MEMORANDUM #3

DATE: June 19, 2012

TO: Tacoma Station Area Plan Project Management Team

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SUBJECT: **Tacoma Station Area Plan**
Transportation Conditions, Opportunities and Constraints
P12071-000-002

The purpose of this memorandum is to document baseline and future transportation conditions in the future Tacoma Station area of the Portland-Milwaukie Light Rail (PMLR) project. Included in this memorandum are transportation inventories, previously documented gaps and deficiencies, and other data related to the station area for the following scenarios:

- Existing transportation system
- Future transportation system with Tacoma Station and PMLR configuration (2030 conditions)

In addition, this memorandum establishes the study area's vehicle trip threshold under existing zoning, establishing the maximum number of trips that would be allowed without requiring transportation mitigations.

Existing Conditions

This section summarizes transportation conditions within the project study area, including:

- Facility inventory
- Land use, vehicle travel, and mode split information from the Metro model
- Pedestrian and cyclist access to the study area
- System gaps, access, capacity, and safety issues

Study Area

The Tacoma Station Area Plan area is generally bounded by:

- The Tacoma/99E interchange on the north
- Highway 224 on the south
- Highway 99E (McLoughlin Boulevard) on the west
- Union Pacific Railroad (UPRR) tracks on the east

The study area also includes the Springwater Trail extending east of the UPRR tracks, and the area west of McLoughlin Boulevard and north of Tacoma Street up to the western edge of the R1 zoned area within the City of Portland. The study area is shown in Figure 1.

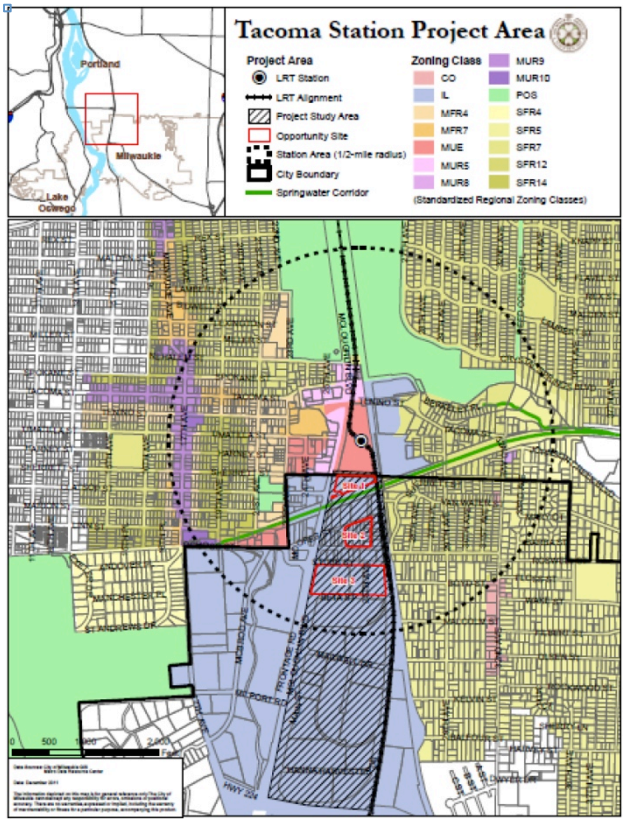

Figure 1: Study Area

Study Area Intersections

The transportation analysis for this project includes the following study intersections:

- SE McLoughlin Boulevard/SE Tacoma Street Interchange NB and SB Ramps*
- SE McLoughlin Boulevard/SE Ochoco Street*
- SE McLoughlin Boulevard/SE Moores Street*
- Main Street/SE Ochoco Street*
- SE McLoughlin Boulevard Loop/ SE Ochoco Street*
- SE McLoughlin Boulevard Loop/ SE West Frontage Road
- Main Street/ SE Mailwell Street*
- Main Street/ SE Milport Road*
- SE McLoughlin Boulevard/ SE Milport Road*
- SE West Frontage Road/ SE Milport Road*
- SE Main Street/SE McLoughlin Boulevard Pull Off
- SE 21st Avenue/ SE Harrison Street*
- SE Main Street/ SE Harrison Street*
- SE McLoughlin Boulevard/Harrison Street*
- SE 32nd Avenue/ SE Johnson Creek Boulevard*

Operational conditions at intersections are provided where they are available from previous PMLR analysis, as indicated by an asterisk (*).

Roadways

Table 1 summarizes motorized and non-motorized functional classifications for key roadways within and near the study area. The functional classification provides data from the City of Milwaukie, Clackamas County, Metro and the Oregon Department of Transportation (ODOT) for standards, operational expectations, and street design, and establishes the basis for access control.

Freight Operations

SE McLoughlin Boulevard is classified as a Regional Truckway, and SE Tacoma Street and SE 17th Avenue are classified as Truck Access Streets by the City of Portland TSP.[1] SE Johnson Creek Boulevard is identified in the City of Milwaukie TSP as a weight restricted local freight route[2]. During the PM peak hour (4:30 to 5:30 p.m.), truck activity along SE McLoughlin Boulevard generally makes up 2% to 3% of all vehicle trips (120 to 190 heavy vehicles). The activity along the side streets in this area varies between 1% and 21% (10 to 50 heavy vehicles) during the same time period. The intersection of SE McLoughlin Boulevard/SE Ochoco Street had the highest freight activity with nearly 200 heavy vehicles entering the intersection during the PM peak hour. SE Main Street carries about 25 heavy vehicles north of SE Milport Road during the PM peak hour.

The Union Pacific Railroad also has an active rail line that runs through the study area. Grade separated crossings in the study area occur at SE Tacoma Street (east of SE McLoughlin Boulevard), Highway 224 (east of Highway 99W), and the Springwater Trail.

There are a number of rail spurs from the Union Pacific Railroad Tillamook Branch line that currently service existing industrial land uses in the north Milwaukie area, particularly between SE Beta Street and SE Mailwell Street, and between SE Mailwell Street and SE Hana Harvester Drive. This branch line has an ungated crossing at SE Mailwell Street and operates with approximately three trains a day.[3]

Figure 2: Ungated crossing at Mailwell Street

[1] City of Portland Transportation System Plan: 2006 Technical Update, Map 6.38.5
[2] City of Milwaukie Transportation System Plan, 2007 Update, Figure 9-1
[3] City of Milwaukie Transportation System Plan (December 2007), Chapter 3, Figure 3-15, page 3-43.

Table 1: Roadway Functional Classifications

Roadway	Bicycle	Pedestrian	Transit	Freight	Motor Vehicle	Design
ODOT						
SE McLoughlin Blvd (Sub Area C[a])	No classification	No classification	No classification	Freight route	Statewide highway	
SE McLoughlin Blvd (Sub Area D[b])	Existing and proposed bike lanes	No classification	No classification	Truck/Freight route	District highway	STA
Metro						
SE McLoughlin Blvd	Regional access Regional corridor (on-street)	Transit/mixed-use corridor	Potential light rail or rapid bus/Potential commuter rail	Main roadway route	Principal arterial (highway) Major arterial	Highway/Regional boulevard
SE Main Street (Sub Area D)	Regional access	Pedestrian district	No classification	Urban center area	Minor arterial	No classification
SE Main Street (Sub Area C)	Regional access	Pedestrian district	No classification	Urban center area	Minor arterial	No classification
SE Tacoma Street/Johnson Creek Boulevard	Regional corridor	Transit/mixed use corridor	Regional bus	No classification	No classification	Regional street
SE Ochoco Street	No classification	Pedestrian district	No classification	Urban center area	No classification	No classification
SE Harrison Street	Regional access	Pedestrian district	Regional bus	Urban center area	Minor arterial	Community boulevard
SE Milport Road	No classification	Pedestrian district	No classification	Urban center area	No classification	No classification
Clackamas County						
SE McLoughlin Blvd	Proposed bikeway	No classification	High capacity transit	Freight route	Major arterial	Freeway/Regional Boulevard/Regional street
SE Main Street	No classification	No classification	Primary bus	No classification	Collector	Community boulevard
SE Harrison Street	Proposed bikeway	No classification	No classification	No classification	Minor arterial	Community boulevard
SE 17th Avenue	City bikeway	City walkway	Community transit street	Freight district (north of McLoughlin)	Neighborhood collector street (north of McLoughlin)	Community main street
SE Tacoma Street/ SE Johnson Creek Boulevard	City bikeway	City walkway	Transit access street	Minor truck street (west of McLoughlin)	District collector street	Community corridor
SE Harney Drive	City bikeway	City walkway	Transit access street	Minor truck street	Neighborhood collector street	No classification
City of Milwaukie						
SE McLoughlin Blvd	Existing and proposed bikeways network	Existing and proposed walkway	Transit route and potential light rail or rapid bus/Potential commuter rail	Major regional truck route	Arterial	Arterial
SE Main Street (Sub Area D)	Existing and proposed bikeways network	Existing walkway	No classification	No classification	Collector	Collector
SE Main Street (Sub Area C)	Proposed bikeways network	Existing walkway	Transit Route	Industrial area	Collector	Collector
SE Harrison Street	Existing and proposed bikeways network	Existing walkway	Transit route	Minor preferred truck (local)	Arterial	Arterial
SE 17th Avenue	Existing bikeways network/ Proposed Bikeways network	Proposed walkway	Transit Route	Minor preferred (local)	Arterial	Arterial
SE Ochoco Street	No classification	Existing walkway/Proposed walkway	Transit Route	Industrial area	Collector	Collector
SE Milport Road	Existing bikeways network/ Proposed Bikeways network	Proposed walkway	Transit Route	Industrial area	Local industrial	Local industrial
SE 32nd Avenue	No classification	Existing walkway	Transit Route	No classification	Collector	Collector
SE 42nd Avenue	Existing bikeways network/ Proposed Bikeways network	Existing walkway	No classification	No classification	Collector	Collector

SE Johnson Creek Boulevard	Existing bikeways network/ Proposed Bikeways network	Existing walkway	Transit Route	Weight restricted minor preferred (local)	Collector	Collector
SE 21st Avenue	Existing and proposed bikeways network	Existing walkway	Transit route	No classification	Arterial	Arterial

