# COLUMBIA LOMBARD
## MOBILITY CORRIDOR PLAN

### APPENDIX C
Mobility and Access

*DRAFT - FEBRUARY 2021*

PBOT
PORTLAND BUREAU OF TRANSPORTATION

**AREA + PROJECT PLANNING**

APPENDIX C

# MOBILITY AND ACCESS NEEDS ANALYSIS

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ATSC | Adaptive Traffic Signal Control |
| Ave | Avenue |
| Blvd | Boulevard |
| CCTV | Closed Circuit Television |
| DLA | Dynamic Lane Assignment |
| GHG | greenhouse gas |
| I-205 | Interstate-205 |
| I-5 | Interstate-5 |
| ITS | Intelligent Transportation Systems |
| LEHD | Longitudinal Employer-Household Dynamics |
| LEP | limited English proficiency |
| LTS | level of traffic stress |
| MLK | Martin Luther King |
| OD | Over-Dimensional |
| ODOT | Oregon Department of Transportation |
| PBOT | Portland Bureau of Transportation |
| PDX | Portland International Airport |
| PedPDX | Pedestrian Master Plan |
| St | Street |
| TDM | Travel Demand Management |
| TMA | transportation management association |
| TMC | traffic monitoring center |
| TSP | Transportation System Plan |
| VMT | Vehicle Miles Traveled |

## Introduction

Columbia Boulevard (Boulevard) and Lombard Street (St) are parallel roadways on opposite sides of the Kenton Line railroad in North and Northeast Portland. Columbia Boulevard and Lombard Street have been included as part of many prior planning processes, which have identified a number of capital projects for improvements. The Columbia-Lombard Mobility Corridor Plan will review these projects, in addition to identifying new ways to improve the corridor and meet the needs stated in the project problem statement. This Mobility and Access Needs Analysis **presents quantitative evaluations of deficiencies and needs for all modes**. It also lists projects that have been identified in previous planning efforts.

### STUDY AREA

**The Columbia-Lombard Mobility Plan focuses on the N/NE Columbia Blvd and the parallel US 30 bypass (portions of N/NE Lombard St, NE Portland Highway, and NE Killingsworth St) between Interstate Avenue (Ave) and I-205, including a buffer area of half a mile to the north and south. On N Lombard St, between Interstate Ave and Woolsey Ave, a high-level active transportation analysis is also being conducted.**

## Freight Corridor Needs

Freight movement represents the economy in motion. To support the economy, goods and commodities must move to the right place, at the right time, to the right markets. Freight mobility depends on efficient, reliable, and safe routes. Metro has documented how this area, which they refer to as Columbia Corridor, serves as a freight hub and provide intraregional, east-west access to I-5, I-205, and Portland International Airport in their Atlas of Mobility Corridors (2015). This corridor not only supports businesses within the corridor itself, but also businesses within the greater region.

### Freight Routes and Critical Connections

Columbia Boulevard and Lombard Street connect the Rivergate Industrial District and US30 corridor/St. Johns Bridge to I-5 and I-205, and link to Hwy 99E/Martin Luther King Jr. Avenue and 82nd Avenue. The City of Portland Freight Master Plan and the Transportation System Plan classify Columbia Boulevard and Lombard Street to Interstate Avenue as Priority Truck routes. Columbia Boulevard and Lombard Street also provide access to Portland International Airport (PDX), rail lines, truck terminals, and shipping channels within the area, and serve through freight movement. Figure 1 shows how Columbia Boulevard and Lombard Street provide connections, including Lombard Street as the over-dimensional route. The over-dimensional route section provides current impedances for over-dimensional loads within the study area. Figure 1 shows one weight restricted location, Lombard Street and 42nd Avenue overcrossing, which is weight restricted. The overcrossing has a funded project to rebuild this connection, allowing for clearances that would allow over-dimensional loads.

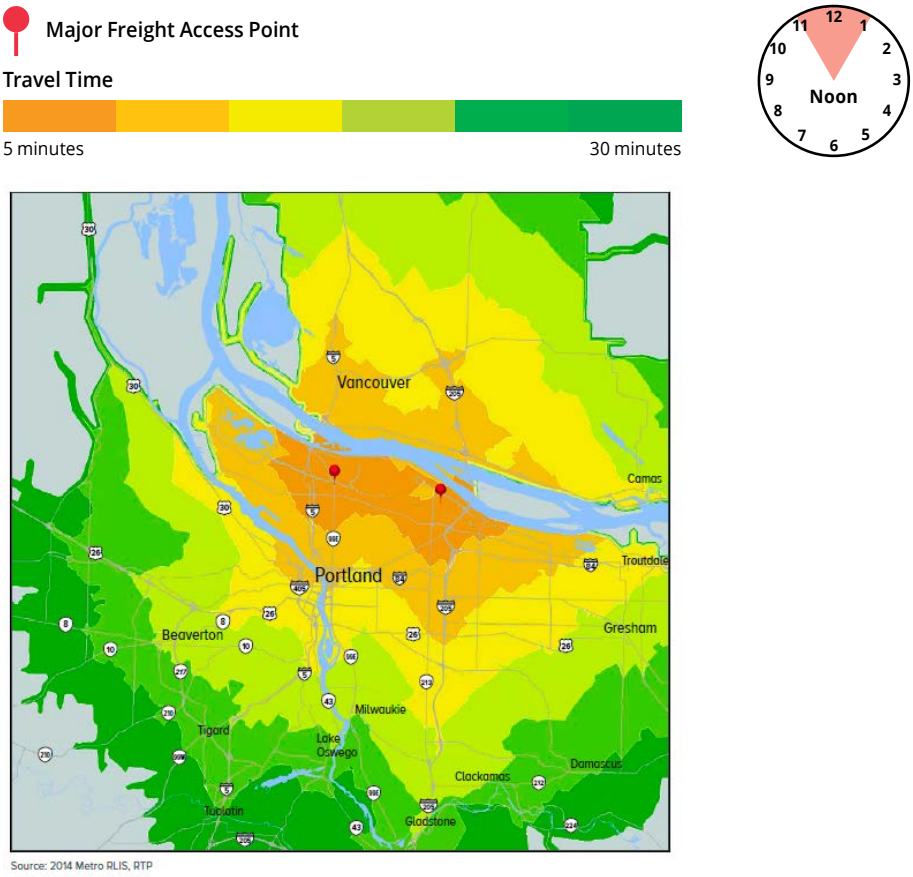
FIGURE 1. **Freight Routes and Critical Connections**

Columbia Boulevard and Lombard Street are critical freight connections within the greater regional and statewide economies. Metro's 2018 Regional Freight Strategy notes the Port of Portland processed 12.7 million tons of cargo, with another 8 to 10 million tons of inland barge cargo moving through the ports of Portland and Vancouver. Most of this cargo is transported beyond the Portland metro region, generally by truck and rail, and as evidenced in subsequent sections of this report, many businesses serve as a support industry within Portland for this freight movement. According to the Regional Freight Strategy (2018), Portland Metro area's industries collectively produced $158.8 billion in gross regional product, making it the country's 20th largest metropolitan economy in 2015. Traded sector industries produce roughly 45 percent of gross regional product while employing 31 percent of workers. Columbia Boulevard and Lombard Street are important freight corridors, serving needs within the immediate industrial areas as well as freight through-movement needs within the region and state. Oregon's total exports rose by 9.3 percent in 2016, and Oregon was the only state on the West Coast to produce a net gain in dollar value. Oregon is the ninth most trade-dependent state in the United States, with traded sector businesses including Nike, Adidas, Columbia Sportswear, Intel, Lattice Semiconductor, Genentech, Oregon Steel Mills, and other large employers in the region.

### Freight Travel Times

Metro's Atlas of Mobility Corridors (2015) evaluated truck travel times to major freight access points within the corridor. Figure 2 depicts truck travel time-sheds showing truck travel times in five minute increments from 5 to 30 minutes for the 11:00 AM-1:00 PM hour, the times during which trucks travel to best avoid peak commute

FIGURE 2. **Truck Travel Time Analysis (Metro, 2015)**




Source: 2014 Metro RLIS, RTP

hours. The map demonstrates that Columbia Boulevard (using the designated freight entry points) provides relatively good freight access within the region.

**While freight accessibility is fairly good within the region, growing congestion threatens this accessibility**. Freight stakeholders have identified reliability of travel times as a need. Just-in-time shipping and getting goods to intermodal facilities or air cargo flights on-time is important for business operations. A lack of predictability in travel times can negatively impact business operations.

### Freight Volumes

The Existing Conditions analysis evaluated traffic volumes, including truck volumes, finding within the corridor, the percentage of truck volumes ranged between 14 to 20 percent, with greater percentages (19 and 20 percent) on the east end of the corridor. **The peak hours for truck travel were between 10:00 AM and 1:00 PM** (The Columbia-Lombard Mobility Corridor Plan Existing Conditions Report, 2019).

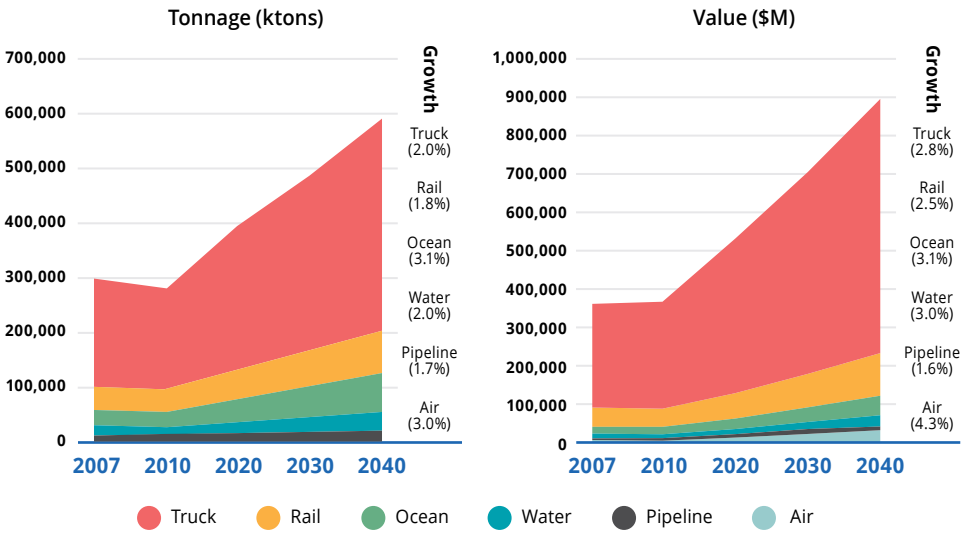
The Port of Portland Commodity Flow Forecast (2015) details how these freight volumes are generated regionally. The region's key industries are:

- Forest products – traditionally most important in the region, and while currently experiencing domestic declines, overseas imports have increased.
- Manufacturing – high-tech electronics is a highly significant sector, and growing in significance.
- Agriculture – traditionally important to the region and experiencing growth in exports to Asia.
- Energy – shift to renewable energy requires changes in demand in the future in terms of commodities.
- Waste and scrap – dramatic increases of exports to China.

Figure 3 displays growth of regional flows of freight by mode measured in tonnage and value. **There is high growth in high value goods by air, and the vast majority of flow movement by truck**. Growth rates are shown in parenthesis.

Metro 2018 Regional Freight Strategy identifies six core industry clusters for freight, which are defined slightly differently and overlap with the Port's identification. Metro has defined clusters as important drivers of regional

FIGURE 3. **Growth of Flows by Mode (Port of Portland 2015 Commodity Flow Forecast, 2015)**



economic activity today that are well-positioned to spark future growth. These industries depend on a well-connected local-regional-international transportation system. The six core clusters are:

- Clean Technology and Green Cities – Manufacturing, energy production, design, and waste disposal industries related to sustainability and resilience.
- Computers and Electronics – Establishments that manufacture computers, computer peripherals, communications equipment, and similar electronics products.
- Health Sciences and Technology – Advanced medical device manufactures, plus related research and development establishments; does not include local hospitals.
- Metals and Machinery – Broad array of goods-producing establishments working with heavy metals, ranging from foundries to pump makers to ship builders.
- Software and Media – Service establishments writing software, planning and managing computer systems, hosting data, and producing and distributing video and sound recordings.
- Sporting Equipment, Apparel, and Design – A unique collection of global apparel companies, personal hardware manufactures, and various design establishments.

**Much of regional good movement is by truck, and Columbia Boulevard and Lombard Street are critical connections, because they provide access to intermodal facilities, PDX, and higher order truck routes, such as I-5 and I-205**. The air-cargo growth rate, by tonnage or value, is the greatest growth rate, and Columbia-Lombard provides a critical connection to PDX. The corridor provides connections, either directly or indirectly, to all of these freight modes. The study area experiences a concentration of flow movement because of its role as a freight hub.

