel lane each direction
- Sidewalk with landscape buffer on both sides
- Left turn lane or planted median where feasible
- Assume bicyclists use other local streets for travel

Lake Forest Park SAFE HIGHWAYS
PERTEET
FEHR PEERS

Multi-use Trail on One Side

- One travel lane each direction
- Multi-use path on the east side (LFP Elementary), sidewalk with landscape buffer on the west side
- Multi-use trail transitions to west side near Town Center
- Left turn lane or planted median where feasible

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3 SQUARE BLOCKS PERTEET FEHR & PEERS

TAC Discussion Questions

- Aware of opportunities to collaborate with other projects in implementing these cross-section types?
- Do any of these cross-section types have a "fatal flaw" we should be aware of?
- Any other relevant information to share that may affect the design of these cross-sections?

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Next Steps

- Confirmed:
  - TAC #3 – SR 104 Intersection Options (*Oct. 4*)
  - SR 104 – Public Meeting (*evening Oct. 18*)
  - TAC #4 – SR 522 Cross-sections (*Oct. 17*)
  - COW – SR 104 Recap & SR 522 Preview (Oct. 23)

- Tentatively Scheduled:
  - TAC #5 – SR 522 – Access to Transit & 145th intersection (*Nov. 1*)
  - SR 522 – SR 522 Public Meeting (*evening Nov. 14*)
  - TAC #6 – Project wrap-up (*December TBD*)

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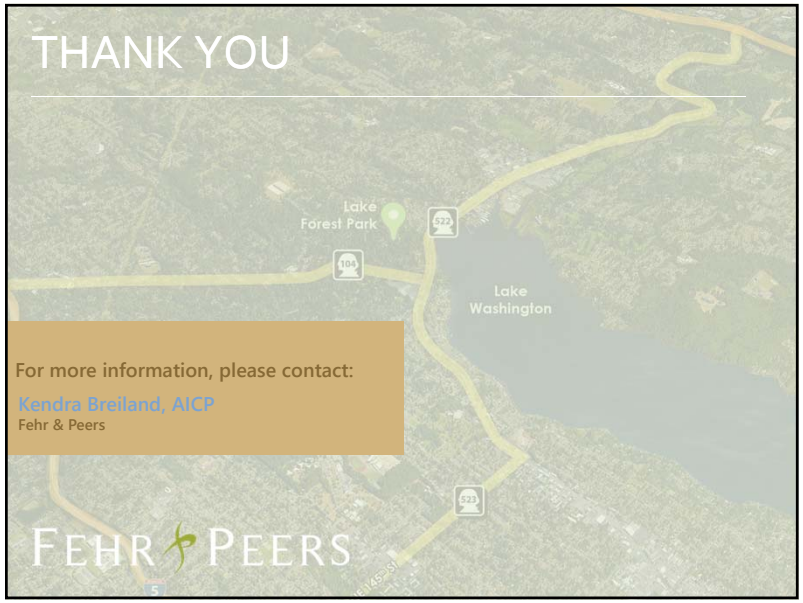
THANK YOU



For more information, please contact:

Kendra Breiland, AICP
Fehr & Peers

FEHR & PEERS

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Presented to:

Committee of the Whole (COW)

October 23, 2017

Agenda

- SR 104 Recap:
  - Cross-section updates
  - Intersections
  - Oct. 18 Public Meeting
- SR 522 Preview:
  - Guiding principles
  - Existing conditions
  - Draft cross-section options
  - Next steps: Access to transit, 145th intersection, Nov. 14 Public Meeting
- Overall Project Schedule



PERTEET
FEHR PEERS

Draft SR 104 Cross-section Options

- Option 1 - Buffered bike lanes and sidewalks
- Option 2 – Complete sidewalks with landscaped buffers
- Option 3 - Multi-use trail on one side
- Option 4 – Hybrid of Sidewalks and Trails

PERTEET
FEHR PEERS

Buffered Bike Lanes & Sidewalks

- One travel lane each direction
- Sidewalk with landscape buffer on both sides
- Buffered bicycle lanes in both directions
- Left turn lane or planted median where feasible
- Assumes bike lanes start around 178th St, just north of Town Center

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FEHR PEERS

Sidewalks

- One travel lane each direction
- Sidewalk with landscape buffer on both sides
- Left turn lane or planted median where feasible
- Assume bicyclists use other local streets for travel

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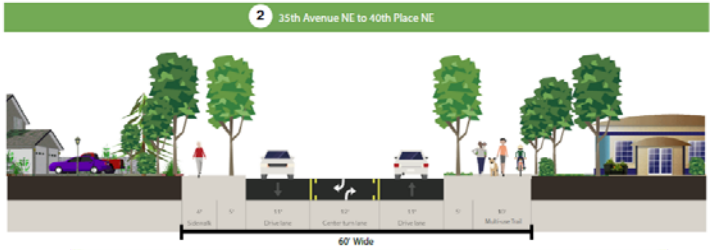
3 SQUARE MILES BLOCKS PERTEET FEHR PEERS

Multi-use Trail on One Side



- One travel lane each direction
- Multi-use path on the east side (LFP Elementary), sidewalk with landscape buffer on the west side
- Multi-use trail transitions to west side near Town Center
- Left turn lane or planted median where feasible

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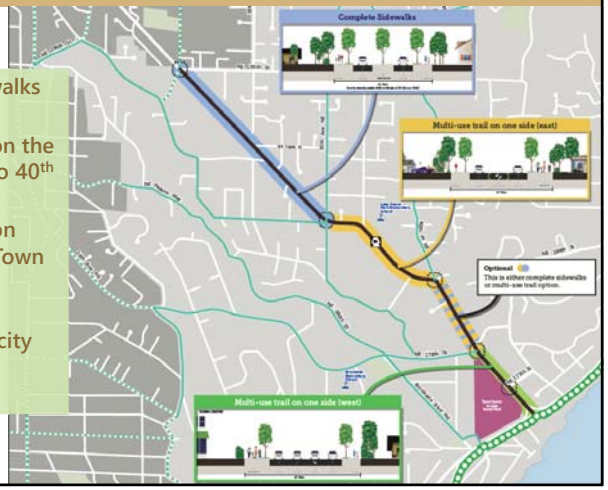
3 SQUARE MILES BLOCKS PERTEET FEHR PEERS

Hybrid Option: Sidewalks and Trails

- Complete sidewalks 195th to 35th
- Multi-use trail on the east side (35th to 40th Place or 178th)
- Multi-use trail on west side near Town Center
- Intentional connections to city bike network



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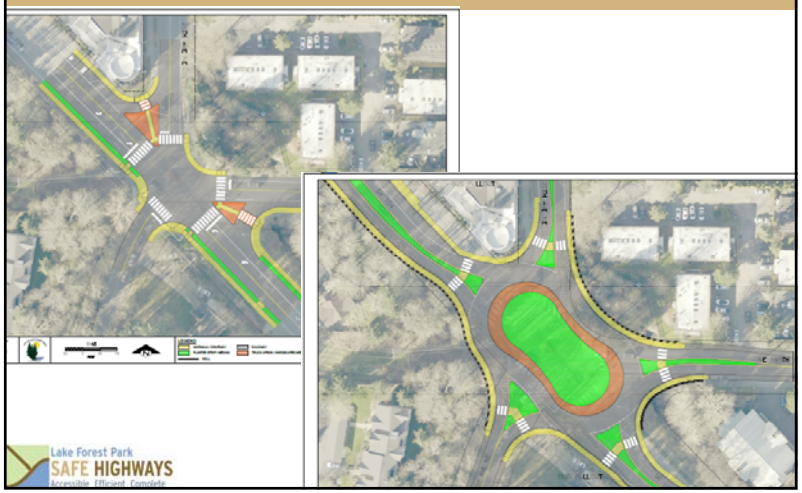
Draft SR 104 Intersection Options

- NE 195th Avenue, 35th Avenue NE, 40th Place NE, and 178 Avenue
- Where possible, evaluating roundabout and non-roundabout concepts for each

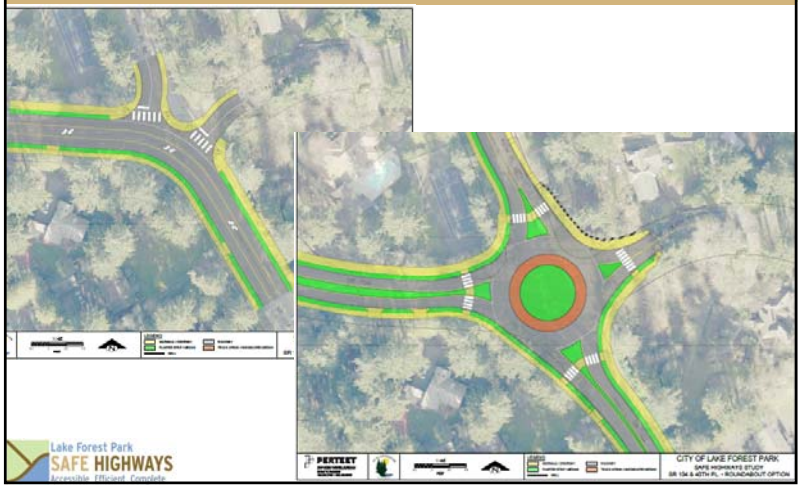
3 SQUARE MILES BLOCKS PERTEET FEHR PEERS

NE 195th Avenue & SR 104

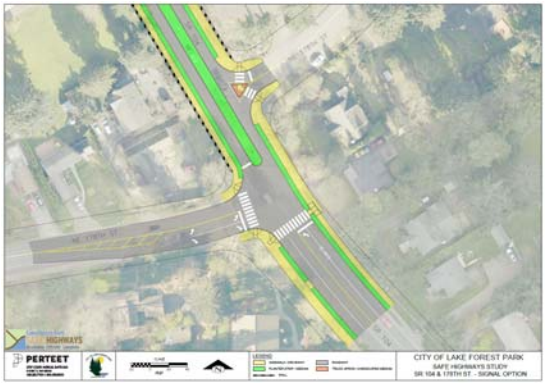


35th Avenue NE & SR 104

40th Place & SR 104



NE 178th Avenue & SR 104



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Oct. 18 Open House - What We Heard

- Roughly 60 people attended (45 signed in)
- Still sifting through feedback, but some of the major themes included:
  - **Walking:** People generally want to see more consistent sidewalks along the corridor
  - **Biking:** Most liked the shared use trails, but some daily cyclists were concerned about mixing with walkers
  - **Driving:** Don't add more lanes and preserve trees, but make sure we are planning for future growth in the Town Center and traffic heading towards the 185th Street Light Rail Station
  - **Roundabouts:** Mixed opinions. Many would like to see the footprint of the 35th Avenue roundabout reduced.
  - **Access:** There was discussion about the removal of left-turn access into east leg of 178th Avenue

SR 522 Preview

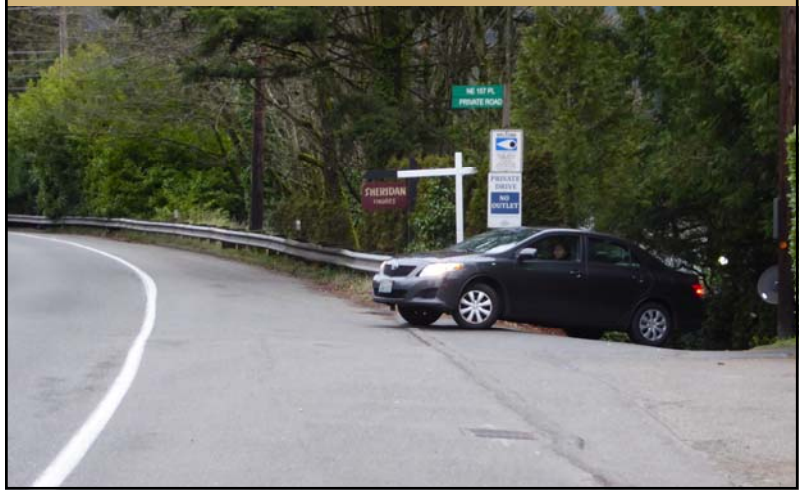
SR 522 Guiding Principles

- Address **safety for all modes**
- **Complete business access transit (BAT) lanes and full sidewalk connections** to support both BRT and local access
- **Minimize impacts** on neighboring properties (e.g. right-of-way, access, noise, visibility)
- **Improve non-motorized access to transit** and crossing opportunities to enhance local access
- **Create a corridor identity/character** and enhance the **natural environment**
- Be a leader in identifying **innovative solutions**, particularly at the Bothell Way/145th Street intersection

SR 522 Today

SR 522 Today

SR 522 Today

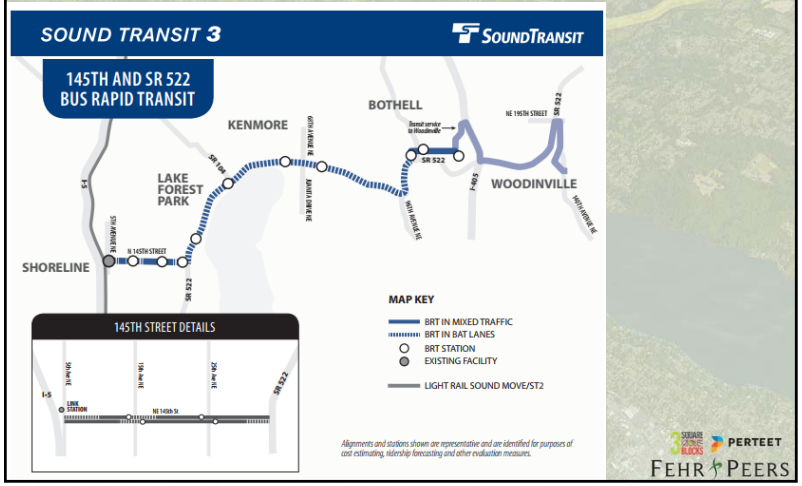


SR 522 Today

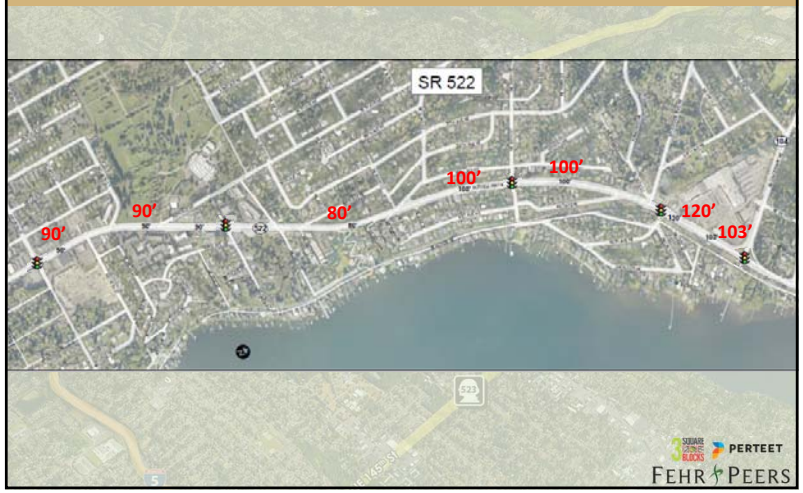
SR 522 Today

SR 522 Today

ST3 Project



Right-of-Way



Draft SR 522 Cross-section Options

- Option 1 – Provide Center Turn Lane
- Option 2 – Limit Left Turn Access

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FEHR PEERS

Option 1A - Buffered Sidewalks

SR 522 – Option 1A

- Center turn lane
- 6′ sidewalks with 4′ landscape buffer (96′ wide)

Option 2A –Median & Buffered Sidewalks

SR 522 – Option 2A

- 8′ planted median
- 6′ sidewalks with 4′ planted buffer (92′ wide)

Option 2B – Buffered Sidewalks

SR 522 – Option 2B

- No median treatment provided
- 6′ sidewalk with 4′ planted buffer (84′ wide)

SR 522 TAC Input

- Maintain & enhance access control throughout the corridor
- Consider inclusion of medians wherever possible
- Ensure sidewalk + amenity zone is a minimum of 10 feet
- Consider lane widths (10 or 11 feet)
- Evaluate if BAT lane is necessary in narrow section between 160th and 153rd in favor of pedestrian amenities and ROW preservation

Next Steps

Meetings

- TAC #5 – SR 522 – Access to Transit & 145th intersection (Nov. 1)
- SR 522 – Open House (evening Nov. 14)
- TAC #6 – Project wrap-up (*December TBD*)

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FEHR & PEERS

Website & Public Face

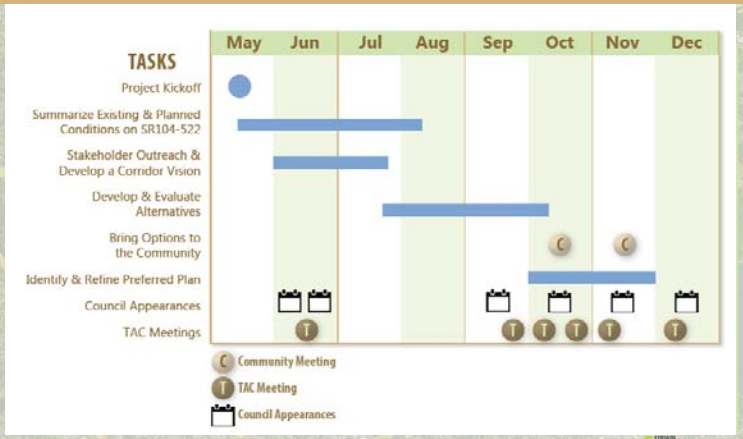
www.lfpsafehighways.com

Provides opportunities to provide input & project materials:

- Project Guiding Principles
- Stakeholder Outreach Findings Memo
- Planning Context Report

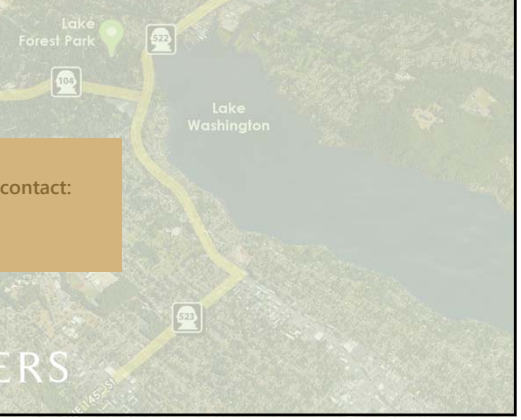
Lake Forest Park SAFE HIGHWAYS

Project Schedule



PERTEET
FEHR & PEERS

THANK YOU



For more information, please contact:

Kendra Breiland, AICP
Fehr & Peers

FEHR & PEERS

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City Council Meeting

December 14, 2017

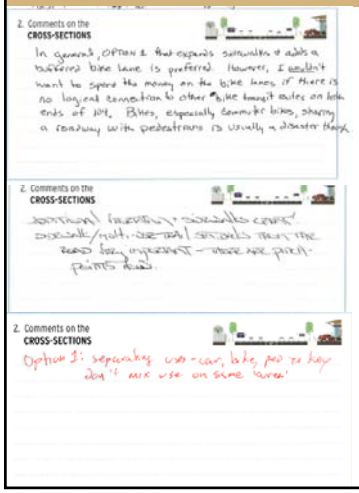
Agenda

- Overview of input received & how it's been incorporated:
  - Non-motorized access to transit
  - SR 104 Cross-sections and intersections
  - SR 522 cross-sections & 145th Intersection
- Next Steps

SR 104 Cross-section Options

- Option 1 - Buffered bike lanes and sidewalks
- Option 2 – Complete sidewalks with landscaped buffers
- Option 3 - Multi-use trail on one side
- Option 4 – Hybrid of Sidewalks and Trails

Oct. 18 Open House - What We Heard



- Roughly 60 people attended
- Some of the major themes included:
  - **Walking:** Want to see more consistent sidewalks
  - **Biking:** Many liked shared use trails, but there were concerns about cyclists mixing with walkers
  - **Driving:** Don't add more lanes and preserve trees, but plan for future growth in the Town Center and traffic heading towards the 185th Street Light Rail Station.

Strongest community preference expressed for the buffered bike lanes (Option 1), as it provides a continuous bicycle facility and provides the most separation among modes.

Buffered Bike Lanes & Sidewalks

- One travel lane each direction
- Sidewalk with landscape buffer on both sides
- Buffered bicycle lanes in both directions
- Left turn lane or planted median where feasible
- Assumes bike lanes start around 178th St, just north of Town Center

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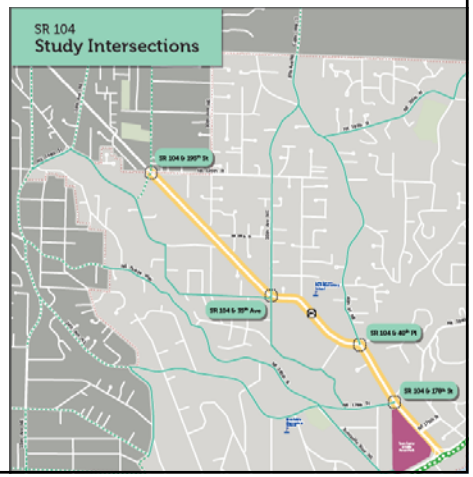
SR 104 Intersection Options

- Roundabout & signalized concepts considered for these intersections:
  - NE 195th Street
  - 35th Avenue NE
  - 40th Place NE
  - NE 178th Street



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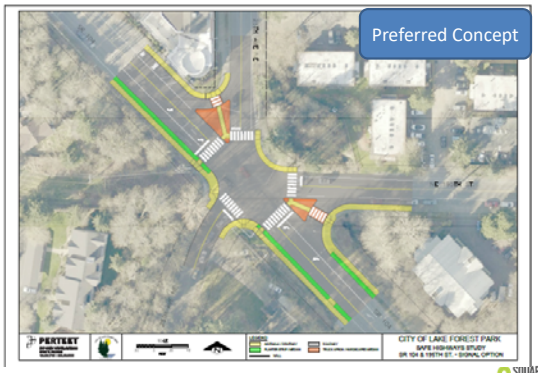
NE 195th Street & SR 104



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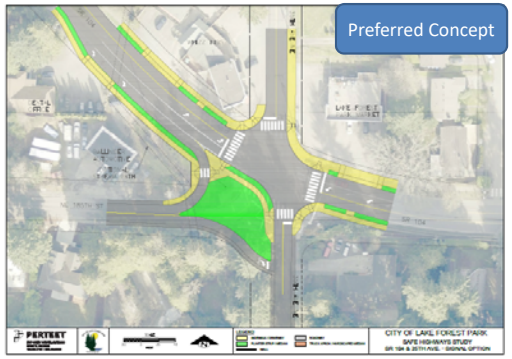
3 SQUARE BLOCKS PERTEET FEHR & PEERS

35th Avenue NE & SR 104



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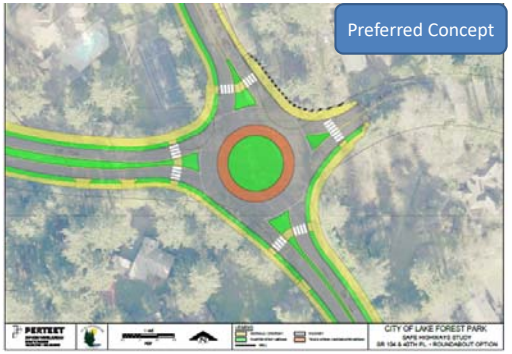
3 SQUARE BLOCKS PERTEET FEHR & PEERS

40th Place & SR 104



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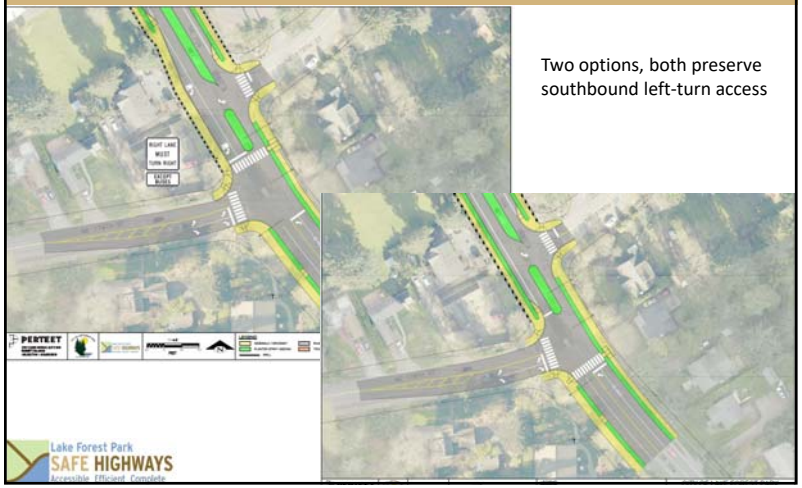
3 SQUARE BLOCKS PERTEET FEHR PEERS

NE 178th Street & SR 104



Two options, both preserve southbound left-turn access

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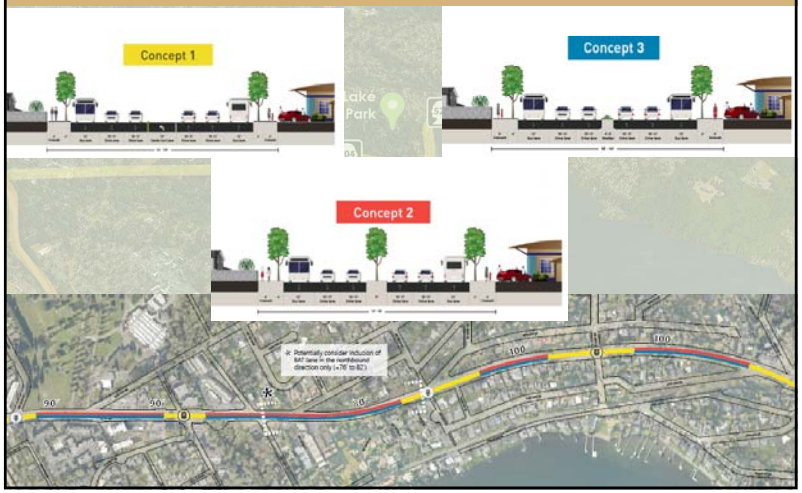
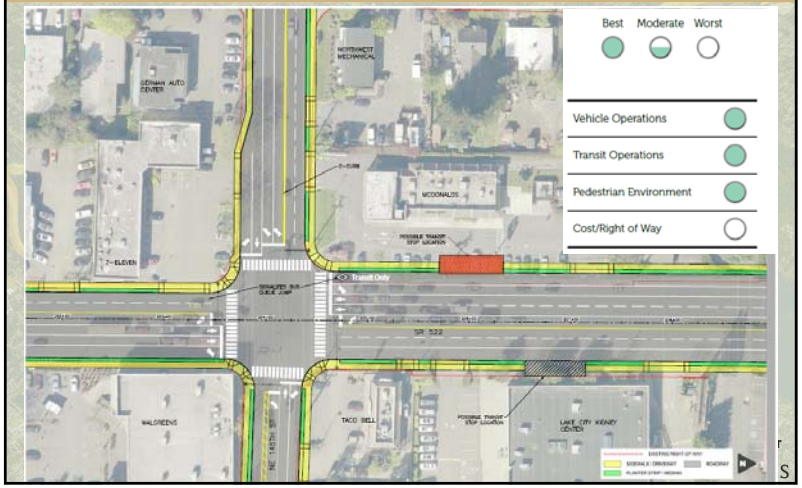
SR 522 Cross-section Concepts



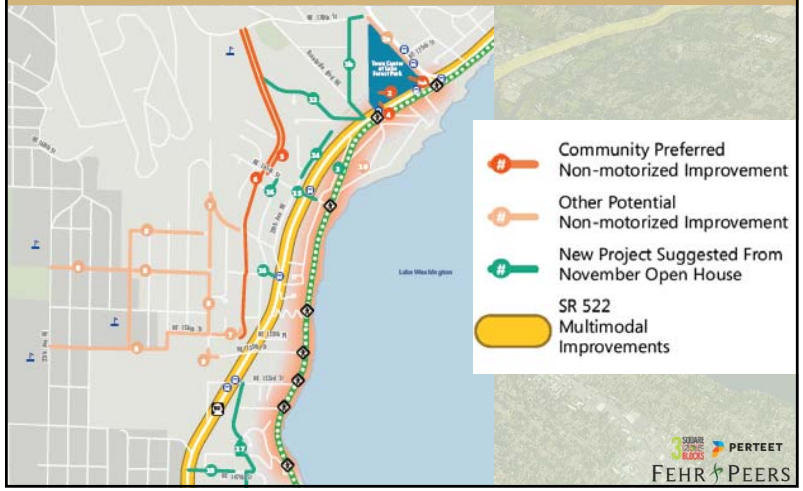
Recommendation

Neighborhood impacts: Narrow as possible to respect right-of-way & provide space for sound mitigation
Safety: Maintain & enhance access control throughout the corridor
Regional transit mobility: Completion of the business access transit (BAT) lanes through Lake Forest Park
Local access: Provision of a basic sidewalk facility on both sides of the street corridor-wide – critical for ADA
Vehicle mobility: Consider existing and future traffic demands to maintain reasonable travel times along the corridor.

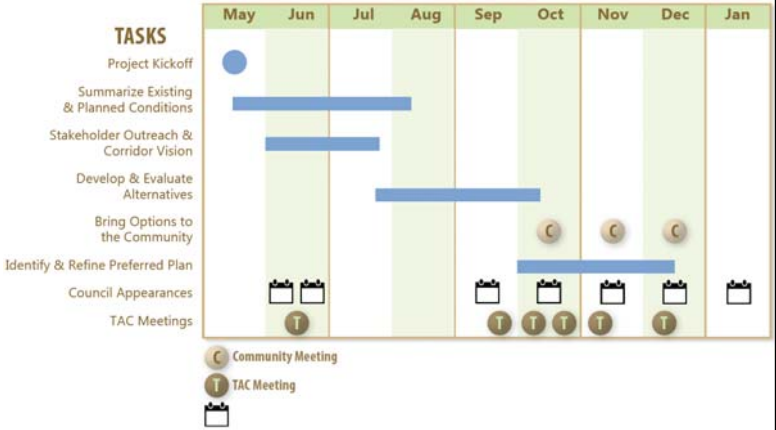
145th Intersection: Option 1



Non-Motorized Access to Transit



Project Schedule



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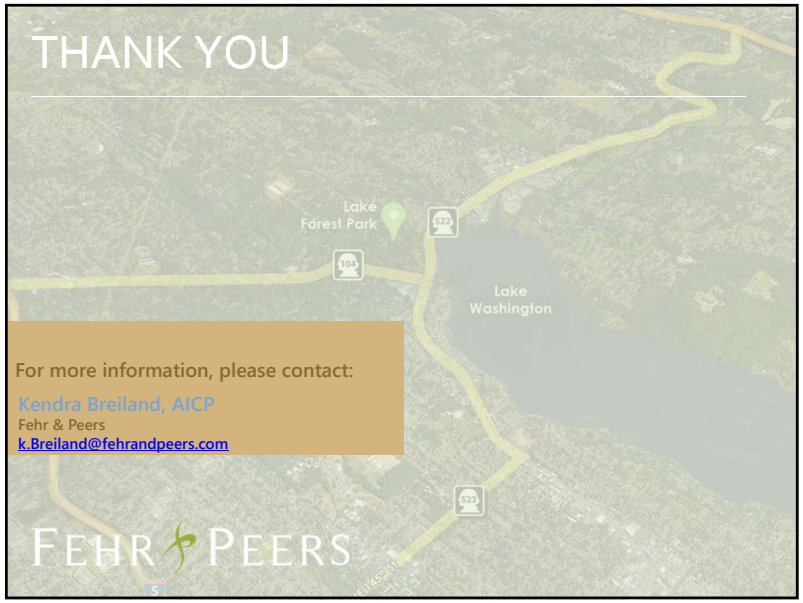

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Appendix D: Community Meetings & Public Input Summary

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Summary of Open House 1 – SR 104 (Ballinger Way)

Meeting Details

October 18, 6 - 8 pm
Lake Forest Park City Hall Council Chambers
17425 Ballinger Way NE

Meeting Purpose

The purpose of the first public Open House was to hear community feedback on

- Cross-section options for SR 104;
- Intersection options for SR 104; and
- The project's public process, schedule, and Guiding Principles.

