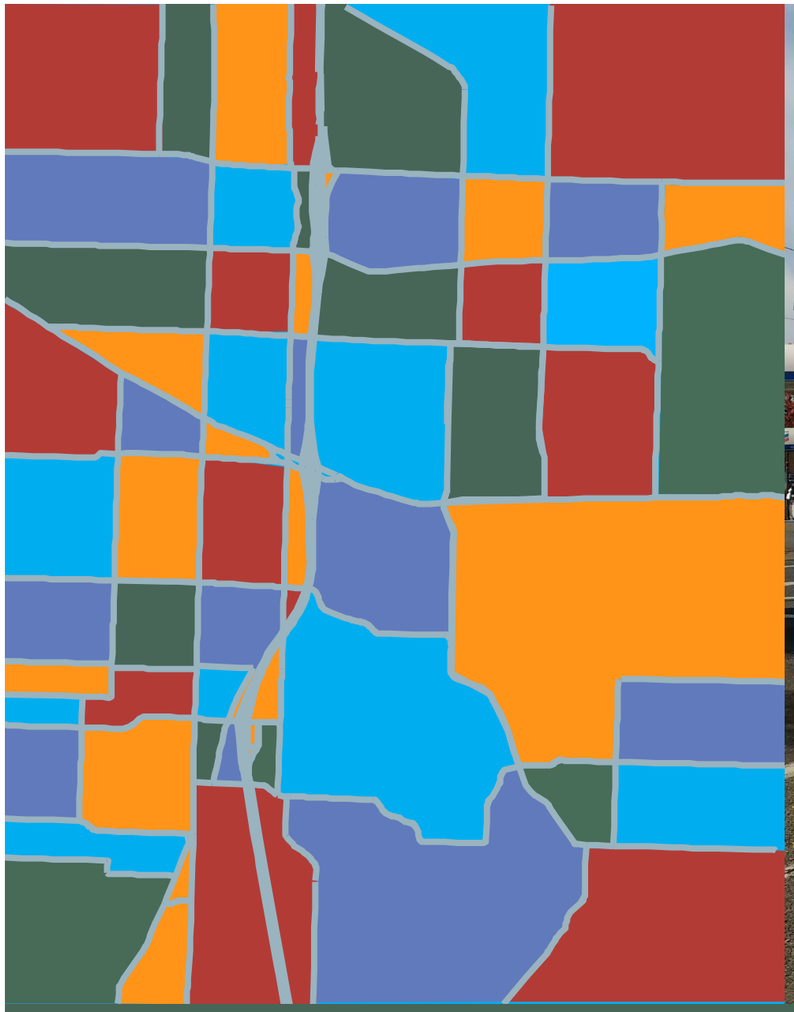

2016 REPORT

EXPANDING THE LENTS GREEN RING

BICYCLE & PEDESTRIAN IMPROVEMENT PLAN
FINAL REPORT
DECEMBER 8, 2016

GEOFF GIBSON | OLIVIA HOLDEN | DYLAN JOHNSTONE | COLIN O'NEILL

This report represents original student work and recommendations prepared by students for the Sustainable Neighborhoods Initiative managed by the Institute for Sustainable Solutions at Portland State University.

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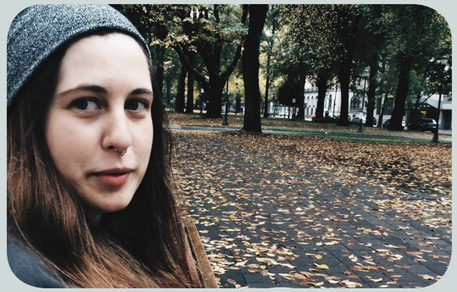
MEET THE TEAM

GEOFF GIBSON

GIS SPECIALIST + BIKE/PED DESIGNER

Pedestrian, cyclist, and transit enthusiast, Geoff is fascinated by all things transportation planning. He currently enjoys geeking out over newly installed bicycle facilities and kicking around a soccer ball.



OLIVIA HOLDEN

LAYOUT, GRAPHICS + DREAMER

Urban enthusiast and active biker, Olivia is an urban and community planner that indulges herself in tactical urbanism, grassroots efforts, community programming, and pedestrian activism.

DYLAN JOHNSTONE

GRAPHICS + BIKE/PED DESIGNER

As an active transportation planner, Dylan is interested in design, safety, and equity. He loves bike repair and baking biscuits in his free time.

COLIN O'NEILL

RESEARCHER + GRAPHICS

Colin is a community development major that sees his future in making cities accessible for cyclists and pedestrians in all parts of town.

PROBLEM STATEMENT

SE Powell Boulevard, Foster Road, and 82nd Avenue, the principal arterials in Lents, are 5-lane roadways with high volumes of vehicle traffic (10,000+ Average Daily Traffic or ADT). These arterials are also primarily auto-oriented with few signalized crossings and long crossing distances and times for pedestrians and bicyclists. In the Lents Town Center, Foster Road turns into a 3-lane, one-way couplet with Woodstock Boulevard (~15,000 ADT) with limited bike facilities. While this allows for easy access for vehicles to and from I-205, it creates connectivity challenges for walking and bicycling. The commercial corridors in Lents are primarily located along these auto-oriented roadways. This is a missed opportunity as recent research has shown that locating bicycling facilities near businesses results in positive economic impacts for the local economy (Clifton et al., 2012). One example in Lents, the Eastport Plaza Shopping Center, is setback from 82nd with large parking lots and the closest bike and pedestrian connection to the shopping center enters on a shared sidewalk on the backside of the Walmart from the 87th Ave neighborhood greenway.

A bike lane disappears suddenly.

Missing sidewalks are more common further east.

No pavement or sidewalks on an entire street.

A cyclist is forced to use the sidewalk.

A cyclist uses a marked cross walk/trail crossing with a median island refuge.

GOALS & VISION

To create a neighborhood loop that will make bicycling and walking safe, convenient, and attractive for Lents residents of all ages and abilities making both local and non-local trips to destinations in Lents and around Portland.

1. Enhance current ridership and use by improving existing infrastructure
2. Improve key crossings and intersection
3. Improve broader connectivity with Green Ring
4. Incorporate policy like PBOT's new minimum bikeway standard,protected bikeways and planning for all ages and abilities
5. Reduce crossing distances and times at key crossing
6. Implement safety measures to reduce serious injuries and fatalities for pedestrians and cyclists
7. Support placemaking and community grassroots efforts
8. Incorporate existing neighborhood plans and policies

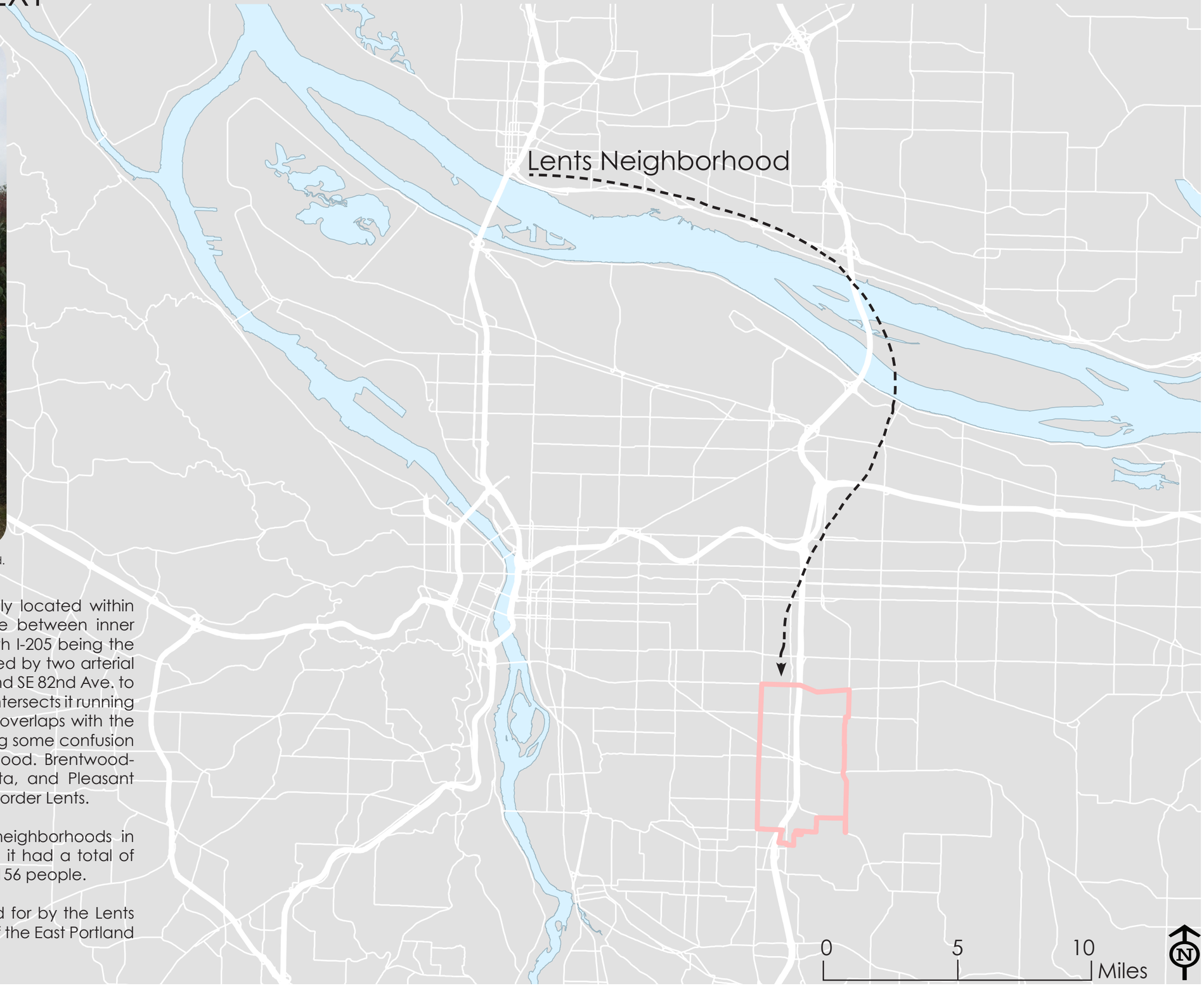
GEOGRAPHIC CONTEXT

An interesting wayfinding sign found in the Lents neighborhood.

The Lents neighborhood is geographically located within the City of Portland. It straddles the line between inner Southeast Portland and East Portland, with I-205 being the dividing line. The neighborhood is bordered by two arterial roads: SE Powell Boulevard to the north, and SE 82nd Ave. to the west, SE Foster Road another arterial, intersects it running east-west. The northeast section of Lents overlaps with the Powellhurst-Gilbert Neighborhood creating some confusion as to the exact extent of the neighborhood. Brentwood-Darlington, Foster-Powell, Mt. Scott-Arletta, and Pleasant Valley are the other neighborhood that border Lents.

For its size, Lents is one of the larger neighborhoods in Portland at 3.75 square miles. As of 2010, it had a total of 7,169 households and a population of 20,156 people.

Lents is locally managed and advocated for by the Lents Neighborhood Association and is a part of the East Portland Neighborhood Office coalition.



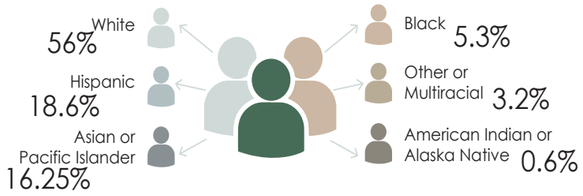
LENTS SOCIAL DEMOGRAPHICS

Compared to the rest of Portland, **Lents is a racially and ethically diverse community**. Since 2000, the population of people of color has nearly doubled from 25.2% to what is now 44%. **Lents also has a large immigrant population - nearly 25% of were born in another country.**

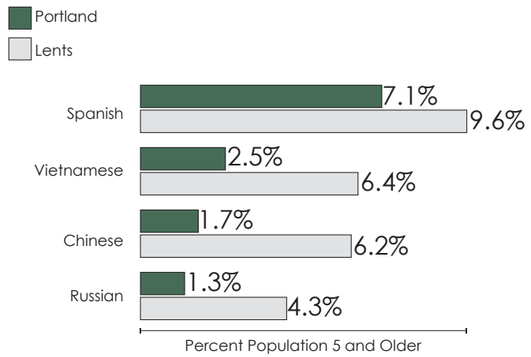
In 2014, 2/5 of the population speak languages other than English at home. Primary languages spoke in Lents include Spanish, Vietnamese, Chinese and Russian. 2.5% more people in Lents speak Spanish than in Portland. Only 1.7% of Portland speaks Chinese, whereas in Lents 6.2% of residents speak Chinese at home. Finally, Russian is spoke almost 3 times more in Lents homes than in the rest of Portland.

Demographic data over time suggests that people are moving from inner Portland to Lents and outer East Portland. Alongside this transition, comes increasing housing costs and land values. Lents residents spend more of their income on housing than the average Portlander. This is particularly significant because these increases cause communities of color and minorities to be pushed out of their neighborhood to other parts of the city.

Currently, 65.8% of Lents residents say driving alone is their primary mode of transportation. Compared to Portland's 7% bicycle mode split, only 3.7% of residents in Lents say that bicycling is their primary mode of transportation. Currently, 4.2% of Lents residents are walking as their primary mode. Residents that carpool as their primary mode is at 9.6%. Finally, only 8.3% of people living in Lents use transit as their primary mode. Car ownership in Lents averages to 2 automobiles per household. By any more, Lents residents commute an average of 25 minutes to work or school everyday.



LANGUAGES SPOKE AT HOME (2014)



PRIMARY TRANSPORTATION MODE (2014)

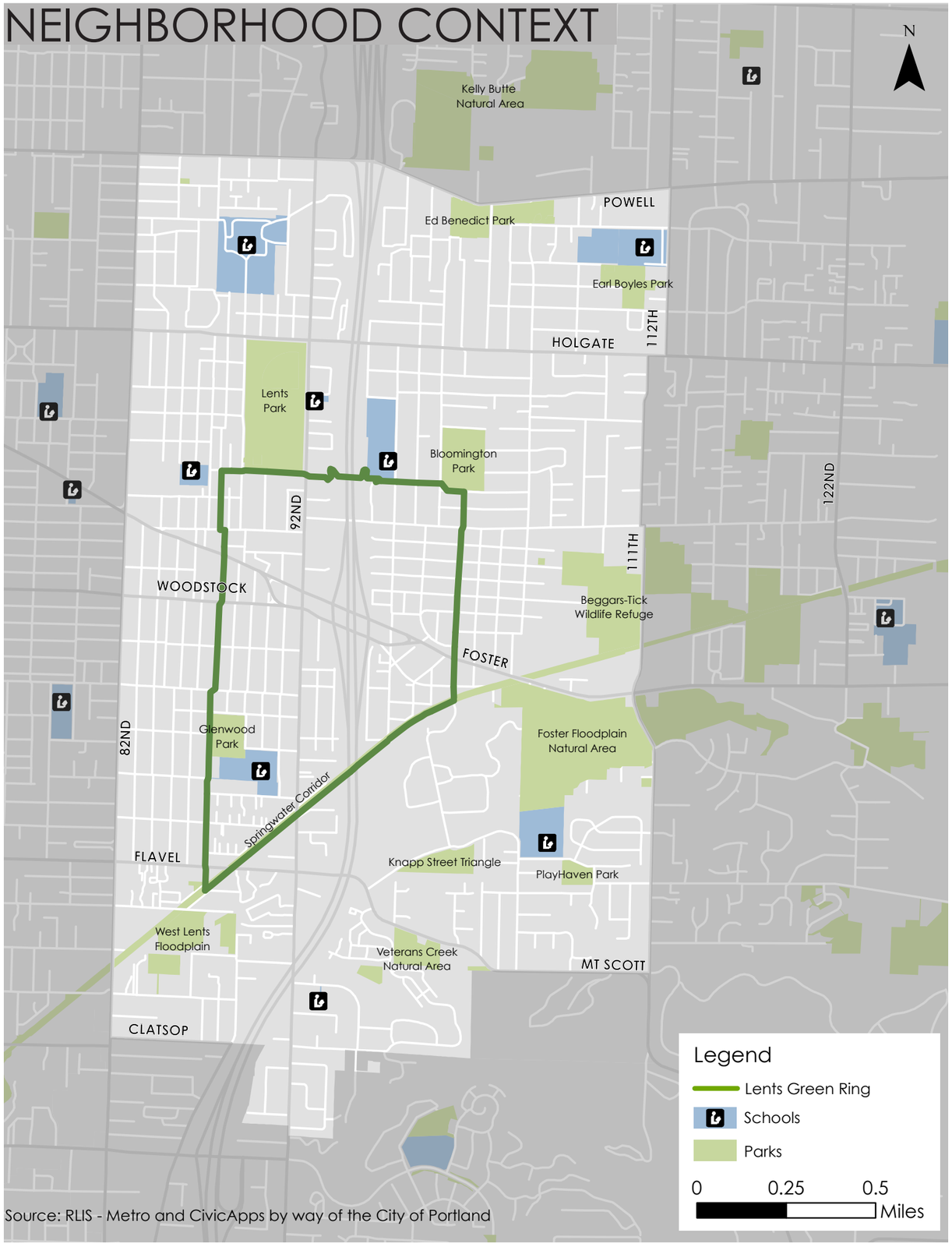
	Drive alone	Carpool		Bike	Walk
LENTS	65.8%	9.6%	8.3%	3.7%	4.2%
MONTAVILLA	61.4%	13.7%	12.2%	3.9%	3%
IRVINGTON	51.2%	8.3%	10%	10.6%	7.5%
CITY OF PORTLAND	58%	9.5%	11.9%	7.2%	5.7%

*Percentages do not add up to 100%.