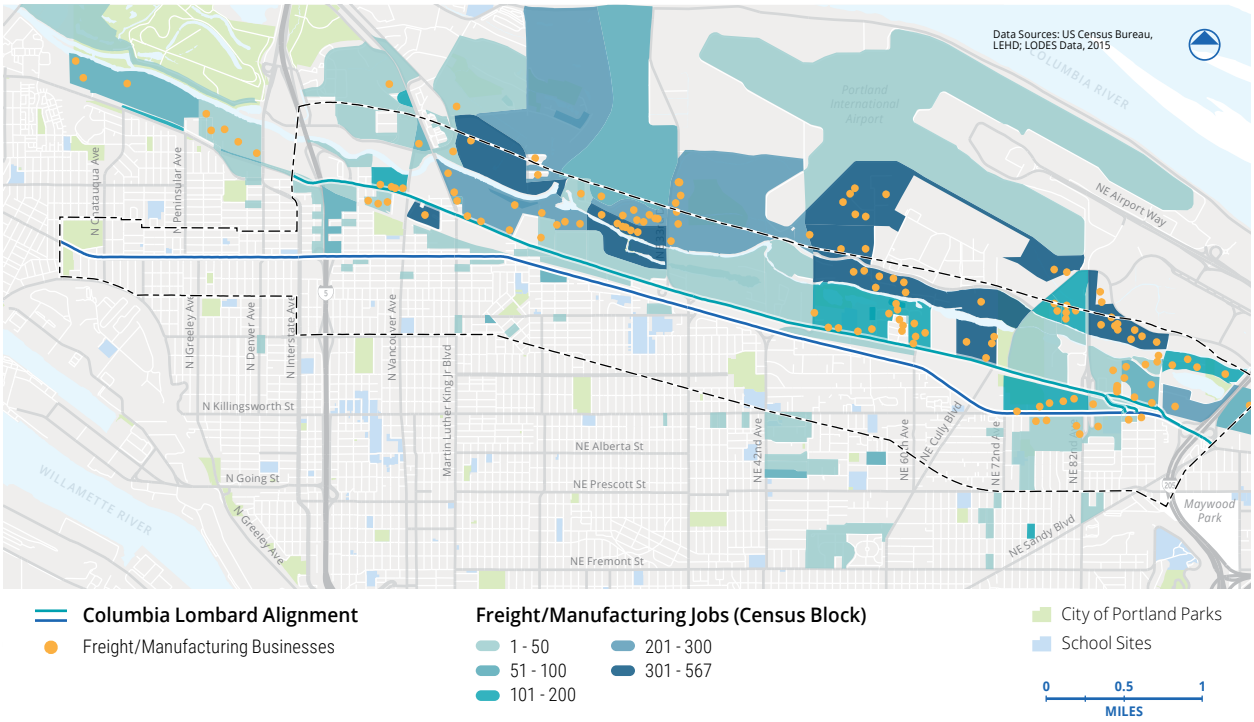
Columbia Boulevard and Lombard Street are part of the international gateway and domestic freight hub within the region. Metro 2018 Regional Freight Strategy states the region's forecasted population and job growth – an additional 670,400 residents and 420,200 jobs by 2040 – along with the associated boost in the consumption of goods and services will drive increased freight demand.

### Freight Generators

Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES) data was evaluated to identify freight generators (businesses that generate freight travel) within the corridor. There are 144 freight generators within the study area (Figure 4). Columbia Boulevard and Lombard St are critical roadways that support the freight district and freight generators within the study area.

Figure 4 displays the number of freight-, transportation-, and manufacturing-related jobs by Census block, with orange and red designating a greater number of these jobs. The corridor supports a high concentration of freight-, transportation-, and manufacturing-related jobs well into the study area. Identification of freight-related jobs is based on the North American Industry Classification System (NAICS) codes 31 to 33 (Manufacturing) and 48 to 49 (Transportation and Warehousing).

FIGURE 4. **Columbia-Lombard Corridor Study Area Freight Related Jobs by Census Block**




## Freight and Rail Access

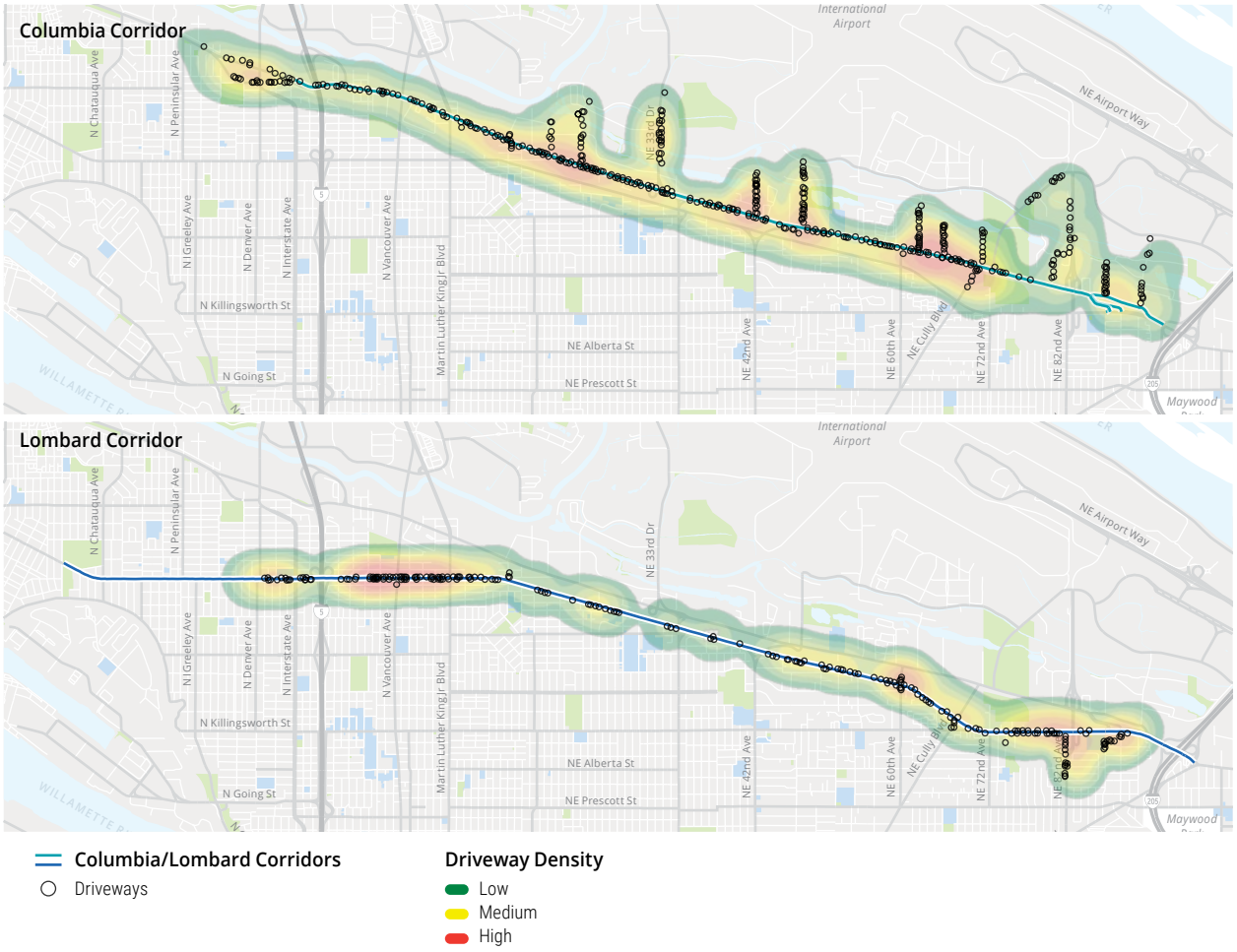
Major access points to the study area are US30/St. Johns Bridge, I-5, I-205, Hwy 99E/Martin Luther King Jr. Ave, and 82nd Ave. Figure 5 displays the density of driveways on Columbia Boulevard, Lombard Street, and other north-south connections within the study area.

On Columbia Boulevard driveways are concentrated between Cully Boulevard and 60th Avenue, between Cornfoot Road and 42nd Avenue, in the vicinity of Ne 21st and 17th avenues, and in the vicinity of I-5. Most of these driveways provide access to businesses in the area.

The pattern of driveways on Lombard Street is different from Columbia Boulevard. The greatest concentration of driveways are between 99E/Martin Luther King Jr. Boulevard and Vancouver Avenue, which is largely residential in this area.

Understanding the frequency of driveways, particularly on Columbia Boulevard in industrial areas, can help inform project recommendations such as the placement of medians or left turn lanes.

FIGURE 5. **Driveway Density**




## Growth in Air Cargo

As previously detailed, the Columbia-Lombard corridor provides access to PDX. Air cargo is important for two reasons: 1) to get goods from the region that are high value or perishable to market, and 2) to support the booming growth in e-commerce and one and two-day delivery.

- The Port of Portland reports air cargo volumes are up worldwide, and air cargo tonnage at PDX has increased more than 21 percent over the last five years (May, 2019).
- In 2016, air cargo specific service was two flights per week, moving shoe parts manufactured in Beaverton to Hong Kong, returning to the States as shoes. Today, PDX operates three flights per week, and up to six during the peak summer perishable season to transport cherries, berries, crab, and other perishable goods. As an example, Cathay Pacific air carrier carries fresh cherries and berries from Oregon and Washington to markets in Asia. Volumes were up more than 35 percent in 2018, relative to their first full year of operation, 2017.
- The Portland Region Westside Freight Access and Logistics Analysis (2013) states freight movement between the Westside Computer and Electronics cluster and PDX freight consolidation area depends on two routes, one being US30 eastbound across the St. John Bridge to Columbia Boulevard. The analysis states the Computer and Electronics industry accounts for over half of the total value of the region's exports.

Maintaining truck mobility through this corridor is a critical support to the Computer and Electronics industry, and fastest routing is one of the factors driving their logistics decisions.

- In addition to getting goods quickly to market, e-commerce has caused the greatest growth in air-cargo with multiple parcel carriers at PDX, including UPS, FedEx, DHL, and Atlas. Amazon.com has fulfilment centers east and west of the Columbia-Lombard study area, in North Portland in the Rivergate area and Troutdale.

The Columbia Corridor is a critical connection to support the enormous growth in air cargo, and growth rates are expected to continue to be high into the future.

**Over-Dimensional Route**

US30 Bypass is designated an over-dimensional (OD) Route, meaning that it is a route designated for oversized loads. Within the study area, Lombard St has the US30 designation and is designated the OD route. Vehicles in excess of the legal load dimensions which are characterized by weight, axle weight, width, height, and length, must acquire a permit before movement of an oversize load in Oregon.

For US30 Bypass Corridor (US 30/St Johns Bridge to Fairway Parkway), a segment of which is this project's study area, 5,296 permits were issued for the 3-year period (December 2012 to December 2015). These counts do not reflect loads operating under an annual Continuous Trip Permit. Below are some examples of over-dimensional loads.

- **Wide** over-dimensional loads are dozers, concrete forms, empty tanks, mobile and modular unites, pre-manufactured steel structures, transformers, vessel sections, crane bodies.
- **Highest** loads were control buildings, empty tanks and tank sections, power boats, mobile and modular units, transformers, excavators.
- **Longest** loads included cranes, excavators, scrapers, material handlers, bridge girders, log loaders, heavy haul combinations.
- **Heavy** loads were crane and excavator bodies, dozers, material handlers, transformers, and other heavy loads.

Some freight stakeholders state they would like to see Columbia Boulevard as the OD route because of its greater proximity to industrial destinations; however, constraints on Columbia Boulevard prevent this designation. Constraints within Columbia Boulevard are:

- **Railroad Bridge at I-5 (UPRR):** This Union Pacific-owned structure crosses over Columbia Boulevard at a diagonal and has a vertical clearance of 16-feet, 5 inches for eastbound traffic and loads. Bridge support piers and guardrails are located in the middle of the roadway, providing a 24-foot horizontal clearance for eastbound traffic and a 24-foot, 6-inch clearance for westbound traffic. The UP rail bridge also crosses under the I-5 bridge mainline structure and the Columbia Boulevard./I-5 southbound on-ramp structure at this location. The UPRR structure of Columbia Boulevard is a known constraint and limits the use of Columbia Boulevard as a continuous route for over-dimensional vehicles..
- **NE 60th Ave Connection:** NE 60th Ave is a 24-foot wide two-lane facility that extends 500 feet between US 30B/N Portland Highway and Columbia Boulevard with signalized intersections at both US30B and Columbia Boulevard. An existing UPRR bridge undercrossing with a vertical clearance of 14-feet limits this connection for high loads and the limited width from the bridge support piers also limits certain wide loads from using this facility (Regional Over-Dimensional Truck Route Study, 2016).