Attendees

The event was attended by 44 members of the public and staffed by the following members of the Project Team:

Kurt Ahrensfeld – Perteet
Kendra Breiland – Fehr & Peers
Neil Jensen – City of Lake Forest Park
Carmen Kwan – Fehr & Peers
Rebecca Fornaby – 3 Square Blocks
Pete Rose – City of Lake Forest Park
Marcia Wagoner – 3 Square Blocks
Evelyn Jahed – City of Lake Forest Park

Agenda

6:00 pm	Open House
6:30 pm	Presentation
7:05 pm	Visit stations and give input
8:00 PM	Adjourn

Project Background

In 2016, the Lake Forest Park City Council adopted a Strategic Plan that identified the need to proactively plan the SR 522 and SR 104 corridors to improve safety and community mobility. In November 2016, Lake Forest Park and regional voters passed Sound Transit 3, a $54 billion package to expand transit in the Puget Sound region through 2041. Sound Transit 3 includes funding to improve SR 522 to accommodate planned bus rapid transit (BRT) service by 2024.

The Safe Highways Study is a product of the City's 2016 Strategic Plan. The Study is documenting preferred cross-sections and treatments along the SR 522 and SR 104 corridors. It is the City's intention that this Study's recommendations will

- Be informative to Sound Transit in the planning of the SR 522 corridor;
- Aid in the identification of non-BRT improvements requiring regional investment; and
- Provide a starting point for regional investment along SR 104.

Presentation

After a Councilmember Phillippa Kassover welcomed attendees to the Open House, Fehr & Peers gave a brief presentation on the SR 104 corridor. The presentation provided attendees an overview of

- The Safe Highways Study, which is a comprehensive corridor study striving to create complete connections for all modes of transportation through an implementable and community-supported plan;
- Materials on display at the Open House, including preferred cross-section and intersection concepts (available on the lfpsafehighways.com Project Files page);
- Key findings from stakeholder interviews (including business groups, residents, and interest groups) conducted at the outset of the project (available on the lfpsafehighways.com Project Files page);
- SR 104 Guiding Principles (available on the lfpsafehighways.com Project Files page);
- Planning Context Report (available on the lfpsafehighways.com Project Files page);
- Existing conditions along SR 104; and
- Project schedule.

Meeting Content & Public Comment Summary

Attendees were provided a comment form with discrete sections for providing feedback on four topics that corresponded with the Open House exhibit stations: the overall project and the SR 104 cross-section and intersection concepts.

A total of 24 comment forms were collected.

Cross-section options:

- Option 1: Buffered bike lanes
- Option 2: Multi-use trail
- Option 3: Sidewalks only
- Option 4: Hybrid of multi-use trail and sidewalks only

While many community members supported the idea of a shared use trail, there was a strong preference expressed for the buffered bike lanes (Option 1), as it provides a continuous bicycle facility and provides the most separation among modes. The community highlighted both the safety and functionality advantages of modal separation.

The buffered bike lane option was originally highlighted as problematic by Metro, as it creates the potential issue of vehicles passing buses while they are at stops. The consultant team has since explored bus stop configurations that alleviate this concern. These stop configurations will be shown at the 12/4 open house.

Intersection options:

- 195th/SR 104: Roundabout and signalized options presented on 10/18.
    - Slight public preference for the signalized option.

  - Signalized option will be shown as the preferred option at the 12/4 meeting as it is more consistent with the following guiding principles without sacrificing other guiding principles:
    - Address safety for all modes (pedestrian and bike safety)
    - Minimize impacts on neighboring properties (e.g. right-of-way, access, noise, visibility)
- 35th/SR 104: Roundabout and signalized options presented on 10/18.
  - Public preference for the four-legged signalized option.
  - Signalized option will be shown as the preferred option at the 12/4 meeting as it is more consistent with the following guiding principles without sacrificing other guiding principles:
    - Address safety for all modes (pedestrian and bike safety)
    - Minimize impacts on neighboring properties (e.g. right-of-way, access, noise, visibility)
- 40th Place/SR 104: Roundabout and stop-controlled options presented on 10/18.
  - Public preference for the roundabout option.
  - Roundabout option will be shown as the preferred option at the 12/4 meeting as it is more consistent with the following guiding principles without sacrificing other guiding principles:
    - Address safety for all modes
    - Consider draw on city's financial resources in selecting design solutions; as well as positioning improvements well for regional, state and federal investment
    - Plan corridor to discourage neighborhood cut-through traffic
- 178th/SR 104: One signalized option presented on 10/18, which showed restricting access to the east leg to right in/right out only.
  - Received extensive public comment about the desire to maintain access to the east leg of 178th.
  - Presenting two new signalized options at the public meeting on 12/4 – both with access to the east leg of 178th preserved:
    - Transit queue jump
    - No transit queue jump

Comments on the overall project:

- More communication with homeowners on SR 104
- Collaboration with other ongoing projects in LFP should be explicit in guiding principles and presentation of information
- Guiding principles should include economic development
- Cross-section and intersection option boards were not self-explanatory and should have been explained in presentation
- Visuals were successful
- Speak to possible funding sources in Open House materials
- Public process should be better explained
- Address polluted runoff from SR 104
- Speed limits should be lowered
- Tree survey—Including critical root zone for each tree in/near ROW—must be performed

- Does the project meet the GMA requirements for "no net loss of ecological function"?
- Will installing 5' buffers remove many existing trees? If so, weigh this trade-off
- When the light rail station at 185th opens, people are unlikely to use park and ride
- Project should encourage the use of town center businesses
- Consider using pavers instead of concrete
- To make ST3 work, "shuttle should meet all express busses from Seattle (522) and go up SR 104"
- The k-rail retailing wall across from 10th and Ballinger is not high enough
- Will the state buy into these plans to assure that SR 104's character won't change?
- Preference for pathways (like on Brookside), not sidewalks like in Kirkland or Bellevue

Next Steps

The next public Open House will be held on December 4th. Refined concepts, as described above, will be presented to the community.

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Summary of Open House 2 – SR 522 (Bothell Way)

Meeting Details

November 14, 6 - 8 pm
Lake Forest Park City Hall Council Chambers
17425 Ballinger Way NE

Meeting Purpose

The purpose of the second public Open House was to hear community feedback on

- Access control and cross-section options for SR 522;
- Potential changes to the 522/145th intersection;
- Non-motorized access improvements for SR 522; and
- The project's public process, schedule, and Guiding Principles.

Attendees

The event was attended by 71 members of the public and staffed by the following members of the Project Team:

Kendra Breiland – Fehr & Peers
Chris Grgich – Fehr & Peers
Neil Jensen – City of Lake Forest Park
Carmen Kwan – Fehr & Peers
Rebecca Fornaby – 3 Square Blocks
Pete Rose – City of Lake Forest Park
Amanda Ruksznis – Perteet
Sarah Saviskas – Fehr & Peers
Marcia Wagoner – 3 Square Blocks
Cory Roche – City of Lake Forest Park
Daniel Dye – Fehr & Peers

Agenda

6:00 pm	Open House
6:15 pm	Presentation 1
6:45 pm	Presentation 2
7:15 pm	Presentation 3
8:00 PM	Adjourn

Project Background

In 2016, the Lake Forest Park City Council adopted a Strategic Plan that identified the need to proactively plan the SR 522 and SR 104 corridors to improve safety and community mobility. In November 2016, Lake Forest Park and regional voters passed Sound Transit 3, a $54 billion package to expand transit in the Puget Sound region through 2041. Sound Transit 3 includes funding to improve SR

522 to accommodate planned bus rapid transit (BRT) service by 2024.

The Safe Highways Study is a product of the City's 2016 Strategic Plan. The Study is documenting preferred cross-sections and treatments along the SR 522 and SR 104 corridors. It is the City's intention that this Study's recommendations will

- Be informative to Sound Transit in the planning of the SR 522 corridor;
- Aid in the identification of non-BRT improvements requiring regional investment; and
- Provide a starting point for regional investment along SR 104.

Presentation

After Mayor Jeff Johnson welcomed attendees to the Open House, Fehr & Peers gave a brief presentation on the SR 522 corridor. The presentation provided attendees an overview of

- The Safe Highways Study, which is a comprehensive corridor study striving to create complete connections for all modes of transportation through an implementable and community-supported plan;
- Materials on display at the Open House, including preferred cross-section concepts, an SR 522/145th Street intersection concept, and non-motorized access improvements (available on the lfpsafehighways.com Project Files page);
- Sound Transit 3 Regional Transit System Plan as it relates to SR 522;
- Key findings from stakeholder interviews (including business groups, residents, and interest groups) conducted at the outset of the project (available on the lfpsafehighways.com Project Files page);
- SR 522 Guiding Principles (available on the lfpsafehighways.com Project Files page);
- Planning Context Report (available on the lfpsafehighways.com Project Files page);
- Existing conditions along SR 522; and
- Project schedule.

Public Comment Summary

Attendees were provided a comment form with discrete sections for providing feedback on four topics that corresponded with the Open House exhibit stations: the overall project, non-motorized access improvements, the 522/145th intersection, and the SR 522 corridor cross-section concepts.

A total of 27 comment forms were collected.

Cross-section concepts presented:

- Concept 1: Turn lane + Business Access and Transit (BAT) lanes + buffered sidewalks on both sides (96-100' wide)
- Concept 2: 8' median + BAT lanes + buffered sidewalks on both sides (92-96' wide)
- Concept 3: 4' median + BAT lanes + buffered sidewalks on both sides (88-94' wide)

In addition a fourth sub-option, which considers option 3, but with removal of the BAT lane on one side was considered. This option would be 76-82' wide, but would be inconsistent with the representative project approved by regional voters.

Extensive public input was provided by Sheridan Beach members, which included:

- Do not need sidewalks on both sides of the street. Between 39th and Vet hospital, want it on east/lakeside only
- Desire to maintain two-way-left-turn lane access wherever possible
- Consideration of noise levels/sound mitigation
- Desire to reduce speed limit on SR 522 to 35 miles per hour (MPH)

Other input received:

- Do not include two-way-left-turn lane as it is dangerous and serves a limited number of residences
- No sidewalks at all – DANGER, NOISE
- Would like to see better sidewalks between the Vet and the Town Center
- No changes should be a choice
- Build a lid over SR 522 with a park on top!
- Separate through traffic from local traffic – tunnels and/or flyover lanes?
- Bus Queue Jump vs BAT Lanes - Consider bus queue jump on SR 522 instead of completing BAT lanes.
- Close access to SR 522 from 47th Avenue NE – too dangerous
- Cross-sections should be low impact development (LID) –draining to center with vegetated medians and using pervious pavements for sidewalks
- No need for lakeside sidewalk immediately west of SR 104, since the Burke Gilman trial serves as a reasonable alternative and there is no business access.
- Desire to maintain parking & access over medians
- Trees in medians should be applied with caution – sight distance for vehicles & also concerns about maintenance and visual blight
- Sidewalks on the westside of the street would be utilized by people who don't have a car
- Concern about safety for drivers entering SR 522 from 38th Avenue and 39th Avenue– danger merging across BAT lanes, bad sight distance
- Ensure sidewalk is provided on at least one side of road for entire stretch, provide pedestrian crossings at < ¼ mile spacing
- For the 80 foot section, providing one sidewalk is most important, followed by completion of the BAT lanes, followed by providing sidewalks & trees on both sides

In response to the above feedback, Fehr & Peers is looking at ways to update the proposed cross-sections to minimize right-of-way requirements, while ensuring safety and ADA access. Clearly, the community has diverse desires for the corridor (ranging from no changes to building a lid over the corridor with a park on top), so final recommendations will combine our best interpretation of community desires with professional judgement of what is needed along the corridor and meets the spirit of what voters passed with ST3. Locations where the public has requested sound mitigation will also be highlighted. Traffic operations within the corridor are also a major consideration.

145th Intersection option presented:

At the 11/14 meeting, Fehr & Peers presented an option that showed modifications to the 145th intersection with SR 522 to include an additional eastbound left turn lane, as well as modifications to the bus stop locations and conversion of the southbound right turn lane to be a shared bus queue jump/right turn pocket.

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Input:

- Leave as is – nothing is wrong with it
- Why no options with grade separated solutions?
- Need a dedicated bus lane on 145th all the way to the station
- Move transit stops further to south beyond the 7-11.
- Move bus stops away from the intersection
- Give pedestrians a head start on signals – all-way diagonal crossings?
- Separate bus stops for King County Metro routes (at 7-11) and SR 522 (along 145th)

In response to the above feedback, Fehr & Peers has explored three options for this intersection that will be presented at the December 4th public open house:

- **Option 1:** Redesign southbound approach to include the following:
  - Additional southbound bus only lane between the curb and right turn lane
  - The additional lane is added so that the SBRT and EBLT can have an overlapping phase and so SBRT traffic will not be blocked by a southbound bus
- **Option 2:** Consolidate the southbound stop south of the intersection and the westbound stop west of the intersection to a near side stop about 100' north of the intersection
  - Buses will use the shared bus/right turn lane
- **Option 3:** Shift southbound stop 100' south of the current location so queues won't spill back into the intersection

Each of the above options has been evaluated in terms of its ability to improve congestion for cars and transit, pedestrian environment, and cost/right of way needs. These findings will be presented on December 4th.

Non-Motorized Access Projects:

At the November 14th open house, Fehr & Peers presented 11 potential projects to improve non-motorized access to transit. Participants were asked to place a dot by their favorite three and also suggest additional projects they believed were missing.

Top 5 projects selected by open house attendees:

- Project 3a/b – Pedestrian bridge over SR 522
- Project 2 – Pedestrian paths identified between Town Center and Transit Stops
- Project 4 – Improved NE 170th / SR 522 pedestrian crossing
- Project 5 – Add sidewalk along 37th Ave NE
- Project 6 – Traffic calming along 37th Ave NE

Input:

- Pedestrian bridge over SR 522 needed either at NE 170th Street or Ballenger Way
- I question the basic concept of providing for all modes – what is the cost/benefit
- Consider emergency fire access routes when proposing traffic calming on 37th Avenue NE; some didn't like the idea of speed bumps on this street
- Be conscientious of sign clutter that can ruin user experience on the trail for Project 10.

- West sidewalk on SR 522 north of NE 165th Street may not be needed. Consider sidewalks on 39th Ave instead.
- Tunnel - Some expressed a desire for a SR 522 tunnel between Brookside and NE 155th St.
- Find and exploit routes that are not along existing routes – look for ways to use undeveloped rights-of-ways for trails connections
- Cyclists at NE 165th Street do not stop. Consider some sort of rumble strip on Burke Gilman Trail approaching stop sign?
- Brookside and 170th Street - Consider revisions to SR 522 at Brookside Boulevard and NE 170th Street. The Fire Department expressed concerns about queueing in front of the Fire Station, which blocks access. Explore changing roads to one-way. (This may be addressed in the Central Subarea Plan/Safe Streets.)
- Do not use access improvements to facilitate transit oriented development (TOD)
- The street by Brookside needs a sidewalk
- Move crosswalks on 165th and 160th Streets to east side (lake side) of SR 522

Proposed New Projects:

- Project 1b - Have an improved bike/pedestrian facility along Brookside Boulevard/44th Avenue NE behind the Town Center as opposed to Project 1 on the west side of SR 104.
- Project 12 – upgrade current extruded curb walking path to sidewalks on Hamlin Road (Brookside Boulevard to 37th Avenue NE)
- Project 13 – formalize existing goat trail connection from 41st Ave to Burke Gilman Trail
- Project 14 – improve walking conditions on 39th Avenue NE from NE 165th Street north to street end / pedestrian trail near Veterinary clinic / gas station.
- Project 15 – improve pedestrian crossing of SR 522 at NE 165th Street. If grade separated crossing is not possible, improve at-grade crossing. Consider enhanced striping, signal timing change
- Project 16 – staircase maintenance and improved lighting at existing stair case near 39th Ave NE southbound bus stop and to NE 165th Street north of 39th Avenue NE.
- Project 17 – South East City Traffic Calming to reduce cut through traffic on 37th Avenue NE to 148th Street to 153rd Street.
- Project 18 – Sidewalk extension on 147th Street east of SR 522.
- Project 19 – On-street parking monitoring program near BRT stations. Consider time limited parking or Residential Permit Zone parking to discourage “hide-and-ride” behavior.
- Project 20 – Pedestrian overpass at NE 165th Street to facilitate the Sheridan Beach Club Community

In response to the above feedback, Fehr & Peers will present the top 5 supported non-motorized access projects and the new projects proposed by the community at the December 4th open house and seek further input on preferred investments.

Where residents want to access SR 522 BRT:

- Most attendees wanted a stop near the Town Center and at NE 165th Street. However, it is likely higher representation of residents near NE 165th Street attended the Open House.

- The stop pair at NE 153rd Street and the stop at 39th Avenue NE were identified as lightly used.

Other Comments on the Overall Project:

- Want park and ride at 145th or on DejaVu lot rather than town center
- Desire to build two 150-space garages: one at 145th and one at town center
- Why did it take six months to have a public meeting?
- Concern that this project is too focused on safety and not enough on traffic congestion
- Noise and air pollution (dust, diesel) conflicts between buses and single family neighborhoods
- Missing environmental goals about tree canopy maintenance and surface water pollution

Appendices

Handout
Comment form
Exhibits

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Summary of Open House 3 – SR 104 and SR 522

Meeting Details

December 12, 6 - 8 pm
Brookside Elementary School
17447 37th Ave NE

Meeting Purpose

The purpose of the third public Open House was to demonstrate the ways in which community feedback has been incorporated into the preferred SR 104 cross-section and intersection options, SR 522 cross-section and 145th intersection options, and non-motorized access to transit improvements.

Attendees

The event was attended by 95 members of the public and staffed by the following members of the Project Team:

Kurt Ahrensfeld – Perteet
Kendra Breiland – Fehr and Peers
Chris Grgich – Fehr and Peers
Daniel Dye – Fehr and Peers
Rebecca Fornaby – 3 Square Blocks
Neil Jensen – City of Lake Forest Park
Pete Rose – City of Lake Forest Park
Amanda Ruksznis – Perteet
Sarah Saviskas – Fehr and Peers
Marcia Wagoner – 3 Square Blocks

Agenda

6:00 pm	Open House
6:15 pm	Presentation
7:00 pm	Open House
8:00 PM	Adjourn

Project Background

In 2016, the Lake Forest Park City Council adopted a Strategic Plan that identified the need to proactively plan the SR 522 and SR 104 corridors to improve safety and community mobility. In November 2016, Lake Forest Park and regional voters passed Sound Transit 3, a $54 billion package to expand transit in the Puget Sound region through 2041. Sound Transit 3 includes funding to improve SR 522 to accommodate planned bus rapid transit (BRT) service by 2024.

The Safe Highways Study is a product of the City's 2016 Strategic Plan. The Study is documenting preferred cross-sections and treatments along the SR 522 and SR 104 corridors. It is the City's intention

that this Study's recommendations will

- Be informative to Sound Transit in the planning of the SR 522 corridor;
- Aid in the identification of non-BRT improvements requiring regional investment; and
- Provide a starting point for regional investment along SR 104.

Presentation

After Mayor Jeff Johnson welcomed attendees to the Open House, Fehr and Peers gave a presentation on the SR 104 and SR 522 corridors. The presentation provided attendees an overview of

- The Safe Highways Study, which is a comprehensive corridor study striving to create complete connections for all modes of transportation through an implementable and community-supported plan;
- How the Safe Highways study feeds into future Sound Transit 3 work;
- Planning Context Report (available on the lfpsafehighways.com Project Files page);
- Community engagement efforts to date, including stakeholder interviews, Technical Advisory Committee (TAC) meetings, and Open Houses;
- SR 522
    - Guiding Principles,
    - Existing conditions,
    - Preferred cross-section options and community feedback on those options, and
    - Preferred 145th intersection options and community feedback on those options;
- SR 104
    - Guiding Principles,
    - Existing conditions,
    - Preferred cross-section options and community feedback on those options, and
    - Preferred intersection options and community feedback on those options;
- Preferred non-motorized access to transit projects and community feedback on those projects;
- Project website;
- Project schedule.

Public Comment Summary

Attendees were given a comment form with discrete sections for providing feedback on topics corresponding with the Open House exhibit stations, including

- The overall project;
- Non-motorized access to transit;
- SR 104 cross-section and intersection options; and
- SR 522 cross-section and 145th intersection options.

A total of 36 comment forms were collected.

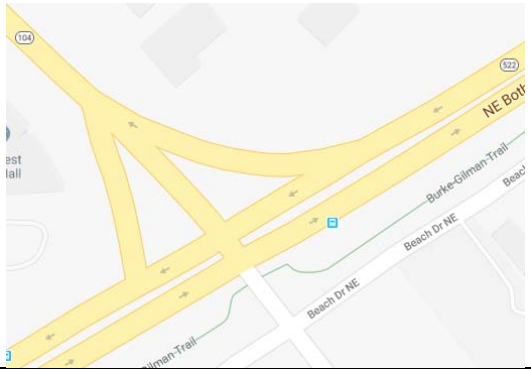
Station 1: Overall project

- Remove tolls on SR 522 and I 405 during construction of SR 522
- The impacts of tolling SR 522 were never mitigated
- Traffic diverts cuts through neighborhoods between SR 522/145th and Brookside—think of traffic calming to discourage this (this comment was also made by one other participant)
- Reducing speeds on SR 522 would help with noise abatement

- Should consult with LFP Streamkeepers and LFP Stewardship Foundation
- Project hasn't looked closely enough at environmental impacts
- Should make sure SR 104 improvements don't preclude future bus rapid transit (BRT)
- Want to see more data—why isn't there a concept for a tunnel, lid, or park on SR 522?
- Sheridan Beach Club should have been consulted in developing Guiding Principles
- Planning context fails to mention or evaluate trees

Station 2: Non-motorized Access to Transit

Project #	Comments Received
1a	• 1 person expressed support
1b	• 1 person expressed their support for this. Sidewalks are key – there is lots of cut through traffic and speeding. An extruded curb would not be sufficient. • Add backdoor access to Town Center/SR 522 BRT from 44th aligned with 174th
2	• 1 person expressed support
3a	• 1 person expressed support
3b	• Several people supported this • 2 people expressed that they didn't support the bridge—3a is more cost effective and easier to update over time • "Strong support for Project 3B and providing more than one grade separated crossing of SR 522"
4	• Several people supported this • "Support for Project 4, also make sidewalks and ped zones more obvious in area of gas station" • "This project may be overkill"
5	• Several people supported this • The street along Brookside school until 165th is where improvements for walking and biking are most needed
6	• 1 person supported this
7	
8	
9	• 1 person supported this
10	• 1 person supported this
11	
12	• 1 person expressed support
13	• 2 people did not feel this trail is used enough to justify the cost—the goat trail works just fine
14	• Several people supported this • "I like the sidewalk on 39th Avenue" • 1 person expressed support, but prefers a path that connects up to Hamlin instead of having pedestrians use the existing easement that ends at the Vet—it's challenging to interact with the cars coming in and out of the gas station
15	• Several people supported this • "Would like to see 5 second pedestrian lead in signal at 165th (similar to signal near

	Starbucks)" • There was a request to also consider an underpass—"it can work with good lighting—look at the tunnel in Kenmore as an example" • "An overpass at 165th would be unsightly"
16	• 2 people expressed support—"the City should fund this"
17	• 1 person expressed support—"we have lots of cut through traffic"
18	
19 - NEW	• 3 people expressed their support for this new project. Connecting these streets would go a long way towards increasing access to transit and student access to Brookside Elementary from the hillside and Sheridan Heights. There is currently property for sale between 35th Ave and 33rd Ave, which could help make this more feasible. 
20 - NEW	• There is a blind corner at the intersection of Shore Drive NE and Beach Drive NE – this is a safety hazard for pedestrians and cyclists
21 - NEW	• A safe connection is needed for people walking from the Vet through Willows Park to the Town Center • Two people would like to see pedestrian safety improvements at the intersection of 44th and Brookside—it's a tough corner as a pedestrian—cleaning up the vegetation to improve sightlines would help
22- NEW	• At Beach Drive NE, pedestrians are crossing illegally and cars/bikes don't know to look for them—it's a big safety hazard 

Additional Comments:

- There are numerous "near misses" at the intersection of 165th and the Burke-Gilman Trail—cyclists don't stop, and there is poor sight distance for motorists going westbound
- On SR 522, there was a request to maintain the southbound left turn lane just north of 165th—a resident makes this U-turn and backs into her driveway

- In regards to Safe Streets, there was a request to lower speed limits and avoid confusing signage on 35th—this individual would also like to see lower speed limits citywide (a movement to "20 is plenty")
- Several comments were made against a sidewalk on the west side of SR 522
- There was a request for a more generous waiting area for pedestrians and bicyclists on SR 522 in front of Starbucks
- A sidewalk is needed on SR 522 between the Vet and Starbucks
- Consider eliminating Brookside Boulevard connection—route 170th into alignment with road in front of Fire Station

Station 3A: SR 104 Cross-sections

- "Most important thing for me as a walker is not to share same space with bikes" (This comment was made by one other participant)
- Safe for pedestrians first, also preserve green space—future is not cars!
- Support for buffered bike lanes (this comment was made by three other participants)
- Should include business access and transit (BAT) lanes from 40th Place to SR 522 to accommodate future bus rapid transit (BRT)
- Support for multiuse trails
- Does not think anyone would bike on SR 104—want to use Perkins Way instead
- Concerned about ROW taken for bike lane
- Prefers hybrid option

Station 3B: SR 104 Intersections

- Concerned about removing 185th leg from signalized option and how it will lead to more neighborhood cut-through
- Desire to dead end 185th in preferred option for 35th to daylight creek
- 40th Place—like "rotary" but crosswalks should be three to four car lengths from rotary; wants rotary to be 90-100 foot island diameter
- Does not support roundabout at 40th
- At 178th, prefer bus queue jump option, but bus lane should be longer—would prefer a fully realigned intersection where 178th legs meet up
- Support for all preferred options (this comment was made by one other participant)
- Prefers roundabouts at 35th and 40th
- Likes 178th options
- Prefers 178th Option 1 (bus queue jump option)
- Supports 40th place roundabout (this comment was made by one other participant)

Station 4A: SR 522 Cross-sections

- Please build an overpass of SR 522 with an elevator
- Like having green space/rain gardens to capture runoff/harmful metals from getting into streams
- Safety measures for homes with backyards at grade with SR 522—prevent cars from running into backyards
- Noise wall on west side of SR 522, especially with sidewalk
- Improvements to fences on west side of SR 522 to prevent burglaries

- Sidewalks on both sides of SR 522 for the entire length!
- Resident on 157th Place NE are concerned about loss of center turn lane—does team have u-turn calculations to confirm length needed for u-turn pockets? Could the u-turns be controlled by lights/sensors to keep queues from backing up?
- No sidewalk on west side of SR 522 between vet and 153rd (This comment was made by two other participants)
- Limiting turns on SR 522 will put more pressure on 165th and other intersection (as well as create cut through)
- Concern that removal of rockeries and plants will lead to a 15-20 foot wall in some places
- "I do not understand the pushback on the sidewalk—there should be safe sidewalks on both sides throughout"
- Fully construct BAT lanes, don't consider option to do one direction only
- At intersections, there should be pedestrian refuge islands at center and between BAT and general purpose lanes
- Medians present opportunity for storm water cleansing—and also safety!
- Keep bus stop at 165th (this comment was made by one other participant)
- Noise and speeds are a huge concern (this comment was made by two other participants)
- Do not want to lose left in/out access with median—keep two way left turn lane (this comment was made by two other participants)
- Desire for noise abatement on lakeside of SR 522 north of SR 104 (this comment was made by one other participant)
- Pedestrians and bikes are violating the light at 104/SR 522 near Civic Club
- Proposed statement: "If given the choice between constructing a sidewalk on the west side of SR 522, which would require acquisition of usable property on either side of SR 522, the City would recommend against acquiring residential property and abandon the west-sidewalk idea"
- Sidewalks are OK so long as no property is acquired and people use them
- Is median warranted?
- Sidewalks on one side, not both—push road into hillside, not lakeside (this comment was made by two other participants)
- Strongly agree with sidewalks on both sides—public right-of-way should be used for the public
- Desire for sound abatement on SR 522 from Brookside to 160th, both sides (this comment was made by two other participants)
- Revisit idea of sidewalks on both sides of street—don't like crime implications
- Doesn't support BAT lanes (thinks they dangerous to cross)
- Light pollution concerns for homes east of SR 522 in Sheridan Beach
- Likes sound wall east of SR 522 in Sheridan Beach
- Oppose sidewalks on both sides of the street throughout corridor—SR 522 not a good place to walk (this comment was made by two other participants)
- Does not support public funding for sound walls
- Include trees either on a median or lateral sidewalk(s)

Station 4B: SR 522/145th Intersection

- Prefer Option 1 (this comment was made by five other participants)
- Want bigger options, i.e. separate lane cutting the corner with a station, flyover from eastbound 145th to northbound 522. Think big or this is going to be awful! (this comment was made by one other participant)

- Prefer Option 3 (this comment was made by two other participants)

Park and Ride

- Put garage where Everest Kitchen use to be (near 145th) or behind it, will stop congestion of bus stopping traffic (this comment was made by one other participant)

Next Steps

Materials from this and other events are available at www.lfpsafehighways.com. It is anticipated that the draft recommendation will be available in February 2018.

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Appendix E: Planning Context Report

Lake Forest Park Safe Highways Planning Context Report

Prepared for:
City of Lake Forest Park

September 12, 2017

SE17-0540

FEHR PEERS

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Table of Contents

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Introduction

The City of Lake Forest Park is a desirable suburban community that over 13,000 residents call home. True to its name, Lake Forest Park is defined by its proximity to Lake Washington and its forested, park-like ambiance. However, Lake Forest Park is also defined by two major highway corridors that traverse the community: Bothell Way (SR 522) and Ballinger Way (SR 104). While these corridors connect Lake Forest Park residents to jobs, services, and other regional opportunities, they also divide the community by their sheer size, traffic volumes, and outdated designs, which offer little in the way of accommodations for those not travelling in a car. Further, the same corridors connect the region's north and northeast areas to drivers who do not necessarily know they are coming through our community.

In 2016, the Lake Forest Park City Council adopted a Strategic Plan, which identified the need to proactively plan the SR 522 and SR 104 corridors to improve safety and community mobility.

This Strategic Plan goal came at a fortuitous time. In November 2016, regional voters passed Sound Transit 3, a $54 billion package to expand transit in the Puget Sound through 2041. Sound Transit 3 includes funding to improve SR 522 to accommodate planned bus rapid transit (BRT) service by 2024.

This Safe Highways Study is a product of the City's Strategic Plan. The Study will document preferred cross-sections and treatments along the SR 522 and SR 104 corridors. It is the City's intention that this Study's recommendations will be informative to Sound Transit in the planning of the SR 522 corridor, identification of non-BRT improvements to seek other regional investments, and provide a starting point for regional investment along SR 104.

Overall Process

The Safe Highways Study began in mid-2017. While it is an engineering study evaluating infrastructure options along SR 522 and SR 104, it is also a community-driven process. The ultimate goal of the Safe Highways Study is to identify recommendations for study of intersection treatments and corridor cross-sections of SR 522 and SR 104, which the community can support, while balancing important considerations including safety, character, and local access with regional mobility. The region will not support the needs of Lake Forest Park unless Lake Forest Park articulates them and they are broadly understandable.

