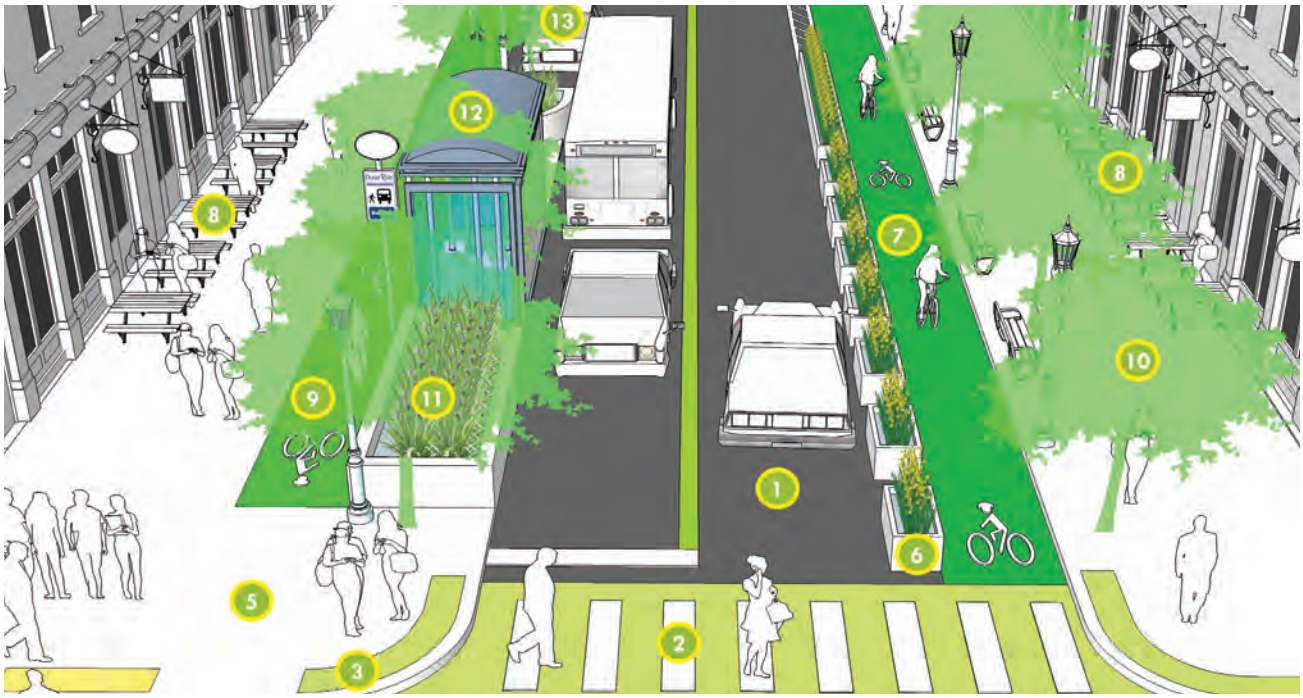

Active Transportation Proposals for Portland Neighborhoods

Fall 2017 Bicycle and Pedestrian Planning Lab
School of Urban Studies and Planning
Portland State University

Mike Rose • Co-Instructor
Derek Abe • Co-Instructor

UNIVERSITY OF OREGON
TRIMET
SCI Sustainable Cities Initiative
SCYP Sustainable City Year Program

Acknowledgements

The authors wish to acknowledge and thank TriMet and their Southwest Corridor partners for making this project possible. We would also like to thank the following staff who were instrumental to this project.

Jeb Doran, Senior Project Manager, TriMet

Dave Aulwes, Senior Designer Transit Coordinator, TriMet

About SCI

The Sustainable Cities Initiative (SCI) is a cross-disciplinary organization at the University of Oregon that promotes education, service, public outreach, and research on the design and development of sustainable cities. We are redefining higher education for the public good and catalyzing community change toward sustainability. Our work addresses sustainability at multiple scales and emerges from the conviction that creating the sustainable city cannot happen within any single discipline. SCI is grounded in cross-disciplinary engagement as the key strategy for improving community sustainability. Our work connects student energy, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.

About SCYP

The Sustainable City Year Program (SCYP) is a year-long partnership between SCI and a partner in Oregon, in which students and faculty in courses from across the university collaborate with a public entity on sustainability and livability projects. SCYP faculty and students work in collaboration with staff from the partner agency through a variety of studio projects and service-learning courses to provide students with real world projects to investigate. Students bring energy, enthusiasm, and innovative approaches to difficult, persistent problems. SCYP's primary value derives from collaborations resulting in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

SCI Directors and Staff

Marc Schlossberg, SCI Co-Director, and Professor of Planning, Public Policy, and Management, University of Oregon

Nico Larco, SCI Co-Director, and Associate Professor of Architecture, University of Oregon

Megan Banks, SCY Program Manager, University of Oregon

About TriMet

The Tri-County Metropolitan Transportation District of Oregon was created by the Oregon Legislature in 1969 to operate and oversee the mass transit of the Portland Metropolitan region. This public entity was formed by the legislature as a municipal corporation to replace the multiple private interest mass transit companies that previously operated in Multnomah County, Clackamas County, and Washington County; the counties that make up TriMet.

In addition to operating bus lines, light rail, and paratransit in the defined Tri-Metropolitan district, TriMet also connects to external mass transit services to provide wider blanket coverage for the region. TriMet's nationally recognized transit system provides more than 100 million rides annually, and carries 45% of rush hour commuters going into the Downtown Portland area. TriMet not only moves people, but helps build sustainable cities by improving public health, creating vibrant, walkable communities, supporting economic growth, and working to enhance the region's livability.

Several civic leaders have been highlighted as key figures in the creation, establishment, and ultimate success of TriMet. Governor Tom McCall is credited with the initial call for the creation of the public corporation; other key contributors include Congressman Earl Blumenauer, Rick Gustafson, Dick Feeney, and Mayor Neil Goldschmidt. All were instrumental in shaping the organization itself, as well as the land use, civic development, and transformation policies that make TriMet the success that it is today.

The vision and efforts of these individuals and countless others have borne fruit. Recently, TriMet celebrated the second anniversary of the opening of the most recent light rail line. Since its inauguration the 7.3-mile MAX Orange Line has experienced continued growth, having a 6% year-to-year increase in ridership. Illustrating the holistic approach that has been a part of TriMet from its inception, there have been wider community benefits such as a positive impact on employment and a focus on sustainable practices such as bio-swales, eco-roofs, a first-in-the-nation eco-track segment, solar paneling and regenerative energy systems.

TriMet is a key partner in the region's Southwest Corridor Plan and Shared Investment Strategy. Eleven partner agencies are participating in planning for a new 12-mile light rail line in southwest Portland and southeast Washington County that will also include bicycle, pedestrian, and roadway projects to improve safety and access to light rail stations. Southwest Corridor stakeholders include Metro (the regional government), Washington County, Oregon Department of Transportation, and the Cities of Beaverton, Durham, King City, Portland, Sherwood, Tigard, and Tualatin. This collaborative approach strives to align local, regional, and state policies and investments in the Corridor, and will implement and support adopted regional and local plans. These initiatives and outcomes from participation with the UO's Sustainable City Year Program will help develop ideas that are cost-effective to build and operate, provide safe and convenient access, and achieve sustainability goals while supporting the corridor's projected growth in population and employment.

Course Participants, Portland State University

Team 1: Barbur Boulevard/19th Street MAX Station Integration

Madison Levy, Graduate, Urban and Regional Planning

Kelly White, Graduate, Civil Engineering

Baxter Shandobil, Graduate Certificate, Transportation

Kai Hirakawa, Undergraduate, Community Development

Team 2: Baylor/Clinton Station Pedestrian + Bike Access Plan

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Steve Rosen, Graduate, Urban and Regional Planning

Mohammad Hotak, Graduate, Urban and Regional Planning

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Executive Summary

Under the guidance of instructors Mike Rose and Derek Abe, Portland State University students worked in small groups to create active transportation plans for two sites within TriMet's Southwest Corridor project area.

Barbur Boulevard/19th Street MAX Station Integration

The proposed SW Barbur Boulevard/19th Street MAX Station will be located in Southwest Portland as part of the new Southwest Corridor MAX Line connecting Downtown Portland with Tigard and Tualatin. This project focused on three main goals for Tri-Met as they construct a new MAX Station at 19th and Barbur: safety prioritization for bicyclists and pedestrians, improved connectivity for all road users to the new station, and community involvement to help identify solutions for the first two goals. A variety of recommendations are proposed, with a focus on three levels: station level, regional connectivity, and intersection level.

Baylor/Clinton Station Pedestrian + Bike Access Plan

The Southwest Corridor Light Rail will connect Downtown Portland with Tualatin through the City of Tigard. In coordination with Tri-Met Southwest Corridor Light Rail project, students developed a bicycle and pedestrian station access plan for the proposed Baylor/Clinton MAX station on Southwest 70th Avenue in the Tigard Triangle. The team's mission in developing this plan is to ensure that all of the existing and future residents, workers, shoppers, students, and other people within this station's walkshed and bikeshed will be able to get to and from the station on foot and by bicycle along safe, attractive, and comfortable walkways and bikeways. In addition, this plan includes complete bicycle and pedestrian networks for the Tigard Triangle and connections to the bicycle and pedestrian network beyond.

The proposed plan recommends near-term and long range phases. Design guides for various roadway types are included, as well as complete street design elements such as bike lane buffers, bus stops, crossing sidewalk extensions, mini-roundabout, Red Rock Creek Trail, street furniture, street lighting, street trees, and a wayfinding program. Eight specific policies and programs are proposed, as well as the cost implications.

One Letter
Consulting & Design

Dec. 7th, 2017

SW Corridor Max:

Barbur and 19th Station Integration

MADISON LEVY

Project Manager, Lead Designer

Madison originates from Louisville, Kentucky and thinks of her hometown as Portland's little brother. She is in her final year of the MURP program at PSU where she has been focusing on Land Use and Transportation Planning. In addition to her studies, Madison has been a researcher at the Institute of Metropolitan Studies and the Transportation Research and Education Center while also interning on the Transportation Planning team at CH2M.

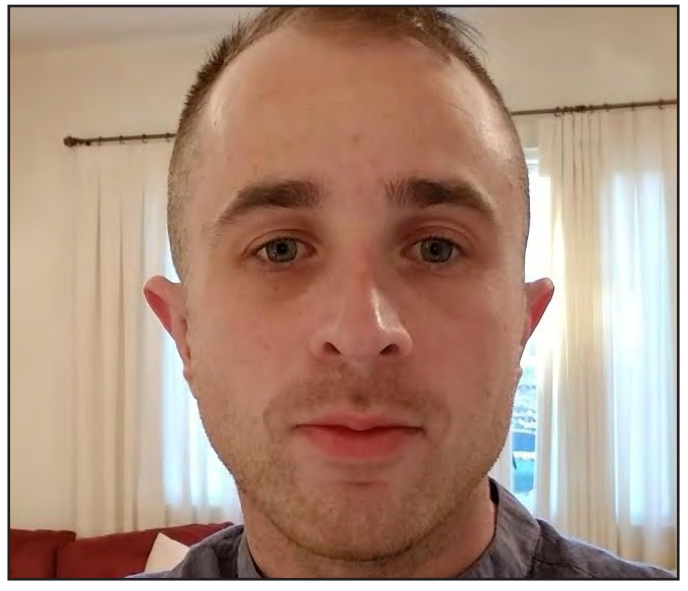
KELLY WHITE

Facilities Design, Editor

Kelly is finishing her first quarter in the Masters in Civil Engineering Program at PSU. She grew up in Tacoma, Washington, attending Pacific Lutheran University for undergraduate degrees in both Physics and Computer Science. Her transportation background comes from an internship with the Washington State Department of Transportation in the Traffic Design Office, and more recently with DKS Associates as a Planning Intern.

BAXTER SHANDOBIL

GIS



Baxter is completing his first term in the Transportation Graduate Certificate at PSU, and is a prospective MURP student for Fall 2018, where he plans to focus on transportation. He grew up in Alameda, CA, and got his bachelor's degree in economics from Oregon State University. In Spring 2017, Baxter earned a GIS certificate from Portland Community College, and began his current position at the Portland remote sensing firm, Quantum Spatial.

KAI HIRAKAWA

Kai is a senior undergraduate student majoring Community Development and interning at the Center for Public Service at Portland State University. He grew up in Kamakura city in Japan. Kai hopes to make use of his community development experiences in Portland through a career in international work.

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Project Statement

The proposed SW Barbur Boulevard/19th Street MAX Station will be located inside of Portland's Urban Growth Boundary (UGB) in Southwest Portland as part of the new Southwest Corridor MAX Line connecting Downtown Portland with Tigard and Tualatin. This stop will be located on Barbur Boulevard, which is also considered Oregon State Highway 99W or Pacific Highway. Relative to major corridors, Interstate 5 runs parallel to the east of Barbur Boulevard, about 315 feet away from the intersection of 19th/Barbur. Downtown Portland is less than 4 miles north of the intersection, and Tigard is slightly over 4 miles south of the intersection.

This document will focus on three main goals for Tri-Met as they construct a new MAX Station at 19th and Barbur: safety prioritization for bicyclists and pedestrians, improved connectivity for all road users to the new station, and community involvement to help identify solutions for the first two goals.

Alignment

The Southwest Corridor Max alignment has not yet been finalized by TriMet. We propose a route that follows along SW Barbur Ave with a small diversion south onto SW Multnomah Boulevard for half mile westward approach to the Barbur/19th station on the southeast side of the intersection.

Existing Conditions : Land Use

SW 19th and Barbur Figure Ground

Hamburger Drive In: Individual Parking spaces each accessible from SW Barbur.

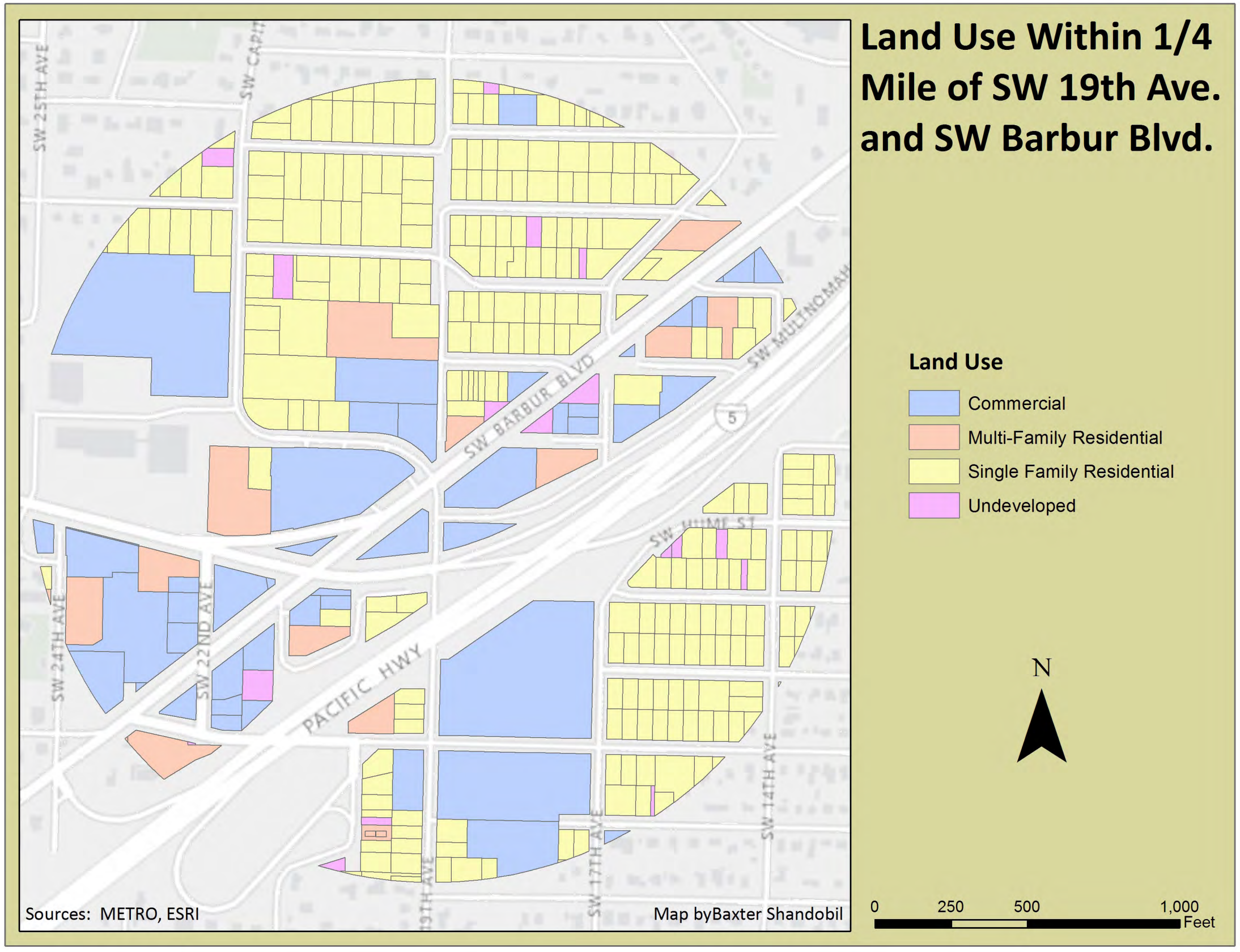
Barbur Blvd Rentals: 80 feet parking lot access from SW Capital Hill Road.

The 1/4th mile surrounding the intersection of SW 19th Ave and SW Barbur Blvd is first defined by its relationship with I-5, which functions as a bisecting scar, for what would otherwise be a residential neighborhood. When I-5 was aligned in the 1960's, it generated a redundant route out of downtown Portland. Along this stretch, SW Barbur Blvd and I-5 run within 500 feet of each other. SW Barbur provides two lanes in each direction and I-5 provides three.

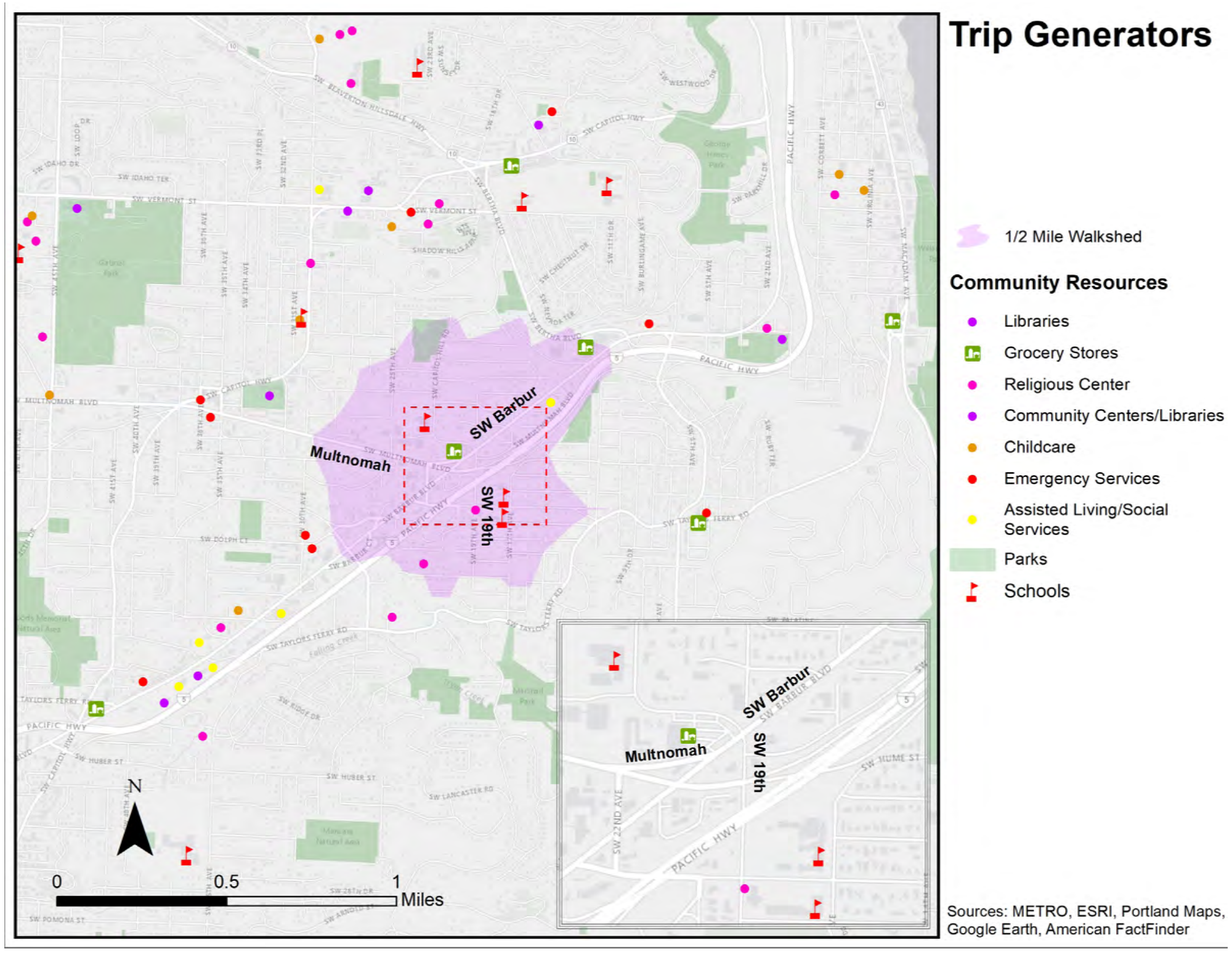
SW Barbur avenue is designed to move cars through the area and is buffered by commercial zoning on either side. There are two overpasses that allow residents to cross I-5 to reach the south eastern portion of the study area. These routes are also zoned for commercial development. What does exist of multi-family residential lots abut commercial lots.

The commercial uses along SW Barbur near SW 19th were developed with large setbacks. This allowed for front parking. Parking access was maximized by removing all curbs. This essentially created a single driveway that extends the entire length of the street side lot line. A car oriented design such as this also excludes any sidewalks that would cater to pedestrian movement.

Existing Conditions : Land Use



Existing Conditions : Trip Generators



Trip Generators

1/2 Mile Walkshed

Community Resources

- Libraries
- Grocery Stores
- Religious Center
- Community Centers/Libraries
- Childcare
- Emergency Services
- Assisted Living/Social Services
- Parks
- Schools

Sources: METRO, ESRI, Portland Maps, Google Earth, American FactFinder

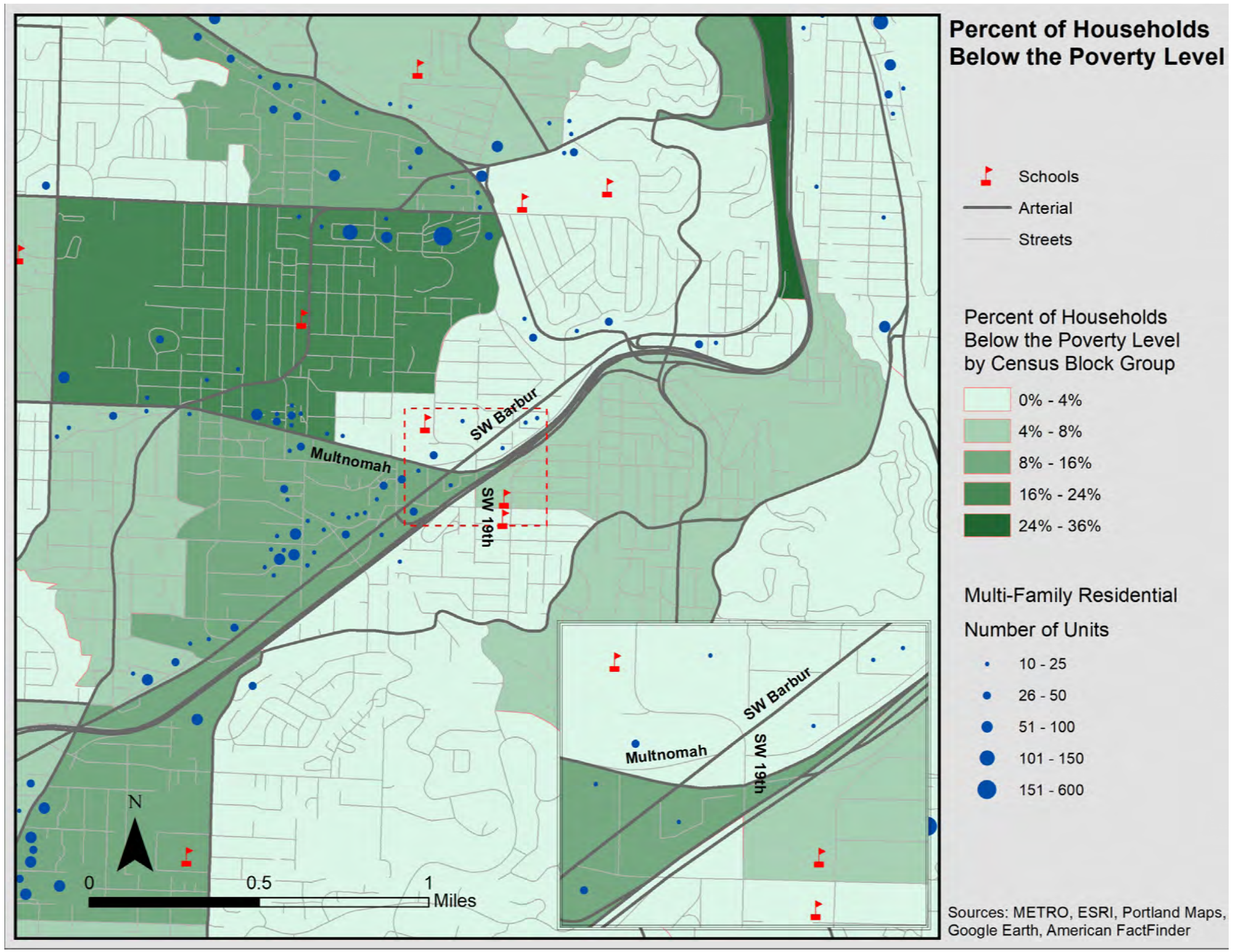
The immediate area around the proposed Max station would serve three nearby schools and a Safeway market. Capitol Hill Elementary School, St. Clair School, and the West Hills Christian School together serve over a thousand students. The 3 schools are within a half mile of each other, and within a quarter mile of the proposed Max station.

School	Private/ Public	Enrollment	Grades
Capitol Hill E.S	Public	445 students	K-5
St. Claire School	Private	225 students	K-8
West Hills Christian	Private	410 students	K-8

The SW Barbur/19th intersection is dominated by the Safeway grocery store. It is the only multi-floor structure in the area. Its first floor is a parking garage. The second floor has a balcony seating area that is accessible to the public and looks out on the intersection.

Outside of the grocery store and the schools, there are few trip generators within the walkshed. The walkshed is surrounded from the southwest to the northeast by a ring of trip generators. The outer ring will benefit from bike infrastructure. Once the station comes online the walkshed will likely fill in with more business development that will cater to more pedestrian movement.

Existing Conditions : Trip Generators

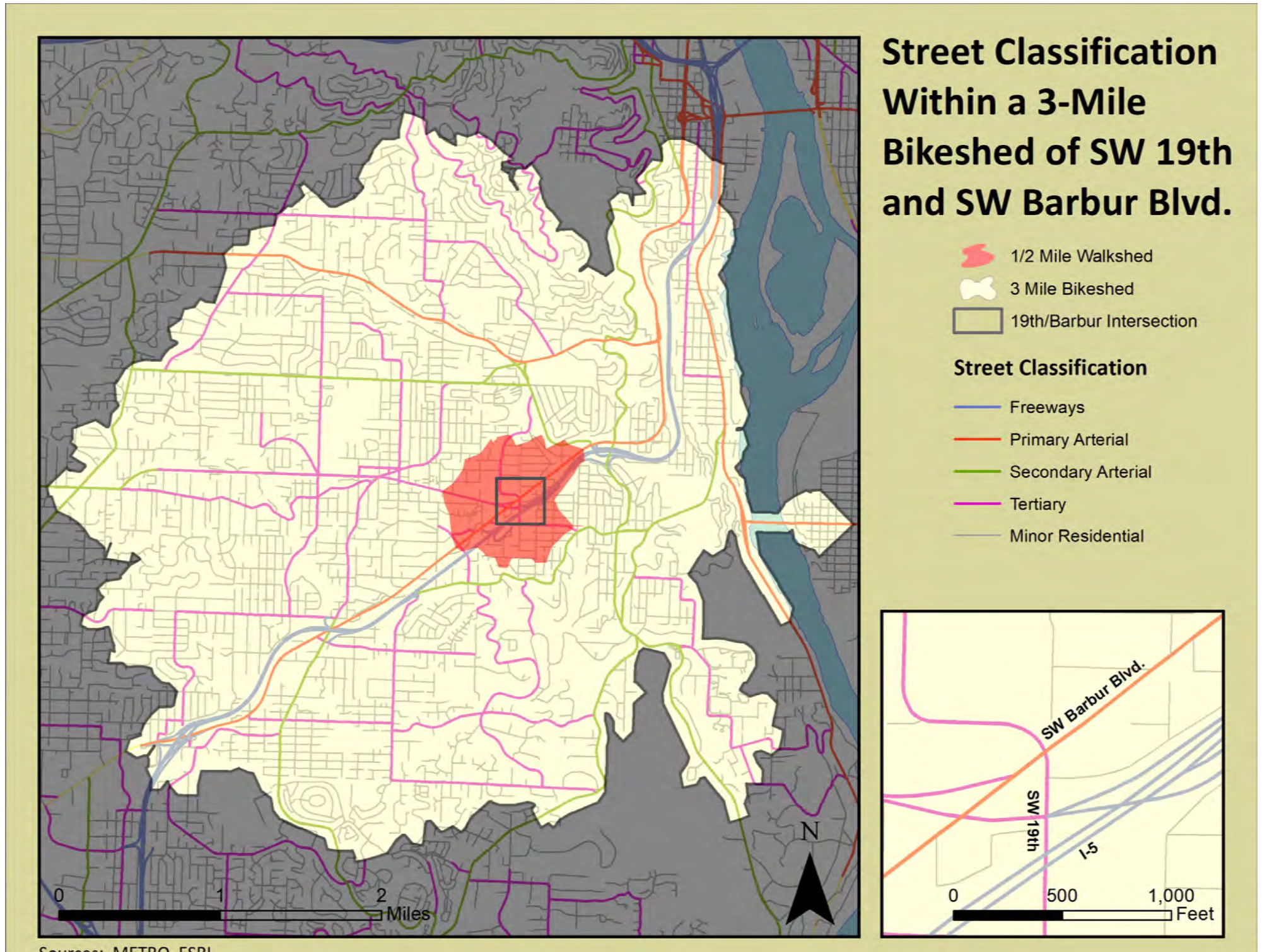


The greater the residential density, the more intense demand there is on surrounding infrastructure to get people from point A to point B. North of the SW Barbur and 19th intersection, SW Nevada and Capitol Highway have a cluster of multifamly housing. There is also a string multifamily housing further west on SW Barbur.

Low Income Residents

More thn 25% of the people living in the census block north of the proposed LRT station live in poverty. This block also has the highest intensity of MFR housing. The block immediately to the west of the proposed station, has the next highest poverty rate.

Existing Conditions : Transportation System

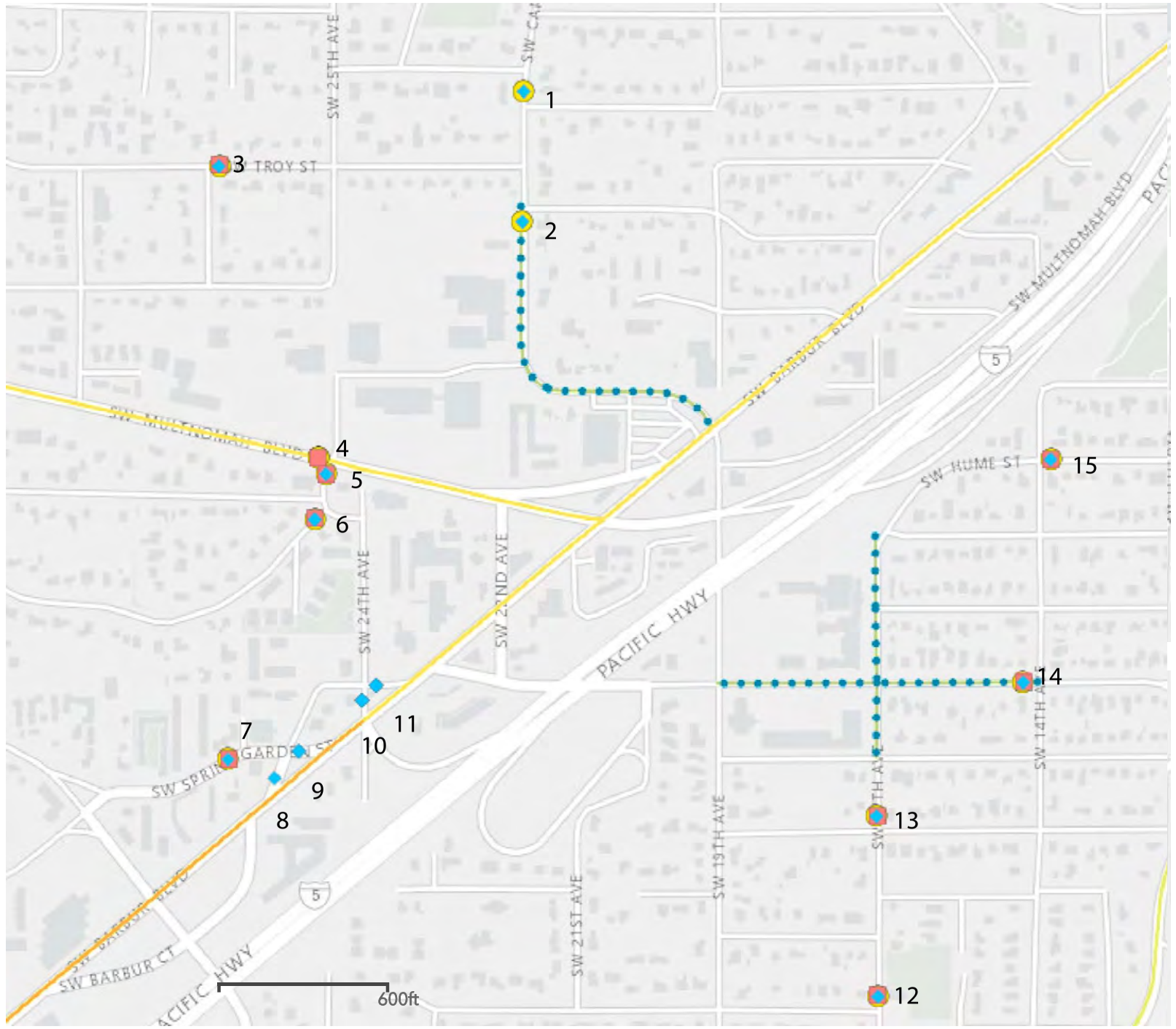


The posted speed limit on Barbur is 35 mph and there is a sidewalk on the southwestern side of the intersection. Observations in the field were made during the morning peak hours, which showed heavy northbound traffic on Barbur and little freight presence. A more detailed description of the annual average daily traffic (AADT) and the freight percentages along Barbur can be seen in Table 1.[1] Both directions of 19th Street are one lane roads with a posted speed limit of 25 mph leading up to the intersection. At the intersection, each leg has a left turn lane and a through/right turn lane.