Due to these constraints within the study area, as well as other restrictions on Columbia Boulevard, Lombard Street has the over-dimensional route and US30B designation.

### Freight-Specific Needs

Freight needs analysis was based on an evaluation of past planning work related to freight needs in the area, conversations with stakeholders and information from the Port of Portland. Below is a summary of freight related needs:

**Do not impede freight:** Key freight issues are safe separation between modes, maintaining Columbia Boulevard and Lombard Street as key freight routes, and northsouth connections within the corridor. With the exception of peak period congestion at the east end, the corridor functions well for freight now. Adding facilities for bicycle travel on Columbia Boulevard in particular or adding traffic signals could impede mobility of the freight corridor in the future. No other east-west routes are prioritized for truck/freight movement exist.

**Increasing Demand:** Demands of e-commerce are increasing the needs for air cargo and will drive an increase of truck travel through the Columbia-Lombard corridor to PDX. The Port of Portland reports air cargo volumes are up worldwide, and air cargo tonnage at PDX has increased more than 21 percent over the last five years (May, 2019). Some of this cargo comes from the computer, tech, and electronics industry to the west (Washington County), which is quickly growing.

**Reliability:** Supply chain logistics are increasingly sophisticated and just-in-time shipping as well as getting goods to intermodal facilities and air cargo routes during specific timeframes are increasingly important to business operations. Freight stakeholders emphasize the importance to prioritize Columbia Boulevard and some segments of Lombard St for freight movement and truck priority. ITS to prioritize truck movement potentially can aid reliability for freight movement within the study area.

**Over-Dimensional Loads:** As described in the section above, Columbia Boulevard is the primary freight route within the study area; however, height constraints at I-5 and 60th Ave prevent OD route designation on Columbia Boulevard, which is why Lombard St has the state highway and OD route designation. Between 2012 and 2015, 5,296 single-use OD permits were issued, which does not reflect continuous trip permits.

**Inadequate Space for Larger, Modern Trucks:** Columbia Boulevard has some narrow access points to properties, and in some cases, properties have loading docks that are inadequate for larger modern trucks. For this reason, some trucks use the center-turn lane of Columbia Boulevard to load and unload cargo, which is a misuse of the facility. Addressing inadequate spacing for larger trucks on private properties is not a need this transportation planning process can address; however, preventing the unsafe use of roadway facilities for loading and unloading is a study area need.

**Overcrossings or At-grade Crossing Closures:** The Kenton rail line in the study area is the region's most congested rail corridor, and 2040 rail forecasts for the Kenton rail line are anticipated to impact the regional rail system. Operators proposed responses include to construct double or triple-tracking in response to growing freight rail demand, and previously proposed overcrossings or at-grade closures identified as in previous plans need to be constructed to help accommodate growing freight rail demands (see subsequent "previously identified projects," section).

**Columbia Widening Project:** Both Metro's Regional Transportation Plan (for the 2028-2040 timeline) and the City's Transportation System Plan (TSP) list widening Columbia Boulevard from three to five lanes between 60th and 82nd, which is the only three-lane cross-section in Columbia Boulevard's otherwise five-lane cross-section.

**Columbia/Cully Project:** The Portland Freight Master Plan (2006) identifies this project for signalization and turn lanes and the completion of pedestrian and bicycle facilities. This intersection serves air cargo facilities at the Port.

## Pedestrian and Bicycle Corridor Needs

The purpose of this section is to present an analysis of mobility and access needs for people walking and biking in the Columbia-Lombard Mobility Corridor study area. The Mobility and Access Needs Analysis presented here consists of the following: 1) a demand analysis to identify the expected level of active transportation activity along the corridor, 2) a bicycle level of traffic stress (LTS) analysis to estimate the level of comfort for people biking in the corridor, and 3) a crossing gaps analysis to identify pedestrian infrastructure deficiencies. These results are then synthesized and placed within the context of health and equity concerns in the project area.

### Demand Analysis

#### INTRODUCTION AND METHODOLOGY

The demand analysis identifies expected walking and biking activity by overlaying the locations where people live, work, play, learn, shop, and access public transit into a composite sketch of user demand. The results of this analysis can be used to inform development of bike and pedestrian network improvement projects by highlighting areas where there is high demand.

The demand analysis was applied to the project corridor, using a buffer of one half-mile.[1] The purpose of the demand analysis is to identify relative levels of activity within the study area. The half-mile buffer was selected because larger buffers leave the differences along the corridor obscured by the much higher levels of activity in inner Portland. All the data inputs were aggregated to a point grid with 150 feet of spacing to allow for a consistent unit of analysis.

The demand model scoring method is a function of density and proximity. Scores are a result of two complementing forces: distance decay, the effect of distance on spatial interactions that yields lower scores for features farther away from other features; and spatial density – the effect of closely clustered features that yields higher scores. Scores will increase in high-feature density areas where those features are close together. Scores will decrease in low-feature density areas where features are farther apart.

Each demand input is scored on a scale of 1 to 5 based on density and proximity, with higher ratings meaning greater demand in that category (Table 1). Scores were then aggregated to calculate the composite demand score. Each category received equal weight in the scoring.

"Live," "Work," and "Shop" categories used counts (residents, employees, and arts and recreation and service jobs, respectively) to assign an aggregate score on a scale of 1 to 5. "Play" and "Learn" categories were assigned a score based on whether a location of interest (to play or learn) was present.

[1] *The buffer was extended to three miles for employment north of the project corridor to account for the greater distances to origins and destinations among these commercial, transportation, and industrial land uses. The large employers north of the project corridor are a significant demand generator and accessing them requires traveling along or across the project corridor.*

FIGURE 6. **Population Density**

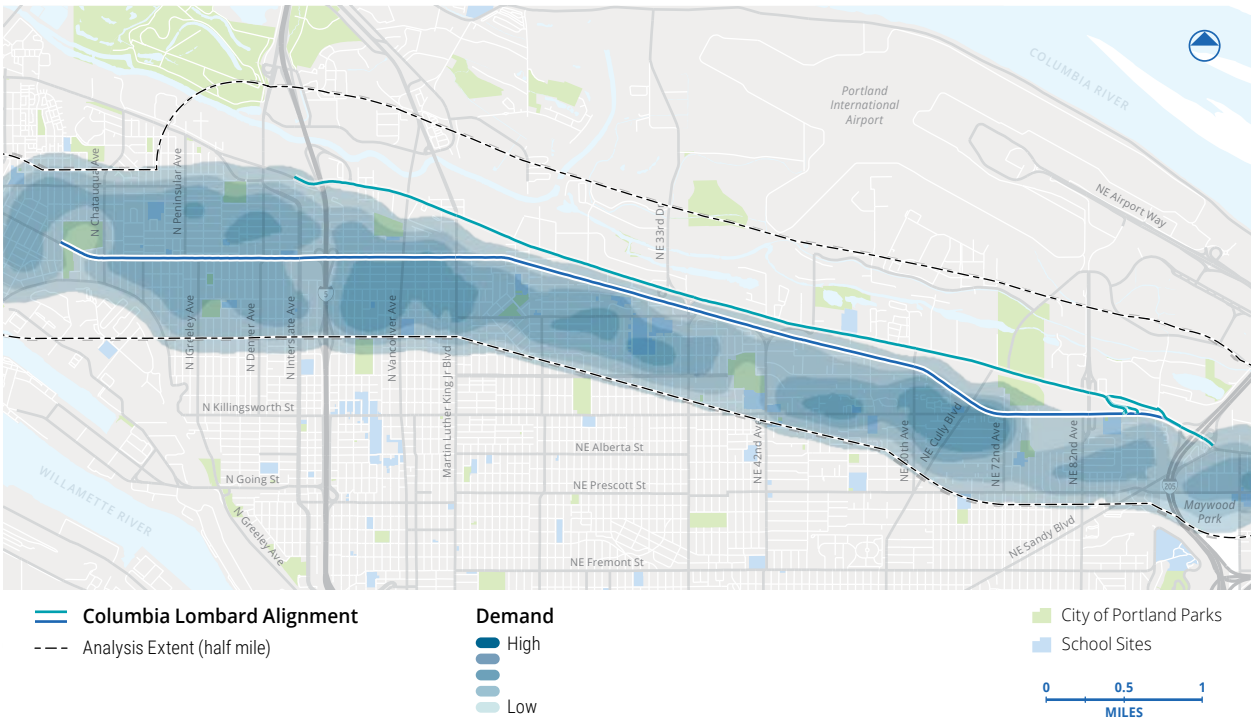



TABLE 1. **Demand Analysis Inputs and Scoring Methodology**

| Category | Input | Score Method | Score Range |
|---|---|---|---|
| LIVE | Total Population | Density of population (by census block, assigned to points) | 1-5 |
| WORK | Total Employment | Density of employment (by census block, assigned to points) | 1-5 |
| PLAY | Park | Feature located within 150 feet of point | 5 |
| | Trail (including 150-ft buffer) | Feature located within 150 feet of point | 3 |
| SHOP | Retail and Service Jobs (CNS 7/17/18) | Density of retail employment (by census block, assigned to points) | 1-5 |
| LEARN | College Campus or Elementary School | Feature located within 150 feet of point | 5 |

## LTS RESULTS

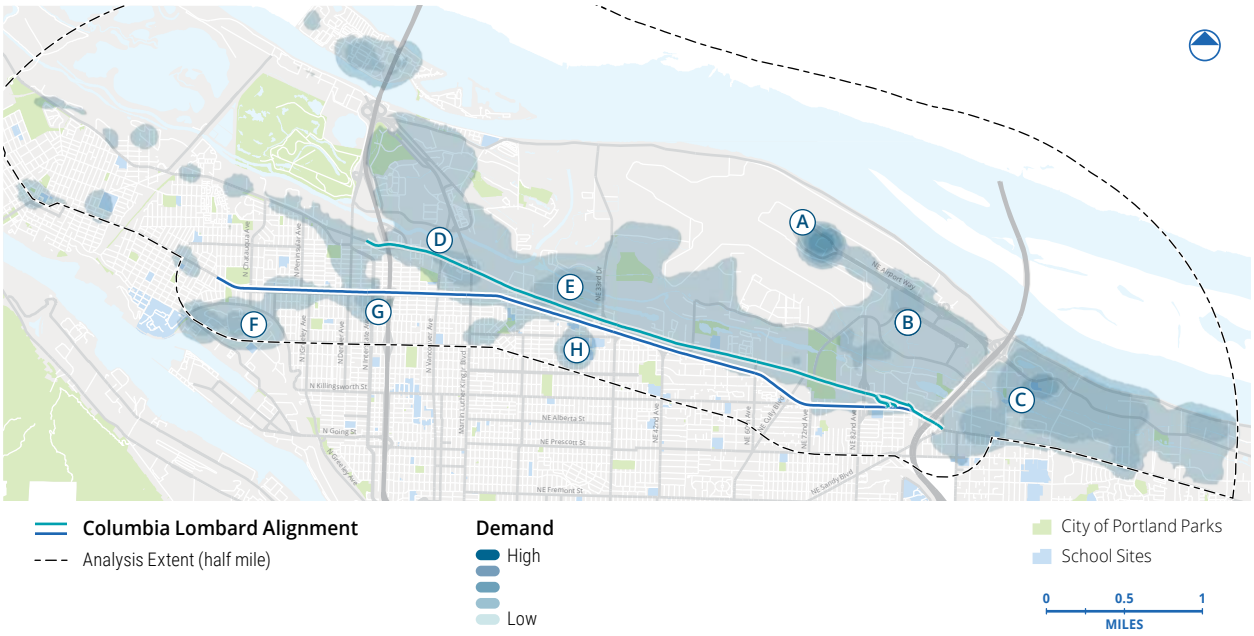
### *Where People Live*

This category includes 2010 Census block-level population density. The areas shaded more deeply in blue represent higher demand areas relative to the lighter shades in Figure 6.

Key findings include the following:

- Consistent with the project understanding, nearly all residents in the project area live south of N/NE Lombard Street east of MLK Jr Boulevard, and on both sides of N/NE Lombard St reetwest of NE MLK Jr Boulevard. Relative residential demand is consistently higher in the south than in the north. The areas scoring high on relative residential density are typically composed of multi-family housing. Per the Existing Conditions report prepared for this plan, residential demand is expected to increase in these areas.

FIGURE 7. **Employment Density**




*Where People Work*

This category is based on 2015 census block level Longitudinal Employer-Household Dynamics (LEHD) employment statistics[2] (Figure 7). Depending on the type of job, employment can act as a trip attractor (e.g., retail stores or cafes), trip generator (e.g., office parks and industrial areas), or both. Specific employment types, such as retail, are therefore also used in the "where people shop" category.

