



BELLEVUE
**PEDESTRIAN
& BICYCLE**
IMPLEMENTATION INITIATIVE

DOWNTOWN DEMONSTRATION BIKEWAY ASSESSMENT REPORT



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LEVY PROJECT**
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May 2019

The Downtown Demonstration Bikeway project
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PROJECT OVERVIEW

At its February 5, 2018 meeting (see [agenda materials](#)), the Bellevue City Council voiced support for the Transportation Commission's recommendation to implement a demonstration bikeway project in which temporary and low-cost treatments are made to 108th Ave NE between Main St and NE 12th Street (see [Commission Transmittal Letter to the City Council](#)). Councilmembers concurred with the Transportation Commission that a before-and-after study should be conducted based on data and community engagement to assess outcomes for all street users including people bicycling, walking, driving, using transit, and transporting goods (see [minutes](#)).

At its April 12, 2018 meeting, the Transportation Commission endorsed an assessment framework for the Downtown Demonstration Bikeway informed by input from the Bellevue Downtown Association, industry best practices, and guidance documents from other communities (see [memo](#)). The assessment framework provides insights into community outcomes in safety, efficiency, and livability (see Figure 1).

At its May 7, 2018 meeting (see [agenda memo](#)), the City Council awarded the construction contract for the project in the amount of \$365,933.70, plus all applicable taxes. The project was fully funded by the [Neighborhood Safety, Connectivity and Congestion Levy](#), approved by voters in November 2016 to implement bicycle facility improvements citywide and in Downtown. Construction began in mid-June and lasted for several weeks.

On July 31, 2018, the City of Bellevue celebrated the grand opening of the 108th Ave NE Demonstration Bikeway (see Figure 2), the first bikeway spanning the length of Downtown (see [flyer](#)). Staff began evaluation of the project several weeks prior to the grand opening and continued collecting data for months thereafter, leveraging loop detectors, bluetooth readers, thermal sensors, video analytics, attitudinal surveys, street level and video observations, and conversations with residents, businesses, coach operators, and other stakeholders to complete this assessment.

In November 2018, a rapid-build bus platform was installed on 108th Ave NE south of NE 2nd St (see Figure 3). The platform creates an in-street elevated stop area for buses to pull up to without having to cross into the curbside bike lane. The platform has ramps on both sides that allow cyclists to cross the level pedestrian walkway without having to interact with a bus. The platform also improves transit efficiency by facilitating an in-lane stop, eliminating time spent pulling back into the travel lane after riders have boarded. The project was funded with a \$55,000 grant from King County.

This report and the companion [Technical Appendix](#) details the results of the Downtown Demonstration Bikeway project. These reports recognize that Bellevue must consider the broader context within which its transportation network evolves—how it preserves and enhances economic vitality, community character, human health, and environmental resources—in addition to serving peoples' mobility needs.

DEMONSTRATION BIKEWAY ASSESSMENT FRAMEWORK

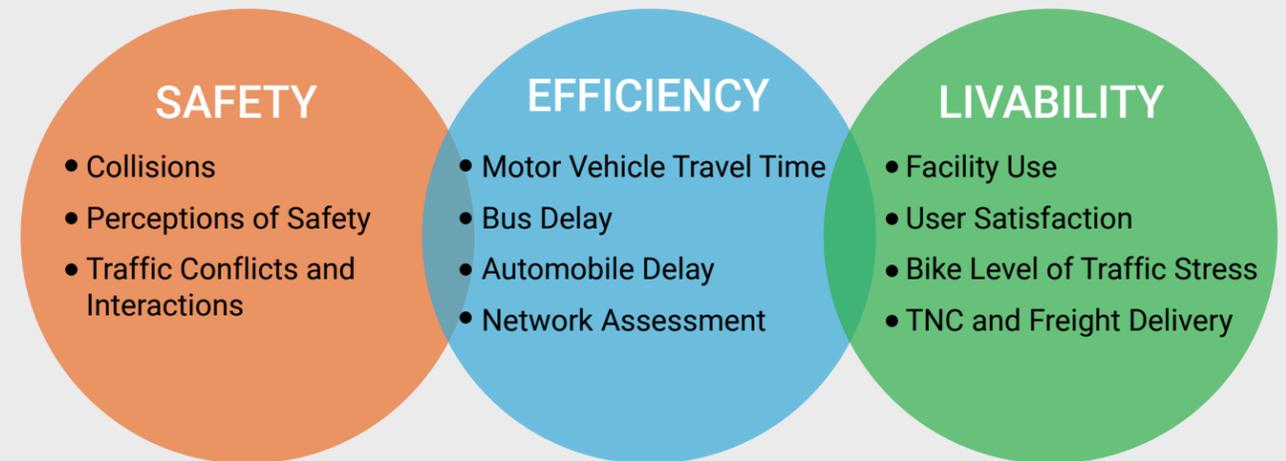


Figure 1. New strategies for transportation require new measurements of success. Working with the Transportation Commission, City of Bellevue staff developed a performance-based assessment framework that measures results that can help inform choices for future projects.



Figure 2. Bellevue's Mayor, Deputy Mayor, and City Council members at the demonstration bikeway grand opening celebration on July 31, 2018.

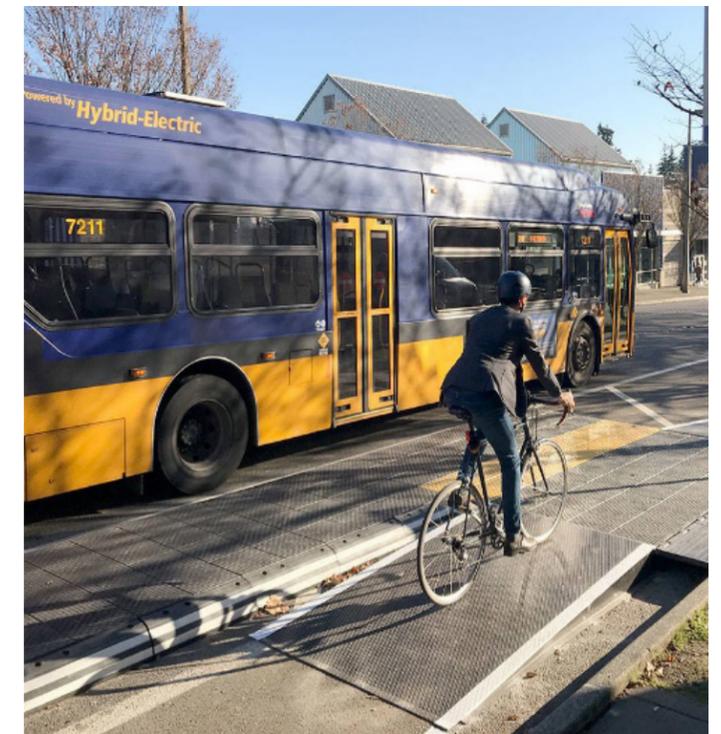


Figure 3. The new bus platform is installed on 108th Ave NE south of NE 2nd St. It is made of 300 interlocking plastic panels that snap together, allowing for its rapid installation.

PROJECT DESCRIPTION

Goals

The goal of the Downtown Demonstration Bikeway is to provide bicyclists with a designated space to ride north-south along 108th Ave NE in Bellevue's most bustling neighborhood. Other project objectives are to:

- Complete a bike route linking the I-90 Trail and 520 Trail, filling a gap in one of the city's eleven cross-city bicycle priority corridors—a City Council adopted performance target in the [2009 Pedestrian and Bicycle Transportation Plan](#);
- Provide bike lanes that connect to and from the Bellevue Transit Center, where about 20,000 people get on and off the bus daily;
- Separate people on bikes from cars as much as possible to create an environment where most adults feel comfortable riding a bike;
- Apply modern bikeway design concepts used in cities such as Seattle, Portland, and Vancouver, BC for the first time in Bellevue;
- Collect data to assess how the project affects travel for all street users, including people walking, bicycling, using transit, and driving;
- Help inform future bicycle investments on this and other streets in downtown Bellevue.

Design

The project is part of the [Bicycle Rapid Implementation Program](#) developed in 2016 to identify low-cost investments that would help create a complete network of safe bicycle facilities citywide. Design elements of this three-quarter-mile project include:

- Separated bike lanes for most of the corridor from Main Street to NE 12th Street. Lane dividers include painted buffer areas, temporary curbs and posts, and planter boxes;
- Striped bike lanes in narrow road segments, such as intersection approaches at NE 4th, 6th, and 10th Street;
- Bright green pavement markings highlighting mixing areas between bikes and cars, such as turn lanes, high-traffic driveways, and next to bus stops at the Bellevue Transit Center;
- Shared lane markings (called "sharrows") at two existing median islands where the road is too narrow to install bike lanes.

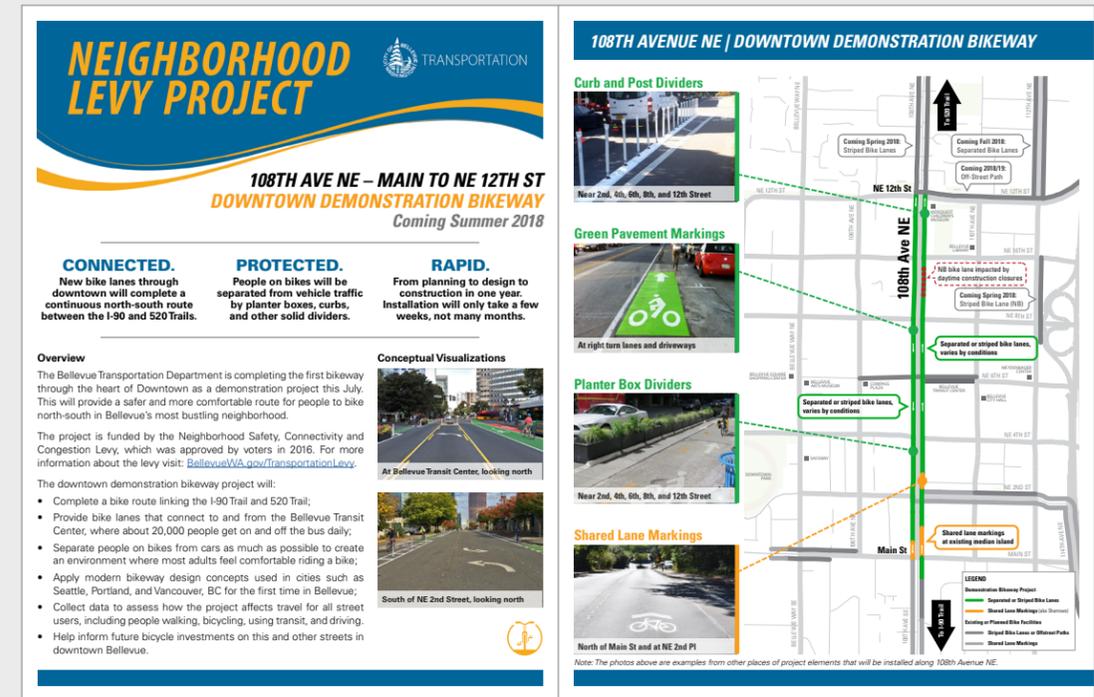


Figure 4. This flyer was posted to the project webpage and distributed at events in advance of the bikeway's installation. It highlights how the demonstration relates to the Bicycle Rapid Implementation Program commitment to "Connected. Protected. Rapid." and describes the elements comprising the city's first quick-build protected bike lanes.



Figure 5. Planter boxes were installed in the painted buffer area along several segments of the demonstration bikeway, providing a decorative form of enhanced physical separation.



Figure 6. Green markings installed where the bike lanes pass by high-traffic driveways call the attention of people driving and bicycling to be alert through areas where their paths cross.

PROJECT TAKEAWAYS

Quick-Build and Iterative Design

Using temporary and low-cost treatments, a demonstration project provides a real-world opportunity to evaluate how the latest bikeway design concepts function in Bellevue. With this project's demonstration approach, the City was also able to:

- design and build the project faster;
- collect data to understand the project's benefits and impacts;
- determine if the project is working well or if any issues need to be addressed;
- make modest refinements to the street design quickly, if necessary;
- recommend next steps for the street, including whether and how to make the bikeway permanent.

The bike lanes were installed by narrowing existing travel lanes and repurposing lanes along some blocks. One vehicle travel lane in each direction remains along the entire corridor, and right turn lanes remain at high-traffic intersections. A new southbound right turn lane was installed at NE 4th St to improve bus operations and address safety concerns for people crossing the intersection on foot. Construction took place for approximately one month, with work taking place at night to minimize traffic impacts.

Outcomes

This report offers comprehensive insight into project impacts and benefits—measurable and perceived—on all street users. To complete this assessment, City of Bellevue staff compiled data from pavement loop detectors, bluetooth readers, thermal sensors, video analytics, attitudinal questionnaires, street-level and video observations, and conversations with residents, businesses, bus operators, and other stakeholders.

The following are some key takeaways from this assessment:

- Average daily bike ridership increased by 35 percent.
- About 4,500 bike share trips used 108th Ave NE in the first six months—the most along any street in Bellevue.
- People who bike along the corridor overwhelmingly feel safer and more comfortable, and people who drive and walk do too.
- There was no change in trends in police-reported collisions along the corridor.
- Riding on the sidewalk decreased by up to 18 percent, with 85 percent of people opting to bicycle in the on-street bike lanes.
- Motor vehicle travel times along the corridor changed by less than a minute.
- Bus travel times along the corridor were not impacted, and at NE 4th St, a new right turn lane reduced bus delay by 30 percent.

These and other results are addressed in greater detail in the rest of this report, organized by the three outcome areas of safety, efficiency, and livability.



Figure 7. A person riding northbound in the bike lane north of NE 6th St, where curbs, posts, and planter boxes physically separate people on bikes from motor vehicle traffic.



Figure 8. A person riding southbound in the bike lane south of NE 8th St, where Tuff Curb—a durable traffic safety product—provides physical separation for people on bikes.



Figure 9. A person riding northbound in the striped bike lane south of NE 2nd St, where the street is only wide enough to provide a painted buffer in the southbound direction.

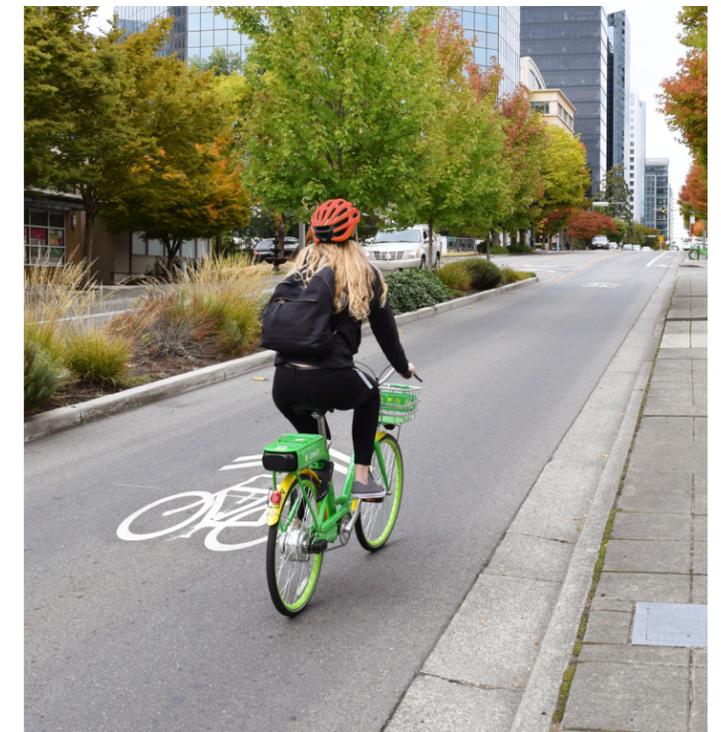


Figure 10. A person riding northbound in the marked shared lane north of Main St, where the travel lane is too narrow for a bike lane due to an existing planted median.

COMMUNITY ENGAGEMENT

Online Questionnaires

Online questionnaires were administered before and after the demonstration bikeway project was implemented.

The first questionnaire asked the public about their practices and perspectives about bicycling in Downtown. It also sought their help with selecting the preferred street for the demonstration bikeway and developing a design that balances community priorities. The results supported the selection of 108th Ave NE as the first bicycle corridor completed in Downtown.

The second questionnaire asked the public to provide feedback on their experiences of the demonstration bikeway. With questions related to perceived safety, specific design features, and behavioral issues, the questionnaire sought to understand what works, what doesn't, and how 108th Ave could be improved to better address the needs of people bicycling, walking, and driving along the corridor.

Both questionnaires were advertised on the City's website, social media pages, email listserv, and in the It's Your City newsletter; postcards were distributed at events (before) and by mail to area households (after); local organizations, businesses, and media outlets were notified and encouraged to promote the questionnaire to their members, employees, and audiences.

Selected quotes and notable takeaways from these questionnaires appear throughout this document. The complete results—summarized by question and all individual responses—are available online for both surveys on the [project webpage](#).

Bus Operators

In addition to its designation as a bicycle priority corridor, 108th Ave NE is also a primary transit corridor through Downtown. The Bellevue Transit Center is located at NE 6th St, where more than a dozen routes converge and serve more than a third of all bus boardings and alightings occurring in Bellevue daily. Four frequent routes operate along segments of 108th Ave NE—Routes 550, 271, 234/235, and the RapidRide B Line—providing service every 15 minutes or better during the peak and every 30 minutes or better off-peak.

To better understand how the addition of the demonstration bikeway impacts bus operations, Transportation Department staff engaged King County Metro bus operators at the Bellevue Operations and Maintenance Base. Staff spoke with bus operators to hear their observations, any challenges they have experienced as a result of the redesigned street, and any suggestions they have for further refinement.

Transportation Department staff also joined a Route 550 operator for a ride-a-long to see things from his perspective firsthand.

A summary of the feedback they provided is available in the [Technical Appendix](#).

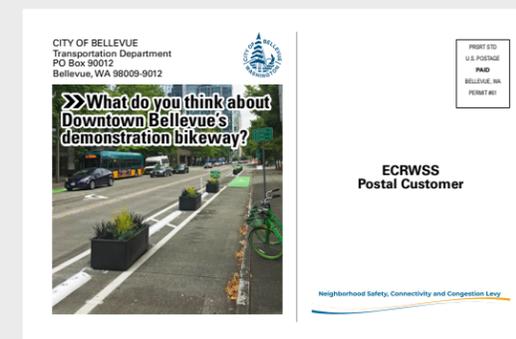
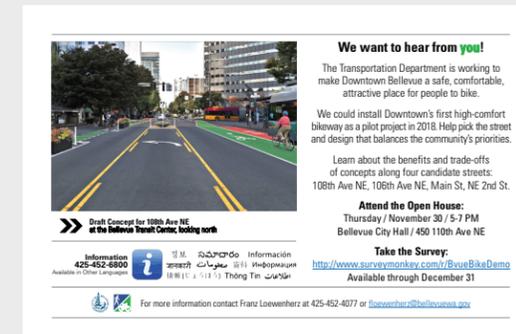


Figure 11. Postcards were distributed for the before (top) and after (bottom) questionnaires to solicit input from the community. An excerpt from the before questionnaire (right).