Note: ODOT functional classification as shown in the *1999 Oregon Highway Plan*, January 2006.
Metro functional classification as shown in the *2004 Metro Regional Transportation Plan, July 8, 2004*.
Clackamas County functional classification as shown in the *Clackamas County Comprehensive Plan*, last updated January 6, 2005.
City of Milwaukie functional classification as shown in the *City Milwaukie Transportation System Plan*, Adopted Ord. #1975 December 4, 2007
NHS = Federal Highway Administrations (FHWA) classification of National Highway System.
[a] Sub Area C includes the area south of SE Tacoma Street and north of Highway 224
[b] Sub Area D includes the area south of Highway 224 and north of SE Park Avenue

Bicycle Facilities and Activity

SE McLoughlin Boulevard, SE 17th Avenue and parts of SE Tacoma Street are classified as City Bikeways by the City of Portland.[4] SE Milport Road and Highway 224 are classified as shared facilities for bicyclists. SE Tacoma Street has bike lanes within the study area, except for a short section east of SE 17th Avenue and east of SE McLoughlin Boulevard where gaps exist. SE 17th Avenue has no bike lanes within the City of Portland. Within the City of Milwaukie, SE 17th Avenue has bike lanes, but a few gaps are present near Highway 224 and SE McLoughlin Boulevard. SE Main Street, SE Johnson Creek Boulevard and SE Harney Drive have bike lanes within the study area. SE 42nd Avenue has a shared facility between SE Johnson Creek Boulevard and SE Filbert Street and bike lanes south of SE Filbert Street. The City of Milwaukie's TSP identifies proposed bike lanes along SE Main Street and recommends filling in the missing gaps along SE 17th Avenue in this study area.[5]

At the north end of the study area, the Springwater Trail multi-use path traverses the study area east to west, connecting the City of Portland to the City of Gresham through the City of Milwaukie and Clackamas County. One existing access point on the north side of the trail connects via a steep ramp to the sidewalk on the eastern side of SE McLoughlin Boulevard.

Bicycle count data was collected at study area intersections during the AM and PM peak hours for the SDEIS (2007). At intersections along SE Main Street and SE McLoughlin Boulevard, bicycle count data did not indicate any bicycle activity during the PM peak hour. Minimal activity (one bicycle) was observed at four of the intersections along SE Johnson Creek Boulevard.

Figure 3: Bike lanes on SE Main Street

Bike lanes on SE Main Street are not shown in the bicycle network that was documented for the South Corridor process, but this is a striped and signed bikeway, as shown in Figure 3 on the right. Figure 4 displays the existing bicycle network within the study area as previously identified in the South Corridor FEIS process. Additional though substandard bicycle connections existing on SE Main Street, SE 29th Avenue, and SE 17th Avenue.

[4] City of Portland Transportation System Plan: 2006 Technical Update, Map 6.38.3.
[5] City of Milwaukie Transportation System Plan, 2007 Update, Figure 6-1, 2007.

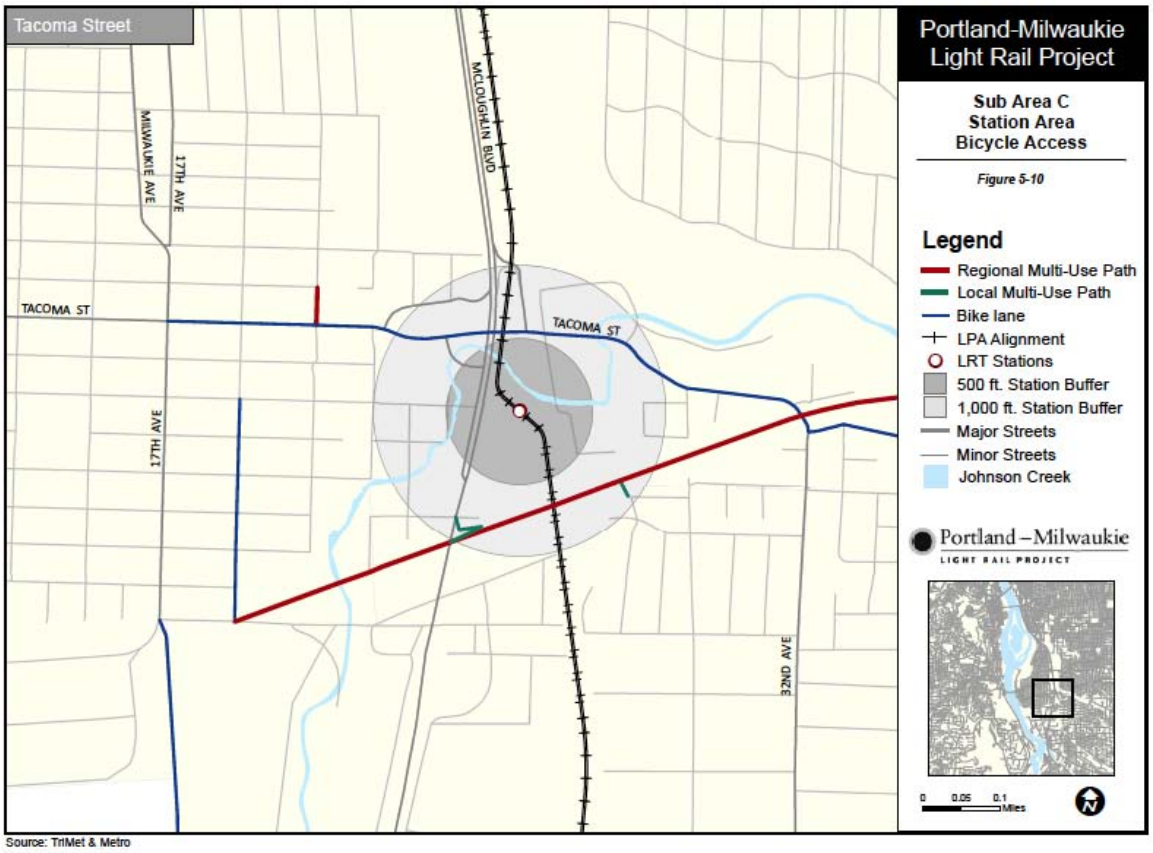

Figure 4: Existing Station Area Bicycle Access

Pedestrian Facilities and Activity

Pedestrian trips were counted and compiled for the AM and PM peak hours at the same intersections evaluated for vehicle traffic. The intersection of SE Johnson Creek Boulevard and SE 42nd Avenue had the highest level of pedestrian activity (six pedestrian crossings) during the AM peak hour. The other study area intersections had five or fewer pedestrian crossings during the AM peak hour. During the PM peak hour, the highest level of activity (nine pedestrian crossings) was observed at the northbound ramps at the intersection of SE Tacoma Street and SE McLoughlin Boulevard. The other study area intersections had five or fewer pedestrian crossings during the PM peak hour. Figure 5 summarizes pedestrian count data.

Sidewalks are not provided on most of the streets in the study area; however, where sidewalks are present they generally range in width from five feet to ten feet. Connectivity gaps in the pedestrian network primarily occur on SE McLoughlin Boulevard south of SE Ochoco Street, SE Ochoco Street east of SE McLoughlin Boulevard, SE 17th Avenue, SE Johnson Creek Boulevard and SE Milport Road.

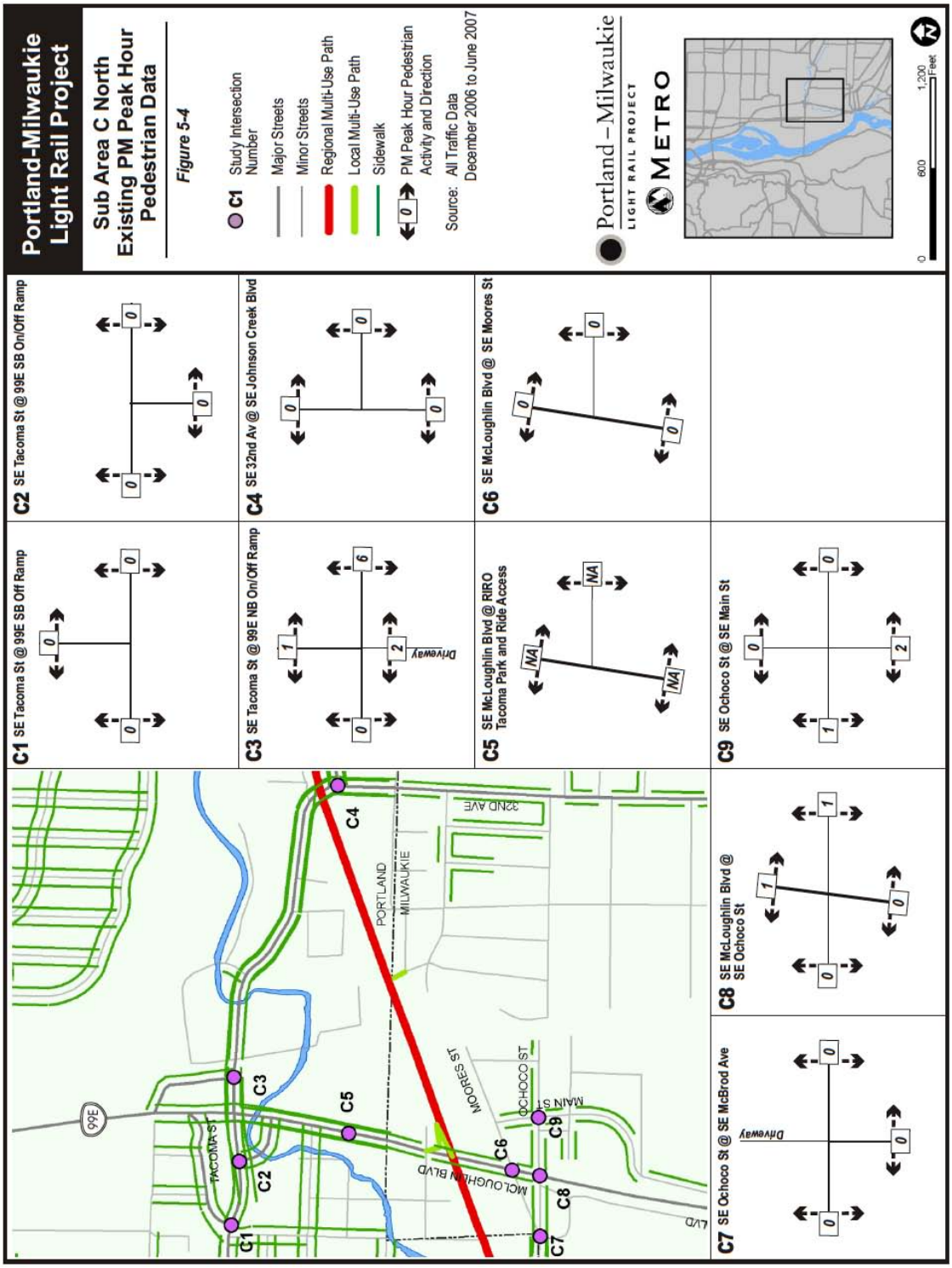

Figure 5: Existing Pedestrian Activity (Sub Area C North)