COMMUTE TIME (2014)

On average, Lents residents *commute* 25 minutes.

NEIGHBORHOOD CONTEXT

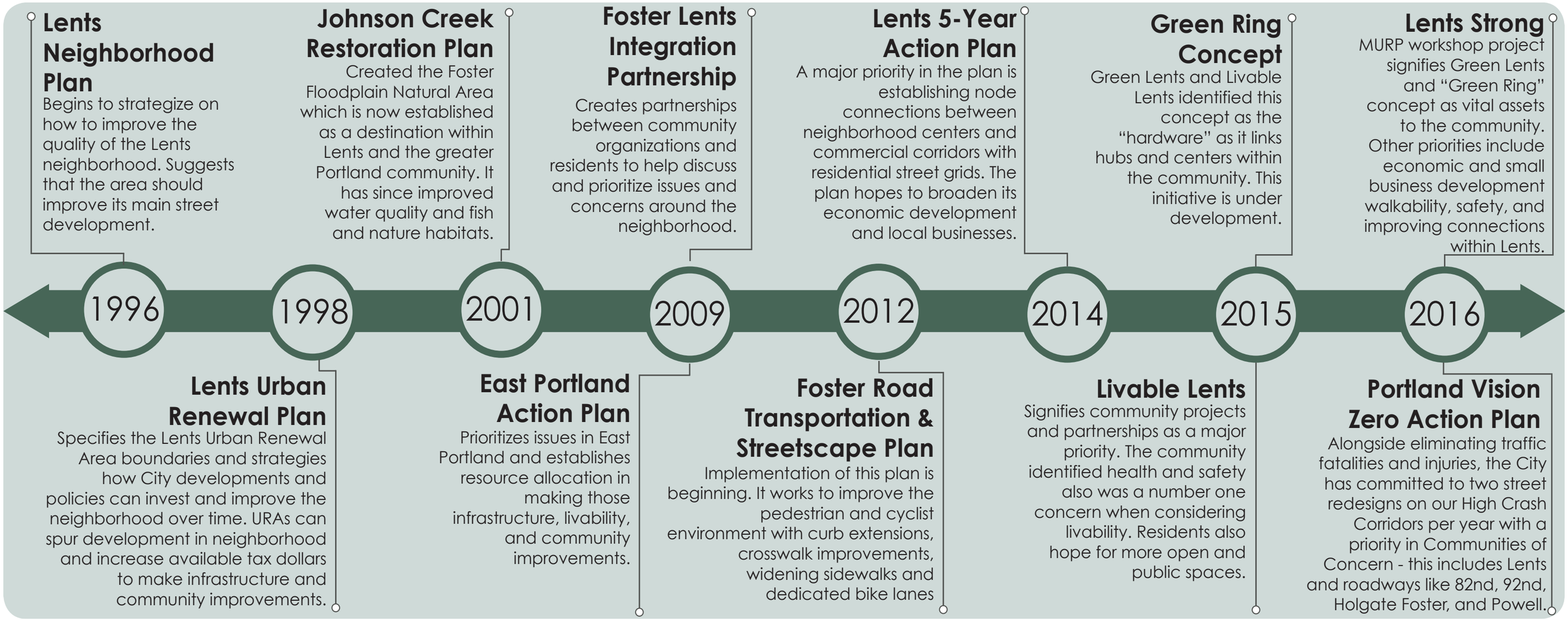


Source: RLIS - Metro and CivicApps by way of the City of Portland

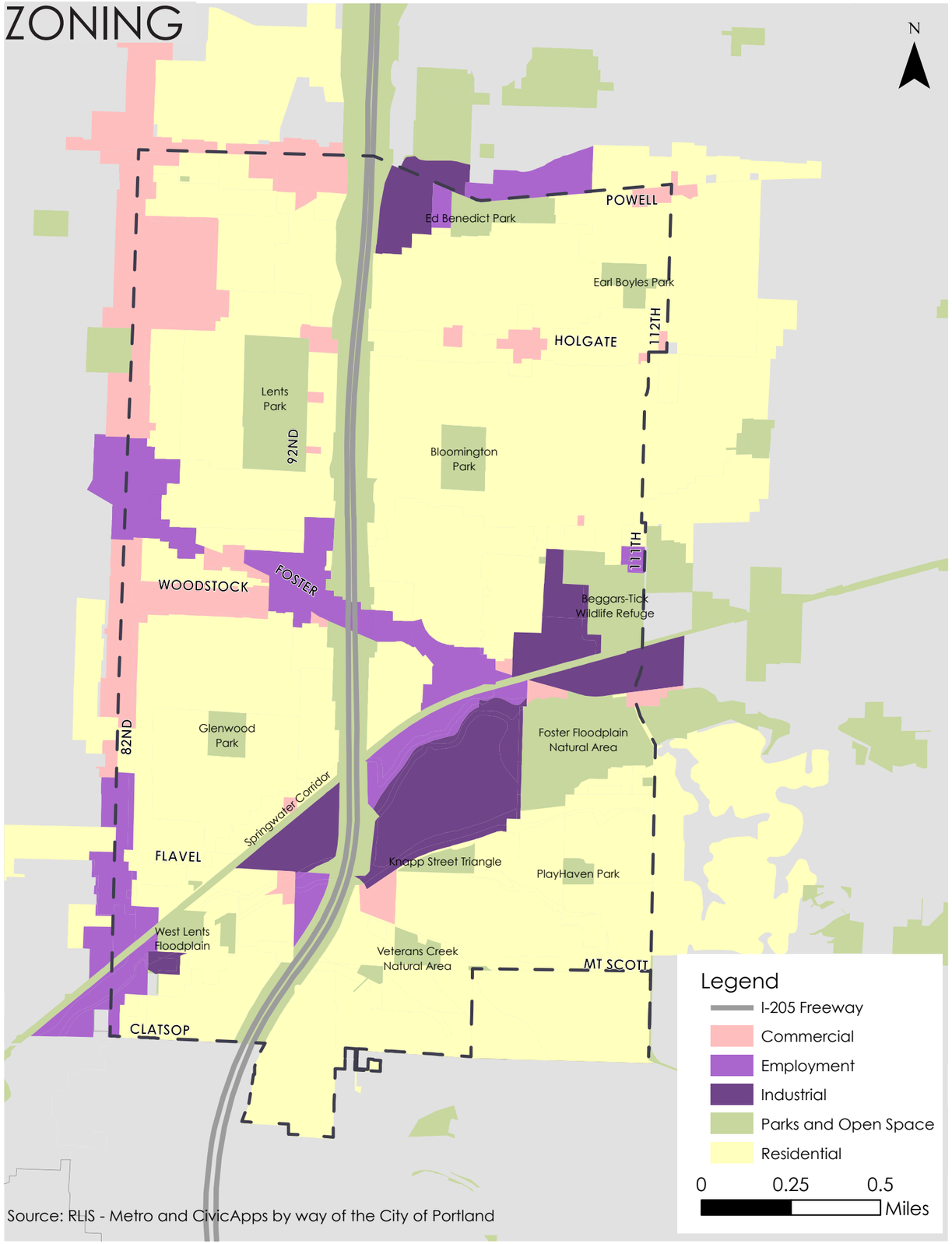
Data source: US Census and American Community Survey

PLANNING CONTEXT

Lents has been considered in several planning initiatives over the last 20 years. Since then several of these plans have been implemented and further community outreach has led to other projects and actions. In the same amount of time, Lents has diversified in several aspects like race, income, and travel preferences.



ZONING



Source: RLIS - Metro and CivicApps by way of the City of Portland

LAND USE CHARACTERISTICS

COMMERCIAL

Old Lents Town Center, SE 92nd and Foster, is expected to see an upgrade in the near future. Other streetscape improvements on SE Foster will encourage more businesses and redevelopment to occur here. Walmart and Fred Meyer are located conveniently off of 82nd Avenue. Just north is Eastport Plaza Mall offering a variety of restaurants and local businesses.

Render by PDC of the heart of Lents Town Center - 92nd & Foster

INDUSTRIAL & EMPLOYMENT

Walmart and Fred Meyer are major employers located within the neighborhood businesses. Lents also offers numerous auto-oriented industries like towing, parts, and trailers. With an Urban Renewal Area in place, Lents provides the opportunity for new businesses and employers to establish themselves and for Lents residents to compete for new jobs in the area.

Foster Automotive Outfitters - 83rd Avenu & Foster Road

RESIDENTIAL

Lents consists of a fairly consistent street grid making the neighborhood feel well connected. Lot sizes are a bit larger than inner Portland, offering more yard and open spaces. Many streets have speed humps to slow traffic, making the street more friendly for children and older adults, walkers, and cyclists. Housing in Lents is limited, but still relatively affordable.

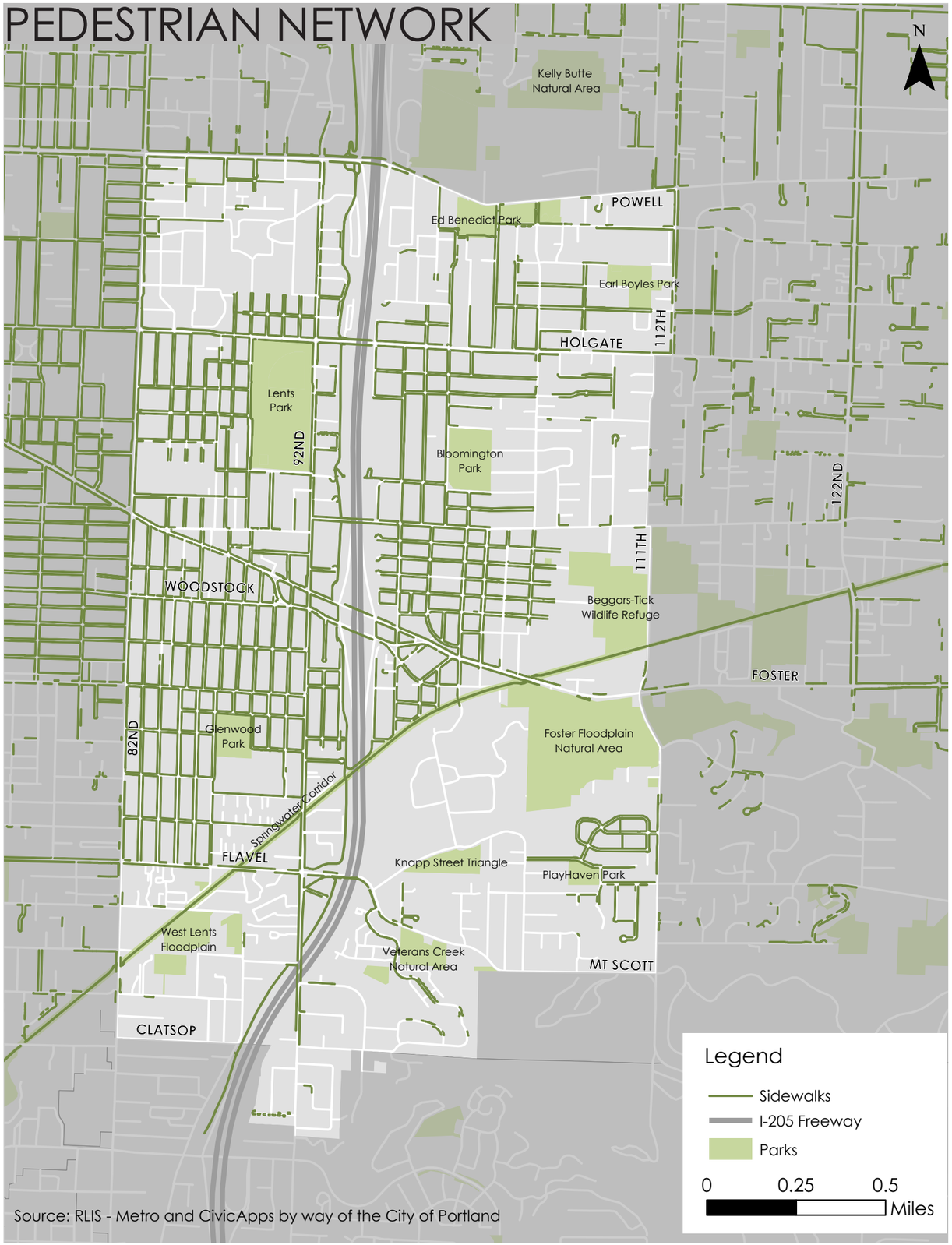
Typical 20mph residential street, bordered by Lents Park

OPEN SPACE

Residential areas are well connected with spacious open spaces and parks. Lents and Bloomington parks are home to Saturday soccer and baseball games. Springwater Corridor and I-205 Multi-use Path offer miles of off-street walking and biking. Johnson Creek and Foster Floodplain Natural Area were reclaimed in 2012 connecting the neighborhood to a beautiful natural area.

Signage directing the community to natural area at 103rd & Foster

PEDESTRIAN NETWORK



Source: RLIS - Metro and CivicApps by way of the City of Portland

SIDEWALK & CROSSWALK CONDITIONS

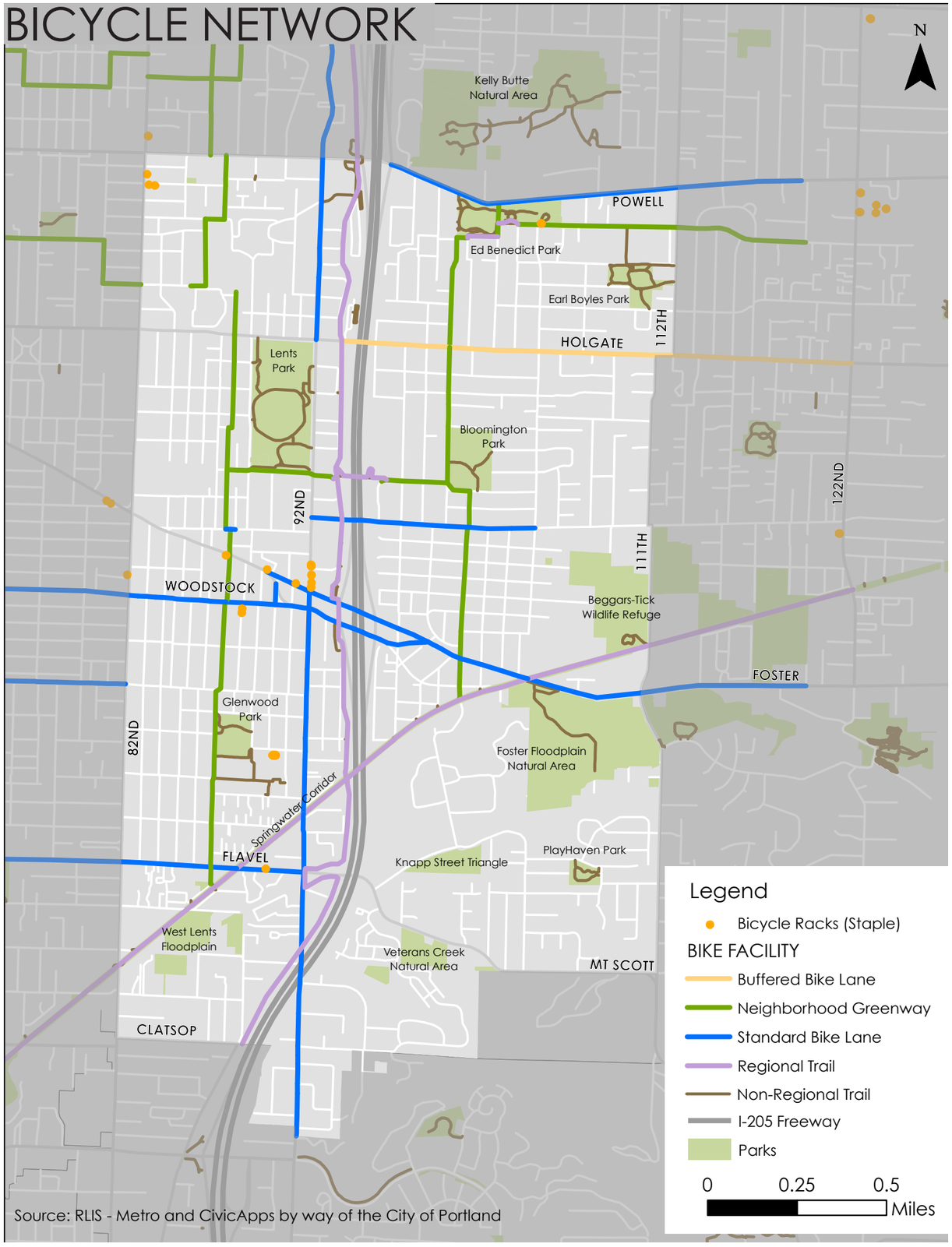
The Lent's neighborhood is really a neighborhood of haves and have-nots when it comes to sidewalks and pedestrian crossings. While much of the neighborhood west of I-205 has sidewalks (though certainly not all), the areas to the east are lacking, particularly in the northeast quadrant. Of particular note in this area is the lack of sidewalks running adjacent to Bloomington Park (sidewalks are across the street). Such a set up leaves people with disabilities unable to traverse the outside of the park, and rely only on a couple paths within. Additionally SE 104th Ave is another area with pedestrian constraints. There pedestrians have to walk alongside faster moving traffic in gravel.