Distance from Int.	AADT	Freight %
.15 miles SW	21,400	2%
.3 miles NE	19,100	2%

Existing Conditions : Transportation System

Portland's Bureau of Transportation has done traffic studies at a handful of intersectsions in the study area. These studies are broken down into 3 types: Traffic Volume, Traffic Speed, and Vehicle Class. Each study point has been grouped based on how they inform the recommendations.



	Location	Group
1	SW CAPITOL HILL RD N of CANBY ST	SW Capitol Hill Rd
2	SW CAPITOL HILL RD S of SW MOSS ST	SW Capitol Hill Rd
3	SW TROY ST E of 27TH AVE	SW Troy
4	SW MULTNOMAH BLVD W of 25TH AVE	SW Multnomah Blvd
5	SW 25TH AVE S of MULTNOMAH BLVD	SW Hume
6	SW HUME CT W of 25TH AVE	SW Hume
7	SW SPRING GARDEN ST W of 27TH AVE	SW Spring Gardens
8	SW SPRING GARDEN ST-BARBUR BLVD RAMP N of SW BARBUR BLVD	SW Barbur Access
9	SW SPRING GARDEN ST E of SW 26TH AVE	SW Barbur Access
10	SW 24TH AVE S of SPRING GARDEN ST	SW Barbur Access
11	SW SPRING GARDEN ST E of 24TH AVE	SW Barbur Access
12	SW 17TH AVE N of MARIGOLD ST	Schools Cluster
13	SW 17TH AVE N of DOLPH ST	Schools Cluster
14	SW SPRING GARDEN ST W of 14TH AVE	Schools Cluster
15	SW HUME ST E of 14TH AVE	Schools Cluster

SW Capitol Hill Road
- High Traffic volume on 2 lane road
- N and S bound speeding
- No Pedestrian Facilities

SW Troy
- Heavy East bound traffic, especially AM Peak
- E bound speeding
- Unmarked lanes

SW Spring Gardens St
- Heavy daily traffic on 2 lane road
- W bound speeding
- No Pedestrian Facilities

SW Barbur Access
- Heavy daily traffic on W bound exit
- No pedestrian Facilities
- Gap in Bike Lane

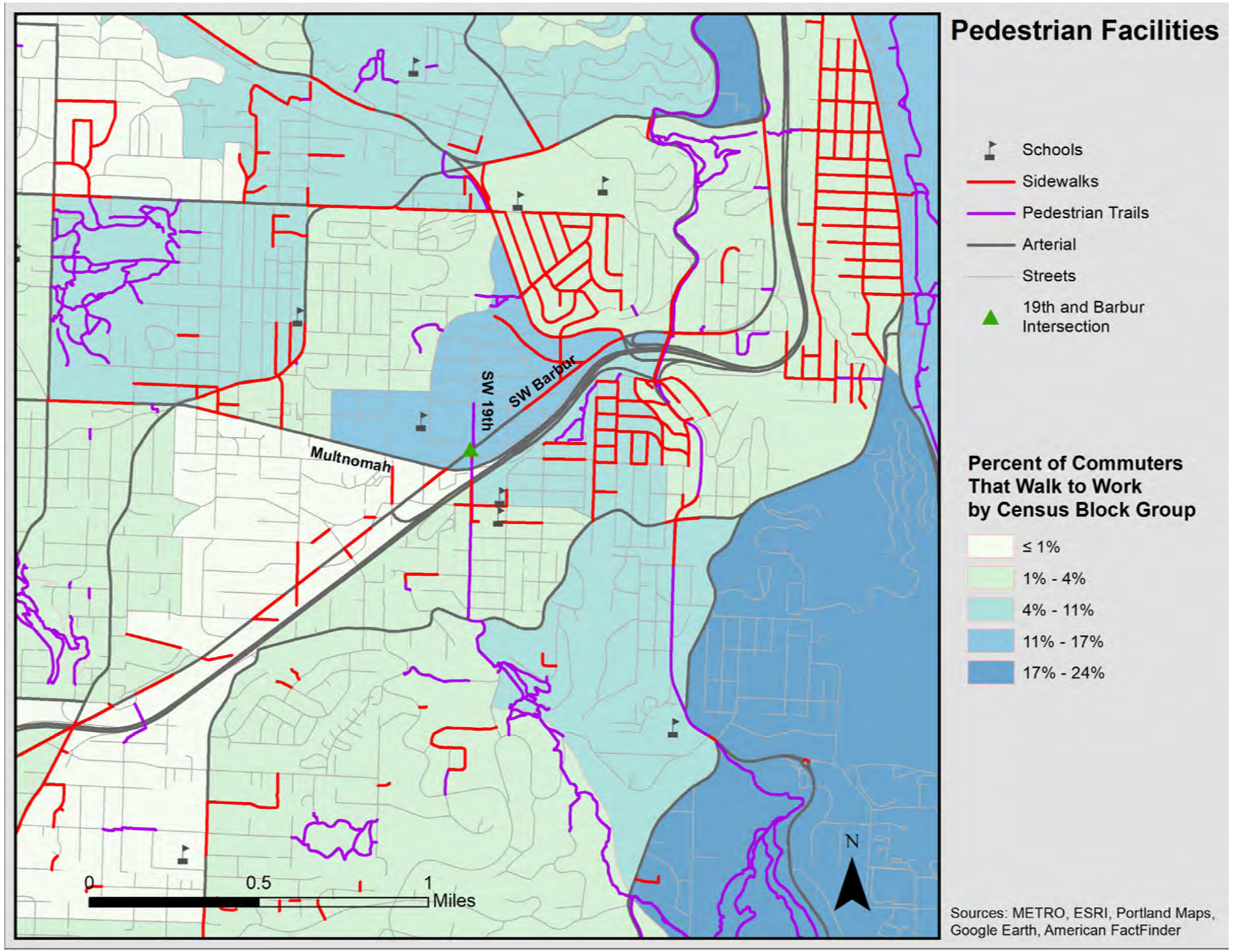
Schools - 17th
- N and S bound speeding
- Unmarked road
- No Pedestrian Facilities

Schools - Spring Garden
- Heavy daily traffic
- Highest level of Speeding in both directions
- Bike Sharrow
- School Zone

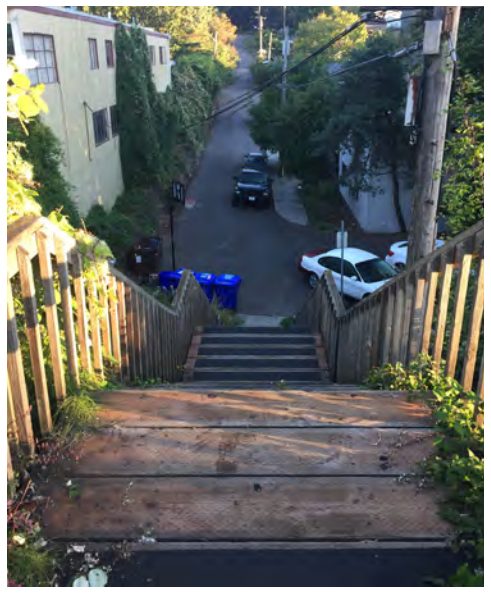
1 **2** **3** **4** **5** **6**

		Traffic Volume			Traffic Speed			Vehicle Class		
	Bound	ADT Volume	AMPkHr Vol	PMPkHr Vol	Posted Speed	Spd 85th	PctOver Posted	PctOver Posted10	% Cars	% Trucks
1	N	1091	140	131	25	27	**28.9**	0.6	-	-
1	S	1325	197	135	25	28	**38.5**	0.9	-	-
2	N	1277	144	154	25	27	**28.8**	0.2	-	-
2	S	1687	272	212	25	27	**29.2**	0.2	-	-
3	E	783	154	87	25	27	**32.8**	1.3	97.1	2.9
3	W	599	79	86	25	26	20.8	0.3	97.3	2.7
4	E	-	-	-	45	43	5.9	0.1	95.3	4.7
4	W	-	-	-	45	40	2.3	0	96.3	3.7
5	N	378	30	31	25	16	0	0	94	**6**
5	S	646	80	54	25	16	0.1	0	96	4
6	E	146	16	12	25	23	6.7	0.2	93.6	**6.4**
6	W	174	14	16	25	22	2.6	0	93.1	**6.9**
7	E	-	-	-	25	26	18.7	0	94.7	**5.3**
7	W	**2097**	**98**	**288**	25	27	**32.6**	0.3	95.7	4.3
8	S	428	32	35	-	-	-	-	-	-
9	W	**1981**	**118**	**230**	-	-	-	-	-	-
10	N	865	90	76	-	-	-	-	-	-
10	S	885	90	82	-	-	-	-	-	-
11	E	243	19	27	-	-	-	-	-	-
11	W	259	22	27	-	-	-	-	-	-
12	N	628	142	46	25	28	**37.1**	0.9	97.3	2.7
12	S	602	58	89	25	29	**44.9**	0.6	96.9	3.1
13	N	462	79	38	25	27	25.6	0.7	96.6	3.4
13	S	590	55	84	25	24	10.6	0	98.1	1.9
14	E	**2644**	**207**	**299**	25	31	**68.7**	**3.4**	96	4
14	W	**4065**	**384**	**365**	25	31	**63.8**	**3.2**	95.7	4.3
15	E	172	38	24	25	21	1.8	0	96.9	3.1
15	W	208	49	24	25	23	4.9	0	93	7

Existing Conditions : Pedestrian Network

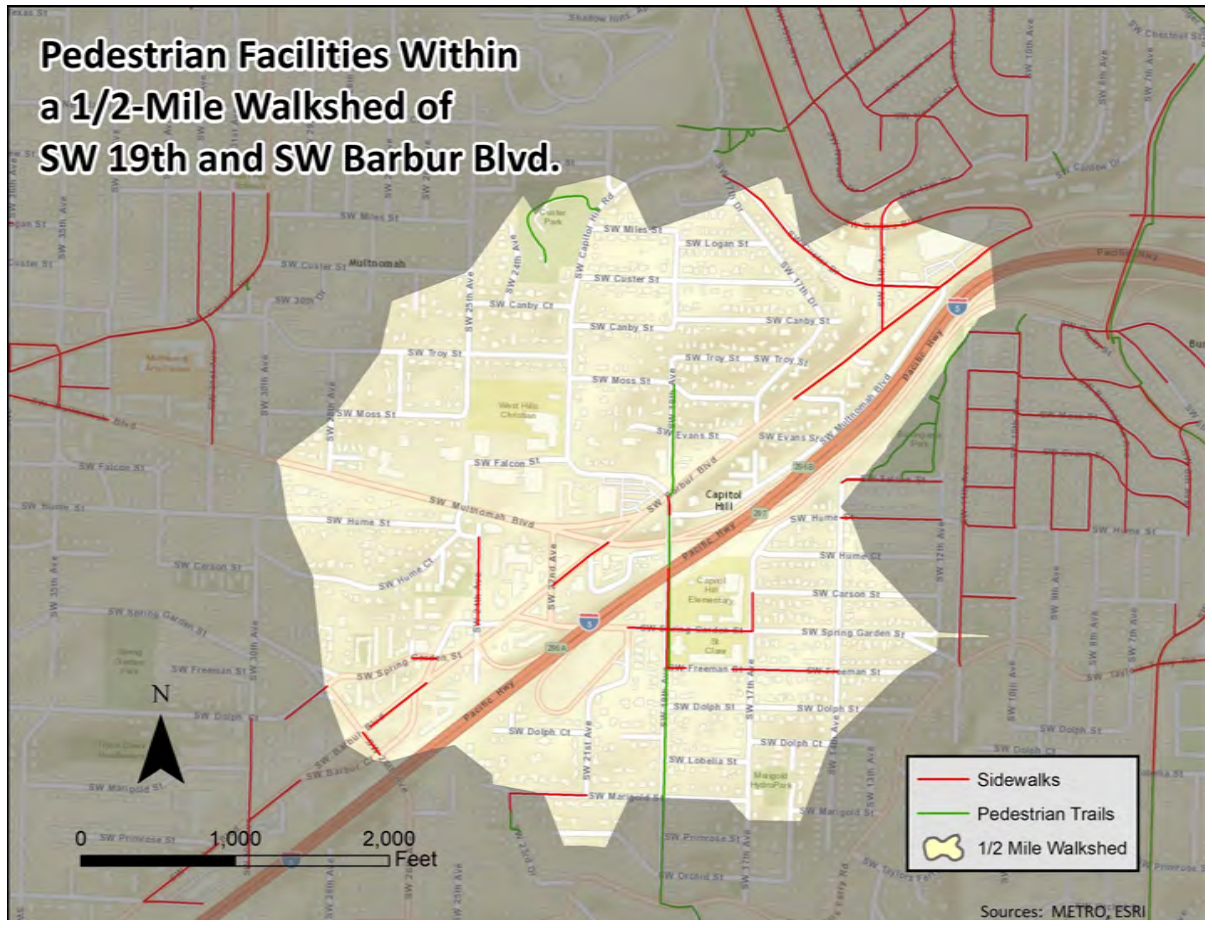


Due to its hilly nature, SW Portland has large gaps in its pedestrian network. Over time goat paths began to wear paths into the ground in the absence of formalized sidewalks. Slowly these paths evolved into SW Trails network, which includes a handful of stairways to provide pedestrian only travel when grades are too steep.

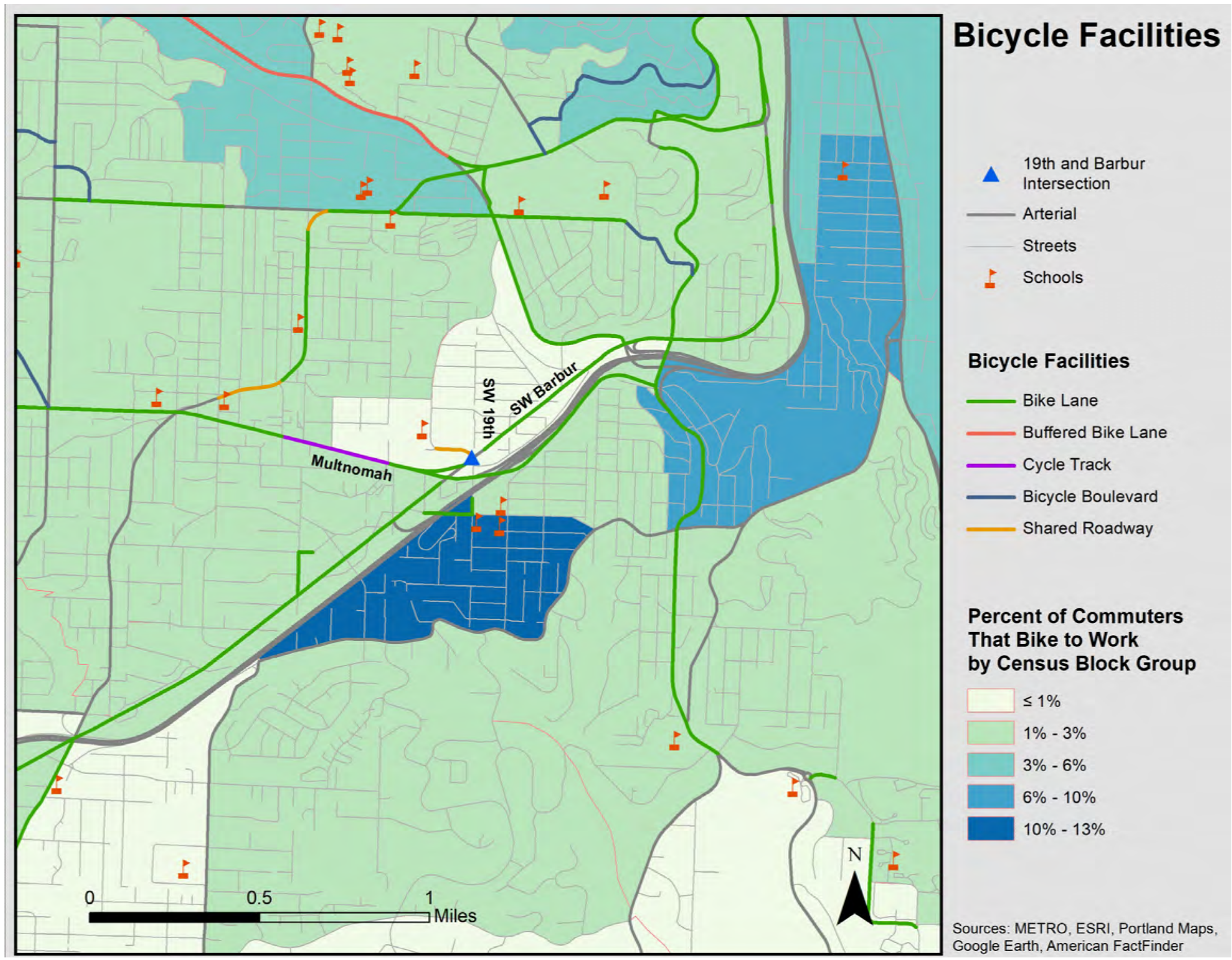


Existing Conditions : Pedestrian Network

The SW Barbur and SW 19th intersection itself has four light guided crosswalks and one pedestrian relief island installed. However, once crossed, there are few routes pedestrians can safely walk. Overall the intersection's connectivity is weak.



Existing Conditions : Bike Network



Bicycle Facilities

19th and Barbur Intersection
Arterial
Streets
Schools

Bicycle Facilities

Bike Lane
Buffered Bike Lane
Cycle Track
Bicycle Boulevard
Shared Roadway

Percent of Commuters That Bike to Work by Census Block Group

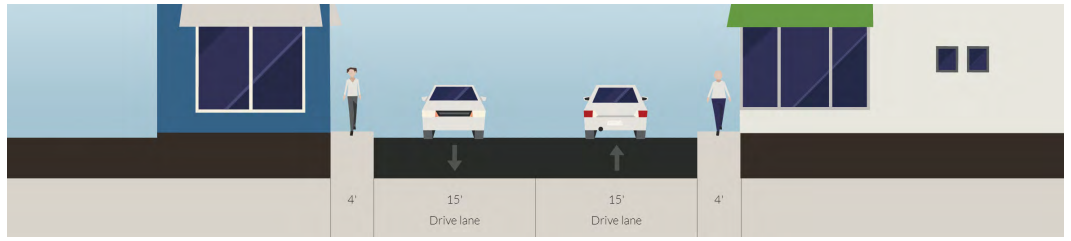
≤ 1%
1% - 3%
3% - 6%
6% - 10%
10% - 13%

Sources: METRO, ESRI, Portland Maps, Google Earth, American FactFinder

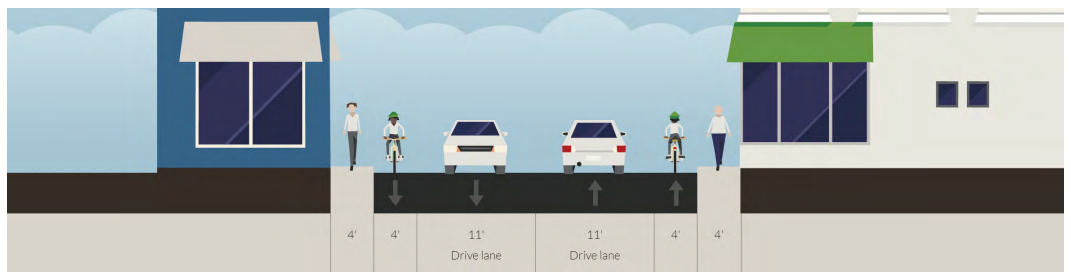
The bike infrastructure of the 3 mile bikeshed is predominantly oriented to moving cyclist along the same alignment as I-5. The northwest section has some facilities that direct cyclist to the downtown connectors, but the rest of the area is without bike facilities.

The census block to the southwest of the proposed LRT station has the hghest rate of biking to work of the area. More then 10% of the residents use the bike network to get to work. In order to get on the bike lane that runs along most of Barbur, residents must first get across I-5. To do this they must use one of the overpasses.

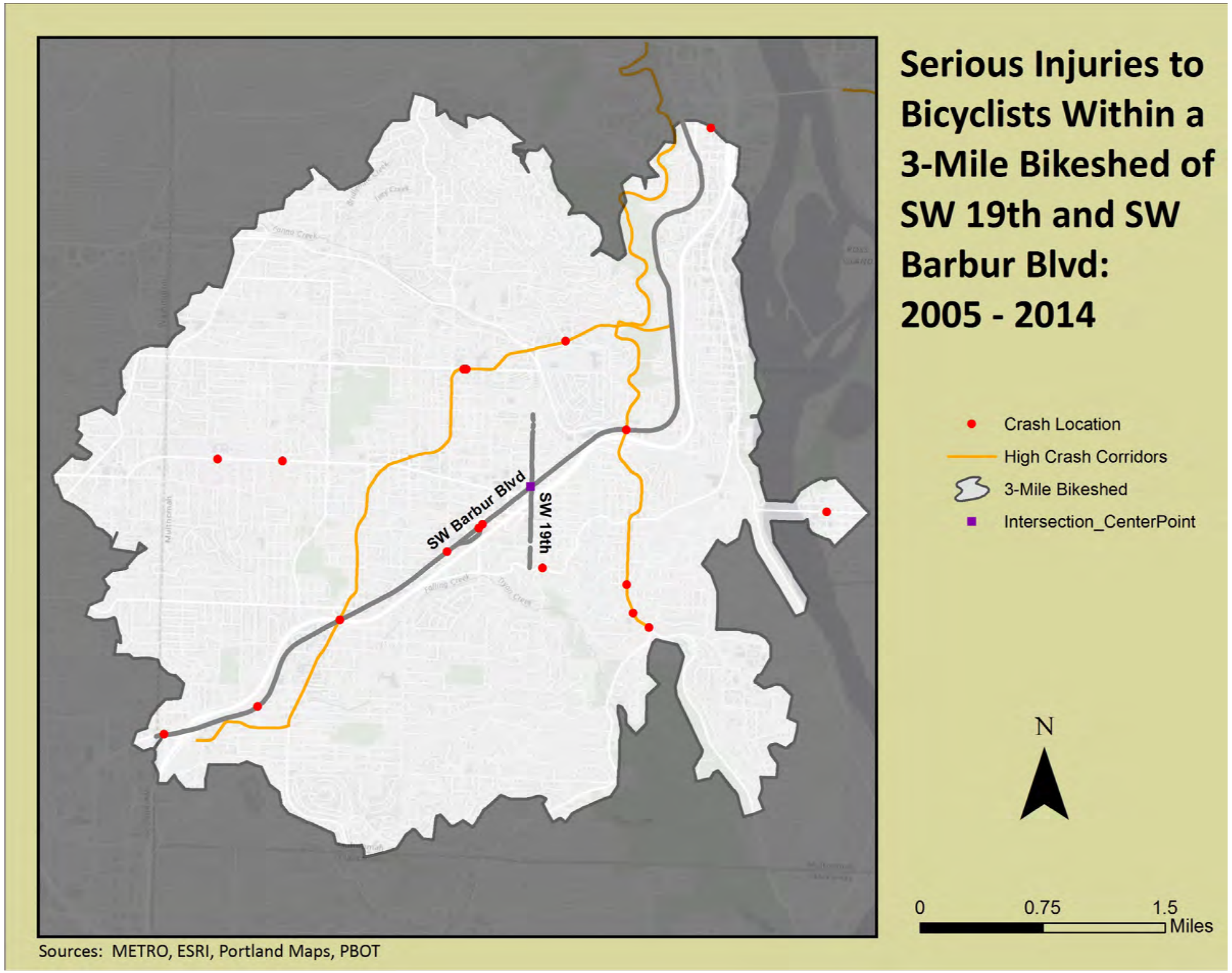
SW 19th I-5 overpass



SW Spring Garden I-5 overpass



Existing Conditions : Bike Network

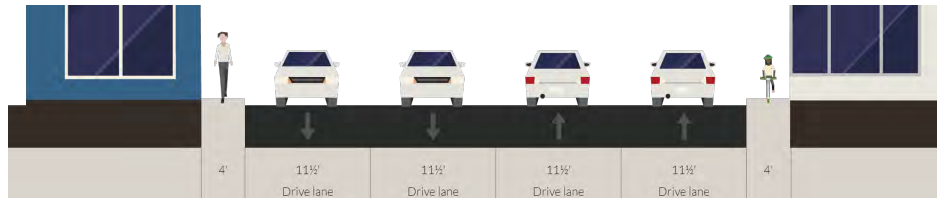


SW Barbur Boulevard has been identified by the City of Portland Bureau of Transportation as a high crash corridor in their SW Barbur Boulevard High Crash Corridor Safety Plan adopted in January 2012. Barbur was selected as a high crash corridor to focus on for a number of reasons: approximately 50% of the corridor lacks sidewalks, the incidence of crashes at driveways is about 50% higher than the citywide average, and the incidence of crashes caused by drivers disregarding traffic signals is about 50% higher than the citywide average. The document sets out a plan to improve Barbur, including pedestrian safety as one of the top priorities.

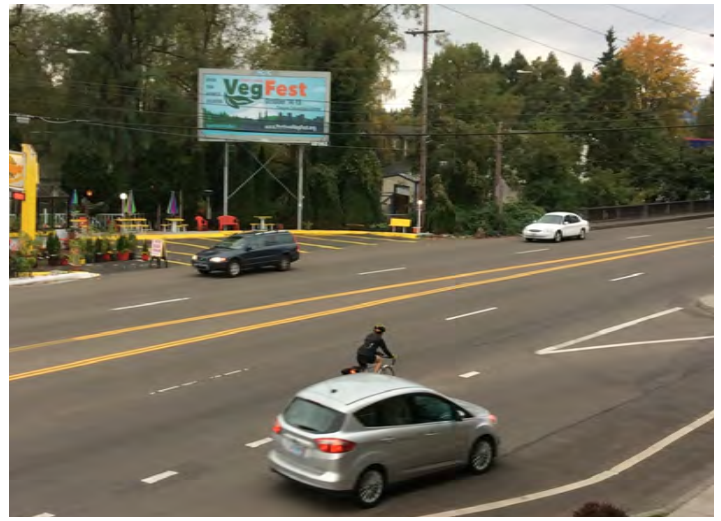
While much of the corridor has already been upgraded, the intersection of 19th and Barbur still needs some improvement with the safety issues of the sidewalk environment and crossings and connections to existing bike facilities. Traffic speed and volume is not prohibitive to walking, although the perceived safety of the area may be lower due to the proximity of pedestrians to the auto traffic. 3 serious crashes are shown on the map of the serious injuries to bicyclists within the 3 mile bikeshed of the intersection. It should be noted that the crashes shown on the map are of one severity: when bicyclists were hit by cars. There were 18 of these crashes from 2005-2014 in this study area.

Existing Conditions : Bike Network

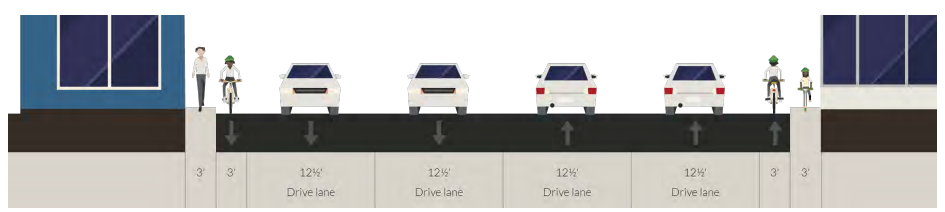
SW Barbur and Multnomah Blvd overpass

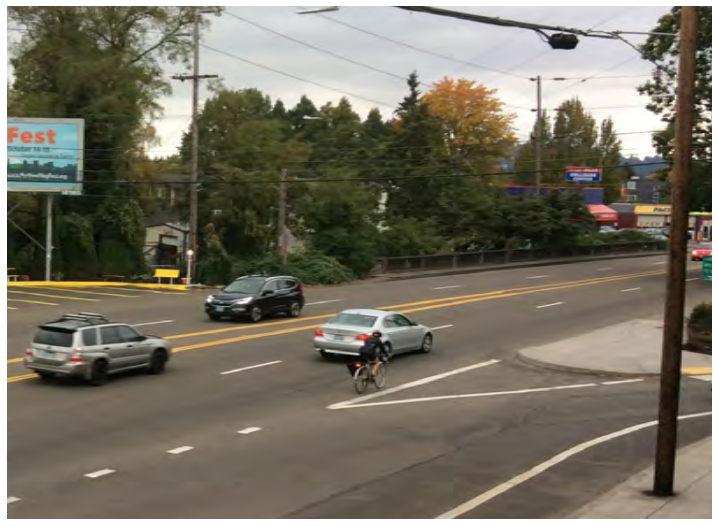


On the southern portion of Barbur's intersection with 19th, the bike lane diverts onto SW Multnomah and begins heading West. The 70 feet of bike lane that is present on SW Barbur to ease this diversion creates more hazard and confusion for cyclist. Drivers expect cyclist to follow the bike lane on to SW Multnomah and aren't prepared for them to be reintroduced to their ROW along Barbur.

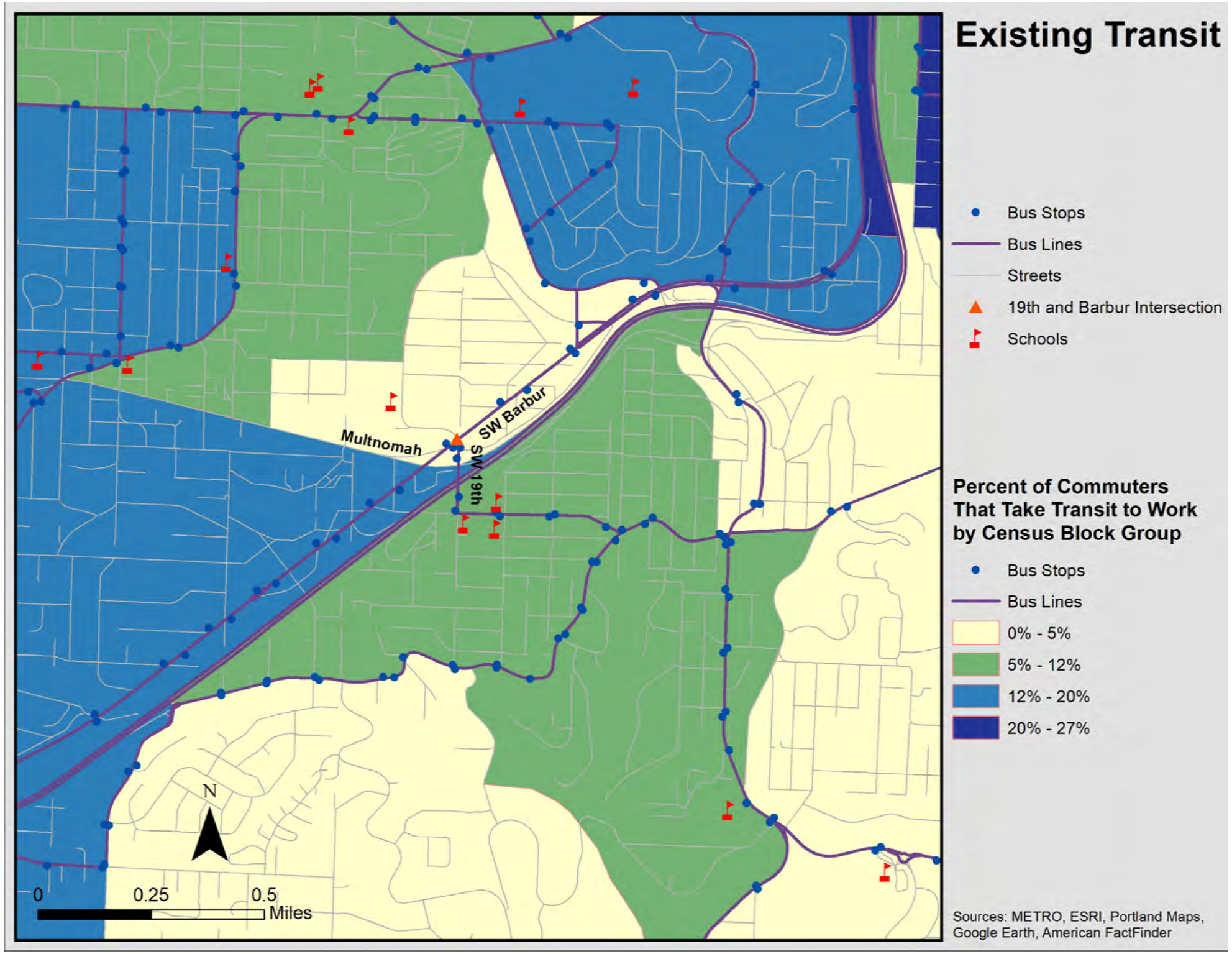


SW Barbur SW 26th overpass





Existing Conditions : Public Transportation



Existing Transit

- Bus Stops
- Bus Lines
- Streets
- 19th and Barbur Intersection
- Schools

Percent of Commuters That Take Transit to Work by Census Block Group

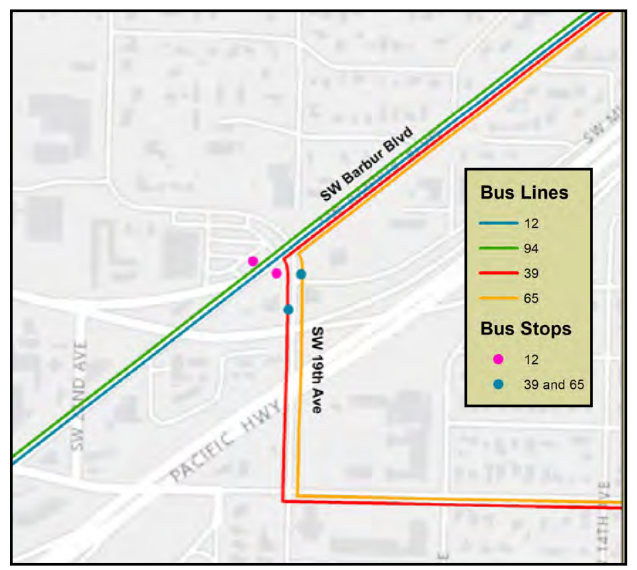
- Bus Stops
- Bus Lines
- 0% - 5%
- 5% - 12%
- 12% - 20%
- 20% - 27%

Sources: METRO, ESRI, Portland Maps, Google Earth, American FactFinder

Currently, the TriMet buses support the trips between Tigard area and the city center. Three bus lines have stops around the intersection at SW 19th Ave. and SW Barbur Blvd.