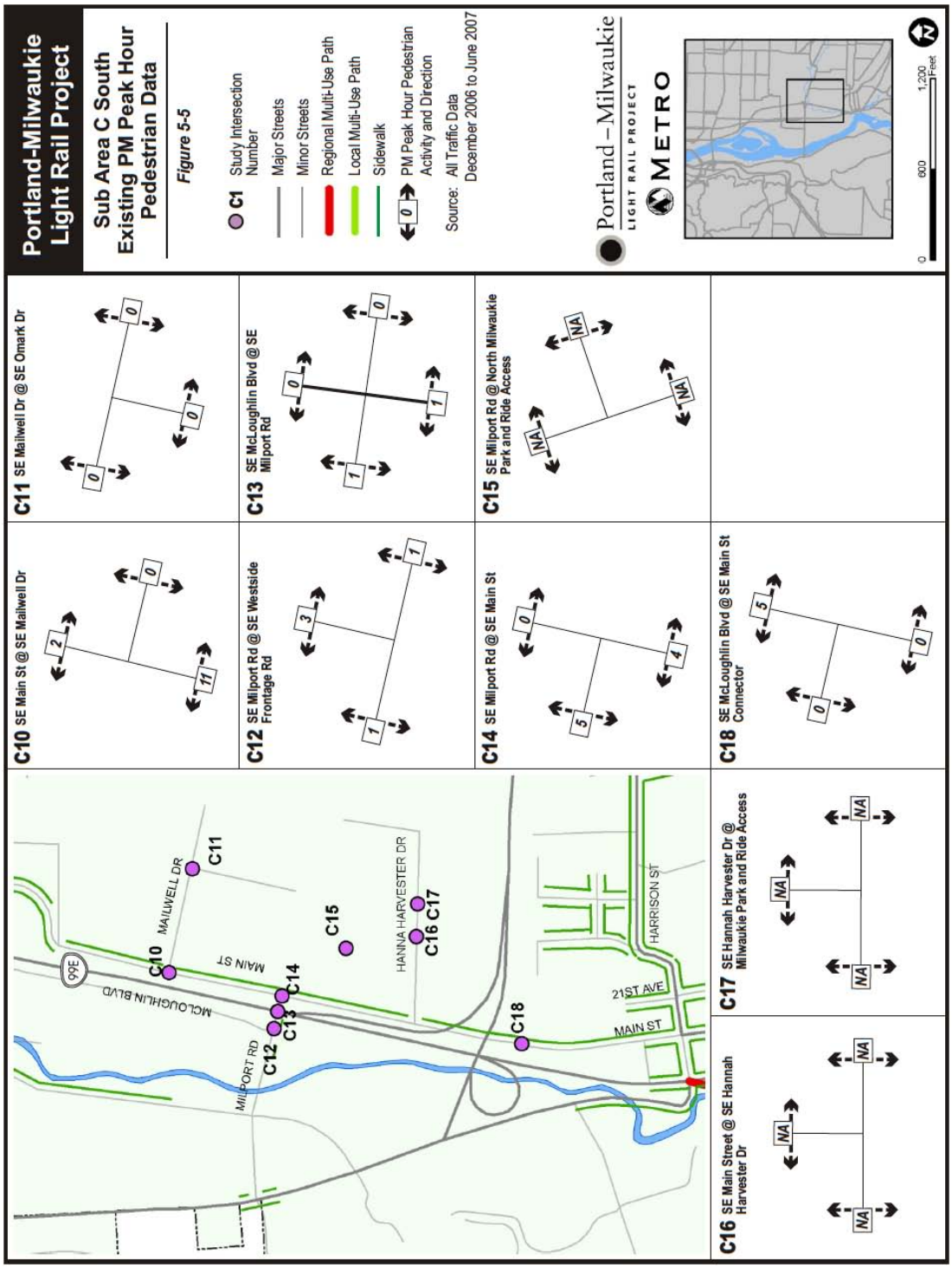

Figure 6: Existing Pedestrian Activity (Sub Area C South)

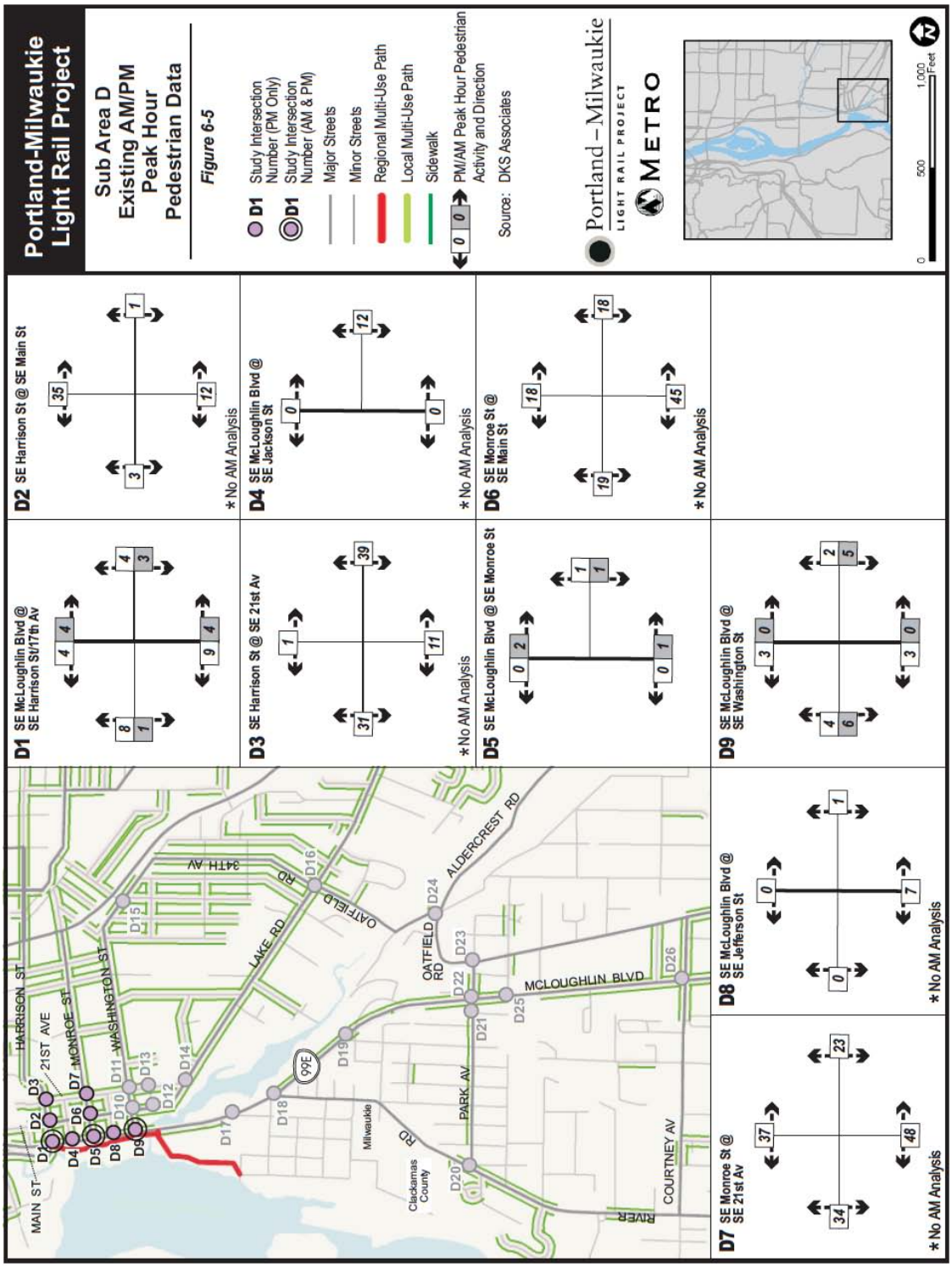

Figure 7: Existing Pedestrian Activity (Sub Area D)

Travel Shed for Walking and Cycling

Connectivity to the future station area is constrained by significant physical barriers such as:

- Union Pacific Railroad Tracks
- SE McLoughlin Boulevard, which has widely spaced pedestrian crossings
- The Springwater Trail, which separates the future station from the current industrial area to the south

Figure 8 shows the travel sheds for typical walking (up to ½ mile) and bicycling (up to 3 mile) trips to the station.