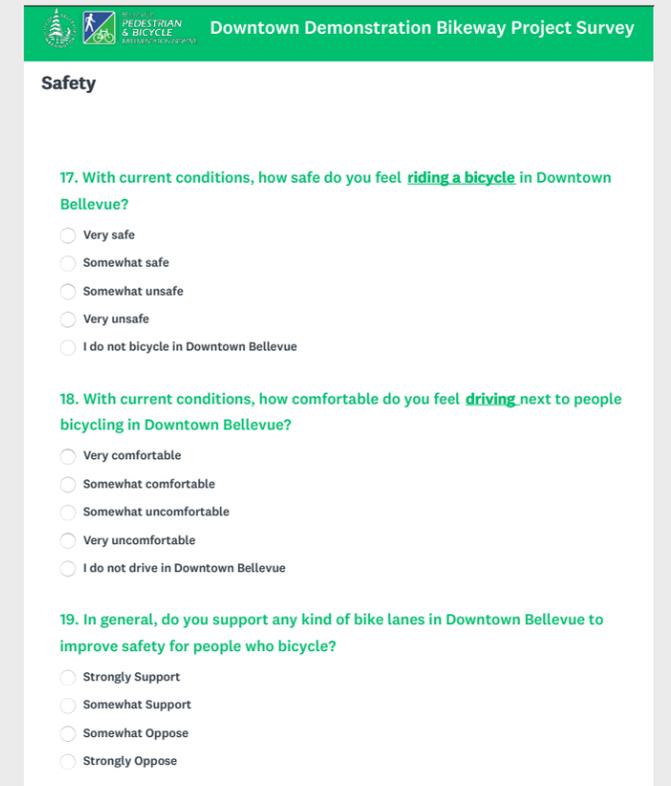


Figure 12. Transportation Engineer Darcy Akers discussed the demonstration bikeway with Jennifer Reed, a Metro operator for 17 years who currently drives the B Line.

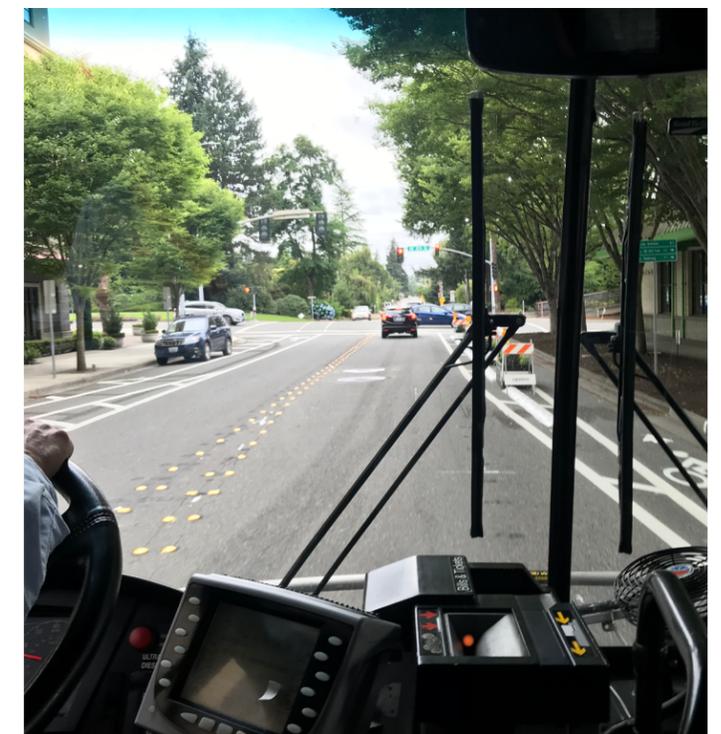
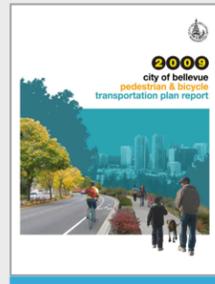


Figure 13. A bus operator's view of the northbound bike lane approaching NE 12th St. Operators noted that conflicts arise here as buses turn right when people biking continue straight.

PROJECT TIMELINE

PLANNING

2009
February 17



City Council adopts the [Pedestrian and Bicycle Transportation Plan](#), which establishes and sets targets for the completion of continuous, cross-city, bicycle priority corridors, including one north-south and one east-west bikeway in Downtown by 2014 (PB-2).

2015
February 9



City Council approves Pedestrian and Bicycle Implementation Initiative [program principles](#). They include a commitment to “advance the implementation of Bellevue’s planned Bicycle Priority Corridors to facilitate continuous bicycle travel along a connected grid of safe facilities throughout the City and the region.”

2016
April 28



Transportation Commission endorses the [Bicycle Rapid Implementation Program \(BRIP\)](#). Informed by [community outreach](#), the BRIP identifies projects that are: (1) connected, prioritizing a network that “fills the gaps”; (2) protected, promoting physically separated facilities to minimize conflicts; (3) rapid, leveraging early-win opportunities.

2016
November 8



Bellevue voters endorse the 20-year, transportation-focused [Neighborhood Safety, Connectivity and Congestion Levy](#) (Proposition 2). The vote follows an outreach effort that includes three open houses across the city and discussion at several City Council meetings. Bicycle network improvements are one of the six programs funded by the levy.

IMPLEMENTATION

2018
January 4



The Bellevue Downtown Association (BDA) endorses [a recommendation](#) to the City to implement a demonstration bikeway project on 108th Ave NE. Engagement of additional Downtown stakeholder groups and the broader community takes place concurrently (see [Additional Letters](#) and [Public Communications](#)).

2018
January 11



The Transportation Commission reaffirms the 2009 Plan directive to implement a north-south bicycle route through Downtown (see [meeting minutes](#)). Commission votes to proceed with implementing a demonstration project on 108th Ave NE and requests staff develop and share a framework for assessing the project (see [transmittal letter](#)).

2018
February 5



City Council supports the demonstration bikeway project and concurs that a before-and-after study should be conducted to assess outcomes for all street users based on data and community engagement (see [meeting minutes](#)). Transportation Commission endorses staff’s [proposed assessment framework](#) at its April 12 meeting.

2018
July 31



A celebration event is held to mark the official opening of the Downtown Demonstration Bikeway and launch of bike share. Mayor John Chelminiak, Transportation Director Dave Berg, and BDA President Patrick Bannon recognize the occasion and invite more than 130 attendees to ride it for themselves (see [event photos](#), [video](#)).

SAFETY

COLLISIONS

MEASURE
Number of police-reported collisions

BASELINE PERIOD
5-year history from
January 2013–December 2017

BEFORE PERIOD
July–December 2017

AFTER PERIOD
July–December 2018

LOCATION
108th Ave NE from Main St to NE 12th St

BACKGROUND
Safety is an important goal for the Downtown Demonstration Bikeway. The installation of separated bicycle facilities aims to increase ridership while not increasing collisions. For this measure, collisions along this corridor were reviewed both by mode and severity.

Typical before and after studies of collisions look at three to five years of data. Although only 6 months of collision data are available for this assessment, Transportation staff will continue to monitor the corridor.

Key Takeaways

- Since the bikeway was installed, there have not been any police-reported bicycle collisions along 108th Ave NE in Downtown (see Figure 14).
- One unreported collision was shared with Transportation Department staff via email. While exiting a driveway, a person driving struck a person bicycling southbound in the bike lane (see [Technical Appendix](#)).
- In the 6-month after period, there were 14 collisions involving all modes, which roughly equals the before average if expanded to a full year (see Figure 15 and Figure 16).
- The average number of collisions in the previous 5 years was 28.8 collisions per year for the entire corridor (see Figure 17).

Technology & Methodology

The collision data comes from law enforcement officers and is reviewed by Transportation Staff before being entered into a database maintained by the Transportation Department for data analysis. The data includes all police-reported collisions that took place in the public right of way. The data includes all intersections and segments along 108th Ave NE between and including Main St and NE 12th St.

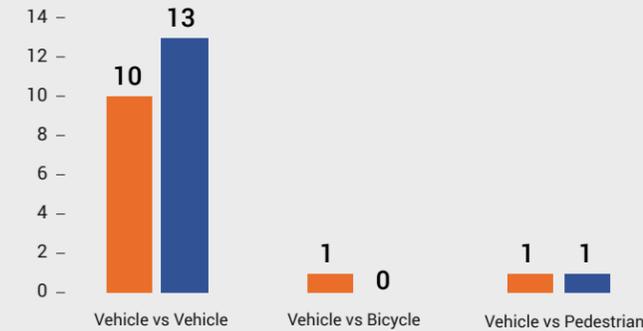


Figure 14. Reported Collisions by Mode

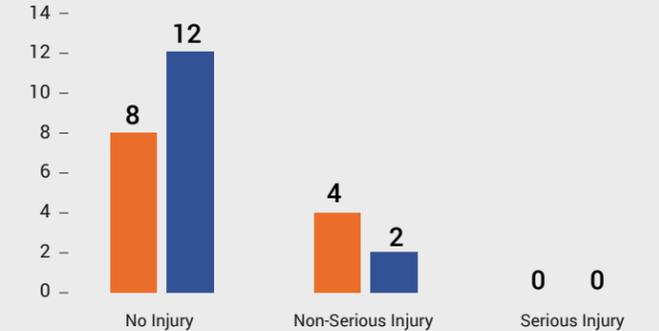


Figure 15. Reported Collisions by Injury

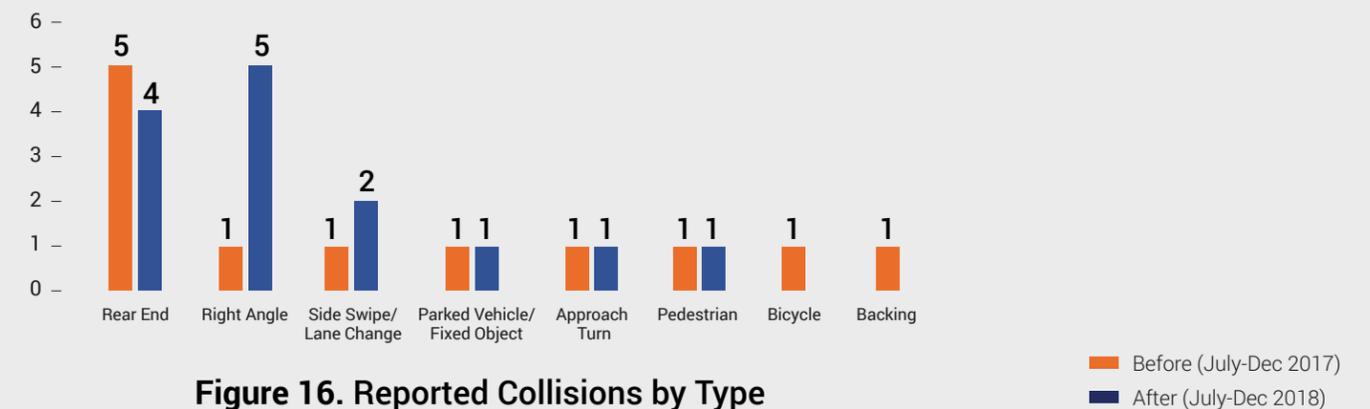


Figure 16. Reported Collisions by Type



Figure 17. Total Number of Collisions



MEASURES

- Bicyclist usage of different facility types
- Observed conflicts and interactions between different modes

BEFORE PERIOD

May 4 and June 7, 2018

AFTER PERIOD

July 17, August 9, and October 11, 2018

LOCATION

Observations:

- Main St/108th Ave
- NE 4th St/108th Ave NE
- NE 8th St/108th Ave NE

BACKGROUND

An important goal of this demonstration bikeway is to improve safety on the corridor for all modes of transportation. There were several points of interest to understand the effectiveness of the bikeway’s design – sidewalk interactions, curbside interactions, and roadway interactions.

Prior to the installation of the demonstration bikeway, only one segment of 108th Ave NE included a designated bike lane—the northbound intersection approach at NE 4th St. In addition to observing the different types of interactions between street users, this measure is intended to determine whether providing dedicated on-street bike lanes reduced the frequency of

Key Takeaways

- Average bicycle sidewalk riding reduced by 18% at NE 8th St and by 8% at NE 4th St.
- 85% of bicyclists use the bike lanes at NE 4th St and NE 8th St.
- Main St had less sidewalk riding to begin with but also saw slightly less after the bikeway was installed.

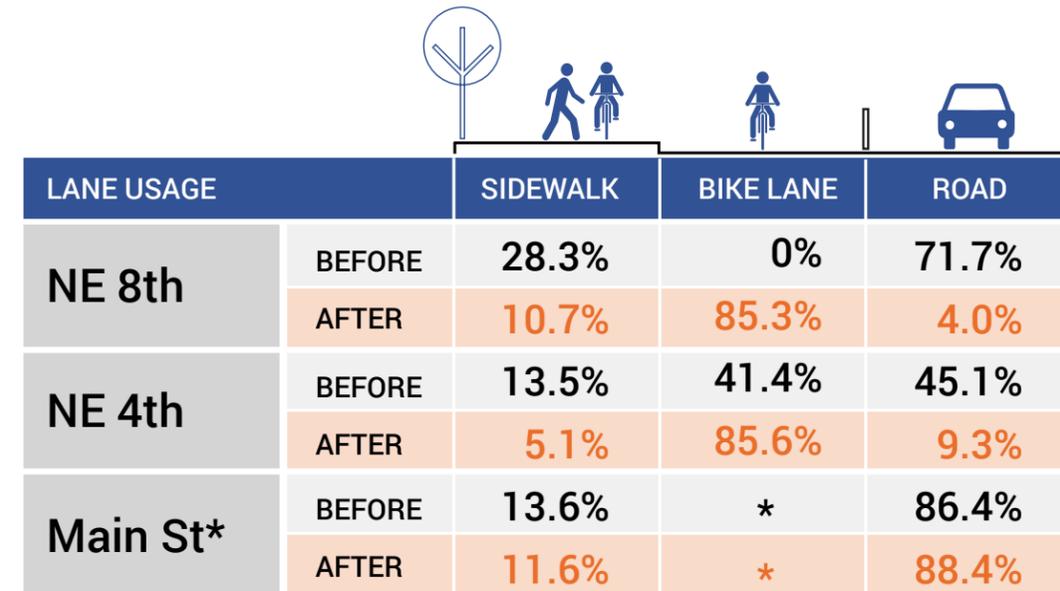


Figure 18. Bicycle Usage by Facility Type

*At Main St, bike facility does not have continuous separated facilities through the entire intersection, so bikes must mix with traffic (when sharrow are present on the roadway). Because of this, all bikes on the roadway were considered “in road”.

Technology & Methodology

Manual observations of video from traffic cameras were used to collect this data. For the sidewalk riding and general observations of conflicts, video was observed from 7 AM to 7 PM at three intersections along the corridor that have traffic cameras: Main St, NE 4th St, and NE 8th St.

Video observations were also collected for locations where delivery and passenger pick-up/drop-off was occurring in the bike lanes. Refer to the section on TNC and Freight Delivery for more information on curbside interactions (see page 32).

FUTURE OF CONFLICT ANALYSIS

In recognition of the need for an enhanced method of deriving insights on traffic conflicts (beyond interns observing video footage) the City of Bellevue and [Brisk Synergies](#) entered into a strategic partnership in February 2019. The partnership will leverage Bellevue’s existing traffic cameras for predictive analytics of near-miss events. For future evaluations, this new system could replace limited manual observations and provide deeper insights to the rate and severity of conflicts at intersections between people driving, walking, and bicycling. This insight could help the City proactively identify intersections warranting safety improvements, consistent with Bellevue’s Vision Zero initiative.

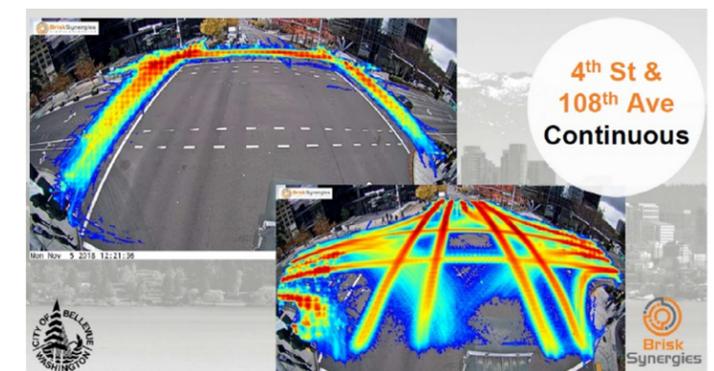


Figure 19. Heatmap from Brisk Synergies video intelligence algorithms depicting pedestrian crossings and motor vehicle turning movements at 108th Ave NE and NE 4th St.