Possible access to MAX Station via existing bus lines:

- Line 94 - express line from Sherwood to Downtown Portland through Tigard on Barbur Blvd. Does not stop at intersection but runs through it.
- Line 12 - Tigard Transit Center to Parkrose Transit Center. Two stops on either side of the intersection on Barbur Blvd.
- Line 39 - to and from Lewis and Clark College. Stops on the south side of 19th.
- Line 65 - Marquam Hill along Barbur Blvd provides weekday rush-hour service between Burlingame and Marquam Hill, along Terwilliger, Spring Garden, 19th and Barbur. Stops on the south side of the intersection on 19th.

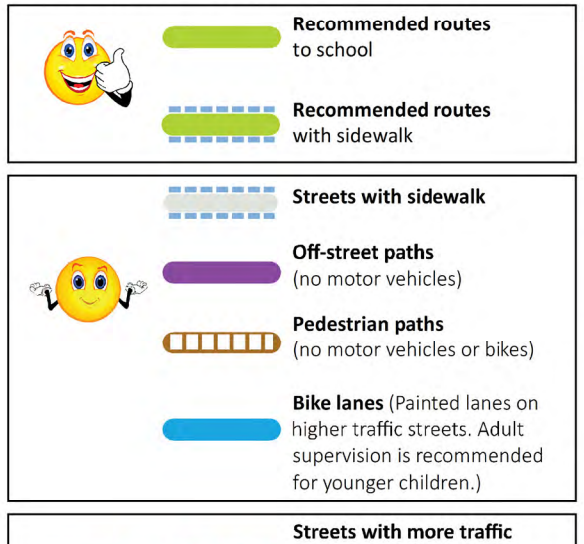


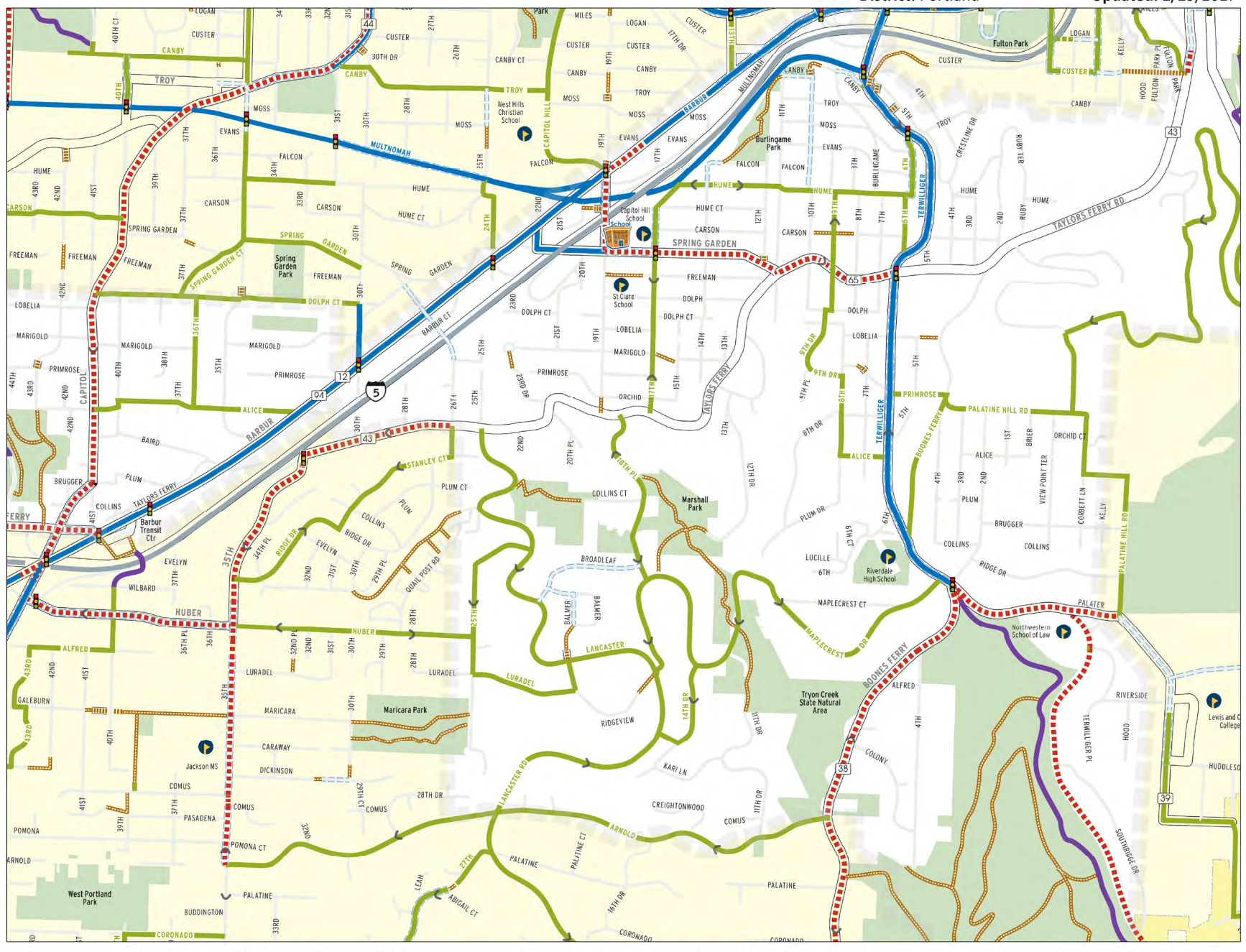
Existing Conditions : Safe Routes to School

Capitol Hill Elementary School

8401 SW 17th Ave

District: Portland **Updated:** 2/25/2017





The City of Portland and authors of this map ("City") provide this map "as is" for the user's convenience and expressly disclaim any representations or warranties regarding map information and road conditions. There may be discrepancies between what is shown on the map and actual conditions so riders and walkers are reminded to remain vigilant for road hazards. The City assumes no liability for any errors, omissions, or inaccuracies in the information provided for bicyclists who choose to travel on the routes depicted. Because bicycle riding involves inherent risk, users of this map waive any and all liability against the City for use of this map or routes. The trails are intended for recreational purposes. Many of the trails are located on unimproved public right of way. The City does not maintain the trails and the footing may be uneven.

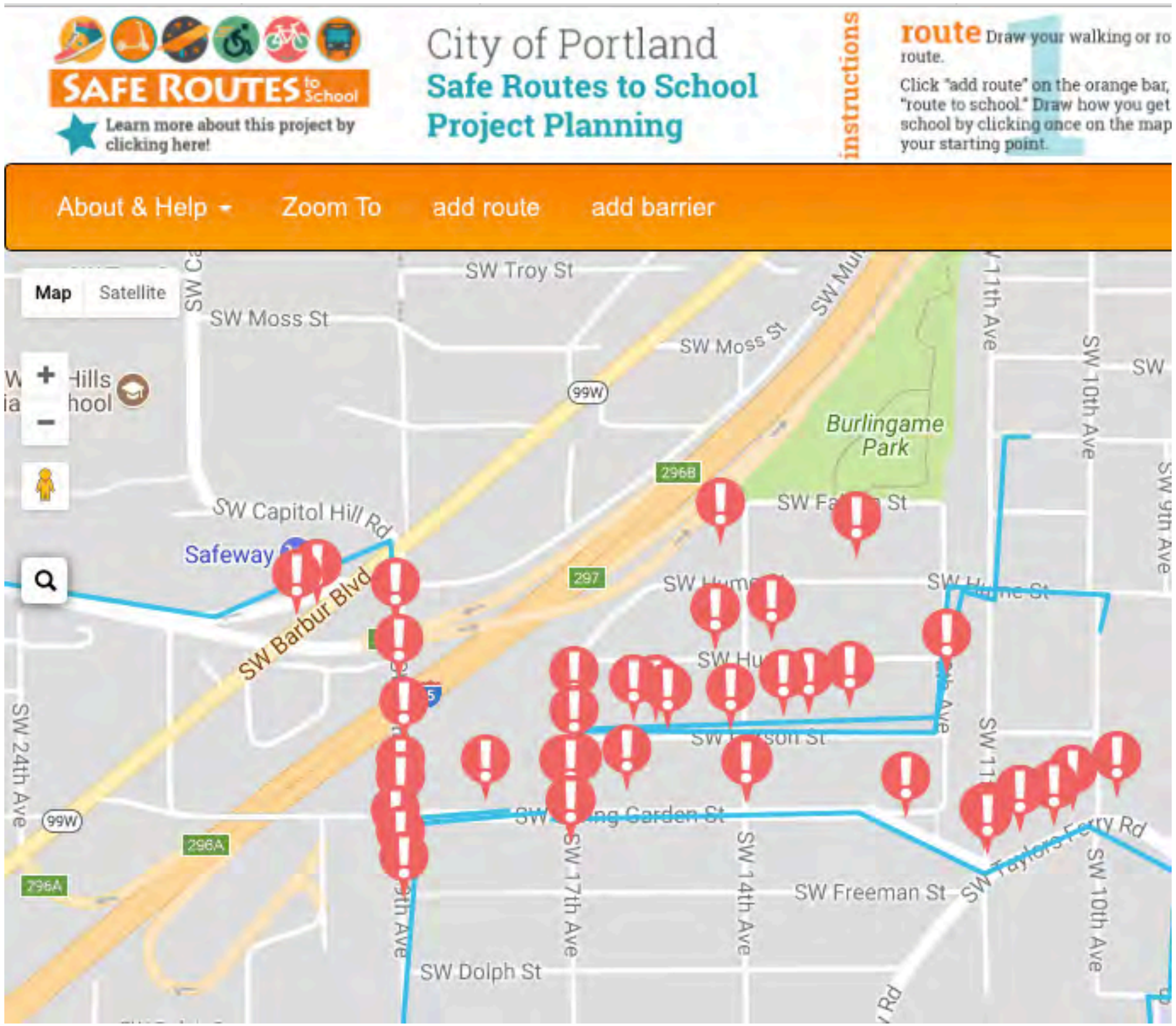
PBOT PORTLAND BUREAU OF TRANSPORTATION

SAFE ROUTES to School

If you see safety problems along the recommended routes, please contact Janis McDonald at (503) 823-5358 or SafeRoutes@portlandoregon.gov

Portland has been working on the Safe Routes to School initiative to provide public school students a safe biking or walking route to school. As part of that work, each public school was accessed to identify safe routes for students to take and to find where conflicts occurred. Assessments often result in improved infrastructure or a facility redesign. In 2007 Capitol Hill Elementary school had the right of way surrounding the schools dedicated and developed as a contiguous sidewalk.

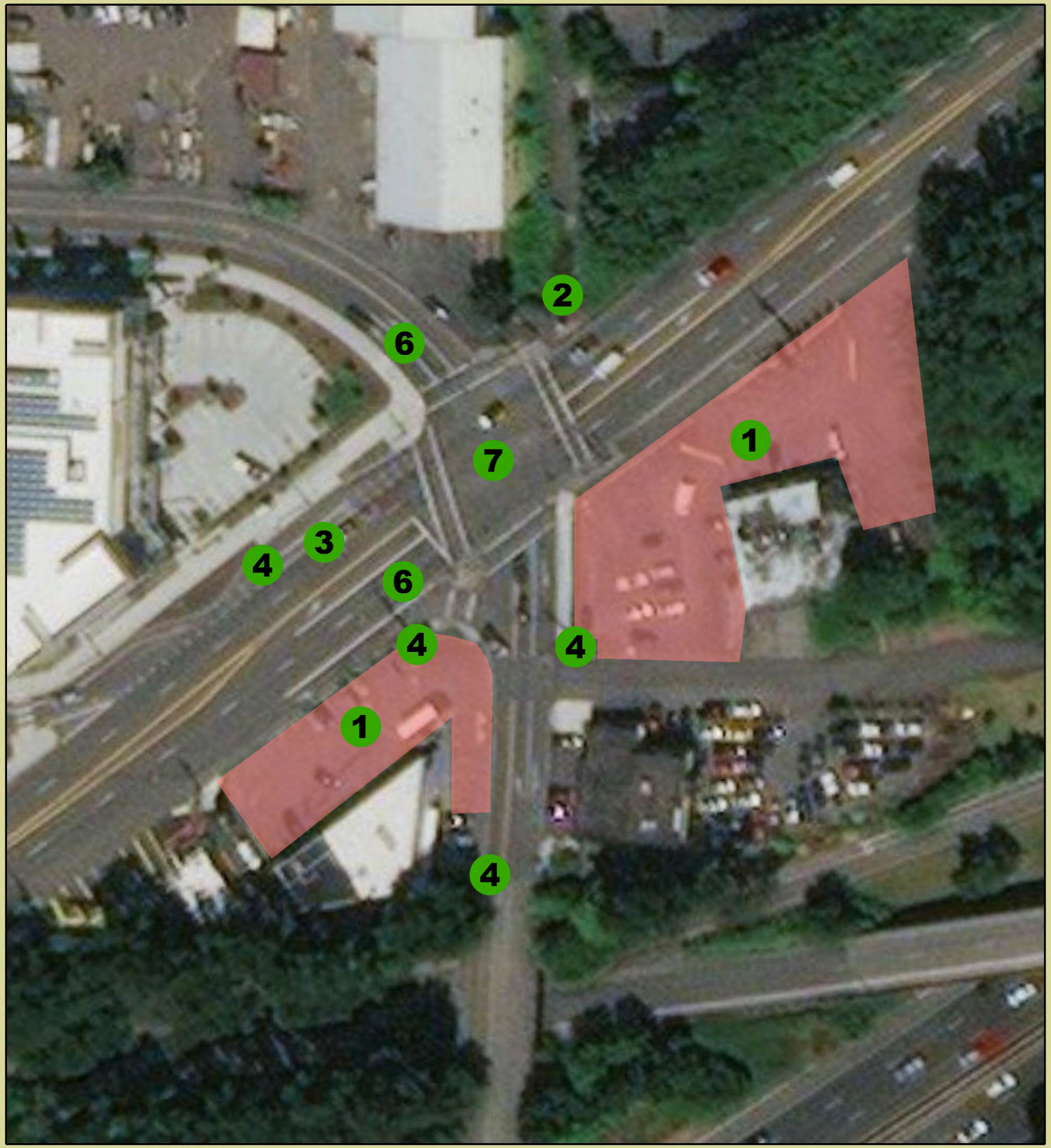
Existing Conditions : Safe Routes to School



In 2017, Portland's Bureau of Transportation collected data from parents, teachers, and neighbors of their school clusters to identify which projects to design and install next. This map shows the frequency of public comment on problem areas around Capitol Hill Elementary school. The blue lines are routes students currently take to school and exclamation points are areas of concern. Of 46 comments collected, the top 3 issues were lack of sidewalks, fast traffic, and high traffic volumes.

Issue	Frequency
Lack of sidewalk	19
Fast traffic	8
High traffic volume	8
Unmarked crosswalk	4
Poor pavement, roadway condition	2
Scary spot (bad house, dog, etc.)	2
No bike lanes	1
No shoulder	1
No signal	1

Existing Conditions : Opportunities



SW 19th and Barbur: Opportunities

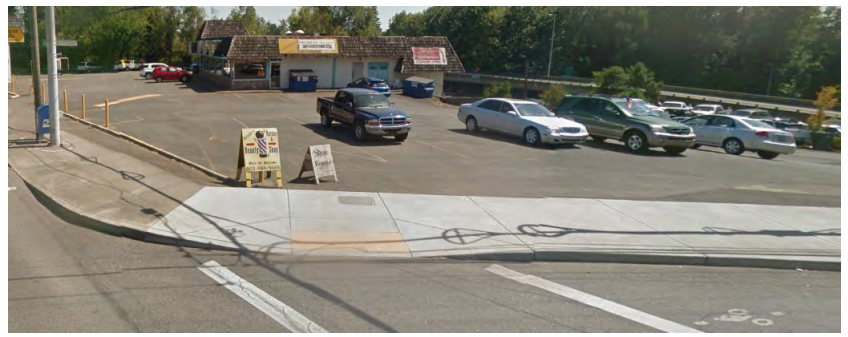
1. Empty Space in Parking Lots
2. Connection to SW Trails
3. Exisiting Bike Lanes On Barbur
4. Existing Bus Stops
6. Shared Road Markings 19th
7. Light Freight Traffic

N

0 100 200 Feet

Sources: METRO, ESRI, ODOT

Existing Conditions : Opportunities

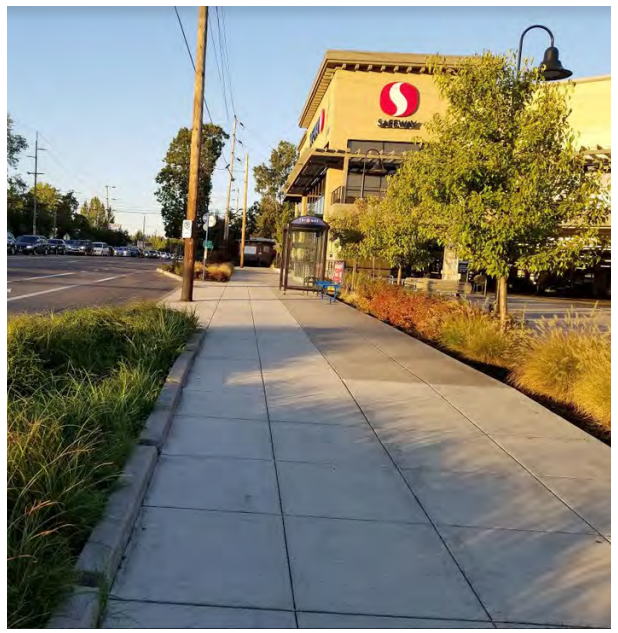


1 Curb development and right-of-way expansion is possible on the east side of Barbur where there are large parking lots and very small stretches of existing sidewalk.

2 Near the intersection there is the existing pedestrian infrastructure of the SW Trails could connect to any improvements done with this project.

3 Improvements of the walking infrastructure and the existing bike lanes on Barbur that could connect to any improvements done with this project.

4 Existing transit connections: The 12, 29, and 65 TriMet busses all stop at or near the corner of SW 19th and Barbur There are multiple existing transit lines that have stops at the intersection, providing future MAX riders and current bicyclists and pedestrians more options for transportation.

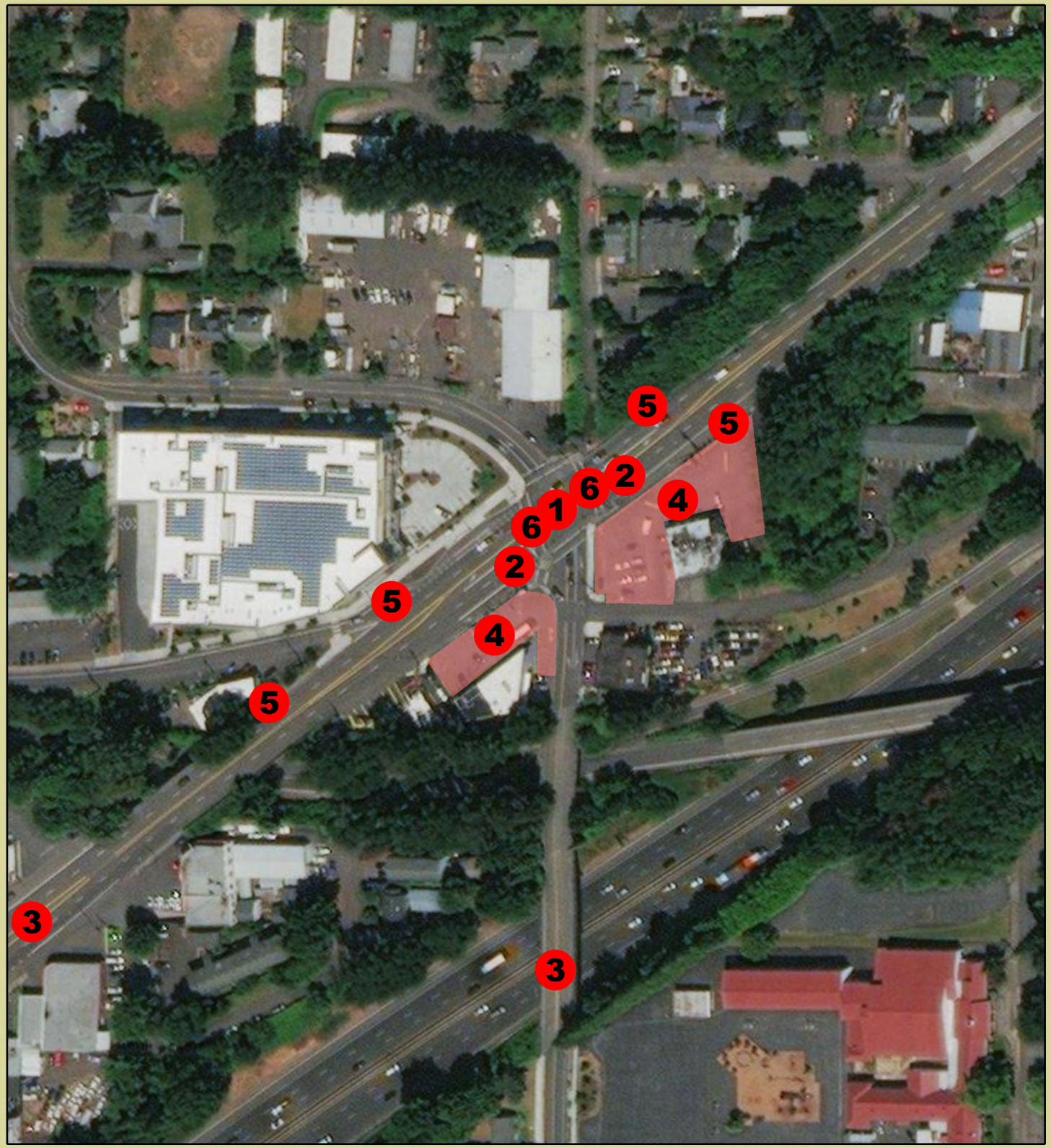


5 Large ROW available for sidewalks.

6 Existing bikelane down most of SE Barbur.

7 Due to Barbur's proximity to Interstate 5, the freight traffic is very low which is beneficial for the safety of pedestrians and cyclists.

Existing Conditions : Constraints



SW 19th and Barbur: Constraints

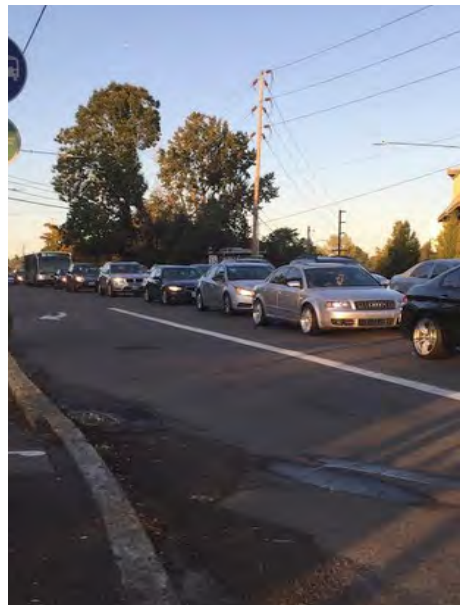
1. High Traffic Volume
2. Bikes not Prioritized in Intersection
3. Narrow Overpasses
4. Parking Lots Privately Owned
5. Gaps in Bike Lanes
6. Long Crossing Distance on Barbur

N

0 200 400 Feet

Sources: METRO, ESRI, ODOT

Existing Conditions : Constraints



1 Barbur has a high amount of traffic, especially at peak hours of the day, that may make bicyclists and pedestrians at the intersection uneasy. The speed of the vehicles also has an impact on non-motorized users' perceived safety.

2 Bicyclists are not prioritized through or near the intersection.

3 Narrow Overpasses.

The lack of existing sidewalk facilities will be a problem the project will have to focus on. While large parking lots exist for potential purchase, there is still the need to acquire the land for improvement. **4**

Gaps in the bicycle network. **5**

6 Long crossing distances at SW Barbur and SW 19th.

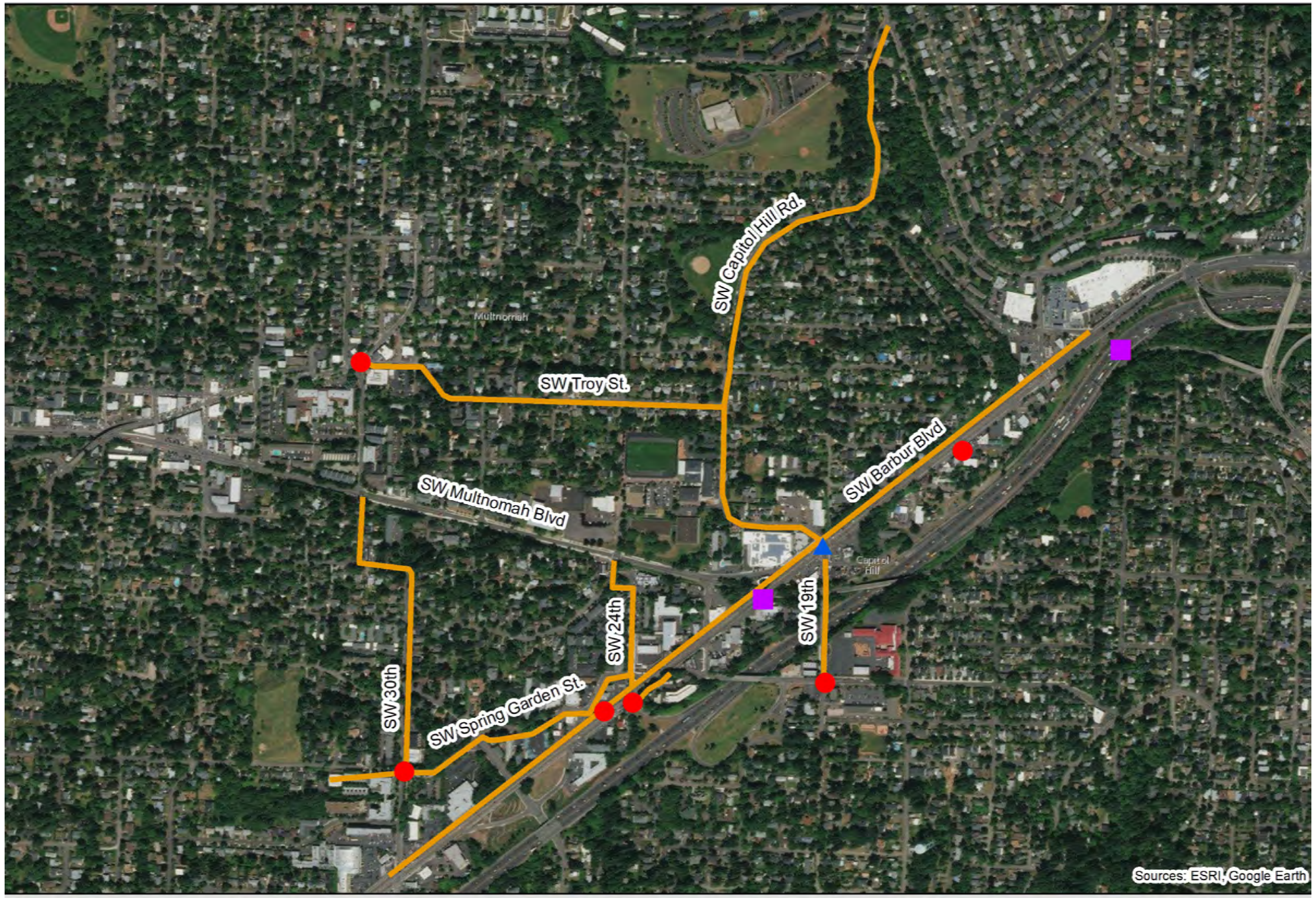
Recommendations

Project recommendations are provided at three levels: Station, Regional Connectivity and Intersection. The following sections will describe each recommendation in detail, and then provide cost estimates and a prioritization matrix regarding the overall project goals. To summarize, the project team has developed a phasing solution for Tri-Met to implement all recommendations in a cost-effective and safety-focused manner.

Station recommendations were made in order to guide Tri-Met's upcoming construction decisions to focus on bicyclist and pedestrian safety. Without a parking garage planned for this station, active transportation commuters should be prioritized in the selection of amenities. The recommendations in the following section primarily reflect the project's safety and community involvement goals.

Regional Connectivity recommendations were made towards the ultimate goal of a safe and comfortable bicycle and pedestrian network to connect future MAX riders to major residential areas, commercial attractions like Multnomah Village, and most importantly to the nearby schools. These recommendations will improve overall safety for all road users of this neighborhood, as well as achieve the project's goal of full connectivity.

Intersection recommendations were made to improve the safety of crossings that will experience an increase in activity with a new MAX Station nearby. The regional connectivity recommendations will be complimented with easy and comfortable crossing improvements throughout the project area, achieving all three goals of safety, connectivity, and community involvement.



Recommendations : Station Level

The station-level recommendations listed below should be included in the station at the time of construction by Tri-Met, and therefore were not included as part of the cost estimate process.

1. **Pedestrian and Bicyclist Wayfinding**

To promote usage of the recommendations listed in the following sections, wayfinding signage is recommended to be part of the initial station plan. A collaboration with SW Trails, Multnomah Village, and the surrounding schools is also recommended for the development of the wayfinding signage to connect pedestrians with already existing infrastructure.

2. **Station Area Shelters and Seating**

Shelters and seating in the station area will make MAX riders feel more comfortable year-round when waiting for the next train to arrive. Seating also provides assistance to those in need, creating better accessibility for all potential riders.

3. **Z-Crossings Over Tracks**

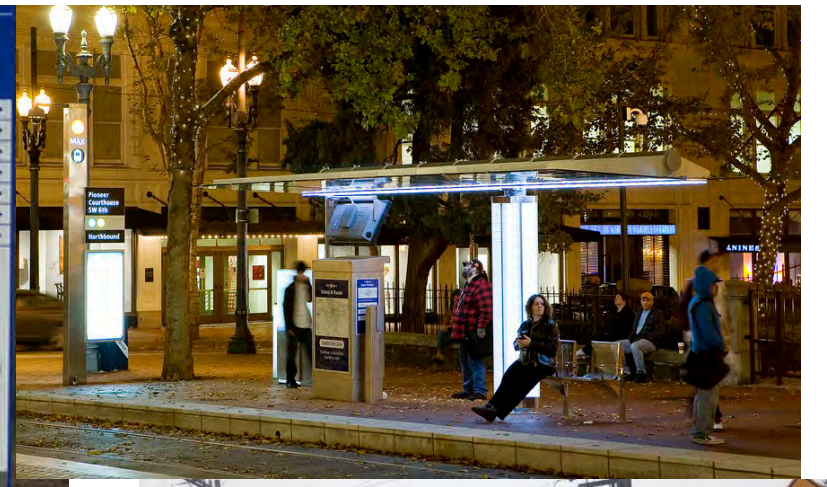
In order to get across the new light rail tracks that will be put in place, pedestrian warning and safe crossings are necessary. It is recommended that pedestrians be forced into a "Z" pattern for crossing the train tracks, so that before they step into the line of the train they are forced by railings and signage to be facing the direction the train is coming from.

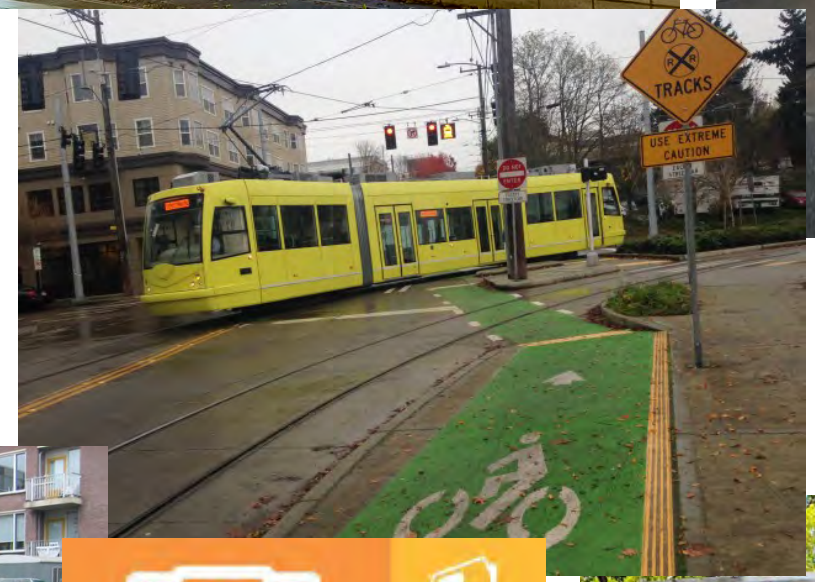
4. **Bike Parking and Fix-It Stations**

To encourage bicyclists to ride to the MAX Station rather than drive, Tri-Met should provide bike and ride options, covered bike racks, and bicycle fix-it stations. In conjunction with bicycle improvements listed in the following sections, bicyclists will be attracted to the station because of these amenities.