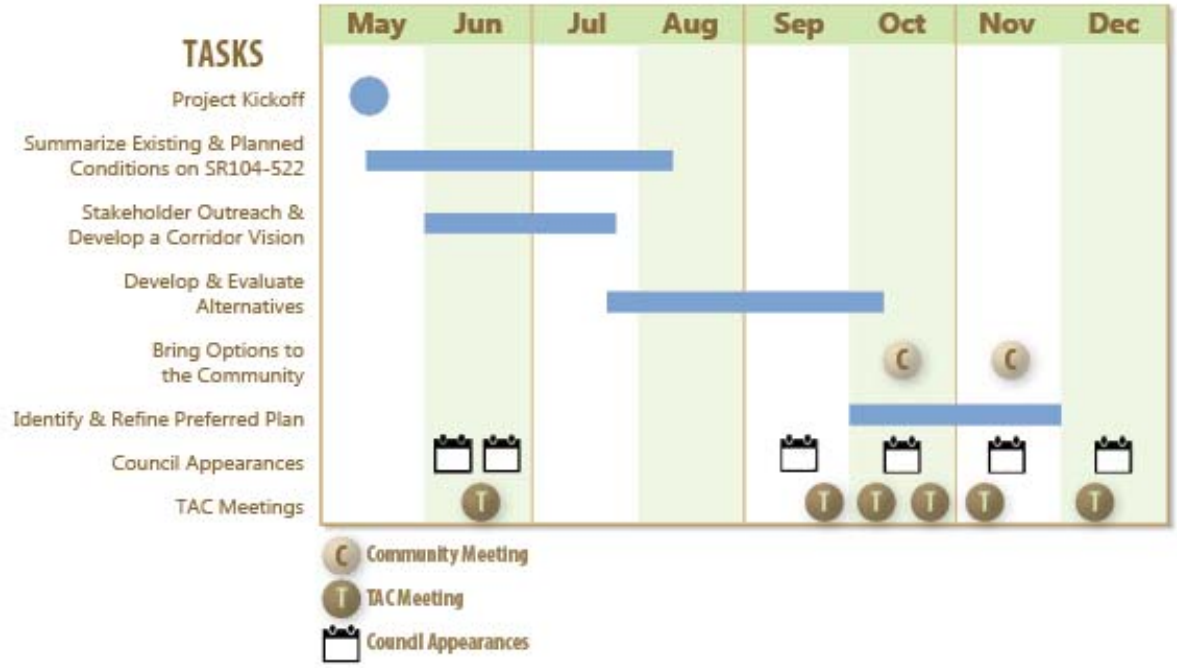
The process includes one-on-one stakeholder discussions, community workshops, a project website, multiple council discussions, and a Technical Advisory Committee

comprised of agency partners (neighboring cities, WSDOT, King County Metro, and Sound Transit) and Merlone Geier, the Lake Forest Park Town Center owner.

The Safe Highways Study recommendations will be developed over the course of Fall 2017 in advance of Sound Transit beginning its corridor planning work on SR 522 in early 2018.

Timeline

The following timeline shows the schedule for completing the Safe Highways Study. The study began in early 2017 with draft recommendations for Council by the end of 2017.



Guiding Principles

To guide this process, including the evaluation and selection of preferred corridor improvements, the Project Team began by establishing a set of guiding principles. These guiding principles are divided into three groups:

- Principles for the **overall project** apply to both corridors and how the Project Team will conduct this Study.
- Principles for **SR 522** are specific to achieving the ultimate vision of a future BRT corridor that is also a community asset.
- Principles for **SR 104** focus on realizing a corridor vision that improves safety and mobility while maintaining rural character.

Overall Project

- Engage the community and respect neighborhoods
- Recognize each corridor's role in regional mobility and local mobility access
- Coordinate with state, regional entities, and neighboring cities to identify mutually beneficial solutions
- Create equitable corridors that provide safe and inviting travel for all people, regardless of mode, age, or ability

SR 522

SR 522 Today

- Address safety for all modes
- Complete business access transit (BAT) lanes and full sidewalk connections to support both BRT and local access
- Minimize impacts on neighboring properties (e.g. right-of-way, access, noise, visibility)
- Improve non-motorized access to transit and crossing opportunities to enhance local access
- Create a corridor identity/character and enhance the natural environment
- Be a leader in identifying innovative solutions, particularly at the Bothell Way/145th Street intersection

SR 104

SR 104 Today

- Address safety for all modes
- Maintain the corridor's unique identity and natural landscape
- Take a phased approach that provides benefits over time
- Consider draw on city's financial resources in selecting design solutions; as well as positioning improvements well for regional, state and federal investment
- Protect natural environment and encourage low impact design approaches
- Plan corridor to discourage neighborhood cut-through traffic
- Minimize impacts on neighboring properties (e.g. right-of-way, access, noise, visibility)

Corridor Profile – SR 522

Introduction

State Route 522 is called a "highway of statewide significance" and this term seems to fit. It is a major artery connecting Seattle with the Eastside carrying approximately 20 percent of cross-lake trips. It is also identified as a freight corridor connection US 2 with I-5. With traffic volumes topping 50,000 vehicles on a weekday heading through Lake Forest Park, the importance of this roadway is evident. It is this heavy usage of SR 522 that makes it an appealing location for bus rapid transit: it goes where people want to go.

At the same time, SR 522 serves as a main travel route for Lake Forest Park residents, however it bisects the community, separating most residents from amenities along Lake Washington and the Burke Gilman Trail. The following corridor profile identifies the key challenges and opportunities to consider in identifying potential corridor concepts and community recommendations for this corridor.

Plans for the Corridor and Prior Studies

The following three recent studies provide information relevant to planning the SR 522 corridor.

145th Street Multimodal Corridor Study

The City of Shoreline led a multimodal corridor study of 145th Street (SR 523), which connects to SR 522 at the southwest edge of this study area. Sound Transit 2 will provide a Link light rail station just north of 145th Street at 5th Avenue by 2023. The 145th Street study considered future improvements for pedestrian, bicycle, and transit connections along the corridor to improve access to the proposed Link light rail station. Proposed improvements included widening of 145th Street at the SR 522 signal to increase capacity and improve signal timings. The preferred street cross-section is in **Figure 1.**

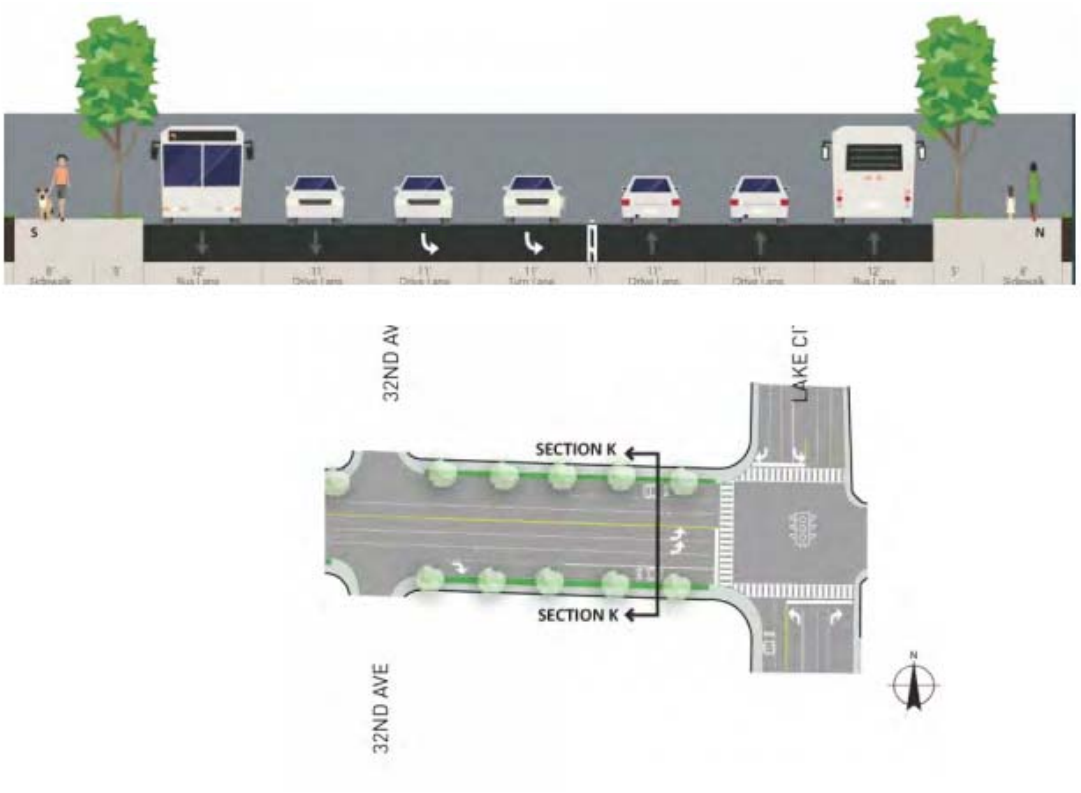


Figure 1. Preferred Concept for NE 145th Street/SR 522

Source: 145th Multimodal Corridor Study, City of Shoreline, November, 2016.

ST3 BRT Project Sheet Info

Sound Transit 3 identifies funding to implement BRT between the 145th Street light rail station in Shoreline and UW Bothell, with potential lower frequency service to Woodinville. Sound Transit estimates that this eight-mile BRT service could generate up to 10,000 daily riders. Along SR 522, the project looks to provide continuous BAT lanes and seven pairs of stations, some in Lake Forest Park and others at points east in Kenmore and Bothell. The corridor would also feature three park & ride garages, one of which is assumed to be at the Lake Forest Park Town Center. The BRT service, which would run on 10-minute headways through Lake Forest Park, would be in place by 2024.

King County Metro Connects

King County Metro Connects is a long-range vision for transit service within King County, and was adopted in January 2017. The plan includes several routes within the Safe Highways Study area. The plan envisions a Rapid Ride service line between the UW Link Light Rail System and the Bothell Transit Center along SR 522. A new frequent service route is also planned between the Shoreline Community College and the Kenmore Transit

Center by 2025. The route would use SR 522 and SR 104. It also proposes an express route between the Edmonds/Kingston Ferry Terminal, Bothell, and Redmond, which would run along both SR 522 and SR 104 by 2040.

The planned new routes within the study area are shown in **Figure 2,** below.

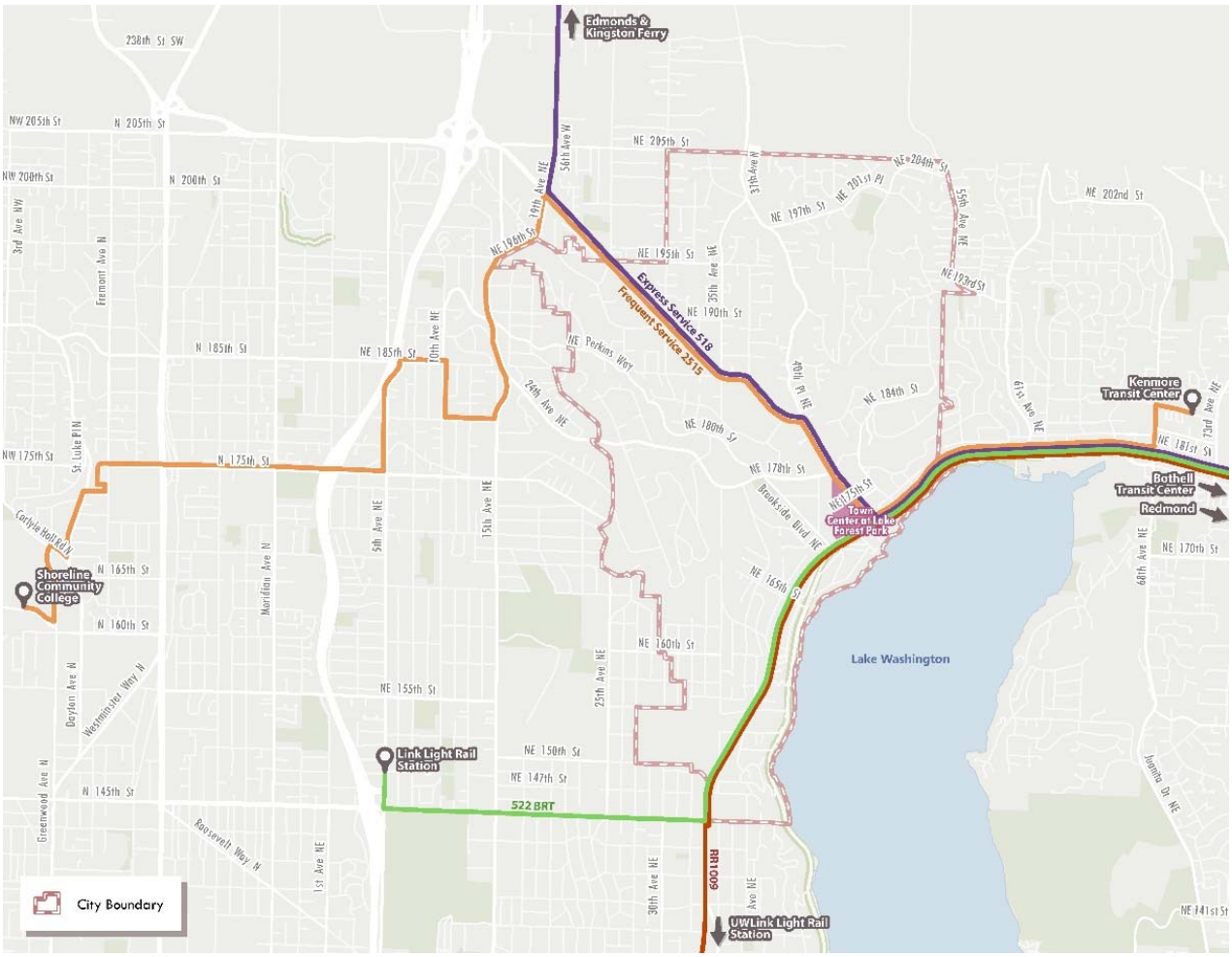


Figure 2: Planned King County Metro Service Routes

Source: Metro Connects, King County Metro, 2017

Safe Streets

The Safe Streets effort focused on making Lake Forest Park's streets safer for all users and improving connections to transit and key amenities, such as parks, schools, trails, and retail. The final report, adopted by City Council in July 2017, recommends ten public realm investments identified by the community, which are broken into two priority tiers. Safe Streets did not address SR 522 and SR 104 specifically, but several of the project recommendations will provide safer connections to transit along SR 522 for people

traveling on foot or by bicycle. For example, Project 1 adds a sidewalk on 37th Avenue NE from just south of NE 178th Street, where the existing sidewalk ends, to NE 165th Street, filling a crucial sidewalk gap used by many transit riders. Project 4 adds a variety of pedestrian amenities and traffic calming measures in the southwest region of Lake Forest Park near three schools, which people of all ages use to access transit. Additionally, Project 6 incorporates traffic calming measures on 37th Avenue NE and a small portion of NE 156th Street, which is a key pedestrian and bicycle corridor adjacent to SR 522. A summary map from the project is in **Figure 3.**

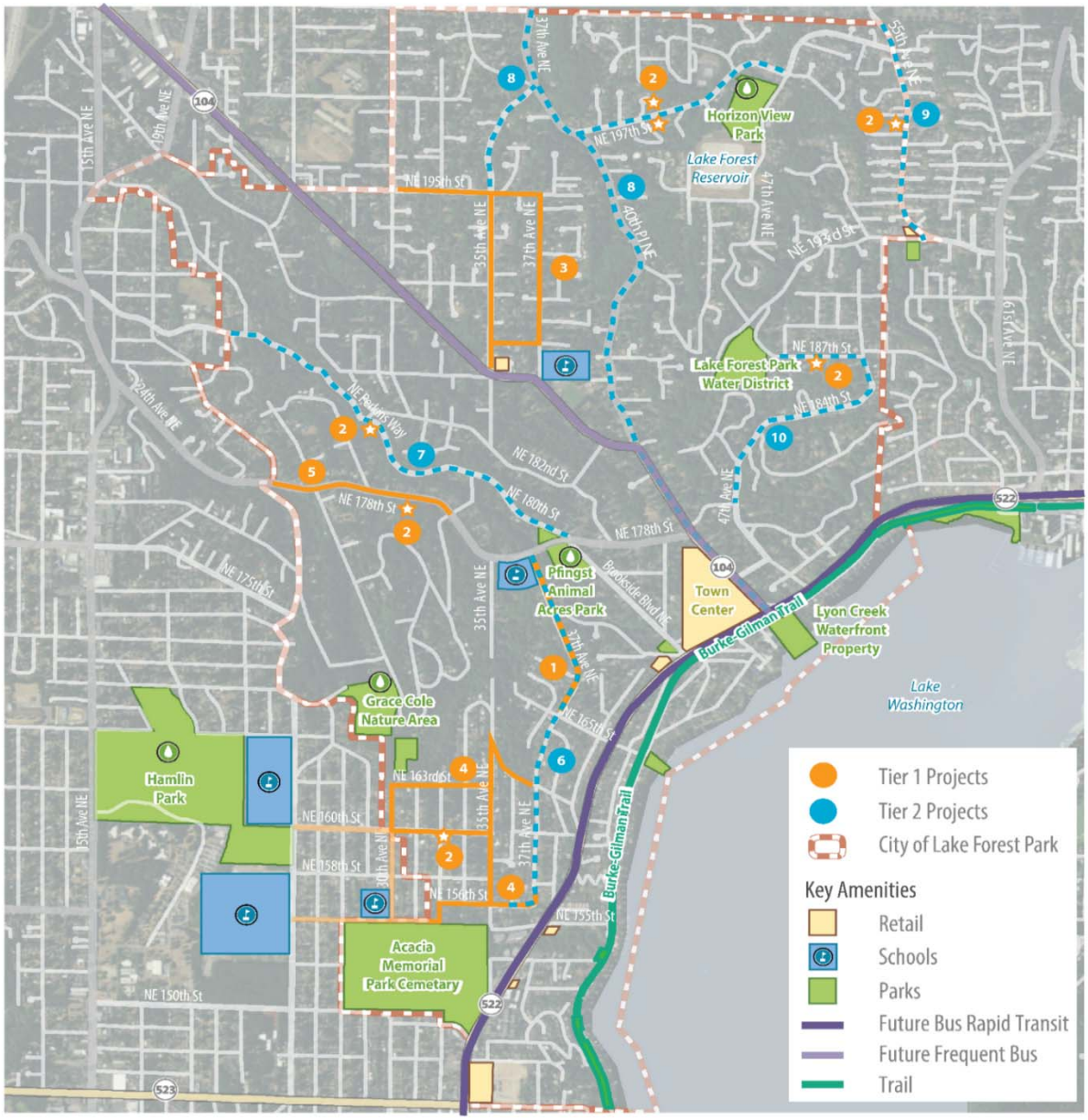


Figure 3. Safe Streets Project Recommendations.

Source: Safe Street Study, City of Lake Forest Park 2017.

Planning Context Topic Areas

The remainder of this report focuses on the two study corridors, SR 522 and SR 104. The corridor discussions are each further broken down by geographic segment and topic area. There are five geographic segments along SR 522 and four segments for SR 104 (see **Figure 4**). The figure also identifies the specific study intersections the Safe Highways Study will focus on. Additional intersections were evaluated on SR 522 as traffic operations will change under any proposed cross-sections.

Throughout this study 'northbound on SR 104' refers to travel towards Mountlake Terrace and away from the Town Center.

'Northbound on SR 522' refers to travel towards Kenmore and north of Lake Washington.

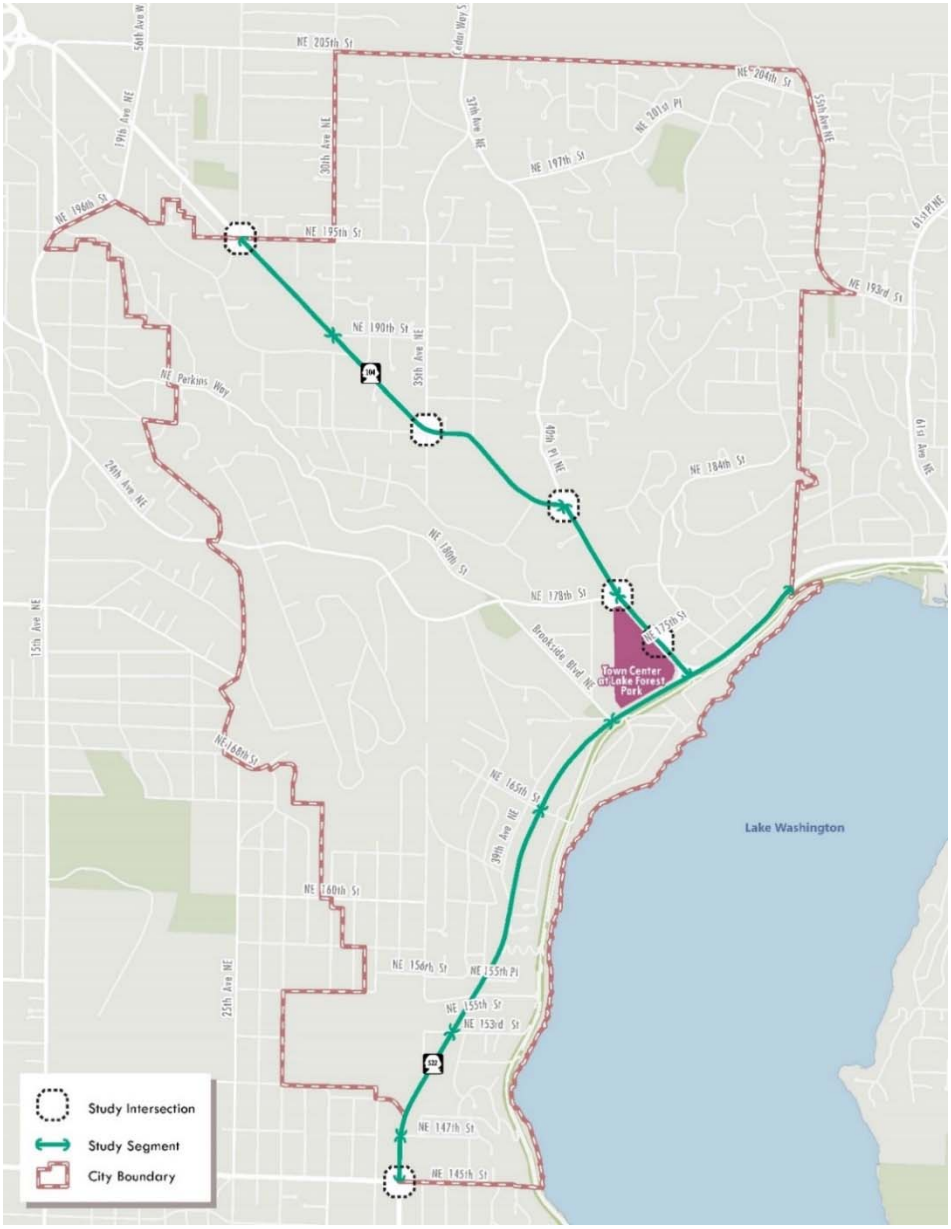


Figure 4. Study Area

For each segment, we provide discussion by topic area. Each segment then includes a summary section, which highlights the key findings in each topic area. The following provides overview information on the topic areas.

Context & Land Uses

This report will describe the land use context around each segment, including land use types (residential, commercial, etc.), future plans for redevelopment, neighborhood access, environmental conditions, as well as the jurisdiction of properties in the corridor. The best transportation facilities integrate seamlessly with their surrounding land use contexts, thus it is important to have a handle on how these conditions create opportunities and constraints within the corridors.

As shown in **Figure 5**, the City's zoning map from the Comprehensive Plan, the majority of the surrounding land uses along the study corridors is a variation of single-family homes (identified in purple, green, yellow, and light blue), and will continue to remain that way into the future. This adds to the challenge, as residential driveway consolidation or street frontage improvements on the corridor may not be implemented through redevelopment.

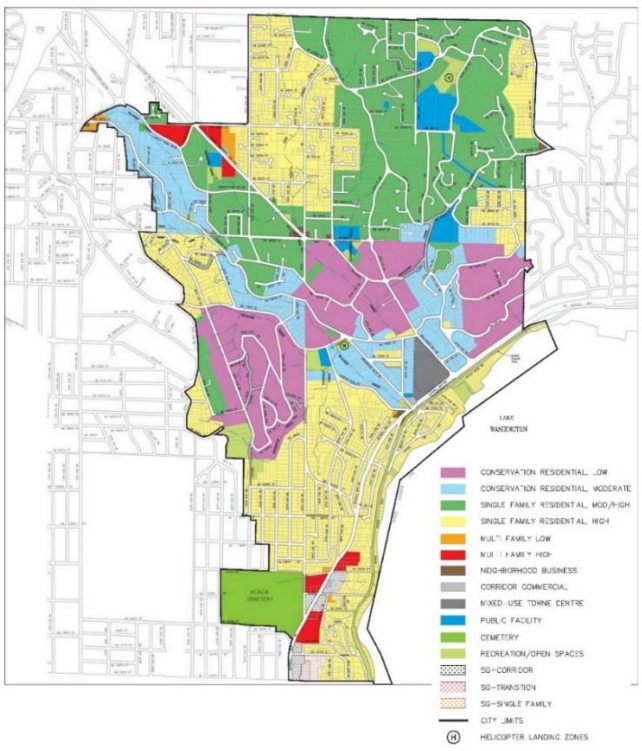


Figure 5. Land Use Map

Source: Lake Forest Park Comprehensive Plan Update, 2015.

Pedestrian/Bike Amenities

The latter sections of the report will describe conditions for walking and biking along each study segment. While each segment is unique in its accommodations for walking and biking, there are a few common themes that apply to the entirety of the SR 522 and SR 104 corridors in Lake Forest Park that can be described here.

SR 522

The Burke Gilman Trail runs parallel to SR 522. The trail is adjacent to SR 522 near the Town Center, but is almost a half-mile from SR 522 near NE 145th Street. It provides a high quality, exclusive facility for walking and biking that is offset from the SR 522 corridor. Return trips from the trail into the City can be difficult however due to the elevation difference of almost 200 feet uphill to SR 522. This regional trail extends from Seattle along the northshore through Lake Forest Park, Kenmore, and Bothell, and connects to the Lake Sammamish Trail.

Multi-use Burke-Gilman Trail

SR 104

Along SR 104, pedestrian facilities are intermittent and no bicycle facility currently exists. Today, only the most experienced riders use SR 104, with most riders routing along a system of lower speed, lower volume residential streets in Lake Forest Park.

Transit Service

This section describes overall transit services available along each corridor. While each segment is unique in terms of the transit stops and infrastructure for accessing stops, transit routes tend to serve the entirety or several segments of each corridor. **Figure 6** shows a map of existing transit routes in Lake Forest Park.

SR 522

The corridor is served by five routes:

- 308 Downtown Seattle Via I-5: directional serving southbound in the morning, and northbound in the evening.
- 309 First Hill Express: directional serving southbound in the morning, and northbound in the evening.
- 312 Downtown Seattle: directional serving southbound in the morning, and northbound in the evening.
- 372 University District Lake City: all day routes on weekdays, with headways of about 10 minutes during the peak periods
- 522 Downtown Seattle: all day routes on weekdays, with headways of about 10 minutes during the peak periods

SR 104

The area is served by three routes:

- 308 Horizon View: directional serving southbound between 6:00 AM and 8:00 AM and northbound between 4:30 PM and 6:30 PM with approximately 1-hour headways.
- 331 Shoreline City Center/Aurora Village: all day weekday service, with approximately 30-minute headways.
- 342 Shoreline Park-and-Ride/Bellevue: directional serving southbound between 4:30 AM and 7:00 AM and northbound between 4:00 PM and 6:30 PM with approximately 30-minute headways.

Average transit boardings and alighting by stop are shown in **Figure 7** and **Figure 8**. Transit stops along SR 522 have the largest number of boardings and alightings, which is reasonable given the more frequent bus service on SR 522 compared to SR 104.

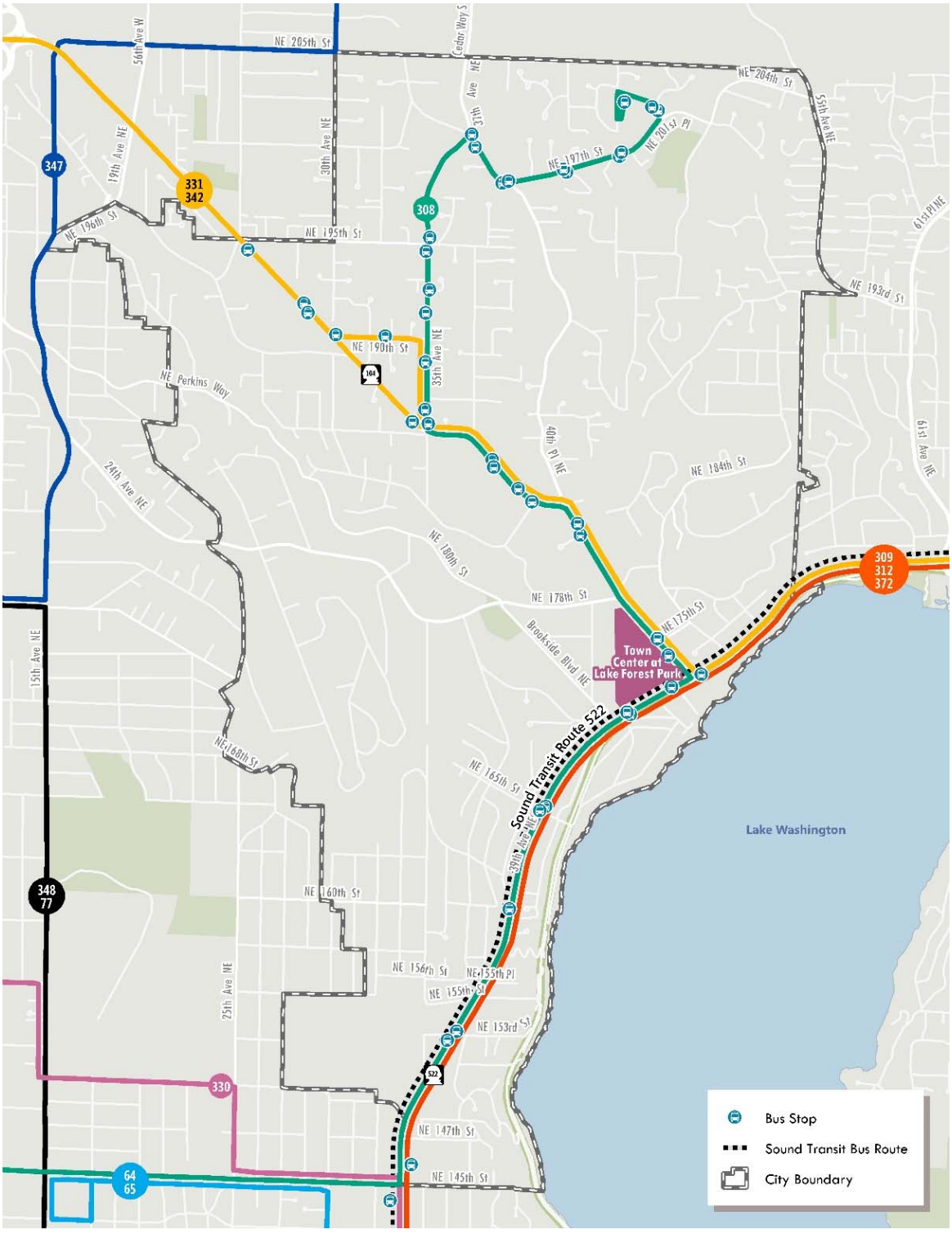


Figure 6. Existing Transit Service

Source: King County Metro, Fehr & Peers, 2017.