Pedestrian crossings vary across the area. Along the I-205 path, for example, there appears to be adequate marked crossings, mostly with some form of median island refuge available. However, there are also plenty of issues. The crossing at SE 87th and SE Holgate, along the neighborhood greenway, has no marked crossings and only rudimentary pedestrian curb cuts. It also has limited visibility due to a steep hill to the west making the area unsafe overall.

Finally, walking in and out of the neighborhood is a challenge. With SE Powell Blvd. to the north, there are few options for signalized crossings. Those that are there take a while to activate and thus don't encourage walkability. SE 82nd is very much the same though with the added emphasis on there being a large commercial presence on the street thus facilitating a stronger need for better pedestrian access. Overall, the Lents neighborhood badly needs increased and enhanced pedestrian facilities.

Pedestrian experience on SE Foster Road and 80th Avenue. Mixed-use establishments include fruit market and other small businessess. Sidewalks are wide although offer minimal amentities like cover and frequent crossings.

BICYCLE NETWORK



BICYCLE ACTIVITY & CONDITIONS

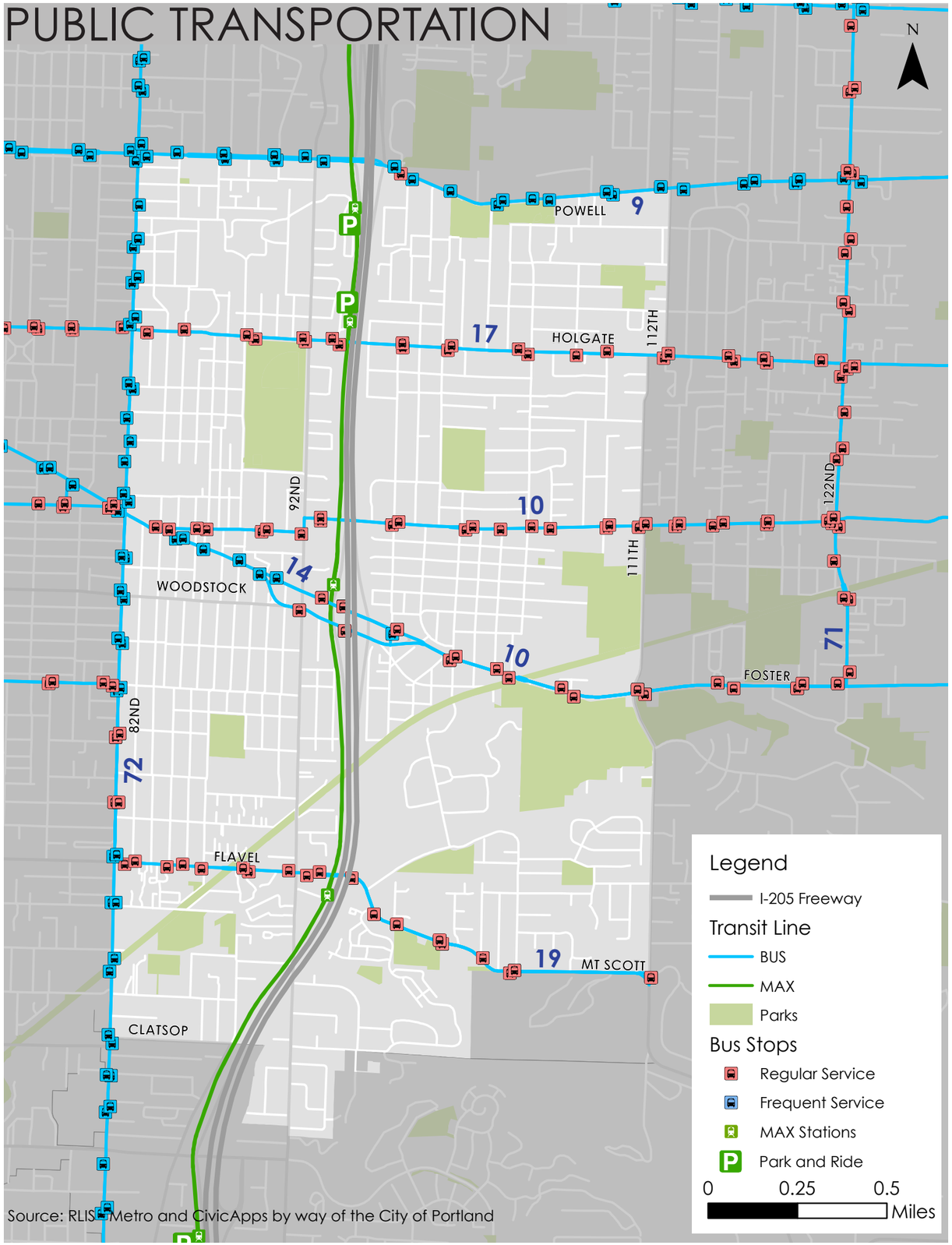
The bike infrastructure in the Lents neighborhood already has a good start. Its network of low-stress, neighborhood greenways is well-connected with other local residential streets, trails in parks, the I-205 Multi-Use Path, and the Springwater Corridor Trail. These neighborhood greenways can be found along SE 87th, 100th/101st Ave., Steele St., and Bush St.

Standard bike lanes are located along the arterials and major collectors on SE 92nd, Foster Rd., Woodstock Blvd., and Flavel St. A buffered bike lane along SE Holgate intersects the I-205 Multi-Use Path and extends to 122nd eastward.

The I-205 Multi-Use Path creates a continuous north-south spine and the Springwater Corridor works similarly for an east-west connection. One major barrier is the I-205 freeway, which limits the number of east-west connections. People riding can either take high volume arterials and major collectors with bike lanes (e.g., Powell Blvd., Foster Rd., Harold St., Woodstock Blvd., Holgate) or if they prefer something more low-stress, the designated bike and pedestrian facilities (e.g., Steele St. bike-ped bridge and Springwater Trail). Still, it is important to note that research shows people still prefer not to bike on higher volume roadways even with bikeways (Federal Highway Administration).

In terms of pavement quality, most of the roadways and trails are in fair to good condition. Some of the ramps and connections onto the paths could be formalized or improved to provide better access for bikes and people using mobility devices.

A cyclists uses the Steele St. neighborhood greenway next to Lents Park as an east-west connection.



TRANSIT ACCESSIBILITY

Each MAX station operates as a transit hub of sorts along the I-205 leg of the Green Line. The four MAX stations within the boundaries of the Lents neighborhood have immediate access to the I-205 Multi-Use Path as well as east-west bus routes. The Powell and Holgate stations are the only park and rides with 391 and 120 parking spaces respectively. These stops are also the shortest distance apart at 1/3 of a mile via the I-205 Multi-Use Path and the MAX.

The Powell Boulevard Station has the only direct connection with a frequent bus route. The #9 bus connects the Gresham transit center with the 5th/6th Avenue pedestrian mall via South Waterfront.

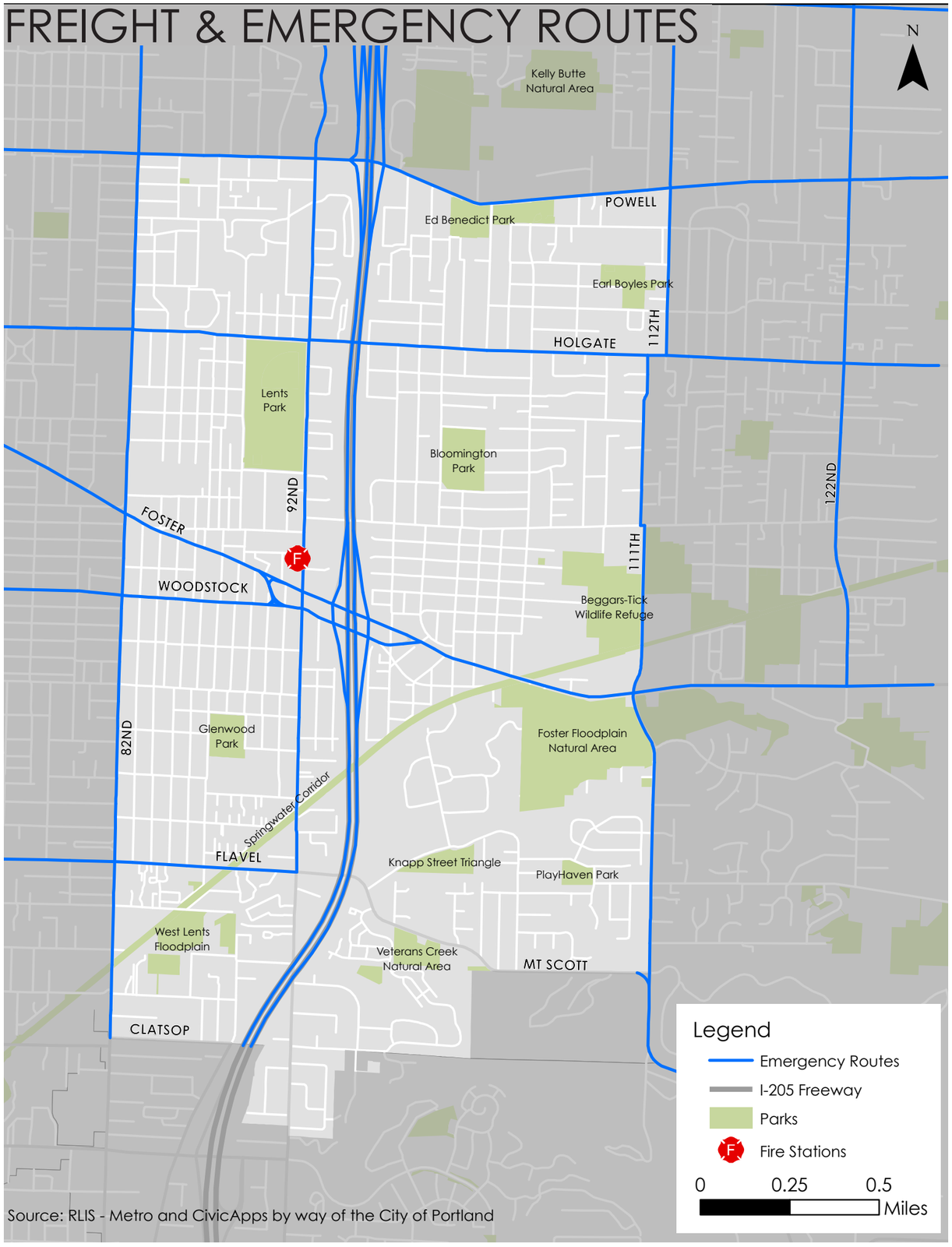
The #17 bus connects the Holgate Park and Ride with transit options east to 134th and Holgate. The western leg of the route terminates at NE 27th and Saratoga with stops at South Waterfront, Pioneer Square and the NW District. Lents Town Center/ Foster Road MAX stop is within one block of the #10 bus connecting Lents Town Center with Portland City Center during weekdays. Two blocks west it connects with the #14 route, which is a designated frequent bus route into Portland City Center through the Hawthorne corridor.

The #19 bus connects Lents Town Center with the Gateway TC via Portland City Center. Access to this route is available at the Flavel Street stop as well as the Green Ring portion of the Springwater Trail.

All east-west routes through Lents cross 82nd Avenue and connections can be made north-south on the #72 bus along 82nd.

Minimal bike parking is available at the 4 MAX Stations in Lents. Bike lockers range from 8 to 10 spots at the MAX stops. Lockers are available on a reservation basis, and currently all stops have available space. Locker rentals are $25 for a six-month period. There are currently no first come, first serve lockers.

Powell MAX Green Light Rail Stop on a sunny, Saturday afternoon.



ACCESSIBILITY & CONFLICTS

The Lents neighborhood has a number of emergency routes running through it. These routes run along the primary arterial routes as well as I-205. In addition to emergency routes, SE Powell Blvd. I-205, and SE Foster Rd. east of I-205 are freight routes through the neighborhood.

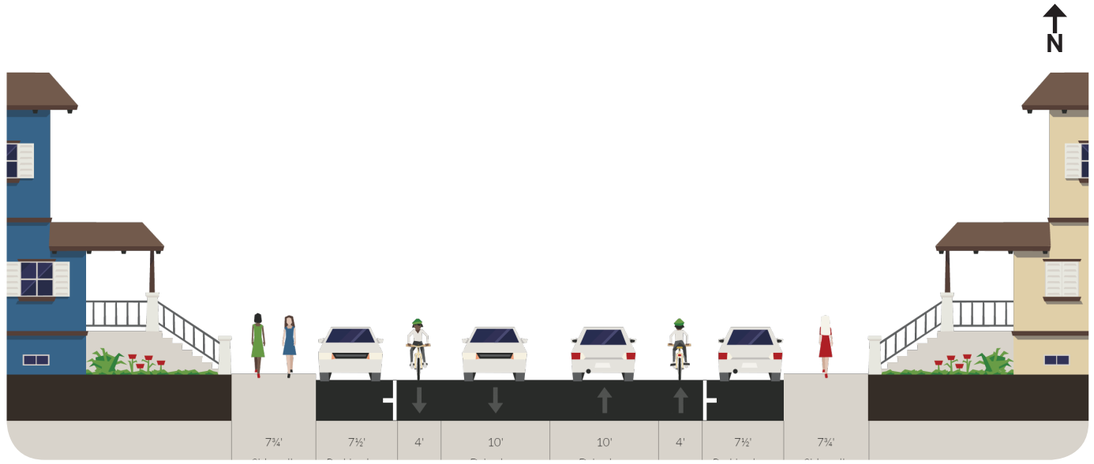
Because of these routes, particularly along the arterials, it will be uniquely challenging to propose any long term streetscaping or developments along these corridors. Closing them down even temporarily will propose a challenge for event organizers.

I-205 serves as an important freight and emergency route bisecting the Lents neighborhood.

SE Foster Rd is also a primary emergency route that bisects the neighborhood north and south, with some minor freight connections.

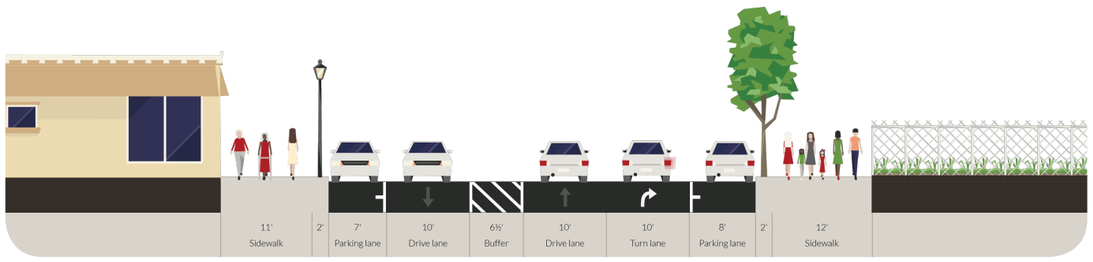
STREET CROSS SECTIONS

SE 92nd Avenue South of Foster Road



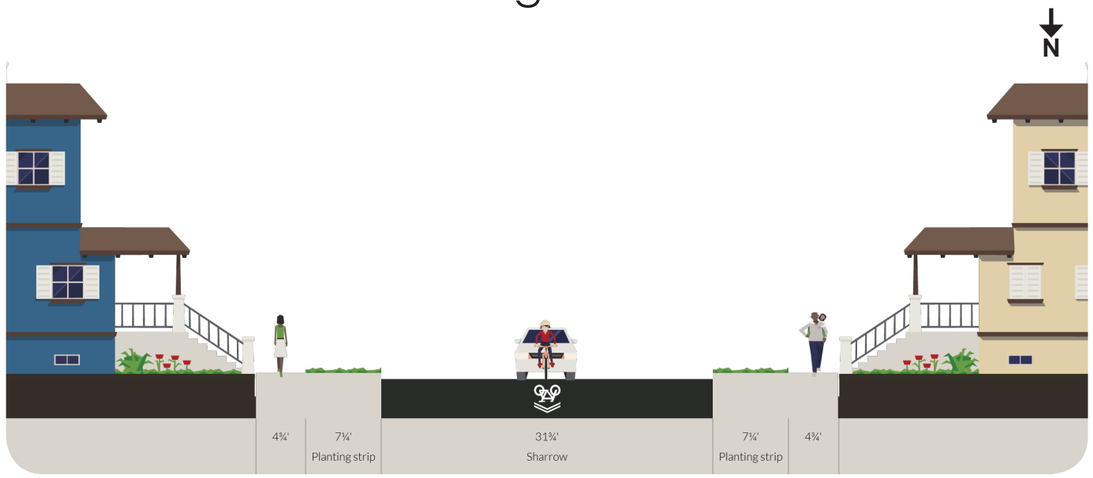
This is a representation of 92nd Avenue both north and south of the Lents Town Center. It is also fairly representative of the other major collector roads in Lents, such as Woodstock and Harold. Notably parking is buffered by relatively narrow bike lanes. Travel lanes with a speed limit of 35mph are abutted directly to the bike lanes. A mix of residential and commercial uses are found along these streets and most have off-street parking adding another layer of complexity at driveways for cyclists and pedestrians using 92nd Avenue. Sightlines for people leaving the off-street parking or turning onto Foster can become obstructed by the parking lanes.