5. **Encouragement of Bicycle and Pedestrian Commute Options**

It is recommended that Tri-Met work with local residents, neighborhood associations, and employers along Barbur and into downtown to create incentive programs for their employees that involve using the new MAX Line and active transportation options in order to get there.





Recommendations : Regional Connectivity

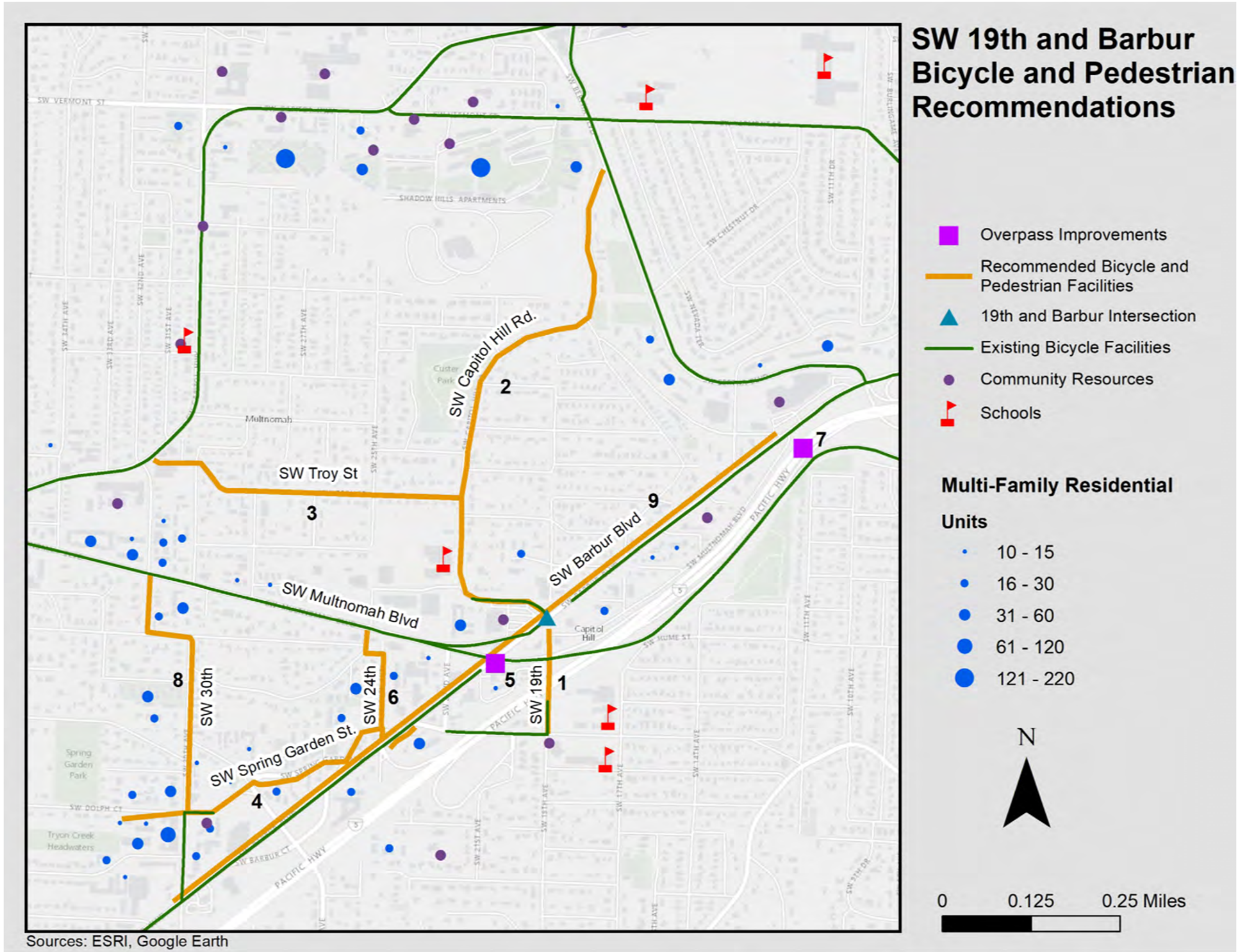
Within the three-mile radius surrounding the station there are 9 recommendations for making pedestrian and bicycle access significantly safer and more pleasant. These improvements promise to support the plan's goals of improving and increasing bicycle and pedestrian access to the station.

1. 19th Street Bike Lanes and Sidewalks

The 19th Street overpass of Interstate 5 is essential for connection to the station from the neighborhoods and schools south of Interstate 5. An existing striped bike lane should be extended from its current termination near Spring Garden Street to Barbur Boulevard Sidewalks should be filled in through the large commercial parking lots surrounding the commercial businesses on the corner of Barbur and 19th Street.

2. Capitol Hill Road Bike Lanes, Sharrows, and Sidewalks

As one of the direct connections to the new MAX Station, Capitol Hill Road needs to be improved for both bicyclists and pedestrians. The new sidewalks near the Safeway should be extended throughout the length of Capitol Hill Road to Bertha Boulevard on both sides of the street. A striped bike lane should be added going up-hill, and sharrows going down-hill to connect with the existing sharrows at the intersection. Right-of-way acquisition is expected for the in-fill of the sidewalks and room for the striped bike lane, however a great majority of the houses on Capitol Hill Road have front yards that will provide the extra space for these improvements without demolition of any buildings.



Recommendations : Regional Connectivity

3. Troy Street Bike Sharrows and Sidewalks

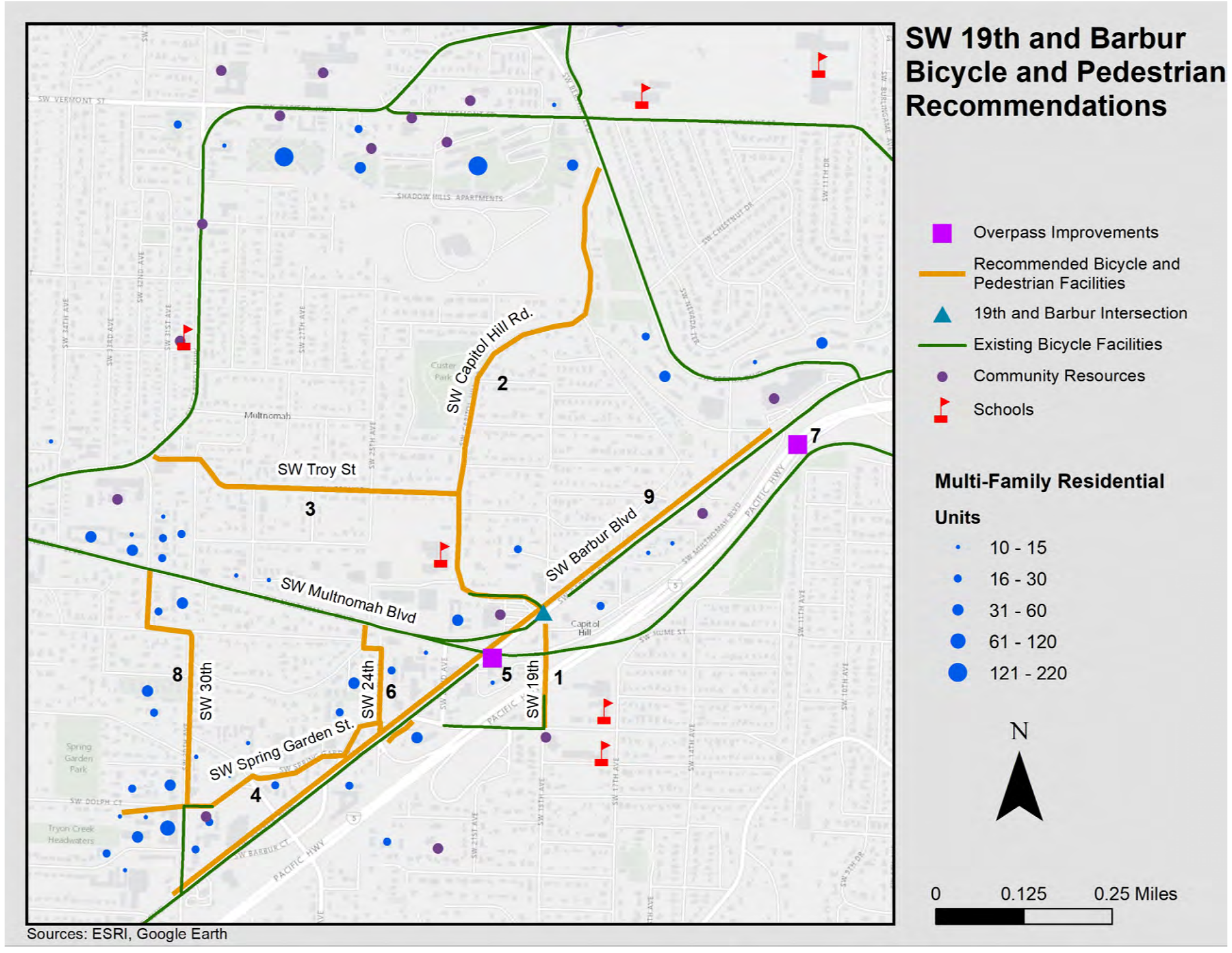
A connection to Multnomah Village from the new MAX Station has been identified as a priority due to it's commercial attraction and surrounding neighborhoods. While Multnomah Boulevard provides one route for connecting bicyclists and pedestrians, a second route lies along Capitol Hill Road and Troy Street. Troy Street is classified as residential with low vehicle speeds, therefore Bike Sharrows are recommended to increase safety for bicyclists on this alternative route. Sidewalks should be installed for pedestrians to use this route as well to not only benefit station-goers, but also neighborhood residents that wish to walk safely to Multnomah Village.

4. Spring Garden Street and Dolph Street Bike Lane, Sharrows, and Sidewalks

To connect residents that live or work south of the new MAX Station near Barbur Boulevard, the improvement of nearby side streets for bicyclists and pedestrians is necessary for improved safety and levels of comfort. Dolph Street and Spring Garden Street north of Barbur can connect future MAX users from these neighborhoods to the direct route of Barbur. An up-hill bike lane and down-hill sharrow improves safety for bicyclists, and the infill of sidewalks on both sides of the street will improve safety for pedestrians.

5. Widening of Barbur Boulevard Overpass of Multnomah Boulevard

Due to the narrow width of the existing Barbur Boulevard overpass of Multnomah Boulevard, the project team has worked under the assumption that Tri-Met will be widening the overpass to account for the extra room that a light-rail train needs for safe travel. It is recommended that this widening be expanded for the safe crossing of both bicyclists and pedestrians along the new overpass as well.



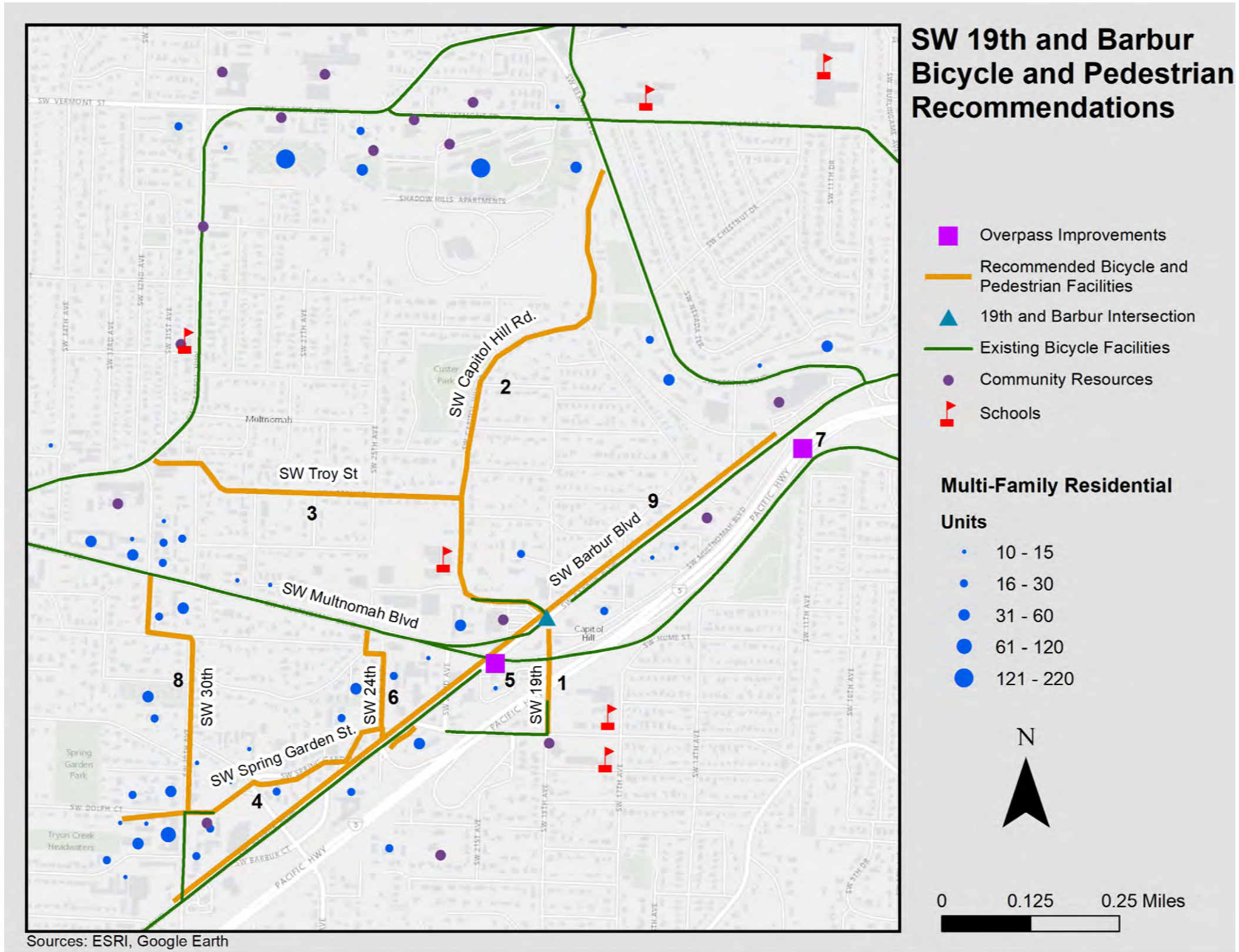
Sources: ESRI, Google Earth

Recommendations : Regional Connectivity

6. 24th Street Bike Sharrows and Sidewalk Infill
Bike Sharrows and sidewalk infill is recommended on 24th Street just south of Multnomah Boulevard and southwest of the MAX station. Improvements in bike and pedestrian infrastructure for this neighborhood will provide convenient and safe access to the MAX Station, as well as help complete the overall active transportation network surrounding the station.

7. Bicycle and Pedestrian Overpass of Interstate-5
The neighborhoods south of I-5 and Barbur Boulevard are connected to the MAX Station by either the 19th Street overpass of I-5 or the much more southern overpass of I-5 on Spring Garden Street. The residents in the north-eastern section of this neighborhood are currently forced to walk multiple blocks before even connecting with 19th Street or Spring Garden Street, or take the high-volume Terwilliger Boulevard overpass. For this reason, a bicycle and pedestrian overpass if I-5 is recommended to connect Burlingame Park and its surrounding residents on a more direct route to Barbur Boulevard and the new MAX Station.

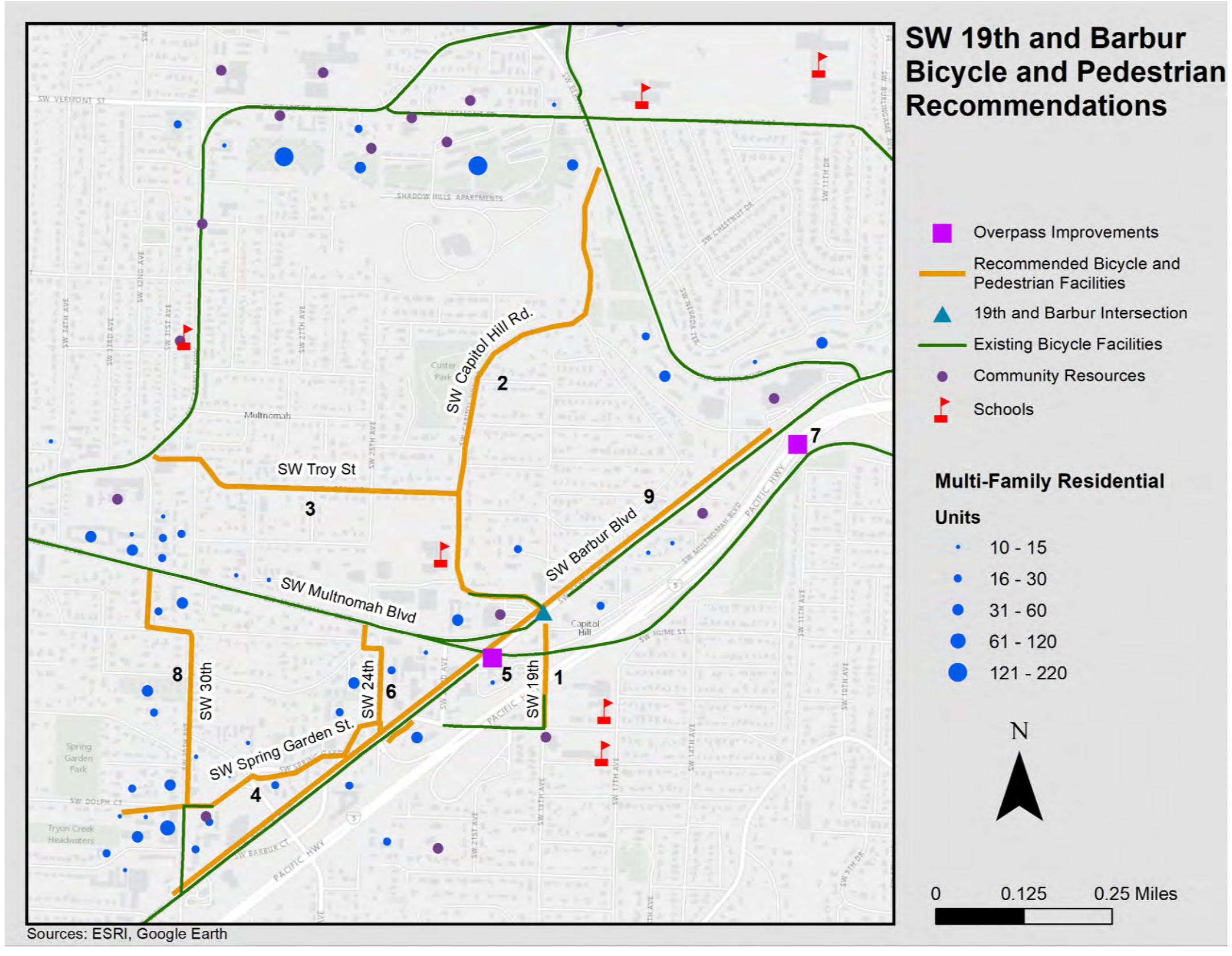
8. 30th Avenue Bike Sharrows and Sidewalks
Bike Sharrows and Sidewalk infill is recommended on 30th Avenue's sidewalks to connect with existing routes on Barbur Boulevard and Multnomah Boulevard in order to connect businesses and residents southwest of the intersection with safe and comfortable bicycle and pedestrian routes.



Recommendations : Regional Connectivity

9. Barbur Boulevard Bike Lane, Buffer, and Sidewalk Infill

While intermittent bike lanes and sidewalks exist on Barbur Boulevard today, both are lacking near the intersection where the new MAX Station will be. Under the assumption that Tri-Met will be widening Barbur throughout the project area so that the light rail train will have enough room to travel safely, it is recommended that the road be widened enough for a bike lane, a buffer in between vehicle lanes of travel and the bike lane, and ADA compliant sidewalks. Cost estimates for this recommendation were done based on the widening of a road for appropriate bike lanes, buffers, and sidewalks, excluding the cost of widening the road for the MAX Line and the right of way acquisition that will be necessary.



Recommendations : Intersection Level

Pedestrians utilizing the 19th and Barbur MAX Station may travel further than the initial ½ mile walkshed that was analyzed in the existing conditions due to the frequency and consistency of MAX Line service. For this reason, pedestrian improvements were expanded beyond the ½ mile boundary. There are 6 recommendations for making crossing the street significantly safer and more pleasant for pedestrians.

1. 19th Street and Spring Garden School Speed Zone Flashing Sign

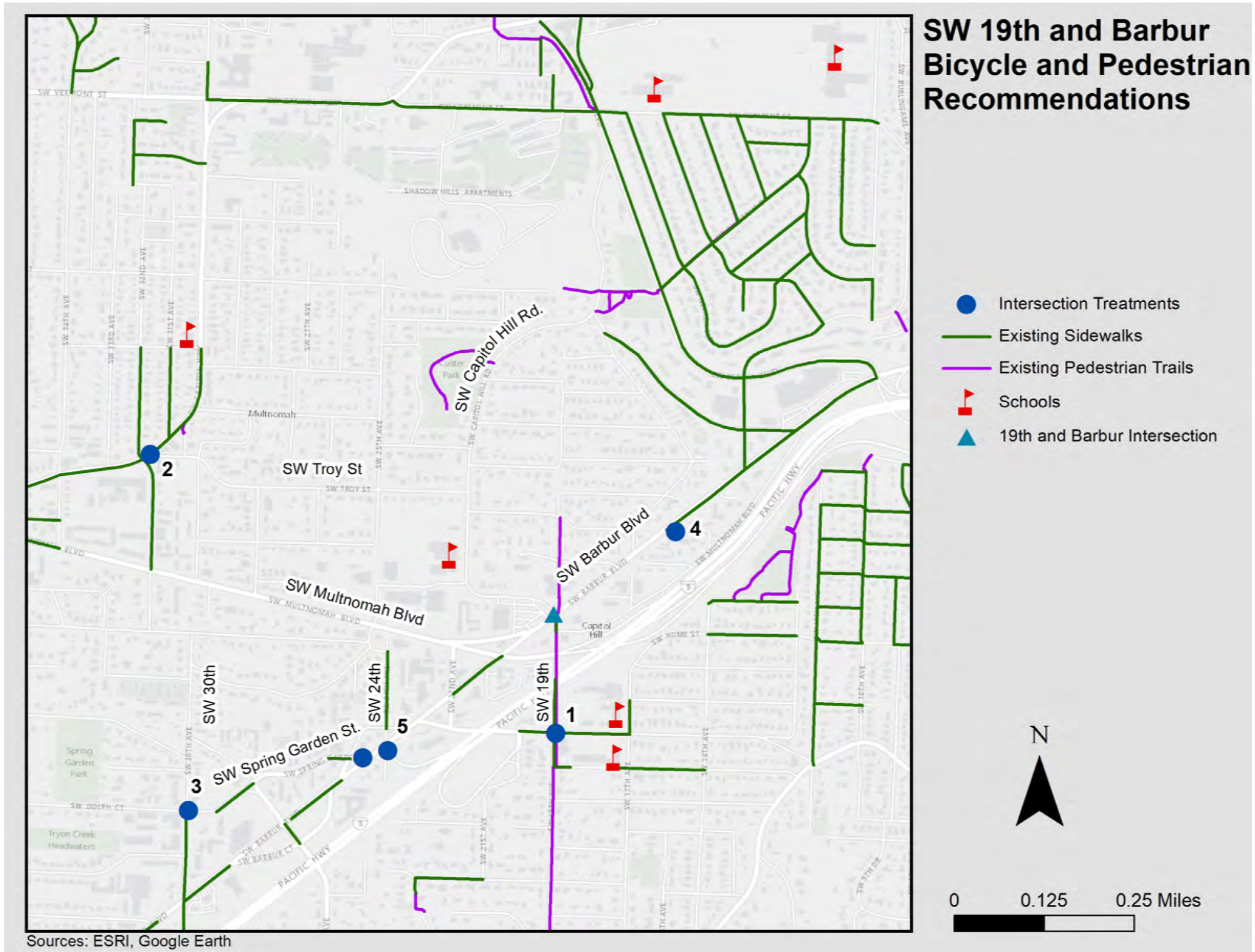
Due to the potential for increased traffic on 19th Street from the new MAX Station, a School Speed Zone Flashing Sign will improve the level of safety and comfort for children and parents of the nearby elementary schools. There is a four-way stop and marked crosswalk located at Spring Garden and 19th Street, and the flashing sign will give drivers an extra warning as they approach this highly prioritized intersection for safety.

2. Troy Street and Capitol Hill Road RRFB Crossing

As mentioned in the regional connectivity recommendations, Capitol Hill Road and Troy Street provide a connection for pedestrians and bicyclists to Multnomah Village from the new MAX Station. A marked crosswalk with Rapid Rectangular Flashing Beacons would greatly improve safety for pedestrians that wish to cross Capitol Hill Road and continue down Troy Street.

3. Dolph Street and 30th Street RRFB Crossing

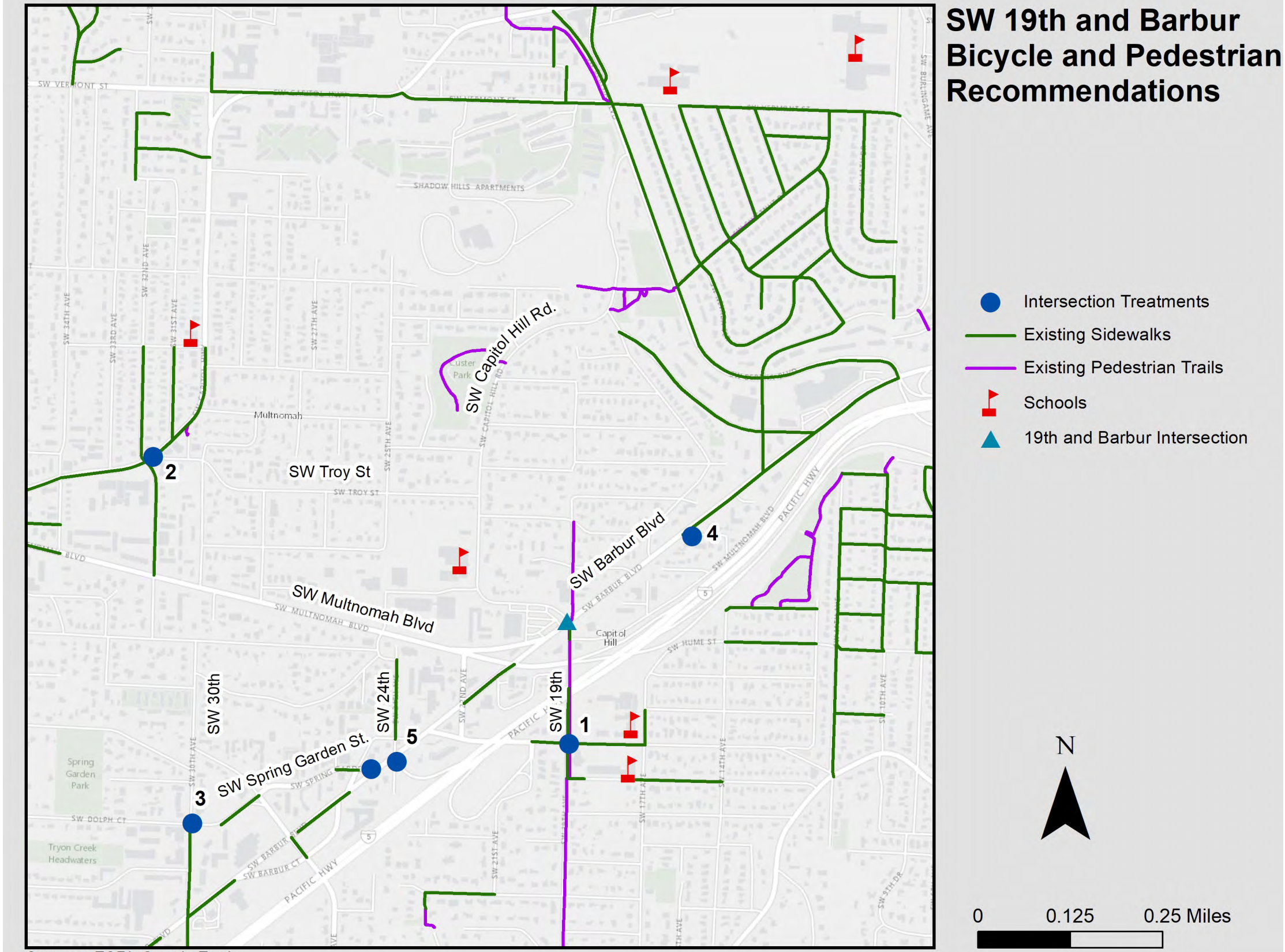
The intersection of Dolph Street and 30th Street is beyond the initial ½ mile walkshed, and has been prioritized for improvement for pedestrians choosing to walk on side streets away from the high-traffic corridor of Barbur Boulevard. A marked crosswalk and Rapid Rectangular Flashing Beacons to help warn drivers of the crosswalk will improve safety at this intersection, as well as walk-ability in this cluster of businesses and housing.



Recommendations : Intersection Level

4. Barbur Boulevard and Moss Street Crosswalk Improvement
Just north of the new MAX Station on Barbur Boulevard is the wide intersection of Moss Street. What seems to be a combination of a driveways and side street, presents a long crossing over two legs of an intersection for pedestrians choosing to walk north of the station along Barbur. Installing marked crosswalks at a 90 degree angle to Moss Street and the adjacent driveway, as well as additional sidewalk at the center of the two legs, will make pedestrians more visible for drivers. This will improve pedestrian levels of safety and comfort.

5. Barbur Boulevard and 24th Street Crosswalk Improvement
The signalized intersection just south of 19th and Barbur Boulevard needs great improvement for pedestrians that will be walking south from the new MAX Station. Marked crosswalks should be installed on all four approaches, along with sidewalk infill on the northern side of Barbur to protect pedestrians as they walk along parking lots of adjacent businesses.



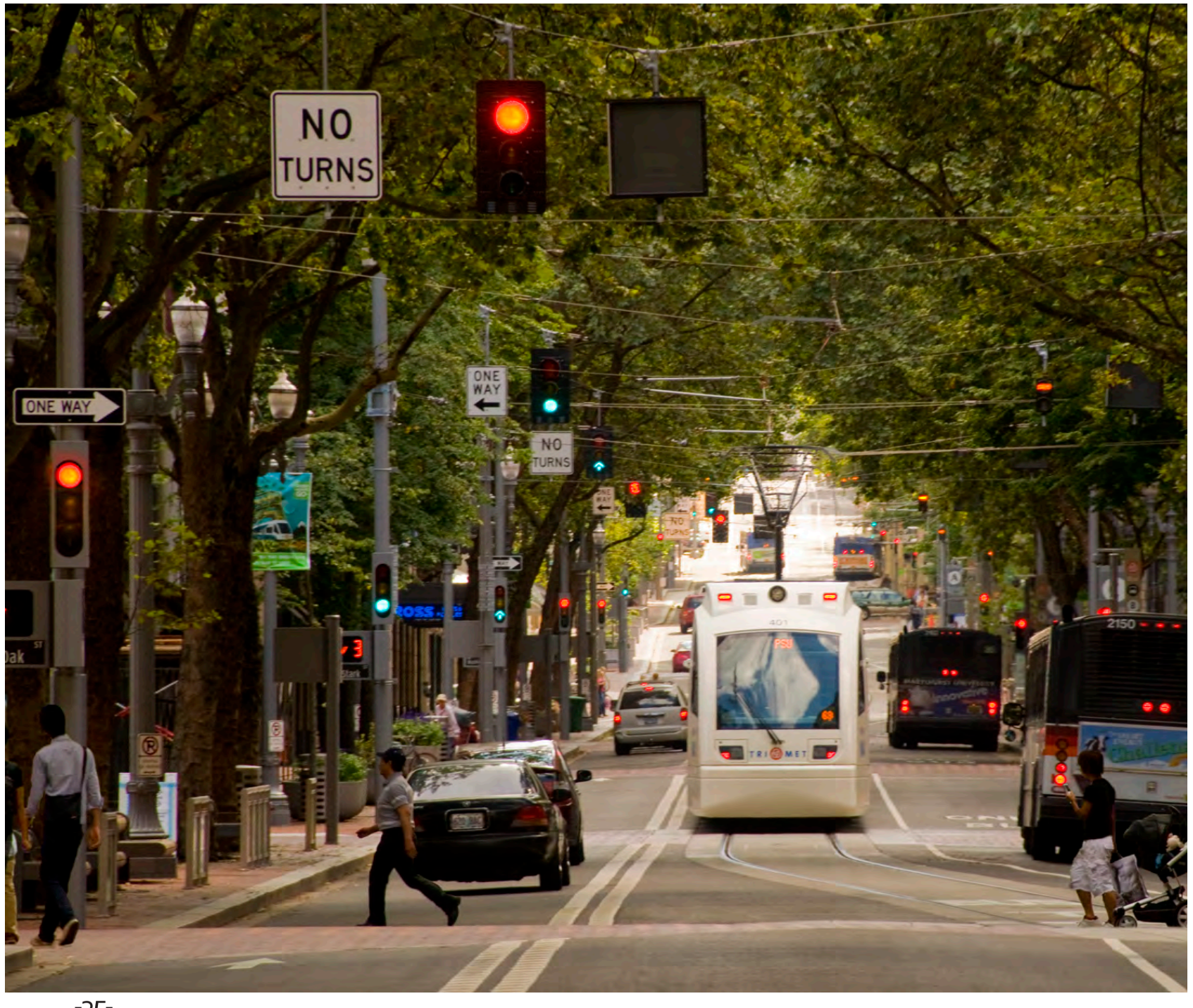
Recommendations : Policy Level

Considering the redundant service that Barbur provides from Tigard to downtown Portland with its close proximity to Interstate 5, the project team recommends policies that focus on reducing the amount of vehicle traffic that uses Barbur as a commuting route. Without the combination of high traffic volume and high speeds, Barbur will become a safer and more pleasant environment for bicyclists and pedestrians that will use this route to get to the new MAX Line and 19th and Barbur Station. This could be done by:

1. Reducing traffic speeds and increasing traffic enforcement.

2. Reducing the number of single-occupant motor vehicle lanes to one instead of two, providing room for larger bike lanes and buffers, larger sidewalks, or a designated transit lane similar to the Tri-Met bus mall in downtown Portland.