TRAFFIC CONFLICTS AND INTERACTIONS



6 Vehicle loading/unloading in the bike lane before vertical separation was added to the painted buffer



4 Motorcyclist using the northbound bike lane at NE 4th St



1 Vehicle improperly stopping in the bike box

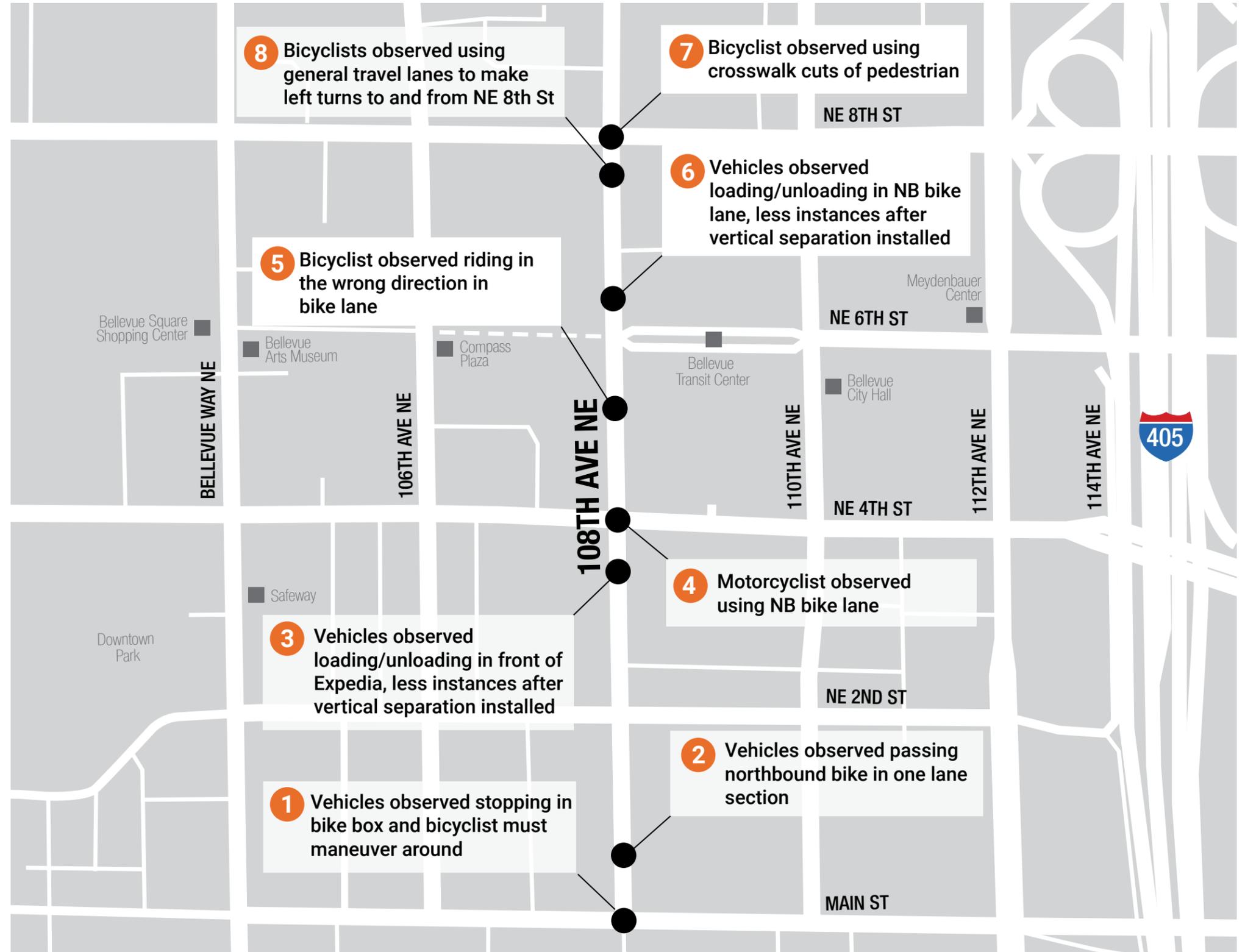


Figure 20. Observed Conflicts and Interactions



MEASURE

Public response to online questionnaires

BEFORE QUESTIONNAIRE

November 10, 2017–January 1, 2018
n=1,262 respondents

AFTER QUESTIONNAIRE

September 1, 2018–November 1, 2018
n=1,232 respondents

BACKGROUND

Most adults would be interested in bicycling more often given a place that feels safe and comfortable to ride. This measure aims to understand the extent to which the demonstration bikeway has changed how people feel when traveling along the 108th Ave NE corridor.

Because crashes are infrequent, and less severe incidents are often unreported, reported crash data is sparse and tends to highlight only the worst-case scenarios; however, near-misses and other uneasy experiences can impact how safe a street feels. Incidents are more likely at locations with less separation and greater exposure to conflicts, but two conflict points that appear similar on paper may feel different because of context-specific factors. Bicycle LTS offers a useful guide for network planning, but other characteristics like slope, pavement condition, and the presence of heavy vehicles may affect the level of stress a person experiences. Comparing questionnaire responses from before and after the project was implemented helps provide deeper insight into the outcomes of related quantitative measures, fill in the gaps, and highlight areas that may warrant additional attention.

Key Takeaways

BEFORE

- Most respondents...
 - » felt unsafe (29% somewhat, 28% very) riding a bicycle in Downtown
 - » felt uncomfortable (26% somewhat, 37% very) driving next to people bicycling in Downtown
 - » felt uncomfortable (31% somewhat, 34% very) walking along 108th Ave NE with bikes sharing the sidewalk
 - » supported bike lanes in Downtown to improve safety (9% somewhat, 60% strongly)
 - » felt 108th Ave was an unsafe and uncomfortable place for people to bicycle (40% somewhat, 23% very)

Sample perspectives from questionnaire respondents:

"If there were a safe way to get from the 520 Trail to downtown Bellevue, I'd be thrilled. This project will likely make it 'good enough' and I'd likely try riding my bike to downtown from my house in Redmond, which I'm not currently willing to do because of Bellevue's comparative lack of bike-friendly infrastructure."

"It is a crazy idea to put bike lanes on 108th Ave NE. There is already too much bus traffic and car traffic. It is unsafe for pedestrians trying to cross at intersections even with traffic lights. Do not encourage bicyclists in downtown Bellevue. Bicyclists need to ride on streets and not on sidewalks—it is plain ridiculous to consider bike lanes and riding bikes on sidewalks."

"There is already jams of cars there, bikes can share sidewalks. In places other than Bellevue Transit Center there is little foot traffic. So we could keep streets for cars, and then use space more efficiently on sidewalks."

"I believe that if cyclists are aware that it is safe to cycle to, from and within downtown Bellevue, they will use the cycling resources. I will if it is safe. Because cars travel so fast, I only feel safe if they are far from me when I am on a bicycle."

AFTER

- All user groups feel safer and more comfortable on 108th Ave NE.
 - » People bicycling: 43% agree, 44% strongly agree
 - » People driving: 30% agree, 13% strongly agree
 - » People walking: 25% agree, 12% strongly agree
- People bicycling on 108th Ave NE feel driver behavior is safer and calmer (41% agree, 24% strongly agree).
- Among respondents overall...
 - » 75% feel that people should not bicycle on sidewalks
 - » 75% feel that bike lanes should be available to make roads safer
 - » 66% feel that bike lanes should be separated from motor vehicles
 - » 65% feel that more bike lanes should be installed at other locations in Downtown

"It is great to see people biking on 108th. If biking is safer, it makes me feel safer as a pedestrian since there is a bike buffer between cars and sidewalk."

"I don't think sharrows are safe when there's only one lane in each direction. Too many drivers ignore them or are very unsafe in their passing and following distance."

"The real win here was converting the 108th southbound lane between 8th and the transit center into one lane: it made it vastly safer to turn into the parking garages."

"With the bike lane, I really like how one section has a divider between the car and bike lanes. It seems to be most safe. However, my biggest area of concern for bikers is when I need to cross the bike lane to make the right turn on to 8th. If there are going to be bike lanes in Bellevue, which there probably should be more of, they should not cross with car lanes for biker safety."

PERCEPTION OF SAFETY

Figure 21. Before Questionnaire Results

Do you feel that 108th Ave NE is a safe and comfortable street for people bicycling today? n=622



How comfortable do you feel driving next to people bicycling in Downtown Bellevue? n=1,137



When walking along 108th Ave NE, how comfortable are you with people on bicycles sharing the sidewalk? n=622



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Very Safe/Comfortable Somewhat Safe/Comfortable I Don't Know/Use that Mode on 108th Somewhat Unsafe/Uncomfortable Very Unsafe/Uncomfortable

"Until you go to a continuous protected lane, you aren't really being serious. The message to both bikes and cars has to be simple—bikes go here, cars go there, and there is separation between them. Until you go there, bikers (especially casual ones) won't feel truly safe."

"Roads are too tight to accommodate bike traffic safely. Taking away road space entirely for bikers would only make things worse. Nobody bikes in downtown Bellevue."

"The existing infrastructure is sufficient for bicycling in downtown Bellevue. Adding lanes isn't going to increase the number of bicyclists."

"Figure out a way to make it safer for bikers without taking away from cars and making traffic and parking worse. Otherwise you're going to kill the downtown area."

"In my experience, this is the most trafficked north-south street in downtown Bellevue (except, perhaps, for Bellevue Way). We'd all benefit by having a safer bike route there."

Figure 22. After Questionnaire Results

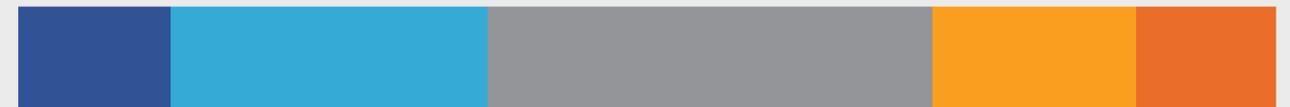
As a person who rides a bicycle on 108th Avenue, do you agree or disagree with the following: It feels safer and more comfortable riding a bicycle on 108th Avenue. n=436



As a person who drives a motor vehicle on 108th Avenue, do you agree or disagree with the following: It feels safer to drive a motor vehicle on 108th Avenue. n=810



As a person walking on 108th Avenue, do you agree or disagree with the following: It feels safer and more comfortable to walk on 108th Avenue. n=721



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Agree Strongly Agree Undecided Disagree Disagree Strongly

"It is great to see people biking on 108th. If biking is safer, it makes me feel safer as a pedestrian since there is a bike buffer between cars and sidewalk."

"Many bikes still use the sidewalk. What is the point of spending all this money on bike lanes? We cannot control every biker's behavior and some obviously feel more comfortable on the sidewalk."

"Removal of right turn lane northbound at NE 12th has made the situation worse and more dangerous for bicyclists going straight. I nearly got hit by a car turning right—the driver simply didn't look."

"I use the green bike lanes when I ride to work. I feel much safer as a biker to have this new visibility of the bike lanes and with the dividers. It is frustrating though to see cars infringe on the bike space as it feels they aren't observing that bikers could be in the lanes."

"I get that the bike lanes are important for the safety of bikers, however it's taking up lanes for motor vehicles and causing more traffic downtown which can be very frustrating."

EFFICIENCY

MOTOR VEHICLE TRAVEL TIME

MEASURE

Travel time captured by Bluetooth

BEFORE PERIOD

June 4–8, 2018

AFTER PERIOD

June 19–October 31, 2018

LOCATION

Bluetooth travel time collection hardware was installed at four locations between Main St and NE 10th St (see map)

BACKGROUND

The demonstration bikeway required changes to the roadway to accommodate people riding bicycles however it was desired to still limit the impact on people driving. One measure to observe the potential impact of the demonstration bikeway is to review travel time along 108th Ave. It is easy for a person driving along a corridor to measure how long it takes to get from one point to another. This measure reports the average time it takes for a person to drive between detection points along the corridor.

The traffic signals along 108th Ave NE are not synchronized along the entire corridor in the north-south direction. In Downtown, NE 4th St and NE 8th St are coordinated in the east-west direction. Vehicle travel time along corridors that are not synchronized can be more random and dependent on congestion at intersections.

Key Takeaways

- Vehicle travel time changed by less than a minute. The average midweek travel time from north of NE 8th St to south of NE 4th St has decreased from 2.5 to 2.1 minutes southbound and 2.6 to 2.3 minutes northbound.
- During the month of June, there was construction and road closures on 106th Ave NE at NE 6th St which may have impacted travel times on 108th Ave NE in the before period.

Technology & Methodology

Bluetooth travel time detectors passively detects radio signals for passing by vehicles and matches them between devices along a corridor. The units use a time stamp and a portion of the MAC address (for security reasons) to create matches and calculate travel time. The data is collected in 15-minute intervals and only Monday-Friday was used in the study. Additionally, the week in which the bike lanes were striped was not included in the average. For this study BlueTOAD detectors were used.

The Bluetooth detection devices use algorithms to exclude outliers but this requires meeting a threshold of matches to calculate a result with statistical confidence. Although 4 devices were installed between Main St and NE 10th St, there were only enough matches for the segment from south of NE 4th St to south of NE 10th St could be used (travel between devices 1,2 and 3).

	AM PEAK (7am-10am)	PM PEAK (4am-7pm)	Daily Average (7am-7am)
Northbound			
BEFORE	1.9 min	3.1 min	2.6 min
AFTER	1.9 min	2.6 min	2.3 min
Southbound			
BEFORE	1.8 min	3 min	2.5 min
AFTER	1.8 min	2.4 min	2.1 min

Figure 23. Vehicle Travel Time

From south of NE 4th St to north of NE 8th St (Locations 1 to 3)