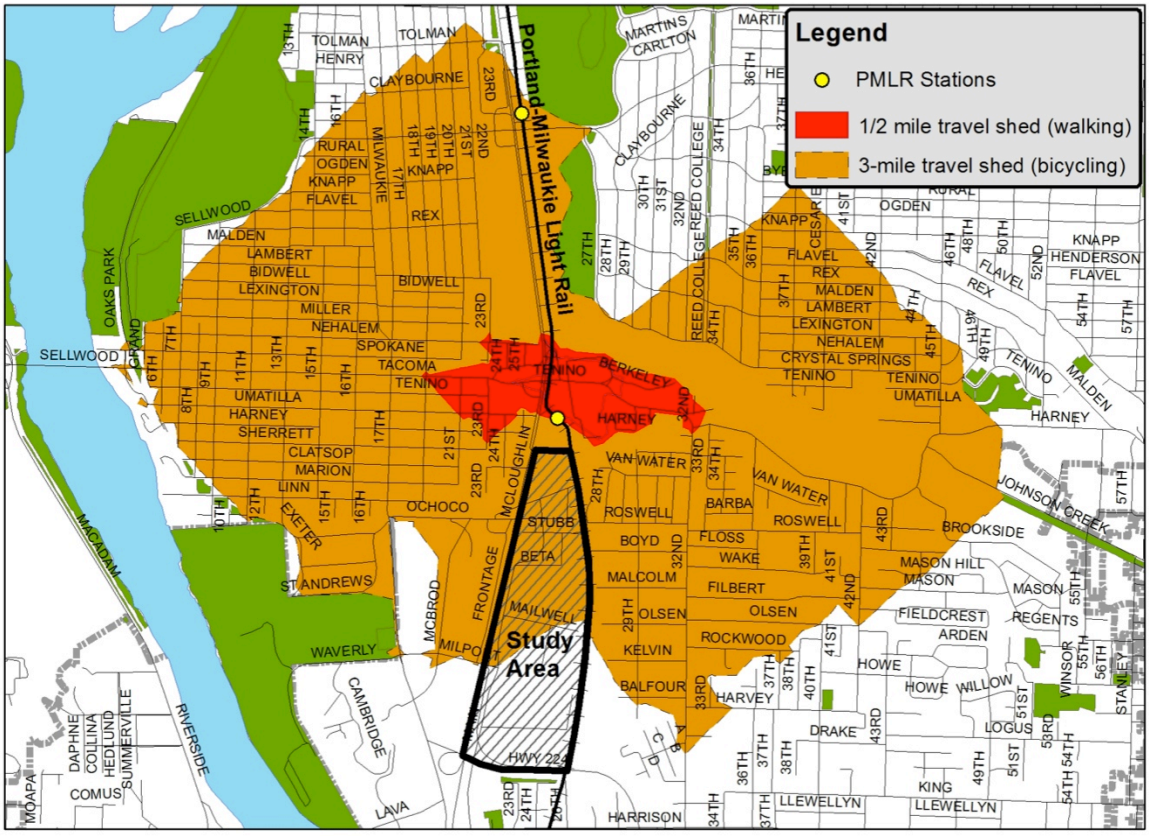

Figure 8: Walk and Bike Travel Sheds to Tacoma Station (Source: Alta Planning and Design)

Transit System

The Tacoma Street to Highway 224 study area is currently served by eight TriMet bus routes. Some of these routes operate up to 20 hours of the day, with approximately 35 transit stops. Each day, there are approximately 1,100 boardings and approximately 1,050 departures for an on/off ridership of approximately 2,150 trips. Table 2 summarizes the existing transit service for this study area.

Table 2: Existing 2009 Transit Service (Tacoma Street to Highway 224)

Route	AM Peak		PM Peak		Hours of Operation		Daily Sub Area Ridership		
	Headways (min)	LOS	Headways (min)	LOS	Hours	LOS	Ons	Offs	Total
19	10	B	10	B	20	A	198	180	378
28	60	F	60	F	13	D	17	5	22
31	15	C	15	C	17	B	43	35	78
32	15	C	30	D	12	D	43	35	78
33	15	C	15	C	13	D	43	35	78
70	12	B	15	C	19	A	346	424	770
75	15	C	15	C	20	A	296	218	514
99	20	C	15	C	3	F	10	5	15

SOURCE: 2008 TriMet Passenger Census Data.

Notes: Rank is of the 103 bus routes TriMet provides, and excludes MAX ridership data.

Level of service is defined by the elapsed time from the departure of one bus to the arrival of the next bus.

Two measures are used to describe transit level of service. The first is headways (time between bus arrivals), and the second is hours of bus operation during the day. The study area (depending on route) has headways that range from 10 minutes (LOS B) to 60 minutes (LOS F), while the hours of service range from as few as three hours (LOS F) for routes that only operate during the peak periods (express routes) up to routes that operate approximately 20 hours of the day (LOS A).

Figure 9 shows the transit routes, transit stops, and approximate ridership within the study area as of SDEIS publication. Within the Tacoma Street to Highway 224 sub area, transit shelters are provided along SE 17th Avenue at SE Ochoco Street and at the intersections of SE McLoughlin Boulevard/SE Ochoco Street, SE Main Street at SE Milport Road, and along SE 32nd Avenue. Some routes have been modified since the SDEIS work: Route 41 has been discontinued, and Route 31 now runs on Main Street along with Routes 32 and 33.

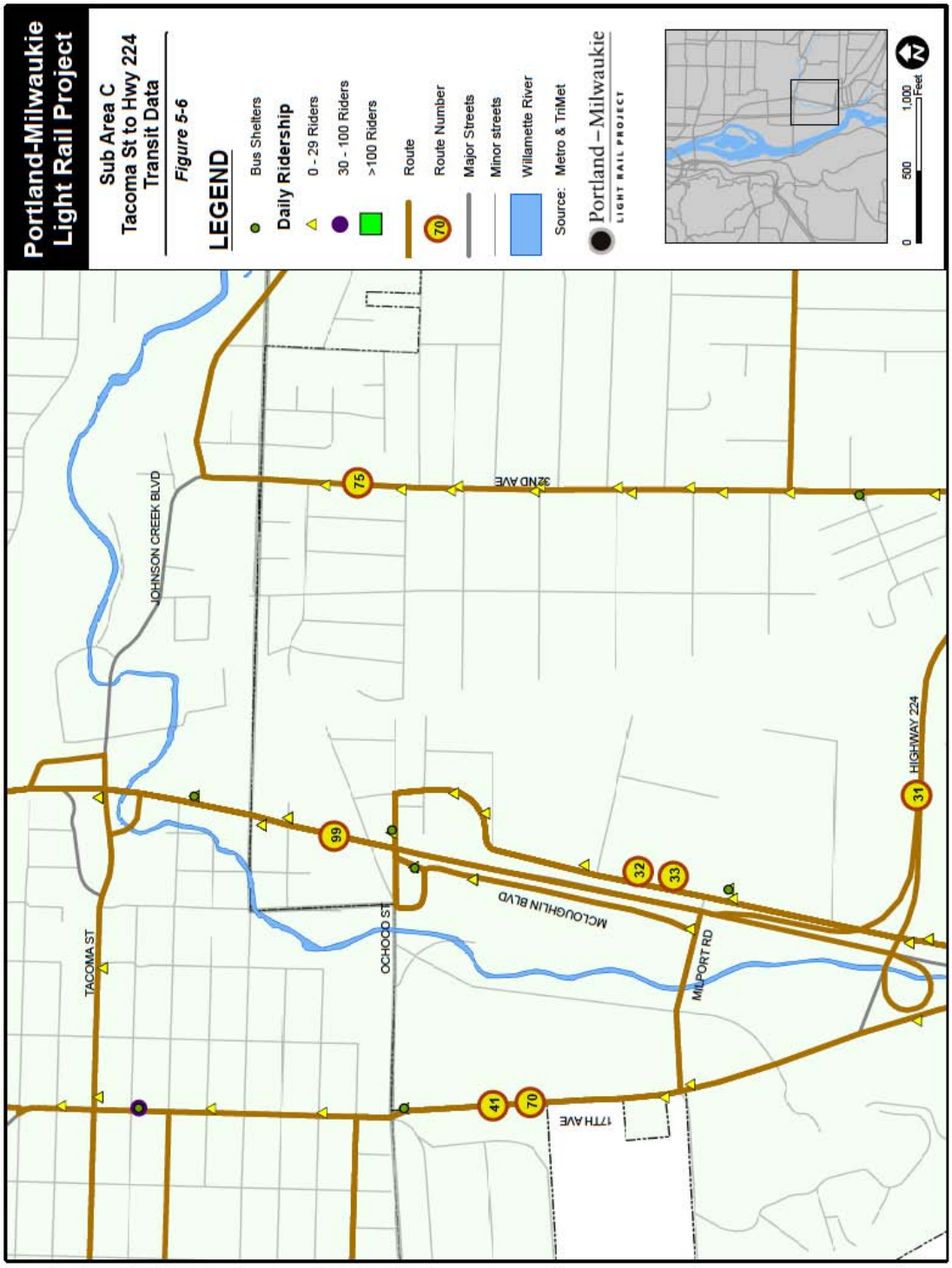

Figure 9: Existing Transit Services and Amenities

Travel Patterns

This section summarizes data from Metro's travel demand model[6] regarding land use assumptions, vehicle miles traveled, and mode split. The current Metro "beta" model generally has more moderate growth assumptions between 2010 and 2035 than the adopted RTP model had for the same 25-year increment, so 2035 traffic forecasts using the beta model would likely be more consistent with the 2030 traffic volumes used in the PMLR FEIS.

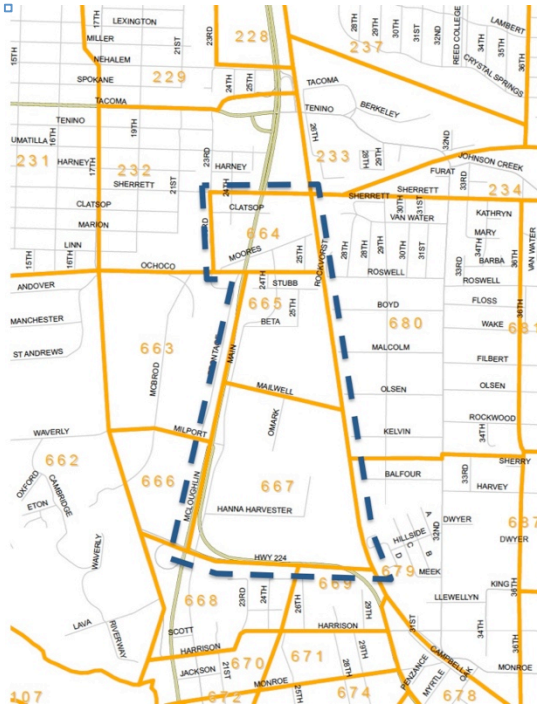

Figure 10: Study Area Transportation Analysis Zones

Model Land Use

Metro's travel demand model estimates existing and future traffic patterns on the regional transportation network based on 2010 and 2035 land use assumptions. These assumptions regarding households and employees are organized in over 2,000 transportation analysis zones (TAZs) within the metropolitan region, which then generate travel within and between zones. The study area is generally represented by TAZs 664, 665, and 667 from the Metro model, shown in Figure 10. Table 3 shows land use assumptions for 2010.