3. Work with local businesses and residents to create a Traffic Management Association (TMA) to promote incentive programs and ridership, as discussed previously as a station recommendation.



Cost Estimate

The proposed station improvements and network upgrades have been designed so that they can be implemented in stages as funding becomes available. In order to maximize flexibility the costing for these projects has been calculated for each individual treatment, so that Tri-Met can incorporate the 19th/Barbur Station improvements in system-wide funding goals at their discretion. There are 6 recommendations for making crossing the street significantly safer and more pleasant for pedestrians.

Totals By Area		Subtotals	With 70% Buffer (see note)
Regional Connectivity Recommendations			
19th Ave Bike Lanes and Sidewalk	$44,108.79		
Capitol Hill Rd Bike Lanes, Sharrows, and Sidewalks	$1,727,654.33		
Troy St Bike Sharrows and Sidewalks	$1,084,485.21		
Spring Garden St and Dolph St Bike Lane, Sharrows, and Sidewalks	$526,380.67		
Barbur Blvd Widening of Overpass of Multnomah Blvd	$13,000,000.00		
24th St Bike Sharrows and Sidewalk Infill	$10,404.45		
Bicycle and Pedestrian Overpass of I-5	$13,000,000.00		
30th St Bike Sharrows and Sidewalks	$999,852.12		
Barbur Blvd Bike Lane, Buffer, and Sidewalk Infill	$1,651,934.81		
TOTAL		$30,407,821.50	$32,044,820.38
Intersection Level Recommendations			
19th and Spring Garden School Speed Zone Flashing Sign	$6,552.00		
Troy St and Capitol Hill Rd RRFB Crossing	$44,500.00		
Dolph St and 30th St RRFB Crossing	$23,193.49		
Barbur Blvd and Moss St Crosswalk Improvement	$508,375.09		
Barbur Blvd and 24th St Crosswalk Improvement	$64,065.34		
TOTAL		$499,708.75	$646,685.92
GRAND TOTAL		$30,907,530.25	$32,691,506.30

Note: Buffer includes contingency (25%), engineering and design (20%), construction (15%), and administration (10%).

Prioritization Evaluation

In order to guide implementation priorities One Letter Consulting has created a prioritization matrix which evaluates each project according to a range of weighted criteria. The criteria considered are presented below. These prioritizations have been weighted so that the categories of Network Connectivity and Comfort and Safety received the most emphasis.

Criteria	Weighting	Definition
Network Connectivity	1 - 10	Contribution of treatment towards providing contiguous routes for active transportation.
Comfort and Safety	1 -10	Assessed effectiveness of improvements for increasing safety and accessibility for all users, as well as perceived safety and travel comfort for cautious and vulnerable users.
Cost	1 - 5	Funding required to complete project.
Ease of Implementation	1 - 5	Time, staffing, and disruptions of daily station use required to complete project.
Maintenance	1 - 5	Ongoing maintenance burden implicated in safe continued use of completed projects.

Totals are conveyed as averages to keep weighting consistent for projects which do not involve all categories (for example, bike parking does not impact network connectivity). Color coding offers a visual shortcut for prioritization – totals of 2-4.5 have been assessed as the lower priority projects, 4.5-5.5 are the medium priority, and from 5.6-10 are the highest priority projects.

This matrix should be used as a decision-making guide for the project prioritization, together with other factors. These projects offer benefits to a range of local populations, as well as environmental and health benefits with wider implications for the region. Final decisions should be implemented as a multi-stakeholder process which utilizes the priorities matrix but considers

Prioritization Evaluation

	Network Connectivity	Comfort and Safety	Cost	Ease of Implementation	Maintenance	Total
	1/5/10	1/5/10	1/3/5	1/3/5	1/3/5	average
Regional Connectivity Recommendations						
19th Ave Bike Lanes and Sidewalk	10	5	5	3	3	5.2
Capitol Hill Rd Bike Lanes, Sharrows, and Sidewalks	10	10	1	3	3	5.4
Troy St Bike Sharrows and Sidewalks	5	10	1	3	3	4.4
Spring Garden St and Dolph St Bike Lane, Sharrows, and Sidewalks	5	10	3	3	3	4.8
Barbur Blvd Widening of Overpass of Multnomah Blvd	10	10	1	5	3	5.8
24th St Bike Sharrows and Sidewalk Infill	1	5	5	3	3	3.4
Bicycle and Pedestrian Overpass of I-5	1	5	1	1	3	2.2
30th St Bike Sharrows and Sidewalks	5	10	1	3	3	4.4
Barbur Blvd Bike Lane, Buffer, and Sidewalk Infill	10	10	1	5	3	5.8
Intersection Level Recommendations						
19th and Spring Garden School Speed Zone Flashing Sign	5	10	5	5	3	5.6
Troy St and Capitol Hill Rd RRFB Crossing	5	10	5	5	3	4.4
Dolph St and 30th St RRFB Crossing	1	10	5	5	3	4.8
Barbur Blvd and Moss St Crosswalk Improvement	10	10	3	5	5	6.6
Barbur Blvd and 24th St Crosswalk Improvement	10	10	1	5	3	7

Phasing

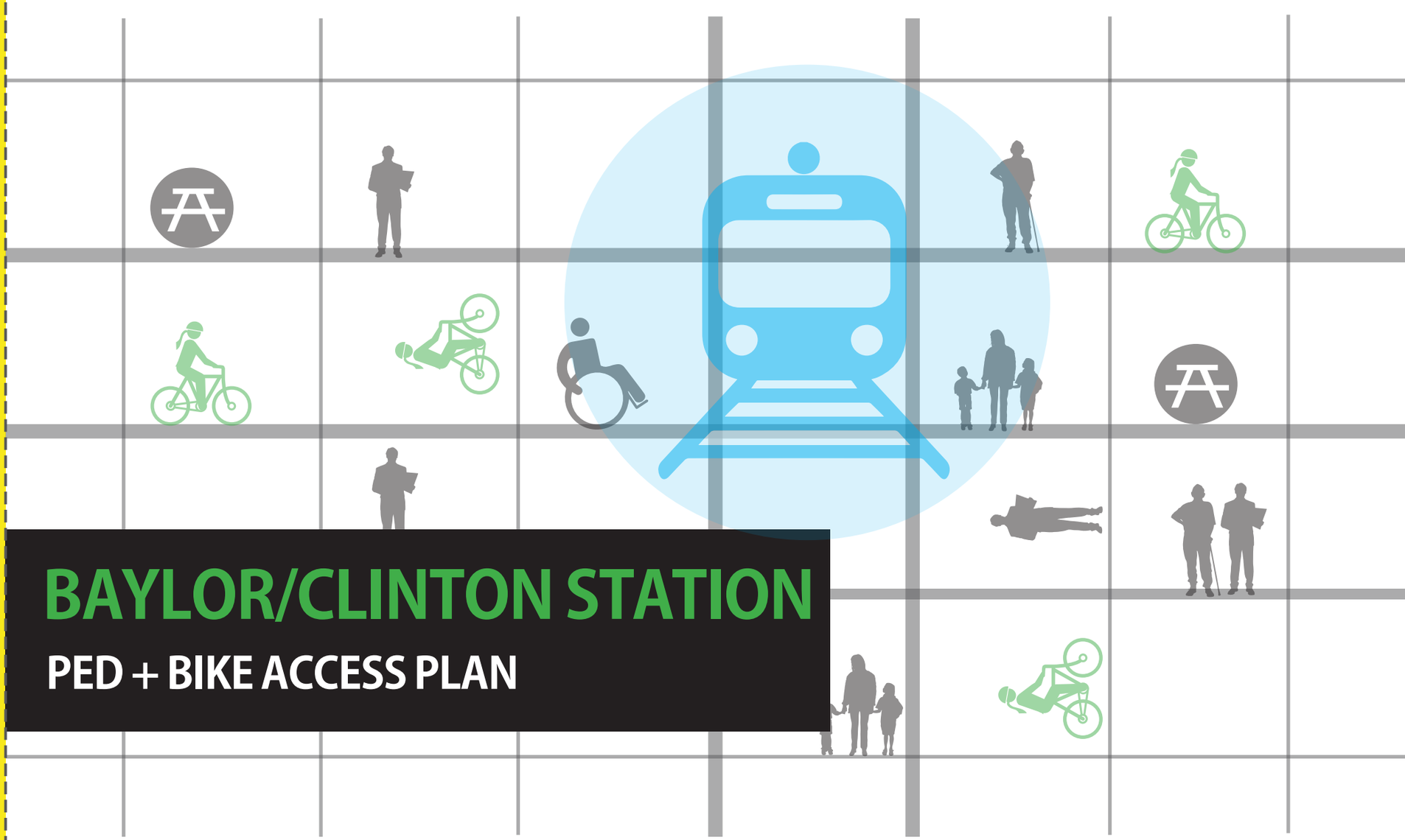
Based on the priority calculations we suggest the following phasing implementation:

Phase one consists of improvements that are either directly on Barbur Boulevard where construction of the MAX Line will be taking place, or on the direct cross streets that will connect with the new station – 19th Street and Capitol Hill Road. These improvements are prioritized in Phase 1 because all bicyclists and pedestrians traveling to the station will be traveling on these roads, and should be implemented in conjunction with the construction of the new station.

Phase two consists of improvements that connect station-goers to the major neighborhoods and activity centers that are accessed further than the streets that intersect with the station directly, but are still prioritized over other recommendations due to their safety implications. These improvements should be made within two years of the completion of the MAX station.

Phase three completes the bicycle and pedestrian network proposed for the project. These improvements should be made within four years of the completion of the MAX station.

Recommendation	Total		Priorities Phase 1	Phase 2	Phase 3
Regional Connectivity Recommendations					
19th Ave Bike Lanes and Sidewalk	$33,910.00	5.2	$33,910		
Capitol Hill Rd Bike Lanes, Sharrows, and Sidewalks	$1,267,241.00	5.4	$1,267,241		
Troy St Bike Sharrows and Sidewalks	$809,371.00	4.4			$809,371
Spring Garden St and Dolph St Bike Lane, Sharrows, and Sidewalks	$393,001.00	4.8		$393,001	
Barbur Blvd Widening of Overpass of Multnomah Blvd	$13,000,000.00	5.8	$13,000,000		
24th St Bike Sharrows and Sidewalk Infill	$7,800.00	3.4			$7,800
Bicycle and Pedestrian Overpass of I-5	$13,000,000.00	2.2			$13,000,000
30th St Bike Sharrows and Sidewalks	$746,210.50	4.4			$746,210
Barbur Blvd Bike Lane, Buffer, and Sidewalk Infill	$1,150,288.00	5.8	$1,150,288		
Intersection Level Recommendations					
19th and Spring Garden School Speed Zone Flashing Sign	$5,000.00	5.6	$5,000		
Troy St and Capitol Hill Rd RRFB Crossing	$44,500.00	4.4	$44,500		
Dolph St and 30th St RRFB Crossing	$22,970.00	4.8		$22,970	
Barbur Blvd and Moss St Crosswalk Improvement	$379,395.00	6.6	$379,395		
Barbur Blvd and 24th St Crosswalk Improvement	$47,843.75	7	$47,844		
Recommendation Total	$30,907,530.25		$15,928,178	$415,971	$14,563,381
Totals with 70% Buffer	$32,691,506.30		$17,047,190	$549,574	$15,094,742



BAYLOR/CLINTON STATION

PED + BIKE ACCESS PLAN

DATE: 12/07/2017

TABLE OF CONTENTS

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APPENDIX: COST ESTIMATE CALCULATIONS


CROSSWALK
CLOSED

MISSION

The Southwest Corridor Light Rail will connect Downtown Portland with Tualatin through the City of Tigard. In coordination with Tri-Met Southwest Corridor Light Rail project, the Four-Sided Triangle team has developed a bicycle and pedestrian station access plan for the proposed Baylor/Clinton MAX station on SW 70th Avenue in the Tigard Triangle.

The Four-Sided Triangle team's mission in developing this plan is to ensure that all of the existing and future residents, workers, shoppers, students, and other people within this station's walkshed and bikeshed will be able to get to and from the station on foot and by bicycle along safe, attractive, and comfortable walkways and bikeways. Additionally, this plan includes complete bicycle and pedestrian networks for the Tigard Triangle and connections to the bicycle and pedestrian network beyond.

FOUR-SIDED TRIANGLE

OUR TEAM

Hayden Glines
[Dream Title]

Hayden hails from sunny Sacramento, California. He studies Community Development at Portland State University because he believes that safe and accessible transportation is a human right.

Qingyang Xie
[Dream Title]

Qingyang was born and raised in Beijing's Wangjing neighborhood. She came to America to study anthropology at Reed College, and is now a post-grad student at PSU's School of Urban Studies and Planning.

Steve Rosen
[Dream Title]

Steve Rosen is a has lived in sprawl, small towns, and big cities. He walks, bicycles, rides public transit, motorcycles, and even drives a car. He currently in PSU's Master of Urban and Regional Planning program.

Mohammad Hotak
[Dream Title]

Mohammad was born in Kabul City, but he spent his childhood as a refugee in Pakistan. He came to the US in 2016 as a Fulbright scholar to pursue his graduate degree in planning, with a specialization in active transportation at PSU.

STRATEGY

The plan is divided into near-term and long-range phases. The near-term phase is intended to be built along with the MAX station so that people can access the station from existing development as soon as the line begins operation. It is designed to be inexpensive and quick to build while providing a complete network to access all existing development in the station area.

The long-range phase is intended to be built as development in the station area proceeds over the coming decades. It is a complete reorientation of the streets in the station area to prioritize the person over the automobile.

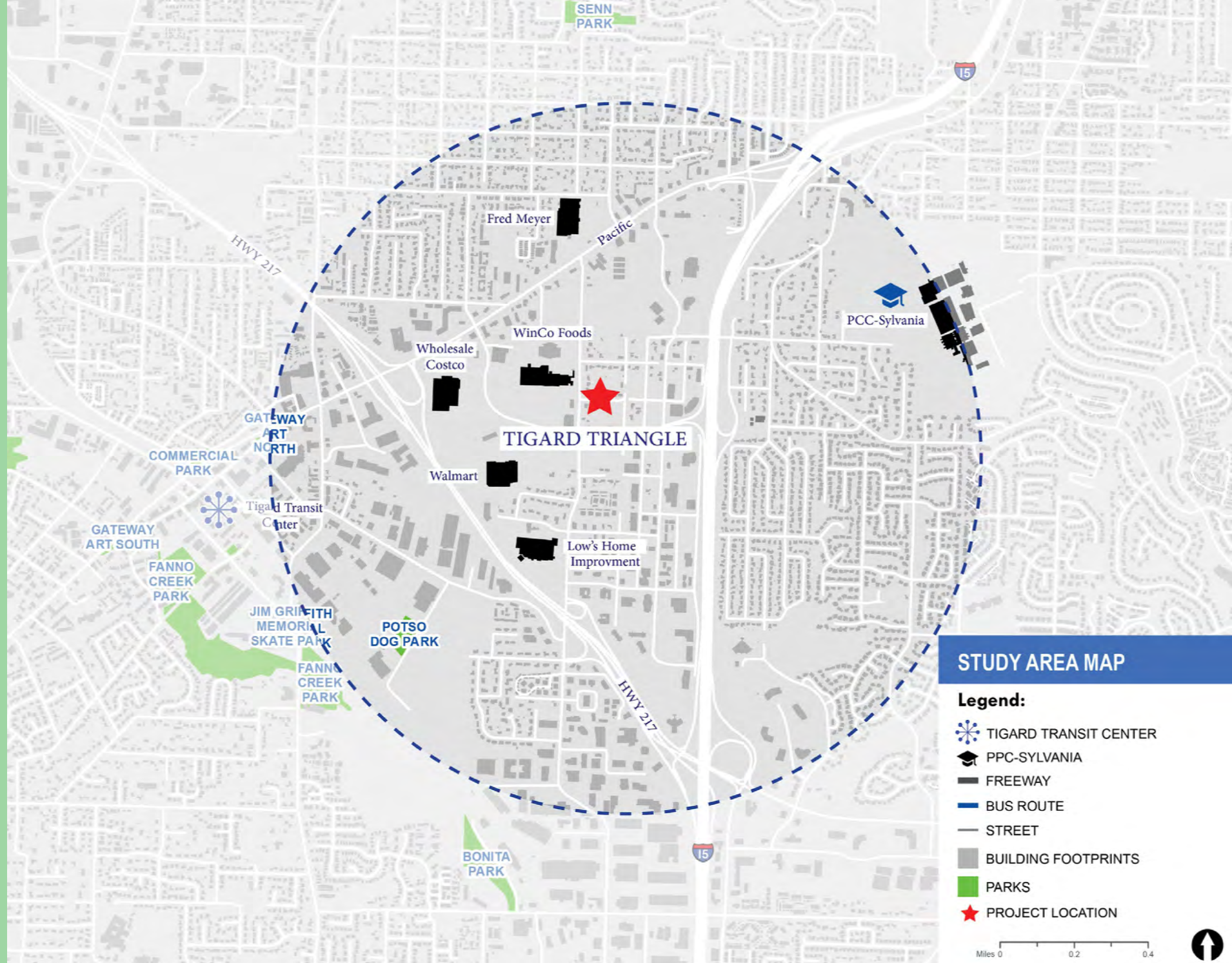
This plan describes the existing conditions, opportunities for improvement in the area, near-term and long-range network plans and has a guide to building the correct infrastructure to implement the plan. It supports decision-makers by providing multiple alternatives for developing the Near-Term Station Access Plan network, and supplying cost estimates and guidance for selecting among those alternatives.

" Plans are worthless, but planning is everything.
- Dwight D Eisenhower "

TIGARD TRIANGLE

The Tigard Triangle is an area bound by Interstate 5, Hwy 217 and Hwy 99, and is about the same size as Downtown Portland. The Tigard Triangle is planned to be developed as a walkable, bikeable, medium-density area with a vertical and horizontal mix of dwellings, workplaces, and shops. Its zoning code requires pedestrian-scaled development and pedestrian-oriented streets.

In the area immediately adjacent to the station, there is no minimum parking requirement. Portland Community College's Sylvania Campus is a long walk or a short bike ride away from the Triangle.. These factors necessitate a high-quality active transportation network



EXISTING CONDITIONS

DEMOGRAPHICS

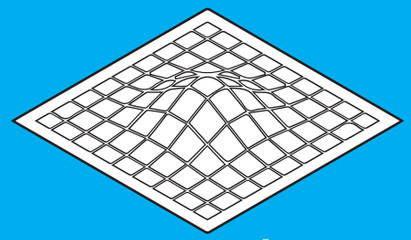
The Triangle is currently one of the least densely populated areas along the Southwest Corridor MAX Line. Its population density is around 1,000 residents per square mile, compared to the average neighboring density of around 3,000 residents per square mile. Its population sees a much lower income per capita than its neighbors, as well. Average annual income per household is $34,178. The Tigard Triangle's median age is 32 years old, younger than the regional average.

Residents of the Triangle choose alternative transportation more often than the neighboring areas. 8.5% of residents walk to work and 2.2% of residents take their bikes. Current levels of transit ridership are lower than average, at 5.5%. This might be due to the poor connectivity and coverage offered by public transportation in the area.

Demographic

Existing Development

Planned Development



Topography

Circulation Network

Planned Circulation Network

[Continued from previous.]

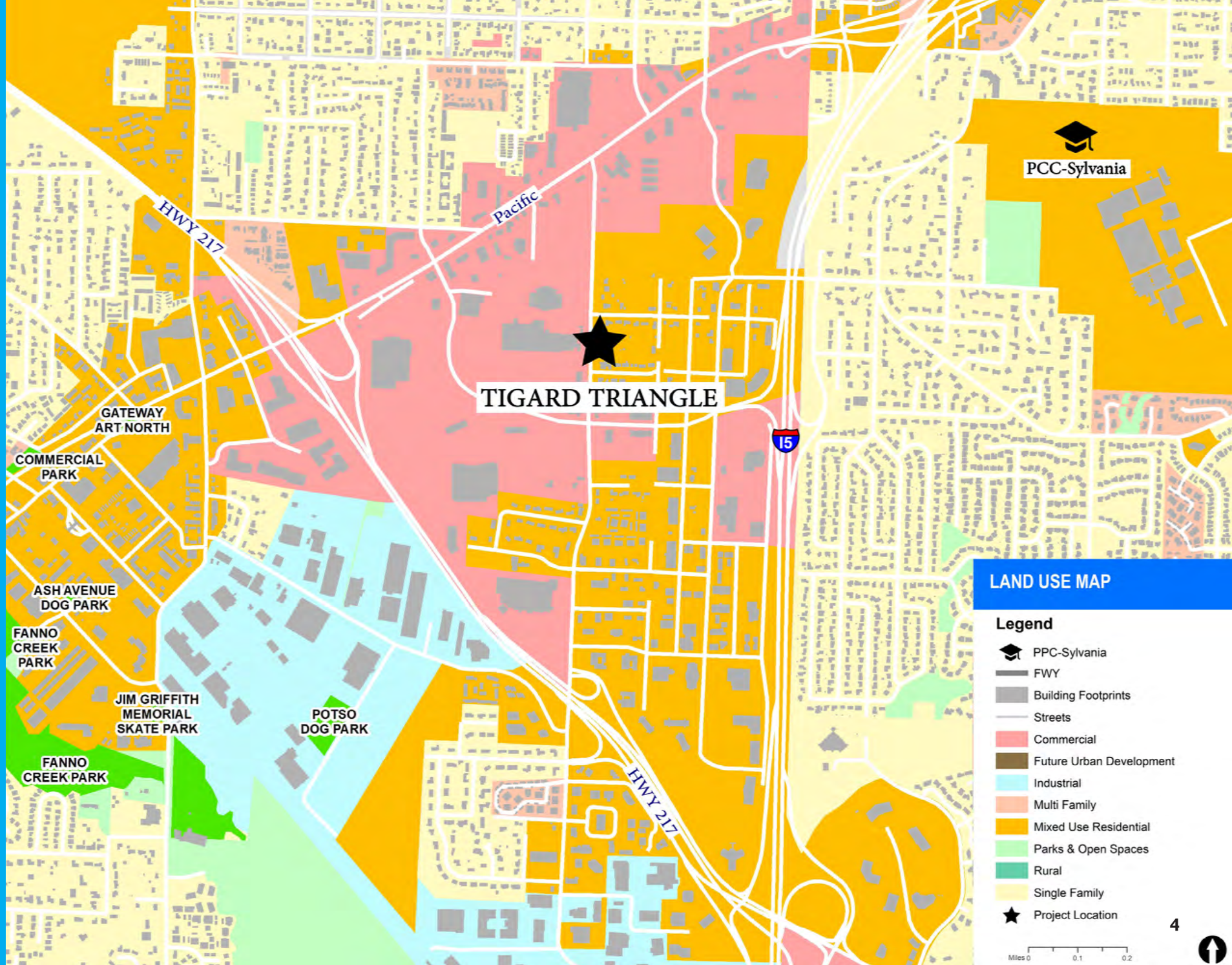
The Tigard Triangle has a much lower population density and overall number of residents due to low overall land use density. Much of this area is currently dedicated to commercial space. These commercial spaces employ over 15,000 people. Most of the workers working in the Tigard Triangle commute in, with an inflow of over 14,000 workers Those that commute in largely rely on their cars for transportation. The Tigard Triangle is only serviced directly by TriMet's Bus Line 78. Bus Lines 12, 64 and 94 service the Triangle indirectly through stations situated along the Triangle's northern border, Pacific Highway W. External connectivity for pedestrians and bicyclists is limited due to the geographic constraints of the Triangle's border of freeways and highways.

Portland Community College's Sylvania Campus is in the area. This campus has nearly 28,000 students enrolled. PCC students have a mean age of 29 and modal age of 20.

EXISTING DEVELOPMENT

The Tigard Triangle is relatively undeveloped and unfriendly to pedestrians and bicyclists. Current zoning has not encouraged a high intensity of use. Much of the existing development follows traditional single-use zoning patterns. Office buildings to the north and south, along with the "Big Box" commercial buildings (such as Costco and Winco) to the west, allot wide swaths of their lots to parking spaces. The automobile-oriented development has created a network without much connection and low intersection density.

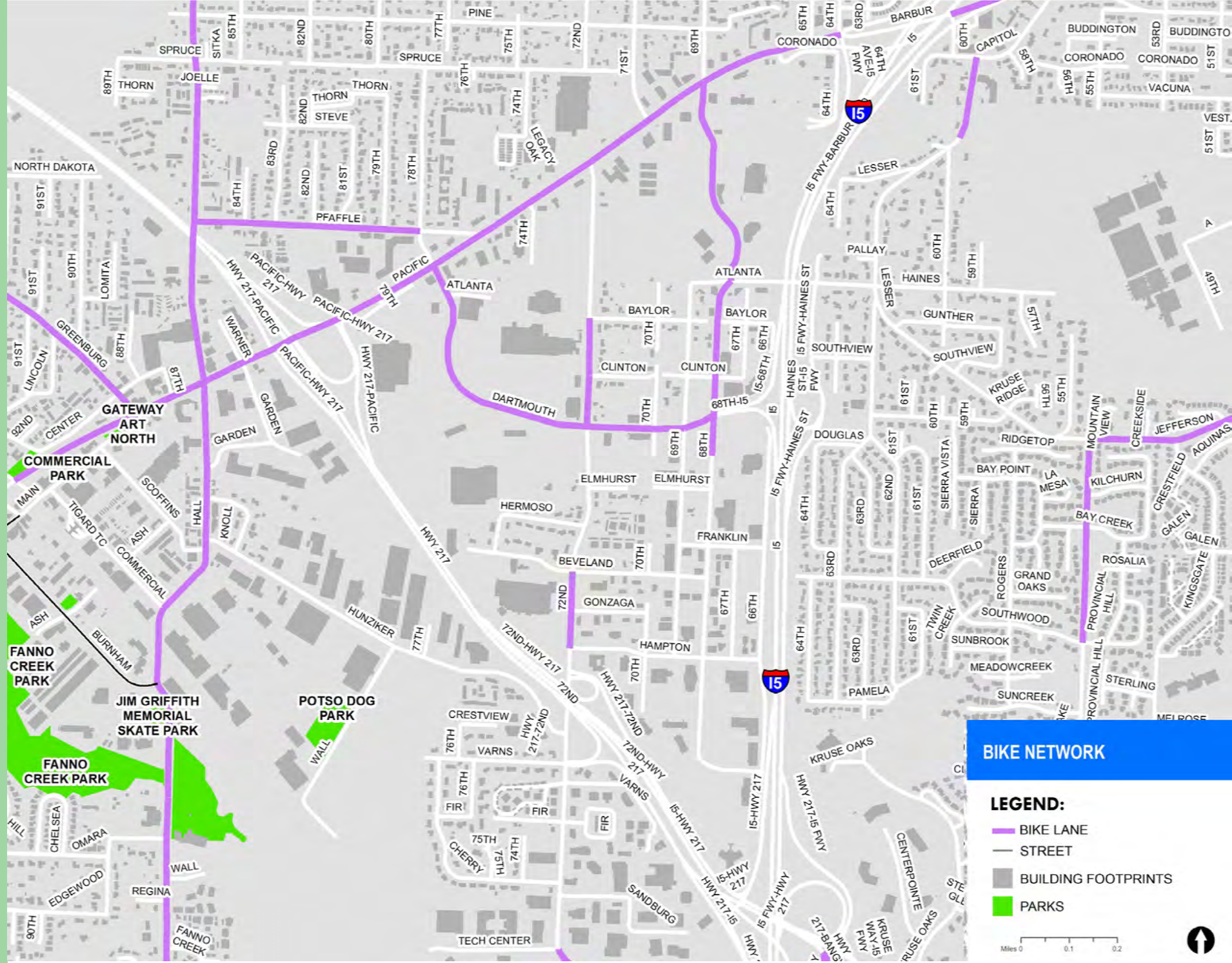
Rights-of-way are largely unimproved in the Tigard Triangle. The improved rights-of-way exist along the major streets, SW Dartmouth and SW 72nd. Bus stations along SW 68th Avenue do not have adequate facilities and reside along unimproved Rights-of-way.



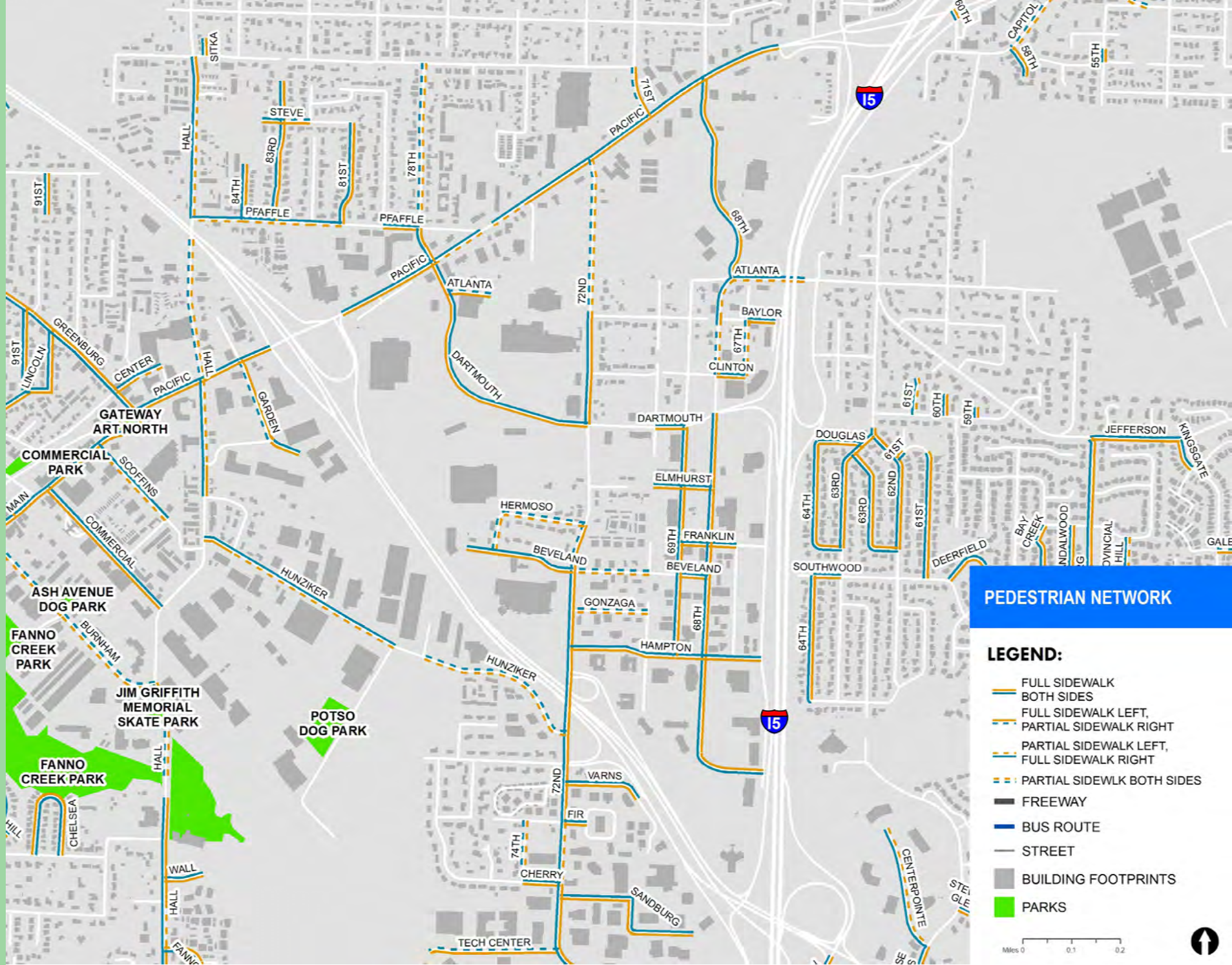
EXISTING BIKE NETWORK

The current pedestrian and bicycle facility network is disconnected. Due to low existing street connectivity, pedestrian and bicycle facilities cannot reach parts of the Triangle. Existing adequate pedestrian infrastructure is centered around the office buildings in the south of the Tigard Triangle, along SW Dartmouth Street and the Pacific Highway.

The area along these streets are the most adequately lit in the Tigard Triangle. The facilities along SW Dartmouth Street are adjacent to one of the higher stress streets in the area. SW Dartmouth lacks the traffic calming measures that would walking and biking safer and more comfortable.