Figure 24. BlueTOAD Travel Time Unit on a street light pole

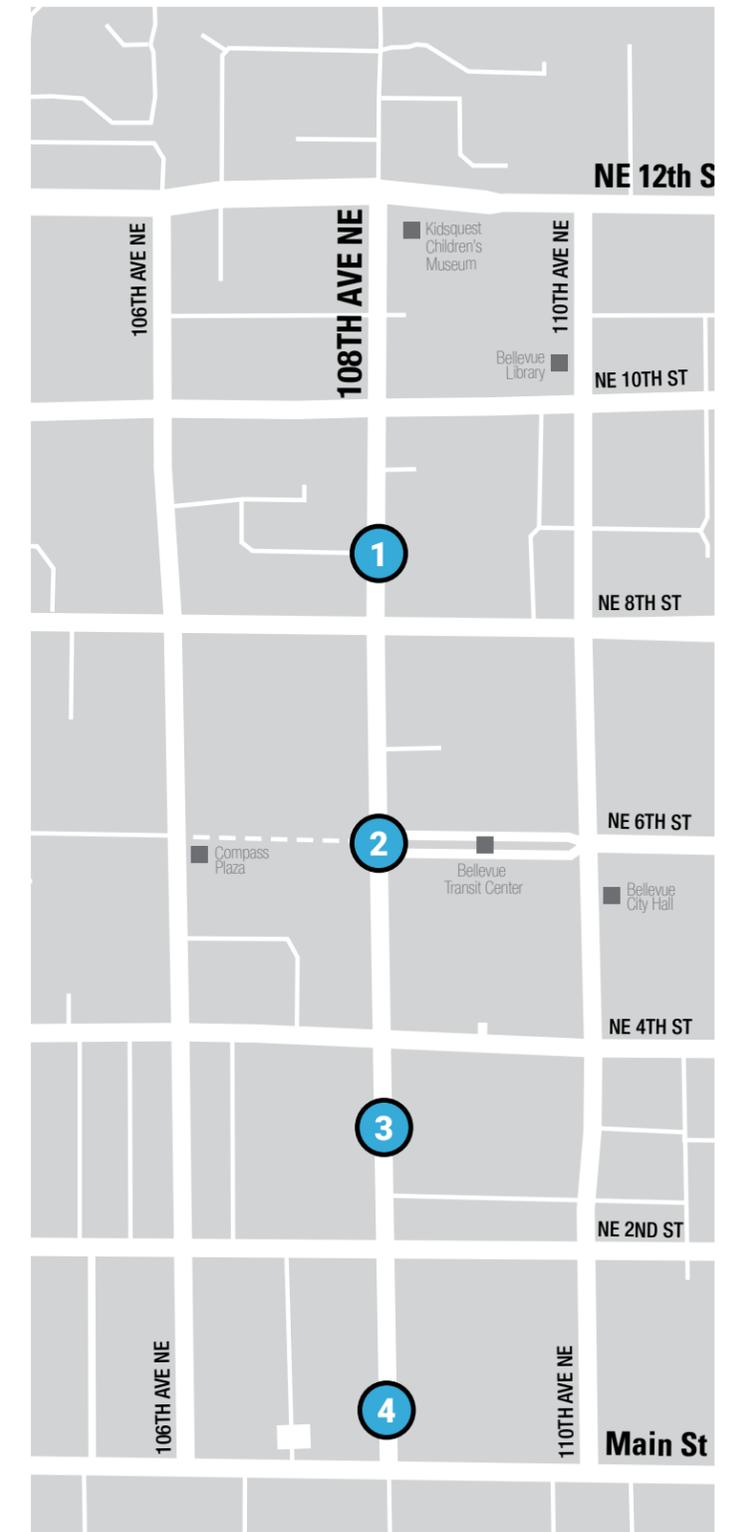


Figure 25. BlueTOAD Unit Locations

MOTOR VEHICLE TRAVEL TIME

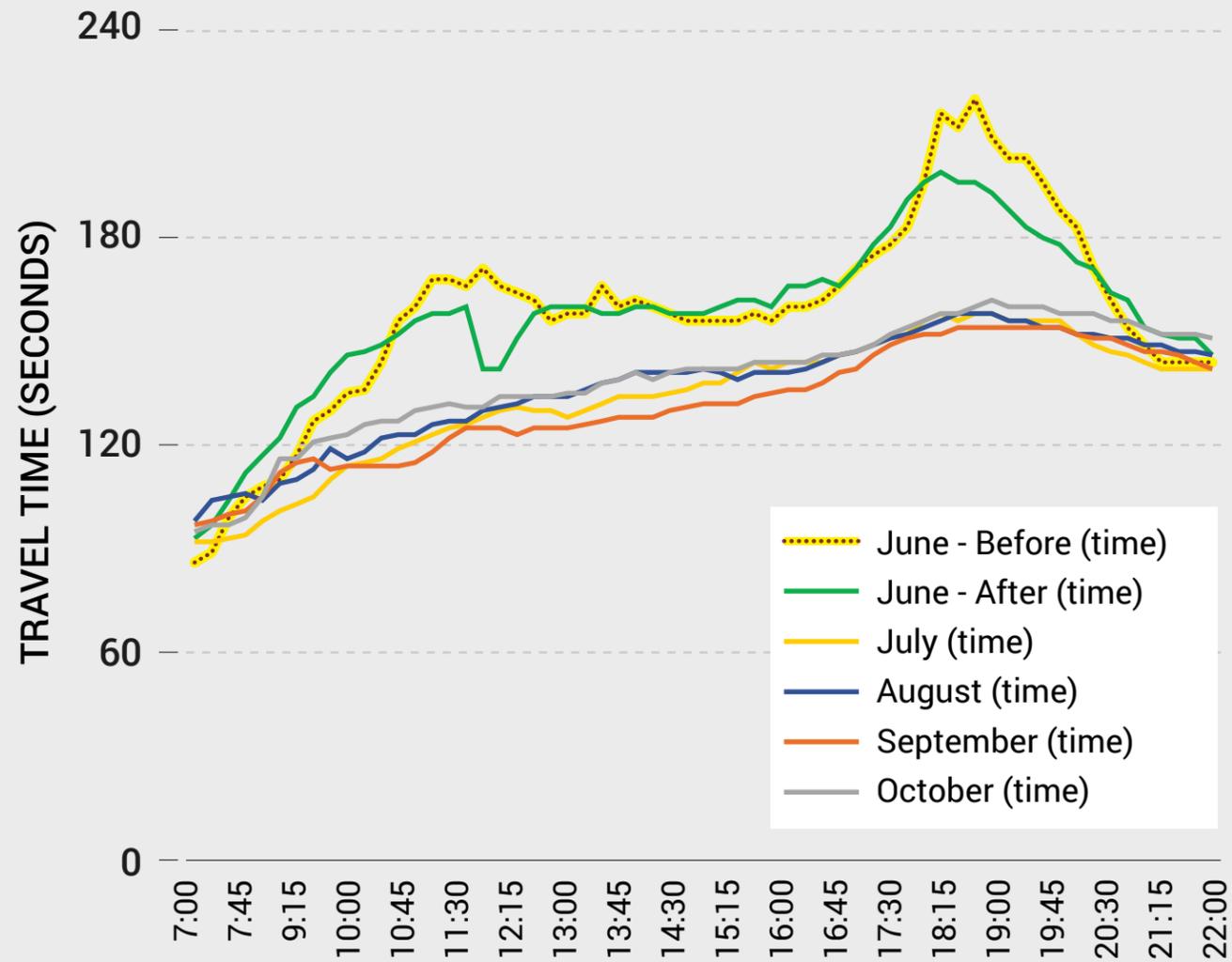


Figure 26. Northbound Travel Time
108th Ave - NE8th St to NE4th St

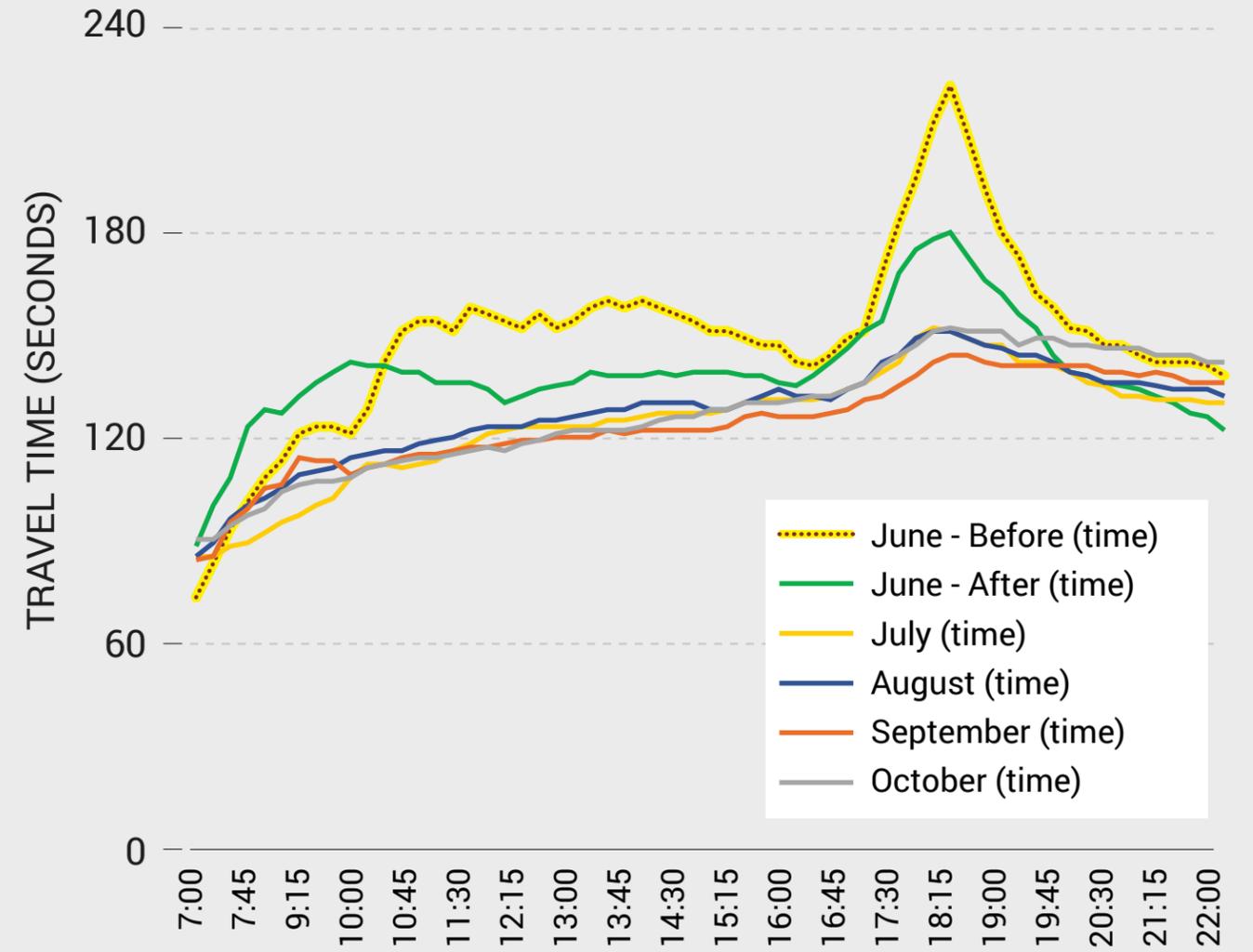


Figure 27. Southbound Travel Time
108th Ave - NE8th St to NE4th St

BUS DELAY

MEASURES

- Average dwell time
- Operator feedback

BEFORE PERIOD

April 23–May 4, 2018

AFTER PERIOD

October 8–19, 2018

LOCATION

Key transit movements at:

- NE 8th St/108th Ave NE
- NE 6th St/108th Ave NE
- NE 4th St/108th Ave NE

BACKGROUND

This measure aims to understand the impact of the demonstration bikeway on transit efficiency. The Bellevue Transit Center is located in the middle of the corridor. One consideration of this project was to minimize the disruption of regular bus operation. While only a few routes travel north-south along the entire corridor, many of the popular routes have turning movements onto and off of 108th Ave NE.

At the Transit Center, northbound and southbound bus signals were installed to create a queue jump for transit vehicles exiting the layover and bus stops zones along 108th Ave NE. There were no modifications to the access into and out of the transit center itself. At NE 4th St, a new right turn lane was installed and an overlap was added for the westbound-to-southbound turning movement.

Key Takeaways

OBS DATA

- Overall, the average bus delay did not increase after the installation of the demonstration bikeway.
- The new southbound-to-westbound right turn overlap reduced average bus dwell time by over 30% (15 sec).

OPERATOR FEEDBACK

- Most common feedback from transit operators was:
 - » the space better defines where to expect bicyclists
 - » the new configuration is too narrow/tight
 - » the bus queue jump is helpful in heavy traffic but confused some drivers
 - » there is a potential conflict with bicyclists at the NB-to-EB right turn at NE 12th St



Figure 28. New bus signal at NE 6th St

Technology & Methodology

Data was provided by King Country Metro from their Onboard System. This data captures instances where a bus stops for more than 5 seconds. The data was filtered to exclude instances when a bus was stopped with its doors open or at an actual bus stop because that infers passenger loading and unloading.

The data was filtered based on the GPS data to only include data within 300 feet of the intersection in question for each route. The movements evaluated are frequent transit movements by routes operating along the 108th Ave NE bikeway. The dwell time was averaged for both the AM peak (7am–10am) and PM peak (4pm–7pm) on Monday–Friday.

Feedback from the transit operators was collected at the King County East Base on October 15 and October 22, 2018. Staff set up a table and asked for feedback from transit operators that drove routes along the 108th Ave NE corridor. Detailed feedback provided from sixteen transit operators can be found in the [Technical Appendix](#).



Figure 29. New sensor for the bus signal

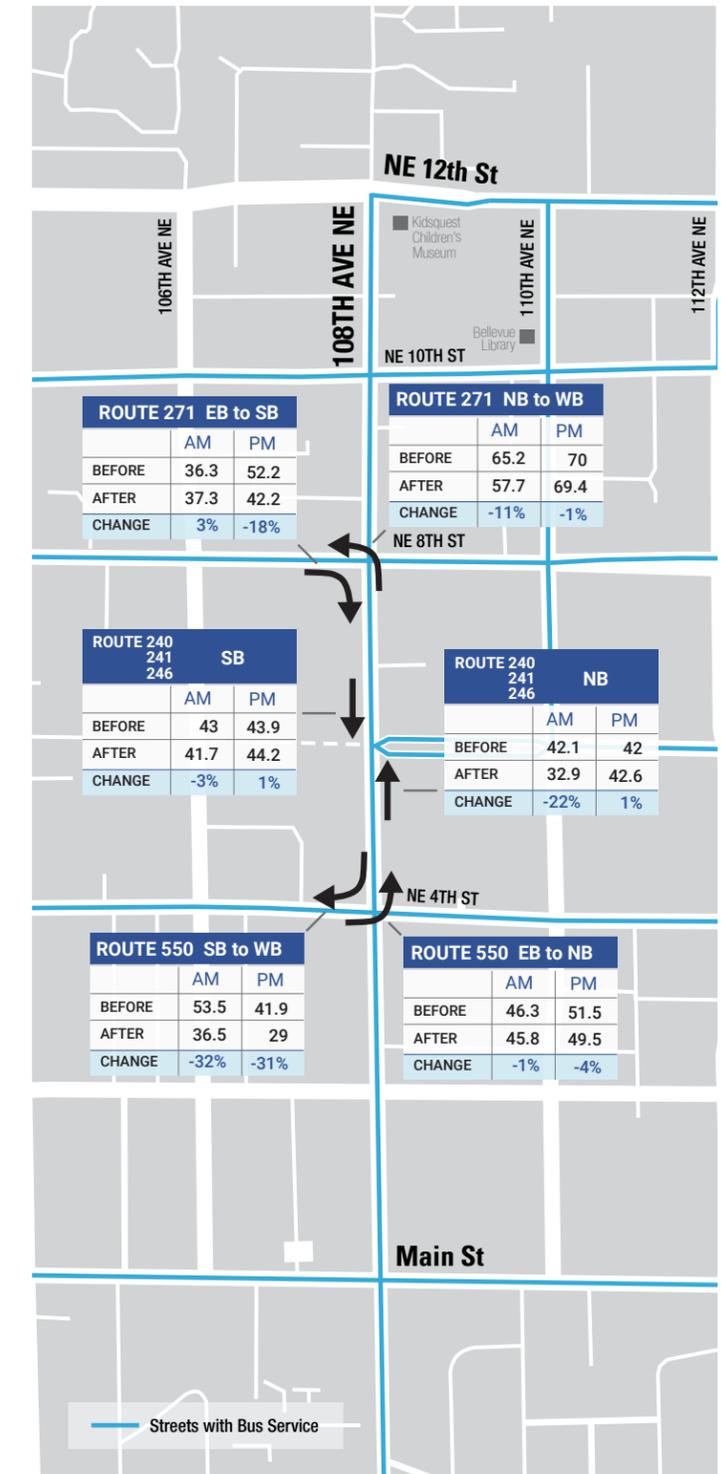


Figure 30. Average Bus Dwell Time (in seconds) for Key Transit Movements

AUTOMOBILE DELAY



MEASURE
Total intersection delay in seconds per motor vehicle

BEFORE PERIOD
October 2017

AFTER PERIOD
October 2018 (for "After-Updated")

LOCATION
All signalized intersections on 108th Ave NE between Main St and NE 12th St

BACKGROUND
A Synchro traffic model was initially developed to compare alternative design options for the bikeway. The model was created using volumes from 2017, and a microsimulation was used to estimate the intersection delays for each signalized intersection along the corridor. The "Before" and "After" conditions show the calculated delay and the corresponding motor vehicle level of service (LOS) that were reviewed by the Transportation Commission during the design process. The model was updated in 2018 to match the bikeway's final design. The "After-Updated" model includes new design features like a bus queue jump at NE 6th St and volumes collected after the installation of the bikeway to reflect changes in travel patterns.

LOS is the sum of the traffic flow ratios for all critical lane groups at an intersection. City code uses LOS standards for Mobility Management Areas as part of the review process. All of the intersections studied meet concurrency standards, but LOS can also be used as a measure for comparing changes to the operation of an intersection.

Key Takeaways

- Overall, the calculated delays for the "After-Updated" conditions were consistent with what was predicted in the initial Before and After modeling.
- The model showed slight changes in delay that were consistent with changes in volumes observed in the after condition.
- The NE 6th St and 108th Ave NE intersection indicated slightly more delay in the After-Updated condition due to the added bus queue jump, which was not initially modeled.

Technology & Methodology

The traffic model was developed using Synchro and SimTraffic software by Trafficware. Before conditions used existing signal timing and phasing based on the historical averages for the adaptive signal system. The After-Updated condition revised traffic signal timing based on historical averages after installation. The model was calibrated based on observed conditions and included pedestrian volumes and major driveways.

SimTraffic was used to capture the impact of queuing and delay at adjacent intersections. Intersection delay and level of service is based on the Highway Capacity Manual. This is a calculated value, not a measure of actual conditions.

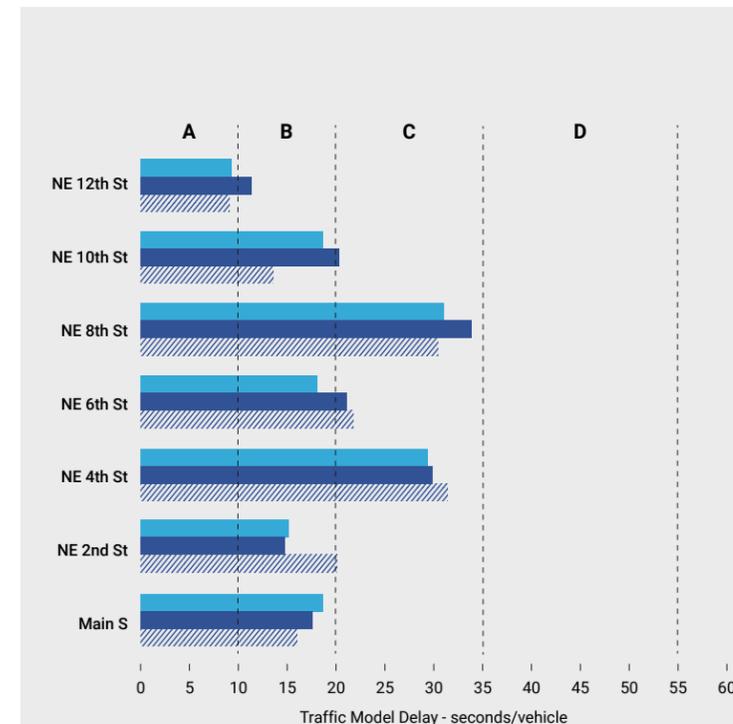


Figure 31. AM peak intersection delay

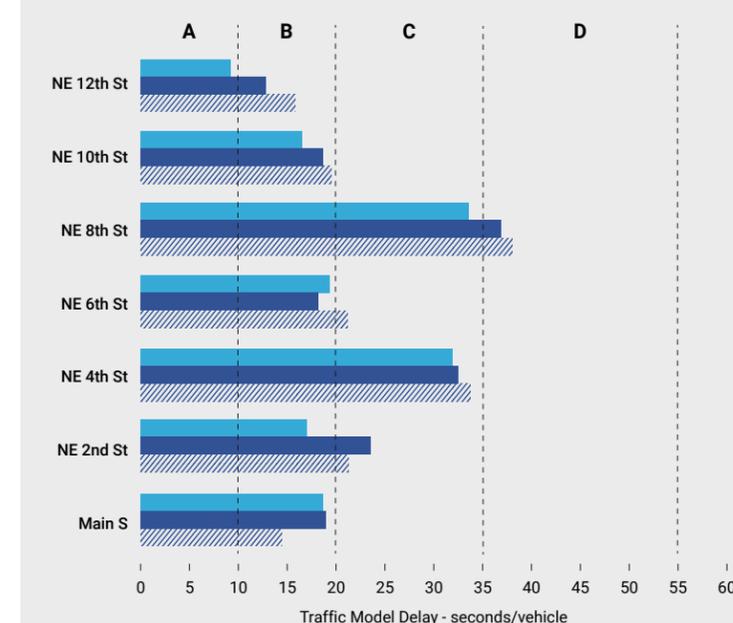


Figure 32. PM peak intersection delay

Sample perspectives from questionnaire respondents:

"Bike lanes that have replaced right turn lanes have increased traffic delays (plus, from a biker's standpoint, people still drive in them!)"

"The new bike lanes have increased commuting pain on 108th. Taking turn lanes away on a road with that amount of traffic has exacerbated an already painful commute."

"The bike lanes have certainly resulted in much slower car progress through downtown, particularly the absence of left- and right-turn lanes."

"I live on 108th. Traffic has slowed significantly since the bike demo was installed. Turn lanes for cars have been removed. General purpose lanes have been removed. This is all contributing slower traffic flow."

"As a driver in Bellevue and 108th I have not noticed any increase in traffic or commute times to/from Downtown Bellevue as a result of these lanes. Would be great to see bike lanes becoming more and more prevalent making everyone safer, healthier and with less carbon footprint!"

"Since the implementation of the bike lanes, it has been considerably more difficult to make a left hand turn out of the City Center Building. If the desire is to create bike lanes, they should be created on streets with generally less traffic, like 106th and 110th. 108th has too many cars and in all reality should probably be a one-way street anyways. This bike lane experiment has been nothing but an impediment to traffic in my view."

"At the interaction of 108th Ave SE and Main St, north bound went from two lanes to one lane. Vehicles turning left, turning right and going straight all have to use one lane which slows down movement of north bound traffic especially during school hours at Bellevue High School."

NETWORK ASSESSMENT

MEASURE

Percent of time the adaptive signal system measures above 100 degrees of saturation

BASELINE PERIOD

August–October 2017

BEFORE PERIOD

April–May 2018

AFTER PERIOD

August–October 2018

LOCATION

Signalized intersections along NE 4th St and NE 8th St between 106th Ave NE and 110th Ave NE

BACKGROUND

In a transportation network, modifications to one intersection or corridor can impact how other streets in the system operate. This measure aims to understand the impact that changes to 108th Ave NE associated with the demonstration bikeway may have had on the surrounding transportation network.

Bellevue started deploying an adaptive signal system in 2010 that is now active citywide. An adaptive signal system reacts to the changes in motor vehicle traffic volumes to adjust the amount of green signal time given to each movement. The system will adjust timings based on real-time conditions. Modification to 108th Ave NE could impact other corridors like NE 8th St and NE 4th St. By considering the degree of saturation at these surrounding intersections, we can infer whether there is new congestion on other corridors not included in this evaluation as a result of the bikeway project.

Key Takeaways

- None of the locations showed a significantly increased in the percent of time with a degree of saturation over 100.
- 110th Ave NE/NE 4th St was more saturated during the before period, likely due to the full road closure of 110th Ave NE south of NE 6th St.