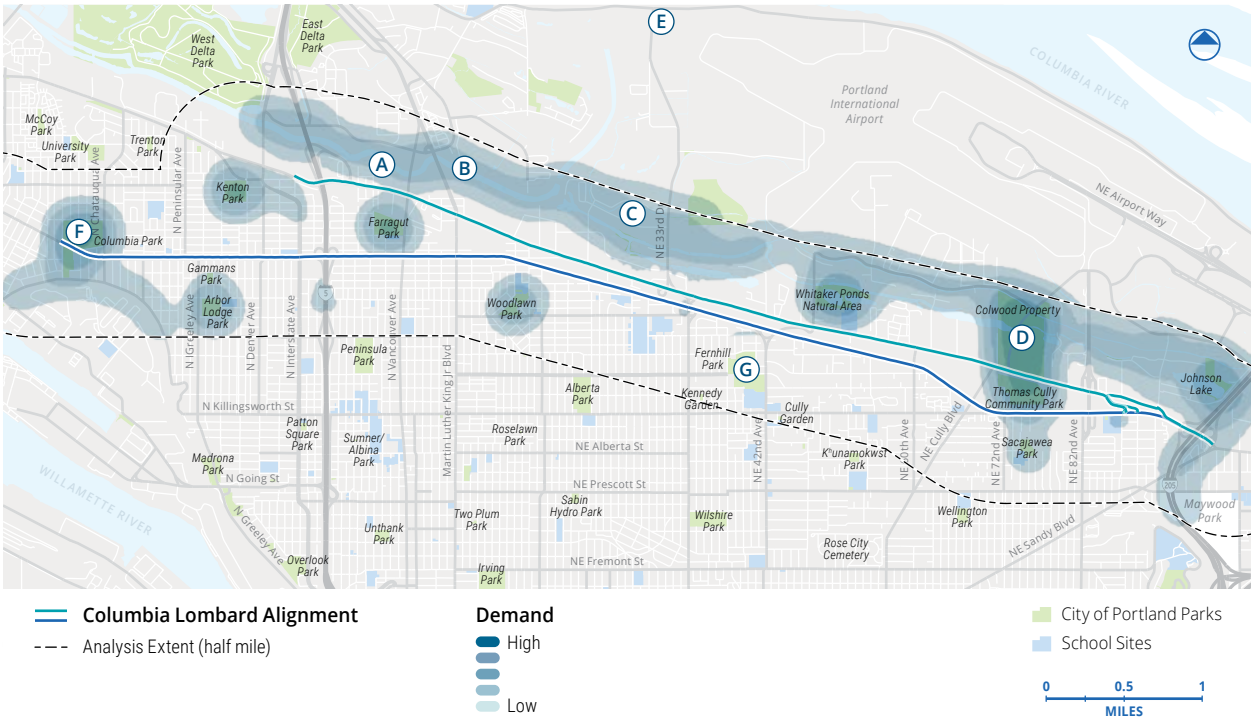
The analysis extent for the employment density analysis was extended for 3 miles north of N Lombard Street to the west and NE Sandy Boulevard to the east. This is due to the prevalence of employment north of the study corridor that generates trip demand on the corridor and the larger distances between the lower density land uses typical of this area. The expanded analysis helped to capture more information about the location and density of employment in this area to inform development of safe bike and pedestrian network connections stemming from the Columbia-Lombard corridor. Due to the prevalence of industrial employment, freight routes and traffic in this area, locating suitable alternative routes for bicyclists and pedestrians is of particular importance.

Key findings include the following:

- Employment density is highest at the PDX, which includes the Port of Portland office headquarters (A).
- Employment density is generally higher north of the project corridor than to the south. These areas consist of industrial and commercial uses with particular concentrations at Cascade Station (B), along and north of NE Sandy Boulevard east of the I-205 junction (C), and in the vicinity of N Columbia Boulevard and NE MLK Jr Boulevard (D) and NE Columbia Boulevard and NE 33rd Avenue (E).
- South of the project corridor, employment concentrations include Swan Island along the southwest edge of the project area (F), the commercial cluster located adjacent to the MAX station at N Interstate Ave and

[2] *LEHD data are derived from unemployment insurance earnings data and quarterly census of employment and wages data from the U.S. Census Bureau. They represent the number of jobs.*

FIGURE 8. **Recreational Density**




N Lombard Street (G), and the Concordia University campus stretching southwest of NE Dekum Street and NE 33rd Avenue (H).

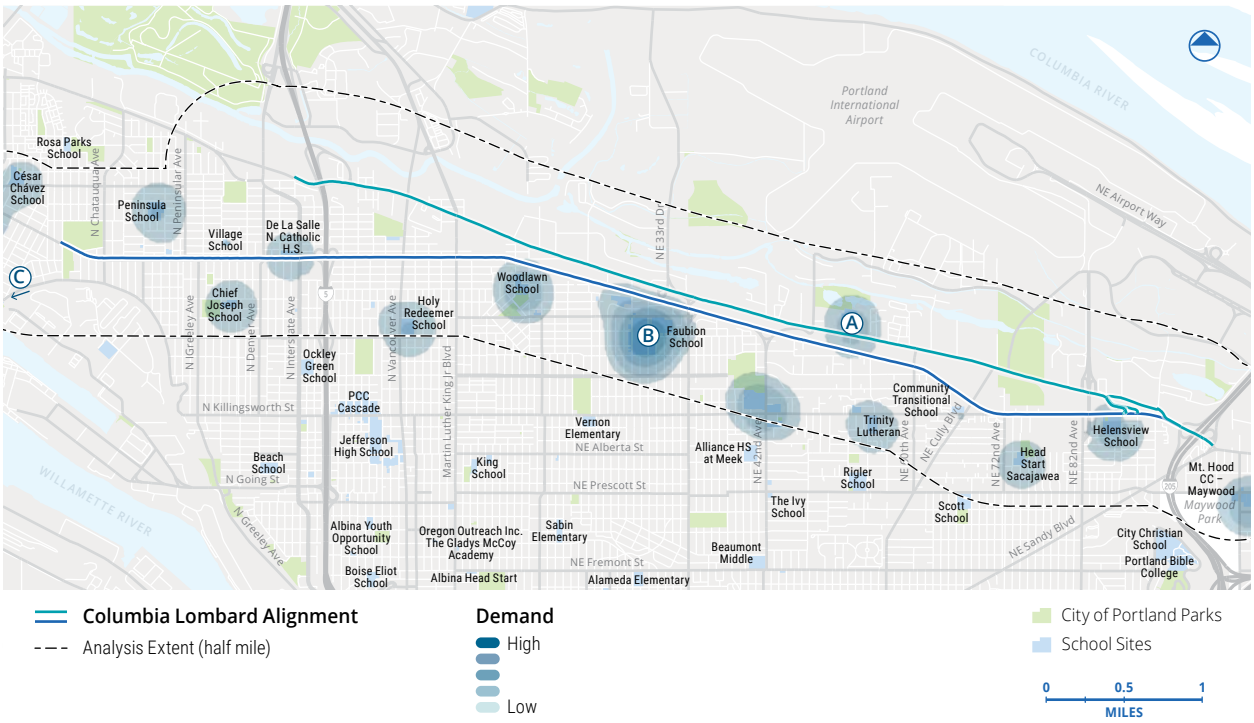
### *Where People Play*

This category shows the locations of parks and trails providing recreational opportunities (Figure 8).

Key findings include the following:

- Recreational density is highest north of the Columbia-Lombard corridor. These recreational opportunities include the Columbia River Slough and the Columbia Slough Trail (A), the Columbia Children's Arboretum (B), several golf courses and driving ranges ((C) and (D)), and the nearby Columbia River waterfront (E).
- Other areas of recreational density are scattered around the project area based on the location of parks and the trails that connect them, including Columbia Park (F) and Fernhill Park (G).

FIGURE 9. **School Density**



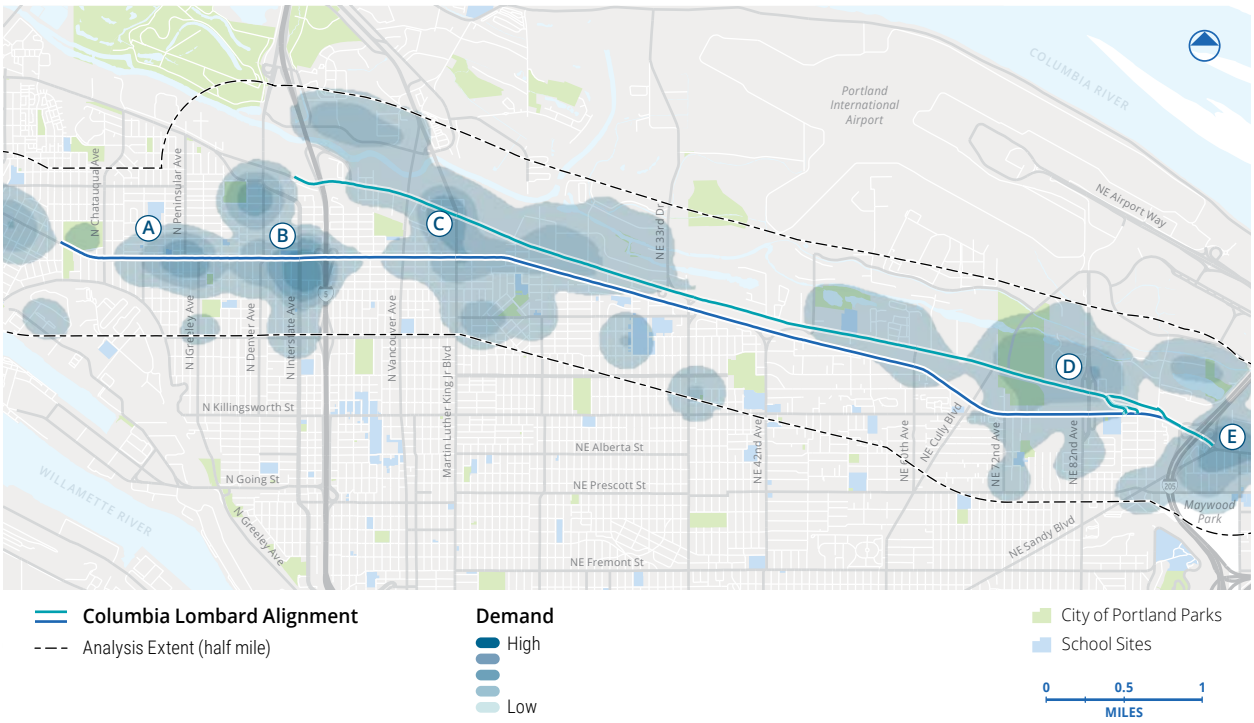

### *Where People Learn*

This category shows the locations of all school levels, from elementary schools to universities (Figure 9).

Key findings include the following:

- All schools and their corresponding density clusters are located south of N/NE Lombard Street east of MLK Jr Boulevard and on both sides of N/NE Lombard Street west of NE MLK Boulevard, with the exception of the Native American Youth and Family Center and Early College Academy along NE Columbia Boulevard east of NE 57th Avenue (A).
- The Concordia University and Faubion Elementary School complex stretching southwest from Dekum St and 33rd Ave makes up the densest cluster of learning opportunities (B), with other schools scattered evenly along the southern side of the analysis area.
- The University of Portland, while located just outside of the analysis area (west along Willamette Boulevard), represents an additional consideration for educational density and demand (C).