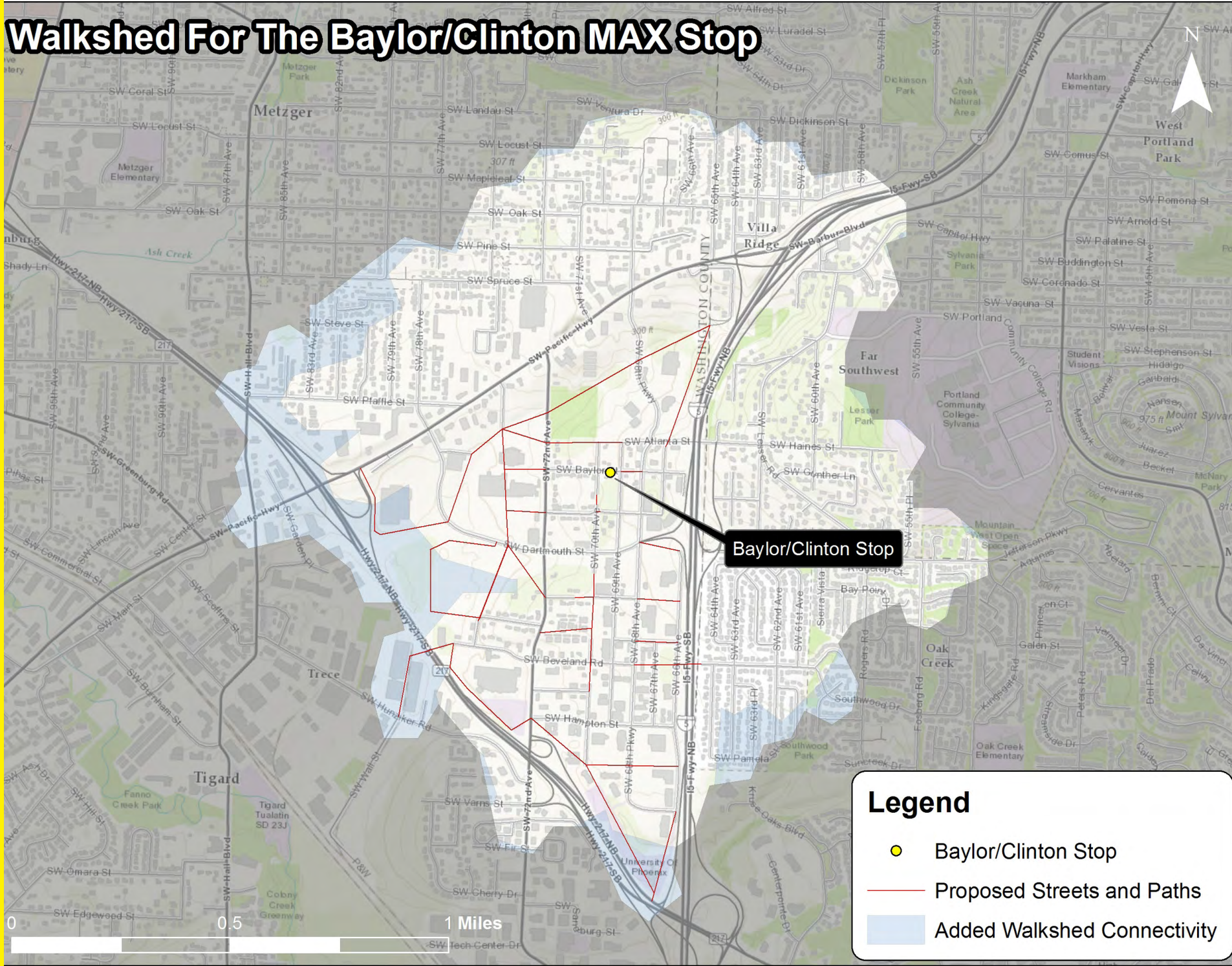


EXISTING PEDESTRIAN NETWORK



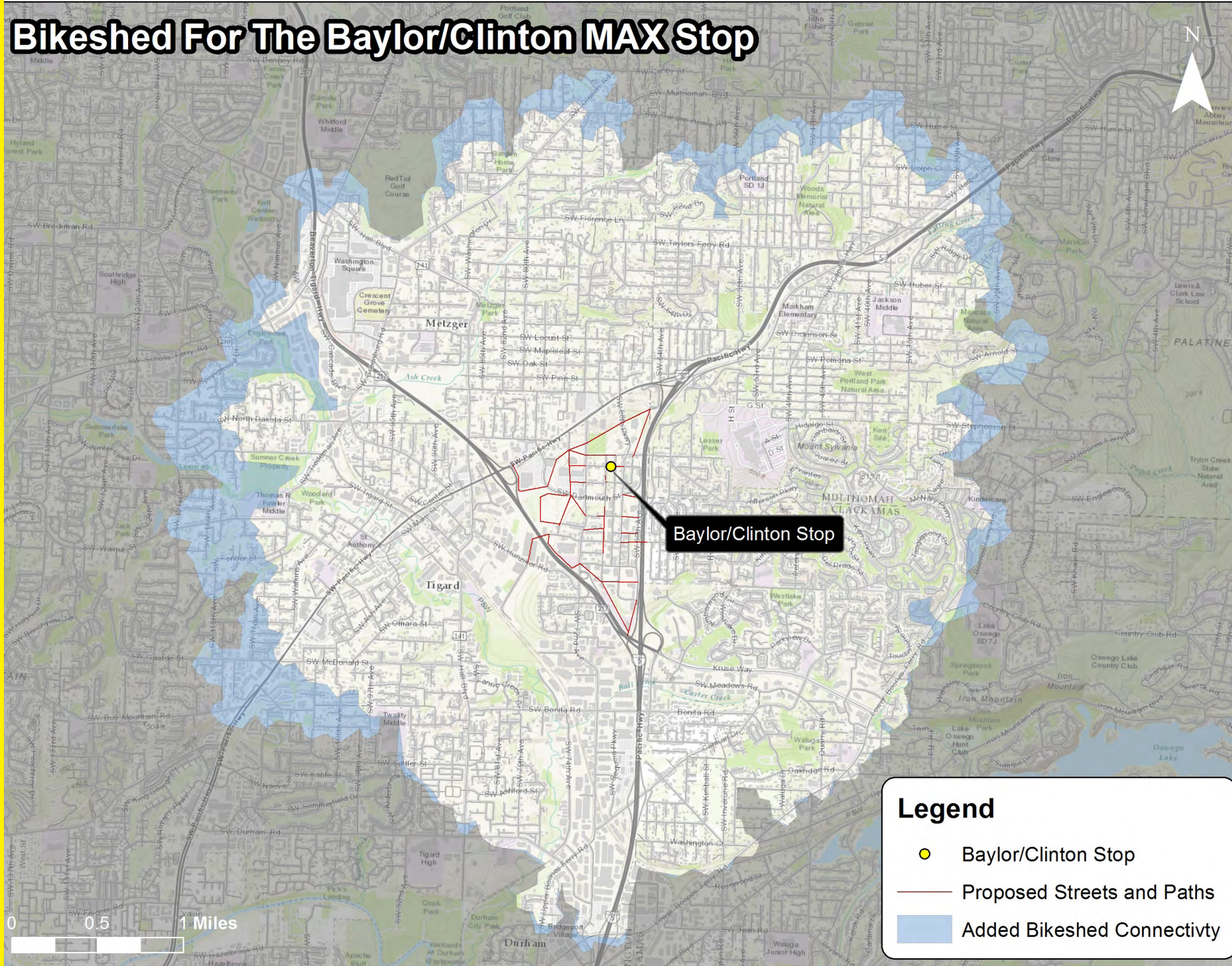
WALKSHED MAP

A one mile walkshed utilizing the current streets and paths of the SW Baylor stop suffers due to low street connectivity. With the construction of the new paths and streets, the new walkshed expands west. The internal connections will make short trips quicker and easier within the walkshed.



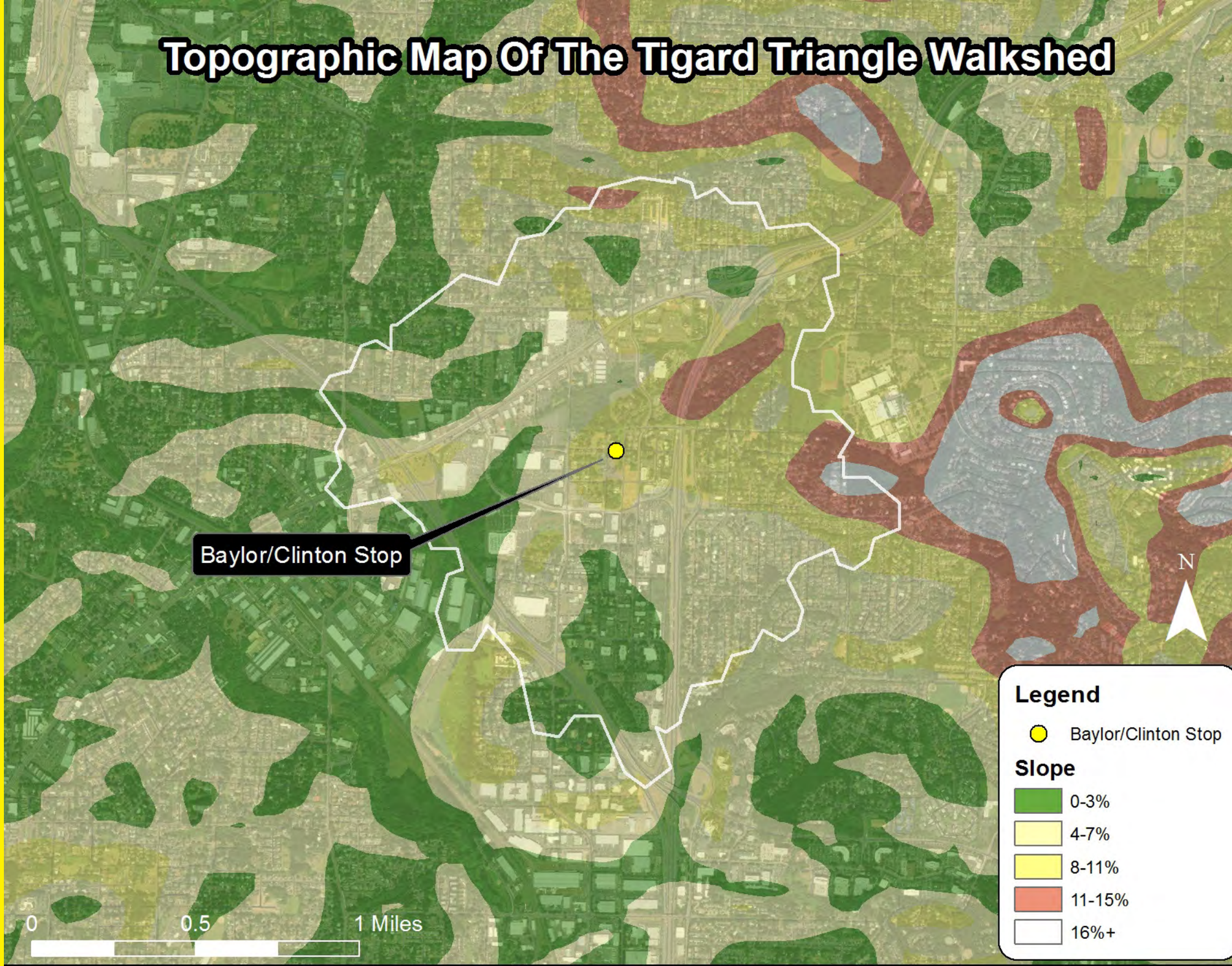
BIKESHED MAP

The 3 mile bikeshed expansion is not concentrated solely along the south and west border of the new bikeshed. The new bikeshed expansion to the east arises from a planned pedestrian and bicycle bridge over the I-5 Freeway, adding a new connection between Portland and Tigard. The new range of the Bikeshed expands further into Portland, a steeper area than the Triangle.

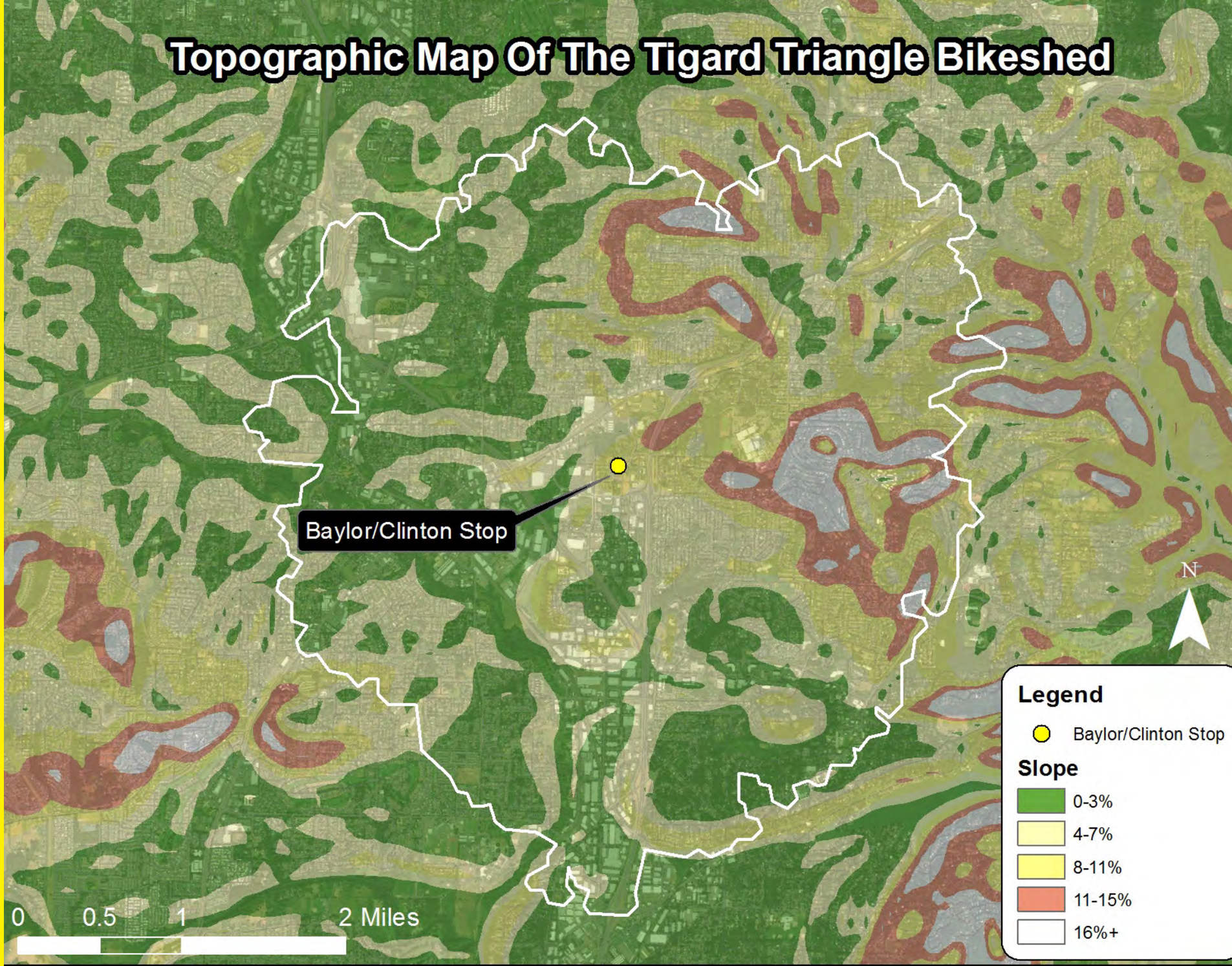


TOPOGRAPHY

The station area is fairly steep. The station's immediate surroundings have a slope between 8% and 11%. Most of the walkshed has slopes between 4% and 11%. The bikeshed has terrain with slopes over 16%. This poses problems for weaker bicyclists, people with limited mobility, and for engineers who must design new facilities to comply with the Americans with Disabilities Act to accommodate people with limited mobility.

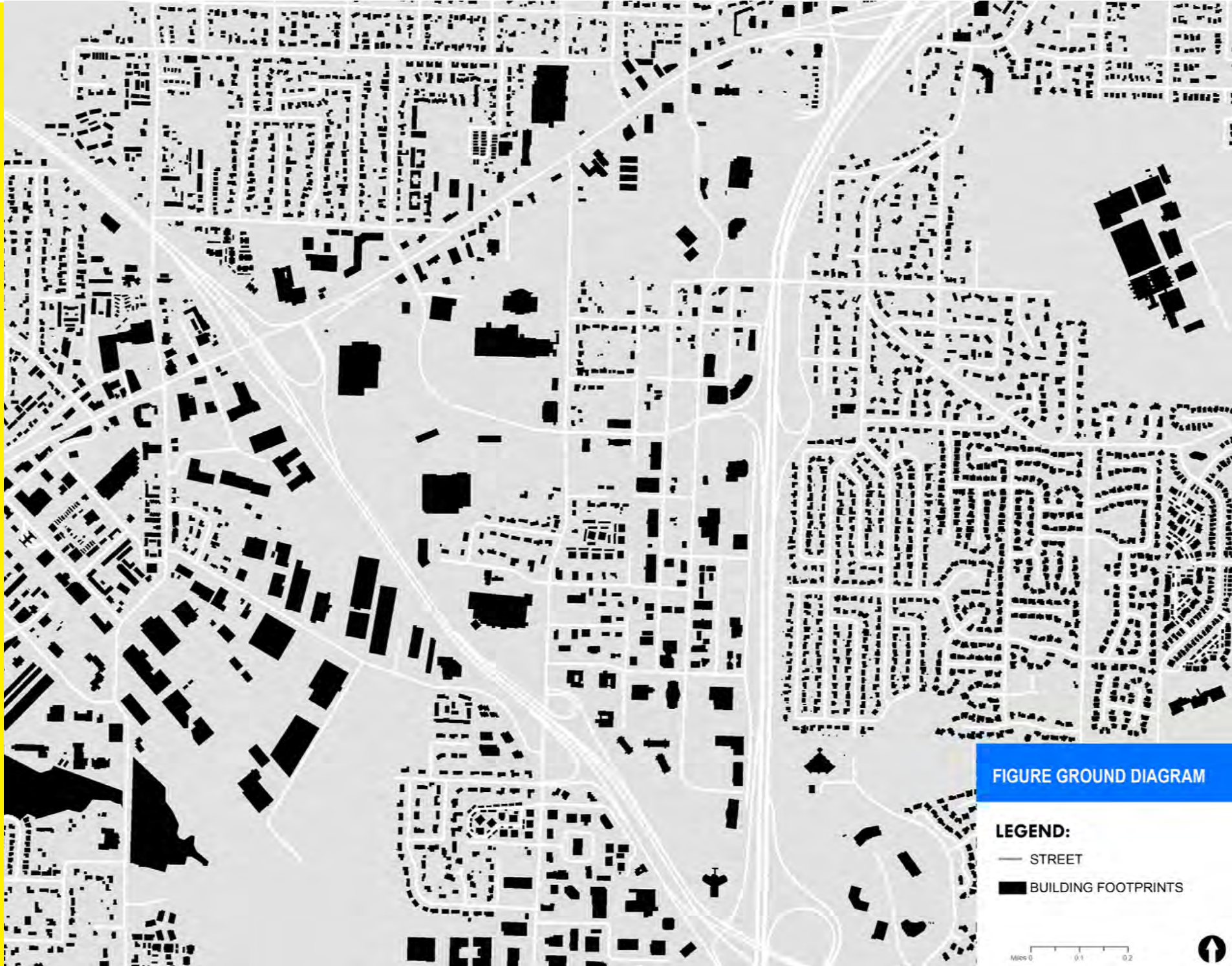


Topographic Map Of The Tigard Triangle Bikeshed



PLANNED DEVELOPMENT

New development will be more amenable to bicyclists and pedestrians. The City of Tigard has changed much of the zoning of the Tigard Triangle to Triangle Mixed Use (TMU) in the Tigard Triangle Lean Code. This upzone will allow for much denser development, particularly in the eastern half of the Tigard Triangle. This denser development will encourage alternative transportation methods. Included in the Lean Code is a new network of streets, paths and trails, with a total length of 6 miles. This added connectivity will make wayfinding easier and create greater network cohesion. The Lean Code also requires street improvements with new developments. Bicycle parking will be much more dense than existing stocks of bike racks. The Lean Code and Tigard's Strategic Plan call for land acquisition and site improvement to existing areas in order to create new recreational trails within the Triangle.



OPPORTUNITIES

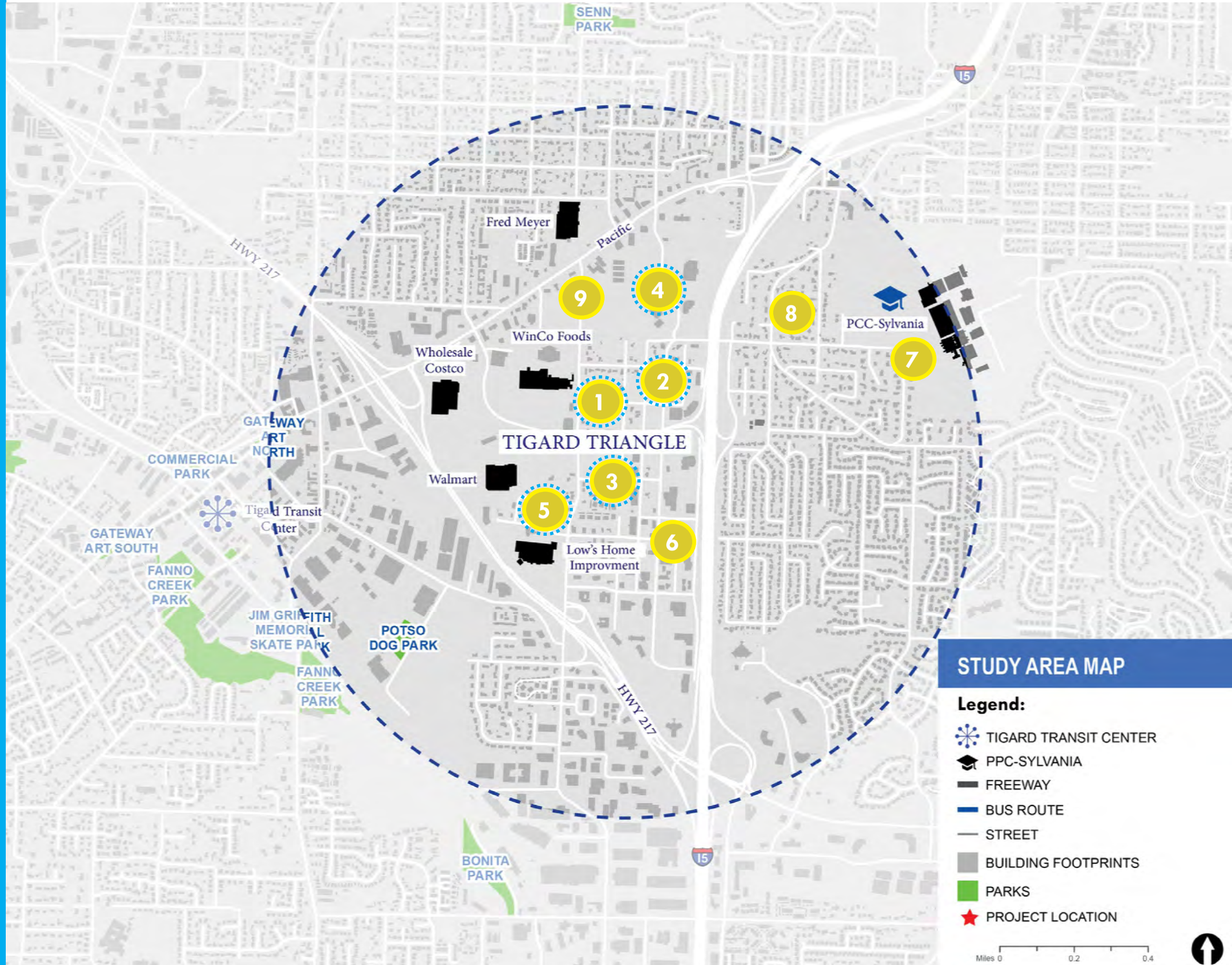
1- One proposed Max station on SW Clinton/Baylor St and 70th Ave

2- Many green lands and vacant lots:
The triangle has low density with many undeveloped green lands and vacant lots for infill developments and right-of-way expansion

3- Incomplete street network:
With projected growth, there will be opportunities to fill in the missing streets and improve connectivity of the area

4- Denser zoning and more infill developments:
The Tigard Triangle Strategic Plan (adopted Mar. 2015) has changed the zoning codes to encourage denser, mixed-use development, which will encourage more biking and walking.

5- No required parking for future development:
According to the Tigard Triangle Strategic Plan, future land use plan does not require parking for new development.



OPPORTUNITIES

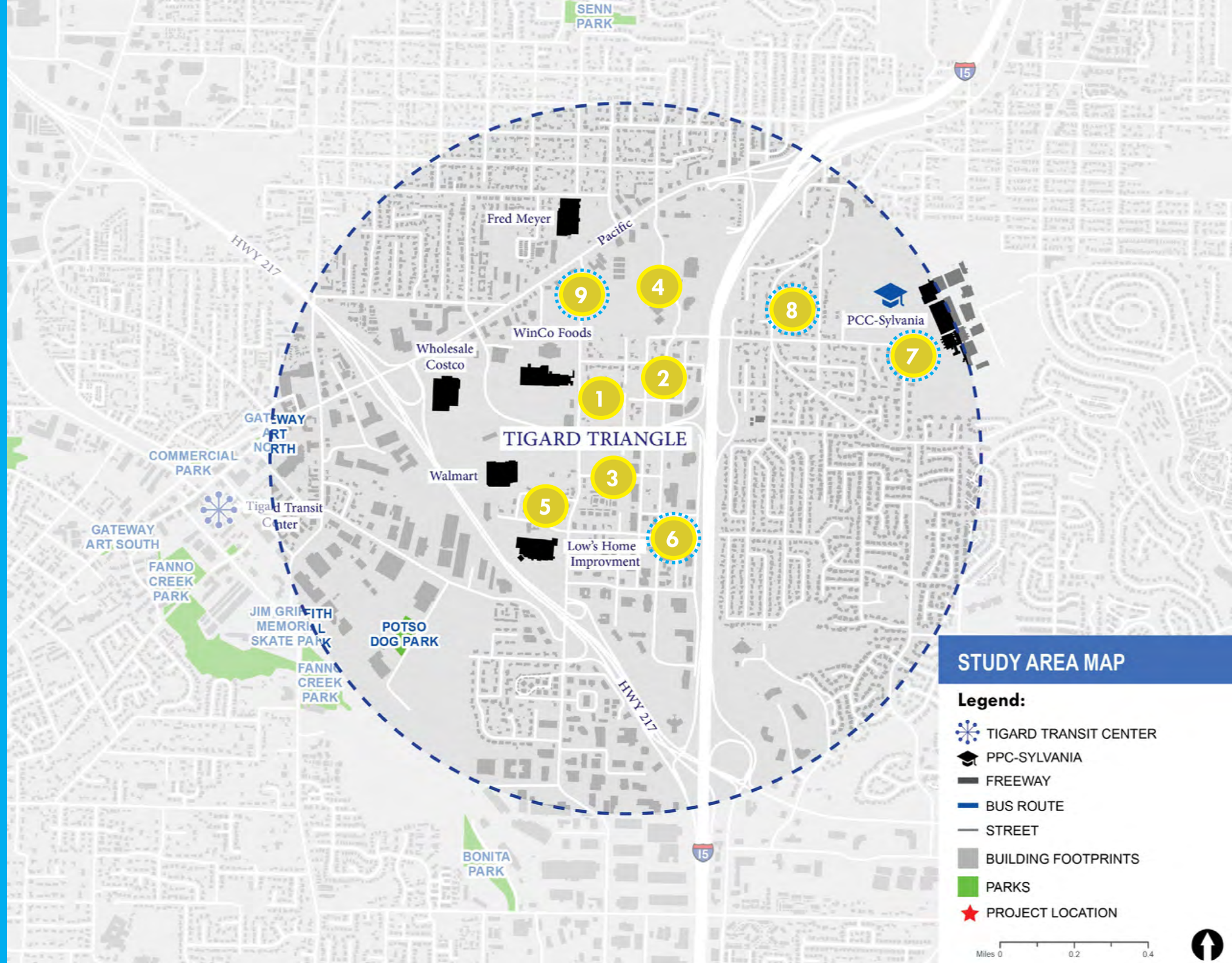
6- Projected growth in businesses and employment opportunities.
The current employment center in the southern part of the triangle is projected to provide more employment opportunities.

7- PCC Sylvania
The campus is about 1 mi to the east of the triangle. The Max station will serve students and staff and generate more collection trips.

8- Proposed shuttle bus to PCC Sylvania:

Metro has proposed a shuttle bus service from the Max station to campus.

9- Red Rock Creek Trail:
The trail goes through the triangle and connects to the Fanno Creek trail southwest to the triangle. It provides opportunities for separate bike highway and recreational trips.



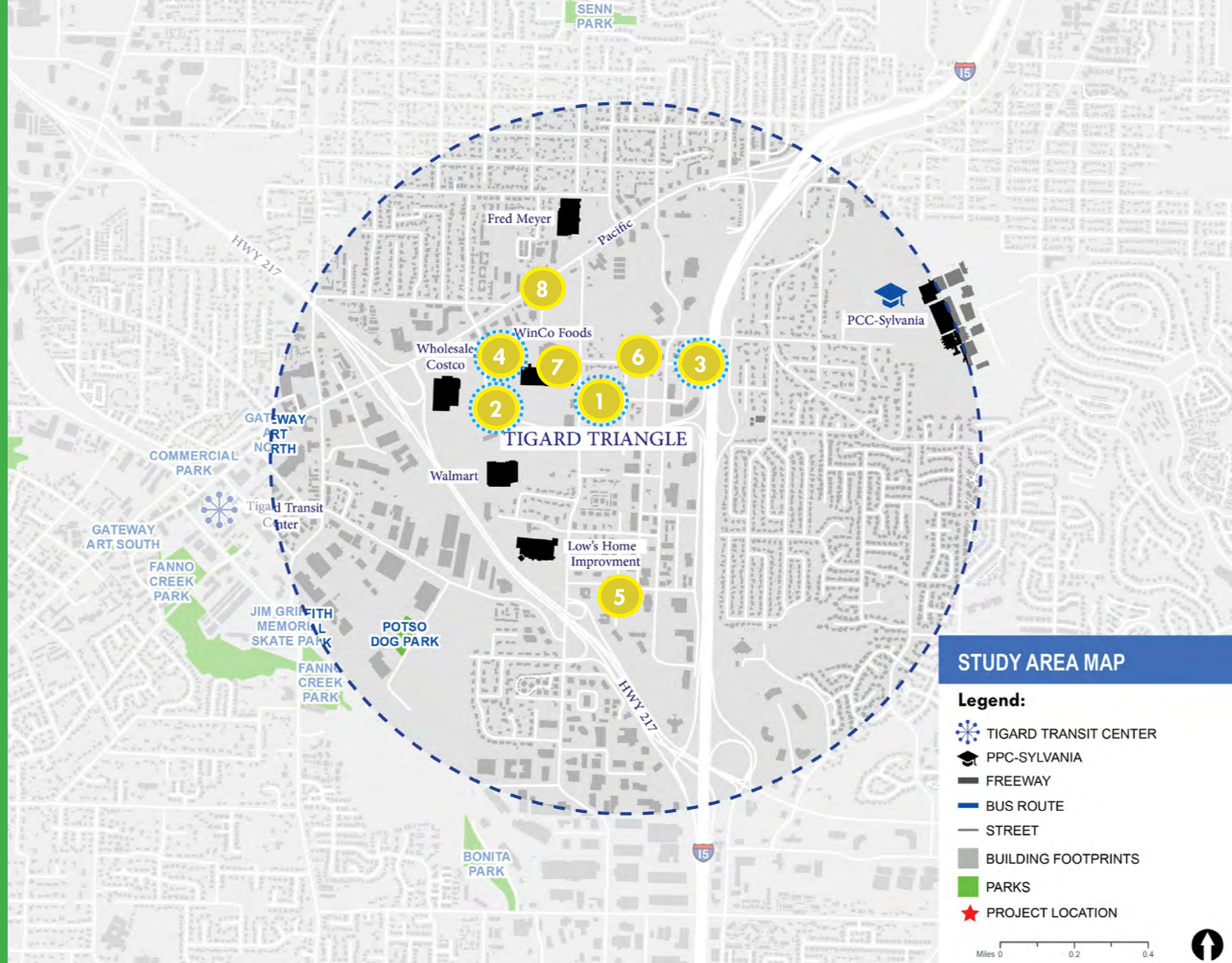
CONSTRAINTS

1- Hilly Topography
The triangle features relatively hilly topography. The slope on SW Dartmouth St between Interstate 5 and SW 72nd is especially steep, which creates a barrier for bicyclists and pedestrians.

2- High traffic volumes and speed on major streets
SW Dartmouth and SW 72nd have the high traffic volumes and speed due to connection with freeway.

3- Limited connectivity across highways:
The only crossings available for pedestrians and bicyclists are SW Haines St & Interstate 5, and SW 72nd & Hwy 217.

4- Existing car-oriented development:
The existing development and road design caters to the need of motorists and makes it hard to motivate the transition to alternative modes.



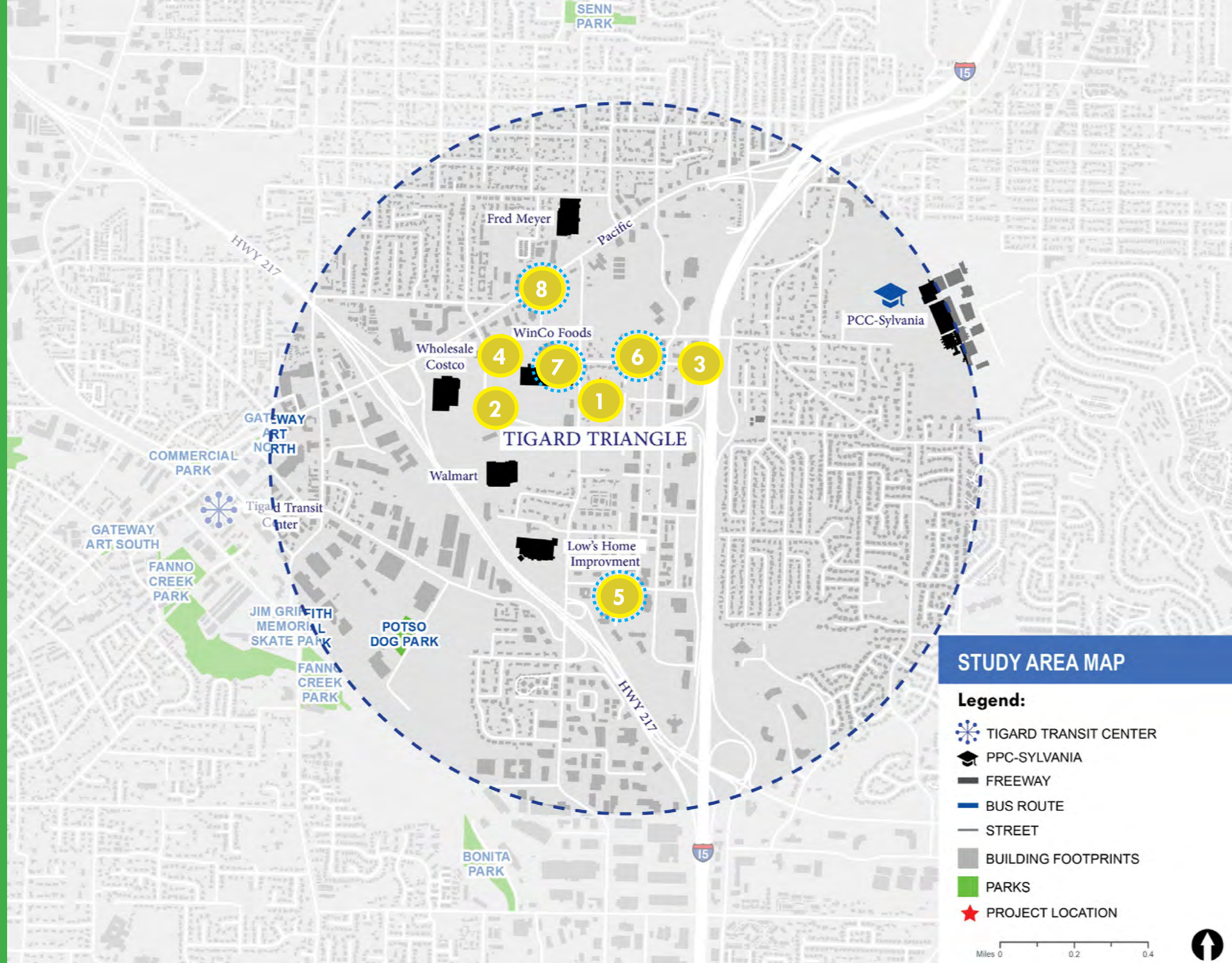
CONSTRAINTS

5- Opposition from residents and workers
Driving is the main mode choice for residents and employees. Taking away parking space and car lanes may elicit strong oppositions.