Technology & Methodology

The measure of degree of saturation is calculated by Bellevue's adaptive signal system (SCATS) and is used to make real-time adjustments to signal timing. To determine this outcome, historical data was pulled from the adaptive signal system for each approach. The approach averages were weighted based on turning movement volumes to calculate the intersection average. The historical average was based on eight days before and eight days after and the peak periods evaluated were 7am to 10am (AM Peak) and 4pm to 7pm (PM Peak).

WHAT DOES DEGREE OF SATURATION OVER 100 MEAN?

As degree of saturation nears 100, it is inferred that the intersection approach is becoming congested. Up to 100, there is generally enough time in a green signal phase for the vehicles already queued to make it through the intersection, but vehicles that arrive after the phase has begun may not. When degree of saturation is over roughly 120–130, it may take multiple green cycles to clear the queue. If multiple adjacent intersections exceed this level, people may experience gridlock.

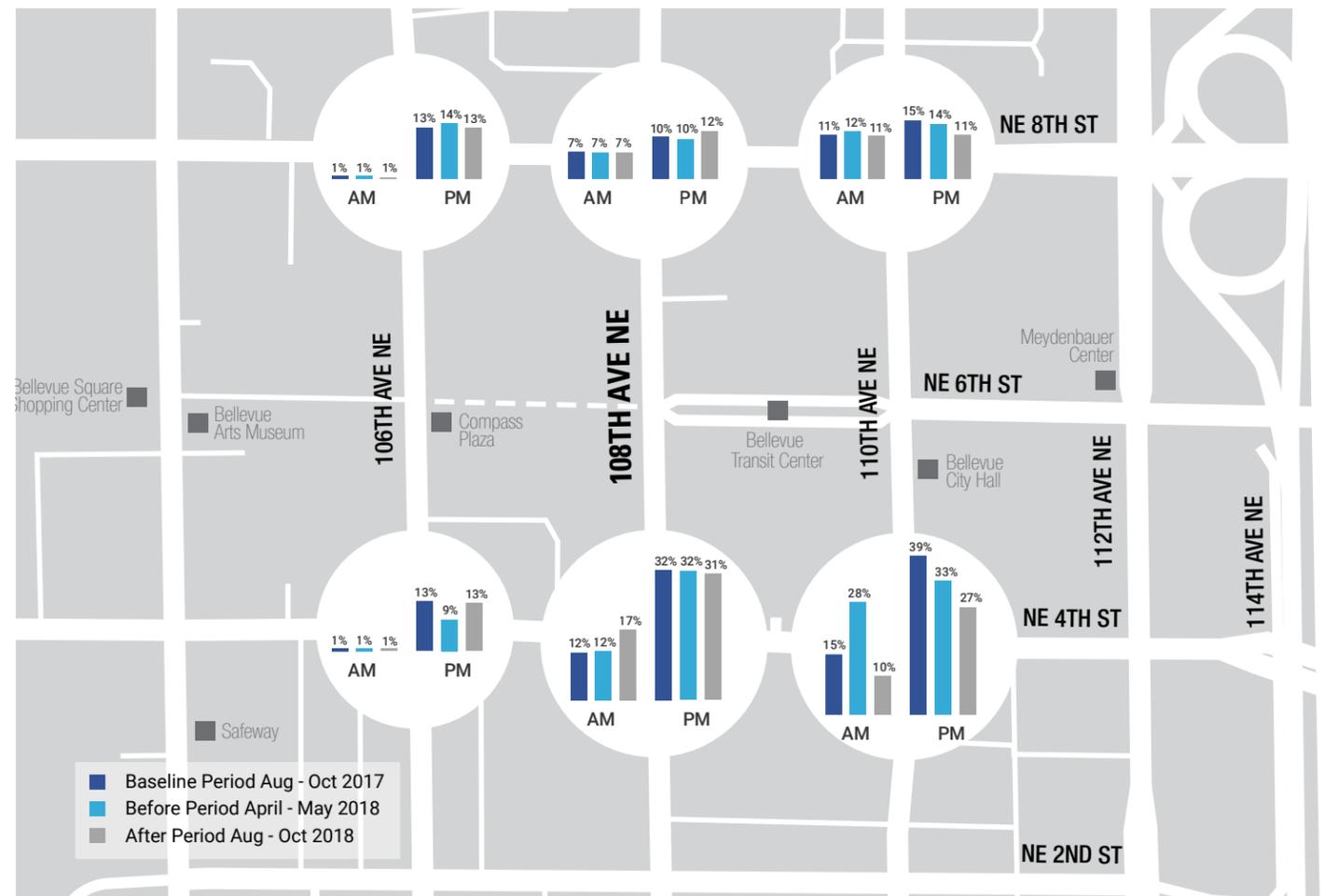


Figure 33. Percent of Time over 100 Degrees of Saturation



LIVABILITY

FACILITY USE - BICYCLE VOLUMES

MEASURE
Bicycle count along 108th Ave

BEFORE PERIOD
May 23–June 11, 2018

AFTER PERIOD
June 15–November 13, 2018

LOCATION
Northbound and Southbound at NE 4th St and 108th Ave

BACKGROUND
This measure is one of the outcomes for livability and aims to understand how the demonstration bikeway impacts mobility—particularly multimodal opportunities. Bellevue aspires to accommodate all modes of transportation as identified through the City’s Pedestrian and Bicycle Implementation Initiative. This demonstration project aims to increase the attractiveness of biking Bellevue so it is important to measure if ridership increases after.

Historically bicycle counts have typically been collected during peak hours. This demonstration provided 24/7 counts and also was an opportunity to pilot the latest technology in bicycle counting.

A midweek average was used because bicycle patterns on the weekend and weekday vary significantly. The volume is for the entire day (24 hr count).

It is also worth noting that the month of May is Bike Everywhere Month so the before period is likely reflective of a high bike volume time period, similar to the summertime.

Key Takeaways

- Average daily bicycle ridership increased by 35%.
- The highest number of bicycles recorded in one hour was 32.
- Part of August saw lower ridership because of poor air quality due to regional forest fires. If this smoky period is excluded, the August weekday average is 147 daily rides.

Technology & Methodology

Bicycle volumes were collected using thermal video detection. Two units were installed, one for northbound and one for southbound at NE 4th St on 108th Ave NE as bicyclist exited the intersection. A midweek average was used because bicycle patterns on the weekend and weekday vary significantly. The volume is for the entire day (24 hr count). See the [Technical Appendix](#) for volumes by day and direction.

The cameras used were Trafisense2 and have the latest technology for differentiating vehicles and bicycles on the roadway. Accuracy was validated through manual observation and finetuning.

There were occasional drops of network communication causing loss of data, so only full days of data were included. Before data was collected for the curb travel lane because there was not a designated bike lane.

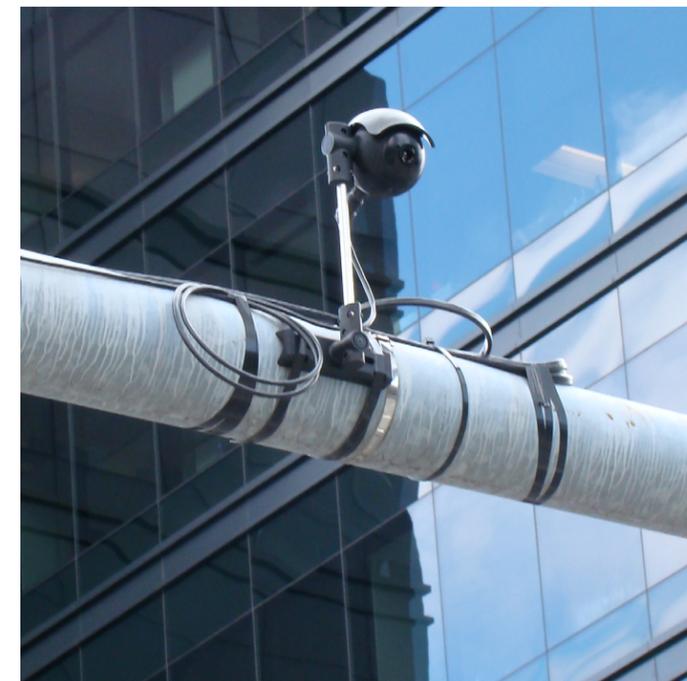
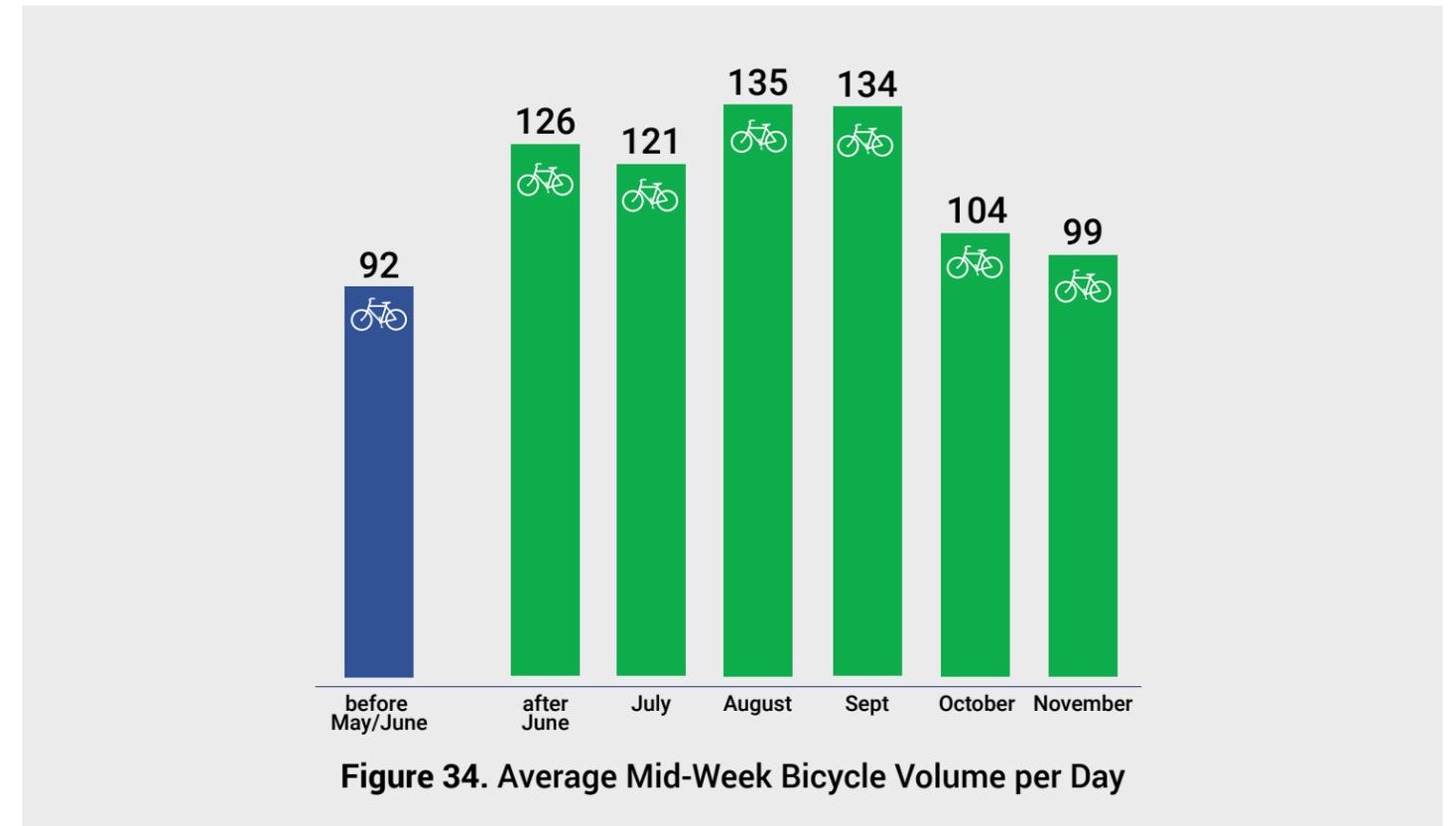


Figure 35. Image of video detection camera



Figure 36. Video output from detection camera

FACILITY USE - BIKE SHARE



MEASURE

Travel patterns by people using dockless bike share

SIX-MONTH DATA PERIOD

July 31, 2018–January 31, 2019

TOTAL TRIPS

27,905

TOTAL USERS

6,297

BACKGROUND

Bellevue launched a dockless bike share pilot on July 31, 2018—the same day as the opening of the demonstration bikeway on 108th Ave NE. The electric-assisted bicycles are available for use citywide, with the greatest density of bikes available in Downtown. Between 100 and 400 bicycles were available citywide during the first six months of the pilot, growing steadily from launch through November and then declining during the winter months less favorable to bicycling.

Of the 27,905 trips taken during the first six months, more than 55 percent began in Downtown Bellevue (15,607), just over 50 percent ended in Downtown (14,162), and almost 40 percent both started and ended within Downtown (10,990).

Key Takeaways

- 108th Ave NE is the most used corridor by bike share users in Downtown.
 - » At least 16% of all bike share trips (4,487) used 108th Ave NE.
 - » At least 6% of all bike share trips started (1,775) and just under 6% ended (1,622) along 108th Ave NE.
- 108th Ave NE is the most commonly used route for trips wholly within Downtown.
 - » 24% of trips that started and ended within Downtown used 108th Ave NE (2,685 out of 10,990 trips).
 - » 60% of all bike share trips that used 108th Ave NE both started and ended in Downtown.
- West Bellevue and Northwest Bellevue were the most common neighborhood origins and destinations outside of Downtown.
- More than a third of all trips that started or ended outside of Bellevue ended or started in Downtown (904 out of 2,904 trips).
- One quarter of people who used bike share in Bellevue traveled along 108th Ave NE at least once.
- Bike share use along 108th Ave NE is comparable on weekdays and weekends, increasing steadily beginning in the early morning, peaking in the late afternoon, and declining steadily thereafter.
- Bike share trips that used 108th Ave NE lasted 12 minutes and 47 seconds on average; the median trip duration was 7 minutes and 17 seconds.

Technology & Methodology

All bike share bicycles are GPS-enabled and collect data about trip origins, waypoints, and destinations, recording where and when people use bike share. This data provides broader insight into comparative route preferences than static bike counters at specific locations can; however, it reflects only ridership by bike share users, not people riding personal bicycles.

Start and end points are recorded for all trips. Mid-trip waypoints are logged only periodically, so a modest number of bike trips likely traveled along a corridor for a short enough period that no location report (ping) occurred while the bike was within the geographic boundary used for this analysis. Usage estimates for all specific corridors, including 108th Ave NE, are likely somewhat lower than the actual number of trips that used each corridor.