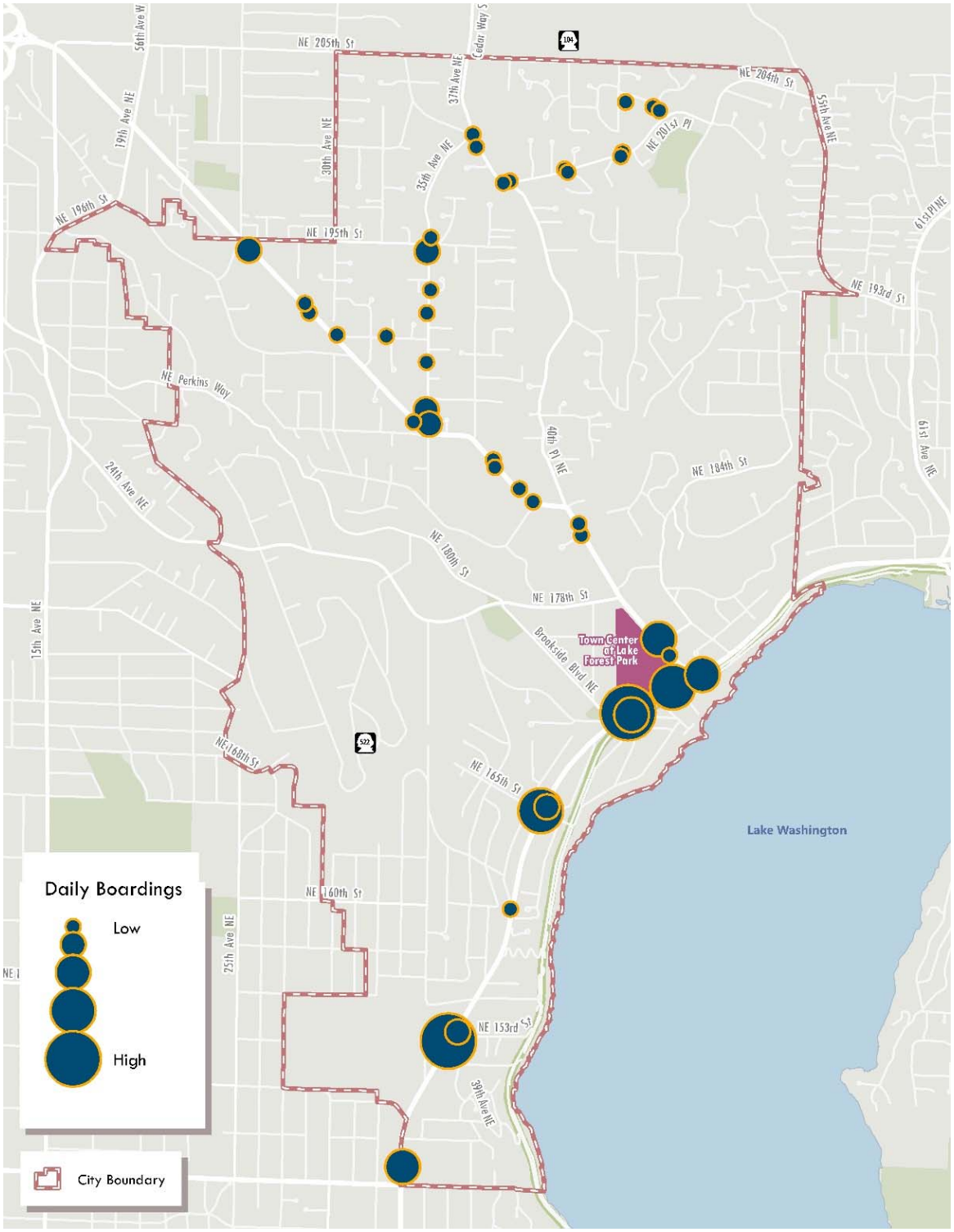


Figure 7. Average Daily Transit Stop Boardings

Source: King County Metro, Fehr & Peers, 2017.

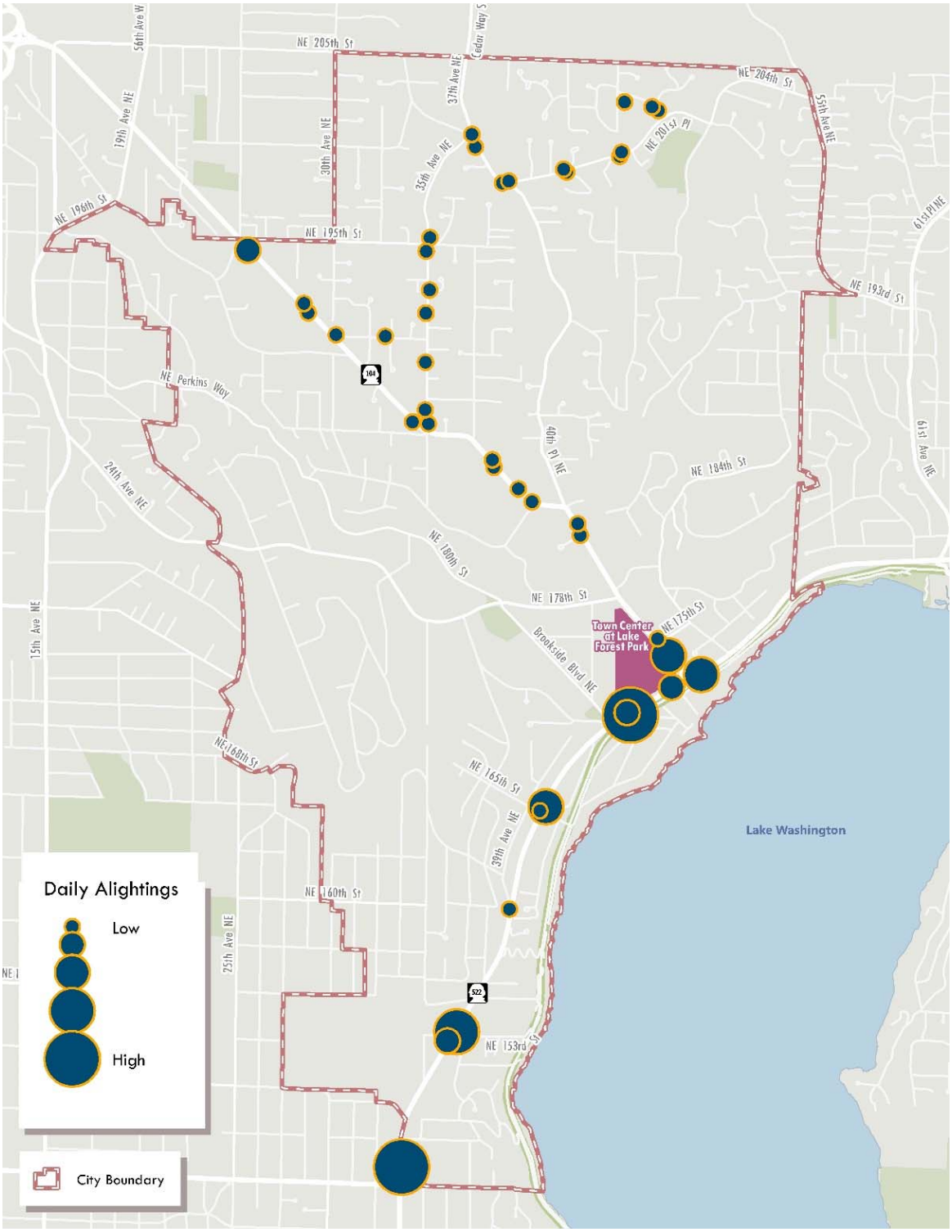


Figure 8. Average Daily Transit Stop Alightings

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

To evaluate vehicle operations along the two corridors, traffic counts were collected in early June 2017 before school let out for the summer. The counts included collection of traffic turning movements at study intersections identified by the study team and City Staff during the AM and PM peak hours, which included 7-9am and 4-6pm during the midweek (Tuesday through Thursday). These volumes were used to analyze the existing traffic operations within the corridor.

Vehicle operations were modeled in Synchro using Highway Capacity Manual 2000 (HCM 2000) methodologies. More current methods are available, however due to several study intersection having more than four legs, severe offsets, or unusual lane geometries that cannot be accurately modeled in later methods, the HCM 2000 was used for all study intersections to be consistent.

Future traffic volumes were forecasted for 2036 using a 0.5-percent growth rate, which corresponds to the expected growth shown in the Puget Sound Regional Council (PSRC) travel demand model. While traffic volumes increased quite a bit between 2011 and 2012 after SR 520 tolling started, traffic growth has since stabilized. Between 2012 and 2013, the traffic growth rate was about 1.5-percent, however, over the last five years (2012 to 2017) the average growth rate for in the corridor was about 0.5-percent, which corresponds to the expected growth in the PSRC model, and the assumptions made for this project.

Intersection operations today and forecast for 2036 are reported in the individual segment discussions later in this report. The Level of Service (LOS) of an intersection is reported from LOS A to LOS F, with A being free flow conditions and F being completely congested. The transportation element of the Lake Forest Park Comprehensive Plan states that the City will strive for a LOS D along SR 522 and LOS E along SR 104. Existing and forecasted 2036 turning movements for SR 522 are shown in **Figure 9** and **Figure 10.**

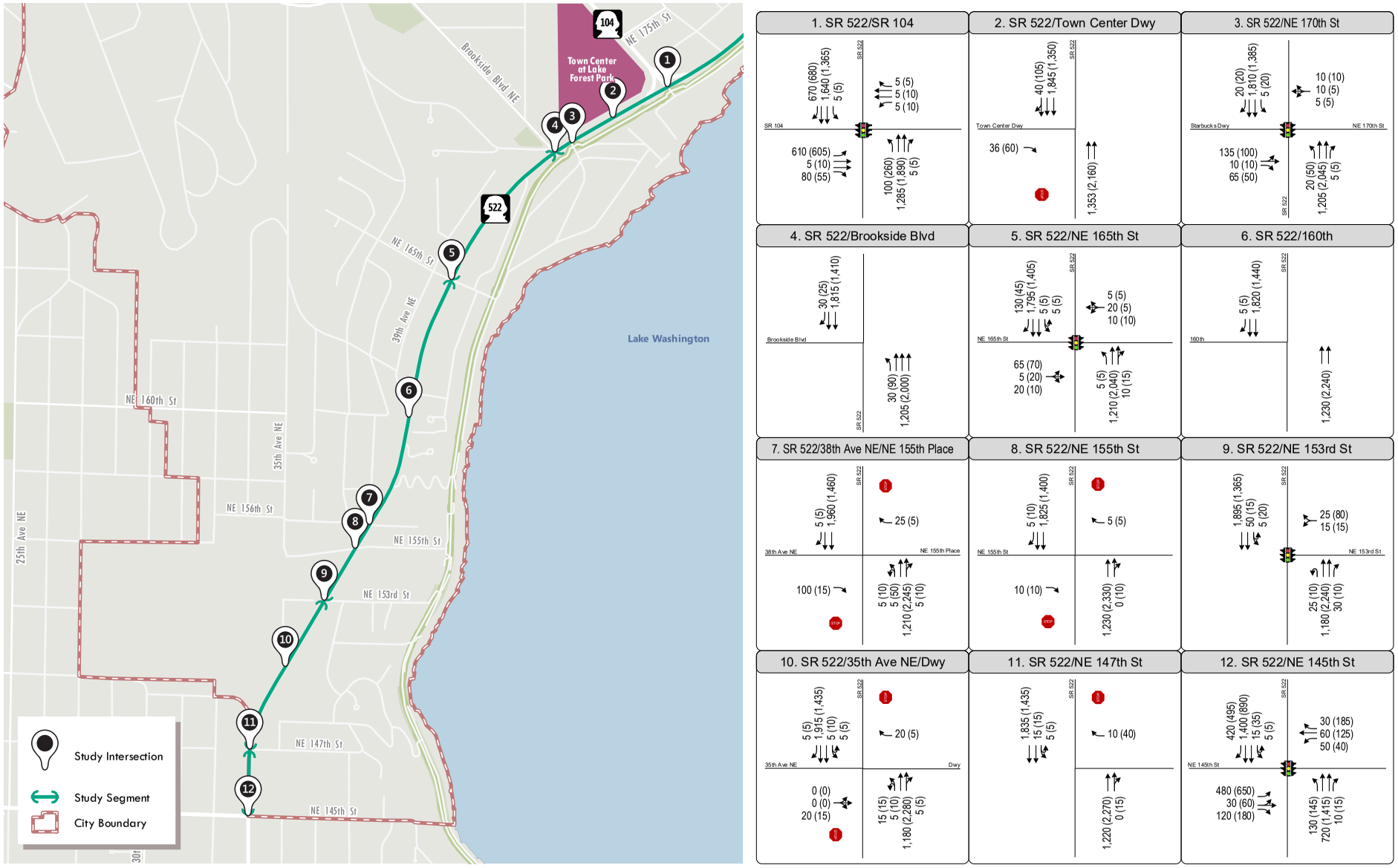
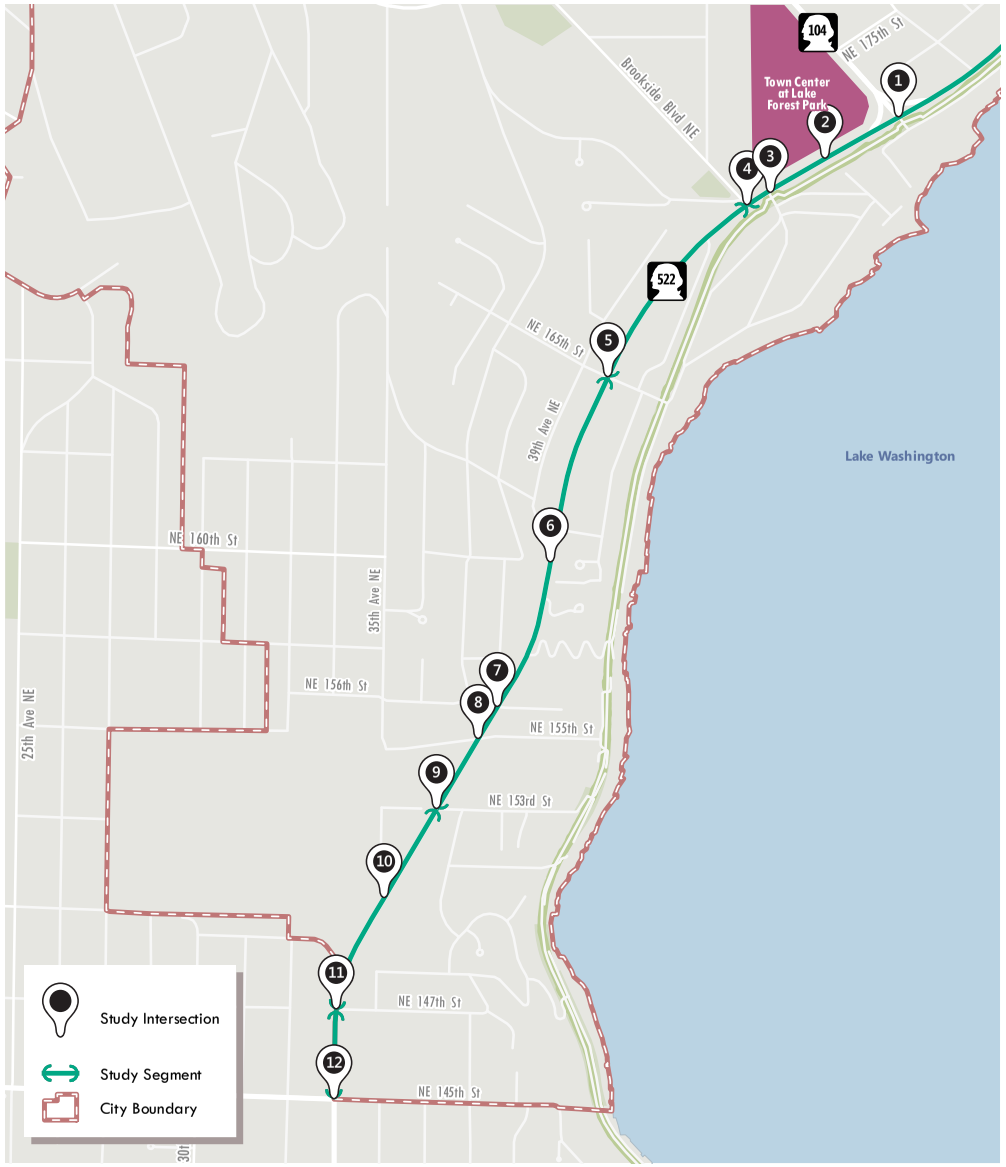


Figure 9
AM(PM) Peak Hour Volumes and Lane Configurations
Existing Conditions



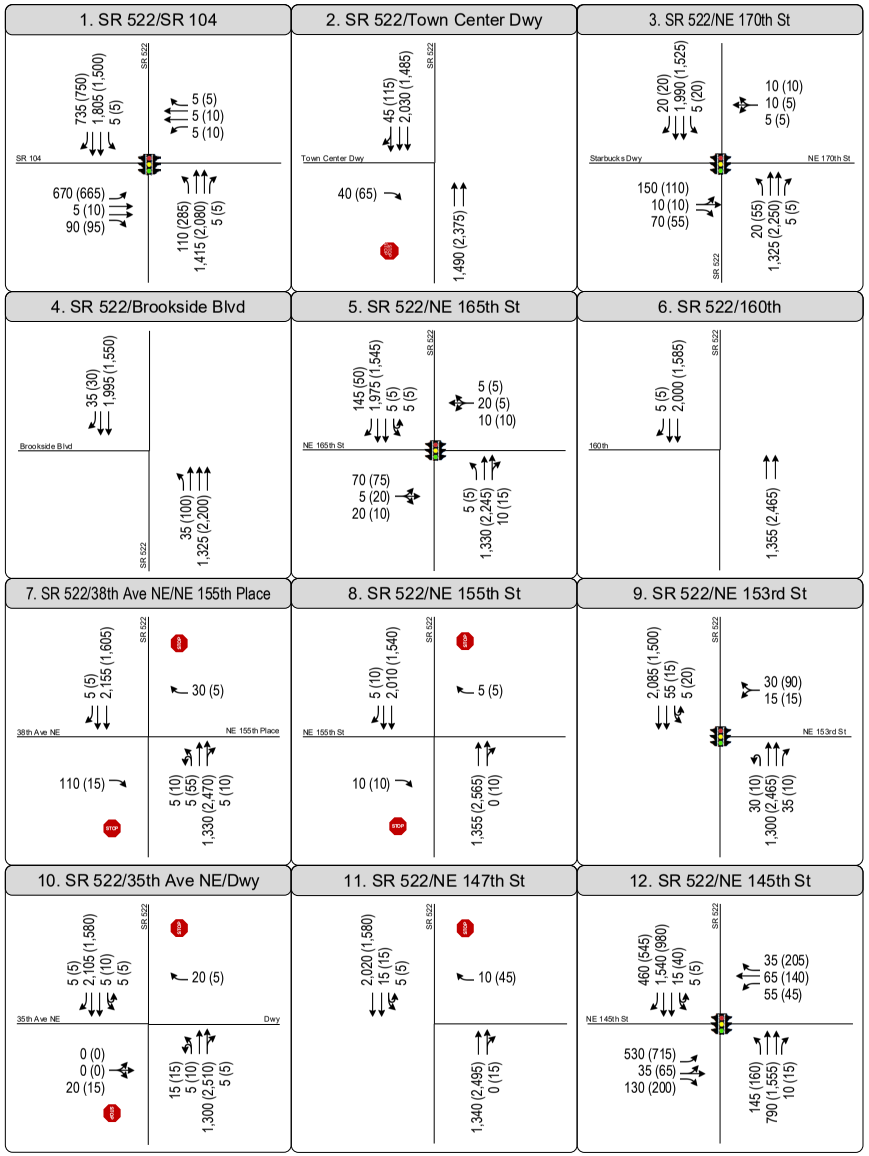


Figure 100
AM(PM) Peak Hour Volumes and Lane Configurations
Future (2036)

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017) along both corridors. A heat map of the number of collisions along both SR 522 and SR 104 corridors is in **Figure 11**. The collision history for specific segments is described later in this report.

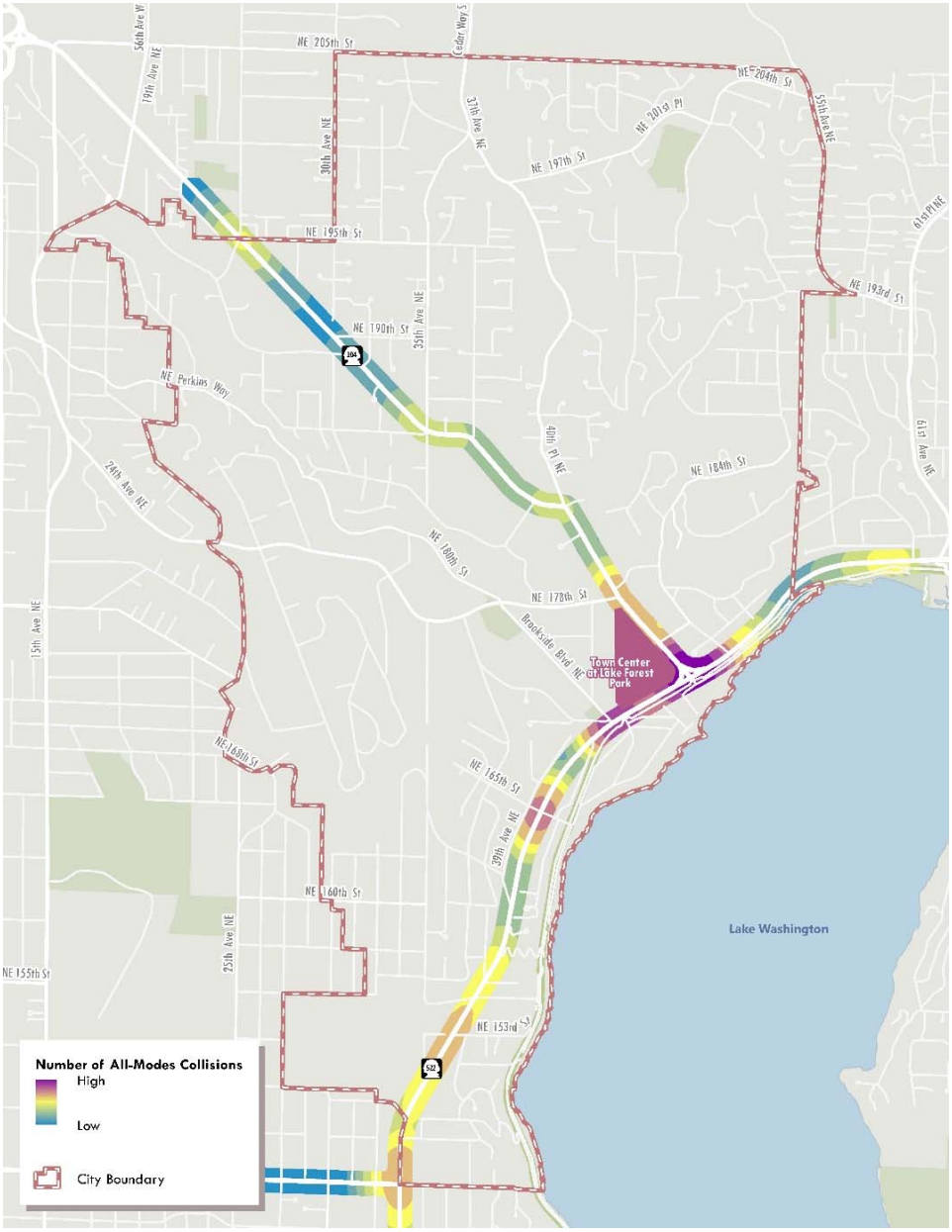


Figure 11. Three-year Collision History on SR 522 and SR 104

Source: Fehr & Peers, 2017.

Utilities, Stormwater, and Right-of-Way

Each segment area provides a description of utilities (location of utility poles and line types), stormwater collection and conveyance systems, and right-of-way considerations that will influence the feasibility of potential corridor treatments.

Town Center: Kenmore City Limits to Brookside

Context & Land Uses

This northeastern most segment of SR 522 begins at the Kenmore-Lake Forest Park border. Northeast of the SR 104 intersection, the corridor is surrounded by single-family neighborhoods that do not directly load onto the corridor.

Southwest of the SR 104 intersection, SR 522 is adjacent to the Town Center, the core retail hub of the City. This also serves as one of the major transit stops within the City, with routes that are destined for major centers like Downtown Seattle, UW Seattle, and UW Bothell. The Town Center is largely surrounded by surface parking. It has been reported that this surface parking serves as an unofficial park-and-ride for transit riders.

On the lakeside of the SR 522, there are two small businesses. Just beyond these buildings is the multi-use regional Burke-Gilman Trail.

Plans for the Town Center include addition of a park-and-ride structure with the addition of the new BRT route, as well as a branded BRT station.

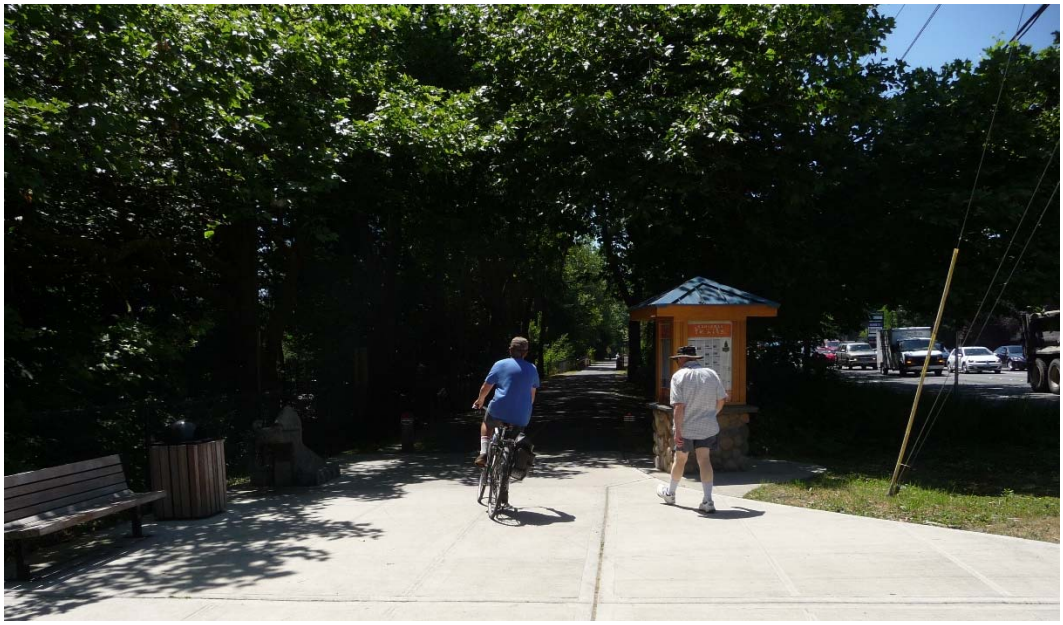
Pedestrian/Bike Amenities

Much of the pedestrian and bicycle travel in this corridor segment is on the adjacent multi-use Burke-Gilman Trail. While sidewalks exist in the residential Sheridan Beach neighborhood adjacent to the lake, There are few sidewalks on SR 522 to connect to, with a few exceptions of connections to a transit stop just north of the SR 104 intersection and just north of the NE 170th Street intersection.

Sidewalks exist on the Town Center side of SR 522 adjacent between SR 104 and NE 170th Street. There is no sidewalk or formal pedestrian pathway between NE 170th Street and Brookside Boulevard; however, a pedestrian could walk through the paved Arco Gas Station area.

In this segment, opportunities for pedestrian and bicyclists to cross SR 522 are at SR 104 (only the south side of the intersection) and at NE 170th Street (both sides of the intersection). The crosswalk on the lake side of SR 522 across NE 170th Street and at SR 104 serves as part of the Burke-Gilman Trail, so there can be high volumes of pedestrians and bicyclists. This trail extends north through Kenmore and Bothell, and connects to the

Lake Sammamish Trail. The trail extends south through various communities in Seattle including Seattle Children's Hospital, UW Seattle, Fremont, and Ballard.



Burke-Gilman Trail near SR 104.

Transit Service

This section of the corridor is served by four stops, two in each direction at either end of the Town Center. These stops serve about 800 riders per day, split evenly in each direction. The most frequently used stops are located just north of NE 170th Street. These stops are served by signalized pedestrian crossings at NE 170th Street and Ballinger Way (SR 104). All four stops are connected to sidewalks and include bus shelters.

The segment boardings and alightings are shown in **Table 1**.

Table 1. Town Center Boardings and Alightings

Stop Name	Total Daily Boardings	Total Daily Alightings
Bothell Way NE & Ballinger Way NE (SB)	114	33
Bothell Way NE & NE 170th Street (SB)	205	30
Bothell Way NE & NE 170th Street (NB)	37	253
Bothell Way NE & Ballinger Way NE (NB)	30	53
Segment Total	386	369

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor varies between six and seven lanes, generally providing two general purpose travel lanes in each direction, dedicated bus lanes in both directions, and left-turn lane access at:

- SR 104 (Ballinger Way)
- NE 170th Street
- Brookside Boulevard NE

Table 2 summarizes operations at each of the study intersection in the segment during the AM and PM peak hours for both 2016 and 2036.

Table 2: Town Center Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
SR 104 (Ballinger Way NE)	Signal	D	43	**E**	**59**	**E**	**65**	**F**	**86**
Town Center Driveway	TWSC	B	12	B	12	B	10	B	11
Brookside Blvd	TWSC	C	18	C	20	B	11	B	10

Source: Fehr & Peers, 2017. TWSC= two-way stop controlled intersection.

As the table shows, the SR 104 (Ballinger Way NE)/SR 522 (Bothell Way) intersection currently operates at below the City's LOS D standard during the PM peak hour. By 2036

AM peak hour operations are expected to degrade to LOS E ,and PM operations will further degrade to LOS F. All other intersections with the study area operate at LOS D or better.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). A heat map of the number of collisions along both SR 522 and SR 104 corridors is shown in **Figure 11**. The collision history for the study area is summarized below.

SR 104

- Average of 13 collisions per year; 40 collisions in the past three years
- 2 collisions involved a bicyclist. Both collisions had a vehicle making a northbound right turn failing to yield to the bicyclist.
- 1 collision involved a pedestrian, where the vehicle going northbound was distracted and failed to yield to the pedestrian.
- Majority of collisions were rear ends, followed by side-swipes from lane changes.

NE 170th Street

- Average of 12 collisions per year; 36 collisions in the past three years
- 2 collisions involved a bicyclist. One was due to bicyclist inattention; the other involved a vehicle that failed to yield when making a southbound right turn.
- 1 collision involved a pedestrian, where a vehicle making a southbound left turn failed to yield to a pedestrian.
- Approximately half of the collisions were rear-end collisions from following too closely/driver inattention.
- 8 collisions were due to making turns, 3 collisions were due to lane changes.

Brookside Boulevard

- Average of 2 collisions per year; 5 collisions in the past three years.
- 2 collisions were vehicles making a northbound left turn not yielding to oncoming cars.
- 1 collision was a rear end, and the other two collision were vehicles not yielding right-of-way while merging into traffic.

Utilities, Stormwater, and Right-of-Way

Utilities: The section of SR 522 from the Kenmore City Limits to Brookside has utility poles on the lake side of the road within the right-of-way, carrying both transmission, distributionand communication lines. The close proximity of the poles to the back of sidewalk and travel lanes is an important consideration with any widening towards the lake.