SE 92nd and Lents Town Center



The layout of 92nd Avenue changes significantly as it approaches the Town Center from the north. Approaching from the south, the bike lane disappears without warning as 92nd crosses Woodstock and Foster Road to make way for right turn lanes, bus stops, and higher traffic volumes turning onto Foster.

SE 101st Avenue and Holgate Boulevard



The streets making up the north-south legs of the Green Ring share this common layout. These are lower volume residential streets without centerlines. Two-way auto traffic and bikes share the roadway. They are designated as neighborhood greenways with daily traffic counts less than 1,500 ADT. They have a pleasant neighborhood feeling to them and traffic is kept relatively calm by speed tables but, there is of course always room for improvement.

*Cross sections are representative of existing conditions, but are not draw to scale.

EXISTING TRAFFIC

Signalized crossing at 87th neighborhood greenway and Foster Rd (~24,000 ADT)

On Holgate Blvd (~15,000 ADT) to the east of 92nd the speed limit increases from 30 mph to 35 mph.

TABLE 1. TRAFFIC COUNTS ANALYSIS

Street	Cross-Street	Average Daily Traffic	Posted Speed (mph)	85th Percentile Speed (mph)	Percent Vehicles Over Posted Speed (%)	Bike Facility	On Green Ring?
SE 82nd	Insley St	26,521	35	-	-	None	No
SE Foster Rd	82nd Ave	24,436	35	-	-	Proposed bike lanes	No
SE Powell Blvd	118th Ave	17,874	35	-	-	Shoulder bike lane	No
SE Holgate Blvd	87th Ave	15,109	30	35.5	58.4	None, crossing with 87th neighborhood greenway	No
SE 92nd Ave	Foster Rd	12,056	25	-	-	None	No
SE 92nd Ave	Holgate Blvd	10,826	35	-	-	None	No
SE Woodstock Blvd	87th Ave	9,385	35	36	17.5	Bike lane	Crossing
SE 104th Ave	Pardee St	2,479	25	27	28.1	None	No
SE Steele St	89th Ave	925	25	26.5	20.5	Shared roadway (sharrows)	Yes
SE 100th Ave	Cora St	406	25	25	13.8	Neighborhood greenway	No
SE 87th Ave	Duke St	256	25	21.5	2.7	Neighborhood greenway	Yes

*This location is not within Lents, but is the closest available count through PBOT.
Source: Portland Bureau of Transportation (PBOT) Traffic Counts, 2011-2016

Higher traffic volumes of 17,000+ ADT are observed on SE 82nd Avenue, Powell Boulevard, and Foster Road (Table 1). Traffic speed data indicates that 58% of vehicles on SE Holgate Boulevard (~15,000 ADT) travel over the posted speed limit of 30 mph. As a major collector going through Lents Town Center, 92nd Avenue has traffic volumes between 10,000-12,000 ADT.

At rush hour long queues form at the intersection at 92nd and Foster Road. Local residential streets in Lents have lower traffic volumes (<2000 ADT). The 87th Avenue and 100th/100st Avenue neighborhood greenways have very low traffic volumes (<500 ADT) and 85th percentile speeds comparable or less than the posted speed limits (20-25 mph).

LEVEL OF TRAFFIC STRESS ANALYSIS

Level of Traffic Stress (LTS) is one metric for determining how comfortable a roadway segment or intersection is for bicycling. The lower the LTS, the easier it is to navigate for people of all ages and abilities. In LTS analysis, the weakest link in a route (i.e., the link with the highest LTS) determines overall LTS for that route (Mekuria, Furth, and Nixon 2012).

- **LTS 1:** Strong separation from all except low speed, low volume traffic. Simple crossings. Suitable for children.

- **LTS 2:** Except in low speed / low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Physical separation from higher speed and multi-lane traffic. Crossings that are easy for an adult to negotiate. Corresponds to design criteria for Dutch bicycle route facilities. A level of traffic stress that most adults can tolerate, particularly those sometimes classified as "interested but concerned."

- **LTS 3:** Involves interaction with moderate speed or multi-lane traffic, or close proximity to higher speed traffic. A level of traffic stress acceptable to those classified as "enthused and confident."

- **LTS 4:** Involves interaction with higher speed traffic or close proximity to high speed traffic. A level of stress acceptable only to those classified as "strong and fearless.

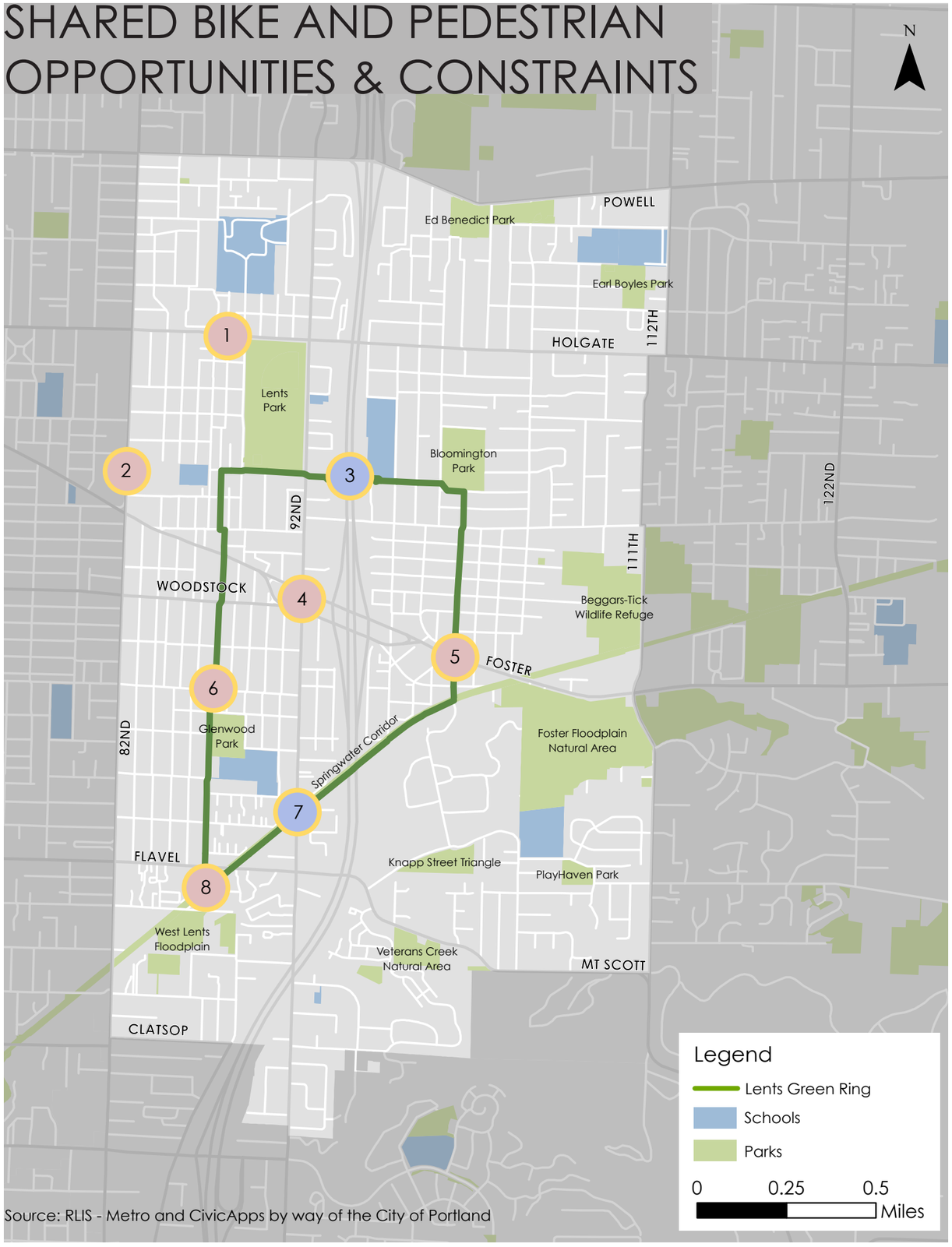
In Lents, the high volume arterials without continuous bike facilities are rated LTS 4 (e.g., 82nd Ave. and Foster Rd.), while neighborhood greenways provide LTS 1 or 2 routes. For where the Green Ring crosses arterials and major collectors, the LTS analysis showed acceptable, low levels of traffic stress for most crossings (Table 2). For unsignalized crossings, streets with 2-3 lanes, median refuges, and lower speed limits scored LTS 1. Still, while the presence of a traffic signal at intersections with Foster are rated as LTS 1, the length of these crossings and proximity to high volumes of fast-moving traffic do not necessarily make them pleasant to wait near or cross, especially for children.

TABLE 2. LEVEL OF TRAFFIC STRESS ANALYSIS FOR GREEN RING CROSSINGS

Street	Cross-Street	Average Daily Traffic	Speed Limit	Number of Lanes	Signalized Crossing	Median Refuge	LTS for Crossings
SE 92nd Ave	Springwater Corridor	12,827	35	2	No	Yes	LTS 2
SE Woodstock Blvd	87th Ave	9,385	35	2	No	No	LTS 2
SE Foster Rd	101st Ave	24,436	35	5	Yes	No	LTS 1
SE Foster Rd	87th Ave	22,789	30	4	Yes	No	LTS 1
SE 92nd Ave	Steele St	12,056	25	2	No	Yes	LTS 1
SE Flavel St	Springwater Corridor	7,888	30	2	No	Yes	LTS 1
SE Flavel St	87th Ave	7,888	30	2	No	Yes	LTS 1
SE Harold St	101st Ave	6,117	30	2	No	Yes	LTS 1
SE Duke St	87th Ave	2,336	25	2	No	No	LTS 1
SE Ellis St	87th Ave	1,979	25	2	No	No	LTS 1

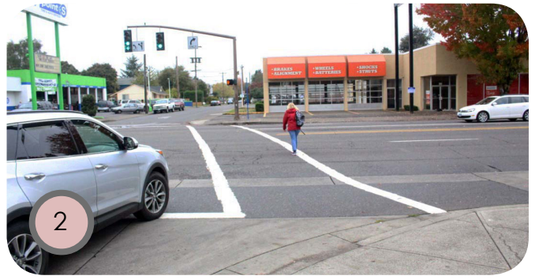
Source: Portland Bureau of Transportation (PBOT) Traffic Counts, 2011-2016

SHARED BIKE AND PEDESTRIAN OPPORTUNITIES & CONSTRAINTS



Source: RLIS - Metro and CivicApps by way of the City of Portland

No marked/signalized crossing at Holgate (~15,000 ADT) and 87th Ave and the crest of the hill on Holgate also reduces sightlines.



82nd is auto-oriented with large setback parking lots with narrow sidewalks and limited bike and pedestrian connections from residential areas.

The Steele St bike-ped bridge provides a low-stress, east-west connection between residential areas, Lents Park, and Oliver Lent School.

In the Lents Town Center at 92nd Ave., bikes and pedestrians experience difficulty crossing higher volume roadways on Woodstock, Foster, and 92nd.

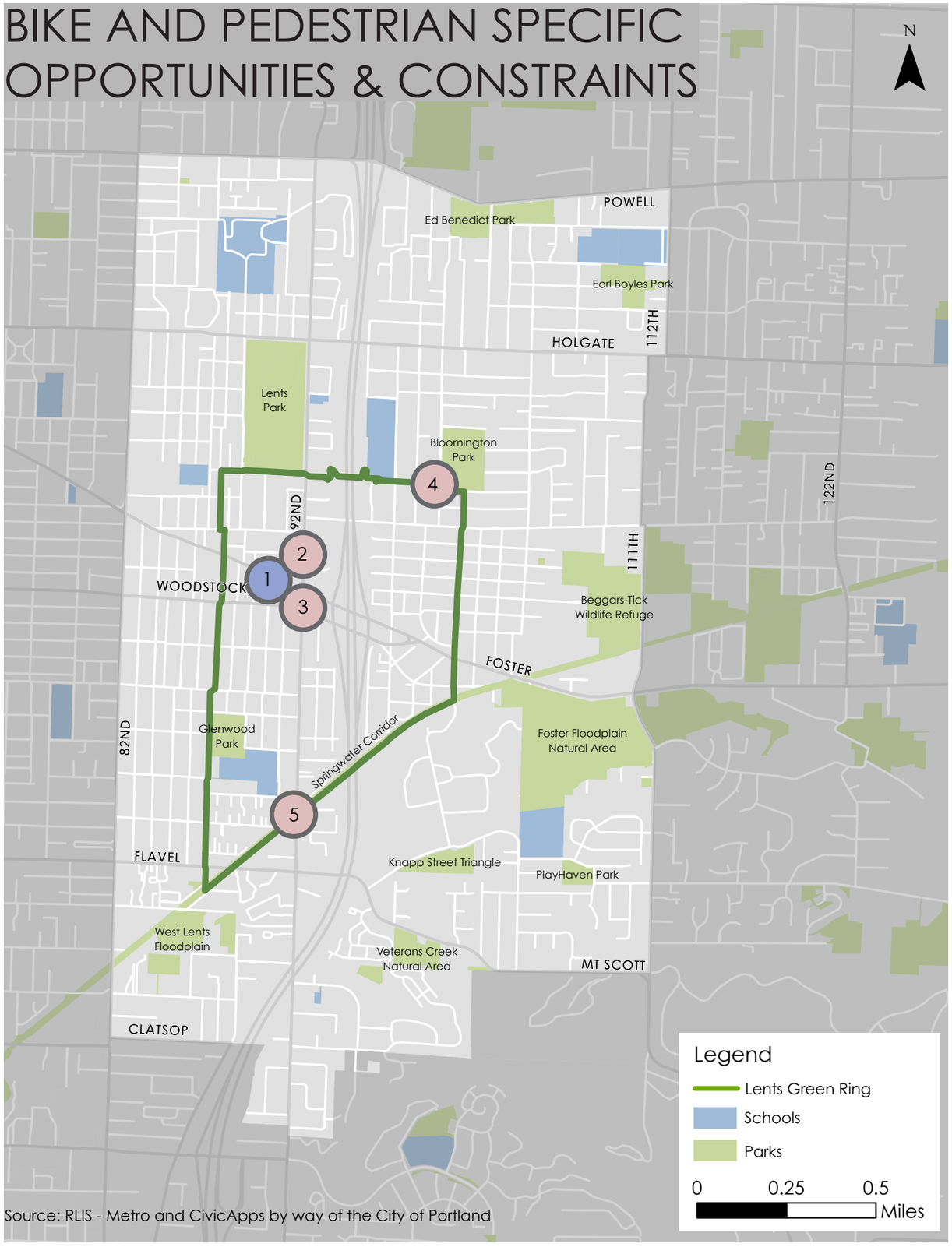
Long crossing distance and waiting times at Foster in order to connect to the Springwater Corridor from the 100th/101st neighborhood greenway.

Difficult crossings on 87th and jogs in the route are weak links along this otherwise low-stress neighborhood greenway.

Lents has strong connections to the Springwater Corridor and I-205 Multi-Use Path. More formal connections could be made to both paths.

At the southwest corner of the Green Ring, a cow path connects the Springwater Corridor and SE Malden Ct., an unimproved street.

BIKE AND PEDESTRIAN SPECIFIC OPPORTUNITIES & CONSTRAINTS



Source: RLIS - Metro and CivicApps by way of the City of Portland

Red painted one-way cycle track near Foster/Woodstock east-side connection.

The bike lanes on 92nd do not connect through the Town Center between Holgate and Woodstock. Instead, they are replaced with a wide shoulder with no shared lane markings or signs.