6- Proposed park and ride Max station:
The park and ride will provide 425 parking units according to Metro's current plan. The large parking lot will encourage more driving.

7- Topography limits east-west connectivity:
The cliff west of SW 72nd Ave between SW Dartmouth St and Baylor St limits the connectivity to the northwest area of the triangle.

8- Area around Hwy 99W zoned as car-oriented
The area around Hwy 99W is designated as a drive-through commercial area in the Strategic Plan. tive modes.

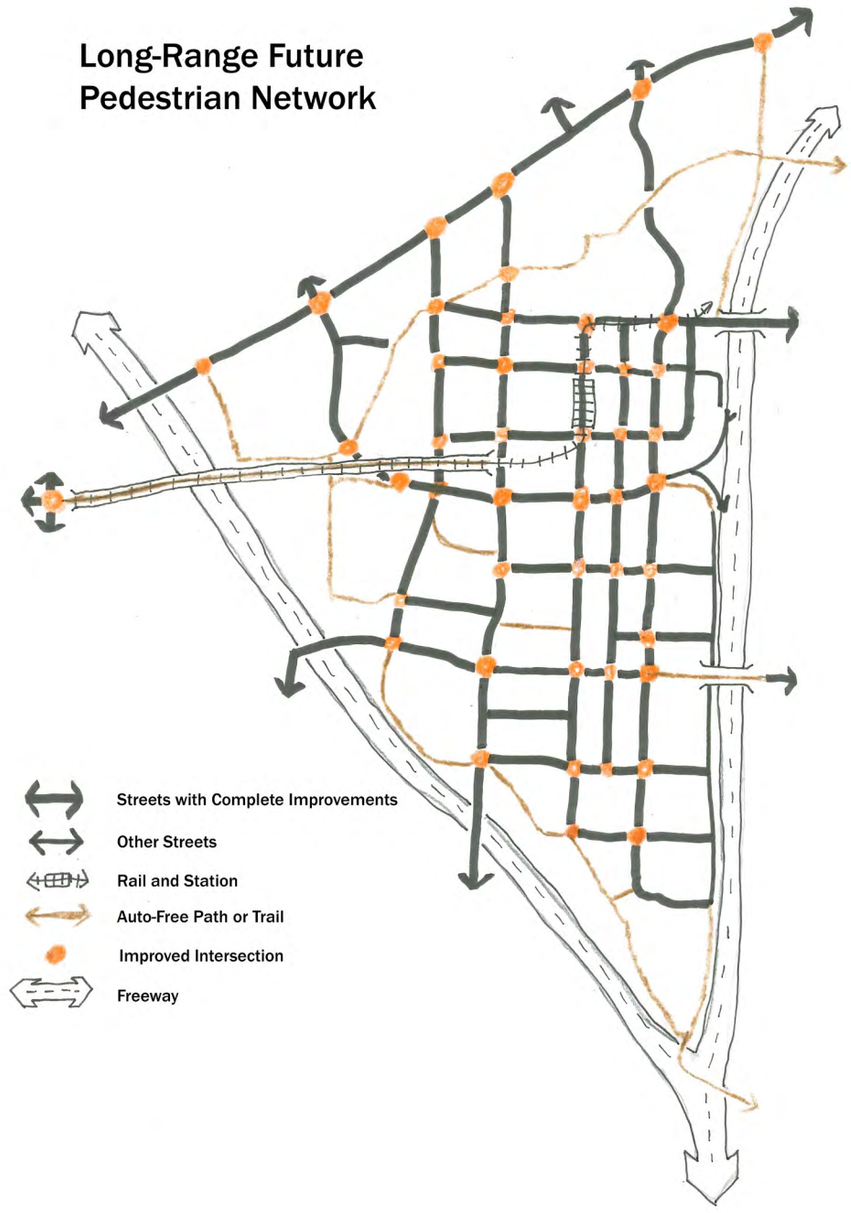


PEDESTRIAN NETWORK

The Pedestrian Station Access Plans describe the network of infrastructure to be provided to people accessing the station on foot. The Near-Term Station Access Plan enhances the existing network by completing the pedestrian facilities on all existing streets. The Long-Range Station Access Plan is the network of streets that will be completed as the Tigard Triangle develops pursuant to the Lean Code. The plans designate streets essential to pedestrian access to the MAX station as Station Access Routes and remainder as Other Streets. In the near-term, Station Access Routes are designated for a higher standard of development than Other Streets. In the long-range future, they will be developed to the standards of the Lean Code, with 14-foot sidewalks, lighting, street trees, and street furniture. Auto-Free Paths/Trails are shared use facilities including trails and the facility sharing MAX's path from the Baylor/Clinton Station to the Downtown Tigard Station.

Immediate Improvements Pedestrian Network

Long-Range Future Pedestrian Network



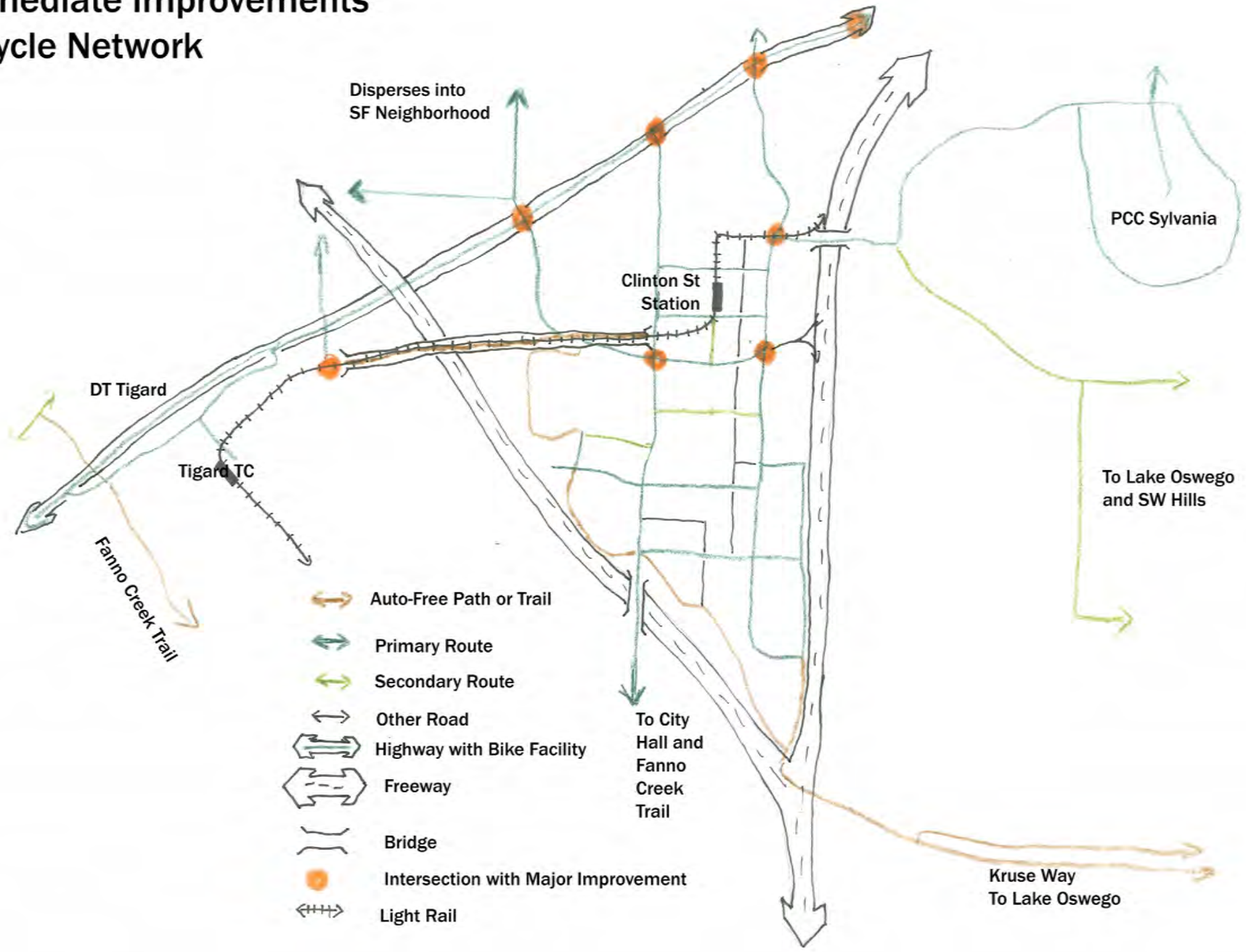
NEAR-TERM BIKE NETWORK

The Near-Term Bicycle Network designates Primary Routes and Secondary Routes that should be improved to provide safe and convenient access to the MAX station upon completion of the Southwest Corridor line.

Primary Routes are longer through routes that connect transit riders in the southern employment area of the Tigard Triangle to the station. They also connect bicyclists with trips originating outside of the Triangle to the station and through the Triangle to points beyond.

Secondary Routes link the Primary Routes to fill in the network. Auto-Free Paths/Trails provide alternatives to on-road routes and improve connectivity and include the MAX aerial structure.

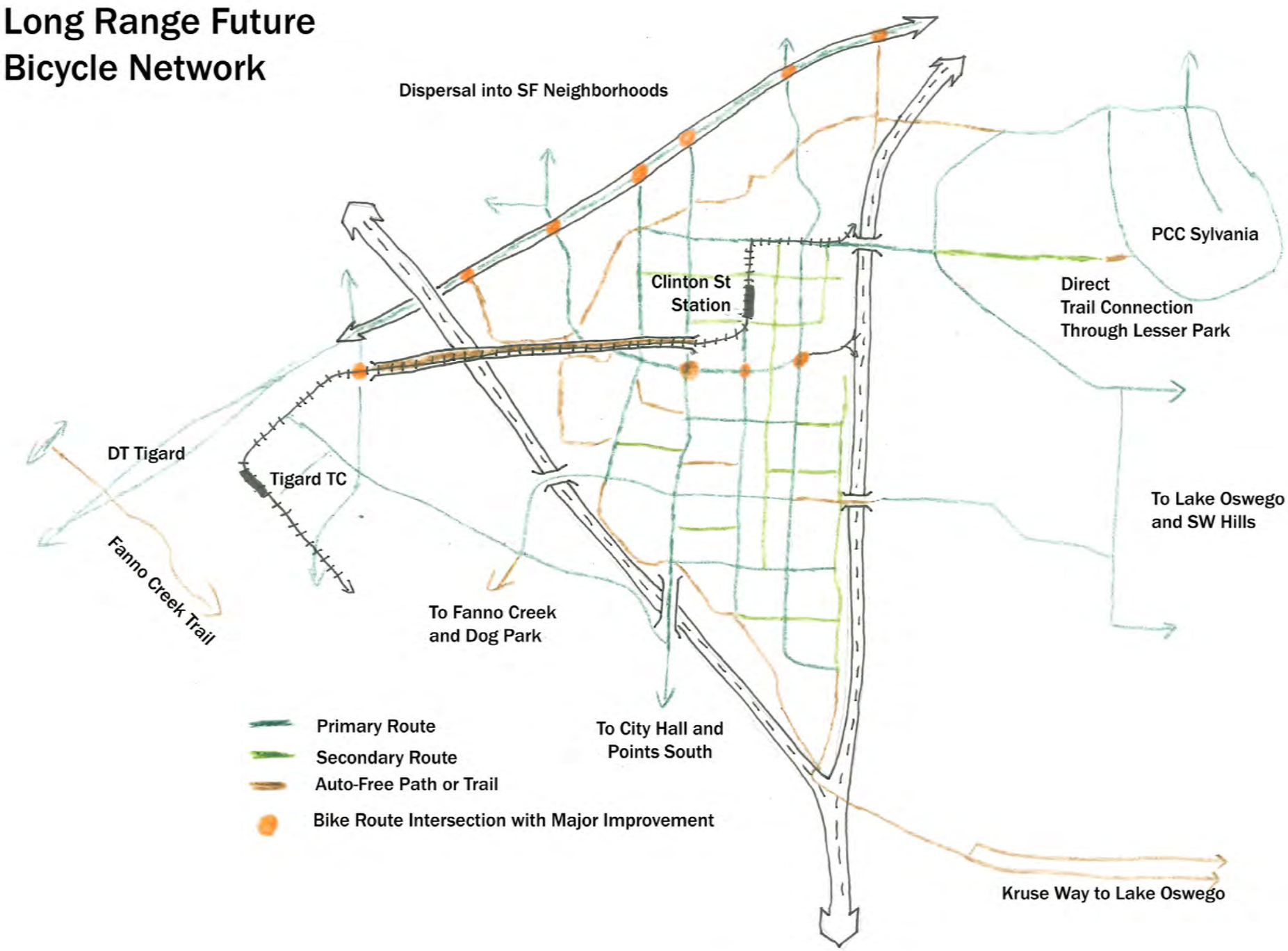
Immediate Improvements
Bicycle Network



LONG-RANGE BIKE NETWORK

The Long-Range Bicycle Network designates Primary Routes and Secondary Routes that will be improved in the decades following the completion of the Southwest Corridor line as development in the Tigard Triangle and greater station area continues. The Long-Range Bicycle Network includes planned streets and a greater density of Primary Routes.

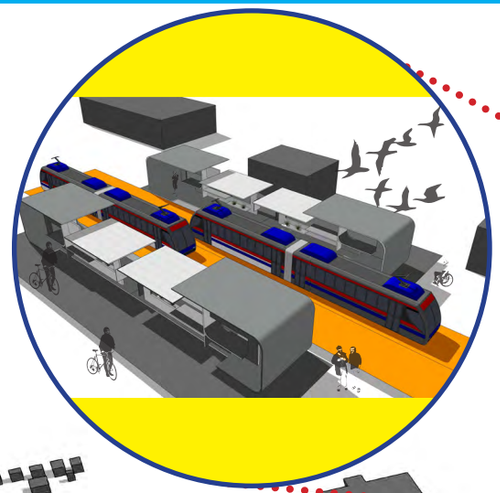
They will be improved to a higher standard with more separated facilities for people on bicycles. This plan includes a trail connecting the Sylvania campus to the station with a shortcut shared-use trail through Lesser Park.



LONG-RANGE BIKESHED NETWORK

This map shows the Long Range Bicycle Network plan extending to the three-mile bikeshed. This map shows the importance of bicycle networks throughout the region. A bicyclist can ride to the station within twenty minutes if he is within this map area. Responsibility to improve these routes rests on the city governments of Tigard, Portland, and Lake Oswego. Many of these routes are already designated bike routes on these cities' transportation maps.

TIGARD TRIANGLE LONG-RANGE PROPOSED BIKE PLAN PRIMARY ROUTES



PCC SYLVANIA

To Lake Oswego & SW Hills

Kruse Way To Lake Oswego

To City Hall & Points South

Pacific Hwy

LEGEND:

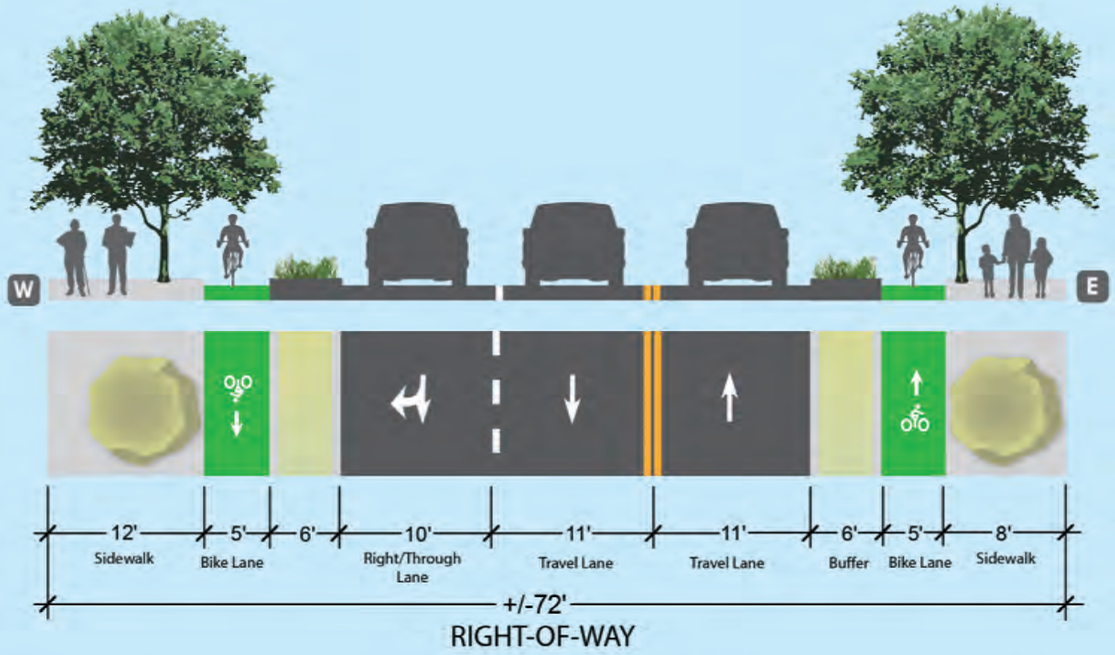
Intersection

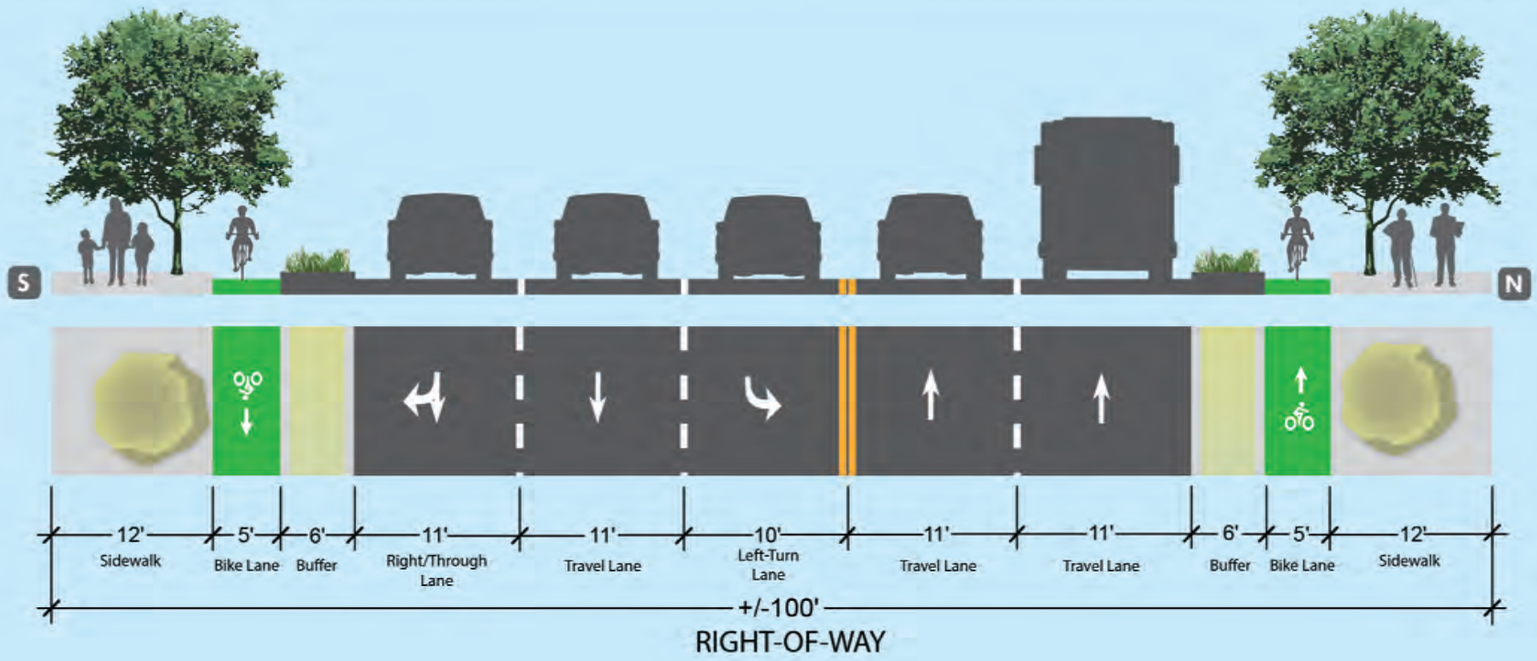
Primary Route

DESIGN GUIDE

ARTERIAL

The long-range design for arterials includes protected bike lanes with vegetated buffer, 8-12 foot sidewalks, and landscape stripe between pedestrians and travel lane. For the arterial intersection, green bike lanes will continue across the intersection to remind turning vehicles of bicyclists. Pedestrian crossing will be striped as zebra lines. On a three-lane intersection, one lane will be designated as a right turning lane. On a five-lane intersection, there will be designated right and left turning lanes.



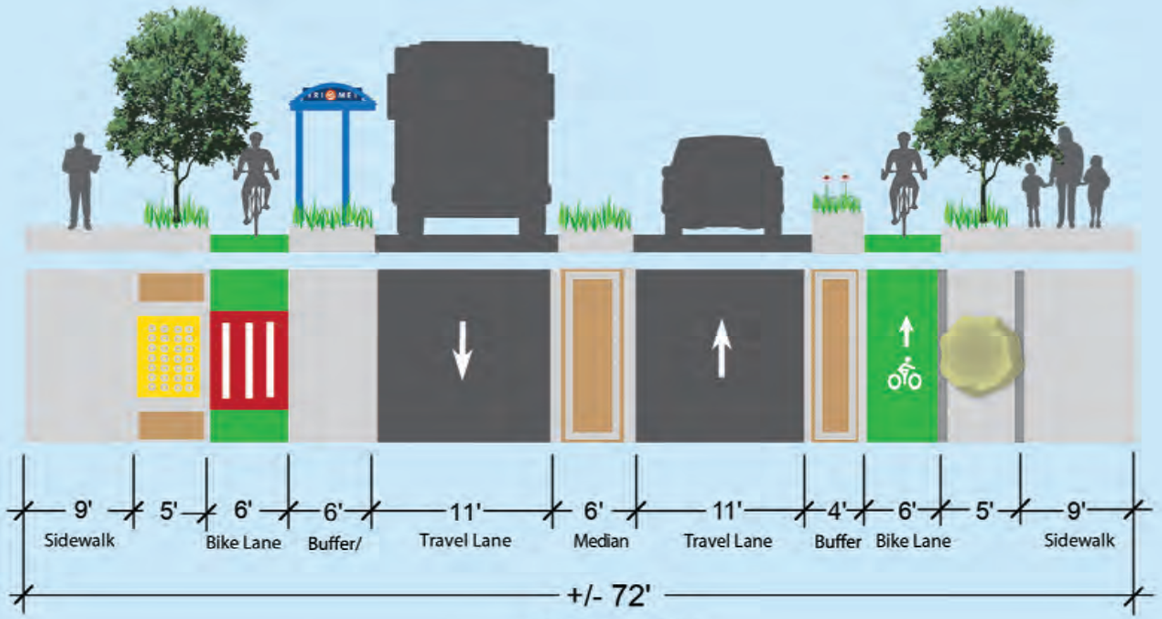


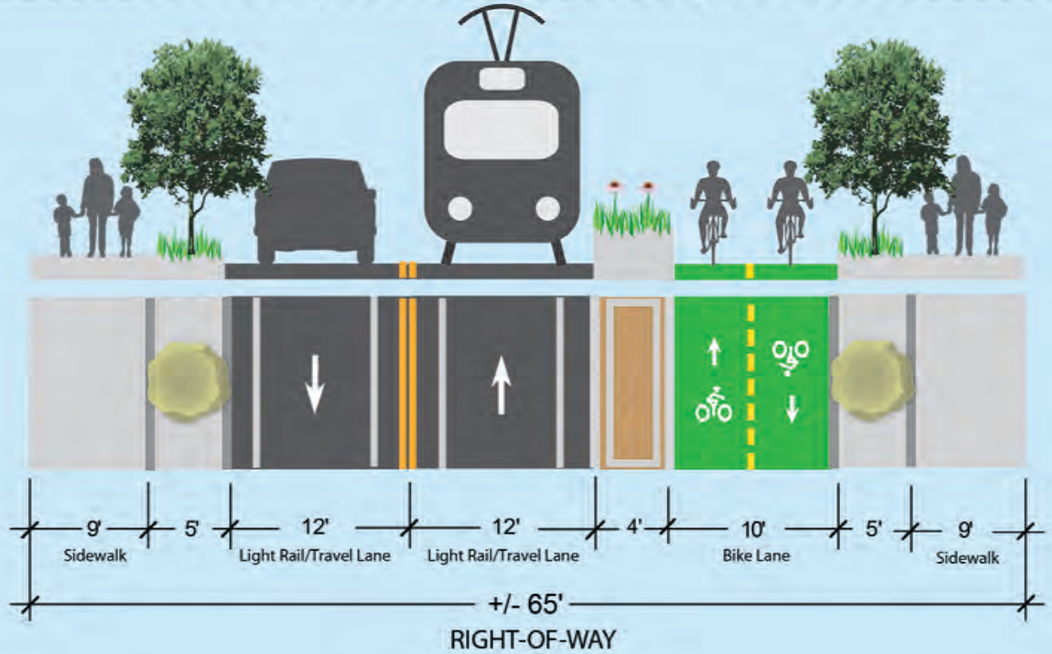
DESIGN GUIDE

TRANSIT STREET

There are two types of transit streets in the triangle: bus street and light rail street. The bus street include protected bike lanes with vegetated buffers, vegetated median, and landscaped sidewalks. Bus stop is installed on the six-foot vegetated buffer, which is connected to the sidewalk with red paint and zebra line on bike lane.

The light rail shares the street with vehicles, per TriMet design. A two-way bike lane, separated from the travel lane with vegetated buffer, continues onto the bridge across Interstate 5 on SW Haines St on one end and onto the light rail and bike/ped bridge on the other. The route crosses busy, wide intersections. The continuous two-way bike lane can reduce conflict with vehicles/light rail. Allowing bicyclists to stay on one side of the street can reduce the need to cross intersections and increase safety. Two-way bike lanes also saves space on the light rail and bike/ped bridge.





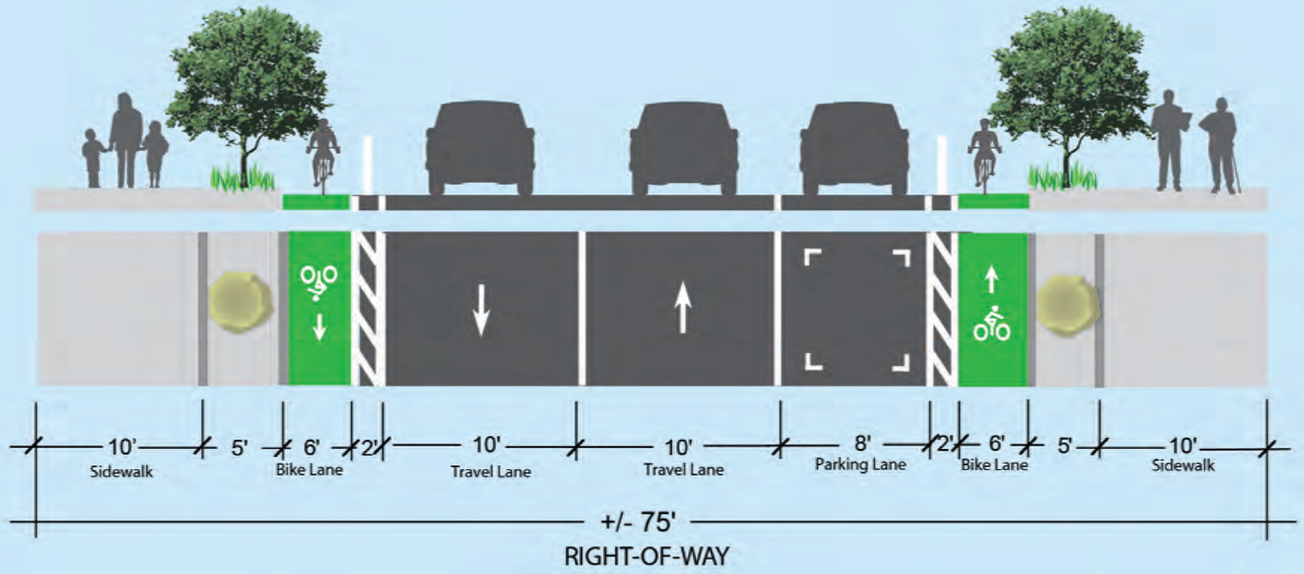
DESIGN GUIDE

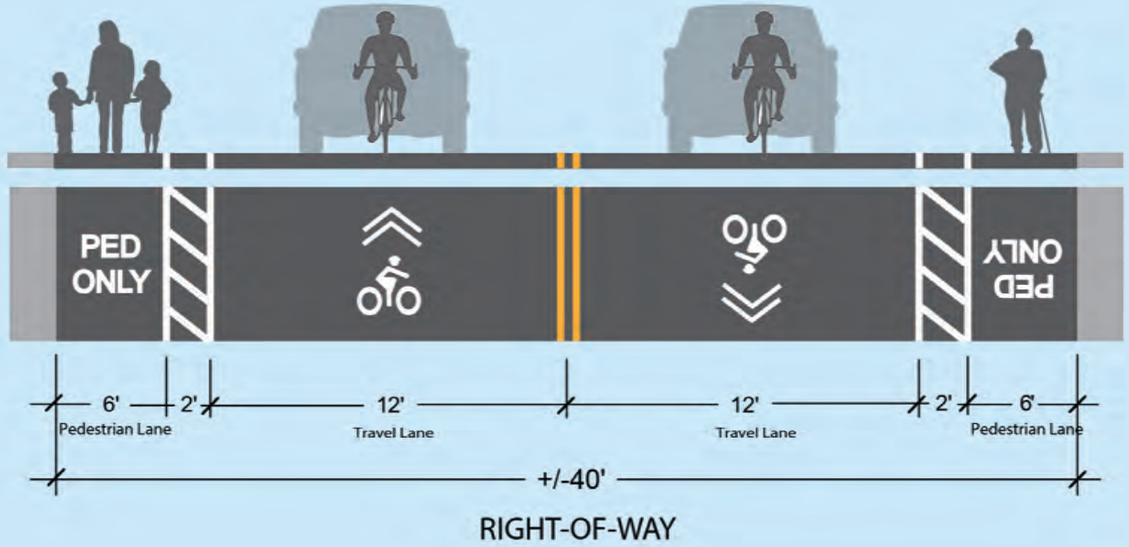
Long-Range Primary Route:

The design guide for primary bike routes features protected bike lanes, 2-foot buffer with bollards or vegetated strips, landscaped sidewalks that separate pedestrians from vehicles, an optional parking lane between bike lane and travel lane when the width allows, and a three-foot vegetated median to calm traffic.
The intersection treatments are comparable with arterials, including zebra line pedestrian crossing with yellow paint on bike lanes, continuous green bike lanes across intersection, and one pedestrian safety island in place of the median.

[Neighborhood Street - Near-Term

Currently, the majority of the neighborhood streets are unstriped and without sidewalks, some with speed bumps installed. Due to the proximity to the station, these streets need to be improved with pedestrian only lanes and connected bike routes in the near term to ensure safety and convenience for light rail riders. To reduce the cost and construction time, the project team recommends converting neighborhood streets into bike boulevards with six-foot striped pedestrian lanes.