Table 3: Metro Model Assumed Land Uses

Land Use	TAZ 664	TAZ 665	TAZ 667	TOTAL
Households	3	0	0	3
Retail Employees	6	16	30	52
Service Employees	0	19	31	50
Other Employees	196	146	425	767

Source: Metro

[6] Metro "Beta" model, November 2011.

Vehicle Miles Traveled (VMT)

In order to calculate VMT for trips to and from the study area for 2010, TAZs 664, 665, and 667 were again selected. The travel distance for all trips for which the origin or destination included one of these TAZs were combined to arrive at an estimate of VMT. Using this approach, vehicle trips to and from the study area during the two hour PM peak totaled **5,622** vehicle-miles of travel. The general paths of these trips are shown in Figure 11. The model estimates that most trips to and from the study area use Highway 99W, and a significant number of trips use King Road and Highway 224 to the east, and the Sellwood Bridge to the west.

Figure 11: Vehicle paths to and from the study area (2-hour p.m. peak)

Mode Split

The same three TAZs were analyzed to determine the proportion of trips to and from the study area made by various modes. Table 4 shows the Metro model's estimation of mode split for the study area.

Table 4: Metro Model Assumed Mode Splits

Mode	2010 Total Daily Trips	2010 Mode Split
Single Occupant Vehicle	2,216	77%
2+ Occupant Vehicle	527	18%
Transit	92	3%
Walk or Bike	61	2%

Source: Metro

The model assumes a significant increase in the share of transit trips to and from the area between 2005 and 2035, reducing the share of SOV and HOV trips.

Traffic Volumes

Data was collected for 24-hour volume counts at selected locations within the study area. Figure 12 and Figure 13 show the ADT along SE McLoughlin Boulevard and SE Tacoma Street.

Peak hours (AM and PM) are clearly evident on both figures. On SE McLoughlin Boulevard, the PM peak hour is about 50 percent greater than the AM peak hour, while on SE Tacoma Street, the PM peak hour is only slightly greater than the AM peak. Due to the nature of the study area intersections, both AM and PM peak hours have been recorded at select intersections for further analysis.

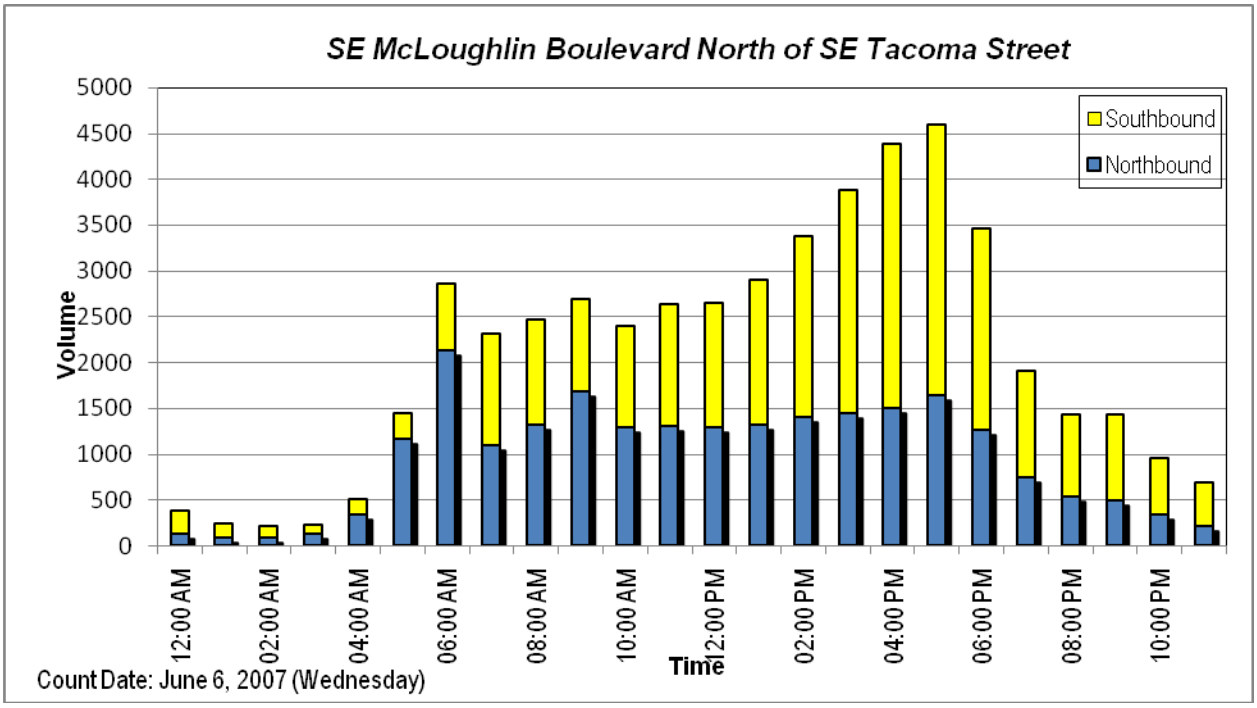

Figure 12: 24-hour Traffic Count, SE McLoughlin Boulevard

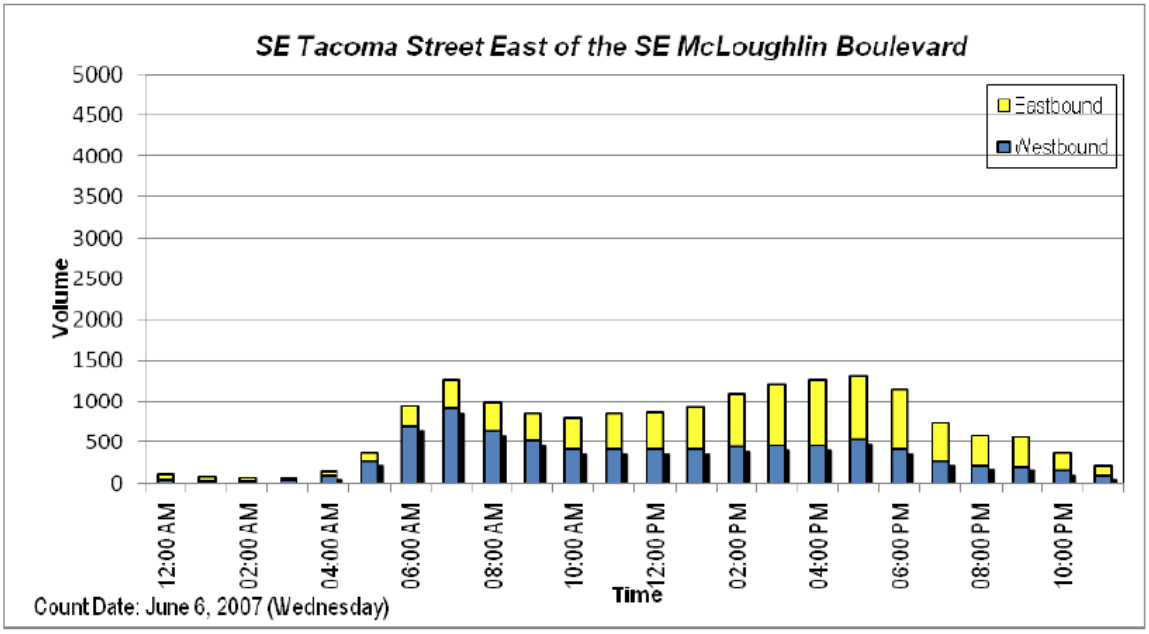

Figure 13: 24-hour Traffic Count, SE Tacoma Street

Operations

While the analysis of ADT is helpful in understanding of how key roadways are used in the area, ADT counts alone do not indicate the ability of a street network to carry additional traffic or the quality of service provided by street facilities. Intersections are typically the controlling locations for traffic flow, and the ability of a roadway system to carry traffic efficiently is nearly always diminished at intersections. The 24-hour motor vehicle count indicated that the PM peak period is the most heavily used during the day and, therefore, would represent the worst case conditions along the corridor. Based on this heavy usage, AM and PM peak period turning movement counts at key sub area intersections were conducted October 2006 through May 2009 to help evaluate capacity conditions in the sub area for the peak periods.[7] Figure 14 and shows the locations and data for the turning movement counts within the sub area.