The narrow (~3.5-4 ft) bike lane on 92nd Ave. (~12,000 ADT) going northbound ends just prior to intersection with Woodstock Blvd. to create a right-hand turn lane for motor vehicles. No signs indicate that the bike lane will end or that bikes will be mixing with auto traffic.

No sidewalks on SE 100th neighborhood greenway near Bloomington Park.

Some local residents have voiced safety concerns regarding the Springwater Corridor, especially around the recently removed homeless encampments.

WORKING TOWARD THE GREEN RING

Lents has drawn an enormous amount of attention over the last 5 years. Green Lents is a small, non profit community organization working to improve the neighborhood and create a welcoming and safe place for people to live. One of their latest projects includes the Green Ring bikeway loop on various residential and neighborhood greenways. We hope to expand on this idea while providing a base for creative tactics and strategies for bicycle and pedestrian design.

Lents has a lot of amenities already to build off of and the future SE Foster Road Streetscape Plan will build off that. What it lacks most, at this point, is key safety connections at various intersections and as well as proper pedestrian facilities such as sidewalks and crosswalks around the neighborhood. With primary focus on crossings and intersections in and around the Green Ring, Lents should see an increase in use and ridership among its youth and other residents.

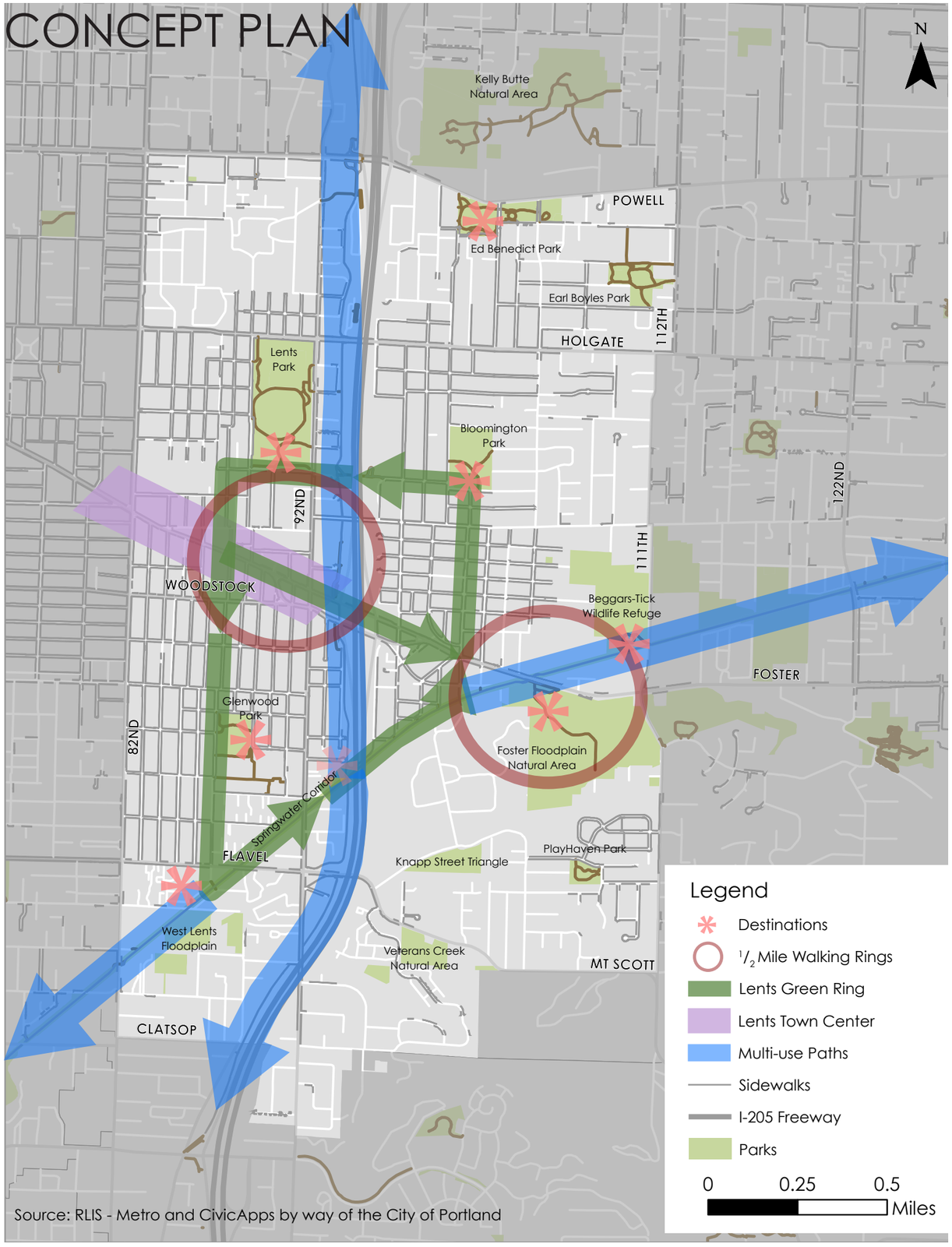
Green Lents

Better Block PDX

OREGON Walkways

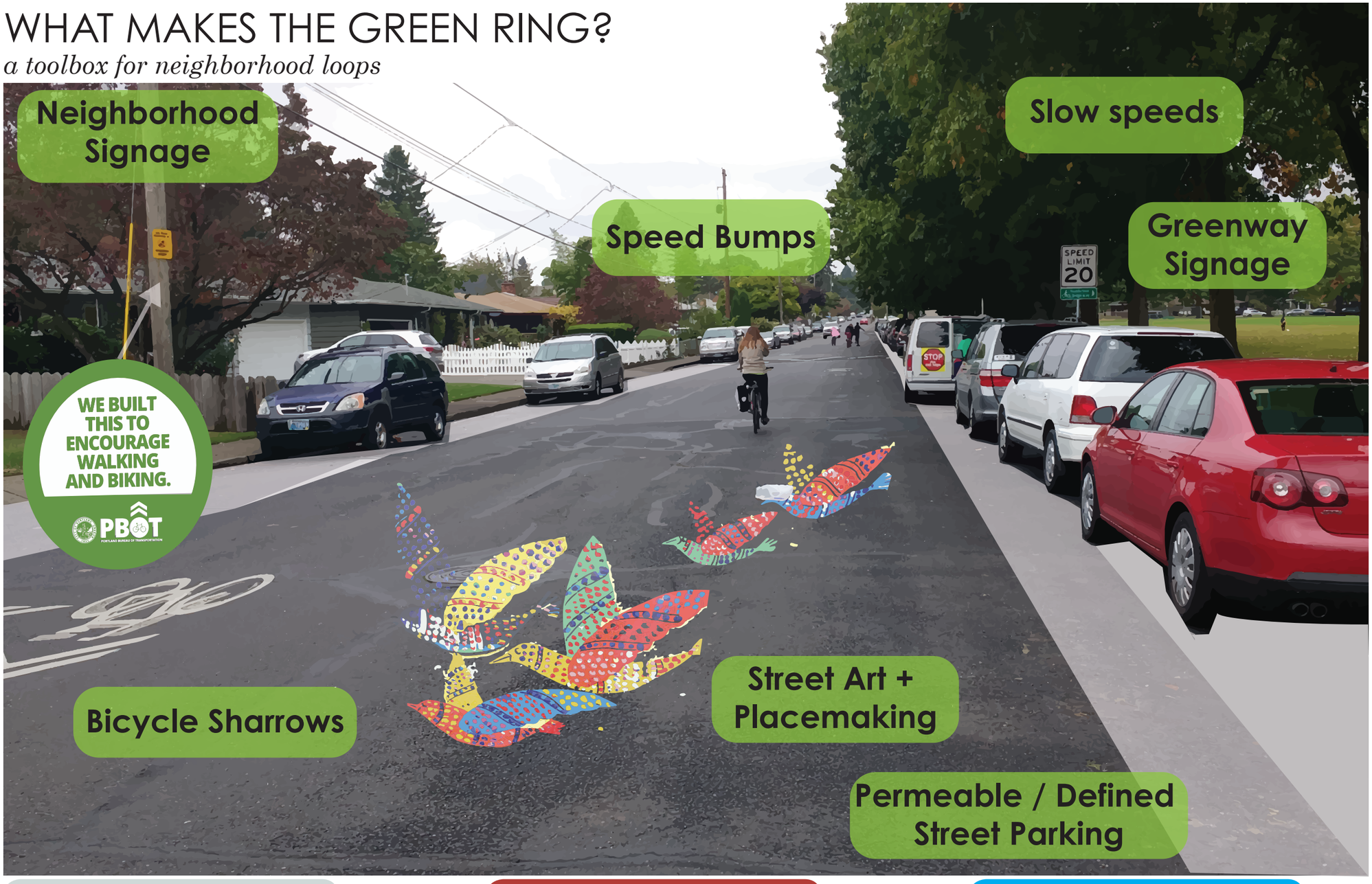
- Working with Oregon Walks and Better Blocks PDX, our aim is to identify areas where an event can successfully be held on a pedestrian scale. The green ring as is today is too large.
- Using the Green Ring and the I-205 Multi-Use Path as a spine of the neighborhood, we aim to find a series of connections to trip generators and primary locations and ensure that there are the appropriate safety facilities to make these connections possible.
- Develop potential mini-rings within the Green Ring to create a true pedestrian district within the neighborhood.
- Create connections to outside of the neighborhood beyond the Springwater Corridor and I-205 Trail that will give cyclists in the neighborhood a better cycling network.

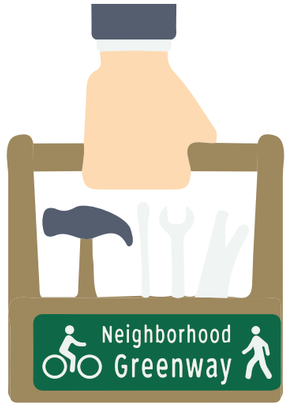
CONCEPT PLAN



WHAT MAKES THE GREEN RING?

a toolbox for neighborhood loops





GREEN!

Highlight vegetation and scenery along the ring, when available use bioswales and rain gardens. Permeable parking defines area where the driver should park as well as decrease impermeable surfaces.

SHARED!

Traffic speeds should be 20 mph or less. This gives children and older adults the opportunity to take over the street.

VIBRANT!

You should want to play and spend time on these green rings. The should be exciting and creative spaces for all people.

COMMUNITY DRIVEN!

Projects should be championed by community members and residents. Organizations like City Reair, Better Block and Oregon Walks can help facilitate these efforts.

FUN + ACTIVE!

Green rings should be full of children, families, commuters, and older adults enjoying the space together, as a unified, diverse community.

FOSTER CREATIVITY!

Street art and community projects like patios and benches or free libraries create a fun and innovative environment for people.

INVITING + SAFE!

Lighting and eyes on the street making the ring feel safe and comfortable. Street art and murals can act as your eyes in less residential or active places.

RECOMMENDED BEST PRACTICES

Raised Crossings

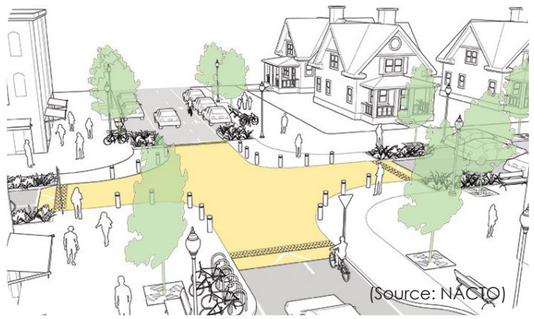
(Source: NACTO)

(Source: FHWA)

Raised trail crossing for the Burke-Gilman Trail, Seattle WA

Raised crossings require drivers to slow down and increase yielding behavior. Because the crossing is at grade with the sidewalk, priority is usually given to pedestrians and bicyclists.

Raised Intersections


(Source: NACTO)

Cambridge, MA

Raised intersections encourage motorists to travel at slow speeds and yield to pedestrians at crosswalks.

Green Infrastructure


SE Belmont St., Portland OR

Yates St., Victoria BC

Bioswales and planters that help mitigate stormwater runoff can also be used to create protected bike lanes or curb extensions at crosswalks.

Crosswalks and ADA Upgrades


(Source: Ennis Flint)


(Source: SDOT)

High visibility crosswalks provide clear visual cues for motorists. Adding bright yellow, tactile ADA strips and clear edges help visually impaired users.

Pedestrian Safety Islands


(Source: NACTO, NYCDOT)
New York City


Ann Arbor, MI

Pedestrian safety islands reduce crossing distances by allowing pedestrians or bicyclists to cross one lane of traffic at a time.

Protected Bike Lanes

Two-way protected bikeway, New York City

Telegraph protected bikeway pop-up event, Oakland CA

Protected bike lanes are created through vertical separation, including parking, flex posts, planters, curbs, or raised bike lanes.

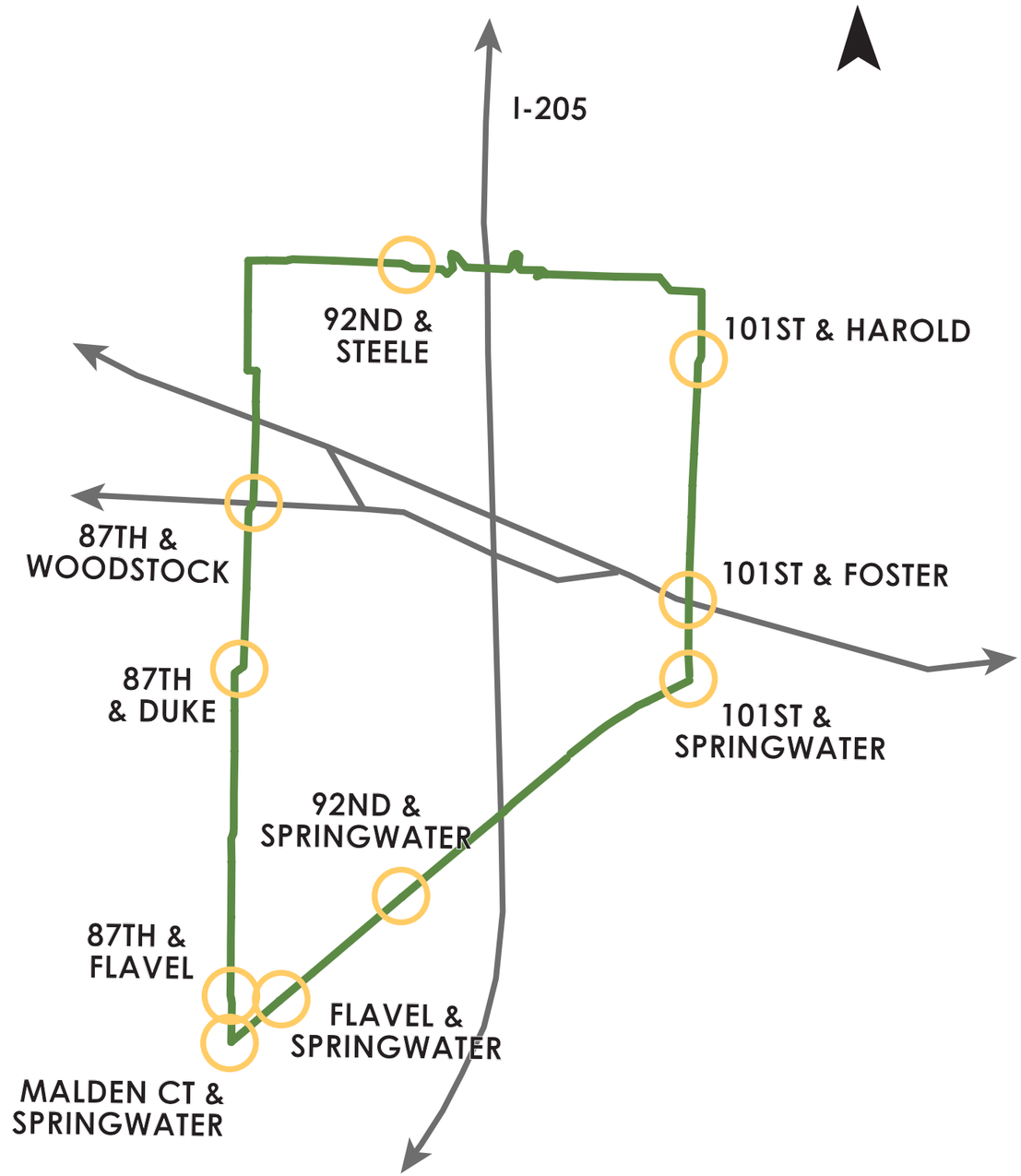
PROJECT IMPROVEMENTS LIST

TABLE 3.