FIGURE 10. **Retail Density**



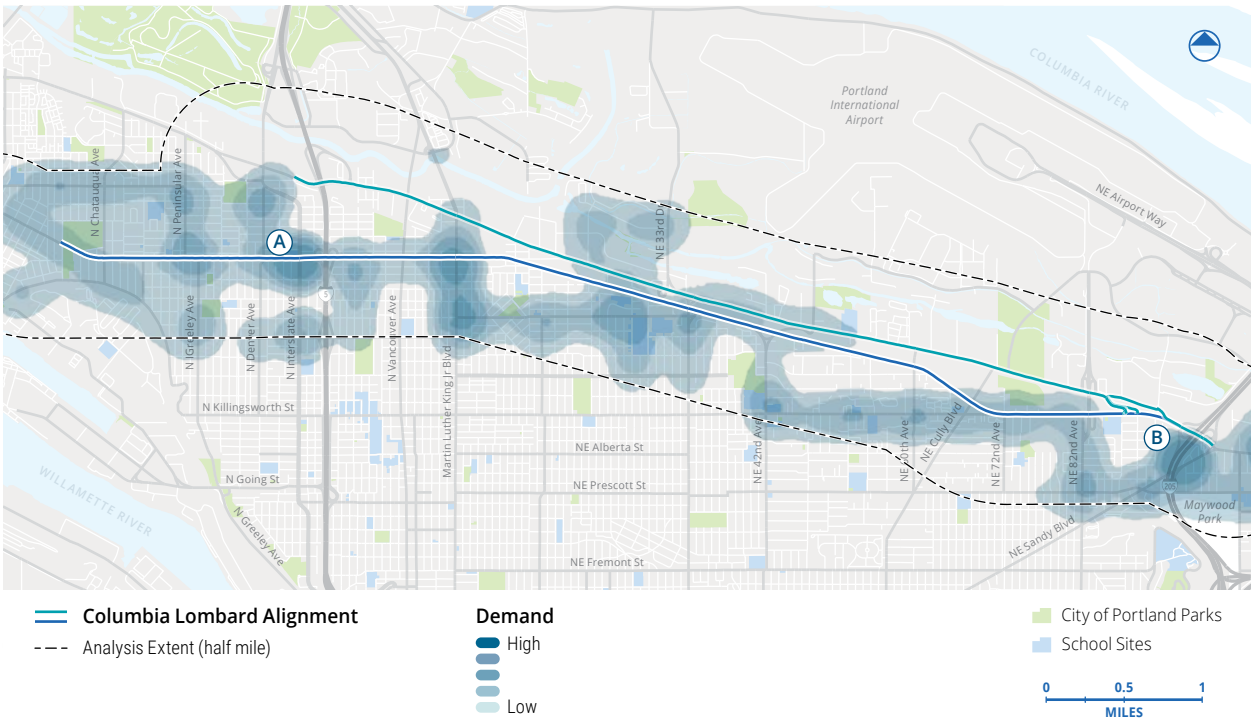

*Where People Shop*

This category is based on 2015 Census block-level LEHD employment statistics. This analysis (Figure 10) includes the three types of employment in the LEHD categories that correspond directly to retail spending: retail jobs (CNS07), arts and recreational jobs (CNS17), and hotel/service jobs (CNS18). This analysis relies on the assumption that the location of these jobs can reasonably predict locations where people will go to shop or otherwise make short-term trips to consume goods or a service.

Key findings include the following:

- The demand for retail and services is concentrated in pockets within the study area. It is not consistently high along Columbia Boulevard and Lombard Street.
- Commercial clusters along N Lombard St (A), and at the intersection of the project corridor and N Interstate Avenue (B), NE MLK Jr Boulevard (C), NE 82nd Avenue (D), and NE Sandy Boulevard (E) are major destinations for retail trips.

FIGURE 11. **Transit Density**



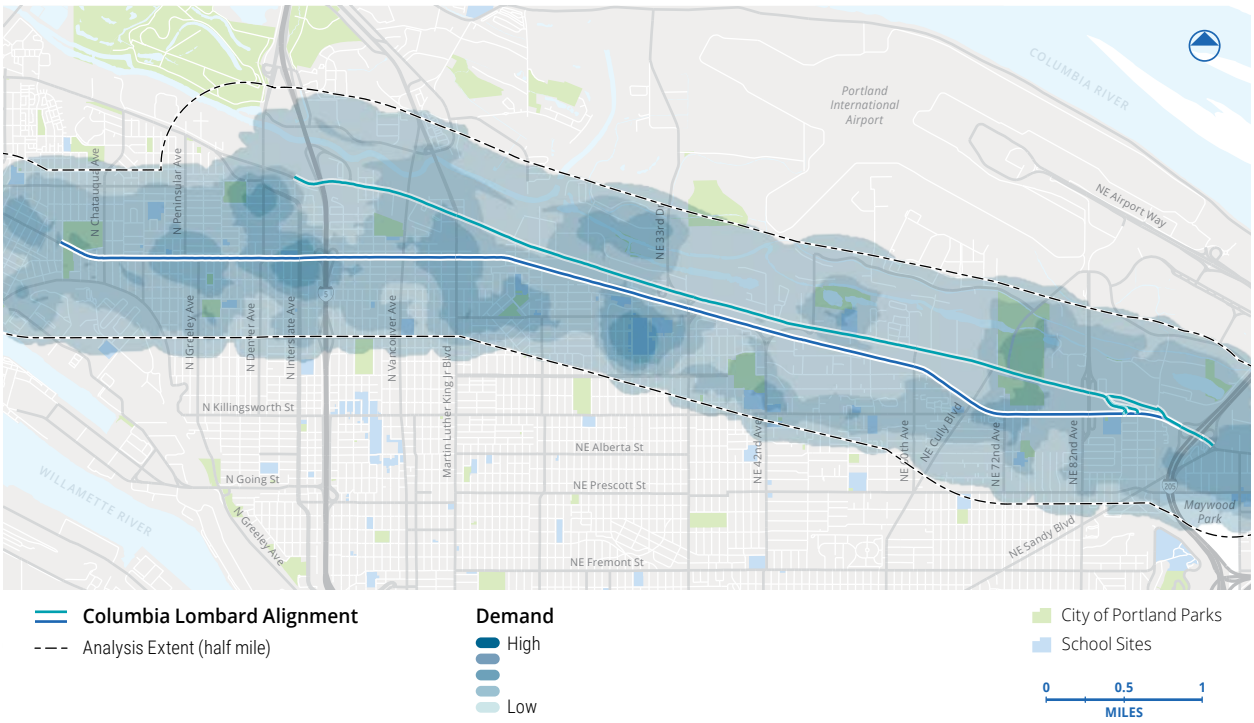

*Where People Ride Transit*

This category includes locations of current bus stops and MAX light rail stops. Transit stop density is further weighted based on existing ridership, so that heavily utilized stops score higher (Figure 11).

Key findings include the following:

- Ridership and corresponding demand are highest at the two MAX stations located within the analysis area (the N Lombard Yellow Line Transit Center at N Interstate Avenue and N Lombard Street to the west (A), and the Parkrose/Sumner Red Line Transit Center at the junction of NE Sandy Boulevard and I-205 to the east (B).
- As reflected in the heat map in Figure 11, the highest concentrations of existing transit users are generally located in the areas south and west of the project corridor.

FIGURE 12. **Composite Demand**




*Composite Demand*

The combined distribution of residents, employment, recreational opportunities, schools, retail/services, and transit is presented below as a composite demand map. The darker shades of blue on Figure 12 indicate a high demand for walking and biking trips based on the volume and density of trip generators and attractors.

Key findings from the composite demand map and the overall analysis include the following:

- In general, the Columbia-Lombard corridor bisects clusters of demand to the north and south of the analysis area. **In particular, the corridor separates dense areas of residents to the south and dense areas of employment and recreational opportunities to the north.**
- The N Lombard Street and N Interstate Avenue intersection, and the streets that surround it, represent the largest general area of demand in the analysis area.
- The Concordia University/Faubion Elementary campus area represents a more concentrated node of demand.
- N Interstate Avenue, NE MLK Jr Boulevard, and NE Sandy Boulevard are corridors representing moderate-to-high demand that establish north-south connections to the Columbia-Lombard corridor.
- Additional major employers were identified north of the analysis extent. They are shown in Figure 7.

## Bicycle Level of Traffic Stress (LTS)

### INTRODUCTION AND METHODOLOGY

The bicycle LTS analysis estimates the level of comfort for people biking on each street within a half mile of Columbia Boulevard and Lombard Street throughout the study area. Most bicyclists will not tolerate out-of-direction travel that increases their trip length by 10 percent (equal to a half mile on a five-mile trip).[3] As a result, the analysis includes all streets within the project area and within the maximum out-of-direction threshold for most bicyclists.

The analysis uses the posted speed limit, the number of travel lanes, bicycle facilities, and conditions at intersections. This analysis follows the methodology in the Oregon Department of Transportation (ODOT) *Analysis Procedure Manual*.

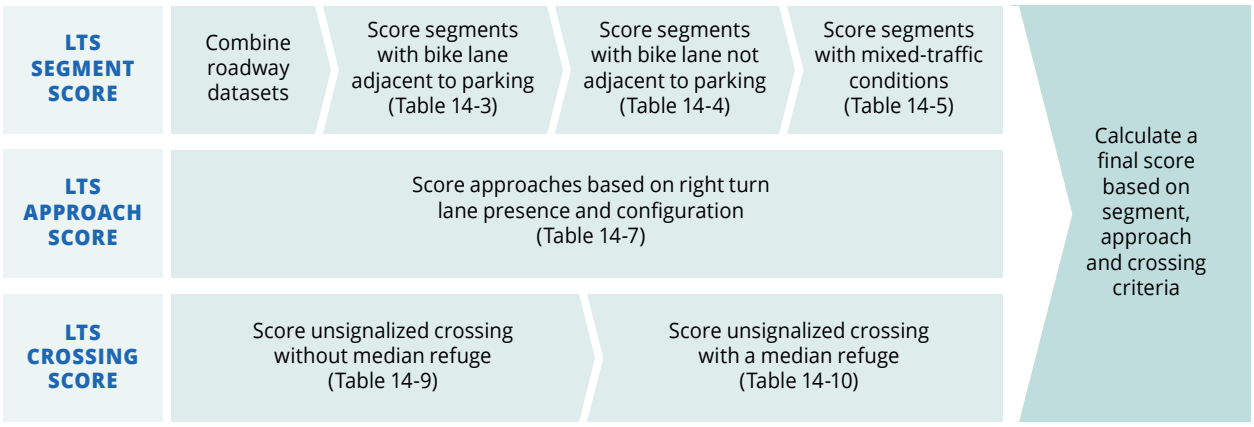
LTS assesses the roadway along three different areas: the segment, the intersection approach, and the crossing (Figure 13).

- Segment: Each segment is given a score based on factors that contribute to describing the experience of what it is like to travel by bicycle along the roadway.
- Intersection Approach: As the segment approaches an intersection, a score is assigned based on the characteristics of the roadway and the presence of a right-turn lane or bike lane.
- Crossing: A score is assigned based on what it is like to travel across this roadway.
- Final Composite Score: A final LTS score is assigned to each roadway based on the weakest link principle, meaning that the lowest scoring portion of the roadway (segment, approach, intersection) is assigned to that roadway link.

The ODOT methodology classifies road segments into one of four levels of traffic stress based on these factors.

- LTS 1 represents roadways where bicyclists of all ages and abilities would feel comfortable riding.
- LTS 2 represents slightly less comfortable roads, where most adults would be comfortable bicycling.
- Streets with LTS 3 or LTS 4 are much more stressful and are comfortable only for experienced bicyclists.

FIGURE 13. **LTS Scoring Method**




[3] ODOT Analysis Procedure Manual, Chapter 14, Bicycle Level of Traffic Stress

## BICYCLE LEVEL OF TRAFFIC STRESS (LTS) RESULTS

The bicycle LTS throughout the study area follows a pattern of lower-stress neighborhood networks isolated by higher-stress collector and arterial roadways (Figure 14). Columbia Boulevard is rated an LTS 4 throughout the study area, and the Lombard corridor is primarily an LTS 4, with a few sections rated at an LTS 3. Figure 15 illustrates the LTS results for streets in the study area that are designated as bikeways in the City of Portland Transportation System Plan (TSP).