FACILITY USE - BIKE SHARE

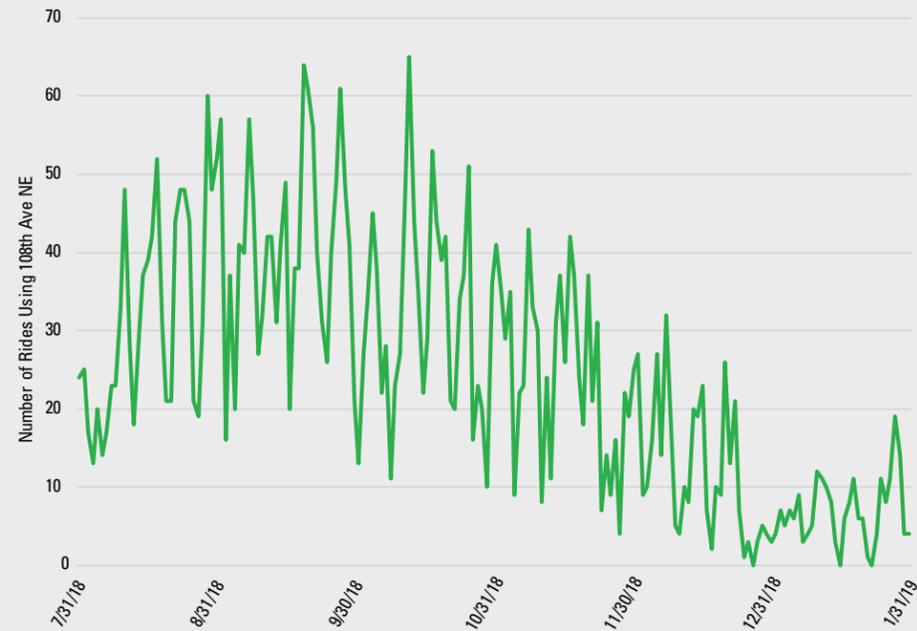


Figure 37. Number of Daily Bike Share Rides Using 108th Ave NE

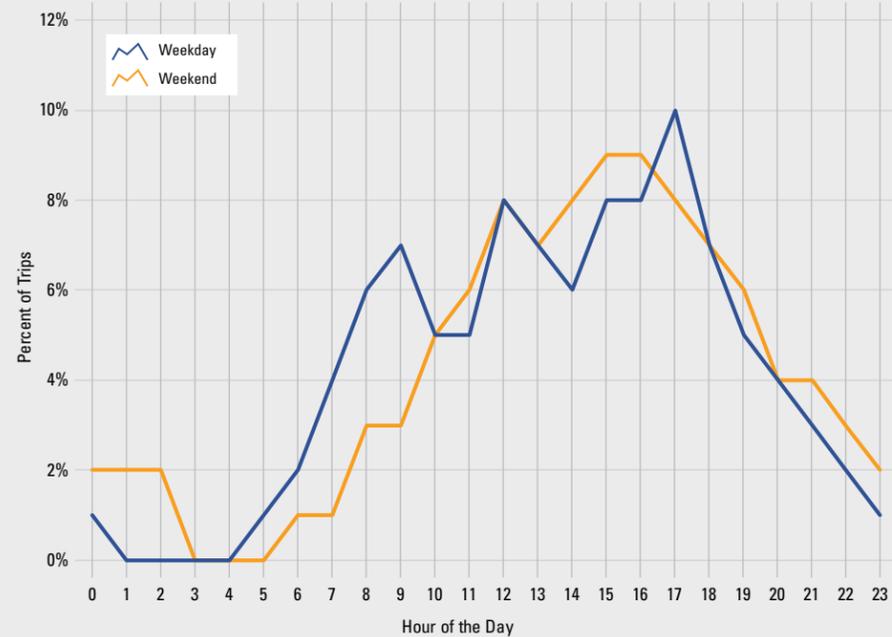


Figure 38. Fraction of Bike Share Trip Starts on 108th Ave NE by Time of Day

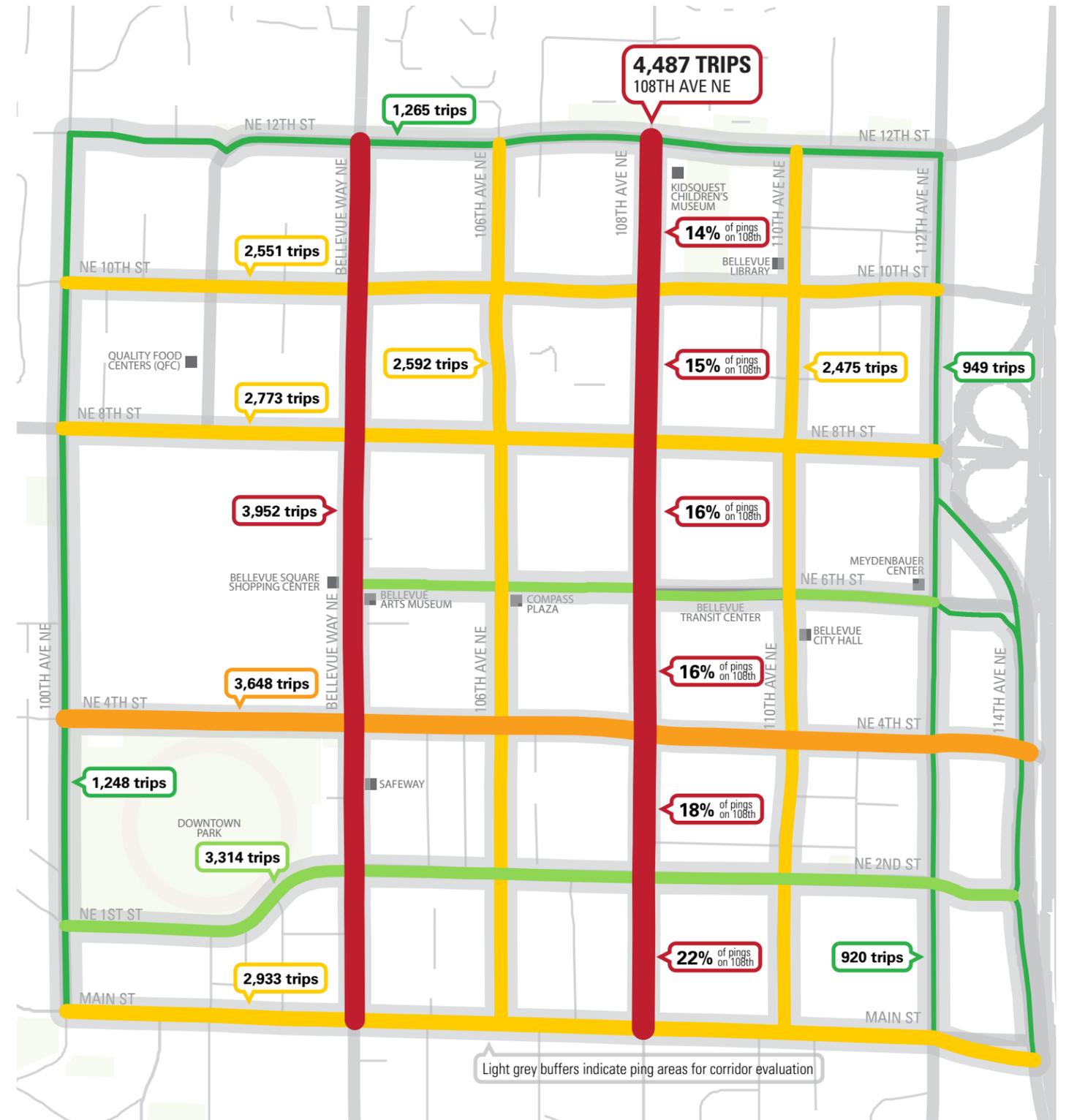


Figure 39. Number of Bike Share Trips by Downtown Corridor

FACILITY USE - VEHICLE VOLUMES



MEASURE
Turning movement counts for the AM and PM peak hour

BEFORE PERIOD
April 24, 2018

AFTER PERIOD
October 16, 2018

LOCATION
Signalized intersections on 108th Ave NE between Main St and NE 12th St

BACKGROUND
Manual turning movement counts were collected in the spring before the demonstration bikeway was installed and again in the fall after all construction was completed and school was back in session.

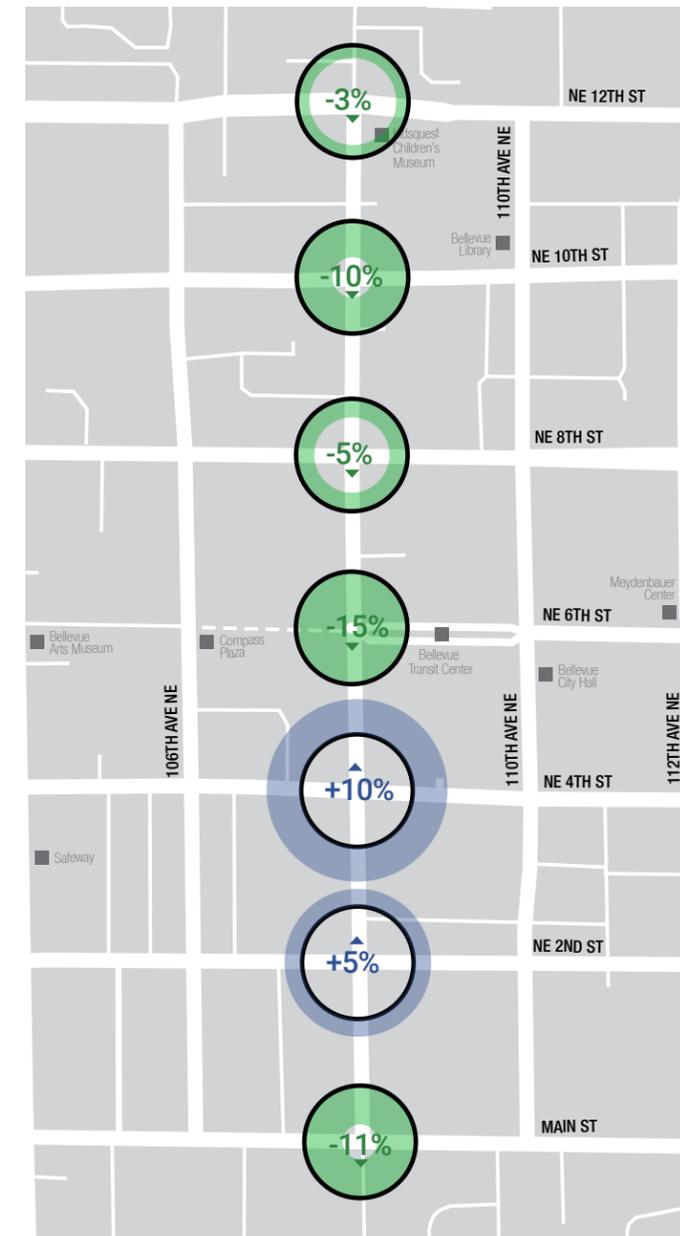
These counts were used to measure change in vehicle volumes and to calculate vehicle delay. Knowing the actual vehicle volume at each intersection also helps inform our understanding of metrics in this assessment that are not directly measured. For example, the change in volumes can be a benchmark for modeled metrics like vehicle travel time and delay. Similar to the influence of bicycle volumes on exposure in crash rates, vehicle volumes could also impact how safety metrics along the corridor are interpreted.

Key Takeaways

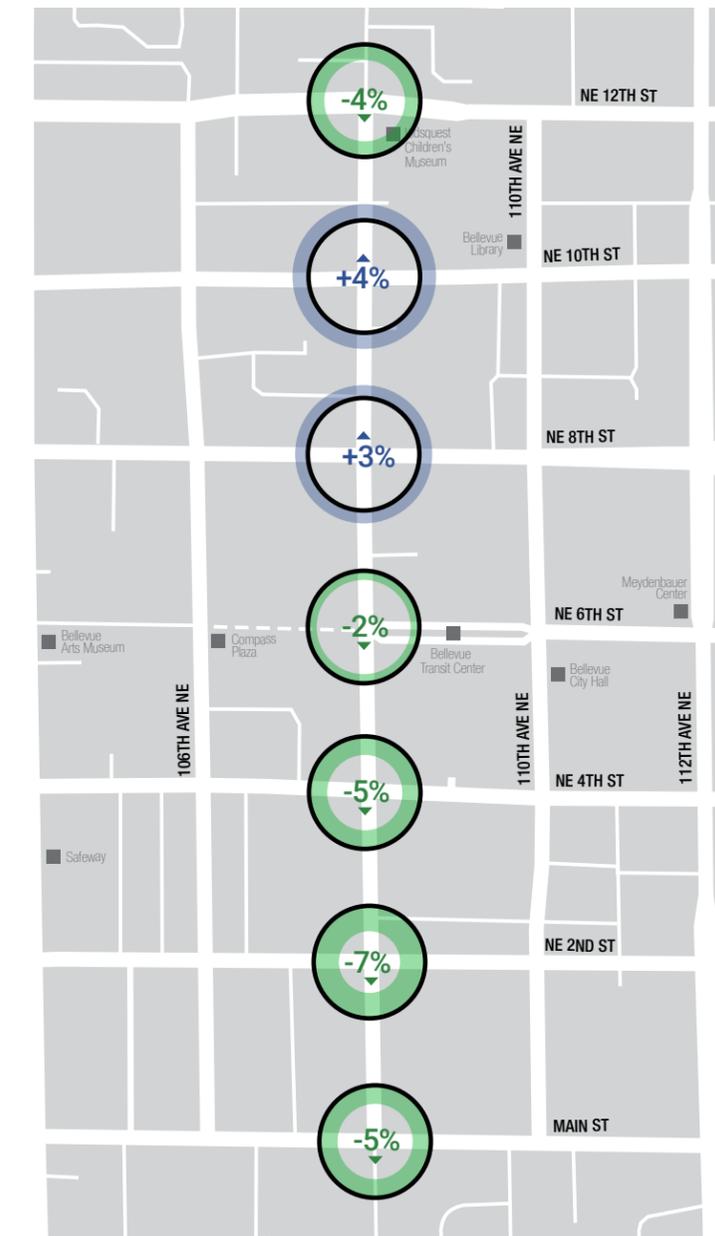
- The change in peak hour vehicle volumes varied by intersection but overall was not significant for most intersections.
- Volumes decreased north of NE 6th St in the AM peak but increased in the PM peak. The trend was the opposite for intersections south of NE 6th St.

Technology & Methodology

A consultant was hired to count the individual turning movement (left, through, right) for each intersection for both AM and PM peak hours. Both before and after were collected on a Tuesday with no precipitation and school was in session. Construction impacts were avoided as best as possible and the data was collected when there were no construction activities on the corridor. Full manual counts can be found in the [Technical Appendix](#).

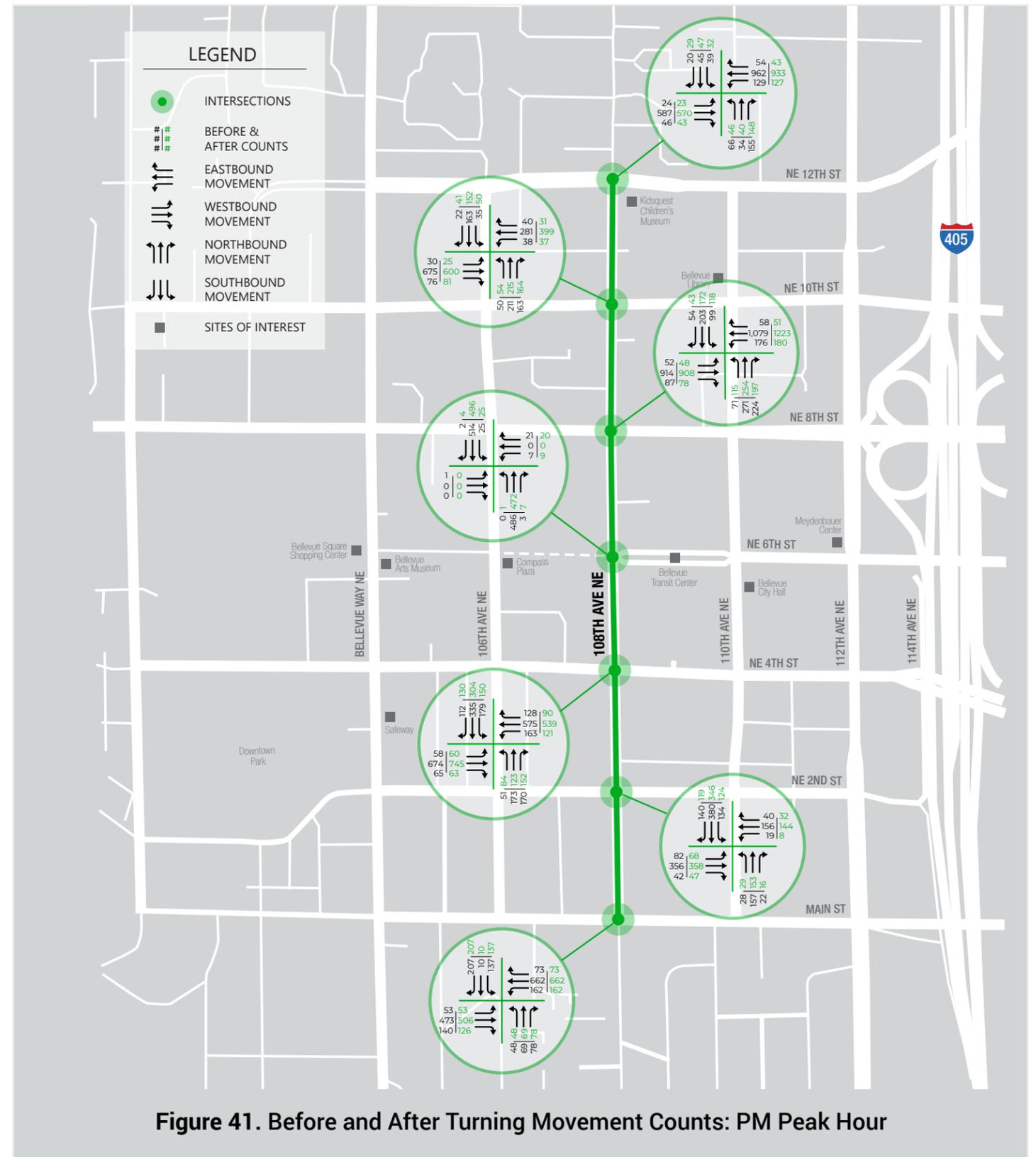
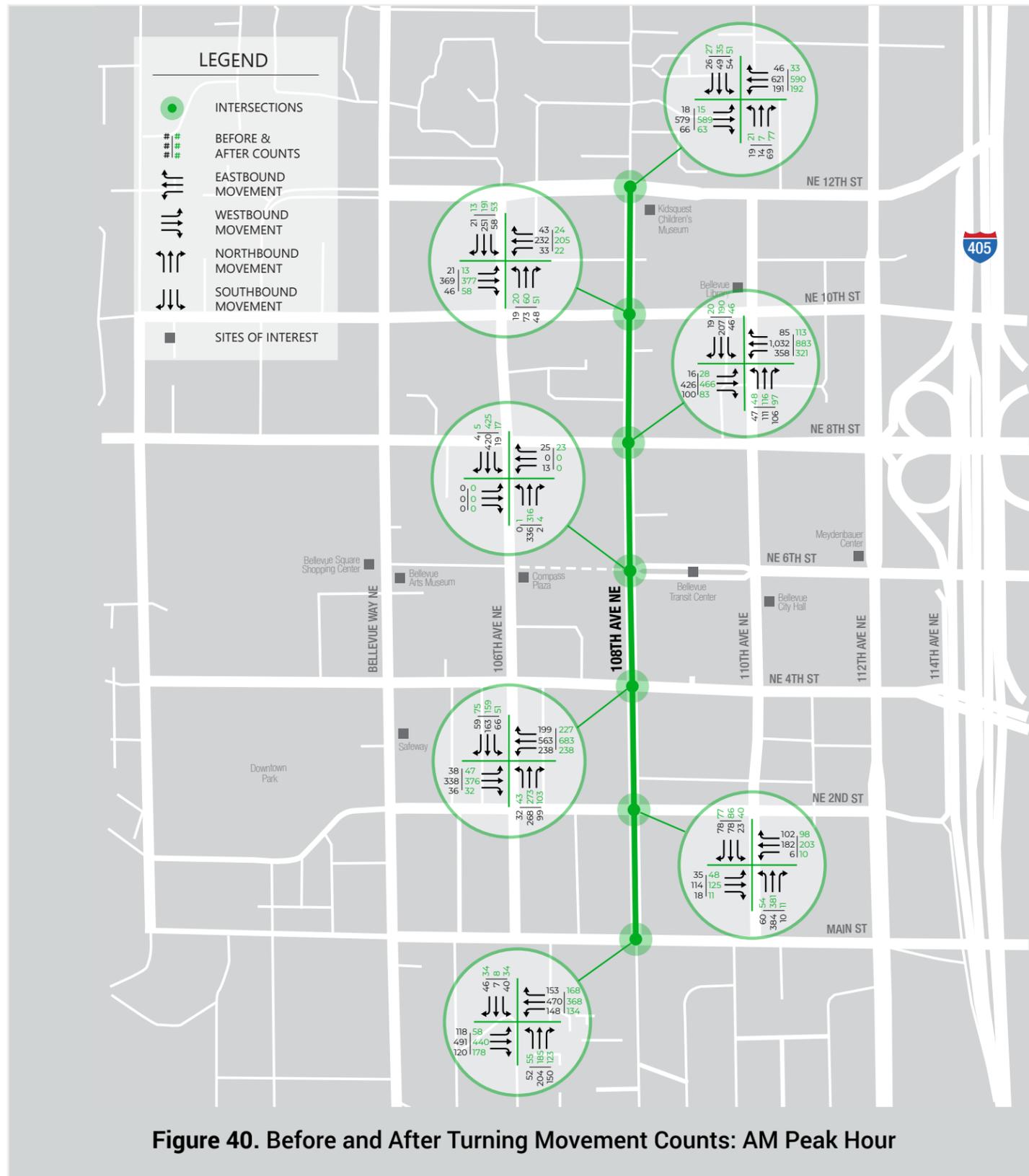


AM Peak Hour	Total Intersection Vehicle Volume		
INTERSECTION	BEFORE	AFTER	% CHANGE
NE 12th St	1752	1700	-3%
NE 10th St	1214	1087	-10%
NE 8th St	2553	2417	-5%
NE 6th St	819	699	-15%
NE 4th St	2099	2307	10%
NE 2nd St	1090	1144	5%
Main St	1999	1785	-11%



PM Peak Hour	Total Intersection Vehicle Volume		
INTERSECTION	BEFORE	AFTER	% CHANGE
NE 12th St	2161	2081	-4%
NE 10th St	1784	1849	+4%
NE 8th St	3288	3387	+3%
NE 6th St	1058	1034	-2%
NE 4th St	2683	2561	-5%
NE 2nd St	1556	1444	-7%
Main St	2142	2025	-5%

FACILITY USE - VEHICLE VOLUMES



USER SATISFACTION



MEASURE
Online questionnaires

BEFORE PROJECT
November 10, 2017–January 1, 2018
n=1,262 respondents

AFTER PROJECT
September 1, 2018–November 1, 2018
n=1,232 respondents

BACKGROUND
This measure aims to understand the public’s perception of 108th Ave NE and their level of support for bicycle facilities along the corridor and in Downtown more broadly before and after implementation of the demonstration bikeway. Responses to multiple questions were cross-referenced to determine how perspectives compare across different groups—for example, among those who have biked versus driven along the corridor, and among those who are confident versus more concerned riders.