Intersection	Project Improvements
101st & Foster Rd.	HIGH: take eastbound turn lane away on Foster, create bus boarding island on Foster, create pedestrian safety island on 101st with a bioswale and pass through for bikes, corner island to prevent right-hooks for eastbound bicyclists on Foster, ADA tactile strips LOW: raised intersection, increased crossing times
101st & Harold St	HIGH: raised intersection [behind pedestrian island] LOW: add crossbikes, signage, green paint for bike lanes
101st & Springwater Corridor	raised crossing, add lighting, add crossbikes
87th & Duke St.	jog cycle track on south side of Duke St., bioswale pinch point for cycle track, move crossing east and add pedestrian bulb out with bioswale
87th & Flavel	HIGH: raised intersection LOW: add crossbikes
87th & Woodstock Blvd.	protected bike lanes on Woodstock using parking and bioswales, trade two parking spaces for bicyclist turn queue boxes on Woodstock and crossbikes to 87th
92nd & Springwater Corridor	raised crossing, rapid flash beacon, bulb extension and signage on Knapp, lighting along Springwater Corridor
92nd & Steele St.	add sidewalks on Steele St., raised intersection, restricting left turn from 92nd on to Steele (eastbound), extending the pedestrian safety island to create left turn refuge for bikes, remove buffer on 92nd and extend for pedestrian safety island, add pedestrian crosswalk on north side of intersection
Flavel & Springwater Corridor	raised crossing, lighting along Springwater Corridor, add stop sign on Flavel St.
SE Malden Ct & Springwater Corridor*	pave the roadway, add sidewalks on Malden Ct., and make the connection to the Springwater Corridor, lighting along Springwater Corridor

*This project is detailed in a PSU Engineering Capstone project and thus was not a focus for this plan.

Segment	Project Improvements
Steele Street from 92nd Ave to I-205 MUP	fix potholes or repave, sidewalks, street trees, bioswales
Steele Street Pedestrian/Bike Bridge	beautification
Springwater Corridor	lighting
101st from Foster Rd to Springwater Corridor	road pavement, buffer painting, drainage



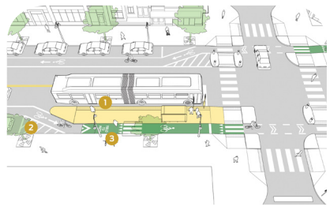
101ST AVENUE AND FOSTER ROAD

View of Foster Rd looking east across 5 lanes of vehicle traffic

Bird's eye view of 101st Ave. and Foster Rd. (Source: GoogleMaps)

Existing

Foster Rd. is a 5-lane arterial with standard bike lanes (~5') with heavy auto traffic (~24,000 ADT) and a 35 mph speed limit. Where the 100th/101st Ave. neighborhood greenway interests Foster Rd., bikes and pedestrians experience long wait times and long crossing distances (~70-75') at the traffic signal. A standard bus stop is located at the southwest corner.



Bus loading island with protected bike lane in San Francisco (Source: NACTO)

Pedestrian safety island that allows for through bikes, but diverts car traffic (Source: NACTO)

Left turn bike queue box (Source: BikePortland)

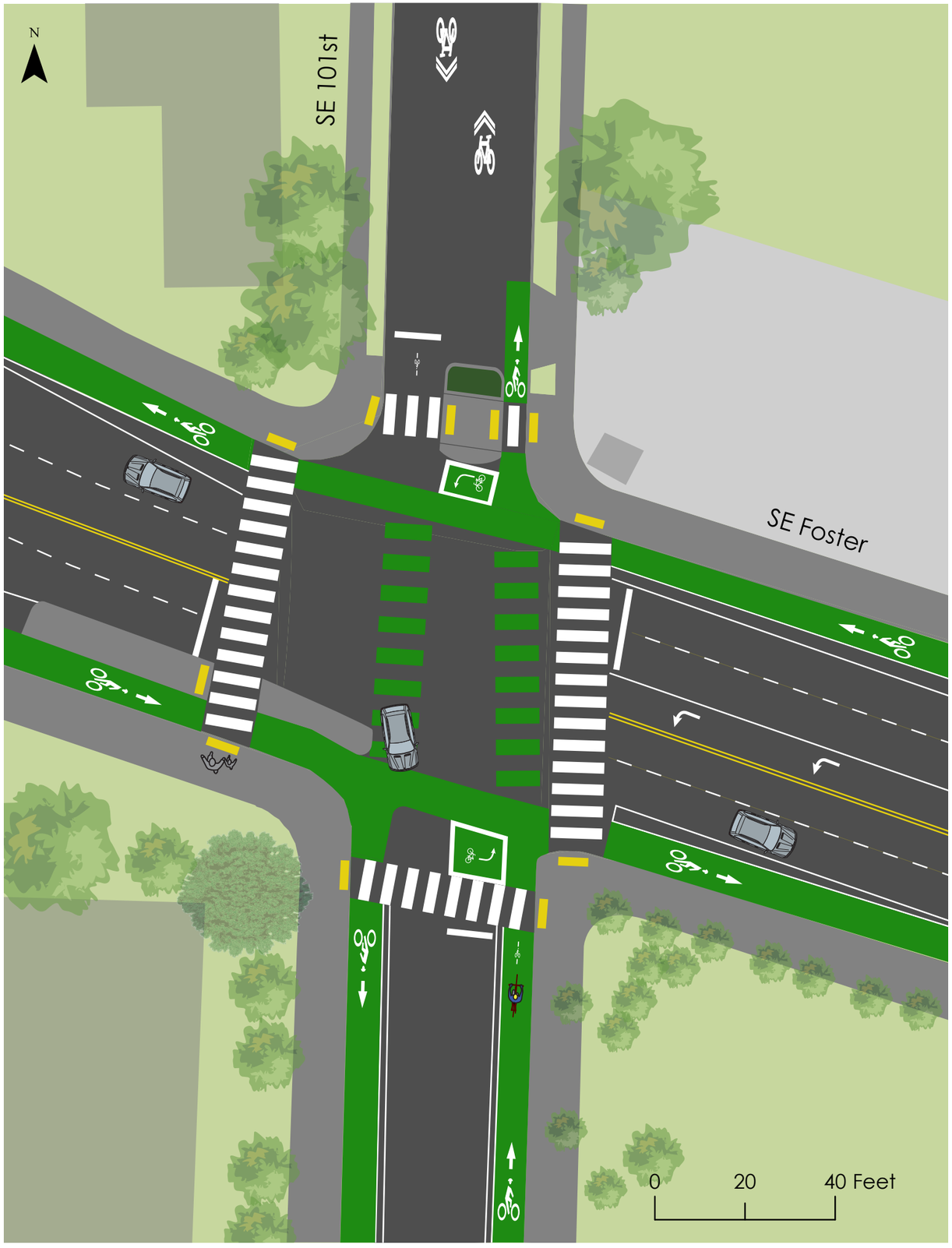
Recommendations

Remove the middle turn lane on the west leg of the intersection on Foster Rd. Using this space, add a bus loading island with a protected bike lane on Foster going eastbound and a corner island at the intersection to protect cyclists from right-hook conflicts. By setting back the crosswalks, space is created for left turn queue boxes for bikes on Foster Rd. On the north leg of the intersection, a pedestrian safety island restricts turning movements for cars off of Foster Rd. going northbound on 101st Ave., but allows for bikes to pass. The driveway next to the coffee cart on 101st is reduced from 35' to 25' to build the proposed pedestrian island with a small bioswale. Increase crossing signal time for pedestrians.

Foster Rd. Dimensions

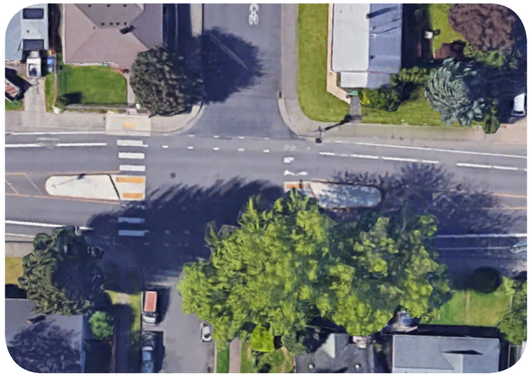
Total Width: 70-75'

Travel Lanes: 10.5' each
Bus Island Width: 10'
Buffered/Protected Bike Lanes: 8' including at least a 1' buffer



101ST STREET AND HAROLD STREET

View of Harold St looking east toward a median pedestrian island.



Bird's eye view of the current intersection(Source: GoogleMaps)

Existing

SE Harold St is a two-lane (1+1) road with medium daily automobile traffic (~6,117 ADT). It has a 5' bike lane on both the north and south side of the road which is aided by median islands that act as a traffic calming device. SE 101st is part of the Lents Green Ring and Portland's Neighborhood Greenway network. Pedestrians have the median islands to cross, though the paint is fading, but bicyclists have fewer amenities.

Raised intersections allow for shared space.
(Source: NACTO)

Cross bikes in Portland give a further visual cue to drivers to be aware.
(Source: BikePortland)

Simple signage reinforces other elements of the crossing.
(Source: BicycleTuscon)

Recommendations

Raise the entire intersection beginning from the far ends of the median islands on SE Harold St as well as a bit along SE 101st St. This would further emphasize the crossing as a slow-down area that's already being reinforced by the traffic calming of the median islands. Install new cross bikes nearer to the center of the intersection to give a further visual element to automobiles that cyclists cross there. Repaint the crosswalks that are fading. Add signage for automobiles to inform them of the crossing. Consider adding a stop sign for cars on SE Harold St. to give pedestrians and cyclists the right of way.

Current Harold St. Dimensions

Total Width: 45' Travel Lanes: 10.5' each
Bike Lanes: 5'

87TH AVENUE AND FLAVEL STREET

View of 87th Ave looking North from the median island on Flavel.

Bird's eye view of 1the current conditions of the intersection (Source: GoogleMaps)

Existing

SE 87th Ave is a critical part of the Lents Green Ring as well as Portland's Neighborhood Greenway system. Flavel St. is a two-lane (1+1) road with medium amount of automobile traffic (~7,888 ADT) and two 5' bike lanes. Pedestrians have two median islands, but they're not very usable for bicyclists. South of Flavel is actually a different road called SE Malden Ct, which is unpaved and contains no sidewalks creating a barrier for bicycles and pedestrians.

A raised intersection in Minnesota.
(Source: StreetsMN)

Pedestrian safety island that allows for through bikes, but diverts car traffic (Source: NACTO)

Left turn bike queue box
(Source: BikePortland)

Recommendations

This intersection has a similar recommendation as 101st and Harold. Since it already has median islands for pedestrians which also serve as traffic calming devices, there's not much that needs to be done. That said, we still recommend raising the entire intersection to give automobiles a physical cue that they're entering a place where bicycles and pedestrians will be crossing at higher volumes. Add crossbikes nearer to the center of the intersection for a visual cue and re-stripe the current faded crosswalks. SE Malden Ct needs to be paved with the appropriate amenities. This would be an ideal area to add bioswales which can help pay for sidewalks and paving. Also consider shrinking the travel lane from 11' to 10' and increase bike lanes from 4' to 5'

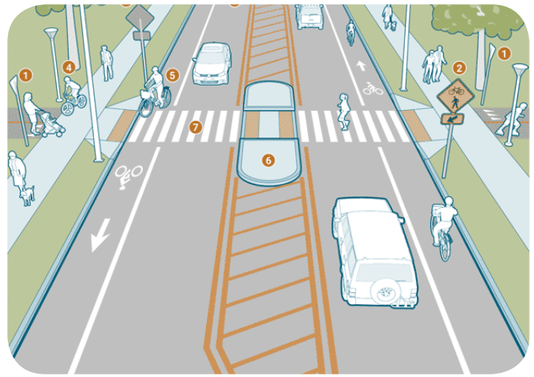
Current Flavel St. Dimensions

Total Width: 44' Travel Lanes: 11' each
Bike Lane Width: 5'each

RETHINKING MULTI-USE PATHS
INTERSECTION & PATH DESIGN

Existing crosswalk and pedestrian island at Springwater Corridor and Flavel (Source: Author's analysis)

Separated 5-foot paths at intersection with delineated pavement and ADA accessibility (Source: Bike.Emory.edu)



Design concept for a mid-block shared use path crossing with a median refuge island (Source: FHWA)

Raised trail crossing for the Burke-Gilman Trail, Seattle WA (Source: FHWA)

Given the increasing ridership and use on the Springwater Corridor and I-205 Multi-Use Path there is potential to widen the paths to a more desirable and accessible width of 12 to 14 feet!

Where paths and streets meet, particular safety measures should be taken. The top left image show the current state of Springwater Corridor and Flavel. This intersection could be improved by widening the pathway, enabling 2-way path separation. Additional precautions include raising the intersection to signify that pedestrians and bikers cross here. This gives them increased visibility to vehicular and other modal traffic.

Finally, reflective paint and signage bumps up the intersection visibility another notch. The image to the left includes a variety of signs:

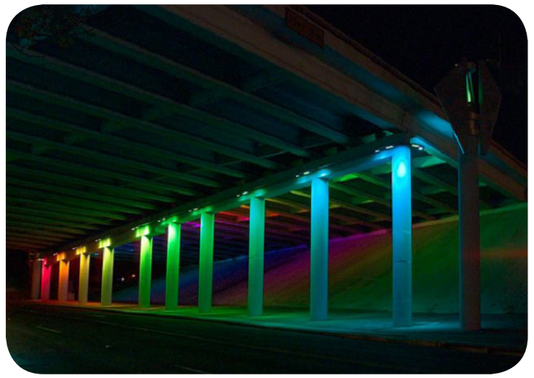
- Watch for Bikes and Pedestrians
- Yielding reflective white arrows on the street
- Bump, elevated crosswalk signage.
- Trail X-ING signage
- Guiding arrow signage
- Lighting

All of these treatments are simple designs that prioritize bikes and pedestrians.

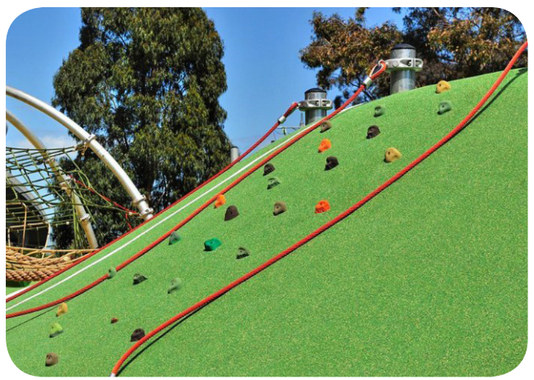
UNDERPASS & SLOPE TREATMENTS

Existing underpass and signage on Springwater Corridor (Source: Author's analysis)

Phoenix Flowers Multi-Use Path is wide and vibrant with red pavement, benches along the hillside and lighting fixtures visible from the roadway above. (Source: Sustainable Cities Collective)



Lighting along the sidewalk in the underpass leaves it visible and exciting at night (Source: UrbanToronto.ca)



Sloped play spaces can activate a bare hillside along a park or path (Source: Lawson Kelsey, LinkedIn Article)

Slopes and underpasses are often times the most dark and damp places along the trail. Design elements can work to mitigate for these safety and perception issues. The Springwater Corridor has several places along it that these treatments can be embraced.

Toronto has a number of underpass walkways that are lit at night with LED colored lights. Some places project light or screens up on to the slope for an artistic and creative approach to lighting.

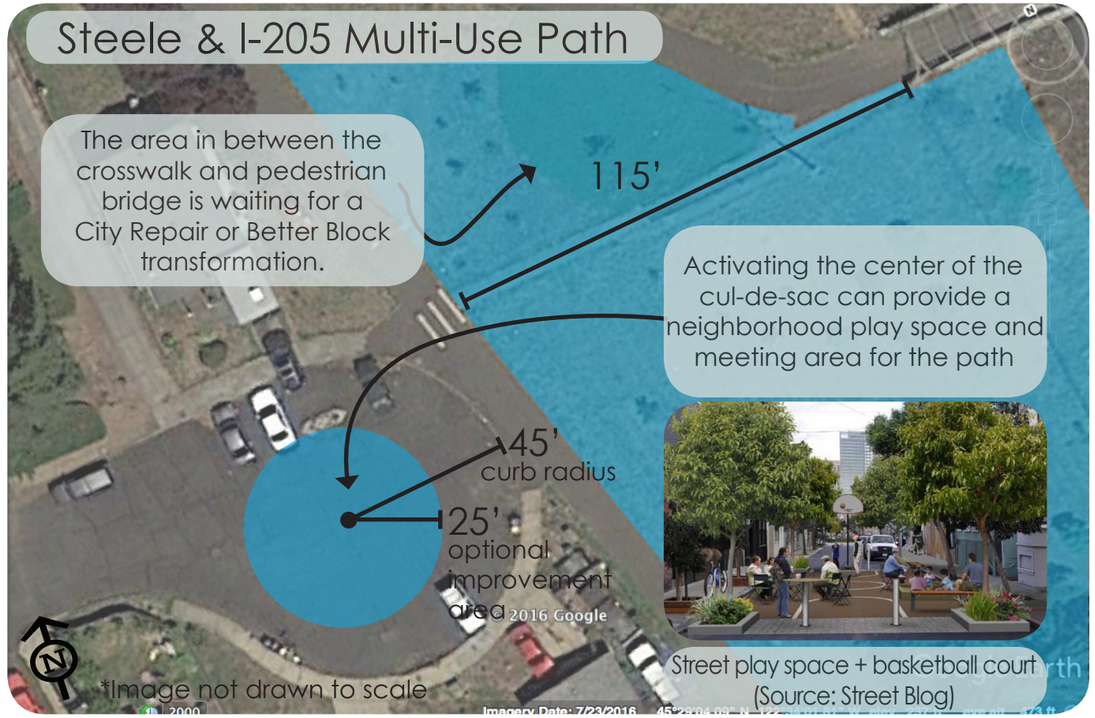
Phoenix Flowers Multi-Use Path is unique in that it is visible from the street above via these flower-shaped light posts that are set up on the sloped hillside.