FIGURE 14. **Level of Traffic Stress Results – All Streets**

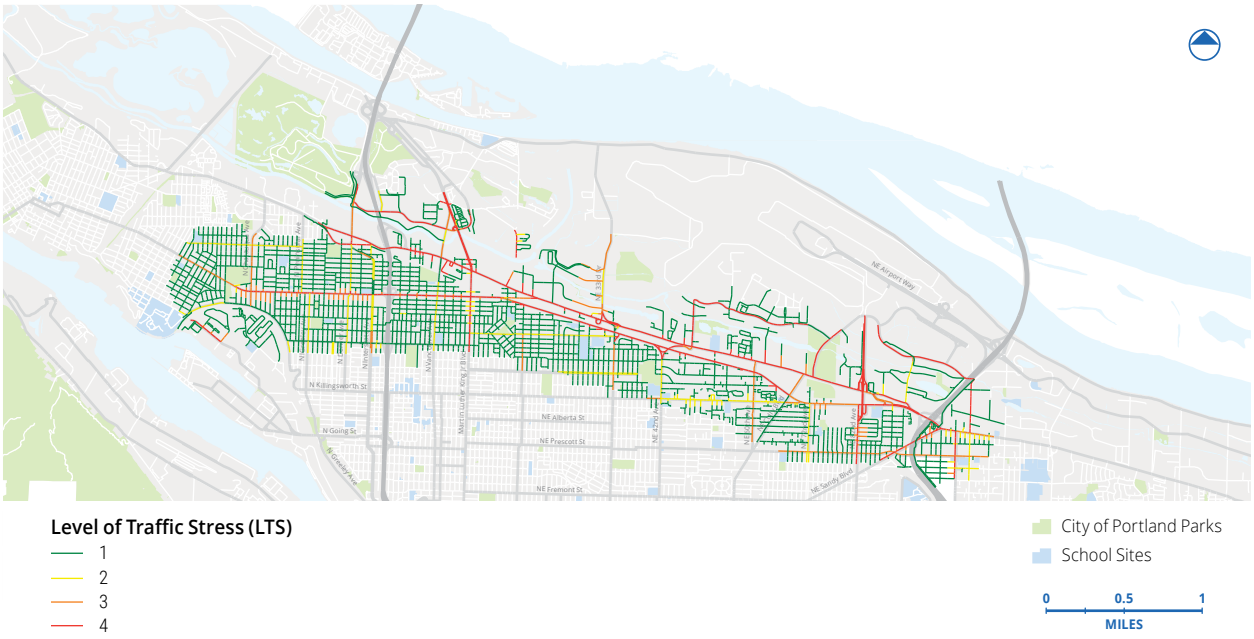



FIGURE 15. **Level of Traffic Stress Results – TSP Bikeways**

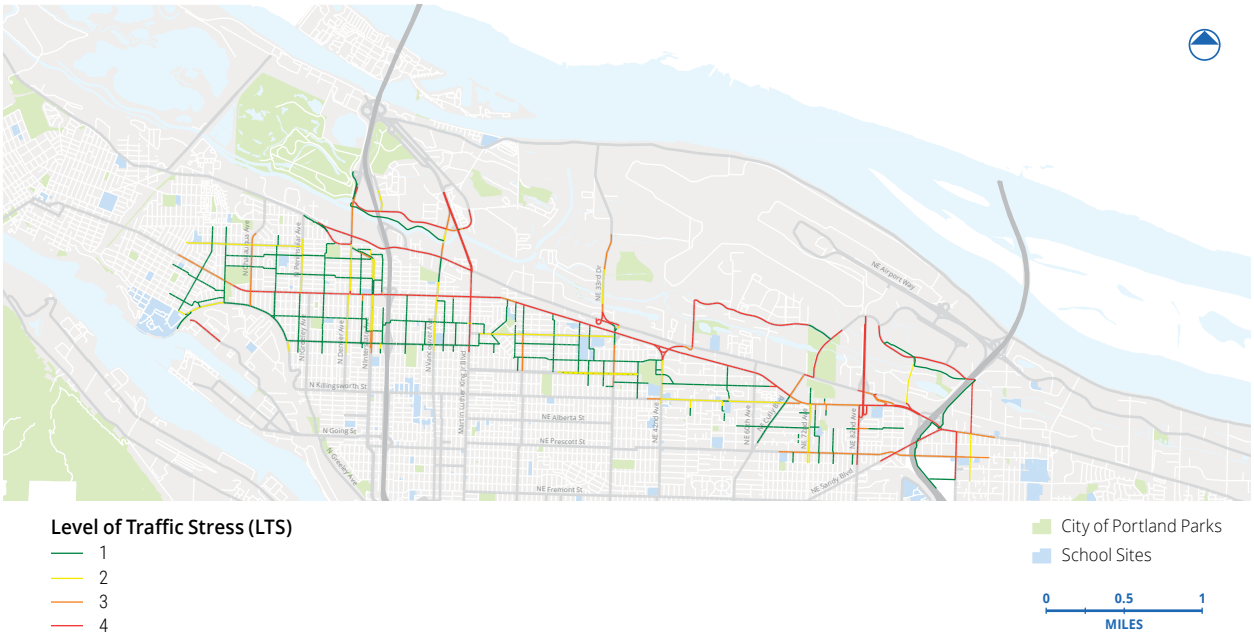
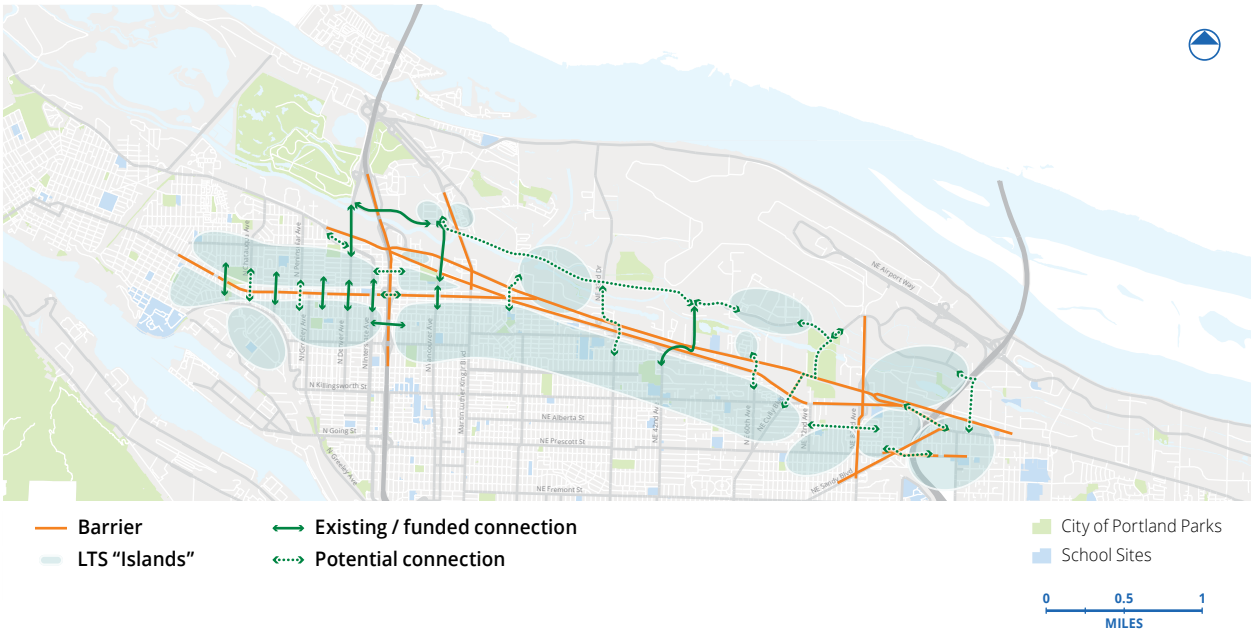


FIGURE 16. **Level of Traffic Stress Islands Map with Connections and Barriers**




## LEVEL OF TRAFFIC STRESS (LTS) RESULTS

The LTS analysis was then used to identify locations where barriers existed in the bicycle network between low-stress facilities, as well as a lack of connections. **The "islands" illustrated in Figure 16 show the areas where it is possible to bike on low-stress facilities, as well as the barriers that exist between the islands**. No safe connection between the islands indicate a person biking must use an uncomfortable route to get from one island to another. Ideally, there would only be one circle on the map indicating that the entire area has high-quality, low-stress connections across barriers like I-5 and Columbia Boulevard. The map also identifies some potential connections that would reduce the number of islands in the study area and expand the areas connected by low-stress streets. These connections will be further analyzed and then used to develop bike route recommendations.

## GAPS AND DEFICIENCIES ANALYSIS

*Bicycle Gaps and Deficiencies*

The following provide a summary of bicycle gaps and deficiencies on the Columbia and Lombard corridors, separated into segments.

### Segment: N Woolsey Avenue to N Interstate Avenue

*Gaps:*

- Lombard Street and Chautauqua Boulevard are high stress throughout this segment.
- There are only three low-stress crossings of Lombard Street (at Interstate, Delaware, and Wabash avenues). The City Bikeway intersections at N Woolsey Avenue, N Chautauqua Boulevard, N Peninsular Avenue, and N Denver Avenue present gaps requiring crossing enhancements to provide low-stress biking conditions.
- A bike lane drop at the Denver Avenue/Lombard Street intersection prevents Denver Avenue from being a low-stress north/south corridor in the segment area.

### Segment: N Interstate Avenue to NE Martin Luther King Jr. Boulevard

*Gaps:*

- Columbia Boulevard is designated as a City Bikeway in this segment and is LTS 4 from MLK Jr Boulevard west to the start of the North Columbia Path. Due to limited right-of-way, adding a protected bike lane to this stretch of Columbia would require reallocating travel lanes (at the expense of freight capacity on a Priority Truck St). It may be more feasible to identify a parallel east-west bikeway alternative along this segment of Columbia Boulevard.
- I-5 is a major east-west barrier in the study area with only one low-stress crossing on the TSP bike network, further south along the Bryant Street Neighborhood Greenway. A potential connection across I-5 between Columbia and Lombard is a bike/ped exclusive overcrossing connecting the Terry Street Neighborhood Greenway in the Kenton neighborhood to the Woodlawn neighborhood east of I-5.
- Lombard Street is a major barrier between low-stress streets traveling north-south. The number of lanes along Lombard Street is the primary reason for the high number of high-stress crossings in this area. Deficient crossings of Lombard Street on City Bikeways include Denver Avenue, Fenwick/Concord Avenue, Vancouver Avenue, and MLK Jr Boulevard.
- Lombard Street, also a City Bikeway, is LTS 4 in this segment. West of Concord Avenue, a road diet will allow for dedicated bike facilities and a more comfortable biking environment. However, east of Concord Avenue (to NE 11th Avenue), it is a Major Truck Street with significant right-of-way constraints due to the I-5 interchange. With no northbound I-5 access from Lombard Street, and no southbound Lombard St access from I-5, this stretch of Lombard Street carries all truck traffic between Interstate Avenue and MLK Jr Boulevard. Adding dedicated bike facilities here would require reallocation of travel lanes with impacts to freight movement. Enhancing parallel east-west bike connections is possible (such as the Bryant Street Neighborhood Greenway), and/or a new low-stress connection to 11th Avenue via Stafford Street.
- Vancouver Avenue from Columbia Boulevard to the Slough Trail is a gap due to the southbound right-turn lane approaching Columbia Boulevard.
- West of Vancouver Avenue, the Columbia Slough Trail provides a low stress east-west connection. However, there are no east-west connections east of Vancouver Avenue due to the gap in the trail.

*Deficiencies:*

- Lombard Street east of NE 11th Avenue is a deficient bikeway with standard striped bike lanes. Upgrading this facility to a protected bike lane would improve the LTS score.

**Segment: NE Martin Luther King Jr. Boulevard to NE 33rd Avenue**

*Gaps:*

- All of Lombard Street and MLK Jr Boulevard are LTS 4 in this segment. Both streets lack any dedicated bike facility.
- MLK Jr Boulevard and 33rd Avenue are the only north-south connections across Lombard Boulevard and Columbia Boulevard and both involve high stress overcrossings without dedicated bike facilities. The 33rd Avenue overcrossing involves unprotected high-speed transitions in both directions.
- The gap in the Columbia Slough Trail (which extends this entire segment) limits east-west connectivity north of Columbia Boulevard. This is the only east-west facility on the TSP network north of Columbia Boulevard in the study area.

*Deficiencies:*

- Uncontrolled crossings of MLK Jr Boulevard received a score of LTS 2. If actual speeds along MLK Jr Boulevard are higher than the posted 30 mph, these crossings would be classified as high stress (this includes Bryant Street, a Neighborhood Greenway on the TSP bikeway network).

**Segment: NE 33rd Avenue to NE 60th Avenue**

*Gaps:*

- All of Lombard Street in this segment is LTS 4.
- No low-stress connections exist between Columbia Boulevard and Lombard St.
- Buffered bike lanes end on Killingsworth at 42nd Ave, which creates an east-west connectivity barrier at 42nd Avenue. Connecting to a north-south route on 37th Ave would provide connected low-stress route to other east-west streets such as NE Simpson Street or NE Jarrett Street.
- The gap in the Columbia Slough Trail west of Cornfoot Road limits east-west connectivity north of Columbia Boulevard.
- Lombard Street, Killingsworth Street, 47th Avenue, and Cornfoot Road are all high stress throughout this segment.

*Deficiencies:*

- The 42nd Avenue overcrossing is currently high stress but there is a funded project to replace the bridge and improve the bike facilities.

**Segment: NE 60th Avenue to NE 82nd Avenue**

*Gaps:*

- There are no low-stress connections between Lombard St and Columbia Boulevard or low-stress crossings of the railroad. Cully Boulevard and 82nd Avenue are the only connections on the TSP bikeway network and are both high stress.
- There is an opportunity to connect Columbia Boulevard and Lombard Street and provide a low-stress crossing of the railroad with a bicycle and pedestrian overcrossing from Cully Park to Colwood Golf Center. This would provide a critical connection from the 70's bikeway north to Colwood golf center (a City-owned

property with park development potential). NE 72nd Avenue already provides a low-stress crossing of NE Killingsworth Street into Cully Park.