Stormwater: Recent development in this section includes storm water collection and conveyance with roadway widening to the west, with unimproved sheet flow to the east towards grass swales and ditches. Widening, as needed, will be to the east, likely including a tight line collection and conveyance system.

Right-of-Way: Right-of-way width along this section ranges from 103 to 120 feet. Established development at the shopping center and the presence of a stream paralleling the roadway on the west side of SR 522, will preclude substantial changes. In particular, there is one building housing Farmers Insurance on the east side that would be impacted by changes to the road prism or new transit amenities.

Town Center Key Findings

Segment Issues and Opportunities

- Town Center is the retail hub of the City, which will likely redevelop under the current owners.
- A new BRT station will be located here, along with a new park-and-ride within the Town Center.
- There are concerns that the Town Center parking lot serves as an unofficial park-and-ride; measures to encourage non-drive alone access to transit and protect parking for Town Center patrons would likely be needed.

- Sidewalks exist on west side of SR 522, adjacent to the Town Center.
- While there are sidewalks in the Sheridan Beach neighborhoods towards the lake, there are few sidewalks on the east side of SR 522 to connect with. Pedestrian and bicycle travel relies on the adjacent Burke-Gilman Trail.
- Signalized crossings of SR 522 are at SR 104 and at NE 170th Street. Both locations can be uncomfortable for pedestrians and cyclists due to high traffic volumes and width of SR 522.

- Stops have shelters and are connected to signalized crossings by sidewalks.
- Highest use stops within the corridor located at NE 170th Street with 525 riders per day.
- Two routes serve the area all day with 10 minute headways in the peak periods. Three additional routes provide peak direction service during the peak hour.

- The SR 104/SR 522 intersection currently operates as LOS E in the PM peak hour. Delays grow in the future with LOS E and F conditions in both peaks by 2036.
- All other intersections operate at LOS D or better.

- At SR 104 about half of collisions were rear-ends, followed by sideswipes from lane changes. 3 collisions involved a pedestrian or bicyclist where a turning vehicle failed to yield.
- At NE 170th Street, the majority of collisions were rear-ends. 3 collisions involved a pedestrian or cyclist, and 2 were turning vehicles failing to yield. The remainder of collisions were from vehicles turning and failing to yield.
- Brookside Boulevard had few collisions the past three years. This is likely because the City prohibited left turns to northbound SR 522 from Brookside Boulevard.

- Overhead utilities are located close to the east side of the road.
- Stormwater facilities are lacking on the east side of the road.
- Much of the right-of-way is used by existing development and roadway prism.

West of Town Center: Brookside to 165th

Context & Land Uses

This corridor segment is surrounded mostly by single-family homes with a handful of offices or neighborhood services, including a gas station near the Town Center. Attractions include the Sheridan Beach Club, which has a private beach and offers swimming lessons/water activities to members and nearby residents.

This segment of the corridor is challenging as many of the homes on the lake side of the corridor have their driveway access directly on SR 522. Any widening or changes to access on the road would need to consider how residential access would change. The west side of the corridor is mostly retaining walls, vegetation, and fences that delineate the residential homes that are higher elevated than the corridor. Any roadway widening on the west side of the road would need to cut into the hillside.

Pedestrian/Bike Amenities

There is one signalized pedestrian crossing of SR 522 at NE 165th Street. This crossing provides access to the Burke-Gilman Trail, the Sheridan Beach Club, and transit stops.

Pedestrian crossing and transit stop at NE 165th Street.

There are no pedestrian or bicycle facilities on this segment of SR 522. The one exception is a short sidewalk from NE 165th Street to transit stops just north of the intersection. Residents on the lake side of SR 522 generally use the Burke-Gilman Trail for trips on foot or by bicycles. Residents on the west side of SR 522 likely use lower volume residential streets that run parallel to SR 522 to access the Town Center by walking; however, there is no direct route. One observation made is that a walking path exists from the 39th Avenue NE cul-de-sac to SR 522 exiting northbound to a paved commercial lot with no sidewalks. See **Figure 12**.

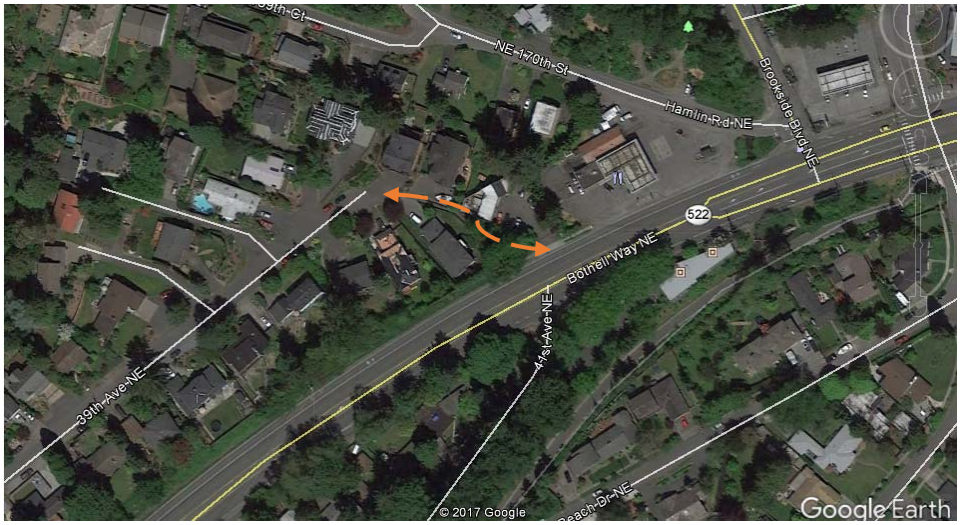


Figure 12. Walking Path on West Side of SR 522.

Source: Google Earth, 2017.

Along this segment, the west side of SR 522 is mostly vegetation, fencing, and retaining walls for residential homes that are at a higher elevation than SR 522. The east side of SR 522 has numerous driveways to access residential homes adjacent to SR 522. Along portions of SR 522, residents park vehicles on the gravel paths adjacent to the SR 522 shoulder.

There are no bicycle facilities on this segment. Bicyclists would likely navigate through one of the side streets to access the Burke-Gilman Trail.

Transit Service

This portion of the corridor is served by two stops, one in each direction located at NE 165th Street. The stops serve approximately 180 riders per day. They are served by a signalized pedestrian crossing at NE 165th Street. Both stops are connected by sidewalks

to the signal and the have side street access to the neighborhoods. The southbound stop includes a bus shelter.

The segment boardings and alightings are shown in **Table 3.**

Table 3: West of Town Center Transit Boardings and Alightings

Stop Name	Total Daily Boardings	Total Daily Alightings
Bothell Way NE & NE 165th St (SB)	11	77
Bothell Way NE & NE 165th St (NB)	83	7
Segment Total	94	84

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this segment varies between six and seven lanes, generally providing two general purpose travel lanes in each direction, dedicated bus lanes in both directions, and a two-way left turn lane that provides left-turn access to driveways and side streets throughout the segment. Dedicated left-turn lanes are provided at the signalized intersection of NE 165th Street.

Table 4 summarizes operations at each of the study intersections in the segment during the AM and PM peak hours for both 2016 and 2036.

Table 4: West of Town Center Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
Brookside Blvd	TWSC	C	18	C	20	B	11	B	10
Beach Dr/NE 170th St	Signal	B	19	C	23	B	19	C	23
NE 165th St	Signal	B	17	B	20	B	16	B	19

Source: Fehr & Peers, 2017.

All intersections within this segment operate at a LOS D or better. Large queues propagate on SR 522 during the peak hours. In the AM peak hour, traffic queues mostly

in the southbound direction, while traffic queues mostly in the northbound direction during the PM peak hour. These queues limit the amount of traffic served at the intersections due to the constraints of upstream signals in any direction.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study area is summarized below.

NE 165th Street Area

- Average of 9 collisions per year; 25 collisions in the past 3 years.
- More than half of the collisions were rear-ends, 6 collisions were making left turns.
- Since bike and pedestrian travel is concentrated along the Burke-Gilman Trail, no collisions involved a pedestrian or cyclist along SR 522. However, a recent incident involved a cyclist not yielding to a pedestrian at a crosswalk on the Burke-Gilman Trail at NE 165th Street.

Utilities, Stormwater, and Right-of-Way

Utilities: The section of SR 522 from Brookside to NE 165th Street includes overhead utility poles on the east side of the road quickly shift to the west side south of Brookside Boulevard and back to the east side approximately two blocks north of NE 165th Street. Within the right-of-way the overhead poles carry both transmission and distribution lines, as well as communication lines. The poles are located alternately in front of residential fencing,at the back of guardrail, and at the edge of the road shoulder. Clear zone with widening is an important consideration. Overhead lines are damaged by high winds due to downed trees occasionally during the fall and winter occasionally.

Stormwater: Extruded asphalt curb (without sidewalks) on both sides of the road create a limited stormwater collection and conveyance system. Widening, as needed, will include an improved tight line collection and conveyance system and water quality treatment.

Right-of-Way: Right-of-way width along this section is typically 100 feet. On the west side there are sections with rockeries that will be affected with widening. On the lake side, existing driveways and parallel parking (on the shoulder) will be key elements to consider with widening towards the east. There are also some locations where garbage is collected on a weekly basis.

West of Town Center Key Findings

Segment Issues and Opportunities

- Residential homes on the lake side of SR 522 have driveway access directly onto SR 522. The west side is mostly retaining walls and is not accessible.
- Main attractions include the Town Center, and the Sheridan Beach Club and Burke-Gilman Trail, which are accessible only at NE 165th Street.

- There are no pedestrian or bicycle facilities along SR 522. Most pedestrian and bicycle travel would need to occur on the Burke-Gilman Trail or parallel residential streets.
- Some homes have a paved or gravel pathway alongside SR 522, which are used to access mailboxes, garbage pick-up, or parking.
- A signalized crossing exists at NE 165th Street.

- The stops are located at NE 165th Street and serve approximately 180 daily riders.
- Both stops have shelters and signalized crosswalks serving them.
- The stops are connected to the side streets by sidewalks.

- All approaches operate at LOS D or better under existing and future conditions.
- Traffic volumes are limited due the capacity constraints at upstream signals.

- Near the 165th Street area, the majority of collisions were rear ends, followed by vehicles making a left turn.
- No collisions involved a pedestrian or cyclist, however a recent incident involved a cyclist not yielding to a pedestrian at a crosswalk at the nearby Burke-Gilman Trail.

- Overhead utilities are located close to the side of the road with clear zone requirements important for any options.
- Stormwater collection is limited to extruded curbs and shoulder collection.
- Right-of-way issues include driveways, shoulder parking, mailboxes and garbage collection (on the lake side) and rockeries (on the west).

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Sheridan Beach/Sheridan Heights: 165th to 153rd

Context & Land Uses

Similar to the previous segment to the north, the surrounding land use on SR 522 is mostly single-family homes. The west side of the corridor is a continuation of retaining wall, fence, and vegetation to separate elevated homes from the study corridor. This changes south of NE 157th Place with multi-family housing. The lake side of SR 522 has homes with driveway access directly onto SR 522. At portions of the corridor there is gravel or paved asphalt just beyond the corridor shoulder where some residents park cars, have mailboxes, and have garbage picked up. The City's comprehensive plan expects this single-family residential zoning to remain the same in the future.

Pedestrian/Bike Amenities

There are no pedestrian sidewalks on SR 522 in this segment of the corridor from NE 165th Street to 38th Avenue NE. The west side of SR 522 is mostly retaining wall, vegetation and fences that separate the higher elevated residential homes from SR 522. There is a short paved walkway on the west side of SR 522 from 39th Street to access the southbound transit stop.

The lake side of SR 522 has numerous driveways to residential homes. At some locations, there is a small raised asphalt separator between the edge of the road and the driveways. There is no continuous walking path for pedestrians through the segment; however, residents do walk on some paved asphalt or gravel shoulder just outside of the SR 522 road to access mailboxes.

South of 38th Avenue NE along the remainder of the segment, the corridor becomes more walkable with sidewalks on both sides of the street. SR 522 has one signalized pedestrian crossing at NE 153rd Street.

There are no bicycle facilities on this segment. Bicyclists likely navigate through one of the side streets to access the Burke-Gilman Trail.

Transit Service

The Sheridan Heights area is served by three stops, one in each direction located at just north of NE 153rd Street and one southbound stop located at 39th Avenue NE. The stops serve approximately 310 riders per day, with the stop at 39th Avenue NE only serving five daily riders.

The stops at NE 153rd Street are served by a signalized crosswalk and sidewalks connect them to side street pedestrian facilities. Both stops also have shelters and illumination from the adjacent signal.

There are no pedestrian crossings of SR 522 near the 39th Avenue NE stop; however sidewalks along 39th Avenue NE and a staircase up the hill from SR 522 connect the stop to pedestrian facilities in the neighborhood. The stop has no shelters or illumination.

The segment boardings and alightings are shown in **Table 5.**

Table 5: Sheridan Beach/Sheridan Heights Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Bothell Way NE & 39th Ave NE (SB)	4	2
Bothell Way NE & NE 153rd St (SB)	152	20
Bothell Way NE & NE 153rd St (NB)	18	117
Segment Total	174	138

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor varies between five and six lanes generally providing two general purpose travel lanes in each direction, a southbound dedicated bus lane, and a two-way left turn lane turn lanes providing left-turn access at driveways and side street throughout the segment. Dedicated left-turn lanes are provided at:

- 38th Avenue NE (northbound only)
- NE 153rd Street

The LOS for the study intersections is shown in **Table 6.**

Table 6: Sheridan Heights Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
NE 165th St	Signal	B	17	B	20	B	16	B	19
NE 153rd Street	Signal	C	25	C	30	C	33	**E**	**56**
NE 155th Street	TWSC	C	20	C	23	C	16	C	17
38th Avenue NE	TWSC	**E**	**37**	**F**	**54**	C	16	C	18
NE 155th Place	TWSC	C	20	C	23	C	16	C	17
39th Ave NE	TWSC	B	12	C	16	C	15	C	17

Source: Fehr & Peers, 2017.

The intersection of SR 522/38th Avenue NE operates at a LOS E in the PM peak hour with AM operations expected to degrade to a LOS F by 2036. This intersection is side street stop controlled. The reported delays represents the difficulty for neighborhood residents entering SR 522 in the morning.

During the peak hours large queues propagate on SR 522. In the AM peak hour, traffic queues mostly in the southbound direction, while traffic queues mostly in the northbound direction during the PM peak hour. These queues limit the amount of traffic served at the intersections, due to the constraints of upstream signals in any direction.

The intersection of SR 522/NE 153rd Street degrades to LOS E during the PM peak hour in 2036. The increase in delay is caused by the increase in through traffic demand on SR 522.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study area is summarized below.

Between 165th to 153rd Street Area

- 2 collisions involved a bicyclist, where a vehicle was turning. No additional information was provided.
- 1/3 of the collisions (10) involved left or right turning movements.

NE 153rd Street Area

- Average of 7 collisions per year; 22 collisions in the past three years.

- No collisions involved a pedestrian or cyclist.
- More than half of the collisions were rear-ends, followed by 4 collisions for turning vehicles, and 4 collisions during lane changes.

Utilities, Stormwater, Right-of-Way

Utilities: This segment of SR 522 includes a section from NE 165th to NE 160th Street without overhead poles directly in the vicinity of the road prism. Overhead poles exist on the east side at 160th Street transitioning to the west side at NE 156th Street and continue up to NE 153rd Street. The overhead poles carry both transmission and distribution lines, as well as communication lines. Some additional distribution poles are on the east side from NE 156th Street to NE 153rd Street. The poles are located in front of residential fencing in some sections, and at the edge of shoulder in other cases. Clear zone with widening is an important consideration. Overhead lines are damaged by high winds from downed trees during the fall and winter occasionally.

Stormwater: Extruded asphalt curb (without sidewalks) or shoulder collection on both sides of the road between NE 165th and NE 156th Street create a limited stormwater collection and conveyance system. Widening, as needed, will include an improved water quality treatment system and tight line collection and conveyance system, such as what exists between NE 156th and NE 153rd Street.

Right-of-Way: Right-of-way width along this section ranges from 80 to 100 feet. On the west side there are sections with rockeries and retaining walls (from NE 153rd to NE 155th Street) that will be affected with widening. On the lake side, existing (steep) driveways and fencing, parallel parking (on the shoulder), and guardrail will be key elements to consider with widening towards the east. There are also some locations housing garbage cans on a weekly basis. Multi-housing residential units and some commercial establishments (Sheridan Market) exist on the east side between NE 156th to NE 153rd Street. These establishments limit widening opportunities.

Sheridan Beach/Sheridan Heights Key Findings

Segment Issues and Opportunities

- Surrounding land use north of NE 157th Place is single-family homes. South of NE 157th Place, it transitions to multi-family homes. This is expected to remain the same in the future.
- The west side of the corridor is mostly retaining wall with few access points for pedestrians or vehicles. The east side of the road has direct driveway access to homes.
- Widening of the roadway either would encroach on residential properties on the lake side, or would require cutting into the hillside on the west side of SR 522.

- North of 38th Avenue NE, there are no sidewalks on either side of the road, except for a short paved connection from 39th Avenue NE to a southbound transit stop.
- South of 38th Avenue NE there are sidewalks on both sides of the road. There is one signalized crossing at NE 153rd Street.
- There are no bicycle facilities on this segment. Bicyclists likely navigate through side streets and challenging steep grades to access the Burke-Gilman Trail.

- The stops serve approximately 310 riders, with the majority at NE 153rd Street.
- Stops at NE 153rd Street have shelters and signalized crosswalks serving them.
- The stop at 39th Avenue NE is connected to the neighborhood via sidewalk and staircase.

- The side street stop controlled intersection at 38th Avenue NE operates at LOS E and F during the morning peak hour and is expected to degrade to LOS F in the future.
- The signalized intersection of NE 153rd Street is expected to degrade to LOS E during PM peak hour in 2036 due to increase through traffic demand.
- Traffic volumes are limited due the capacity constraints at upstream signals.

- Between NE 165th and NE 153rd Streets, half the collisions were rear-ends, followed by vehicles making improper left/right turns. 2 collisions involved a bicyclist with a turning vehicle.
- Near NE 153rd Street, no pedestrian or bicycle collisions were reported. Half the collisions were rear ends, followed by collisions from improper turns and improper lane changes.

- Overhead utilities are located close to the side of the road with clear zone requirements important for any options.
- Stormwater collection is limited to extruded curbs and shoulder collection between NE 165th and NE 156th Streets.

- Right-of-way issues include driveways, shoulder parking, mailboxes and garbage collection (on the lake side) and rockeries and retaining walls (on the west). Multi-family housing and some commercial establishments limit widening to the east near 153rd Street.

Transition Zone: 153rd to 147th

Context & Land Uses

This segment is a mixture of office, retail, and high density multi-family housing, and also includes the Acacia Cemetery. Access to housing is more consolidated with most driveways limited to right-in, right-out only. Some buildings on the east side of SR 522 are right up to the back of sidewalks, which can provide challenges if the roadway is widened for a BAT lane. Other buildings have surface parking between the corridor and the building.

Pedestrian/Bike Amenities

Sidewalks continue on both sides of the corridor through this segment. There is one parcel on the lake side of SR 522 where sidewalks are narrow just north of NE 147th Street. While sidewalks are available, the pedestrian experience may be lacking, as sidewalks are right next to the travel lanes.

There are no bicycle facilities on this segment. Bicyclists would likely navigate through side streets and extreme elevation change to access the Burke-Gilman Trail.

Transit Service

There are no transit stops in this area.

Vehicle Operations

The street cross-section through this segment of the corridor varies between five and six lanes, generally providing two general purpose travel lanes in each direction, a dedicated southbound bus lane, with a landscaped median controlling side street access. A dedicated northbound U-turn lane is provided at the signalized intersection of NE 153rd Street. Left-turn lanes are provided at:

- 35th Avenue NE
- NE 147th Street

The LOS for the study intersections is shown in **Table 7.**

Table 7: Transition Zone Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
NE 153rd Street	Signal	C	20	C	23	C	16	C	17
35th Avenue NE	TWSC	C	16	C	16	D	27	D	33
NE 147th Street	TWSC	B	11	B	11	D	32	**E**	**49**

Source: Fehr & Peers, 2017.

The intersection at NE 147th Street is side street stop controlled and is expected to degrade to a LOS E during the PM peak hour in 2036. This is due to traffic congestion and queues on SR 522 in the northbound direction during the PM peak hour. These queues limit the amount of traffic served at the intersections, due to the constraints of upstream signals in any direction.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study area is summarized below.

Between NE 153rd and NE 147th Street

- No collisions involved a pedestrian or cyclist.
- Majority of collisions (10) were rear ends. 4 collisions were from making improper left or right turns

NE 147th Street

- Average of 3 collisions per year; 9 collisions the past three years.
- More than half the collisions were rear-ends; the remainder were due to improper lane changes.
- No collisions involved a pedestrian or cyclist.

Utilities, Stormwater, and Right-of-Way

Utilities: This segment through the transition zone between NE 153rd and NE 147th Streets has overhead poles on the west side behind the sidewalk. The overhead poles carry both transmission and distribution lines, as well as communication lines. Some

additional distribution poles are on the east side of the road between NE 153rd and NE 147th Street to serve multi-family housing and commercial establishments.

Stormwater: On both sides of the roadway, stormwater collection and conveyance is at the gutter line. Widening to either side will require modification of this existing stormwater system.

Right-of-Way: Right-of-way width along this section is typically 90 feet. The section is well developed with a mixture of multi-family housing and commercial establishments. In addition, there is the existing cemetery on the west side of the road at NE 149th Street. Options for widening in this section are limited without acquiring substantial right-of-way.

Transition Zone Key Findings

Segment Issues and Opportunities

- Land use transitions to higher density multi-family housing, and lower density retail and business offices (land use was revised in 2015 with the Southern Gateway study). Many driveways are consolidated and are right-in, right-out only.
- Some buildings on the east side are adjacent to sidewalks, which can be challenging if the roadway is widened.

- Sidewalks exist on both sides of the corridor through the segment. One signalized pedestrian crossing exists at NE 153rd Street.
- The pedestrian experience may be lacking as sidewalks are right next to travel lanes.
- There are no bicycle facilities on this corridor. Bicyclists would need to navigate through side streets and steep grades to access the Burke-Gilman Trail.

- There are no transit stops in this segment

- All intersections operate at LOS D or better today.
- Under future conditions, side street delay at NE 147th Street NE may decline to LOS E due to PM peak congestion on SR 522.

- Between NE 153rd and NE 147th Streets, the majority of collisions were rear-ends, followed by improper left or right turns. No collision involved a pedestrian or cyclist.
- Near NE 147th Street, more than half the collisions were rear-ends; the remainder were due to improper lane changes.
- No collisions involved a pedestrian or cyclist.

- Overhead utilities are located behind existing sidewalk.
- Stormwater collection and conveyance is well established with the current development. Widening will require modification of the existing system.
- Right-of-way issues include established multi-family housing and commercial establishments which limit widening in this section.

Southend Area: 147th to 145th

Context & Land Uses

This last segment of the corridor is mostly auto-centric commercial retail with surface parking lots. Most businesses are right-in, right-out access as there is a median. The NE 145th Street (also known as SR 523) intersection has high traffic volumes as it is the intersection of two state routes, and 145th Street provides access to I-5 for more regional trips. It also is complex with the number of jurisdictions involved. It's a state route at the borders of Shoreline, Seattle, and Lake Forest Park, with King County overseeing a portion of it as well.

While the location is constrained for auto travel, this area will be the future site of a Sound Transit BRT station. It is expected that transit riders will be drawn to this location to board the new BRT route to transfer to the future Link Light Rail station near I-5. Agencies have stated that prioritization should be given to transit vehicles, with improved non-motorized connections.

Pedestrian/Bike Amenities

There are sidewalks on both sides of the corridor. A signalized crossing of SR 522 is at NE 145th Street. It has been reported that the very wide crossing(6 to 7 lanes)is uncomfortable for non-motorized users.

There are no bicycle facilities on this segment. Bicyclists likely navigate through side streets and steep grades to access the Burke-Gilman Trail.

Transit Service

A single stop exists within this segment, north of NE 145th Street. Approximately 410 riders use the stop per day, with a majority going northbound. It is expected that a similar volume of riders appear on the southbound stop just south of NE 145th Street, outside of the study area of this project.

The stop is connected to the signalized crossing at NE 145th Street by sidewalks along SR 522. The stop also has a shelter. SR 522 is lit via illumination mounted on utility poles along the west side of the street, but there is no transit specific illumination at the stop.

The segment boardings and alightings are shown in **Table 8**.

Table 8: Southend Area Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Bothell Way NE & NE 145th St (NB)	57	350
Segment Total	57	350

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor varies between five and six lanes, generally providing two general purpose travel lanes in each direction, a dedicated southbound bus lane, with a landscaped median controlling side street access. A dedicated northbound U-turn lane is provided at the signalized intersection of NE 153rd Street. Left-turn lanes are provided at:

- NE 147th Street
- NE 145th Street

The LOS for the study intersections is shown in **Table 9.**

Table 9: Southend Area Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
NE 147th Street	TWSC	B	11	B	11	D	32	**E**	**49**
NE 145th Street (SR 523)	Signal	D	43	**E**	**67**	D	54	**E**	**73**

Source: Fehr & Peers, 2017.

While the NE 145th Street intersection currently operates at LOS D, it is expected to operate at LOS E during both peaks in 2036. Additional improvements are expected to improve the LOS at the intersection and to increase capacity to and from the planned transit station accessed via NE 145th Street near I-5.

The intersection at NE 147th Street is side street stop controlled and is also expected to degrade to a LOS E during the PM peak hour in 2036. This is due to traffic congestion and queues on SR 522 in the northbound direction during the PM peak hour. These queues

limit the amount of traffic served at the intersections, due to the constraints of upstream signals in any direction.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study area is summarized below.

145th Street

- Average of 8 collisions per year; 22 collisions the past three years.
- 1 collision involved a bicyclist, where a vehicle making a right turn did not yield to the bicyclist
- About 1/3 of collisions were rear ends with the remainder of the collisions related to lane changes or improper turns.

Utilities, Stormwater, and Right-of-Way

Utilities: This segment includes overhead poles on the west side within or behind the sidewalk. The overhead poles carry both transmission and distribution lines, as well as communication lines. Widening will need to address clear zone issues. There are a few poles on the lake side of the road with distribution to commercial establishments.

Stormwater: On both sides of the roadway, stormwater collection and conveyance is at the gutter line. Widening to either side will require modification of this existing stormwater system.

Right-of-Way: Right-of-way width along this section is typically 90 feet. The section is well developed with commercial establishments. Options for widening in this section are limited without substantial right-of-way and (potentially) access impacts.

Southend Area Key Findings

Segment Issues and Opportunities

- Mostly auto-centric businesses along the corridor.
- Intersection with NE 145th Street is very busy, and will continue to be in the future as it is a planned BRT station.
- This is a complex intersection that requires coordination with many jurisdictions.

- Sidewalks exist on both sides of the corridor.
- There is one signalized crossing at NE 145th Street. This can be unpleasant as the crossing distance is 6 to 7 travel lanes wide.
- There are no bicycle facilities on this segment.

- The area is served by a single northbound stop at NE 145th Street, which serves approximately 410 riders per day. The associated southbound stop is located south of NE 145th Street.
- The stop is connected to the signalized intersection via sidewalks on SR 522.
- The stop has a shelter but no pedestrian level illumination is provided.

- NE 145th Street/SR 522 (Bothell Way) is expected to operate at LOS E without any improvements.
- Improvements are planned for the intersection to increase the capacity to and from the planned future transit station north of NE 145th Street and I-5.
- The NE 147th Street intersection is side street stop controlled and is expected see higher side street delays (LOS E) in 2036.

- Near the 145th Street, 1 collision involved a bicyclist where a right-turning vehicle did not yield to the bicyclist.
- About 1/3 of collisions were rear ends with the remainder of the collisions related to lane changes or improper turns.

- Overhead utilities are located behind or within existing sidewalk, creating some clear zone issues.
- Stormwater collection and conveyance is well established with the current development. Widening will require modification of the existing system.
- Right-of-way and access issues include established commercial buildings which limit widening in this section.

Corridor Profile – SR 104

Introduction

Lake Forest Park serves as the southern terminus for SR 104, a route that connects Shoreline, Mountlake Terrace, and Edmonds to the Kingston Ferry Terminal. From there, the state route continues along the ferry route and connects into Kitsap and Jefferson Counties, ultimately terminating at US 101 on the Olympic Peninsula.

Through Lake Forest Park, SR 104 is a winding, tree-lined route, which residents and passersby appreciate for its natural beauty. However, among the trees and curves are outdated, non-standard intersections, blind driveways, and inadequate multimodal facilities that make it a hazardous route.

Like SR 522, SR 104 serves as a main street for Lake Forest Park. It runs by schools, businesses, and homes, yet provides surprisingly few amenities for people traveling by any mode except their car. The following corridor profile identifies the key challenges and opportunities to consider in identifying potential corridor concepts and community recommendations for the roadway's ultimate form.

Plans for the Corridor and Prior Studies

Below, we describe the Safe Streets Study, which has relevance to understanding the opportunities and constraints along the SR 104 corridor.

Safe Streets

As discussed earlier, the Safe Streets effort focused on making Lake Forest Park's streets safer for all users and improving connections to key amenities, such as parks, schools, trails, and retail. Safe Streets did not address SR 104, but several of the recommended projects will provide safer connections to transit along SR 104 for people traveling on foot or by bicycle. For example, Project 3 adds a sidewalk and bike infrastructure on 35th Avenue NE, improving connections to transit near an elementary school. Project 8 adds a sidewalk or pedestrian path and bicycle infrastructure on 40th Place NE, NE 197th Street, 35th Avenue NE, and 37th Avenue NE, providing safer connections to SR 104 for much of the north part of the City. Additionally, Project 10 adds a sidewalk or pedestrian path on NE 187th Street, NE 184th Street, and a short segment of 47th Avenue NE to tie into the existing pedestrian path on NE 178th Street that connects to SR 104, filling a crucial gap in pedestrian amenities. Refer to **Figure 3** for a recommended projects map.

Town Center: SR 522 to 178th Street

Context & Land Uses

The west side of this segment is adjacent to the Town Center, the commercial and retail hub of the City. Much of the Town Center property adjacent to the corridor is surface parking. Other attractions include the transit stops, as well as access to the Burke-Gilman Trail on the other side of the intersection with SR 522. Future plans include a new park-and-ride located somewhere within the Town Center.

The east side of the segment is mostly single-family residential and is expected to remain this way in the future. Similar to portions of the SR 522 study segments, these homes have their driveway access, mailboxes, and garbage collection along SR 104. See **Figure 13**.

Figure 13: Example of Garbage Collection, Mailboxes, and Driveway Access on SR 104.

Pedestrian/Bike Amenities

Sidewalks exist the length of the entire segment on the Town Center side, which connects to signalized pedestrian crossings at SR 522 and NE 175th Street. There is only one pedestrian crossing on the Town Center side across SR 522 to connect with the Burke-Gilman Trail. The east side of SR 104 has a paved asphalt walkway/sidewalk of varying quality through the segment.

There have been comments that more prominent wayfinding signs and an identified bicycle route to reach the Burke-Gilman Trail is needed. One thought was a widened multi-use path on the Town Center side of SR 104. There are no bicycle facilities on this corridor.