The sloped rock wall to the left is a great example of an innovative way to active an underutilized hillside. Other interactive equipment can be installed to create a lively and fun place for people of all ages and abilities.

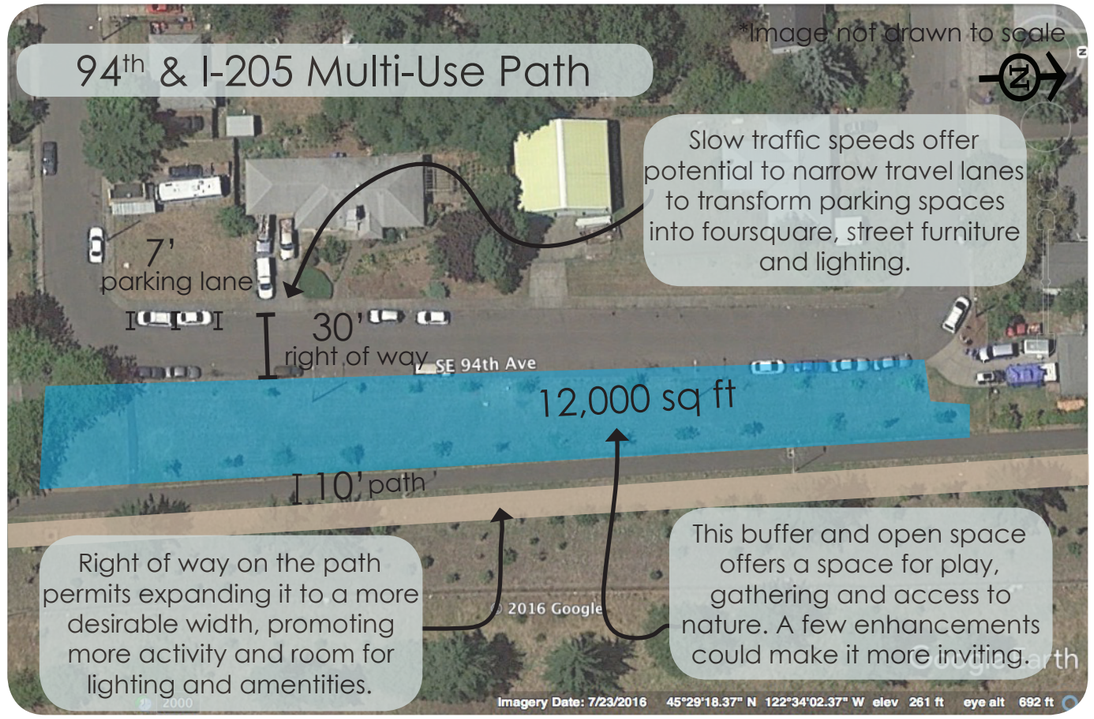
These treatments are particularly interesting because they are relatively low cost and work to establish a more fun, inviting, and safe place to enjoy while in the neighborhood or on the multi-use path.

RETHINKING MULTI-USE PATHS

ACTIVATING CULS-DE-SAC & ADJACENT STREETS



Street play space + basketball court (Source: Street Blog)



PAVING DESIRE PATHS

EXISTING CONDITIONS

MAX Green Line serves the Lents neighborhood, spurring an increased amount of foot and bike traffic. Here you can see a desire pathway cut between the I-205 Multi-use Path and a sidewalk connection to Powell Boulevard
(Source: Author's Analysis)

At the bottom of the Powell MAX Green Stop there is the busy intersection of the I-205 Multi-use Path and Powell Boulevard. The connection to the path is complex to get across. Desire paths maneuver this intersection very wisely after some time.
(Source: Author's Analysis)

Similarly here, a desire path cuts a corner at an intersection on the I-205 Multi-use Path. Given the wear of the grass here you can tell the amount of this path's use.
(Source: Author's Analysis)

BEST PRACTICES + PRECEDENTS

Paving the cow paths is an arguable way to influence practical and idealism in planning and design. The author argues it is a creative way to actively engage the public for relatively low implementation costs.
(Source: Nicolae Naumof, LinkedIn article)

After users lead the way in formalizing pathways in Plaistow, London facilities paves desire path. This is fairly common in Europe to have users contribute to walkways as the neighborhoods are fairly dense and compact.
(Source: 99% Invisible)

Michigan State University waited a winter season before paving the sidewalks to its central square serving the massive university and its students. The complexity in the way we get around is much more fluid than a right angle intersection.
(Source: 99% Invisible)

92ND AVENUE & SPRINGWATER CORRIDOR

Looking south on 92nd Ave

Bird's eye view of 92nd Ave and Springwater Corridor. (Source: GoogleMaps)

Existing

The current trail crossing has some safety amenities but it could use more. Most notably is the lack of visual elements. The current crosswalk is faded and the median island is lacking compared to other median islands in the city.

Recommendations

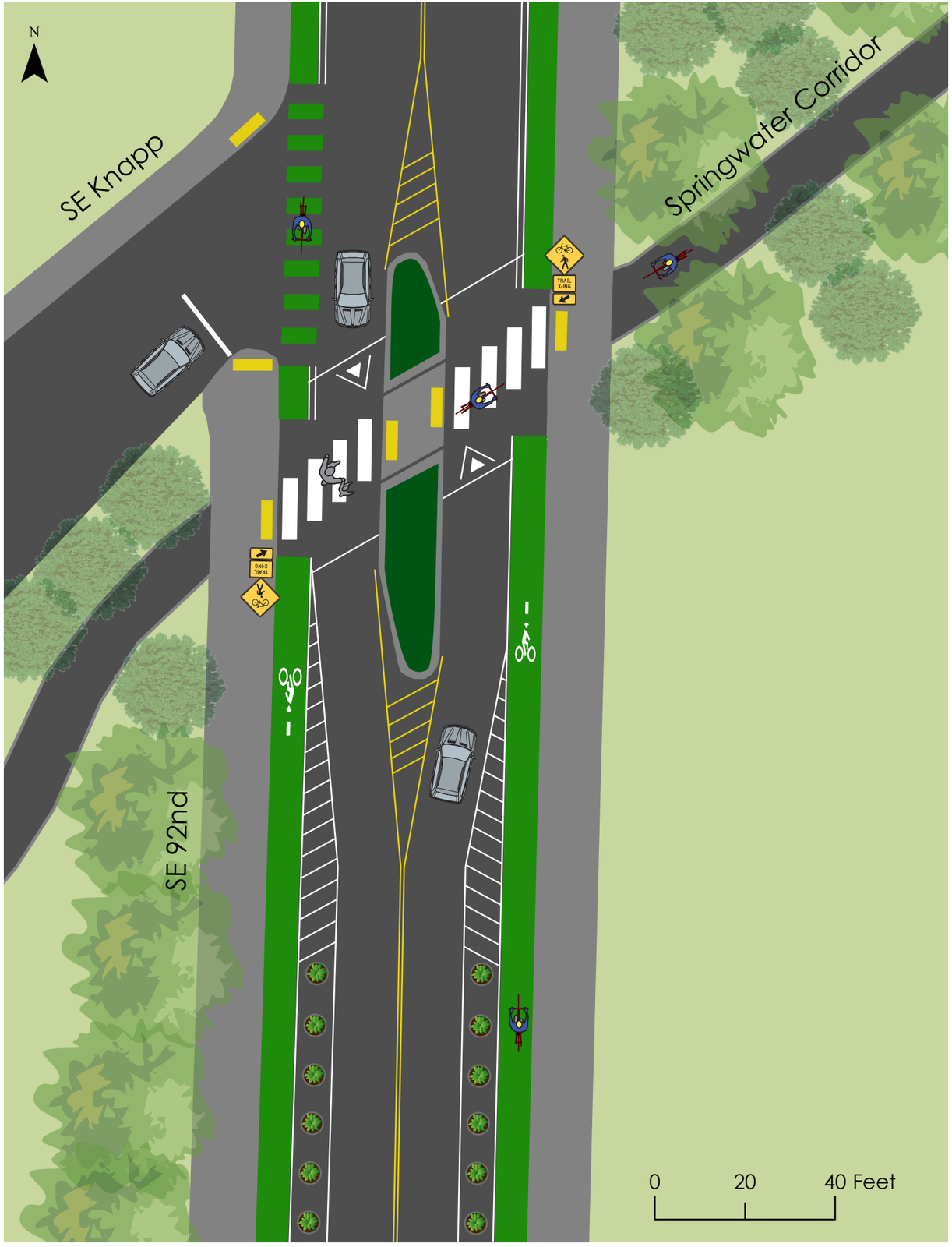
Raise the crossing so that cars are forced to slow down as they enter the crossing. This would be combined with new crosswalk striping, a rapid flashing beacon, and an enhanced median island that is more comfortable, particularly for pedestrians. Additionally, the island would have two new bioswales rather than the dirt patches they have currently. Widen the current north-south bike lanes from its current 4' to 6' on the south side and 5 feet on the north. We also recommend removing parking on the south side and installing planters to create a protected bike lane. For the north end, we recommend a 1-2 foot buffer but continued parking as you get closer to Lents Town Center and residential areas.

92nd Ave. Dimensions

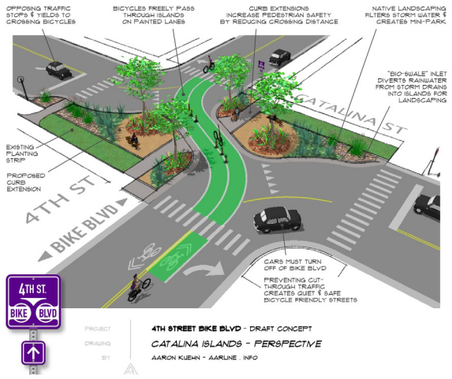
Total Width: 44'
Travel Lanes: 10
Protected Bike Lane: 6' south, 5' north

Enhanced trail crossing that is raised. (Source: FHWA)

Planters can be used to protect cyclists. (Source: FHWA)



RETHINKING OFFSET INTERSECTIONS



Intersection concept for 4th Street at Catalina Street in Koreatown, Los Angeles for a jog to the left. (Source: Aaron Kuehn, Streetsblog LA)

Bike boulevards (also called neighborhood greenways or quietways) use offset intersections or jogs between calm, local streets to deter motor vehicle traffic and create low-stress conditions.

Ideally, the bike boulevard would intersect a street with traffic volumes and speeds equivalent to the bike boulevard so that no treatment besides additional wayfinding and signage is needed to direct users through the offset.

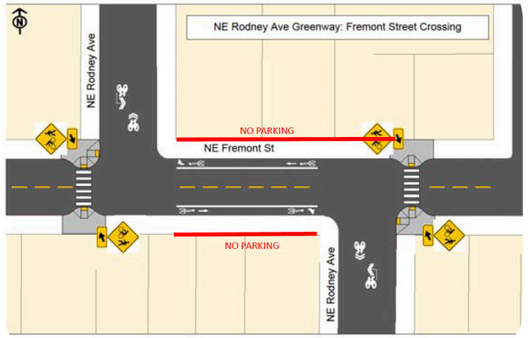
However, when a low-stress bikeway intersects a major street, this often represents the weakest link in the route. In these cases, additional treatments are needed to either reduce motor vehicle volumes and speeds or create clear separation between modes. Practitioners have used jog cycle tracks, left-turn lanes for bicyclists, two-stage turn queue boxes, and median refuge islands to address this problem in places like Portland OR, Seattle WA, and Tucson AZ. The appropriate treatment will depend on the traffic characteristics of the intersecting street and the direction of the jog, left or right.

Two-way cycle track connecting a bike boulevard on Windsor St. for a jog to the right, Seattle WA (Source: NACTO)

Center left turn lanes on SE Stark and 41st for a jog to the right, Portland OR (Source: NACTO)

Center refuge island provides protected connection to an offset trail for a jog to the right, Billings MT (Source: NACTO)

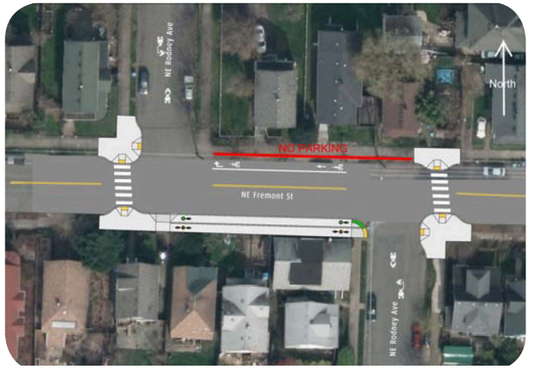
Case Study: NE Rodney and Fremont, Portland OR



Option A: Bike lanes with curb extensions was the preferred option at an open house (Source: PBOT)

Looking northwest from NE Rodney, a neighborhood greenway that jogs to the left along NE Fremont. (Source: Bike Portland)

Option B: Two-way bikeway on the northside. Curb extensions could be substituted with rapid flash beacons at crossing (Source: PBOT)



Option C: Two-way cycle track on southside and westbound bike on northside with curb extensions. This is the most expensive option. (Source: PBOT)

At an open house for the NE Rodney Neighborhood Greenway Project in 2014, Portland Bureau of Transportation (PBOT) presented two design options for connecting the neighborhood greenway through an offset intersection at NE Fremont that includes a jog to the left. The public preferred Option A, on-street bike lanes with curb extensions and two pedestrian crossings with signage. Other residents on the southside of NE Fremont were concerned with losing on-street parking because they do not have off-street parking.

Option C was developed in 2015 as a way to reduce the amount of parking spaces lost and presented in an open house. The final design follows Option A and includes crossbikes adjacent to the crosswalks.

87TH AVENUE & DUKE STREET

Looking south on 87th Ave

Bird's eye view of 87th and Duke. (Source: GoogleMaps)

Existing

At the intersection of 87th Ave. neighborhood greenway and Duke St., the greenway is offset by 67 ft. Users must jog to the right to continue on the Green Ring. Duke St. has traffic volumes higher than recommended for a neighborhood greenway treatment at 2,000+ ADT. Either volume management on Duke St. is needed or strong separation between modes is required to produce a trail-like experience.