- Cully Boulevard is an LTS 1 facility from the southern edge of the study area to Lombard Street and then an LTS 3 between Lombard Street and Columbia Boulevard. Continuing the protected bikeway on Cully Boulevard north of Lombard could potentially provide a low-stress connection to Alderwood Road. Alternatively, connecting to Cully Park via the 70's Bikeway may provide a more direct low-stress route (see above).
- The gap in the Columbia Slough Trail east of Cornfoot Rd limits east-west connectivity north of Columbia Boulevard.
- Cornfoot Road transitions form LTS 1 to LTS 4 where the bike facility ends. Continuing the shared use path on the north side of the street between the USPS property and NE 47th Avenue would provide a low-stress east-west connection and possible alternative to bike facilities on Columbia Boulevard in this segment.

*Deficiencies:*

- Lombard Street, Killingsworth Street, 82nd Avenue, and Alderwood Road are all high stress throughout this segment lacking sufficient separation from motor vehicles.

**Segment: NE 82nd Avenue to I-205**

*Gaps:*

- No low-stress crossings across I-205. The high stress crossings on TSP bikeways are located at Alderwood Road, Killingsworth Street, and Sandy Boulevard.
- Opportunity for low-stress connection on Alderwood Road, connecting the I-205 path and Alderwood Trail. The I-205 path and Alderwood Trail are only 500 feet apart.
- Crossing improvements and protected facilities along NE Killingsworth Street between NE 92nd Avenue and NE Sandy Boulevard are necessary to help people on bikes navigate the high-speed interchange ramps and large intersections. This is a vital connection for people walking and biking north-south on the I-205 path. The Sandy Boulevard overcrossing does not feature dedicated bike facilities. Sidewalks are present, but do not provide a safe connection across freeway ramps. This is another vital connection to/from the I-205 path.

*Deficiencies:*

- No low-stress crossings across 82nd Avenue. The four crossings on TSP bikeways are all high stress (Columbia Boulevard, Killingsworth Street, Alberta Street, and Prescott Street). Opportunity for crossing improvements at these locations include traffic signal/beacon enhancements, marked crossings, ADA compliant curb ramps, and reconfiguration of corner radii. Protected bike lanes are necessary on Prescott Street and the Columbia Boulevard overcrossing to provide a comfortable crossing of 82nd Avenue.
- Large low-stress island between Killingsworth Street/Sandy Boulevard/82nd Avenue/Prescott Street (large pocket of the Sumner neighborhood is completely isolated).

### Pedestrian Infrastructure Conditions and Needs

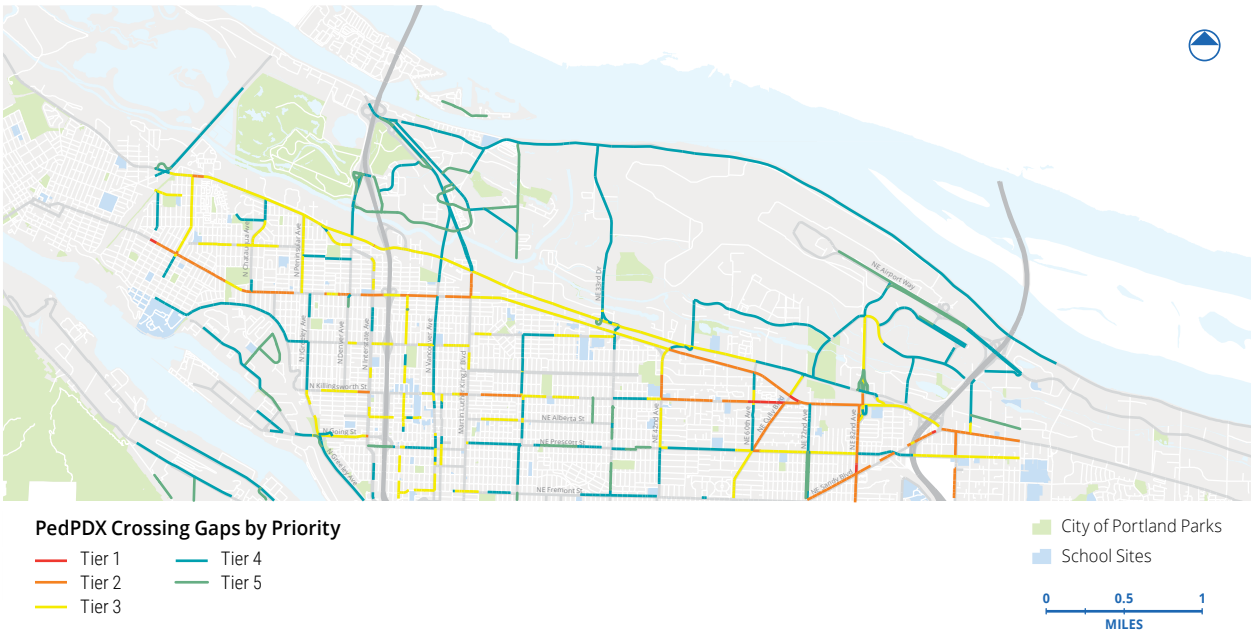
Both Columbia Boulevard and Lombard Street contain extended segments where sidewalks are missing. This presents a considerable barrier to both east-west and north-south pedestrian activity. **Figure 17 highlights where sidewalk gaps exist on one or both sides of the street on and near the corridors**.

FIGURE 17. **Sidewalk Gaps Map**


In addition to sidewalk deficiencies, there are numerous crossing gaps identified in PedPDX, the City's Pedestrian Master Plan. F**igure 18 highlights the areas where crosswalk spacing exceeds the Portland Bureau of Transportation's (PBOT's) crossing spacing guidelines of 800 feet between marked crossings on City Walkways and Major City Walkways**. Several of these areas coincide with stretches where rail crossing opportunities exceed a quarter of a mile.

The PedPDX prioritization framework identified locations for investment based on factors Portlanders reported as the most important when prioritizing pedestrian improvements: Equity, safety, and demand. These crossing gap locations were assigned a prioritization tier of 1 to 5 to guide investment, from high to low, respectively (see PedPDX for more information). **The majority of Columbia Boulevard (west of 82nd Ave) is identified as a Tier 3 crossing gap, and almost the entirety of Lombard Street is identified as either a Tier 2 or Tier 3 crossing gap**. There are also Tier 1 gaps located along Portland Highway and Killingsworth Street near Cully Boulevard. Note that the crossing gaps do not correspond to identified projects. New crossings would require evaluation at the specific location and need to meet warrants.

FIGURE 18. **PedPDX Crossing Gaps Map**




### Rail Crossing Conditions and Needs for People Walking and Biking

The Columbia-Lombard project area contains approximately 8.7 miles of heavily used railroad, which acts as a crossing barrier to cyclists and pedestrians. **Currently, 10 pedestrian accessible crossings provide a limited degree of connectivity across the rail corridor (Table 2)**.

The focus should be on improving the existing crossings to make them safe and comfortable for all users. However, new crossings should also be explored that could better separate people walking and biking from rail/truck freight movement and people driving.

Railroad crossing gaps are lengthy segments along the corridor that a person walking would have to travel in order to safely cross the street at a marked crossing. Other crossing gaps in excess of ¼ mile have been identified at locations along the corridor and should be considered for improvement after the existing railroad crossings have been improved.

**TABLE 2. Existing Rail Crossing Facilities**

| Location | Facility Type | Pedestrian Conditions | Bike Conditions | Bicycle LTS Rating* |
|---|---|---|---|---|
| NE Columbia Blvd near NE Killingsworth St | Undercrossing | Sidewalk on both sides of road throughout crossing area. | Deficiency: Unprotected bike lane (one-way street). Gradual incline. | 4 |
| NE Columbia Blvd near NE Columbia Pkwy | Undercrossing | Sidewalk on both sides of road throughout crossing area. | Deficiency: Unprotected bike lanes on both sides of road throughout crossing area. | 3 |
| NE Cully Blvd near NE Columbia Blvd | At grade | Gap: No pedestrian facilities on either side of road throughout crossing area. Gravel shoulder with obstructions present. | Gap: No dedicated bike facilities on either side of road throughout crossing area. Gravel shoulder with obstructions present. | N/A |
| NE 60th Ave near NE Columbia Blvd | Undercrossing | Gap: No pedestrian facilities on either side of road throughout crossing area. Gravel shoulder present on east side of road. | Gap: No dedicated bike facilities on either side of road throughout crossing area. Gravel shoulder present on east side of road. Not on City Bikeway network. | N/A |
| NE 42nd Ave near NE Lombard St | Overcrossing | Gap: Sidewalks on both sides of the road on SW portion of structure. Pedestrian facilities drop off on NE portion of structure. Narrow shoulders present on NE section. | Deficiency: Sharrows are marked on both travel lanes. | SW Portion: 4 NE Portion: 3 |
| NE 33rd Ave near NE Columbia Blvd | Overcrossing | Gap: Sidewalk on west side of road. | Deficiency: Striped shoulder may serve cyclists. Southern portion includes painted buffer. Northern portion fairly narrow. | 4 |
| NE 11th Ave near NE Lombard St | At grade | Gap: No pedestrian facilities on either side of road throughout crossing area. Gravel shoulder with obstructions present. | Gap: No dedicated bike facilities on either side of road throughout crossing area. Gravel shoulder with obstructions present. Not on City Bikeway network | N/A |
| NE MLK Jr Blvd between Columbia Blvd/Lombard St | Overcrossing | Sidewalk on both sides of road throughout crossing area. | Gap: No dedicated bike facilities, shoulder, or sharrows present. | 4 |
| N Vancouver Ave between Columbia Blvd/Lombard St | Overcrossing | Sidewalk on both sides of road throughout crossing area. | Buffered bike lanes on both sides of road throughout crossing area. | 1 |
| N Columbia Blvd near I-5 | Undercrossing | Gap: No pedestrian facilities on either side of road throughout crossing area. | Gap: No dedicated bike facilities, shoulder, or sharrows on either side of road throughout crossing area. | 4 |
| N Columbia Blvd near Interstate Ave (Business Access) | Undercrossing | Gap: No pedestrian facilities on either side of road throughout crossing area. | Gap: No dedicated bike facilities or sharrows on either side of road throughout crossing area. Narrow shoulder present. | 3 with small portion of 4 |

**N/A if the crossing is not on a designated TSP bikeway*

### Freeway Crossing Conditions and Needs

The I-5 and I-205 freeways present significant barriers for people walking and biking in the study area because all crossing opportunities are limited to existing freeway overcrossings and undercrossings. This means pedestrians may need to travel lengthy distances out-of-direction to reach a safe, comfortable crossing. Furthermore, these critical connections often lack sidewalks, bike facilities, or safe ways to cross freeway ramps. **Table 3 below provides an inventory of freeway crossing gaps and deficiencies**.

TABLE 3. **Existing Freeway Crossing Gaps**

| Location | Facility Type | Pedestrian Conditions | Bike Conditions | Bicycle LTS Rating* |
|---|---|---|---|---|
| I-205 at NE Alderwood Rd | Undercrossing | Deficiency: Sidewalk on southside only | Gap: No bike facility between I-205 Multi-use path and Alderwood Trail | 4 |
| I-205 at NE Killingsworth St | Overcrossing | Gap: Sidewalk on south side of road only. Long crossing distance across Killingsworth. Missing sidewalks and marked crosswalks require out-of-direction travel. | Gap: On-street bike lanes in both directions. WB bikes must transition across high-speed uncontrolled I-5 exit ramp. EB bike lane merges across RT lane, and drops at RT lane. | 4 |
| I-205 at NE Sandy Boulevard | Overcrossing | Deficiency: Sidewalk on both sides of overcrossing, but lacking ADA curb ramps and uncontrolled freeway ramp crossing on east side. | Gap: Striped shoulder on both sides of overcrossing. Facility drops on either end. EB bikes must cross uncontrolled freeway ramp on east side | 4 |
| I-5 at N Schmeer Rd | Undercrossing | Gap: No pedestrian facilities on either side of road. Gravel shoulder with obstructions present | Gap: No dedicated bike facilities on either side of road throughout crossing area. Gravel shoulder with obstructions present. | 4 |
| I-5 at Columbia Slough Trail | Undercrossing | Multi-use path | Multi-use path | 1 |
| I-5 at N Columbia Boulevard | Undercrossing | Gap: No pedestrian facilities on either side of road. | Gap: No bike facilities on either side of road | 4 |
| I-5 at N Lombard St | Overcrossing | Gap: Sidewalk on south side of road only. Non-ADA SB ramp crossing. | Gap: No bike facilities on either side of road. | 4 |
| I-5 at N Bryant St | Overcrossing | Bike/ped bridge. | Bike/ped bridge | 4 |

**N/A if the crossing is not on a designated TSP bikeway*

In addition to the existing freeway crossings, two new bicycle/pedestrian exclusive overcrossings could provide a more direct, safe, and comfortable east-west connection for bikes and pedestrians in the study area. Over I-5, a bike and pedestrian overcrossing at N Terry Street or N Winchell Street would provide a direct connection between the Kenton and Woodlawn neighborhoods via the Terry Neighborhood Greenway. This would provide an alternative to the deficient bike and pedestrian facilities on the Lombard Street overcrossing.