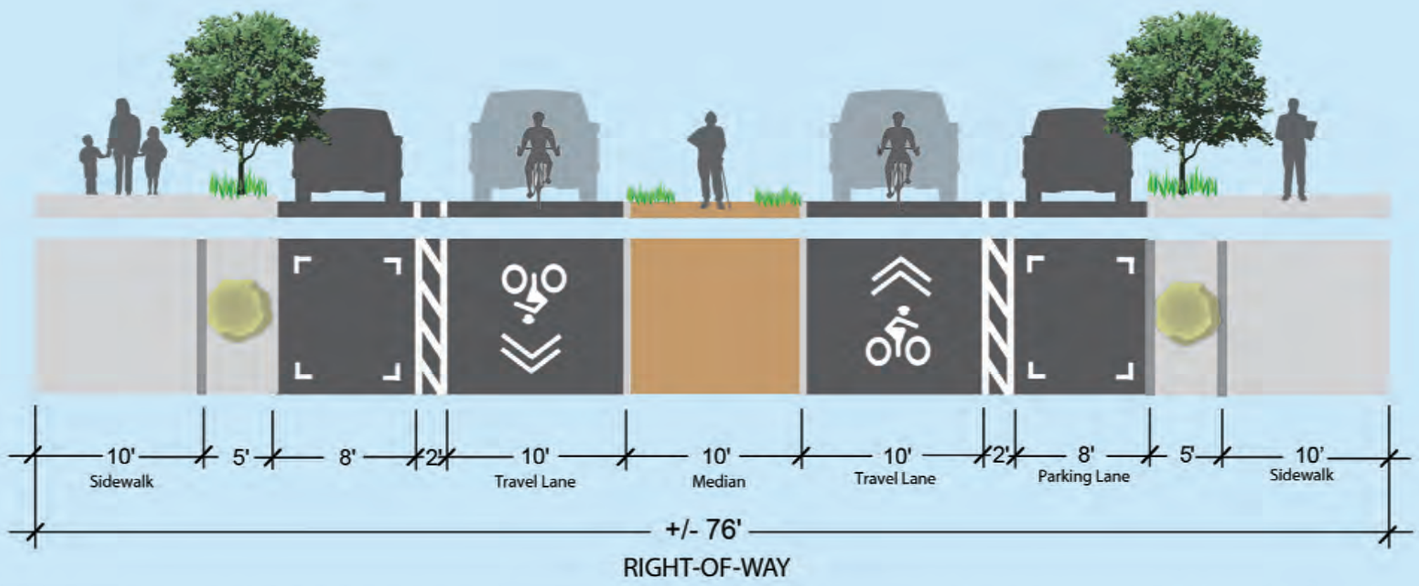


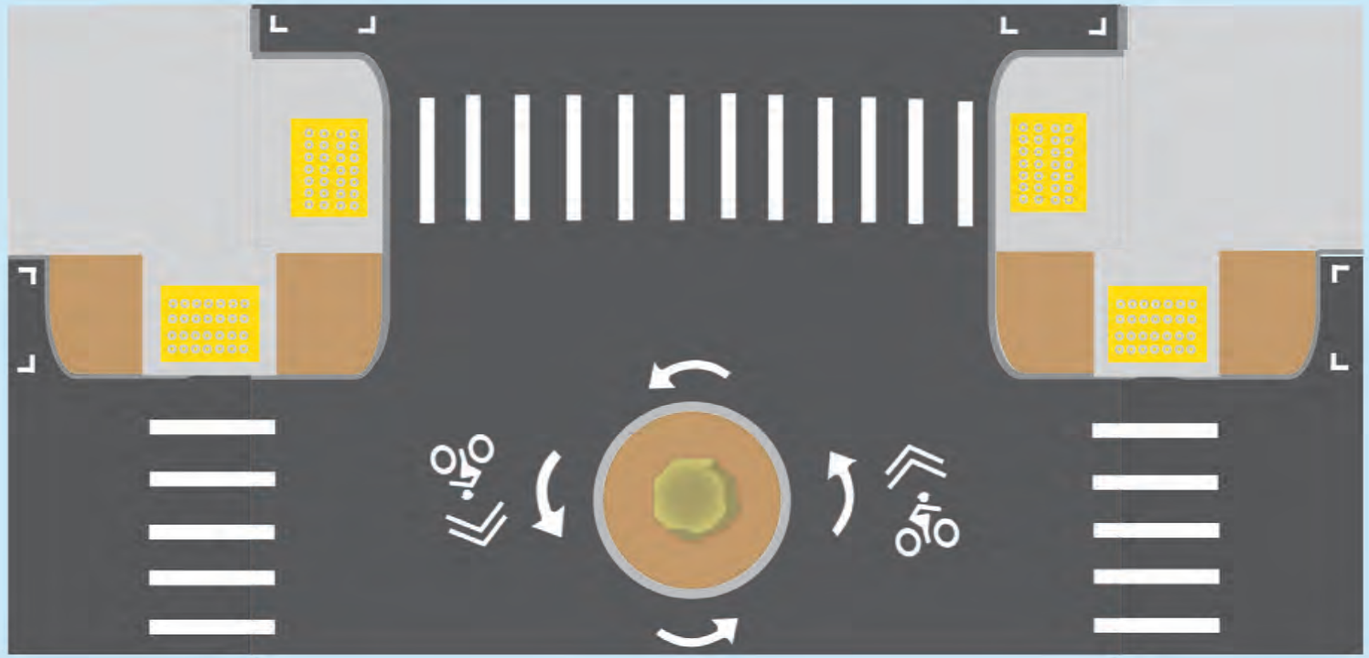
DESIGN GUIDE

Secondary Route

The secondary routes have lower speed limit and are designated as bike boulevards. To project needs for communal space in mixed-use development neighborhoods, a 10-foot median with a pedestrian path surrounded by landscaped stripes is the middle of the street. The median also features seating to encourage lingering and interaction between community members. On-street parking with a 2-foot buffer is provided on both sides of the street. The design also includes sidewalks with landscaped stripes.

A vegetated mini-roundabout is installed in place of stop signs as a traffic calming element and permeable surface area. Sidewalk extensions, or bulb-outs, are installed with ramps and tactile domes. There is no on-street parking at the intersection; sidewalk extensions take up parking lanes.



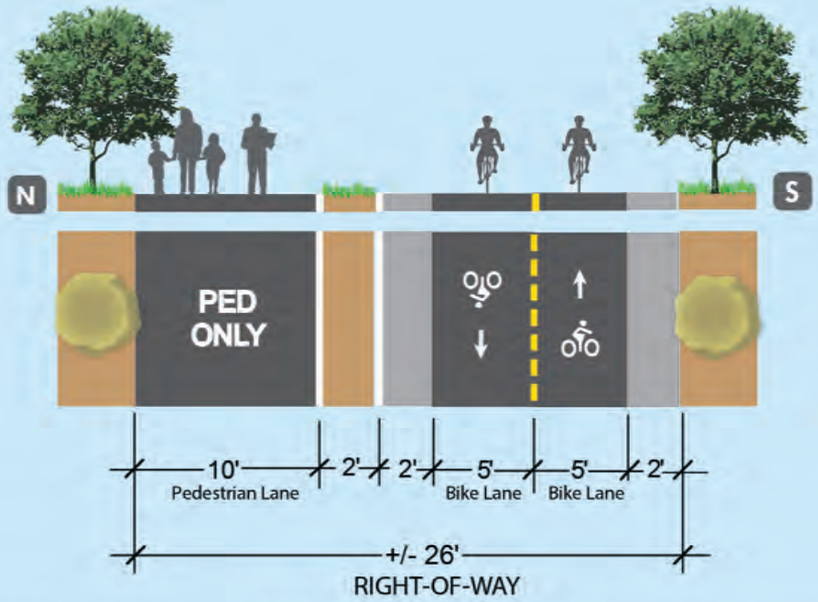


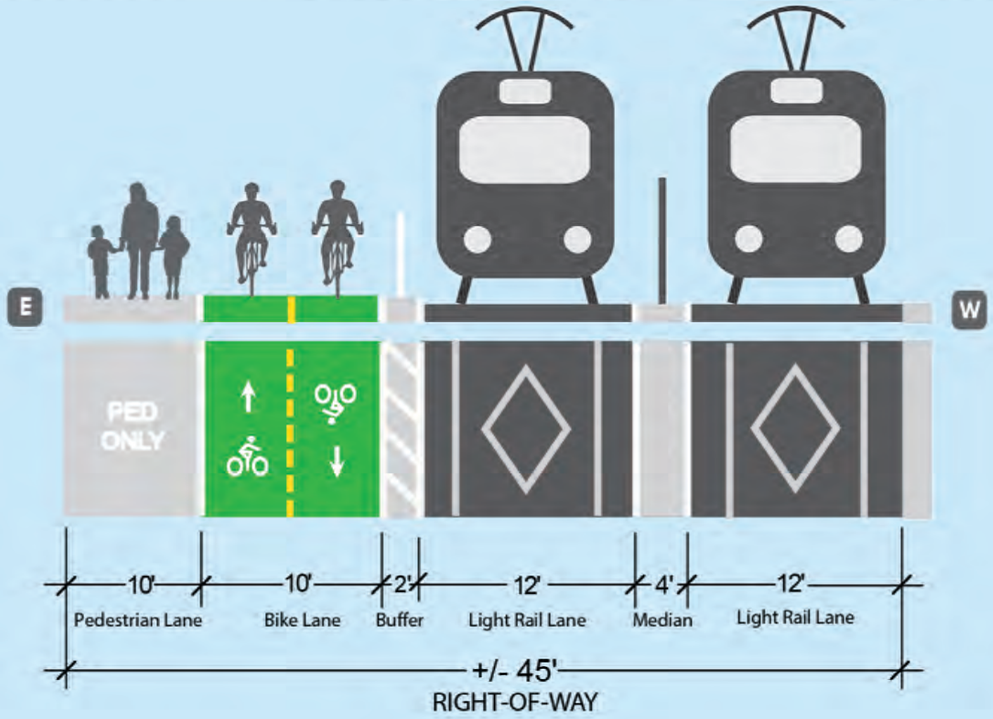
DESIGN GUIDE

Light Rail bike/Ped Bridge:

The Red Rock Creek trail serves as a bike highway with a separate pedestrian lane. The trail is located in the northern part of the triangle and spans across the triangle from Interstate 5 to Hwy 217, parallel to Hwy 99W. It provides an alternative route that will increase connectivity and perception of safety. The trail also provides space for leisure and exercising. To enhance comfort and activate the area, the team recommends benches and ample lighting along the trail.

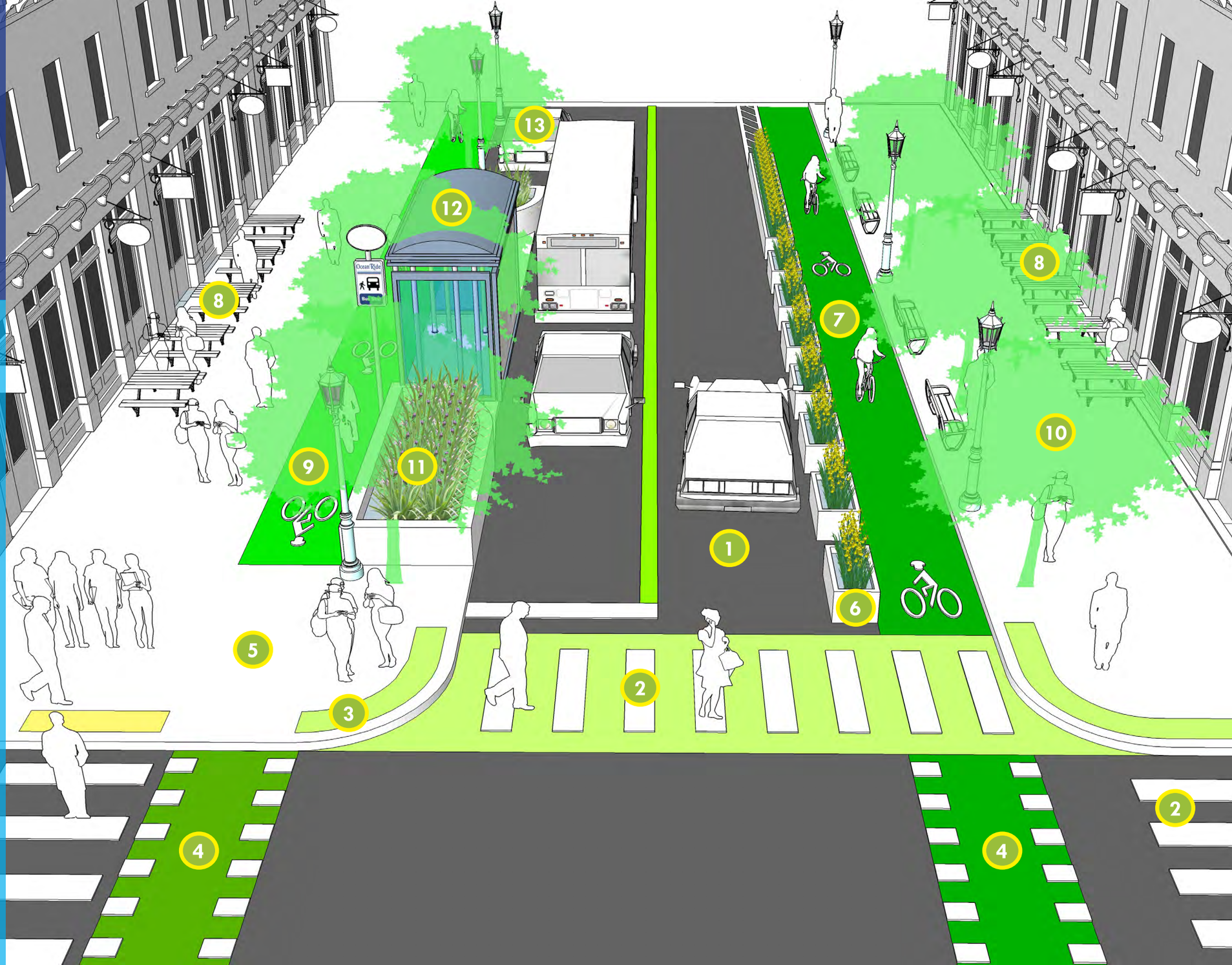
The Light Rail and Bike/Pedestrian bridge is proposed in Tri-Met's light rail plan. It comprises of two light rail lanes, a sidewalk, and a two-way bike lane. A 2-foot buffer with bollards will separate bicyclists from light rail trains and increase perception of safety. The two-way bike lane will be installed along SW 70th, the light rail transit street, and continue onto the bridge





STANDARD DUTCH JUNCTION

COMPLETE STREET DESIGN



1. Two-way Street
2. Street Crossing
3. ADA Ramp
1. Protected Bike Lane
5. Bulb-out
6. Physical Buffer
1. Protected Bike Lane
8. Furniture Zone
9. Raised Bike Lane
10. Street Tree
11. Bioswales for Stormwater
12. Bus Stop
13. Parking Space

RECOMMENDED DESIGN ELEMENTS

1- Bike Lane Buffers

Bike lane buffers protect bicyclists by creating a space between them and automobile traffic. In some locations the buffer is space painted onto the roadway. In other locations, they are concrete planter boxes that block automobiles from entering the bike lane.

2- Bus Stops

Where bus stops and buffered bicycle tracks are on the same street, the bus shelter and passenger loading area is between the cycle track and the motor vehicle travel lane. Bus passengers cross the cycle track to the shelter, which is on a curb extension into the parking lane. The bulb-out bus stop reduces bus delays by keeping the bus in the travel lane as it loads and unloads passengers. The bus does not have to wait for a gap in traffic to reenter the travel lane.

3- Crossing Sidewalk Extensions

Sidewalk extensions, or bulb-outs, extend the sidewalk into the street in order to shorten the crossing distance. The narrower roadway reduces automobile speed. Where the extensions cross bike lanes, they have ramps to allow bicyclists to cross them.

4 - Mini-Roundabout

The mini-roundabout is an intersection improvement that slows traffic by requiring drivers to maneuver around a raised island in the center of an intersection. They are ideal for use at the intersections of two minor streets where the intersection is uncontrolled, and can also be used where intersections are controlled with stop signs. If the island is landscaped or a planter, they serve to beautiful the intersection and reduce stormwater runoff.

5- Red Rock Creek Trail

Red Rock Creek Trail is a planned auto-free multi-use path parallel to Highway 99. It connects the PCC Sylvania campus area to Downtown Tigard. It will be developed as a "bicycle freeway," inspired by Minneapolis' Cedar Lake Trail. It will be wide enough to separate bicyclists from pedestrians and to allow high-speed bicyclists to comfortably pass low-speed bicyclists.

6- Street Furniture

Street furniture will be installed as development in the station area occurs. Street furniture is important element of pedestrian safety and comfort, and benches contribute to accessibility for people with limited mobility by providing a place to rest. However, street furniture is especially context-sensitive and should be selected to fit its surroundings. Public benches and trash cans are essential. Drinking fountains and planter boxes can be added if Tigard's plumbing and maintenance capability allows them.

7- Street Lighting

Street lighting will be installed as streets are improved. It will be designed for pedestrian safety and comfort and to contribute to streetlife after dark. It will be designed to light sidewalks and building street frontages primarily instead of designed primarily to light the roadway. Pedestrian crossings of the roadway will have lighting placed before the crosswalk rather than at the crossing so that light spills onto pedestrians rather than silhouetting them. Light fixtures will be scaled along the lines of the Pedestrian & Bicycle Information Center's guidelines for commercial areas. They will be between 12 and 16 feet above ground level and placed every 60 feet. (Source: http://www.pedbikeinfo.org/planning/facilities_streetscape_lighting.cfm)

8- Street Trees

Street trees calm traffic, provide shade on hot days, alleviate air pollution, and make a street more attractive. Street trees will be installed according to the guidelines of the Tigard Urban Forestry Manual.

9- Wayfinding Program

Wayfinding signs guide people to their destinations, tell them what destinations can be reached using the network, and alert people to the existence of the network. Wayfinding for pedestrians and bicyclists directs them to the networks developed especially for their use. Wayfinding programs are associated with feelings of satisfaction with bicycle networks and prevent feelings of frustration in the users. They are especially associated with female bicyclists' satisfaction with bicycle networks.

POLICIES & PROGRAMS

1- Complete streets during on-street light rail construction

TriMet's should include the construction of entire complete streets to their standards of the final buildout whenever it builds in a public right-of-way. The public rights-of-way on which the MAX runs as a streetcar in this station area are designated as Station Access Routes in the pedestrian network map. They are an element of nearly all conceivable pedestrian routes to the station, and will be used by people who use the park-and-ride lot.

2- Designate SW Clinton & 70th Max station as Bike and Ride

The station's bikeshed will be densely developed, and the bicycle network will make bicycle access safe and convenient. This dense development with safe streets for bicycling will extend outside the walkshed, so MAX may lose ridership if passengers' bicycles are not accommodated. MAX trains have limited capacity for bicycles, and the PCC shuttle will likely have no capacity for bicycles.

TriMet's Bike and Ride stations provide bike racks inside large cages that are unlocked with electronic key cards. This extra measure of security and weather protection encourages commuters who bicycle to the station to leave their bicycles there. Transit riders with origins in the station bikeshed can park bikes there for the day, and transit riders with destinations in the bikeshed can store bicycles overnight.

3- Partner with trip generating institutions to MAX ridership

Existing employment centers in the area lie outside the walkshed of proposed Southwest Corridor MAX stations. The areas designated for dense development in the Tigard Triangle also extend outside of the stations' walksheds. Portland Community College's Sylvania Campus is outside the walkshed. To allow people who do not own bicycles to use MAX to get to these destinations, TriMet should establish partnership with them with the purpose of providing ways to traverse the "last two miles" to the destinations.

TriMet should bring together large employers, institutions, and the managers of large buildings and shopping centers in the area to organize a shuttle bus service, bike share, or other ways to get customers, employees, and residents from the station to their destination. TriMet should call these people together because the solutions benefit from economies of scale and would and would circulate people within the station area, taking workers and students to lunch, dentist appointments, and so on. TriMet's Southwest Corridor Plan already includes a shuttle buses serving PCC Sylvania. Alternatives include service from the Baylor/Clinton Street Station and service from the 53rd and Barbur Station.

4- Require bicycle parking with all construction and improvements within the MAX station bikesheds.

The City of Tigard currently requires that development with inadequate parking be made to conform to the parking requirements when the use is expanded or the use is changed to a use requiring more parking. Lake Oswego currently requires parking provision to be brought to code for new structures, the remodeling of existing structures and a change of use which increases on-site parking or loading requirements or which changes access requirements. Both cities allow exceptions to their bicycle parking requirements.

Portland requires all development to meet all parking requirements prior to occupancy.

Tigard and Lake Oswego should update their codes to require installation of bicycle parking prior to issuance of a certificate of occupancy for any improvement above a reasonable value. They should strike the exceptions from their codes or institute policies of refusing them within the bikesheds of MAX stations.

5- Require installation and widening of sidewalks with major improvements

Sidewalk networks are incomplete throughout the station walkshed. The cities should require or request improvement of sidewalks and frontage during private construction projects, as applicable. Each project is unique, so mandates and requests should be applied judiciously and with helping funds as appropriate. The intention is to get the improvements earlier than they would have otherwise been installed and to minimize the disruptive impacts of construction and the costs of bringing contractors on-site by doing the work when other, similar work is ongoing.

6- Public parking in the station area should be market-priced

Trimet and Tigard should charge for parking in the station area as development in the station area intensifies. Free parking encourages investment, and the provision of free parking is a subsidy to driving paid for by the other passengers and taxpayers at large.

Prices should be market-based so that there is always at least one space of street parking available on each block and so that there are always some spaces available in the park and ride lot for people arriving after the morning peak commute.

7- Implement TriMet's Percent for Art policy at this station and in the station area

TriMet's Percent for Art policy was instituted in 1992. It allocates some money from major capital projects toward station art. This art can be used to create wayfinding pieces or to create pieces that complement each other throughout the station area. They could use the same color or materials palette, or be of the same theme, or work together in some other creative, inventive way imagined by the artist. Consider making the necessary infrastructure artistic rather than adding separate art pieces.

8- Maintain Street Trees

Street trees should be maintained so that the lowest branches do not block the way of the tallest pedestrian and bicyclists. Tree litter like leaves, seed pods, and fallen branches, must be cleared from walkways and bikeways because this litter can cause crashes by reducing traction, hiding tripping hazards, or containing thorns that flatten tires.

COST ESTIMATE ANALYSIS

1-Bicycle Network

There are two alternatives for completing the bicycle network to provide access to the MAX station in the near-term future from existing development at a low cost. They are the Basic Bicycle Network and the Full Bicycle Network. They both use paint and signs to establish the network. The difference is that the full network uses painted buffers between cars and bicycles on primary routes and includes wayfinding signs at decision-making points in the network to allow people to find their way to the new MAX station and throughout the bike network.

	Basic Bicycle Network	Full Bicycle Network
Primary Route	Standard Bike Lanes Regulatory Signs	Buffered Bike Lanes (Striped Buffers) Regulatory Signs Wayfinding Signs at Decision-Making Points
Secondary Route	Shared Lane Markings Regulatory Signs	Shared Lane Markings Regulatory Signs Wayfinding Signs at Decision-Making Points
Assumptions	No useable existing facilities.	No useable existing facilities.
Cost	$143,332.80	$202,863.70

2- Pedestrian Network

There are also two alternatives for completing the pedestrian network to provide access to the MAX station in the near-term future from existing development. One is the lower-cost Basic Pedestrian Network, and the other is the Full Sidewalk Buildout option. The Basic Pedestrian Network assumes that 50% of the pedestrian network is improved adequately. It completes the streets designated Station Access Routes with six-foot-wide sidewalks, curbs, and gutters as appropriate. It completes the streets designated as Other Streets with pedestrian lanes painted on the sides of the street where no sidewalks already exist. The Full Sidewalk Buildout Option estimates the cost of installing sidewalks to the standard required by the Tigard Triangle Lean Code. Both improve intersections. Site investigation found that storm sewers exist in the area.

	Basic Bicycle Network	Full Bicycle Network
Station Access Routes	Curb, Gutter, Six-Foot Sidewalk Infill	14-foot sidewalks Street Lights Street Trees Benches Trash Cans
Other Streets	Six-Foot Painted Pedestrian Lanes	
Intersections	ADA Ramps Where No Ramps Exist, Up to One per Corner Zebra Crosswalks	All-New ADA Ramps Zebra Crosswalks
Assumptions	Half of the Network has Adequate Sidewalks Already	All Sidewalk to be Removed
Cost	$4,499,680.30	$36,018,934.40

3- Bike Route to Portland City College Sylvania Campus

This route connects the station to the campus on existing streets via Atlanta Street, Haines Street, the bridge over Interstate 5, Lesser Road, and Sylvania's G Street into the campus core. It is developed as a bike boulevard with wayfinding signs at each decision-making point on the route.

	Bike Route to PCC
Improvements	Shared Lane Markings Regulatory Signs Wayfinding Signs at Decision-Making Points (Four) Speed Humps (Five)
Cost	$27,235

4- Southwest Triangle Peripheral Trails

These trails that run near the northeast side of Highway 217 run through public land and along the undeveloped margins of lots. Some segments exist as unpaved informal trails. They would be developed with a 12-foot wide paved shared use path The cost estimate here does not include land acquisition.

	Southwest Peripheral
Improvements	12-Foot Wide Shared Use Path Topsoil Shoulders Groundcover Restored with Mechanical Seeding
Cost	$1,067,232

DECISION MATRIX

This matrix is intended to guide the user of this plan in deciding which near-term alternatives to implement. Each alternative is rated by how well it accomplishes each goal. Each goal is weighted by its relative importance. The two bicycle network alternatives are adjacent to each other, as are the two walking network alternatives. The preferred alternative of each of these sets is scored the highest in the Weighted Scores row across the top of the matrix.

The last pair of columns are additional options that enhance the network. These options are not alternatives to each other or to any of the other alternatives; the scores are merely a guide as to how valuable an enhancement each option is. The user of the plan must decide whether and when to add them to the network.

SCORE 1 2 3 4 5

Low → High

DECISION MATRIX

	OPTIONS	BASIC BIKE NETWORK	FULL BIKE NETWORK	BASIC PED NETWORK	SIDEWALK BUILDOUT	PCC BIKE ROUTE	SW PERIPH. TRAILS
	WEIGHTED SCORE	77	84	67	63	73	54
DECISION MAKING FACTORS	WEIGHTING	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE
Cost	5	4	4	3	1	5	3
Connectivity	3	4	4	4	5	3	3
Aesthetically Pleasing	1	3	4	1	5	4	5
Improves Safety	3	3	3	3	5	3	1
Improves Accessibility	2	2	3	2	5	1	1
Ease of Use	2	2	4	3	4	2	5
Speed to Build	5	5	5	4	1	4	2

Full Bicycle Network

Buffered Bike Lane - 7 ft with 2 ft buffer, retrofit, no roadway widening

Item Description	Unit	Quantity/Length per Mile	Unit Cost	Total	Notes
Striping removal	LF	33,285	$0.50	$16,643.00	Assumes 2 lanes
Re-striping	LF	33,285	$0.30	$9,986.00	2 lanes w/ bike lanes
Pavement markings	EA	333	$75.00	$24,964.00	Every 200' each direction
Wayfinding Signs	EA	102	$400.00	$40,800.00	
Regulatory Signs	EA	166	$300.00	$49,928.00	Every 400' each direction
Estimated Direct Cost				$142,321.00	
Contingency	10%			$14,232.10	
Engineering / Design	6%			$8,539.26	
Construction / Overhead / Mc	10%			$14,232.10	
Project Administration	4%			$5,692.84	
Estimated Construction Costs (70% burden)				**$185,017.30**	

Shared Lane Marking

Item Description	Unit	Quantity per mile	Unit Cost	Total	Notes
Shared Lane Markings	EA	32	$275.00	$8,883.00	Every 200' each direction
Wayfinding Signs	EA	0	$400.00	$0.00	
Regulatory Signs	EA	16	$300.00	$4,845.00	Every 400' each direction
Estimated Direct Cost				$13,728.00	
Contingency	10%			$1,372.80	
Engineering / Design	6%			$823.68	
Construction / Overhead / Mc	10%			$1,372.80	
Project Administration	4%			$549.12	
Estimated Construction Costs				**$17,846.40**	

Total Cost	$202,863.70

Basic Bicycle Network					
Bike Lane - retrofit, no road widening, both sides of roadway					
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**	**Notes**
Striping removal	LF	33,285	$0.50	$16,643.00	Assumes 2 lanes
Re-striping	LF	33,285	$0.15	$4,993.00	2 lanes w/ bike lanes
Pavement markings	EA	333	$75.00	$24,964.00	Every 200' each direction
Wayfinding Signs	EA	0	$400.00	$0.00	
Regulatory Signs	EA	166	$300.00	$49,928.00	Every 400' each direction
Estimated Direct Cost				$96,528.00	
Contingency	10%			$9,652.80	
Engineering / Design	6%			$5,791.68	
Construction / Overhead / Mc	10%			$9,652.80	
Project Administration	4%			$3,861.12	
Estimated Construction Costs (70% burden)				**$125,486.40**	

Shared Lane Marking					
Item Description	**Unit**	**Quantity**	**Unit Cost**	**Total**	**Notes**
Shared Lane Markings	EA	32	$275.00	$8,883.00	Every 200' each direction
Wayfinding Signs	EA	0	$400.00	$0.00	
Regulatory Signs	EA	16	$300.00	$4,845.00	Every 400' each direction
Estimated Direct Cost				$13,728.00	
Contingency	10%			$1,372.80	
Engineering / Design	6%			$823.68	
Construction / Overhead / Mc	10%			$1,372.80	
Project Administration	4%			$549.12	
Estimated Construction Costs				**$17,846.40**	

Total Cost	$143,332.80

Full Sidewalk Buildout

41,320 Linear Feet of Sidewalks

Sidewalk, Drainage, C&G - one side of roadway

Item Description	Unit	Quantity	Unit Price	Total	Notes
Standard Concrete Curb and Gutter	LF	82,640	$30.00	$2,479,200.00	
Sidewalk	SF	1,156,960	$8.00	$9,255,680.00	14' Wide
Street Lighting	LF	82,640	$81.67	$6,749,209.00	1 light every 60 feet, one side of the street
Street Tree	LF	82,640	$0.50	$41,320.00	Every 60 feet
Furniture	LF	82,640	$10.00	$826,400.00	one bench, one trash can ea 500 ft.
Remove Concrete	SF	413,200	$6.00	$2,479,200.00	5 feet wide existing
Erosion and Sediment Control	LF	500	$1.25	$625.00	one block at a time
4" base aggregate	SF	1,156,960	$0.65	$752,024.00	
Estimated Direct Cost				$21,831,634.00	
Contingency	20%			$4,366,326.80	
Engineering / Design	15%			$3,274,745.10	
Construction / Overhead / Mobilization	15%			$3,274,745.10	
Project Administration	10%			$2,183,163.40	
Estimated Construction Costs				**$34,930,614.40**	

40 Crosswalks: 7 Major, 33 Minor

Intersections

Item Description	Unit	Quantity/Length per Mile	Unit Cost	Total	Notes
Zebra Crosswalk	LF	8,700	$6.00	$52,200.00	300 feet for major, 200 feet for minor
ADA Ramps	EA	320	$1,200.00	$384,000.00	8 per intersection
Saw cut and remove concrete pavemen	SF	3,200	$75.00	$240,000.00	10 per ramp
Erosion Controls	LF	3,200	$1.25	$4,000.00	10 per ramp
Estimated Direct Cost				$680,200.00	
Contingency	20%			$136,040.00	
Engineering / Design	15%			$102,030.00	
Construction / Overhead / Mobilization	15%			$102,030.00	
Project Administration	10%			$68,020.00	
Estimated Construction Costs (70% burden)				**$1,088,320.00**	

Total Cost				**$36,018,934.40**	

Bicycle Route to Portland City College Sylvania Campus			4,500 Linear Feet		
Item Description	**Unit**	**Quantity**	**Unit Price**	**Total**	**Notes**
Wayfinding Signs	EA	4	$400.00	$1,600.00	
Regulatory Signs	EA	11	$300.00	$3,300.00	Every 400' each direction
Pavement markings	EA	22	$275.00	$6,050.00	Every 200' each direction, thermoplastic bike with chevron
Speed humps	EA	5	$2,000.00	$10,000.00	Every 800'
Estimated Direct Cost				$20,950.00	
Contingency	10%			$2,095.00	
Engineering / Design	6%			$1,257.00	
Construction / Overhead / Mobilization	10%			$2,095.00	
Project Administration	4%			$838.00	
Estimated Construction Costs				**$27,235.00**	

Southwest Peripheral Trails					
Shared Use Path - 12 ft width, concrete			**5,900 Linear Feet of Trails**		
Item Description	Unit	Qty	Unit Cost	Total	Notes
Clearing and Grubbing	SF	147,500	$0.50	$73,750.00	25' wide corridor
Excavation	CY	1,092	$8.00	$8,736.00	
Erosion Controls	LF	1,000	$1.25	$1,250.00	
Aggregate Base Courses	CY	1,092	$50.00	$54,600.00	
Concrete Path	SF	59000	$8.00	$472,000.00	
Topsoil Shoulders	CY	23600	$1.85	$43,704.00	
Mechanical Seeding	SF	64900	$0.20	$12,980.00	
Estimated Direct Cost				$667,020.00	
Contingency	20%			$133,404.00	
Engineering / Design	15%			$100,053.00	
Construction / Overhead	15%			$100,053.00	
Project Administration	10%			$66,702.00	
Estimated Construction Costs				**$1,067,232.00**	

Note: planning level estimates do not include ROW acquisition costs; costs for potentially required bridges or retaining walls; or costs for amenities including lighting, benches, bicycle parking, interpretive kiosks, etc.

Basic Pedestrian Network					
Infill Sidewalk on Station Access Routes		34,355 Linear Feet			
Sidewalk, Drainage, C&G - one side of roadway					
Item Description	**Unit**	**Quantity**	**Unit Price**	**Total**	**Notes**
Standard Concrete Curb and Gutter	LF	34,355	$30.00	$1,030,650.00	
Sidewalk	SF	206,130	$8.00	$1,649,040.00	6' Wide
Estimated Direct Cost				$2,679,690.00	
Contingency	20%			$535,938.00	
Engineering / Design	15%			$401,953.50	
Construction / Overhead / Mobilization	15%			$401,953.50	
Project Administration	10%			$267,969.00	
Estimated Construction Costs				**$4,287,504.00**	
Infill Other Streets on Pedestrian Network with Painted Sidewalk				3,483 Linear Feet	
Painted Sidewalk					
Item Description	**Unit**	**Quantity/Length per Mile**	**Unit Cost**	**Total**	**Notes**
Striping removal	LF		$0.50	$0.00	Assumes 2 lanes
Re-striping	LF	3,483	$0.30	$1,045.00	cost for both sides
Pavement markings	EA	17	$75.00	$1,306.00	Every 200' each direction
Wayfinding Signs	EA		$400.00	$0.00	
Regulatory Signs	EA		$300.00	$0.00	Every 400' each direction
Estimated Direct Cost				$2,351.00	
Contingency	10%			$235.10	
Engineering / Design	6%			$141.06	
Construction / Overhead / Mobilization	10%			$235.10	
Project Administration	4%			$94.04	
Estimated Construction Costs (70% burden)				**$3,056.30**	
40 Intersections: 7 Major, 33 Minor					
Intersections					
Item Description	**Unit**	**Quantity/Length per Mile**	**Unit Cost**	**Total**	**Notes**
Zebra Crosswalk	LF	8,700	$6.00	$52,200.00	300 ft for major, 200 ft for minor
ADA Ramps	EA	40	$1,200.00	$48,000.00	1 per intersection
Saw cut and remove concrete pavemen	SF	400	$75.00	$30,000.00	10 per ramp
Erosion Controls	LF	400	$1.25	$500.00	10 per ramp
Estimated Direct Cost				$130,700.00	
Contingency	20%			$26,140.00	
Engineering / Design	15%			$19,605.00	
Construction / Overhead / Mobilization	15%			$19,605.00	
Project Administration	10%			$13,070.00	
Estimated Construction Costs (70% burden)				**$209,120.00**	
Total Cost				$4,499,680.30	