Transit Service

Two stops exist in the Town Center area on SR 104 on either side of NE 175th Street. Approximately 130 riders use the stop per day. The stop is connected to the signalized crossing at NE 175th Street by sidewalks along SR 104. Both stops also have shelters. There is no transit specific illumination at either stop, but the northbound stop is adjacent to the intersection street lighting. The segment boardings and alightings are shown in **Table 10.**

Table 10: Town Center Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Ballinger Way NE & NE 175th St (SB)	7	67
Ballinger Way NE & NE 175th St (NB)	51	8
Segment Total	58	75

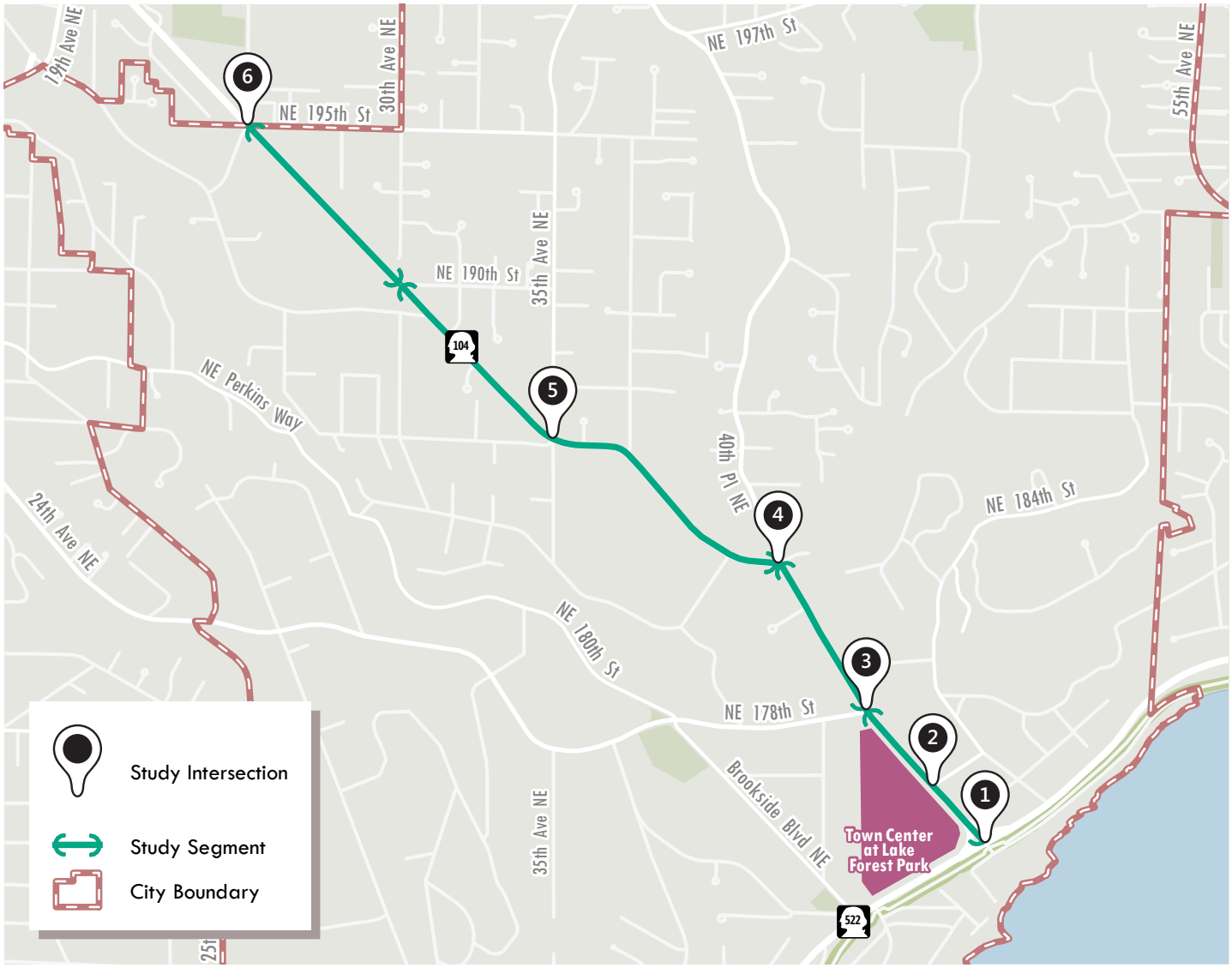
Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor varies between three and five lanes. The road is wider near SR 522 with dual left-turn lanes and channelized right-turn lanes. North of the intersection the road cross-section is one general purpose lane in each direction with a two-way left-turn lane. Dedicated left-turn lanes are provided at the intersections of

- NE 178th Street
- NE 175th Street
- SR 522 (Bothell Way).

Existing and future year vehicle turning movement counts for the SR 104 corridor during the peak hours and shown in **Figure 14** and **Figure 15**.



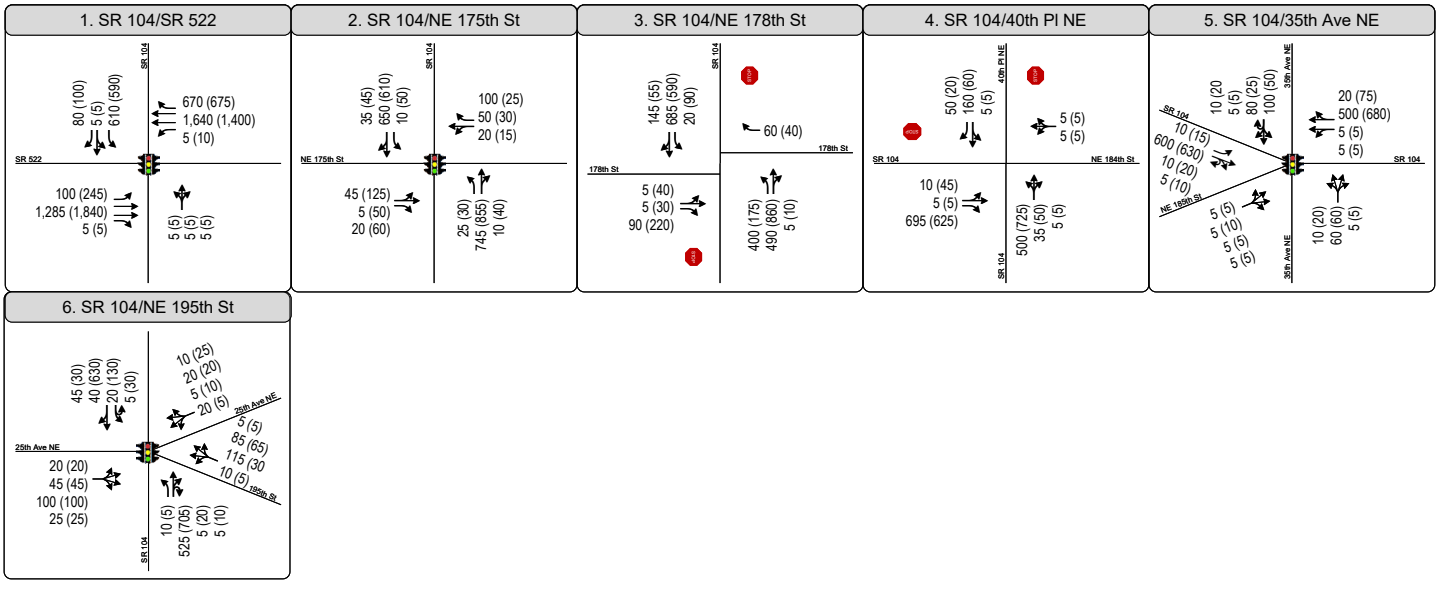
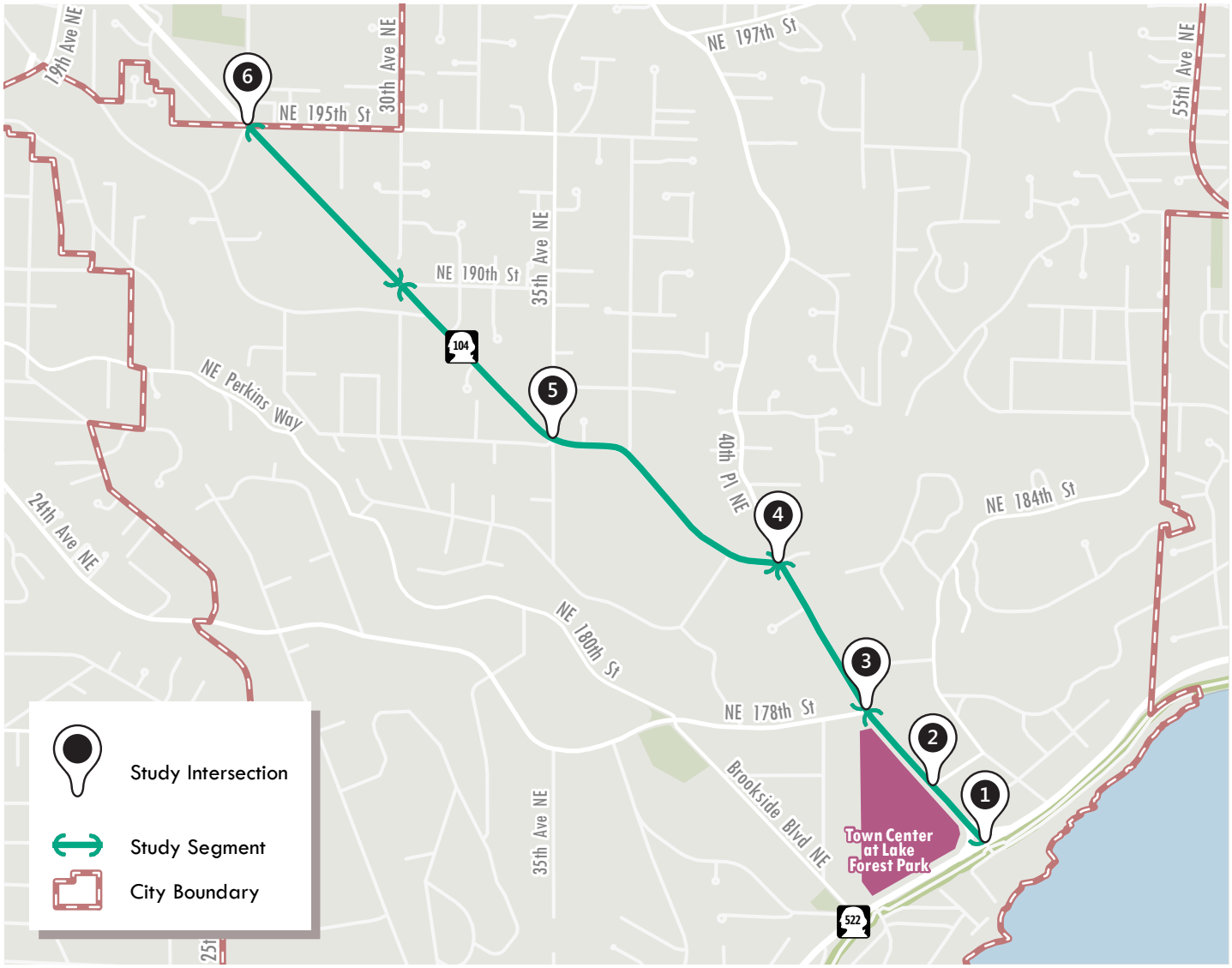


Figure 14
AM(PM) Peak Hour Volumes and Lane Configurations
Existing Conditions



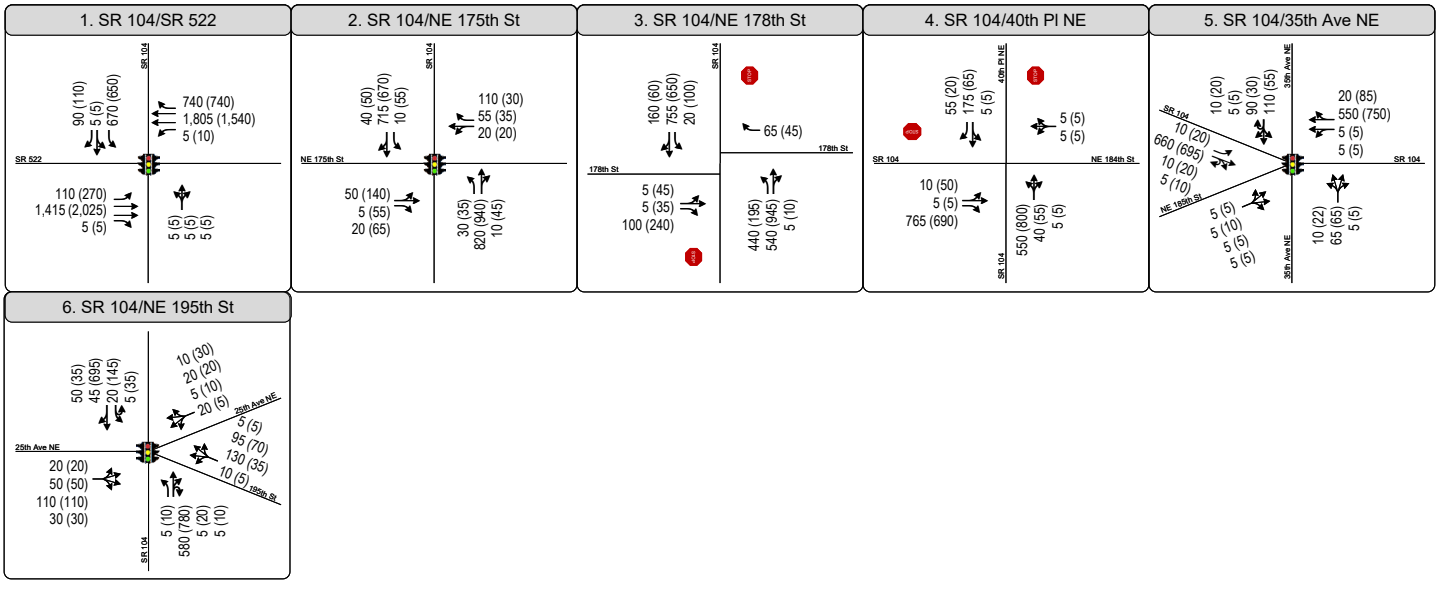


Figure 15
AM(PM) Peak Hour Volumes and Lane Configurations
Future (2036)

The SR 104 (Ballinger Way NE)/SR 522 (Bothell Way) intersection operates at LOS E in the PM peak hour but operations are expected to be more congested in the future with LOS E in the AM and LOS F in the PM peak hour by 2036.

The NE 178th Street intersection is currently an offset intersection that operates like two separate side street stop controlled intersections. The southern approach currently allows for northbound left-turns, which currently operates at LOS F in the PM peak hour. By 2036 this left-turn movement is expected to be highly congested, operating at LOS F during both peak periods.

The LOS for the study intersections is shown in **Table 11.**

Table 11: Town Center Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
SR 522 (Bothell Way)	Signal	D	43	**E**	**59**	**E**	**65**	**F**	**86**
NE 175th Street	Signal	B	11	B	12	C	24	C	25
NE 178th Street (eastbound approach)	TWSC	E	49	**F**	**>100**	**F**	**>100**	**F**	**>100**
NE 178th Street (westbound approach)	TWSC	B	13	B	13	C	19	C	22

Source: Fehr & Peers, 2017.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study intersections is summarized below.

NE 175th Street

- Average of 4 collisions per year; 12 collisions the past three years.
- Almost half the collisions were due to driver inattention and following too closely to vehicles ahead.
- No collisions involved pedestrian or bicyclists.

NE 178th Street

- Average of 7 collisions per year; 20 collisions the past three years.
- Half of the collisions were related to left turns (eastbound NE 178th Street to SR 104, and northbound SR104 to westbound NE 178th Street)

- One collision involved a bicyclist, where the bicyclist did not grant right of way to the vehicle.
- One severe collision involved a speeding vehicle colliding with aa fence while traveling southbound towards SR 522.

Utilities, Stormwater, and Right-of-Way

Utilities: This section of SR 104 includes utility poles on the east side of the road within the right-of-way carrying both transmission and distribution lines, as well as communication lines. The poles are located in front of residential fencing in some sections, and at the edge of shoulder in other cases. Clear zone with widening is an important consideration.

A waterline with hydrants runs along the east side of the SR 104 road prism, as well as along the north and south legs of NE 178th Street.

Stormwater: The Town Center side includes stormwater collection and conveyance along the curb and gutter. Intermittent curb for collection and conveyance on the east side prevents runoff from entering private properties. Widening, as needed, will require modifications to the existing storm drainage system.

Right-of-Way: Right-of-way width along this section is typically 96 feet. Widening in this section, if necessary, will need to balance impacts to the established commercial development on the Town Center side and single-family residences set back from the roadway on the opposite side. On the residential side fencing, and driveways with limited sight distance, largely due to established dense vegetation, will be key elements to consider with widening. There are also some locations where garbage is placed for collection on a weekly basis.

Intersection options for the dog-legged intersection at NE 178th Street are challenged by the right-of-way constraints, topography, road geometry, turning movements and impacts to residences including access.

Town Center Key Findings

Segment Issues and Opportunities

- Adjacent to the Town Center, the retail/commercial hub of the City.
- A new park-and-ride will be located somewhere within the Town Center.
- The other side of the corridor is single-family homes with driveways, mailbox access, and garbage collection on the edge of the corridor.

- There is a full sidewalk on the Town Center side along the segment. It connects to a signalized pedestrian crossings of SR 104 at NE 175th Street and SR 522. The SR 522 crossing connects to the Burke-Gilman Trail and transit stops.
- The residential side of the corridor has a sidewalk/paved asphalt path through the corridor. The path ends approaching SR 522, as there is no pedestrian crossing on this leg of the intersection.
- It has been commented that wayfinding signage and an identified bicycle route to the Burke-Gilman Trail is needed. One idea is a multi-use path on the Town Center side of the corridor.

- Two stops in this area serve about 130 riders per day.
- Both stops are connected to pedestrian facilities and have shelters.
- Signalized crosswalks exist at the adjacent NE 175th Street Signal.

- The SR 522/SR 104 intersection operates at LOS E during the PM Peak hour today. Conditions are expected to degrade to LOS E/F during the peak periods.
- The south leg of the NE 178th Street/SR 104 intersection currently operates at LOS F during the PM peak hour and is expected to operate at LOS F under all future conditions.

- Most collisions at NE 175th Street were rear-ends due to driver inattention. No collisions involved a pedestrian or bicyclist.
- Collisions at NE 178th Street were mostly left-turn collisions (from eastbound NE 178th Street to northbound SR 104, and from northbound SR 104 to westbound NE 178th Street)
- One collision involved a bicyclist, which did not grant right of way to the vehicle.

- Overhead utilities are located close to the east side of the road.
- Existing stormwater system will need to be modified with widening or intersection realignment.
- Widening in this section, if necessary, will need to balance impacts to the established commercial development to the Town Center side and single-family residences set back from the roadway to the other side.
- Options for intersection improvements at NE 178th Street must address right-of-way constraints, topography, road geometry, turning movements and impacts to residences including access.

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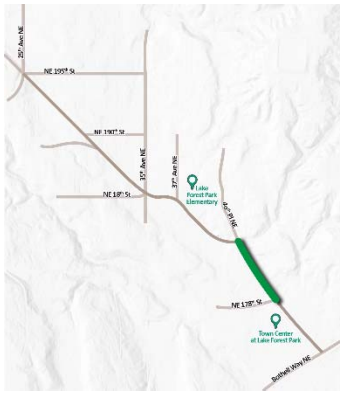

North of Town Center: 178th Street to 40th Place NE

Context & Land Uses

This tree-lined segment of the corridor is surrounded by single-family homes. These homes have their driveway, mailboxes, and garbage collection on the shoulder of the SR 104. The City expects this zoning to remain the same in the future.

Pedestrian/Bike Amenities

Accommodations for walking are better on the east side of SR 104 through this segment of the corridor given the combination of sidewalk or paved asphalt walkway. Portions of the elevated sidewalk also have a grass buffer between pedestrians and vehicles. This side of the corridor also has a wider shoulder and street lighting. The 40th Place NE intersection can be hard for both pedestrian and vehicles to navigate as the road curves and there are no marked crosswalks to identify the pedestrian realm. The skewed intersection also makes for long pedestrian crossing distances.

The west side of the corridor has no formal continuous sidewalk. There is a paved shoulder that pedestrians could walk on, but there is no separation from the vehicle travel lane. In some sections there is a grassy curb separated path for pedestrians to walk on, however it is narrow. Residents may need to walk on this side of the road to access the transit stop near NE 184th Street.

There are no marked crosswalks on this segment of SR 104. This segment of the corridor is a two-lane roadway, so crossing pedestrians may cross cautiously as needed; however this can be difficult given peak hour traffic volumes.

There are no bicycle facilities on this corridor.

Transit Service

Two stops exist in this segment of SR 104 on either side NE 184th Street. Daily ridership at the stops is less than 10 riders. The southbound stop pad connects to paved shoulders via an accessible curb ramp, but no other pedestrian facilities exist on the east side of the road. The northbound stop is served by a bus pull out and connects to a shared use trail on the east side of SR 104. The stop is located adjacent to residential driveways, which

can obscure the stop location. There are no signalized pedestrian crossings in the area. No shelters exist at either stop. The roadway is lit via luminaires mounted on utility poles, but no specific transit lighting is provided.

Existing Transit Service on SR 104

The segment boardings and alightings are shown in **Table 12**.

Table 12: North of Town Center Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Ballinger Way NE & NE 184th St (SB)	1	1
Ballinger Way NE & NE 184th St (NB)	1	1
Segment Total	2	2

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor is generally two lanes, providing one general purpose travel lane in each direction. A dedicated left-turn lane is provided at the intersections of

- 40th Place NE – NE 184th Street
- NE 178th Street

Operations at the NE 178th Street/SR 104 (Ballinger Way) intersection are discussed in the previous section.

40th Place NE/NE 184th Street/SR 104 (Ballinger Way) is a skewed sidestreet stop controlled intersection that currently operates at LOS F. The intersection consists of two unsignalized approaches with the through traffic bearing left northbound, and bearing right southbound. All turning movements are currently allowed at this intersection, with left turns from the stop controlled side streets operating at the lowest LOS.

The LOS for the study intersections is shown in **Table 13.**

Table 13: North of Town Center Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
NE 178th Street (southern approach)	TWSC	E	49	**F**	**>100**	**F**	**>100**	**F**	**>100**
NE 178th Street (northern approach)	TWSC	B	13	B	13	C	19	C	22
40th Place NE - NE 184th Street	TWSC	**F**	**>100**	**F**	**>100**	**F**	**85**	**F**	**>100**

Source: Fehr & Peers, 2017.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study intersection is summarized below.

40th Place NE

- Average of 4 collisions per year; 13 collisions the past three years.
- 7 collisions were vehicles hitting an obstruction (curb, retaining wall, mailbox)
- 1 collision involved a vehicle not granting right-of-way while making a left turn.
- 1/3 of collisions involved speeding.
- One collision involved a vehicle and cyclist and was not intersection related; however no additional detail was provided.

Utilities, Stormwater, and Right-of-Way

Utilities: This segment has utility poles on the east side of the road within the right-of-way, carrying both transmission and distribution lines, as well as communication lines. Some additional distribution poles are on the west side to serve residences. The poles are located in front of residential fencing in some sections, and at the edge of shoulder in other cases. Clear zone with widening is an important consideration. Overhead lines are damaged by downed trees during the fall and winter occasionally.

A waterline with hydrants runs along the west side of the SR 104 road prism as well as up NE 184th Street at the 40th Place NE intersection.

Stormwater: Just north of NE 178th Street, storm water is collected and conveyed on the east side along the intermittent curb and gutter. Closer to 40th Place NE and on the west side between NE 178th Street and 40th Avenue NE, storm runoff is sheet flowed to the adjacent properties. Widening, as needed, will include modification of this existing stormwater system and an improved water quality treatment, tight line collection and conveyance system, such as what exists further to the east on SR 104.

Right-of-Way: Right-of-way width along this section is typically 62 feet. Widening in this section will need to balance impacts to single family residences set back from the roadway on both sides of the road. On the east side, a rockery just north of 178th Street, fencing, and driveways with limited sight distance largely due to established dense vegetation, will be key elements to consider with widening. The residents also place garbage cans out for collection on a weekly basis.

Intersection options for the 40th Place NE intersection include a possible roundabout. The layout of this option will be challenged by right-of-way constraints, topography, road geometry, turning movements and impacts to residences including access.

North of Town Center Key Findings

Segment Issues and Opportunities

- Single-family zoned on both sides of the corridor. Corridor constrained by mail delivery and garbage collection on the shoulders of SR 104.
- Zoning expected to remain single-family in the future.

- The preferred walking path through the corridor is on the east side of SR 104, where there is a sidewalk/asphalt walking path and streetlights. This side also has a wider shoulder.
- Pedestrian crossings at 40th Place NE can be difficult due to the road curvature and skewed intersection layout.
- The west side of SR 104 has a narrower shoulder and at times a curb separated grass pathway. Pedestrians may need to travel on this side to access a transit stop at NE 185th Street.
- There are no bicycle facilities on this corridor.

- Two stops in this area serve less than 10 riders per day.
- There are little to no pedestrian facilities in the area.
- The stop location is unclear and difficult to locate due to driveways and foliage.

- Stop controlled side streets with permitted left-turn movements are expected to continue operating at LOS F in 2035.

- Average of 4 collisions per year near 40th Place NE area, total of 13 collisions.
- About half the collisions involved hitting an obstruction (curb, mailbox, retaining wall, traffic island)
- 1/3 of collisions involved speeding vehicles.
- 1 collision was a left turn collision.

- Overhead utilities are located close to the north side of the road.
- Existing stormwater system will need to be improved or modified with widening or intersection realignment.
- Widening in this section will need to balance impacts to the single-family residences set back from the roadway.
- Options for intersection improvements at 40th Avenue NE must address right-of-way constraints, topography, road geometry, turning movements and impacts to residences including access.

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LFP Elementary Zone: 40th Place NE to NE 190th Street

Context & Land Uses

The surrounding land use includes mostly single-family housing, but the corridor is also adjacent to Lake Forest Park Elementary School and small neighborhood businesses near 37th Avenue NE and NE 190th Street. The road transitions from a two-lane cross-section to three-lane cross-section (added two-way left turn lane) between 40th Place NE and 40th Avenue NE, and between 37th Avenue NE and NE 190th Street. The corridor continues to have trees and greenery lining the road, with a sidewalk on the east side and a paved shoulder on the west side of SR 104. There is a northbound transit stop at the elementary school, and a southbound transit stop near 40th Avenue NE.

Residential homes along the corridor have their driveway access on SR 104 with mail delivery and garbage collection on the shoulder of SR 104.

Figure 16: SR 104 and 190th Street Intersection.

Source: Fehr & Peers, 2017

Pedestrian/Bike Amenities

The east side of SR 104 continues to offer the better pedestrian accommodations with a sidewalk or paved asphalt walkway. Just north of the elementary school, there are jersey barriers or landscaped buffer on both sides of SR 104 to separate pedestrians from vehicle traffic.

There are no marked crosswalks across SR 104 except for a signalized crossing at NE 185th Street. Any crossings, such as to or from residential homes on the west side of SR 104, would have to be made cautiously by pedestrians looking both ways to find a gap in vehicle traffic to cross.

There are no bicycle facilities on SR 104 on this segment.

Transit Service

This section of the corridor serves as a crossroads for transit. Route 308 enters and exits SR 104 at 35th Avenue NE, making a westbound right turn or southbound left turn at the intersection. Routes 331 and 342 are routed off SR 104 via 35th Avenue NE and NE 190th Street, serving Lake Forest Park Elementary. Southbound routes stay on SR 104.

The area is served by several stops along NE 190th Street, 35th Avenue NE, and SR 104 near 35th Avenue. Daily ridership at the stops is approximately 60 riders. The southbound stop at SR 104 and 35th Avenue NE is located within a paved shoulder and marked inside a driveway to the Ballinger Automotive Repair Shop. The stop is not connected to any sidewalk pedestrian facilities, but a paved shoulder does connect the stop to the adjacent signalized crossing at 35th Avenue NE. There is no shelter, but illumination does exist at the stop via a utility pole mounted illumination arm.

Stops along NE 190th Street and 35th Avenue NE consist of on-street facilities. Some stops are located near school zone crosswalks, but no signalized crosswalks. Pedestrian facilities, stop shelters, or transit specific lighting exist along the corridors.

The segment boardings and alightings are shown in **Table 12**.

Table 14: LFP Elementary Zone Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Ballinger Way NE & 40th Ave NE (NB)	1	0
Ballinger Way NE & 37th Ave NE (NB)	1	1
NE 190th St & 33rd Ave NE (NB)	1	2
NE 190th St & Ballinger Way NE (NB)	3	2
35th Ave NE & Ballinger Way NE (NB)	9	8
35th Ave NE & NE 189th Pl (SB)	2	0
35th Ave NE & Ballinger Way NE (SB)	10	0
Ballinger Way NE & 37th Ave NE (SB)	1	2
Ballinger Way NE & 40th Ave NE (SB)	0	0
Ballinger Way NE & 35th Ave NE (SB)	6	9
Segment Total	34	24

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this segment of the corridor is generally two lanes, providing one general purpose travel lane in each direction. A dedicated left-turn lane is provided at

- 35th Avenue NE – NE 185th Street
- 34th Avenue NE
- 40th Place NE – NE 184th Street

Operations at 40th Place NE/NE 184th Street/SR 104 (Ballinger Way) intersection are currently LOS F due to side street delay as described in the previous section.

The LOS for the study intersections is shown in **Table 15.**

Table 15: Lake Forest Park Elementary Segment Vehicle Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
40th Place NE - NE 184th Street	TWSC	**F**	**245**	**F**	**443**	**F**	**85**	**F**	**181**
35th Avenue NE - NE 185th Street	Signal	D	42	D	48	C	34	D	42

Source: Fehr & Peers, 2017.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study intersection is summarized below.

190th Street

- An average of 7 collisions per year; 19 collisions in the past three years.
- Most collisions were rear-end collisions due to driver inattention.
- No collisions involved a pedestrian or bicyclist.
- 7 collisions were vehicles hitting an obstruction (utility pole, guardrail, fence, wooden sign post). Of these collisions, 5 were DUIs and/or involved speeding.

Utilities, Stormwater, and Right-of-Way

Utilities: The segment includes utility poles on the east side of the road up to approximately NE 184th Street and on the west side between NE 184th and NE 190th Streets, within the right-of-way, carrying both transmission and distribution lines, as well as communication lines. Some additional distribution poles are on the opposite sides to serve residences and businesses at 35th Avenue NE. The poles are located at back of sidewalk or asphalt path in some sections, and in planter strips and at the edge of shoulder in other cases. Clear zone with widening is an important consideration. Overhead lines are damaged by downed trees during the fall and winter occasionally.

A water line crosses the SR 104/35th Avenue NE intersection along the south side of 35th Avenue NE.

Stormwater: Drainage is characterized by intermittent asphalt curb sections and shoulder sections between 40th Avenue NE and NE 190th Street. On the shoulder sections, storm runoff is sheet flowed to the adjacent properties. Widening, as needed, will include modification of this existing stormwater system and an improved tight line collection and conveyance system.

An existing box culverted section of Lyon Creek at the 35th Avenue NE intersection is planned to be replaced and will be accounted for in intersection improvement options. The creek crosses the west leg of the intersection (SR 104) and also NE 185th Street.

Right-of-Way: Right-of-way width along this section ranges from 60 to 80 feet. Widening in this section will need to balance impacts to single-family residences set back from the roadway on both sides of the road. Rockeries (on the north side near NE 184th Street), steep slopes with jersey barrier (on the east side just north of 40th Avenue NE), fencing, and driveways with limited sight distance largely due to established dense vegetation will be key elements to consider with widening. The residences also place garbage cans along SR 104 for collection on a weekly basis.