Key Takeaways

BEFORE PROJECT

- A plurality of respondents (42%) never rode a bike in Downtown during the summer months, and many respondents (35%) rode only once a week or less.
- Most respondents (62%) said they would ride a bike in Downtown more often if streets had safe and comfortable bike lanes (see Figure 42).
- Most respondents (62%) felt that some tradeoffs to motor vehicle traffic flow are acceptable to provide safe facilities for people who bike in Downtown (17% agree, 45% strongly agree).
- Most respondents (80%) felt that new bike lanes on 108th Ave NE would help people on bikes get where they want to go in or through Downtown (25% agree, 55% strongly agree).

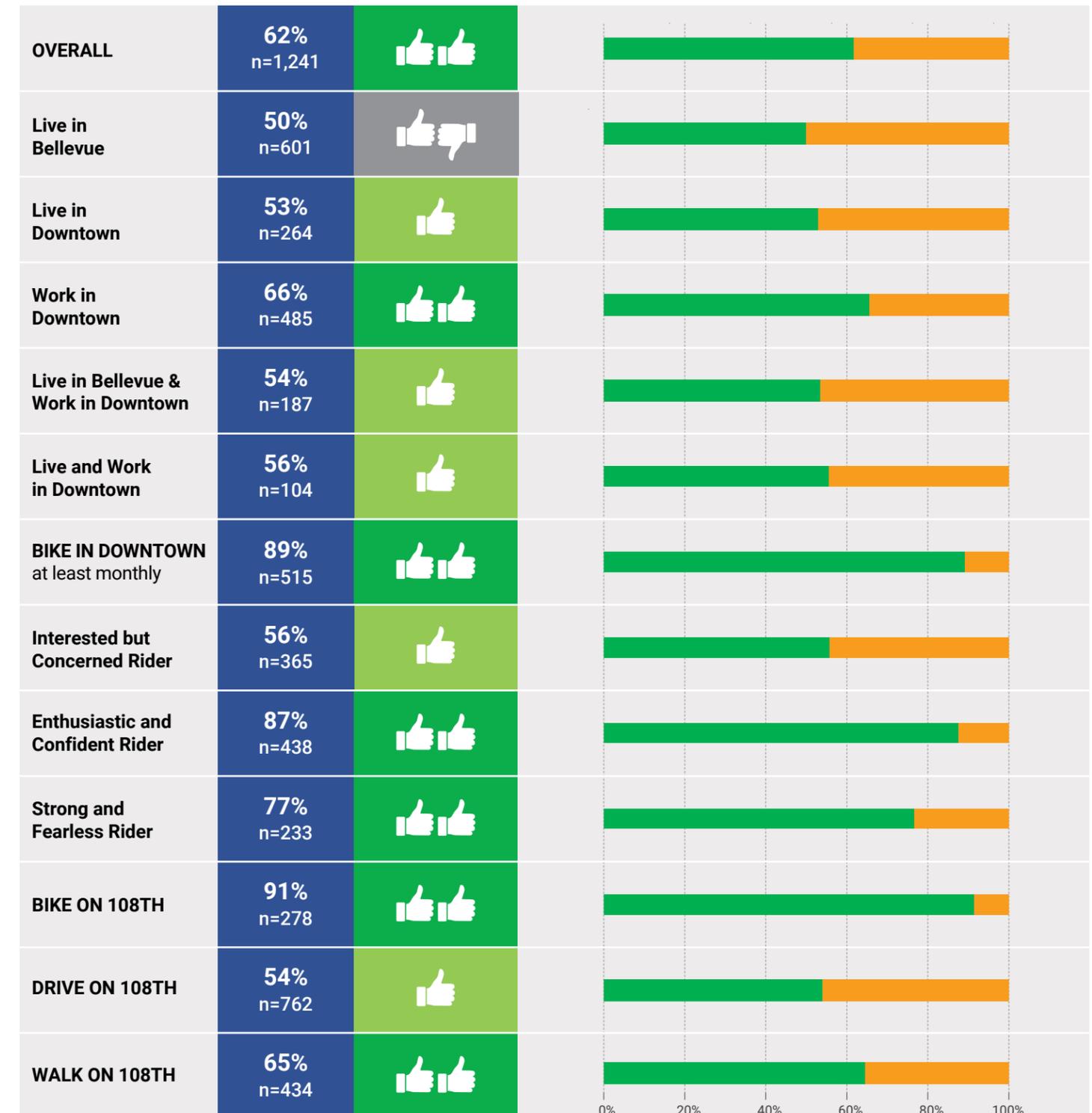
“I currently ride my bike to work most days via the CKC to Northup Way. I would be very happy to extend my riding into Downtown Bellevue on a safe route.”

“I like that it goes right next the transit center, where many people may load and unload bicycles.”

“This won’t be extremely useful for me unless you also connect the apartments, library, and park along 10th, or connect to the mall and downtown park via 4th.”

“I bike in Downtown with a 3 yr. old on the bike and any efforts to improve bike safety are much appreciated.”

Figure 42. Would the following encourage you to ride a bike in Downtown Bellevue more often?
If Downtown streets had safe and comfortable bike lanes



USER SATISFACTION

AFTER PROJECT

- A plurality agree that the design of 108th Ave NE strikes the right balance to address the needs of all street users (30% agree, 17% agree strongly, 20% undecided).
 - » People who have biked along the corridor are especially supportive (44% agree, 31% strongly agree, 13% undecided).
- Most people who have biked along 108th Ave NE agree that additional physical separation is warranted to enhance the bicycling experience (25% agree, 31% agree strongly, 24% undecided).
 - » People who identified themselves as “enthusiastic and confident” or “interested but concerned” riders are more strongly supportive of additional physical separation (60% and 62% in favor, respectively) than those who identify as “strong and fearless” cyclists (49%).
- Most people—regardless of how they typically travel in Bellevue—support building more bicycle lanes at other locations in Downtown Bellevue (13% agree, 52% agree strongly, 7% undecided).
- People bicycling on 108th Ave NE...
 - » feel the added expense of purchasing and maintaining planter boxes is worthwhile (23% agree, 52% strongly agree)
 - » commonly experience motor vehicles parked or waiting in the bike lane (26% very often, 43% sometimes)
- People driving on 108th Ave NE...
 - » like that bikes and cars are more separated (27% agree, 37% strongly agree)
 - » claim it is easier to see people bicycling in the new bike lanes (35% agree, 23% strongly agree)
 - » say it is unacceptable for a motor vehicle to use the bike lane as a pick-up/drop-off zone (20% agree, 40% strongly agree)
- Most respondents are satisfied with the City’s efforts to solicit input from the community on the 108th Ave NE project. Among people who have...
 - » biked on the corridor: 40% agree, 45% agree strongly
 - » driven on the corridor: 29% agree, 29% agree strongly
 - » walked on the corridor: 32% agree, 28% agree strongly

“Love it. It would be great to see the dedicated bike lanes expanded to all of downtown. I live downtown but drive almost everywhere because biking feels like a great way to subject my family to a funeral. If there were dedicated bike lanes, I’d always be biking.”

“I like the improvements to 108th Ave, and I think they will help cyclists and motorists alike. That said, there’s a lot of activity on 108th Ave from multiple sources—transit, pedestrians, cyclists, ride share/taxis, and cars turning, merging, and entering/exiting garages—and I think people are adjusting to the new bike lane, which will take some time.”

“I have thoroughly enjoyed the new bike lanes on 108th. I work in the Symetra building, and prior to the dedicated lanes, I was hesitant to ride my bike to work. I now am wanting to commute by bike as much as possible. I really appreciate the lanes and efforts by the City of Bellevue. I hope they become permanent.”

“Right turns on red lights is still extremely dangerous for pedestrians, as it is at other intersections as well, which we believe needs to be addressed before additional bikes are considered.”

“I used to take 112th on my commute and didn’t feel safe even though I was mostly riding on the sidewalk—drivers aren’t looking for bikes as they pull into / out of parking lots and driveways. Now I take the bike lanes on 108th, and it’s like night and day—I actually feel safe. Thank you Bellevue!!!”

“The 108th project has been a game changer for our family. We go out of our way to use the lanes going between Surrey Downs and anywhere downtown. They also give the street a great character. Combined with the Lime bikes, Bellevue is becoming a great place to bike.”

“I use the bike lane in downtown to go shopping, and I like to take my kids. The bike lane is the safest way for me to spend quality, outdoor time with them downtown. Thank you for putting it there!”

“Thank you for building these! They make my commute safer and more enjoyable, especially in the areas with additional protection from the bollards, curbs, and planters. People parking in the lanes is an issue unfortunately but overall I’m very happy with the project and look forward to seeing more ped/bike friendly design in Bellevue!”



Figure 43. The design of 108th Ave NE strikes the right balance to address the needs of all street users.

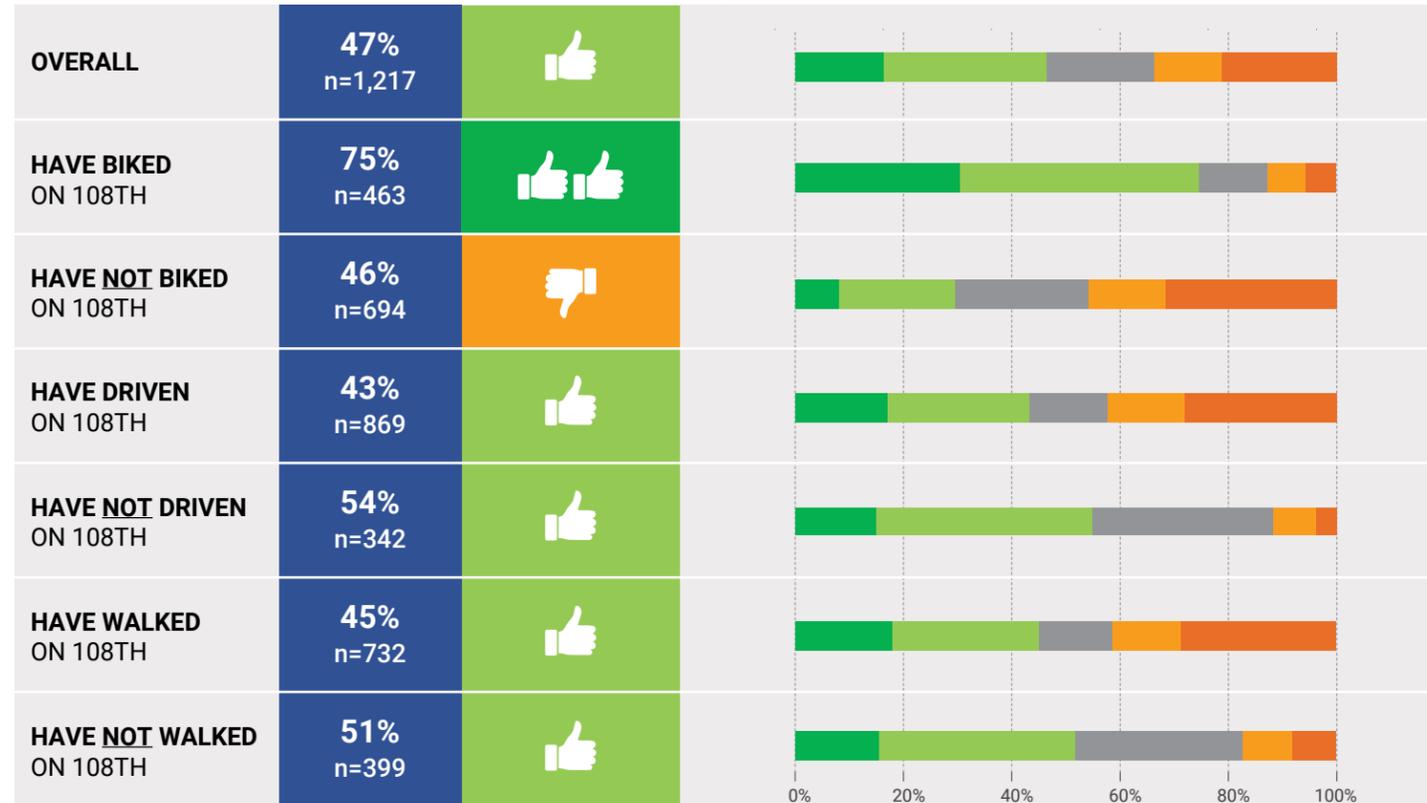


Figure 44. Additional physical separation is warranted on 108th Ave NE to enhance the bike riding experience.

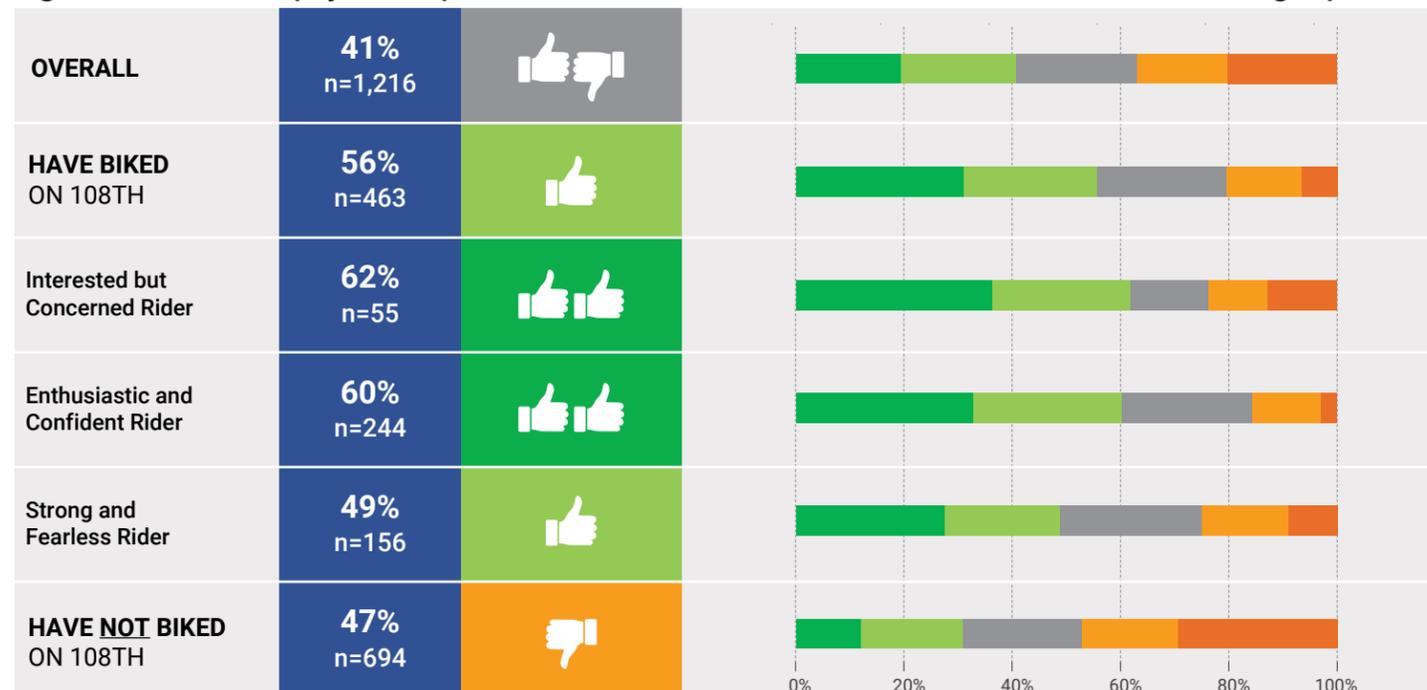
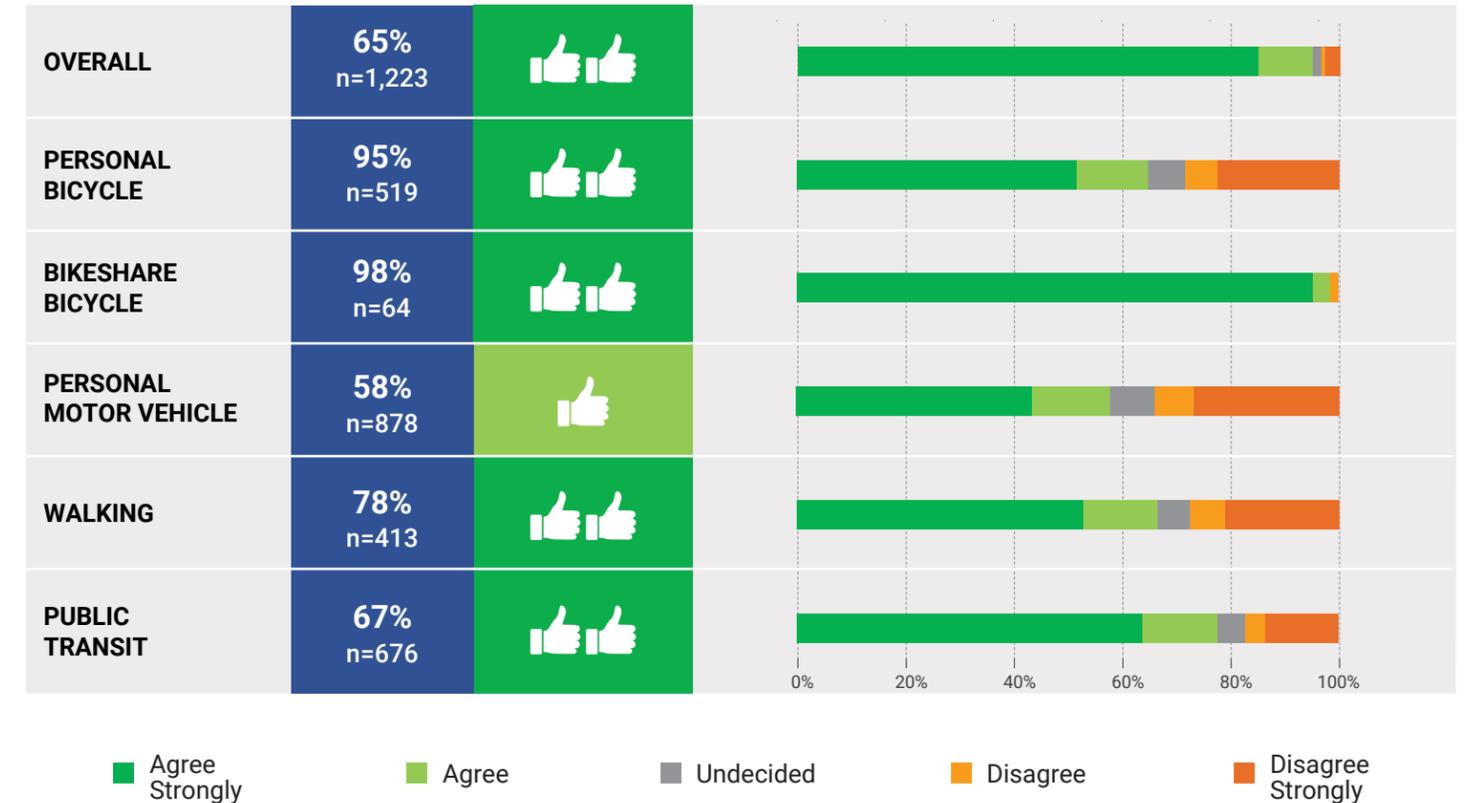


Figure 45. Overall, I would support building more bicycle lanes at other locations in Downtown Bellevue. Modes of travel respondents typically use in Bellevue...