[7] Capacity analysis was done using the methodology in the latest version of the *Highway Capacity Manual, 2003.*

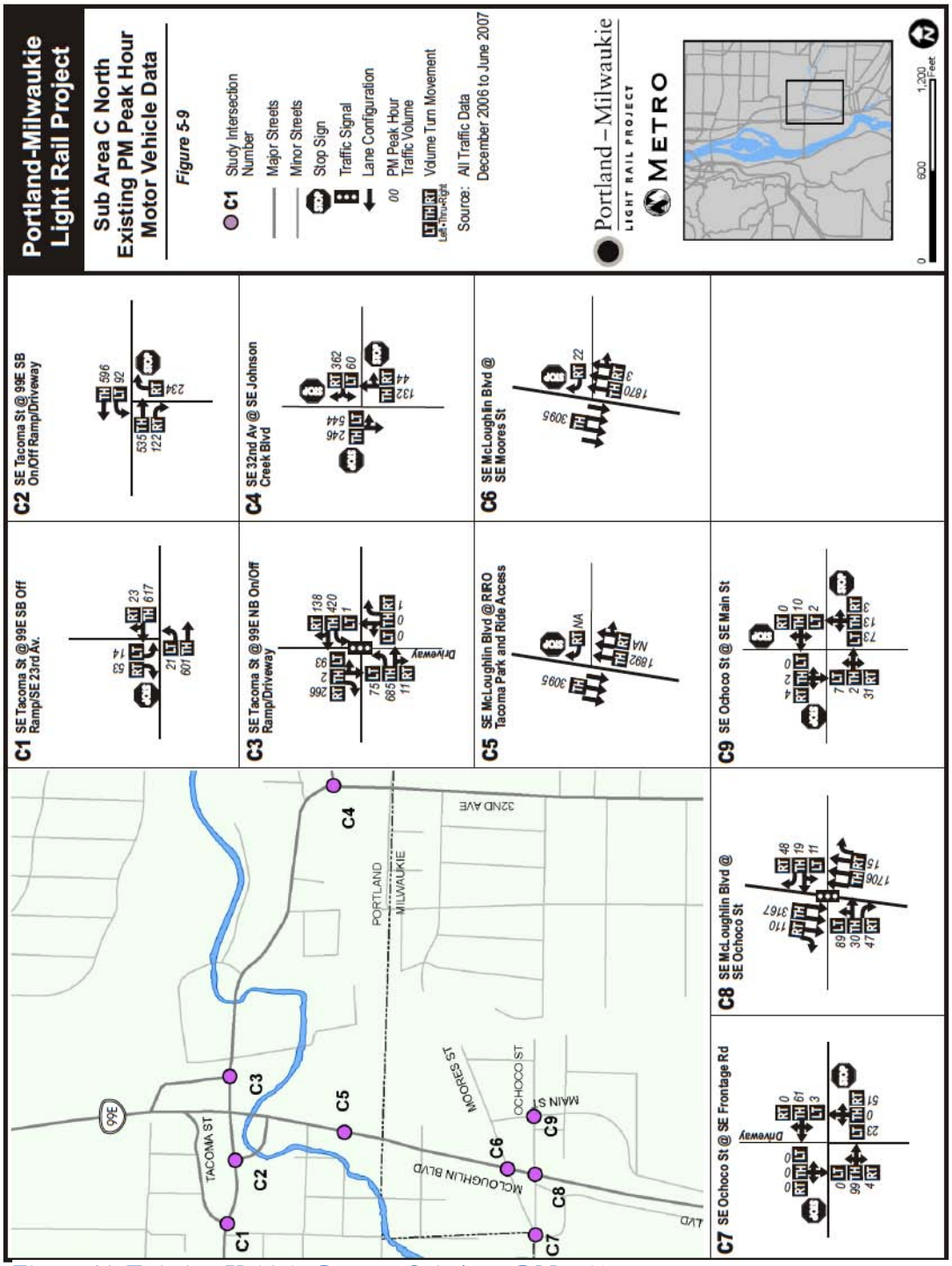

Figure 14: Existing Vehicle Counts (Sub Area C North)

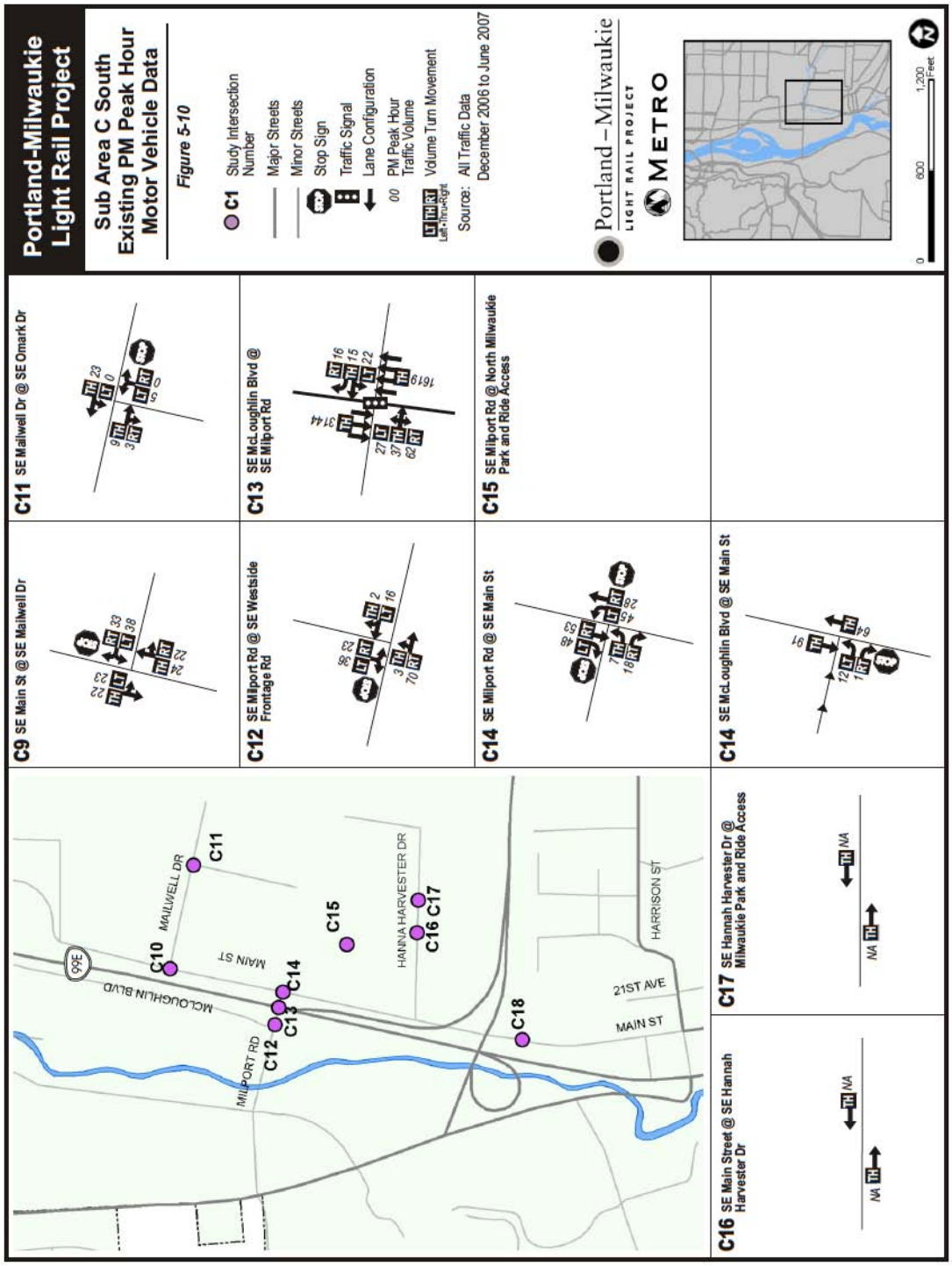

Figure 15: Existing Vehicle Counts (Sub Area C South)

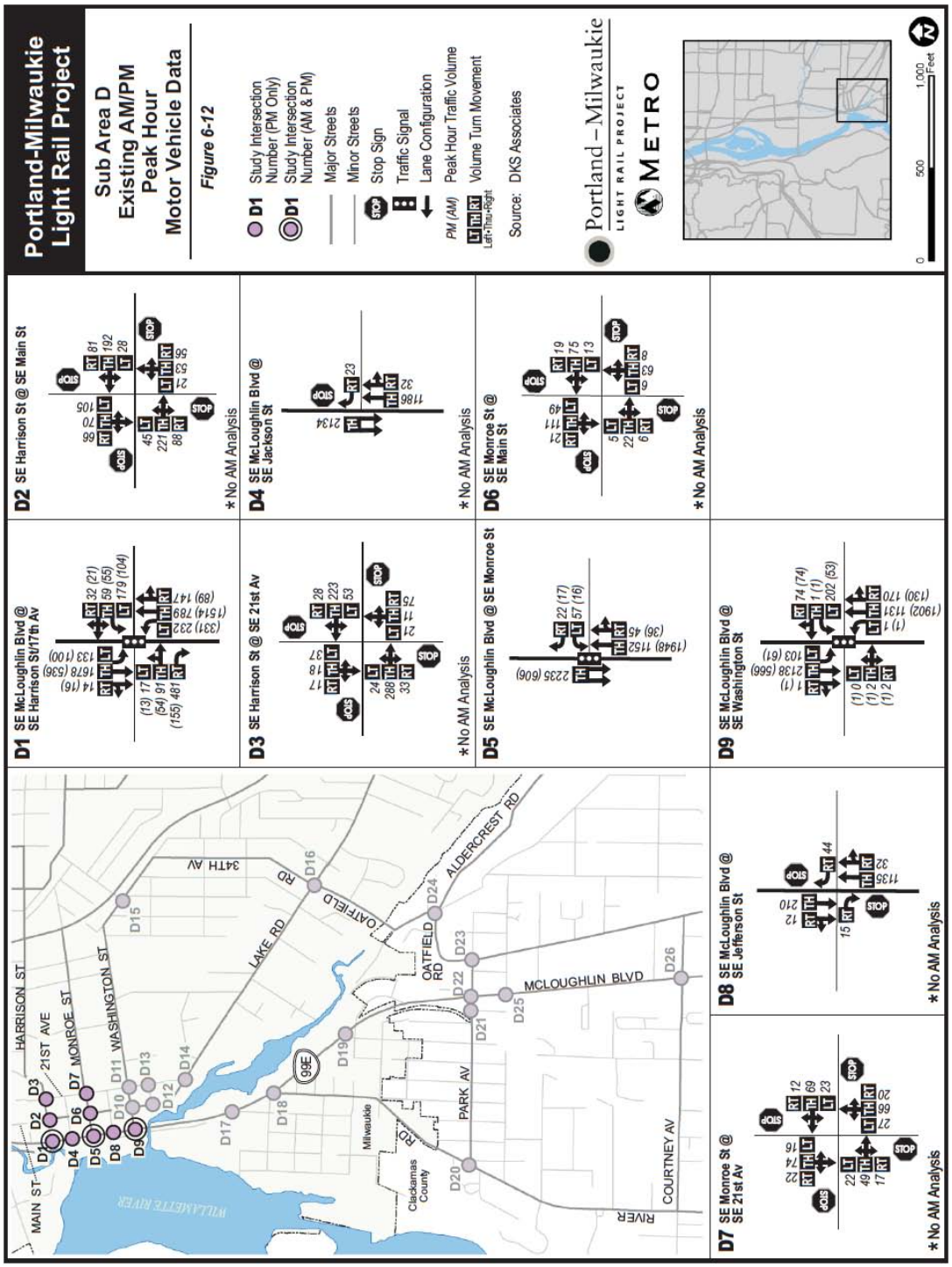

Figure 16: Existing Vehicle Counts (Sub Area D)