NE 33rd and Going St. looking north at a bulb out that reduces the crossing distance for pedestrians. (Source: BikePortland)

Looking east on Going St., bicyclists make a left turn onto the cycle track. A pinch point created using a bioswale allows only bicycle traffic west on Going St. (Source: BikePortland)

Recommendations

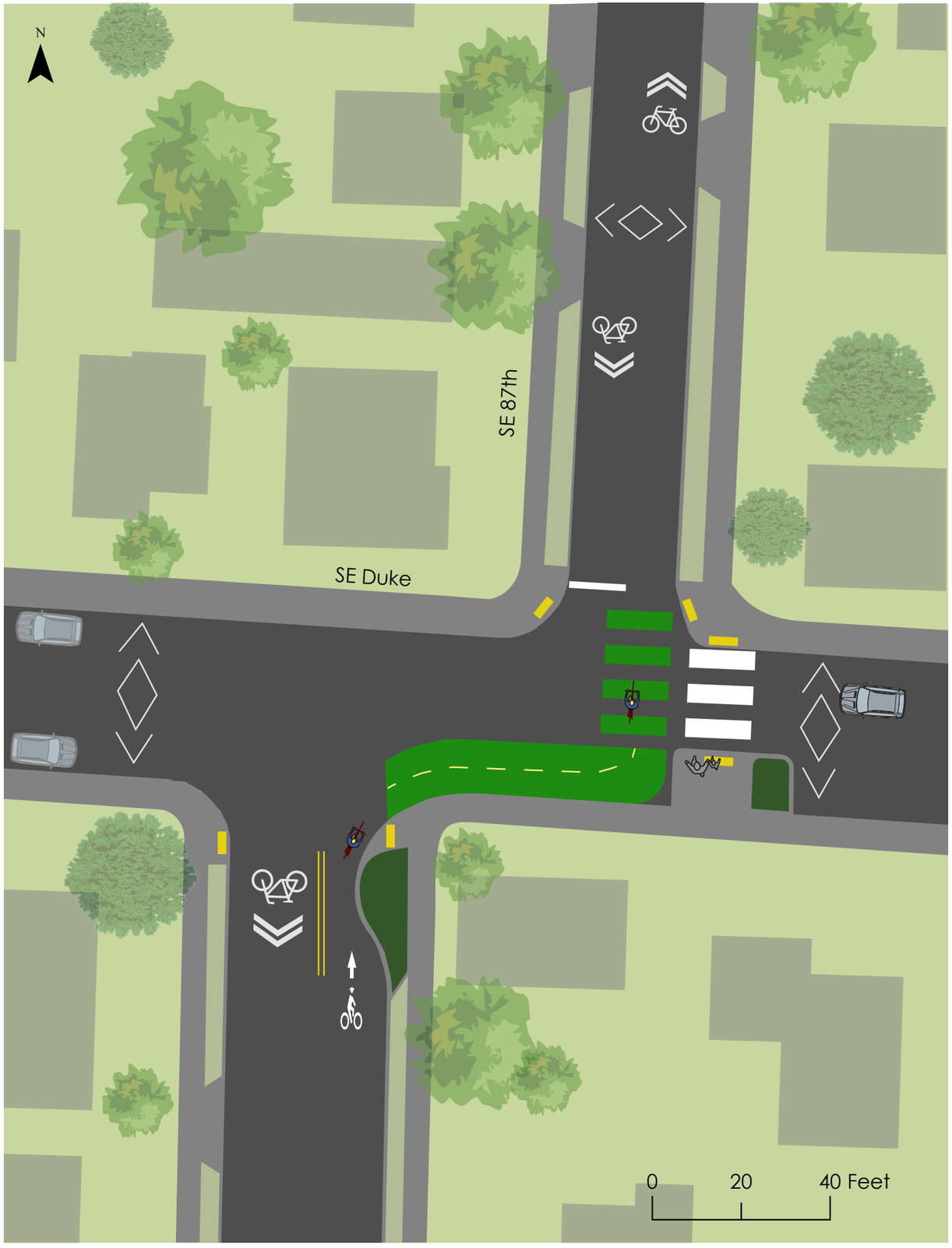
A jog cycletrack on Duke St. with a the pinch point on the south leg of 87th Ave. that includes a bioswale and restricts vehicle traffic traveling north on 87th. In this design, the pedestrian crossing is moved east to accommodate a raised cycle track and a pedestrian safety island and bioswale are constructed to reduce the crossing distance on Duke St. This requires removing parking from one side of a residential street.

Duke St. Dimensions

Total Width: 36'

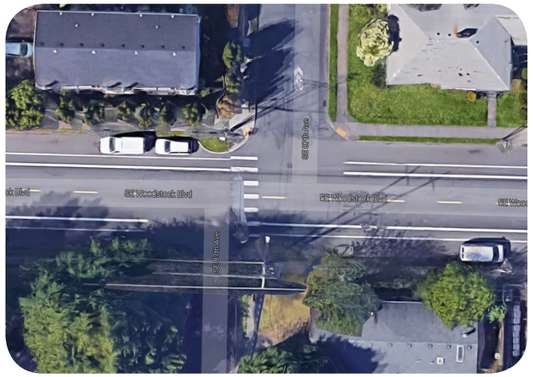
Travel Lanes: 10.5'

Parking Lanes: 7.5' -OR- Two-way Raised Cycle Track: 15' including a 3' landscaped buffer adjacent to sidewalk



87TH AVENUE AND WOODSTOCK BLVD

View looking southwest at 87th and Woodstock

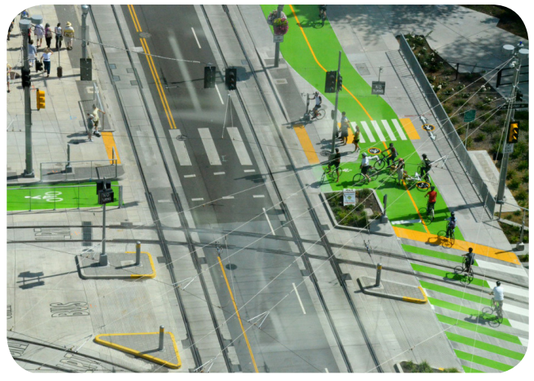


Bird's eye view of 87th and Woodstock (Source: GoogleMaps)

Existing

The intersection of 87th Ave. and Woodstock Blvd. is an unsignalized offset intersection located on the Green Ring. Bicycle lanes (4ft) on both sides of Woodstock act as a buffer for the street parking, leaving bicyclists in the door zone with little space to maneuver. Woodstock has moderate traffic (5,600 ADT). There is existing signage indicating a bike and pedestrian crossing and sidewalk bulb outs.

Recommendations



Left turn queue space and a bioswale on the Southwater Front in Portland OR

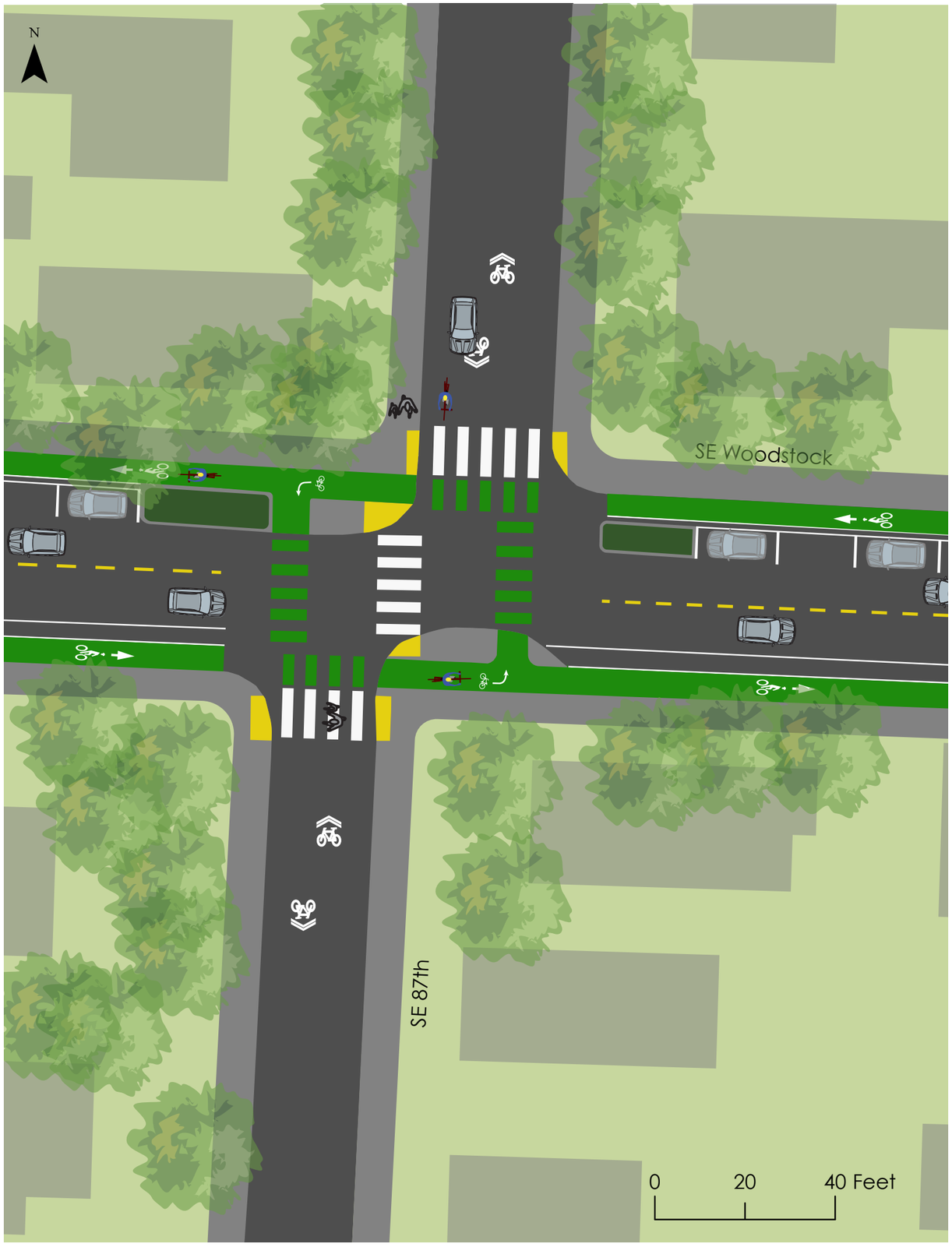
Crossing for the sidewalk and adjacent one-way protected bike lane in the Netherlands

For the westbound lane, switching the parking and bike lane to create a protected bike lane. This also leaves room to remove two parking spaces to create bioswales and left turn queue boxes at the corners, which helps to improve sightlines at the crossing. Parking on the south side of Woodstock is removed, and the eastbound bike lane becomes a buffered bike lane. Crossbikes are added to the 87th Ave. crossings and across Woodstock.

Woodstock Blvd. Dimensions

Total Width: 45'

Travel Lanes: 10'
Protected Bike Lane: 7.5' parking + 2' buffer + 8' bike lane
Buffered Bike Lane: 7.5' with buffer



92ND AVENUE AND STEELE STREET

Looking west on Steele St.

Bird's eye view of 92nd and Steele. (Source: GoogleMaps)

Existing

92nd Ave is a two way street (1+1) with a high amount of daily automobile traffic (~12,056 ADT). The current intersection offers no protection for cyclists and very little for pedestrians. While there is a raised median to slow down traffic, it's not fully protected for cyclists or pedestrians. Moreover, the crosswalk painting is faded on the south side, and is missing entirely from the northside, which is also where the closest park connection resides.

Recommendations

Close off turning traffic entirely for automobiles and build an enhanced median island that would accommodate bicyclists in the middle with a 14.5' two-way cycle track island. The lanes would be angled towards oncoming traffic to give cyclists an easy vantage point. This would provide for two median islands for pedestrians as well on both the north and south end. This intersection improvement would come with new bioswales in both the island refuge and along Steele St east of 92nd which is currently lacking sidewalks and decent pavement. This would make the trip through this section more pleasant overall. Finally, we recommend raising the entire intersection to slow down the busy 92nd Ave traffic.

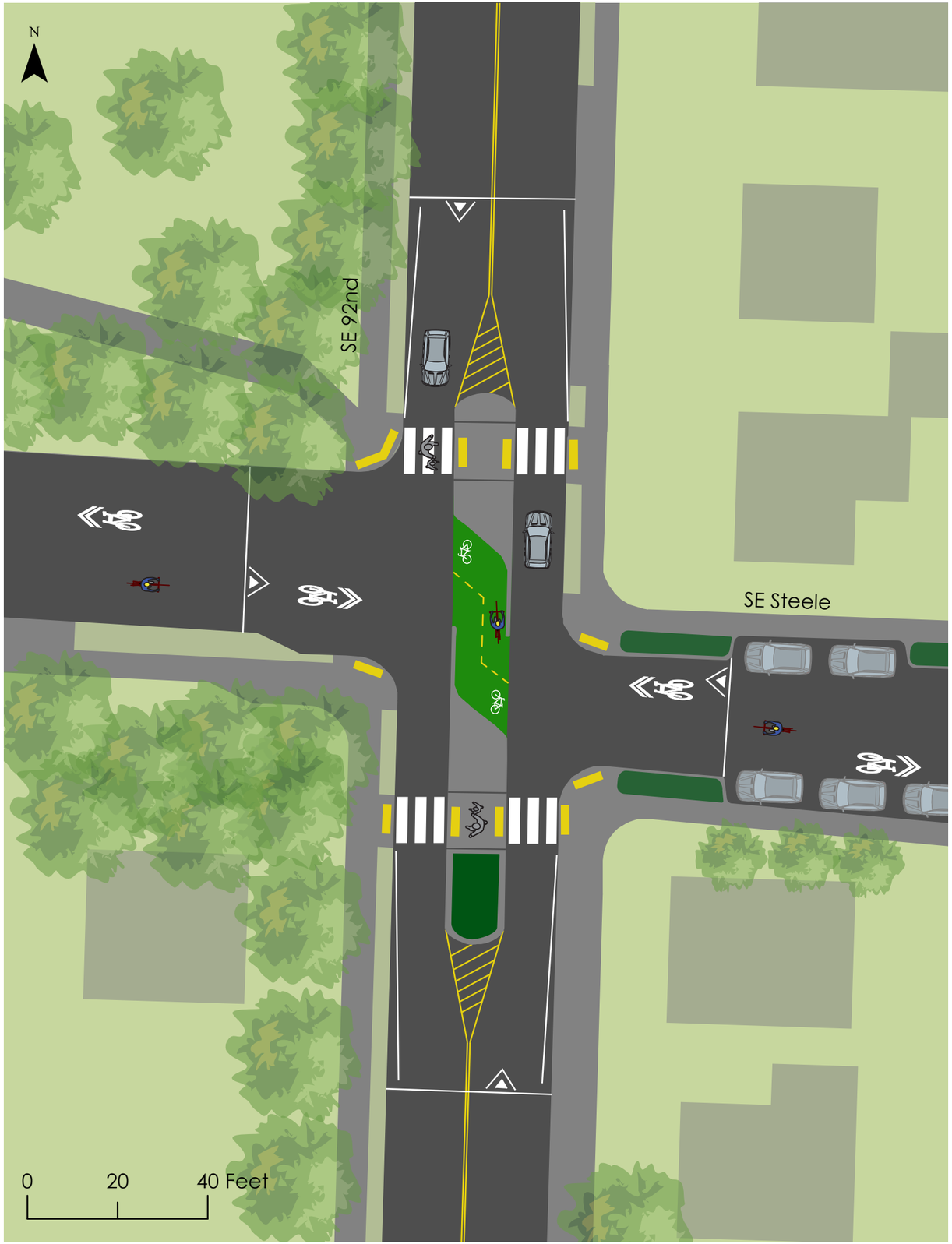
Road Dimensions

Total Width of 92nd: 35.5'

Travel Lanes: 10' each
Two-way Cycle Track on Steele: 14.5'

A median island for cyclists in Bellevue, WA. (Source: NACTO)

An example of an intersection with bike islands and automobile traffic being diverted. (Source: NACTO)



PRIORITIZING IMPROVEMENTS

In order to determine how we thought improvements should be prioritized for crossings, we developed a weighted decision matrix using evaluation criteria described in the table below.

The evaluation criteria were first ranked based on their level or objectivity and importance on a Likert scale (e.g., not very, somewhat, very) given the information that we have available.

Better Block PDX, Oregon Walks, and Green Lents may wish to adjust this matrix to suit their priorities or use other evaluation criteria for the Green Ring moving forward.

TABLE 4.
Final Evaluation Criteria Selection

Potential Evaluation Criterion	Objectivity	Importance	Selected for Final Criterion
Cost	Very	Very	X
Design for all ages and abilities	Somewhat	Very	X
Ease of implementation	Very	Very	X
Implements prior planning recommendations	Somewhat	Somewhat	X
Improve broader connectivity with Green Ring	Very	Very	X
Improve social equity	Somewhat	Somewhat	X
Increase future ridership and use	Not very	Very	
Reduce serious injuries and fatalities for pedestrians and cyclists	Not very	Very	
Placemaking and neighborhood involvement potential	Very	Somewhat	X
Political feasibility	Not very	Somewhat	
Reduce crossing distances and amount of time to cross	Very	Somewhat	X
Strong public support	Somewhat	Very	
Utilize protected bikeway design	Very	Somewhat	X

Source: Author's analysis

Our team determined that 101st & Foster Ave, 92nd & Steele, and 92nd & Springwater Corridor have weighted percentages equal or greater than 80%, which indicates that they should be prioritized over the other intersections.

Corresponding to these priorities, project improvements for the Green Ring could be added slowly during implementation through three phases for the high, medium, and low priority projects.

TABLE 5.
Weighted Decision Matrix for Project Improvements

Intersection	Weighted Grade (%)	Prioritization
101st & Foster	84	High
92nd & Springwater Corridor	81	High
92nd & Steele	80	High
87th & Woodstock	73	Medium
87th & Duke	71	Medium
101st & Springwater Corridor	65	Low
87th & Flavel	65	Low
101st & Harold	63	Low
Flavel & Springwater Corridor	51	Low

Source: Author's analysis

View of Foster Rd looking south at intersection with 101st Ave.

View looking south on 92nd Ave at 92nd & Steele St.

Bird's eye view existing conditions at 92nd & Springwater Corridor

MOVING FORWARD

In October, Green Lents and the Institute for Sustainable Solutions at PSU brought together stakeholders around the project. The group made a timeline of the history of the Green Ring concept highlighting both big ideas and on-the-ground actions such as the Lents Listening Project, community bike rides and walks, and Green Lents projects along the Green Ring. Together, they also completed a visioning exercise to image what the Lents Green Ring could become.

Stakeholders at the meeting included representatives from Lents Youth Initiative, PBOT, BPS, Street Trust (formerly BTA), PSU, OPAL, Oregon Walks, and Better Block PDX.

Based on this meeting and the demonstrated interest in the project, it is likely that the recommendations from this plan may be taken into consideration as the Lents Green Ring project is further developed in coming months.