"108th is a good start. Need to add east/west connections on Main Street and NE 12th Street."

"I do feel that the bike lanes (and reducing from 2 to 1 lane in certain sections) have reduced the car speed on 108th Ave."

"While I appreciate that people who bike, enjoy these improvements, it comes at great cost to the tax payer and even greater cost to the flow of motor vehicles through the city. This seems like a disproportionate cost given how many bicyclists there are in Bellevue and the fact that laws and rules already exist about how motor vehicles and bicyclists need to share the road."

"It seems like a lot of extra expense for so few people. Of course it is safer for bikers and nobody would argue that but I don't believe that the increased safety is proportional to the additional cost. Plus the reduced traffic throughput only hampers mobility in the city"

"I thought the new bicycle lanes were good—they strike the right balance between cost and value, and I felt relatively safe using them. The biggest concern I have is that there are few connections. Without connections, we will never see much traffic from bikes and reduction of vehicle traffic. We need a bicycle network—several north/south and east/west thoroughfares connected to the regional thoroughfares (Eastside Rail Corridor, 520 Trail, etc.)."

BICYCLE LEVEL OF TRAFFIC STRESS

MEASURE

Target bicycle user group based on motor vehicle traffic and bicycle facility characteristics

SPEED LIMIT
30 MPH

TRAFFIC VOLUMES (2015 DATA)

Main St to NE 4th St – 9,500
NE 4th St to NE 8th St – 11,400
NE 8th St to NE 12th St – 6,200

BACKGROUND

This measure rates traffic stress for street segments and intersections based on different types of bicyclists' presumed comfort level riding near motor vehicle traffic.

Bicycle Level of Traffic Stress (LTS) is based on the concept of the maximum level of traffic stress that will be tolerated by specific groups of existing and potential people bicycling: strong and fearless (LTS 4), who are comfortable riding in mixed traffic; enthused and confident (LTS 3), who can tolerate some stress but choose less stressful routes when available and convenient; interested but concerned (LTS 2), which includes most adults; and all ages and abilities (LTS 1), including children and older adults.

The [Multimodal Level of Service Guidelines](#) approved by the Transportation Commission in 2017 establish a target of LTS 1 for Bicycle Priority Corridors in designated Activity Centers. This means the target for 108th Ave NE is to provide a safe and comfortable place for people of all ages and abilities to bicycle.

Key Takeaways

BEFORE

- All street segments (superblocks) were LTS 4—no blocks had continuous bike lanes.
- Only two intersections were LTS 3—southbound at Main St (green through bike lane) and northbound at NE 4th St (through bike lane to the left of right turn lane).
- Most questionnaire respondents believed bicycle facilities in Downtown should be designed to serve...
 - » most adults interested in riding a bike (39%), or LTS 2
 - » people of all ages and abilities (28%), or LTS 1.

Methodology

LTS is based on two key characteristics of vehicle traffic—speed and volume—together with the type of bicycle facility present. As traffic speed and volume increase, more robust bicycle facilities employing more protective measures are required to maintain a level of traffic stress that is tolerable for most adults (LTS 2) and especially for children and older adults (LTS 1). LTS is calculated separately for each direction of travel. Street segments (superblocks) and intersections are classified based on their most stressful feature.

AFTER

- 75% of street segments (superblocks) are LTS 2
- 25% of street segments (superblocks) are LTS 3
- All intersections are LTS 3—most feature skip striping and bike lanes to the left of right turn lanes, one has a green bike box (northbound at Main St).
- Among questionnaire respondents, people bicycling and driving alike...
 - » feel more comfortable traveling along bike lanes that are buffered, physically separated, and painted green
 - » feel least comfortable along street segments with sharrows, where bikes and cars share the lane

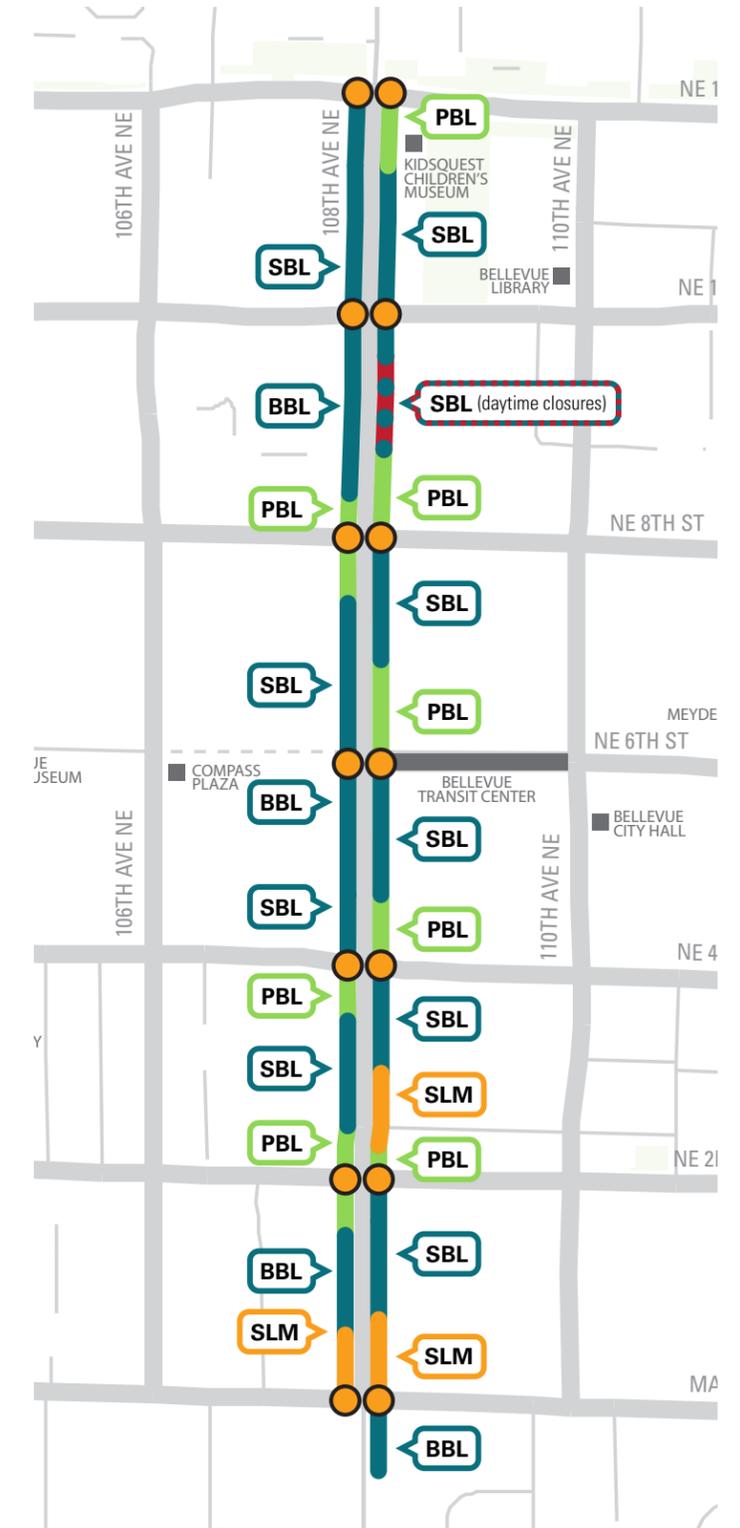


Figure 46. Bicycle Level of Traffic Stress (LTS) along 108th Ave NE

BICYCLE LEVEL OF TRAFFIC STRESS

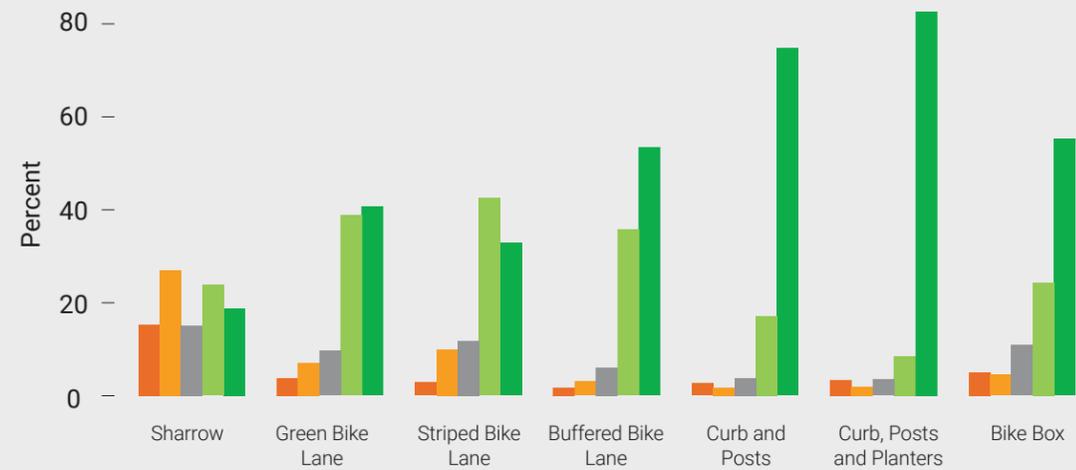


Figure 47. What is your comfort level when riding a bicycle on the following facilities on 108th Avenue? (n=426)

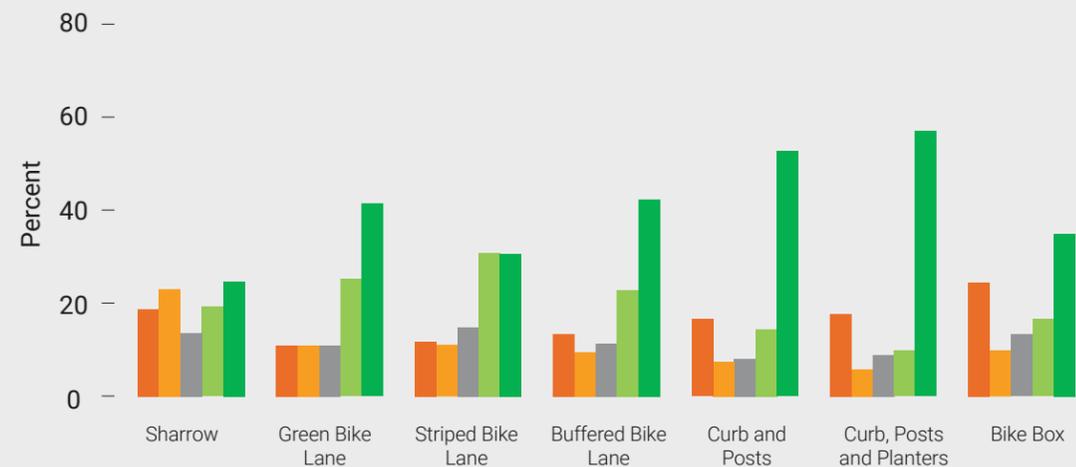


Figure 48. What is your comfort level when driving a motor vehicle next to these bike lane accommodations on 108th Avenue? (n=776)

Very Uncomfortable Somewhat Uncomfortable Neutral Somewhat Comfortable Very Comfortable

Note: Above data reflect responses to the "After Project" questionnaire administered in fall 2018.



Sharrow Green Bike Lane Striped Bike Lane Buffered Bike Lane



Separated Lanes Curb, Post, and Planters Bike Box



Figure 49. Bellevue Level of Traffic Stress (LTS) Categories

TNC AND FREIGHT DELIVERY

MEASURE
Percent of time bike lanes were blocked

BEFORE PERIOD
No data was collected before the bikeway was installed

AFTER PERIOD
– Before installation of vertical separation (i.e., curbs, posts, planters): June 28th
– After installation of vertical separation: September 25 and 27, October 2, 2018

LOCATION
Entire corridor with specific observations on 108th Ave NE north of NE 6th St

BACKGROUND
In Bellevue, TNC passenger load/unload activity has been identified as a growing issue citywide, especially in dense areas like Downtown. Vehicles have been observed stopping in bike lanes, travel lanes, and in bus stop zones. Curb demand and access management is a challenge in cities across the United States, and new resources like the [Curbside Management Practitioners Guide](#), produced by the Institute of Transportation Engineers (ITE), present context-sensitive solutions to help balance the needs of all streets users.

This measure aims to quantify the impact of passenger and freight loading and unloading on the bikeway as well as the impact of the bikeway on load/unload activities. During development of the demonstration bikeway, staff explored opportunities to reduce bike-vehicle conflicts on the curbside along the corridor, specifically with freight delivery and passenger load/unload activities from Transportation Network Companies (TNCs).

Key Takeaways

- The installation of vertical separation reduced the amount of time that the bike lanes were blocked by vehicles by 93%, from 81.9 minutes in a 3-hour period to 5.9 minutes.
- Vehicles blocking bike lanes continued to be observed along segments with gaps in vertical separation.
- Staff worked with TNC providers to create designated load zones in the vicinity.
- New curbside passenger load/unload zones were established on both on 108th Ave NE and on nearby cross streets, such as NE 4th St.

Technology & Methodology

Video observations were also utilized to collect data for the amount of time the bike lane was blocked by taxi, freight and TNC activities on the segment of 108th Ave NE immediately north of NE 6th St on the east side of the road which had previously been used for load/unload. Observations were collected for the morning commute between 7am to 10am.

A [flyer](#) was created which provided information about nearby legal curbside loading zones. These flyers were handed to surrounding property managers as well as both TNC drivers and freight delivery personnel which were illegally blocking the bike lane to better inform about nearby options.

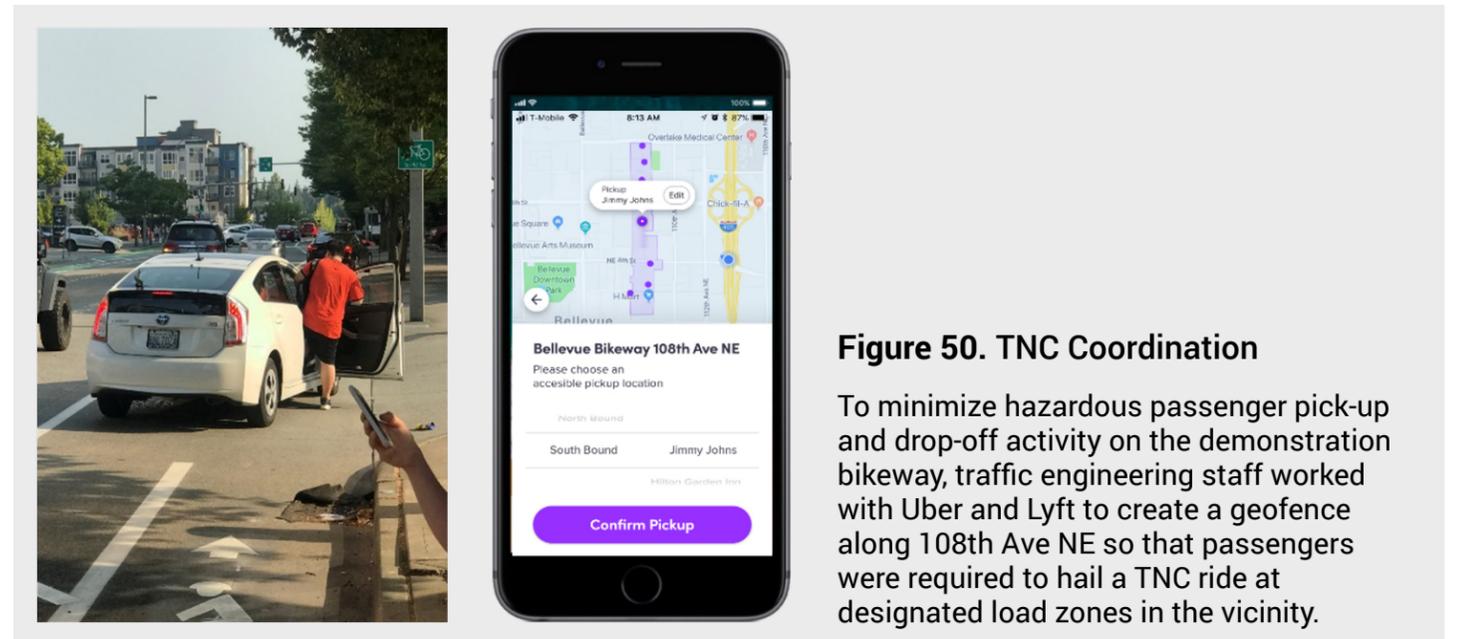


Figure 50. TNC Coordination
To minimize hazardous passenger pick-up and drop-off activity on the demonstration bikeway, traffic engineering staff worked with Uber and Lyft to create a geofence along 108th Ave NE so that passengers were required to hail a TNC ride at designated load zones in the vicinity.

Figure 51. Video Observation Results

MEASURES	BEFORE	AFTER AVERAGE	REDUCTION
 BLOCKAGE TIME	 1 hr 21 min 52 sec	 5 min 52 sec	 93%
AVERAGE PICK-UP	 3 min 52 sec	 2 min 46 sec	 29%
AVERAGE DROP-OFF	 47 sec	 20 sec	 58%
AVERAGE NUMBER OF VIOLATORS	 45	 10.3	 77%



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