The sub area intersections fall within three jurisdictions (the City of Portland, the City of Milwaukie and ODOT) and two different standards for acceptable intersection operations are applied. The City of Portland applies LOS D for signalized intersections and LOS E for the minor leg of unsignalized intersections under its Transportation System Plan.[8] The City of Milwaukie has an LOS D standard for all of its intersections. ODOT uses a V/C ratio as its performance measure rather than LOS.[9] For SE McLoughlin Boulevard (SE McLoughlin Boulevard), ODOT sets a threshold V/C ratio of 1.10[10]. Figure 12 summarizes the intersection operations at sub area intersections by jurisdiction.

Based on those criteria, all but two of the sub area intersections currently operate at acceptable levels of service during the AM and PM peak hours. The unsignalized intersections of SE Johnson Creek Boulevard/SE 32nd Avenue (all-way stop control) and SE Johnson Creek Boulevard/SE 42nd Avenue currently operate with LOS F during the AM peak hour. During the PM peak hour, the unsignalized intersection of SE Johnson Creek Boulevard/SE 32nd Avenue and the signalized intersection of SE Johnson Creek Boulevard/SE Harney Drive currently operate at LOS F.

[8] Based on the *City of Portland Transportation System Plan*, LOS performance measures, section 11.13.
[9] Based on the *City of Milwaukie Transportation System Plan*, Chapter 8 Auto Street Element.
[10] Based on the 1999 Oregon Highway Plan, amended January, 2006.

Table 5: Existing PM Peak Hour Operations

Intersection	Existing Operations			Jurisdictional Standards			Meet Standard?
	Delay	LOS	V/C	V/C 1st Hour	V/C 2nd Hour	LOS	
ODOT							
Tacoma St/McLoughlin Blvd SB off-ramp	32.5	A/D	0.10	0.85	0.85	E	Yes
Tacoma St/McLoughlin Blvd SB on-ramp	18.0	A/C	0.48	0.85	0.85	E	Yes
Tacoma St/McLoughlin Blvd NB on/off-ramp	12.5	B	0.05	0.85	0.85		Yes
McLoughlin Blvd/Ochoco St (LPA)	10.7	B	0.86	1.1	0.99	--	Yes
	7.7	A	0.78	1.1	0.99	--	Yes
McLoughlin Blvd/SE Moores St	12.8	A/B	0.05	1.1	0.99	--	Yes
SE McLoughlin Blvd/SE Harrison	59.1	E	0.98	1.10	0.99		Yes
City of Portland							
SE 32nd Ave/SE Johnson Creek Blvd	>50	F	>1.0	--	--	E	No
City of Milwaukie							
SE Ochoco/Frontage Road west of OR 99E	9.7	A/A	0.06	--	--	D	Yes
SE Ochoco/SE Main Street	8.3	A/A	0.17	--	--		
SE Main Street/SE Mailwell Dr	9.8	A/A	0.11	--	--	D	Yes
SE Milport Road/Frontage Road west of 99E	9.4	A/A	0.08	--	--	D	Yes
SE Main St/SE Milport Rd (LPA)	10.0	A/B	0.02	--	--	D	Yes
SE Harrison St/SE Main St	0.58	15.1	C			D	Yes
SE Harrison St/SE 21st Ave	0.37	12.1	B			D	Yes

SOURCE: DKS Associates (2009)
Note: **Bold** indicates an intersection does not meet jurisdictional standards
LPA = Analysis from locally preferred alternative
V/C = Volume to Capacity ratio
LOS = Level of Service
Delay = Average delay per vehicle

Queuing Analysis

All study area intersections were evaluated for queuing to determine the extent of the 95th percentile queues under 2007 conditions. Queues can spill back beyond adjacent intersections, creating a potential safety impact, especially at a signalized intersection. Figure 17 and Figure 18 summarize the 95th percentile queuing results for the existing AM and PM scenarios. While the storage that is currently provided at the intersections is generally enough for the current demand, there is one intersection where the available storage is exceeded:

- SE 32nd Avenue/SE Johnson Creek Boulevard: Queues at this intersection propagate past adjacent unsignalized intersection in both the eastbound and westbound directions. The eastbound queue does not spill back to Highway 99W ramp terminal intersections on SE Tacoma Street.

As indicated in the figures, storage at the ramp terminal intersections is adequate on the Tacoma Street off-ramps, and queues do not spill back on the main line of Highway 99W.

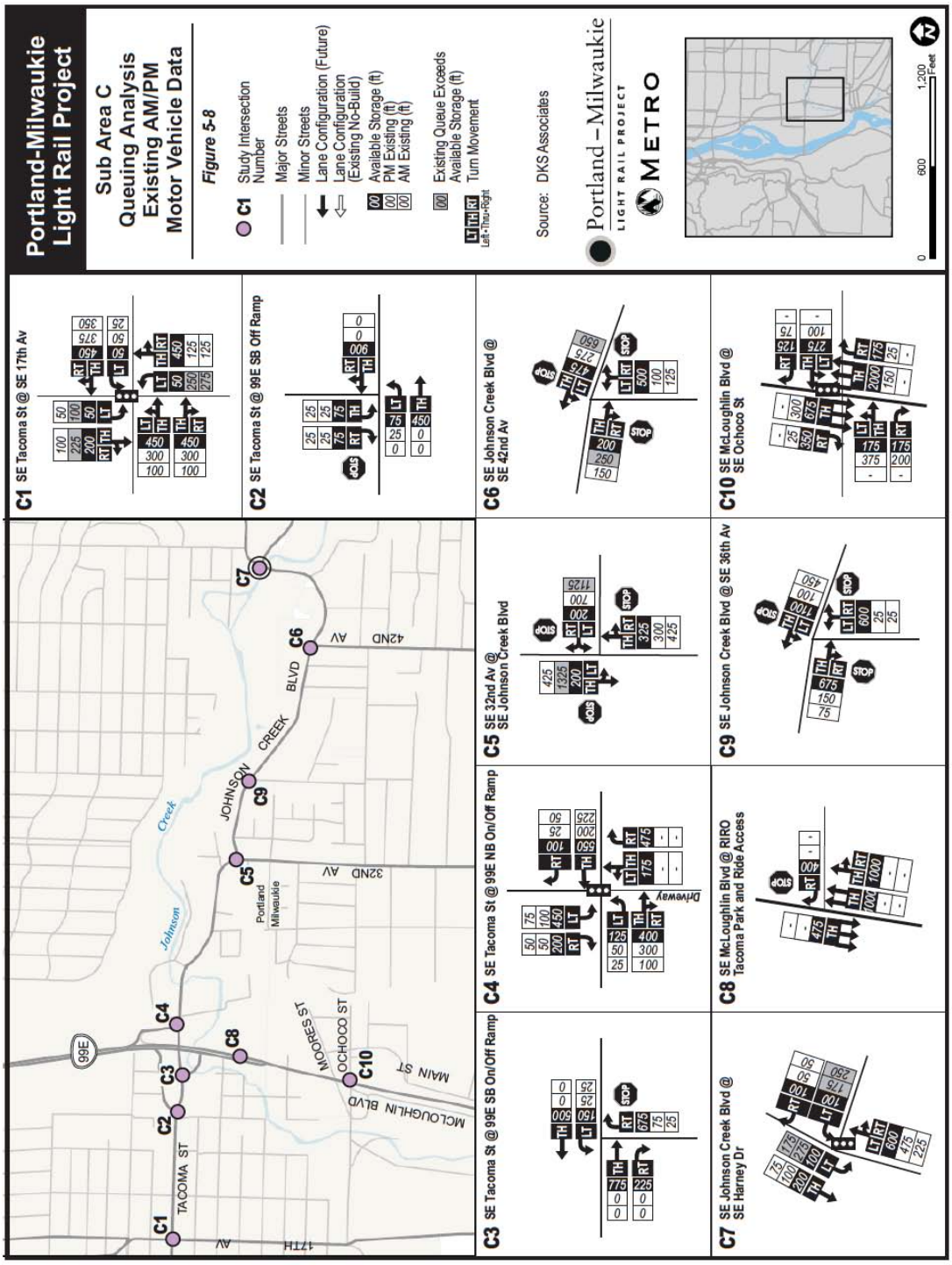

Figure 17: Existing Queuing Conditions (Sub Area C)