Over I-205, a bike/ped bridge from the Sumner neighborhood to the Parkrose/Sumner Transit Center MAX station would provide an improved connection for this neighborhood to and from the MAX line from NE 92nd Avenue. This would provide a much needed alternative to the deficient Sandy Boulevard and Killingsworth Street overcrossings, and a more direct access-way to the MAX station in the middle of I-205.

## Equity and Health Considerations

Several city, regional and state-wide plans and policies, summarized in Appendix A-1 of the Existing Conditions Analysis, emphasize the need to distribute transportation funding and resources in an equitable manner, and to foster health and physical activity while reducing greenhouse gas (GHG) emissions associated with vehicle use. The following provides a critical look at equity and health and transportation needs in the project area.

### EQUITY

To inform work, guide investments, and achieve its Racial Equity Goals, PBOT utilizes an equity matrix that combines two major areas of marginalization (race and income) to estimate the vulnerability of a given census tract's population. A higher score on the equity matrix indicates greater socioeconomic vulnerability. The City also considers limited English proficiency (LEP) in its identification of vulnerable areas. Refer to the Existing Conditions Report for more information.

The Existing Conditions Analysis used the equity matrix framework to identify trends within the project area and compared those trends to Portland overall. People of color make up a greater portion of the focus area (28.9 percent) than in the city overall (22.6 percent), and the median household income is slightly higher in the focus area ($64,507) than in the city overall ($61,532). However, it should be noted that despite the above average median income, the study area has both lower and higher income areas within it.

Within the focus area, the matrix shows deeper levels of marginalization in the Census tracts on the northeast and eastern side of the project area; three of these Census tracts have the highest possible vulnerability risk score (10). Many of the Census tracts with high vulnerability risk scores also have higher portions of LEP residents than the citywide average of 3.8 percent. This demonstrates a greater need for investments in infrastructure that promote mobility options and neighborhood safety in the northeast and eastern sides of the project area. Providing safe transportation connections for local residents in the project area is key to increasing access to opportunity and economic prosperity.

### HEALTH

The project area corridor serves an important regional economic function as a connection for freight between adjacent industrial uses, ports along the Columbia River, and PDX. However, heavy vehicle traffic and industrial uses generate impacts on air quality and the quality of life for neighborhoods south of the corridor. While maintaining freight throughput is necessary, there is an opportunity to reduce other vehicle trips along the corridor by increasing the safety and convenience of walking, cycling, and taking transit. This will, in turn, reduce Vehicle Miles Traveled (VMT) and help to mitigate congestion, which improves air quality in surrounding neighborhoods.

Furthermore, the natural areas around the Columbia River Slough, the Columbia Slough Trail, 40Mile Loop, golf courses, and parks offer a variety of high-demand recreational opportunities north of the project area. However, widely spaced and difficult connections across the corridor mean it is difficult for residents of nearby neighborhoods in North and Northeast Portland to access these amenities without use of a car. The LTS and crossing gaps analyses revealed that essentially all the low-stress facilities north of the Columbia-Lombard corridor are functionally isolated from each other and from the larger low-stress network in neighborhoods to the south. Safe multimodal connections between amenities to the north and residents to the south along the project corridor will encourage physical activity and access to these recreational opportunities.

### Pedestrian and Bicycle Corridor Needs Conclusions

**There is a high demand for pedestrian and cycling trips within and between the north and south sides of the Columbia and Lombard corridors**. In general, the corridor separates concentrations of residents to the south from concentrations of employment and recreational opportunities to the north.

**There is sustained demand along Lombard Street west of I-5 and concentrated pockets of demand at the eastern edge of the study area, west of 82nd Avenue, west of 33rd Ave, and along MLK Jr Boulevard.** The latter three areas all have demand both north of Columbia Boulevard and south of Lombard Street.

The study area has extensive pedestrian and bicycle needs to make it safe and comfortable for people walking and biking, both along and across the corridors. The corridors themselves present major barriers to people biking and walking, with high levels of bicycling stress and extended gaps between safe crossings. The entirety of both Columbia Boulevard and Lombard Street include high-stress facilities for bicyclists, with scores of LTS 3 or 4. Low-stress crossings connecting Columbia Boulevard and Lombard Street are infrequent, isolating the pockets of demand north and south of the corridor. The bicycle facilities east of 82nd Avenue are disconnected from the rest of the bike network with no low-stress crossings across I-205 or NE 82nd Avenue. Safe opportunities for pedestrian and bicycle facilities may existing on parallel facilities within the study area.

**Sidewalk gaps and crossing gaps exist throughout the study area**. The major sidewalk gaps are concentrated in the middle of the study area between MLK Jr Boulevard and NE 60th Avenue and on the eastern and western edges of Columbia Boulevard. Crossing gaps are almost continually present along both corridors due to the distance between signalized intersections and lack of mid-block crossings.

Moving forward, recommendations will be developed to address these identified gaps and deficiencies.

## Conclusions

Both Lombard Street and Columbia Boulevard serve as a critical east-west freight routes supporting connections within the adjacent industrial areas, the Portland region, and the state. Their designations as truck priority streets need to be maintained and enhanced, providing reliable access in the face of growing regional congestion.

The analysis in this report points to the **need for safe separation between modes that allows for predictable use of the corridor**. For pedestrian and bicycle users, high demand for pedestrian and cycling trips exist within and between the north and south sides of the Columbia-Lombard corridor. The most sustained pedestrian and bicycle demand is along Lombard Street west of I-5. Additionally, there are concentrated pockets of demand at the eastern edge of the study area, west of 82nd Avenue, west of 33rd Avenue, and along MLK Jr Boulevard. The latter three areas all have demand both north of Columbia Boulevard and south of Lombard Street.

The following conclusions identify specific needs per segment identified through this needs analysis. These needs and issues should be addressed by the project recommendations.

**Considering the study area as a whole**:

- Identify projects to improve or provide safe and convenient pedestrian and bicycle crossings of Lombard Street and Columbia Boulevard.
- On Columbia Boulevard there is a need for safety treatments to manage access across the corridor, thus reducing the incidences of turning crashes, and access to development on the north side of the street.
- As part of other projects, improve existing rail crossings to make them safe and comfortable for all users.
- Where appropriate continue pedestrian and bicycle facilities across freeway over- and under-crossings.

**N Woolsey Avenue to N Interstate Avenue:**

LOMBARD STREET

- Improve pedestrian and bicycle crossing options at Denver Avenue, Fenwick/Concord avenues, Vancouver Avenue, and MLK Jr Boulevard. This could be accomplished through reducing the number of lanes on Lombard St from four to three lanes and/or providing enhanced pedestrian and bicycle crossing features.
- East of Concord Avenue identify a parallel route for bicyclists to continue east west access across Interstate Boulevard. One option could be along 11th Avenue via Stafford Street.
- Consider a pedestrian and bicycle connection across I-5 between Columbia Boulevard and Lombard Street connecting the Terry Street Neighborhood Greenway in the Kenton neighborhood to the Woodlawn neighborhood east of I-5.
- Improve bicycle facility continuity on Denver Avenue across Lombard Street.

### N Interstate Avenue to NE Martin Luther King Jr. Boulevard

#### COLUMBIA BOULEVARD

- Address I-5 Railroad Bridge over-dimensional constraint through new bridge structure or alternative freight routes. Consider long-term solutions to make Columbia Boulevard the over-dimensional and continuous freight route in the area.
- Address N Vancouver Avenue bridge weight restrictions through structure replacement or modification or alternative freight routes. Consider long-term solutions to make Columbia Boulevard the over-dimensional and continuous freight route in the area.
- Identify congestion relief or travel time reliability improvements on Columbia Boulevard near MLK Jr Boulevard.
- Identify bicycle routes parallel to Columbia Boulevard between MLK Jr Boulevard and the beginning of the North Columbia Path.
- Consider a pedestrian and bicycle connection across I-5 between Columbia Boulevard and Lombard Street connecting the Terry St Neighborhood Greenway in the Kenton neighborhood to the Woodlawn neighborhood east of I-5.
- Close the gap in the Columbia Slough Trail east of Vancouver Avenue. Identify treatments to reduce or eliminate conflicts at the southbound right turn lane from Columbia Boulevard to Vancouver Avenue.

#### LOMBARD STREET

- Improve Lombard Street/11th Avenue intersection to eliminate the high skew angle, provide pedestrian and bicycle access for residents in the area, and serve freight and rail demand.
- Provide protected bike lanes east of NE 11th Avenue.
- Provide treatments to increase travel time reliability.  These could include safety improvement to reduce crash frequency, and/or traffic operations improvements to streamline travel time during peak hours.
- Identify congestion relief or travel time reliability improvements on Lombard Street near MLK.

### NE Martin Luther King Jr. Boulevard to NE 33rd Avenue:

#### COLUMBIA BOULEVARD

- Congestion relief or reliability improvement projects should acknowledge access needs in this section. In addition access needs for large vehicle fleet should be a consideration of any roadway improvements.
- Close the gap in the Columbia Slough Trail to improve east-west pedestrian and bicycle access. Consider connections to and from Columbia Boulevard.
- Improve pedestrian and bicycle crossing facilities at Columbia Boulevard/MLK Jr. Boulevard
- Provide sidewalks on the north and south side of the streets.

LOMBARD STREET

- Improve pedestrian and bicycle crossing facilities at Lombard Street/MLK Jr Boulevard.
- Provide sidewalks.

**NE 33rd Avenue to NE 60th Avenue:**

COLUMBIA BOULEVARD

- Congestion relief or reliability improvement projects should acknowledge access needs in this section. In addition access needs for large vehicle fleet should be a consideration of any roadway improvements.
- Columbia Boulevard/Alderwood Road improvement project is seen by the Port of Portland as a critical project to support air cargo growth in the area.
- Develop bicycle connection north of Columbia Boulevard between Cornfoot Road and NE 47th Avenue.
- Pursue the project to improve the 42nd Avenue overcrossing and provide improved pedestrian and bicycle access.
- Pursue a project to improve multimodal connections on 33rd Avenue overcrossing, including improved pedestrian and bicycle access.
- Provide sidewalks on the north and south side of the street.

LOMBARD STREET

- Address NE 42nd Ave bridge weight restriction through new or modified bridge structure or alternative freight routes. Consider long-term solutions to make Columbia Boulevard the over-dimensional and continuous freight route in the area.
- Provide sidewalks.

**NE 60th Avenue to NE 82nd Avenue**

COLUMBIA BOULEVARD

- Evaluate traffic operations implications of current plans to widen Columbia Boulevard from three to five lanes between 60th Avenue and 82nd Avenue.
- Address NE 60th Avenue/Columbia Boulevard undercrossing over-dimensional constraint through new bridge structure or alternative freight routes. Consider long-term solutions to make Columbia Boulevard the over-dimensional and continuous freight route in the area.
- Improve the intersection of Columbia Boulevard/Cully Street to reduce congestion and facilitate rail traffic. Current project plans identify providing a traffic signal and turn lanes; however, there are concerns this improvement will negatively interact with the nearby rail crossing. Identify and evaluate optional configurations.
- Congestion relief or reliability improvement projects should acknowledge access needs in this section. In addition access needs for large vehicle fleet should be a consideration of any roadway improvements.
- Develop a pedestrian and bicycle railroad overcrossing from Cully Park to Colwood Golf Center.

### LOMBARD STREET

- Continue the protected bikeway on Cully Boulevard north of Lombard Street. Alternatively, connecting to Cully Park via the 70's Bikeway may provide a direct low-stress route.

## NE 82nd Avenue to I-205

### COLUMBIA BOULEVARD AND LOMBARD STREET

- Identify congestion relief or travel time reliability improvements near I-205.
- Provide a bicycle connection between I-205 bike path and NE Alderwood Road.
- Develop pedestrian and bicycle crossing improvements at Columbia Boulevard, Killingsworth Street, Alberta Street, and Prescott Street, or develop a bike/ped bridge from the Sumner neighborhood to the Parkrose/ Sumner Transit Center MAX station.
- Provide sidewalks on Columbia Boulevard and Killingsworth Street.

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