Intersection options for the 35th Avenue NE intersection include a possible roundabout. The layout of this option will be challenging because of right-of-way constraints, adjacent commercial properties such as “Whizz Kids” and “Lake Forest Market”, topography, road geometry, turning movements and impacts to residences including access.

LFP Elementary Zone Key Findings

Segment Issues and Opportunities

- Mostly single-family residential along the corridor. There is the Lake Forest Park elementary school near 37th Avenue NE, as well as some neighborhood commercial businesses near 37th and 35th Avenue NE.
- Residential homes have driveway access on SR 104, with mail delivery and garbage collection on the shoulder of SR 104.
- There is a transit stop northbound at the elementary school and a southbound transit stop at 40th Avenue NE.

- Preferred walking path is on the east side of SR 104 where a sidewalk and paved asphalt walkway exists.
- North of the elementary school there is a jersey barrier separating the pedestrian walkway from vehicle traffic on both sides of SR 104.
- There are no marked crosswalks across SR 104, except at NE 185th Street.
- There are no bicycle facilities through this corridor.

- Northbound routes circulates around the elementary school via NE 195th Street and 35th Avenue NE.
- The segment serves approximate 60 daily riders.
- Stop at 35th Avenue NE is not connected to sidewalk pedestrian facilities.

- Stop controlled side streets with permitted left-turn movements are expected to operate at LOS F under all study conditions.

- The 190th Street area had an average of 7 collisions per year, 19 total collisions.
- Most collisions were rear ends, and no collisions involved a cyclist or pedestrian.
- 7 collisions involved hitting an obstruction, where more than half were DUIs and/or speeding.

- Overhead utilities are located close to the either side of the road.
- Existing stormwater system will need to be improved or modified with widening or intersection realignment.
- Widening in this section will need to balance impacts to the single family residences set back from the roadway.
- Options for intersection improvements at 35th Avenue NE must address impacts to commercial establishments, right-of-way constraints, topography, road geometry, turning movements, as well as impacts to residences at other locations, including access.

Northend Area: NE 190th Street to NE 195th Street

Context & Land Uses

The corridor continues to be surrounded by single-family homes with some higher density multi-family housing closer to the NE 195th Street intersection. The corridor has driveways on SR 104. Mail delivery and garbage collection is on or just past the shoulder of SR 104 for residential homes on SR 104. Garbage collection and mail delivery is not on SR 104 for the multi-family housing on the corridor as they have their own driveways.

Pedestrian/Bike Amenities

The better walking route along SR 104 continues to be the east side of the roadway where there is a sidewalk with trees and a landscape buffer between pedestrians and vehicle traffic. Some small portions are only a paved asphalt walkway. There is a signalized pedestrian crosswalk at NE 195th Street.

There are no sidewalks on the west side of SR 104 in this segment. There is a wide shoulder that pedestrians could potentially walk on, however, there is no separation between the pedestrian and vehicle traffic.

There are no bicycle facilities on this segment of the corridor.

Transit Service

The area is served by three stops, two north of NE 190th Street between two private residential driveways, and a third near 25th Avenue NE. A fourth stop, just north of NE 195th Street is just beyond the project limits. Daily ridership at the stops is approximately 40 riders, with most of riders accessing the routes via the stop located at 25th Avenue NE. The southbound stop north of NE 190th Street does not connect to any pedestrian facilities. The northbound stop consists of a pull out between residential driveways and there are connections to a shared use trail along the east side of the street. There are no shelters or transit specific lighting at either stop.

The stop near 25th Avenue NE is connected to the signalized intersection and pedestrian crossing via a wide paved shoulder. There is a shelter, but illumination does not exist at the shelter.

Transit stop on SR 104 at 25th Avenue NE.

The segment boardings and alightings are shown in **Table 16**.

Table 16: Northend Area Transit Boardings and Alightings

Stop Name	Average Daily Boardings	Average Daily Alightings
Ballinger Way NE & NE 190th St (NB)	1	3
Ballinger Way NE & 25th Ave NE (SB)	16	16
Ballinger Way NE & NE 190th St (SB)	3	3
Segment Total	20	22

Source: King County Metro, Fehr & Peers, 2017.

Vehicle Operations

The street cross-section through this portion of the corridor is generally two lanes, providing one general purpose travel lane in each direction. A dedicated left-turn lane is provided at the intersections of

- 25th Avenue NE – NE 195th Street
- 35th Avenue NE – NE 185th Street

NE 195th Street is the only study intersection in this segment and operates at LOS D or better under all study conditions.

The LOS for the study intersections is shown in **Table 17**.

Table 17: Northend Area Level of Service and Delay

		AM				PM			
		Existing		Future		Existing		Future	
Intersection	Control	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
NE 195th St	Signal	D	40	D	43	C	32	D	42

Source: Fehr & Peers, 2017.

Safety/Collision Data

Collision data was collected for a three-year period (March 2014 to March 2017). The collision history for the study intersection is summarized below.

NE 195th Street Area

- An average of 5 collisions per year; 14 total collisions in the past three years.
- 8 collisions involved making left turns.
- 4 collisions were disregarding the traffic signal.
- 4 collisions were turn related and not granting right-of-way.
- No collisions involved pedestrian or bicyclists.

Utilities, Stormwater, and Right-of-Way

Utilities: This segment includes utility poles on the west side of the road, within the right-of-way, carrying both transmission and distribution lines, as well as communication lines. The poles are located primarily at the edge of shoulder. Clear zone with widening is an important consideration. Overhead lines are damaged by downed trees during the fall and winter occasionally.

At the NE 195th intersection, water lines and sanitary sewer lines exist on both NE 195th Street and 25th Avenue NE legs.

Stormwater: Drainage is characterized by intermittent asphalt curb sections and shoulder sections between NE 190th Street and 195th Street. On the shoulder sections, storm runoff is sheet flowed to the adjacent properties. Widening, as needed, will include

modification of this existing stormwater system and an improved water quality treatment, tight line collection and conveyance system.

At the NE 195th Street intersection, a 24" x 36" corrugated metal pipe carrying a creek crosses the NE 195th Street leg. The creek crosses in a channel east of the intersection and flows downstream into a 30" x 40" corrugated metal pipe, running parallel to the east side of 25th Avenue NE.

Right-of-Way: Right-of-way width along this section is typically 90 feet. Widening in this section will need to balance impacts to single family residences set back from the roadway on primarily the west side of the road. Driveways with limited sight distance will be key elements to consider with widening. The residences also place garbage cans placed out for collection on a weekly basis.

Intersection options for the NE 195th Street intersection include a possible roundabout. The layout of this option will be challenged by the right-of-way constraints, adjacent commercial properties, culvert crossing and topography, road geometry, turning movements and impacts to residences including access.

NE 195th St intersection with utility poles on west side of SR 104

Northend Area Key Findings

Segment Issues and Opportunities

- The corridor is surrounded by single-family homes with multi-family homes closer to NE 195th Street. Residential homes have driveway access on SR 104, with mail delivery and garbage collection off the shoulder of SR 104.

- The main pedestrian walking route is on the east side of SR 104, where there is a separated sidewalk with landscaped buffer with trees.
- There are no sidewalks on the west side of SR 104. There is a wider paved asphalt shoulder.
- One signalized crossing exists at NE 195th Street, where some of the sidewalk ramps are in poor condition.
- There are no bicycle facilities on this corridor.

- Stops near NE 190th Street serve less than 10 riders per day, while the stop located at 25th Avenue NE serves roughly 30 riders per day.
- Stop at NE 190th Street is not connected to pedestrian facilities or crosswalks.
- Stop at 25th Avenue NE is connected to the signaled crossing via a widened shoulder.

- Stop controlled side streets with permitted left-turn movements are expected to operate at LOS F under all study conditions.

- NE 195th Street area has an average of 5 collisions per year; 14 collisions the past three years.
- 8 collisions involved making left turns, and 4 collisions involved not granting right-of-way.
- There were no pedestrian or bicycle involved collisions.

- Overhead utilities are located close to the west side of the road.
- Existing stormwater system will need to be improved or modified with widening or intersection realignment.
- Widening in this section will need to balance impacts to the single-family residences set back from the roadway.
- Options for intersection improvements at 195th Street must address impacts to commercial establishments, culvert crossing, right-of-way constraints, topography, road geometry, and turning movements.

Lake Forest Park
SAFE HIGHWAYS
Accessible Efficient Complete

Appendix F: Roundabout Analysis Results

Lake Forest Park SR-104 Corridor Roundabout Analysis

Four intersections on State Route 104 were analyzed to determine the Level of Service (LOS) that would occur under potential roundabout layouts. This analysis was performed with Sidra 7 intersection software. Sidra can analyze roundabouts using several different methods. For this analysis, we used HCM 6th edition methodology for the capacity model as well as the LOS method. The LOS thresholds were set to be the same as sign control.

The intersections analyzed are as follows:

1. SR-104/NE 195th St/25th Ave NE
2. SR-104/35th Ave NE/NE 185th St
3. SR-104/40th Pl NE/ NE 184th St
4. SR-104/NE 178th St

Intersections one and two have five legs, intersection three has four legs, and intersection four has three legs but there is a side street approximately 135 feet north of the proposed roundabout. Each intersection was analyzed under the following scenarios:

1. Existing (2017) AM Peak Hour
2. Future (2035) AM Peak Hour
3. Existing PM Peak Hour
4. Future PM Peak Hour

The results of the analysis are detailed in the attached tables.

Lake Forest Park SR 104 Roundabout Analysis 8/21/2017
HCM 6th Edition Methodology, Sidra 7.0, LOS Method is same as sign control

AM Peak Hour

	Existing							
Roundabout	Worst Leg	Worst Approach LOS	Worst Approach Avg Delay	Worst 95% Back of Queue Vehicles	Worst 95% Back of Queue in ft	Overall LOS	Overall Average Delay	
SR 104/ NE 195th St/ 25th Ave NE	SouthEast (NB 104)	B	13	6	149	B	10	Single lane roundabout operates OK
SR 104/ 35th/ 185th	NorthWest (SB 104)	B	13	7	166	B	10	Single lane roundabout operates OK
SR 104/ 40th	West (SB 104)	C	16	9	230	B	12	Single lane roundabout operates OK
SR 104/ 178th	North (SB 104)	F	104	65	1632	F	57	v/c>1

	Future							
Roundabout	Worst Leg	Worst Approach LOS	Worst Approach Avg Delay	Worst 95% Back of Queue Vehicles	Worst 95% Back of Queue in ft	Overall LOS	Overall Average Delay	
SR 104/ NE 195th St/ 25th Ave NE	SouthEast (NB 104)	C	17	8	221	B	13	Single lane roundabout operates OK
SR 104/ 35th/ 185th	NorthWest (SB 104)	C	17	10	243	B	13	Single lane roundabout operates OK
SR 104/ 40th	West (SB 104)	C	22	15	365	C	15	Single lane roundabout operates OK
SR 104/ 178th	North (SB 104)	F	176	106	2673	F	93	v/c>1
SR 104/ 178th ***(2 NB lanes)***	*North (SB 104)*	*F*	*117*	*76*	*1912*	*F*	*60*	v/c>1

PM Peak Hour

	Existing							
Roundabout	Worst Leg	Worst Approach LOS	Worst Approach Avg Delay	Worst 95% Back of Queue Vehicles	Worst 95% Back of Queue in ft	Overall LOS	Overall Average Delay	
SR 104/ NE 195th St/ 25th Ave NE	SouthEast (NB 104)	C	23	12	290	C	18	Single lane roundabout operates OK
SR 104/ 35th/ 185th	East (NB 104)	B	13	7	168	B	12	Single lane roundabout operates OK
SR 104/ 40th	South (NB 104)	B	12	7	179	B	11	Single lane roundabout operates OK
SR 104/ 178th	South (NB 104)	E*	47	44	1098	D	32	v/c>1

*LOS F if v/c>1 for each movement, does not apply at the approach level

	Future							
Roundabout	Worst Leg	Worst Approach LOS	Worst Approach Avg Delay	Worst 95% Back of Queue Vehicles	Worst 95% Back of Queue in ft	Overall LOS	Overall Average Delay	
SR 104/ NE 195th St/ 25th Ave NE	SouthEast (NB 104)	**E**	39	21	518	D	27	Single lane roundabout operates OK
SR 104/ 35th/ 185th	East (NB 104)	C	17	10	243	B	14	NE. Single lane roundabout operates OK
SR 104/ 40th	South (NB 104)	B	14	9	236	B	14	Single lane roundabout operates OK
SR 104/ 178th	South (NB 104)	F	86	76	1920	F	53	v/c>1
SR 104/ 178th ***(2 NB lanes)***	*West (178th)*	*D*	*29*	***18***	***453***	*C*	*23*	Does not spill back to signal

Bold=Worst queue (NB 104) not same leg as worst delay

MOVEMENT SUMMARY

Site: 101 [195th-Existing AM]

195th & 25th
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 25th Ave NE											
3a	L1	28	1.0	0.217	4.9	LOS A	1.1	27.4	0.29	0.16	34.3
8	T1	63	1.0	0.217	4.9	LOS A	1.1	27.4	0.29	0.16	34.6
18	R2	139	1.0	0.217	4.9	LOS A	1.1	27.4	0.29	0.16	33.6
18b	R3	35	1.0	0.217	4.9	LOS A	1.1	27.4	0.29	0.16	33.3
Approach		264	1.0	0.217	4.9	LOS A	1.1	27.4	0.29	0.16	33.9
SouthEast: NB SR 104											
3bx	L3	6	2.0	0.650	13.2	LOS B	5.9	148.7	0.73	0.66	31.3
8x	T1	640	2.0	0.650	13.2	LOS B	5.9	148.7	0.73	0.66	30.9
18ax	R1	6	2.0	0.650	13.2	LOS B	5.9	148.7	0.73	0.66	30.7
18bx	R3	6	2.0	0.650	13.2	LOS B	5.9	148.7	0.73	0.66	29.9
Approach		659	2.0	0.650	13.2	LOS B	5.9	148.7	0.73	0.66	30.9
East: NE 195th St											
1b	L3	11	2.0	0.383	11.2	LOS B	1.8	45.9	0.71	0.74	30.9
1	L2	128	2.0	0.383	11.2	LOS B	1.8	45.9	0.71	0.74	30.6
16a	R1	94	2.0	0.383	11.2	LOS B	1.8	45.9	0.71	0.74	30.3
16	R2	6	2.0	0.383	11.2	LOS B	1.8	45.9	0.71	0.74	29.8
Approach		239	2.0	0.383	11.2	LOS B	1.8	45.9	0.71	0.74	30.5
North: 25th Ave NE											
7	L2	26	1.0	0.132	8.4	LOS A	0.5	12.5	0.66	0.66	32.0
7a	L1	6	1.0	0.132	8.4	LOS A	0.5	12.5	0.66	0.66	31.7
4	T1	26	1.0	0.132	8.4	LOS A	0.5	12.5	0.66	0.66	32.0
14b	R3	13	1.0	0.132	8.4	LOS A	0.5	12.5	0.66	0.66	30.9
Approach		71	1.0	0.132	8.4	LOS A	0.5	12.5	0.66	0.66	31.8
NorthWest: SB SR 104											
7bx	L3	5	1.0	0.107	4.2	LOS A	0.5	11.8	0.36	0.22	35.2
7ax	L1	22	1.0	0.107	4.2	LOS A	0.5	11.8	0.36	0.22	34.5
4x	T1	43	1.0	0.107	4.2	LOS A	0.5	11.8	0.36	0.22	34.8
14ax	R1	48	1.0	0.107	4.2	LOS A	0.5	11.8	0.36	0.22	34.5
Approach		118	1.0	0.107	4.2	LOS A	0.5	11.8	0.36	0.22	34.6
All Vehicles		1350	1.7	0.650	10.2	LOS B	5.9	148.7	0.61	0.54	31.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [35th- Existing AM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 35th Ave NE											
3a	L1	12	0.0	0.161	8.3	LOS A	0.6	15.7	0.66	0.66	32.6
8	T1	74	0.0	0.161	8.3	LOS A	0.6	15.7	0.66	0.66	32.9
18	R2	6	0.0	0.161	8.3	LOS A	0.6	15.7	0.66	0.66	32.1
Approach		93	0.0	0.161	8.3	LOS A	0.6	15.7	0.66	0.66	32.8
East: NB SR 104											
1	L2	5	2.0	0.463	7.8	LOS A	3.1	79.3	0.39	0.23	33.5
6	T1	5	2.0	0.463	7.8	LOS A	3.1	79.3	0.39	0.23	33.5
16a	R1	526	2.0	0.463	7.8	LOS A	3.1	79.3	0.39	0.23	33.2
16	R2	21	2.0	0.463	7.8	LOS A	3.1	79.3	0.39	0.23	32.6
Approach		558	2.0	0.463	7.8	LOS A	3.1	79.3	0.39	0.23	33.2
North: 35th Ave NE											
7	L2	110	0.0	0.276	7.8	LOS A	1.3	31.2	0.62	0.61	32.2
4	T1	88	0.0	0.276	7.8	LOS A	1.3	31.2	0.62	0.61	32.2
14	R2	5	0.0	0.276	7.8	LOS A	1.3	31.2	0.62	0.61	31.4
14b	R3	11	0.0	0.276	7.8	LOS A	1.3	31.2	0.62	0.61	31.1
Approach		214	0.0	0.276	7.8	LOS A	1.3	31.2	0.62	0.61	32.1
NorthWest: SB SR 104											
7bx	L3	12	2.0	0.676	13.3	LOS B	6.6	165.5	0.71	0.56	29.6
7ax	L1	706	2.0	0.676	13.3	LOS B	6.6	165.5	0.71	0.56	29.0
14ax	R1	12	2.0	0.676	13.3	LOS B	6.6	165.5	0.71	0.56	29.1
14bx	R3	6	2.0	0.676	13.3	LOS B	6.6	165.5	0.71	0.56	28.4
Approach		735	2.0	0.676	13.3	LOS B	6.6	165.5	0.71	0.56	29.0
West: NE 185th St											
5b	L3	7	0.0	0.054	7.5	LOS A	0.2	5.0	0.64	0.63	32.6
5	L2	7	0.0	0.054	7.5	LOS A	0.2	5.0	0.64	0.63	32.3
2	T1	7	0.0	0.054	7.5	LOS A	0.2	5.0	0.64	0.63	32.2
12	R2	7	0.0	0.054	7.5	LOS A	0.2	5.0	0.64	0.63	31.4
Approach		29	0.0	0.054	7.5	LOS A	0.2	5.0	0.64	0.63	32.1
All Vehicles		1629	1.6	0.676	10.3	LOS B	6.6	165.5	0.59	0.46	31.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [40th- Existing AM]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	543	2.0	0.445	7.1	LOS A	3.2	80.0	0.16	0.05	31.5
8	T1	38	2.0	0.445	7.1	LOS A	3.2	80.0	0.16	0.05	31.5
18	R2	5	2.0	0.445	7.1	LOS A	3.2	80.0	0.16	0.05	30.7
Approach		587	2.0	0.445	7.1	LOS A	3.2	80.0	0.16	0.05	31.5
East: NE 184th St											
1	L2	10	0.0	0.040	5.2	LOS A	0.2	3.9	0.55	0.46	33.9
6	T1	10	0.0	0.040	5.2	LOS A	0.2	3.9	0.55	0.46	33.8
16	R2	10	0.0	0.040	5.2	LOS A	0.2	3.9	0.55	0.46	32.9
Approach		30	0.0	0.040	5.2	LOS A	0.2	3.9	0.55	0.46	33.5
North: 40th Pl NE											
7	L2	5	0.0	0.304	8.2	LOS A	1.4	34.8	0.64	0.63	33.2
4	T1	174	0.0	0.304	8.2	LOS A	1.4	34.8	0.64	0.63	33.2
14	R2	54	0.0	0.304	8.2	LOS A	1.4	34.8	0.64	0.63	32.3
Approach		234	0.0	0.304	8.2	LOS A	1.4	34.8	0.64	0.63	32.9
West: SB SR 104											
5	L2	12	2.0	0.749	15.9	LOS C	9.1	229.1	0.79	0.62	29.7
2	T1	6	2.0	0.749	15.9	LOS C	9.1	229.1	0.79	0.62	29.7
12	R2	818	2.0	0.749	15.9	LOS C	9.1	229.1	0.79	0.62	28.9
Approach		835	2.0	0.749	15.9	LOS C	9.1	229.1	0.79	0.62	28.9
All Vehicles		1686	1.7	0.749	11.6	LOS B	9.1	229.1	0.54	0.42	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Existing AM-Three Legs]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	426	2.0	0.728	13.4	LOS B	9.6	242.5	0.37	0.14	29.5
8	T1	527	2.0	0.728	13.4	LOS B	9.6	242.5	0.37	0.14	29.6
Approach		952	2.0	0.728	13.4	LOS B	9.6	242.5	0.37	0.14	29.6
North: SB SR 104											
7u	U	22	2.0	1.160	104.1	LOS F	64.6	1631.7	1.00	2.92	13.7
4	T1	815	2.0	1.160	104.1	LOS F	64.6	1631.7	1.00	2.92	13.6
14	R2	173	2.0	1.160	104.1	LOS F	64.6	1631.7	1.00	2.92	13.5
Approach		1010	2.0	1.160	104.1	LOS F	64.6	1631.7	1.00	2.92	13.6
West: NE 178th St											
5	L2	13	2.0	0.205	8.1	LOS A	0.8	21.0	0.64	0.64	32.4
12	R2	118	2.0	0.205	8.1	LOS A	0.8	21.0	0.64	0.64	31.7
Approach		132	2.0	0.205	8.1	LOS A	0.8	21.0	0.64	0.64	31.8
All Vehicles		2094	2.0	1.160	56.8	LOS F	64.6	1631.7	0.69	1.51	19.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [195th-Future AM]

195th & 25th
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 25th Ave NE											
3a	L1	31	1.0	0.243	5.2	LOS A	1.3	31.4	0.32	0.18	34.1
8	T1	69	1.0	0.243	5.2	LOS A	1.3	31.4	0.32	0.18	34.5
18	R2	153	1.0	0.243	5.2	LOS A	1.3	31.4	0.32	0.18	33.5
18b	R3	39	1.0	0.243	5.2	LOS A	1.3	31.4	0.32	0.18	33.1
Approach		292	1.0	0.243	5.2	LOS A	1.3	31.4	0.32	0.18	33.7
SouthEast: NB SR 104											
3bx	L3	7	2.0	0.740	17.0	LOS C	8.4	211.7	0.85	0.85	29.7
8x	T1	705	2.0	0.740	17.0	LOS C	8.4	211.7	0.85	0.85	29.4
18ax	R1	7	2.0	0.740	17.0	LOS C	8.4	211.7	0.85	0.85	29.2
18bx	R3	7	2.0	0.740	17.0	LOS C	8.4	211.7	0.85	0.85	28.5
Approach		727	2.0	0.740	17.0	LOS C	8.4	211.7	0.85	0.85	29.4
East: NE 195th St											
1b	L3	12	2.0	0.459	13.8	LOS B	2.3	59.3	0.75	0.81	29.8
1	L2	141	2.0	0.459	13.8	LOS B	2.3	59.3	0.75	0.81	29.6
16a	R1	104	2.0	0.459	13.8	LOS B	2.3	59.3	0.75	0.81	29.3
16	R2	7	2.0	0.459	13.8	LOS B	2.3	59.3	0.75	0.81	28.8
Approach		264	2.0	0.459	13.8	LOS B	2.3	59.3	0.75	0.81	29.5
North: 25th Ave NE											
7	L2	28	1.0	0.161	9.6	LOS A	0.6	15.2	0.68	0.68	31.5
7a	L1	8	1.0	0.161	9.6	LOS A	0.6	15.2	0.68	0.68	31.2
4	T1	28	1.0	0.161	9.6	LOS A	0.6	15.2	0.68	0.68	31.5
14b	R3	14	1.0	0.161	9.6	LOS A	0.6	15.2	0.68	0.68	30.4
Approach		78	1.0	0.161	9.6	LOS A	0.6	15.2	0.68	0.68	31.3
NorthWest: SB SR 104											
7bx	L3	6	1.0	0.121	4.4	LOS A	0.5	13.5	0.38	0.25	35.1
7ax	L1	24	1.0	0.121	4.4	LOS A	0.5	13.5	0.38	0.25	34.3
4x	T1	47	1.0	0.121	4.4	LOS A	0.5	13.5	0.38	0.25	34.7
14ax	R1	54	1.0	0.121	4.4	LOS A	0.5	13.5	0.38	0.25	34.4
Approach		131	1.0	0.121	4.4	LOS A	0.5	13.5	0.38	0.25	34.5
All Vehicles		1492	1.7	0.740	12.6	LOS B	8.4	211.7	0.68	0.65	30.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [35th- Future AM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 35th Ave NE											
3a	L1	14	0.0	0.195	9.5	LOS A	0.8	18.9	0.68	0.68	32.1
8	T1	81	0.0	0.195	9.5	LOS A	0.8	18.9	0.68	0.68	32.4
18	R2	7	0.0	0.195	9.5	LOS A	0.8	18.9	0.68	0.68	31.5
Approach		102	0.0	0.195	9.5	LOS A	0.8	18.9	0.68	0.68	32.3
East: NB SR 104											
1	L2	6	2.0	0.516	8.8	LOS A	3.8	94.9	0.45	0.27	33.0
6	T1	6	2.0	0.516	8.8	LOS A	3.8	94.9	0.45	0.27	33.0
16a	R1	579	2.0	0.516	8.8	LOS A	3.8	94.9	0.45	0.27	32.8
16	R2	23	2.0	0.516	8.8	LOS A	3.8	94.9	0.45	0.27	32.1
Approach		615	2.0	0.516	8.8	LOS A	3.8	94.9	0.45	0.27	32.7
North: 35th Ave NE											
7	L2	121	0.0	0.323	8.9	LOS A	1.5	36.9	0.66	0.66	31.7
4	T1	97	0.0	0.323	8.9	LOS A	1.5	36.9	0.66	0.66	31.7
14	R2	7	0.0	0.323	8.9	LOS A	1.5	36.9	0.66	0.66	30.9
14b	R3	12	0.0	0.323	8.9	LOS A	1.5	36.9	0.66	0.66	30.6
Approach		236	0.0	0.323	8.9	LOS A	1.5	36.9	0.66	0.66	31.6
NorthWest: SB SR 104											
7bx	L3	13	2.0	0.762	17.1	LOS C	9.6	242.9	0.85	0.75	28.2
7ax	L1	776	2.0	0.762	17.1	LOS C	9.6	242.9	0.85	0.75	27.7
14ax	R1	13	2.0	0.762	17.1	LOS C	9.6	242.9	0.85	0.75	27.7
14bx	R3	7	2.0	0.762	17.1	LOS C	9.6	242.9	0.85	0.75	27.1
Approach		809	2.0	0.762	17.1	LOS C	9.6	242.9	0.85	0.75	27.7
West: NE 185th St											
5b	L3	9	0.0	0.072	8.5	LOS A	0.3	6.5	0.67	0.67	32.1
5	L2	9	0.0	0.072	8.5	LOS A	0.3	6.5	0.67	0.67	31.8
2	T1	9	0.0	0.072	8.5	LOS A	0.3	6.5	0.67	0.67	31.8
12	R2	9	0.0	0.072	8.5	LOS A	0.3	6.5	0.67	0.67	31.0
Approach		34	0.0	0.072	8.5	LOS A	0.3	6.5	0.67	0.67	31.7
All Vehicles		1797	1.6	0.762	12.6	LOS B	9.6	242.9	0.67	0.57	30.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [40th- Future AM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	598	2.0	0.492	7.8	LOS A	3.8	95.7	0.19	0.06	31.2
8	T1	42	2.0	0.492	7.8	LOS A	3.8	95.7	0.19	0.06	31.2
18	R2	7	2.0	0.492	7.8	LOS A	3.8	95.7	0.19	0.06	30.4
Approach		647	2.0	0.492	7.8	LOS A	3.8	95.7	0.19	0.06	31.2
East: NE 184th St											
1	L2	12	0.0	0.051	5.7	LOS A	0.2	5.0	0.58	0.50	33.6
6	T1	12	0.0	0.051	5.7	LOS A	0.2	5.0	0.58	0.50	33.6
16	R2	12	0.0	0.051	5.7	LOS A	0.2	5.0	0.58	0.50	32.7
Approach		36	0.0	0.051	5.7	LOS A	0.2	5.0	0.58	0.50	33.3
North: 40th Pl NE											
7	L2	7	0.0	0.355	9.5	LOS A	1.7	42.5	0.68	0.69	32.6
4	T1	191	0.0	0.355	9.5	LOS A	1.7	42.5	0.68	0.69	32.6
14	R2	60	0.0	0.355	9.5	LOS A	1.7	42.5	0.68	0.69	31.7
Approach		258	0.0	0.355	9.5	LOS A	1.7	42.5	0.68	0.69	32.4
West: SB SR 104											
5	L2	13	2.0	0.842	22.1	LOS C	14.5	365.2	0.98	0.87	27.4
2	T1	7	2.0	0.842	22.1	LOS C	14.5	365.2	0.98	0.87	27.4
12	R2	900	2.0	0.842	22.1	LOS C	14.5	365.2	0.98	0.87	26.8
Approach		920	2.0	0.842	22.1	LOS C	14.5	365.2	0.98	0.87	26.8
All Vehicles		1860	1.7	0.842	15.1	LOS C	14.5	365.2	0.66	0.56	29.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Future AM-Three Legs]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	468	2.0	0.803	16.8	LOS C	13.6	344.4	0.49	0.19	28.3
8	T1	580	2.0	0.803	16.8	LOS C	13.6	344.4	0.49	0.19	28.3
Approach		1048	2.0	0.803	16.8	LOS C	13.6	344.4	0.49	0.19	28.3
North: SB SR 104											
7u	U	24	2.0	1.335	175.9	LOS F	105.9	2673.4	1.00	4.16	9.5
4	T1	898	2.0	1.335	175.9	LOS F	105.9	2673.4	1.00	4.16	9.5
14	R2	190	2.0	1.335	175.9	LOS F	105.9	2673.4	1.00	4.16	9.4
Approach		1112	2.0	1.335	175.9	LOS F	105.9	2673.4	1.00	4.16	9.5
West: NE 178th St											
5	L2	16	2.0	0.221	8.1	LOS A	0.9	23.0	0.64	0.64	32.4
12	R2	130	2.0	0.221	8.1	LOS A	0.9	23.0	0.64	0.64	31.7
Approach		146	2.0	0.221	8.1	LOS A	0.9	23.0	0.64	0.64	31.8
All Vehicles		2306	2.0	1.335	93.0	LOS F	105.9	2673.4	0.75	2.13	14.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Future AM-Three Legs - 2NB Lanes]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	468	2.0	0.350	5.9	LOS A	2.0	49.3	0.16	0.06	31.6
8	T1	580	2.0	0.433	6.9	LOS A	2.7	69.1	0.19	0.07	33.3
Approach		1048	2.0	0.433	6.4	LOS A	2.7	69.1	0.18	0.06	32.5
North: SB SR 104											
7u	U	24	2.0	1.197	116.9	LOS F	75.7	1911.5	1.00	3.37	12.7
4	T1	898	2.0	1.197	116.9	LOS F	75.7	1911.5	1.00	3.37	12.7
14	R2	190	2.0	1.197	116.9	LOS F	75.7	1911.5	1.00	3.37	12.5
Approach		1112	2.0	1.197	116.9	LOS F	75.7	1911.5	1.00	3.37	12.6
West: NE 178th St											
5	L2	16	2.0	0.240	9.0	LOS A	1.0	24.6	0.66	0.66	32.0
12	R2	130	2.0	0.240	9.0	LOS A	1.0	24.6	0.66	0.66	31.3
Approach		146	2.0	0.240	9.0	LOS A	1.0	24.6	0.66	0.66	31.4
All Vehicles		2306	2.0	1.197	59.9	LOS F	75.7	1911.5	0.60	1.69	18.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [195th-Existing PM]

195th & 25th
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 25th Ave NE											
3a	L1	22	1.0	0.398	13.6	LOS B	1.8	46.0	0.74	0.79	30.2
8	T1	48	1.0	0.398	13.6	LOS B	1.8	46.0	0.74	0.79	30.5
18	R2	108	1.0	0.398	13.6	LOS B	1.8	46.0	0.74	0.79	29.8
18b	R3	27	1.0	0.398	13.6	LOS B	1.8	46.0	0.74	0.79	29.5
Approach		204	1.0	0.398	13.6	LOS B	1.8	46.0	0.74	0.79	29.9
SouthEast: NB SR 104											
3bx	L3	10	2.0	0.823	23.3	LOS C	11.5	289.5	0.98	1.12	27.4
8x	T1	719	2.0	0.823	23.3	LOS C	11.5	289.5	0.98	1.12	27.2
18ax	R1	20	2.0	0.823	23.3	LOS C	11.5	289.5	0.98	1.12	27.0
18bx	R3	10	2.0	0.823	23.3	LOS C	11.5	289.5	0.98	1.12	26.4
Approach		760	2.0	0.823	23.3	LOS C	11.5	289.5	0.98	1.12	27.2
East: NE 195th St											
1b	L3	6	2.0	0.221	9.4	LOS A	0.9	22.0	0.68	0.68	32.2
1	L2	35	2.0	0.221	9.4	LOS A	0.9	22.0	0.68	0.68	31.9
16a	R1	76	2.0	0.221	9.4	LOS A	0.9	22.0	0.68	0.68	31.7
16	R2	6	2.0	0.221	9.4	LOS A	0.9	22.0	0.68	0.68	31.1
Approach		124	2.0	0.221	9.4	LOS A	0.9	22.0	0.68	0.68	31.7
North: 25th Ave NE											
7	L2	6	1.0	0.138	8.2	LOS A	0.5	13.3	0.65	0.65	32.6
7a	L1	13	1.0	0.138	8.2	LOS A	0.5	13.3	0.65	0.65	32.3
4	T1	26	1.0	0.138	8.2	LOS A	0.5	13.3	0.65	0.65	32.6
14b	R3	32	1.0	0.138	8.2	LOS A	0.5	13.3	0.65	0.65	31.4
Approach		77	1.0	0.138	8.2	LOS A	0.5	13.3	0.65	0.65	32.0
NorthWest: SB SR 104											
7bx	L3	35	1.0	0.780	16.3	LOS C	10.6	265.8	0.72	0.41	29.7
7ax	L1	153	1.0	0.780	16.3	LOS C	10.6	265.8	0.72	0.41	29.2
4x	T1	741	1.0	0.780	16.3	LOS C	10.6	265.8	0.72	0.41	29.4
14ax	R1	35	1.0	0.780	16.3	LOS C	10.6	265.8	0.72	0.41	29.2
Approach		965	1.0	0.780	16.3	LOS C	10.6	265.8	0.72	0.41	29.4
All Vehicles		2130	1.4	0.823	17.8	LOS C	11.5	289.5	0.81	0.73	28.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [35th- Existing PM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 35th Ave NE											
3a	L1	25	0.0	0.182	8.5	LOS A	0.7	17.9	0.66	0.66	32.3
8	T1	74	0.0	0.182	8.5	LOS A	0.7	17.9	0.66	0.66	32.6
18	R2	6	0.0	0.182	8.5	LOS A	0.7	17.9	0.66	0.66	31.8
Approach		105	0.0	0.182	8.5	LOS A	0.7	17.9	0.66	0.66	32.5
East: NB SR 104											
1	L2	5	2.0	0.685	12.9	LOS B	6.6	167.3	0.63	0.41	31.2
6	T1	5	2.0	0.685	12.9	LOS B	6.6	167.3	0.63	0.41	31.1
16a	R1	716	2.0	0.685	12.9	LOS B	6.6	167.3	0.63	0.41	30.9
16	R2	79	2.0	0.685	12.9	LOS B	6.6	167.3	0.63	0.41	30.4
Approach		805	2.0	0.685	12.9	LOS B	6.6	167.3	0.63	0.41	30.9
North: 35th Ave NE											
7	L2	55	0.0	0.175	7.8	LOS A	0.7	17.5	0.64	0.64	32.2
4	T1	27	0.0	0.175	7.8	LOS A	0.7	17.5	0.64	0.64	32.2
14	R2	5	0.0	0.175	7.8	LOS A	0.7	17.5	0.64	0.64	31.3
14b	R3	22	0.0	0.175	7.8	LOS A	0.7	17.5	0.64	0.64	31.0
Approach		110	0.0	0.175	7.8	LOS A	0.7	17.5	0.64	0.64	31.9
NorthWest: SB SR 104											
7bx	L3	18	2.0	0.649	11.5	LOS B	6.2	156.4	0.51	0.29	30.3
7ax	L1	741	2.0	0.649	11.5	LOS B	6.2	156.4	0.51	0.29	29.8
14ax	R1	24	2.0	0.649	11.5	LOS B	6.2	156.4	0.51	0.29	29.8
14bx	R3	12	2.0	0.649	11.5	LOS B	6.2	156.4	0.51	0.29	29.0
Approach		794	2.0	0.649	11.5	LOS B	6.2	156.4	0.51	0.29	29.8
West: NE 185th St											
5b	L3	7	0.0	0.064	7.2	LOS A	0.2	5.9	0.63	0.62	32.5
5	L2	14	0.0	0.064	7.2	LOS A	0.2	5.9	0.63	0.62	32.2
2	T1	7	0.0	0.064	7.2	LOS A	0.2	5.9	0.63	0.62	32.1
12	R2	7	0.0	0.064	7.2	LOS A	0.2	5.9	0.63	0.62	31.3
Approach		36	0.0	0.064	7.2	LOS A	0.2	5.9	0.63	0.62	32.1
All Vehicles		1850	1.7	0.685	11.6	LOS B	6.6	167.3	0.58	0.39	30.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [40th- Existing PM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	788	2.0	0.670	11.8	LOS B	7.1	178.7	0.45	0.21	29.6
8	T1	54	2.0	0.670	11.8	LOS B	7.1	178.7	0.45	0.21	29.6
18	R2	5	2.0	0.670	11.8	LOS B	7.1	178.7	0.45	0.21	28.9
Approach		848	2.0	0.670	11.8	LOS B	7.1	178.7	0.45	0.21	29.6
East: NE 184th St											
1	L2	10	0.0	0.055	7.2	LOS A	0.2	5.1	0.64	0.62	32.9
6	T1	10	0.0	0.055	7.2	LOS A	0.2	5.1	0.64	0.62	32.8
16	R2	10	0.0	0.055	7.2	LOS A	0.2	5.1	0.64	0.62	32.0
Approach		30	0.0	0.055	7.2	LOS A	0.2	5.1	0.64	0.62	32.6
North: 40th Pl NE											
7	L2	5	0.0	0.155	7.9	LOS A	0.6	15.2	0.65	0.65	33.3
4	T1	65	0.0	0.155	7.9	LOS A	0.6	15.2	0.65	0.65	33.2
14	R2	22	0.0	0.155	7.9	LOS A	0.6	15.2	0.65	0.65	32.3
Approach		92	0.0	0.155	7.9	LOS A	0.6	15.2	0.65	0.65	33.0
West: SB SR 104											
5	L2	53	2.0	0.637	11.0	LOS B	6.1	154.0	0.46	0.24	31.6
2	T1	6	2.0	0.637	11.0	LOS B	6.1	154.0	0.46	0.24	31.6
12	R2	735	2.0	0.637	11.0	LOS B	6.1	154.0	0.46	0.24	30.8
Approach		794	2.0	0.637	11.0	LOS B	6.1	154.0	0.46	0.24	30.9
All Vehicles		1764	1.9	0.670	11.1	LOS B	7.1	178.7	0.46	0.25	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Existing PM-Three Legs]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	186	2.0	1.001	46.7	LOS F	43.5	1098.2	1.00	1.25	20.8
8	T1	926	2.0	1.001	46.7	LOS F	43.5	1098.2	1.00	1.25	20.8
Approach		1112	2.0	1.001	46.7	LOS E	43.5	1098.2	1.00	1.25	20.8
North: SB SR 104											
7u	U	98	2.0	0.776	17.3	LOS C	10.4	261.9	0.83	0.67	29.0
4	T1	702	2.0	0.776	17.3	LOS C	10.4	261.9	0.83	0.67	28.6
14	R2	65	2.0	0.776	17.3	LOS C	10.4	261.9	0.83	0.67	28.0
Approach		866	2.0	0.776	17.3	LOS C	10.4	261.9	0.83	0.67	28.6
West: NE 178th St											
5	L2	92	2.0	0.646	19.8	LOS C	4.3	109.1	0.83	0.97	27.5
12	R2	289	2.0	0.646	19.8	LOS C	4.3	109.1	0.83	0.97	27.0
Approach		382	2.0	0.646	19.8	LOS C	4.3	109.1	0.83	0.97	27.1
All Vehicles		2359	2.0	1.001	31.5	LOS D	43.5	1098.2	0.91	0.99	24.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [195th-Future PM]

195th & 25th
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 25th Ave NE											
3a	L1	24	1.0	0.485	17.2	LOS C	2.4	59.7	0.79	0.87	28.8
8	T1	54	1.0	0.485	17.2	LOS C	2.4	59.7	0.79	0.87	29.1
18	R2	118	1.0	0.485	17.2	LOS C	2.4	59.7	0.79	0.87	28.4
18b	R3	30	1.0	0.485	17.2	LOS C	2.4	59.7	0.79	0.87	28.1
Approach		226	1.0	0.485	17.2	LOS C	2.4	59.7	0.79	0.87	28.5
SouthEast: NB SR 104											
3bx	L3	11	2.0	0.941	39.1	LOS E	20.5	517.5	1.00	1.46	23.0
8x	T1	792	2.0	0.941	39.1	LOS E	20.5	517.5	1.00	1.46	22.9
18ax	R1	22	2.0	0.941	39.1	LOS E	20.5	517.5	1.00	1.46	22.7
18bx	R3	11	2.0	0.941	39.1	LOS E	20.5	517.5	1.00	1.46	22.3
Approach		837	2.0	0.941	39.1	LOS E	20.5	517.5	1.00	1.46	22.8
East: NE 195th St											
1b	L3	7	2.0	0.269	11.0	LOS B	1.1	26.8	0.70	0.70	31.5
1	L2	39	2.0	0.269	11.0	LOS B	1.1	26.8	0.70	0.70	31.2
16a	R1	85	2.0	0.269	11.0	LOS B	1.1	26.8	0.70	0.70	31.0
16	R2	7	2.0	0.269	11.0	LOS B	1.1	26.8	0.70	0.70	30.4
Approach		138	2.0	0.269	11.0	LOS B	1.1	26.8	0.70	0.70	31.0
North: 25th Ave NE											
7	L2	6	1.0	0.167	9.3	LOS A	0.6	15.9	0.68	0.68	32.1
7a	L1	14	1.0	0.167	9.3	LOS A	0.6	15.9	0.68	0.68	31.8
4	T1	28	1.0	0.167	9.3	LOS A	0.6	15.9	0.68	0.68	32.1
14b	R3	36	1.0	0.167	9.3	LOS A	0.6	15.9	0.68	0.68	30.9
Approach		85	1.0	0.167	9.3	LOS A	0.6	15.9	0.68	0.68	31.5
NorthWest: SB SR 104											
7bx	L3	39	1.0	0.867	22.5	LOS C	15.7	393.5	0.99	0.60	27.4
7ax	L1	168	1.0	0.867	22.5	LOS C	15.7	393.5	0.99	0.60	27.0
4x	T1	815	1.0	0.867	22.5	LOS C	15.7	393.5	0.99	0.60	27.2
14ax	R1	39	1.0	0.867	22.5	LOS C	15.7	393.5	0.99	0.60	27.0
Approach		1061	1.0	0.867	22.5	LOS C	15.7	393.5	0.99	0.60	27.2
All Vehicles		2346	1.4	0.941	26.8	LOS D	20.5	517.5	0.94	0.94	25.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [35th- Future PM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: 35th Ave NE											
3a	L1	27	0.0	0.220	9.8	LOS A	0.9	21.5	0.69	0.69	31.8
8	T1	81	0.0	0.220	9.8	LOS A	0.9	21.5	0.69	0.69	32.0
18	R2	7	0.0	0.220	9.8	LOS A	0.9	21.5	0.69	0.69	31.2
Approach		116	0.0	0.220	9.8	LOS A	0.9	21.5	0.69	0.69	31.9
East: NB SR 104											
1	L2	6	2.0	0.767	16.3	LOS C	9.6	242.5	0.78	0.55	29.7
6	T1	6	2.0	0.767	16.3	LOS C	9.6	242.5	0.78	0.55	29.7
16a	R1	787	2.0	0.767	16.3	LOS C	9.6	242.5	0.78	0.55	29.5
16	R2	87	2.0	0.767	16.3	LOS C	9.6	242.5	0.78	0.55	29.0
Approach		887	2.0	0.767	16.3	LOS C	9.6	242.5	0.78	0.55	29.5
North: 35th Ave NE											
7	L2	60	0.0	0.210	8.9	LOS A	0.8	21.0	0.67	0.67	31.7
4	T1	31	0.0	0.210	8.9	LOS A	0.8	21.0	0.67	0.67	31.7
14	R2	7	0.0	0.210	8.9	LOS A	0.8	21.0	0.67	0.67	30.9
14b	R3	24	0.0	0.210	8.9	LOS A	0.8	21.0	0.67	0.67	30.6
Approach		122	0.0	0.210	8.9	LOS A	0.8	21.0	0.67	0.67	31.4
NorthWest: SB SR 104											
7bx	L3	20	2.0	0.723	14.0	LOS B	8.0	201.5	0.63	0.38	29.3
7ax	L1	815	2.0	0.723	14.0	LOS B	8.0	201.5	0.63	0.38	28.8
14ax	R1	26	2.0	0.723	14.0	LOS B	8.0	201.5	0.63	0.38	28.9
14bx	R3	13	2.0	0.723	14.0	LOS B	8.0	201.5	0.63	0.38	28.1
Approach		874	2.0	0.723	14.0	LOS B	8.0	201.5	0.63	0.38	28.8
West: NE 185th St											
5b	L3	9	0.0	0.081	8.0	LOS A	0.3	7.5	0.66	0.66	32.1
5	L2	16	0.0	0.081	8.0	LOS A	0.3	7.5	0.66	0.66	31.8
2	T1	9	0.0	0.081	8.0	LOS A	0.3	7.5	0.66	0.66	31.8
12	R2	9	0.0	0.081	8.0	LOS A	0.3	7.5	0.66	0.66	31.0
Approach		41	0.0	0.081	8.0	LOS A	0.3	7.5	0.66	0.66	31.7
All Vehicles		2041	1.7	0.767	14.3	LOS B	9.6	242.5	0.70	0.49	29.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [40th- Future PM]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	867	2.0	0.744	14.4	LOS B	9.4	236.3	0.57	0.29	28.7
8	T1	60	2.0	0.744	14.4	LOS B	9.4	236.3	0.57	0.29	28.7
18	R2	7	2.0	0.744	14.4	LOS B	9.4	236.3	0.57	0.29	28.0
Approach		934	2.0	0.744	14.4	LOS B	9.4	236.3	0.57	0.29	28.7
East: NE 184th St											
1	L2	12	0.0	0.072	8.2	LOS A	0.3	6.6	0.66	0.66	32.4
6	T1	12	0.0	0.072	8.2	LOS A	0.3	6.6	0.66	0.66	32.4
16	R2	12	0.0	0.072	8.2	LOS A	0.3	6.6	0.66	0.66	31.6
Approach		36	0.0	0.072	8.2	LOS A	0.3	6.6	0.66	0.66	32.1
North: 40th Pl NE											
7	L2	7	0.0	0.186	9.0	LOS A	0.7	18.2	0.67	0.67	32.7
4	T1	72	0.0	0.186	9.0	LOS A	0.7	18.2	0.67	0.67	32.7
14	R2	24	0.0	0.186	9.0	LOS A	0.7	18.2	0.67	0.67	31.8
Approach		102	0.0	0.186	9.0	LOS A	0.7	18.2	0.67	0.67	32.5
West: SB SR 104											
5	L2	59	2.0	0.710	13.2	LOS B	7.9	198.7	0.56	0.31	30.7
2	T1	7	2.0	0.710	13.2	LOS B	7.9	198.7	0.56	0.31	30.6
12	R2	809	2.0	0.710	13.2	LOS B	7.9	198.7	0.56	0.31	29.9
Approach		875	2.0	0.710	13.2	LOS B	7.9	198.7	0.56	0.31	29.9
All Vehicles		1947	1.9	0.744	13.5	LOS B	9.4	236.3	0.57	0.33	29.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Future PM-Three Legs]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	205	2.0	1.123	85.5	LOS F	76.0	1919.4	1.00	2.14	15.3
8	T1	1018	2.0	1.123	85.5	LOS F	76.0	1919.4	1.00	2.14	15.3
Approach		1223	2.0	1.123	85.5	LOS F	76.0	1919.4	1.00	2.14	15.3
North: SB SR 104											
7u	U	108	2.0	0.852	22.5	LOS C	15.4	388.7	0.99	0.84	27.1
4	T1	773	2.0	0.852	22.5	LOS C	15.4	388.7	0.99	0.84	26.8
14	R2	73	2.0	0.852	22.5	LOS C	15.4	388.7	0.99	0.84	26.3
Approach		953	2.0	0.852	22.5	LOS C	15.4	388.7	0.99	0.84	26.8
West: NE 178th St											
5	L2	101	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.6
12	R2	318	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.2
Approach		420	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.3
All Vehicles		2596	2.0	1.123	53.3	LOS F	76.0	1919.4	0.98	1.50	19.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [178th- Future PM-Three Legs - 2NB Lanes]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB SR 104											
3	L2	205	2.0	0.180	4.7	LOS A	0.8	19.5	0.35	0.23	32.1
8	T1	1018	2.0	0.892	26.3	LOS D	17.9	453.0	1.00	0.93	25.9
Approach		1223	2.0	0.892	22.7	LOS C	17.9	453.0	0.89	0.81	26.8
North: SB SR 104											
7u	U	108	2.0	0.818	19.3	LOS C	11.4	288.1	0.85	0.72	28.3
4	T1	773	2.0	0.818	19.3	LOS C	11.4	288.1	0.85	0.72	27.9
14	R2	73	2.0	0.818	19.3	LOS C	11.4	288.1	0.85	0.72	27.4
Approach		953	2.0	0.818	19.3	LOS C	11.4	288.1	0.85	0.72	27.9
West: NE 178th St											
5	L2	101	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.6
12	R2	318	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.2
Approach		420	2.0	0.772	29.4	LOS D	6.2	156.1	0.89	1.13	24.3
All Vehicles		2596	2.0	0.892	22.5	LOS C	17.9	453.0	0.88	0.83	26.7

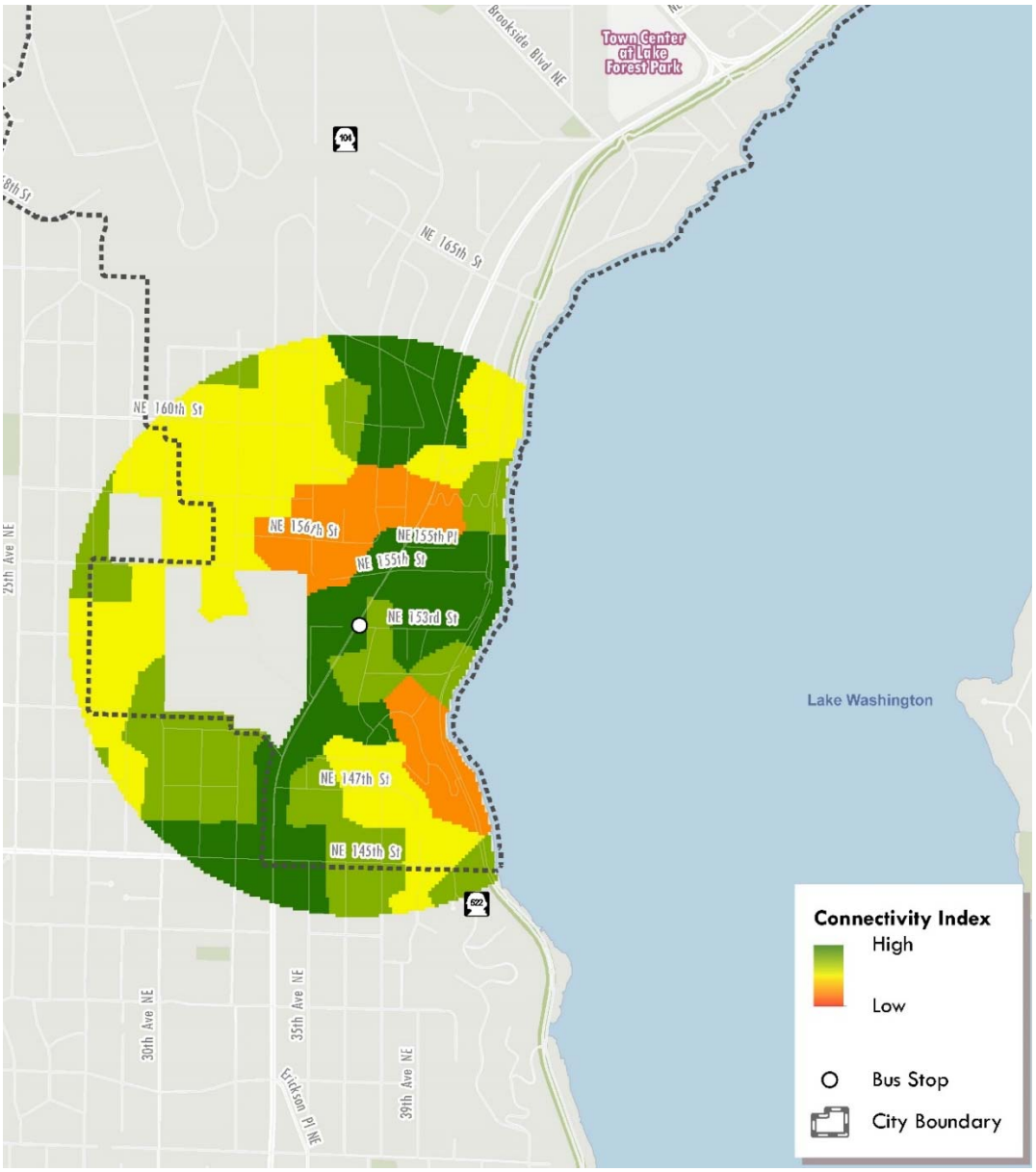
Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lake Forest Park
SAFE HIGHWAYS
Accessible Efficient Complete

Appendix G: Non-motorized Connectivity Analysis

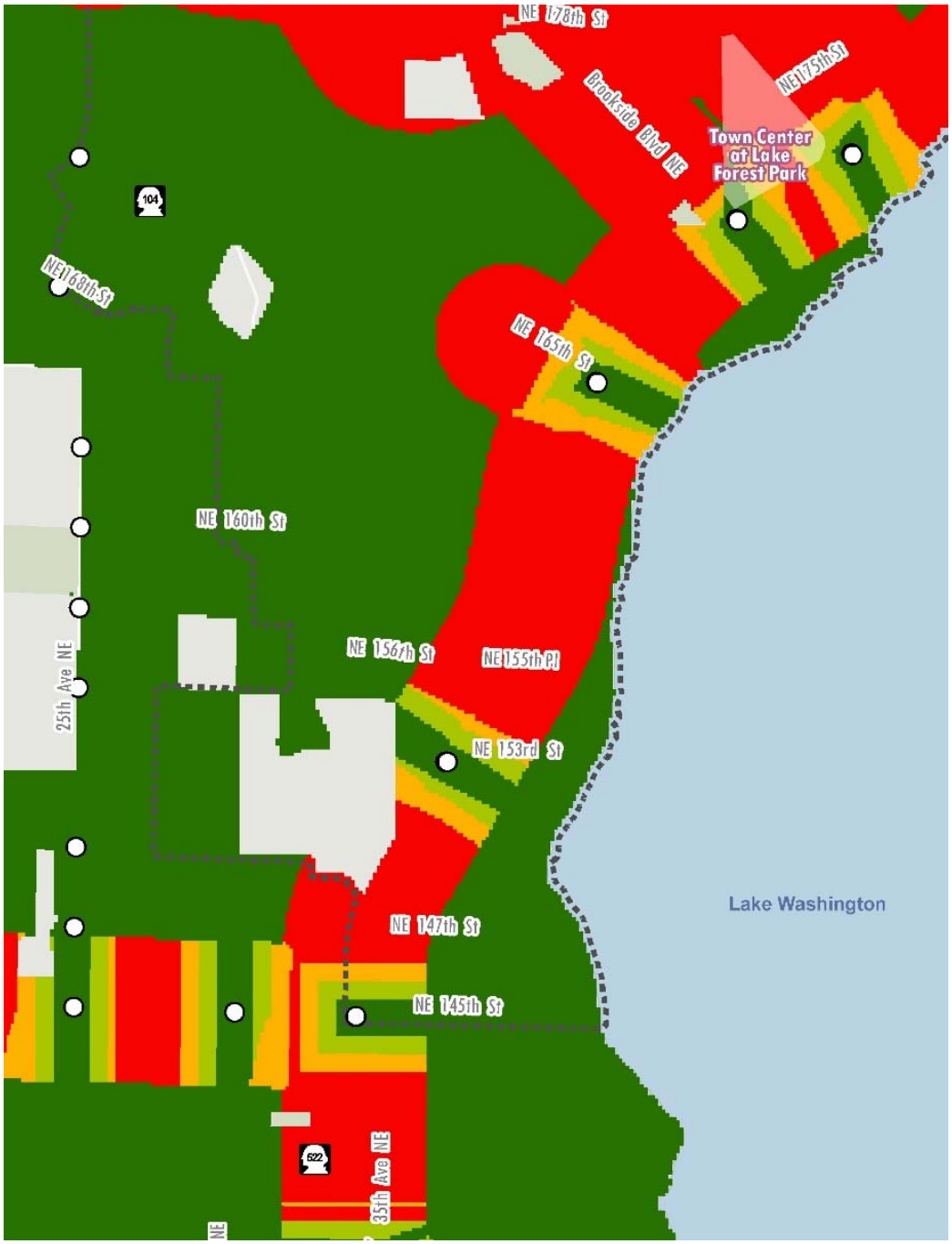
Non-motorized Access to Transit Connectivity Analysis

Using a tool that Fehr & Peers developed for King County Metro and Sound Transit, Fehr & Peers assessed non-motorized connectivity – how accessible the bus stops on SR 522 are for people walking or biking. Evaluation included route directness, intersection density, sidewalk density, and arterial crossing frequency. We conducted six separated analyses, using each of the six bus stops on SR 522 in Lake Forest Park as the center point of analysis. The regression-based analysis resulted in a composite connectivity coefficient based on this evaluation and a number of demographic and land use variables. This was used in conjunction with the route directness results and local knowledge of the area to identify potential projects to improve non-motorized access to bus stops on SR 522. The following show example results of various spatial analyses completed.

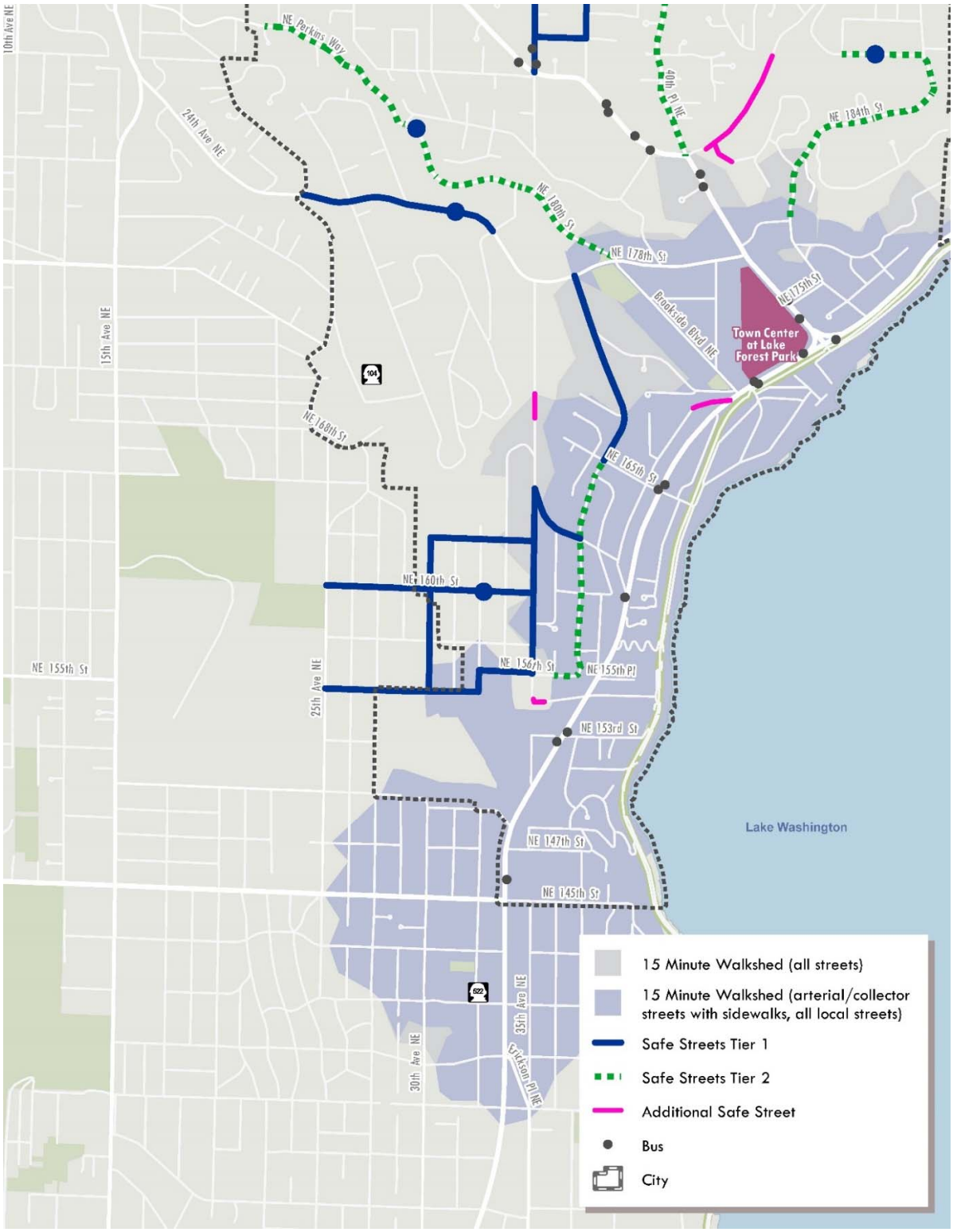


Example Connectivity Analysis Results near the SR 522 and NE 153rd Transit Stop.

The signalized crossing evaluation below shows in red the limited crossings available on SR 522 between the Town Center and the southern City boundary. In addition to the connectivity analyses, a 15-minute walkshed from each transit stop was mapped to identify how large the transit capture shed is to today. This was overlaid with Safe Streets Project ideas to help identify what access improvement projects could potentially be included in the Safe Highways project.



Example Signalized Crossings Mapping Results



15-min Walkshed from SR 522 Transit Stops Layered with the Safe Streets Projects.