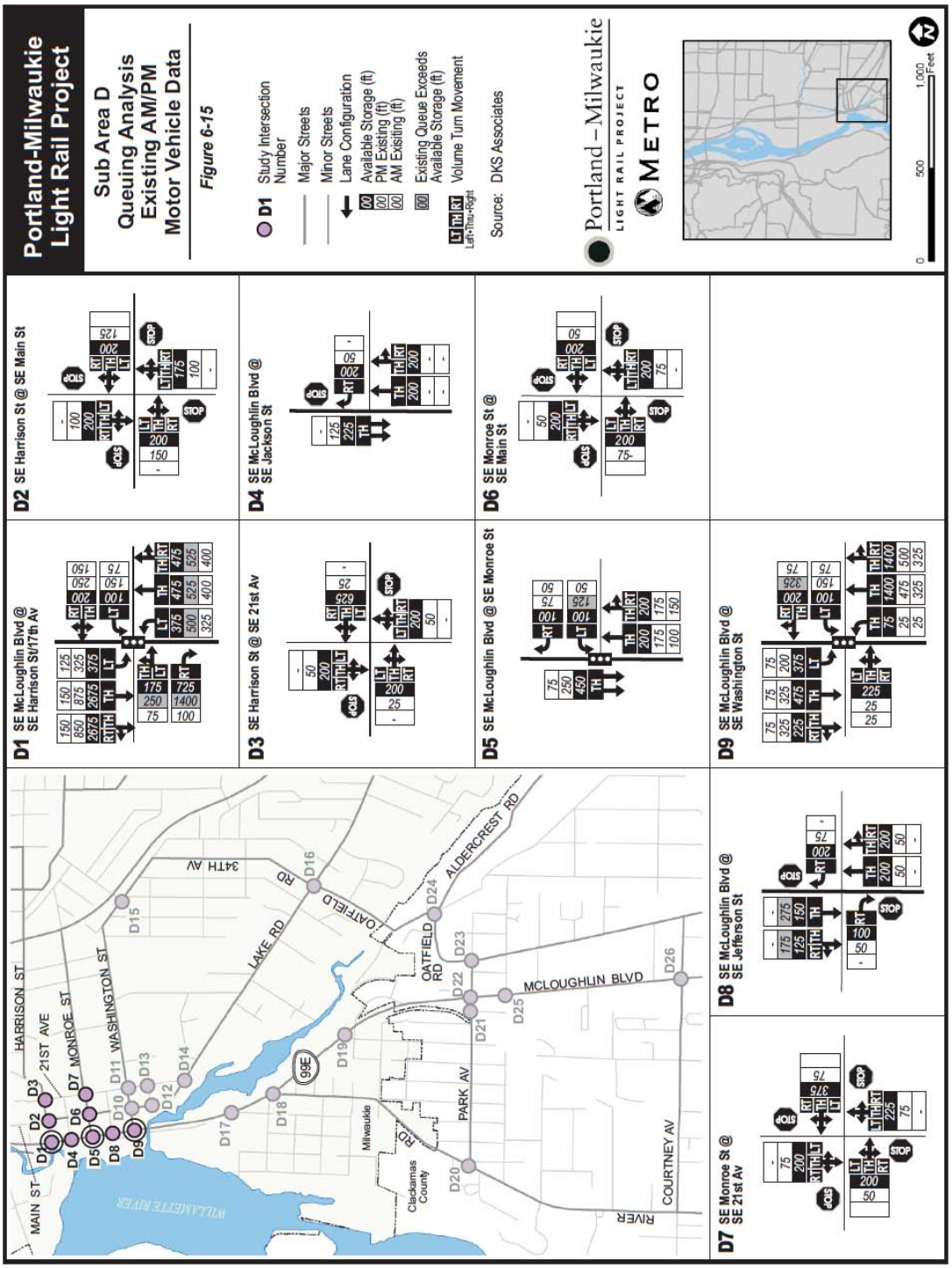

Figure 18: Existing Queuing Conditions (Sub Area D)

2030 Baseline Conditions

This section describes the light rail alignment, stations, and park-and-ride options that comprise 2030 baseline conditions. 2030 conditions as documented in previous PMLR FEIS work are expected to be equivalent to 2035 conditions under Metro beta model forecasts, since this new model has less aggressive growth assumptions than the model for the adopted 2035 RTP. For the Tacoma Station, the 2008 LPA proposes an 800-space park-and-ride, the LPA Phasing Option proposes a 320-space park-and-ride.

The proposed alignment will be located within dedicated right-of-way between the SE Tacoma Street overpass and SE McLoughlin Boulevard, and follow SE McLoughlin Boulevard north/south crossing over (to the east) after the Tacoma station site to run on the east side of the existing Tillamook rail branch track. The alignment will cross over the existing Tillamook rail line via an overpass. The Tacoma Street Station is the only planned station within the study area, which is shown in Figure 19.

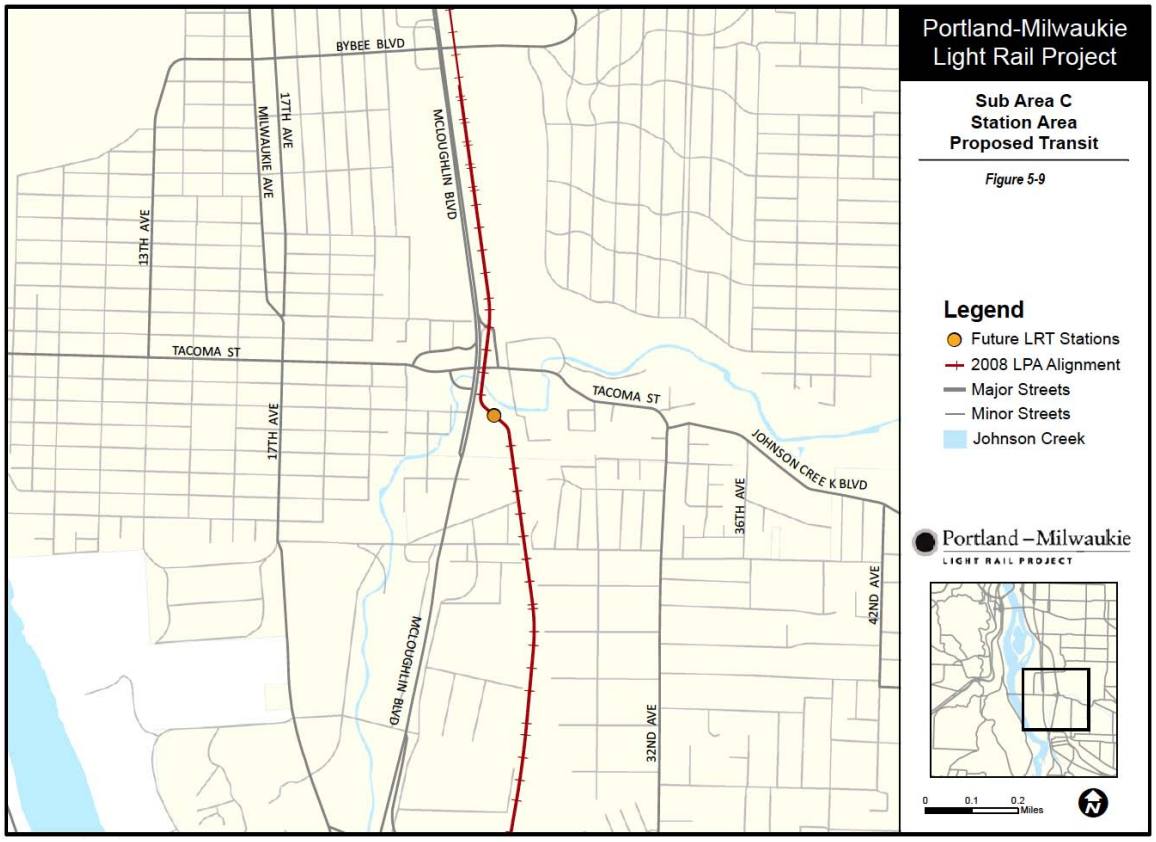

Figure 19: Study Area with Planned LRT Alignment

Tacoma Street Station and Park and Ride

The Tacoma Station park-and-ride includes two vehicular access points: a full access, existing signalized intersection at SE Tacoma Street, and an existing right-in/right-out access on SE McLoughlin Boulevard. The right-in/right-out access point on SE McLoughlin Boulevard is

proposed to be a right-in access only, with right-out for emergency vehicles, as well as vehicles from the Pendleton Woolen Mills site. Conversion of this access to a right-in-only for motor vehicles minimizes weaving and safety concerns along SE McLoughlin Boulevard within the interchange area. The SE McLoughlin Boulevard access point is 1,375 feet south of the northbound ramps from SE Tacoma Street and 1,100 feet north of the SE Ochoco Street intersection. Tacoma Station site elements, including accesses, are shown in Figure 20.

Under the 2008 LPA alignment, the Tacoma Street Station park-and-ride would provide 800 parking spaces and generate approximately 560 PM peak hour vehicle trips (160 in, 400 out). As allowed under the LPA Phasing Option, the park-and-ride that TriMet will construct as part of the 2014 PMLR project will be a 320 space facility and would generate approximately 225 PM peak hour vehicle trips (65 in, 160 out).

Assumed Projects

Mitigation projects within the study area that are assumed with the construction of PMLR include:

- **Tacoma Park-and-Ride south access** – Consolidate business accesses south of park-and-ride (two Pendleton Woolen Mills driveways) with access road. Only allow right-in operations to minimize effects of weaving on SE McLoughlin Boulevard.
- **SE Tacoma St./SE McLoughlin Blvd. SB Off-Ramp** – (1) Restripe for dual stage left turn onto SE Tacoma St. or (2) Modify interchange and signalize intersection or (3) Do nothing and seek a design exception.
- **SE Tacoma St./SE McLoughlin Blvd. NB On /Off- Ramp** - Restripe SE Tacoma Street between park-and-ride access and SE Tenino Drive as two separate left turn lanes, providing increased vehicle queue storage. Seek design exception to allow for operations over 0.85 V/C ratio rather than widen SE Tacoma Street to meet standards.
- **SE Johnson Creek Blvd./SE 32nd Ave** - Add westbound right-turn pocket of 100 feet and signalize intersection.

Also, an ODOT restriping project scheduled for summer 2012 will change lane configurations on southbound SE McLoughlin Boulevard near the Tacoma Street interchange. It will shift the start of the third southbound travel lane so it begins at the Tacoma Street on-ramp rather than at Nehalem Street, allowing a dedicated lane for drivers entering from SE McLoughlin from the Tacoma Street ramp. The project will also add a raised pedestrian refuge island at the southbound Tacoma Street ramp.

A project to construct stairs near the UPRR tracks from the Springwater Trail down to the Tacoma Station area was not included as part of final design for the project. However, the City of Portland continues to pursue potential funding for this project element.

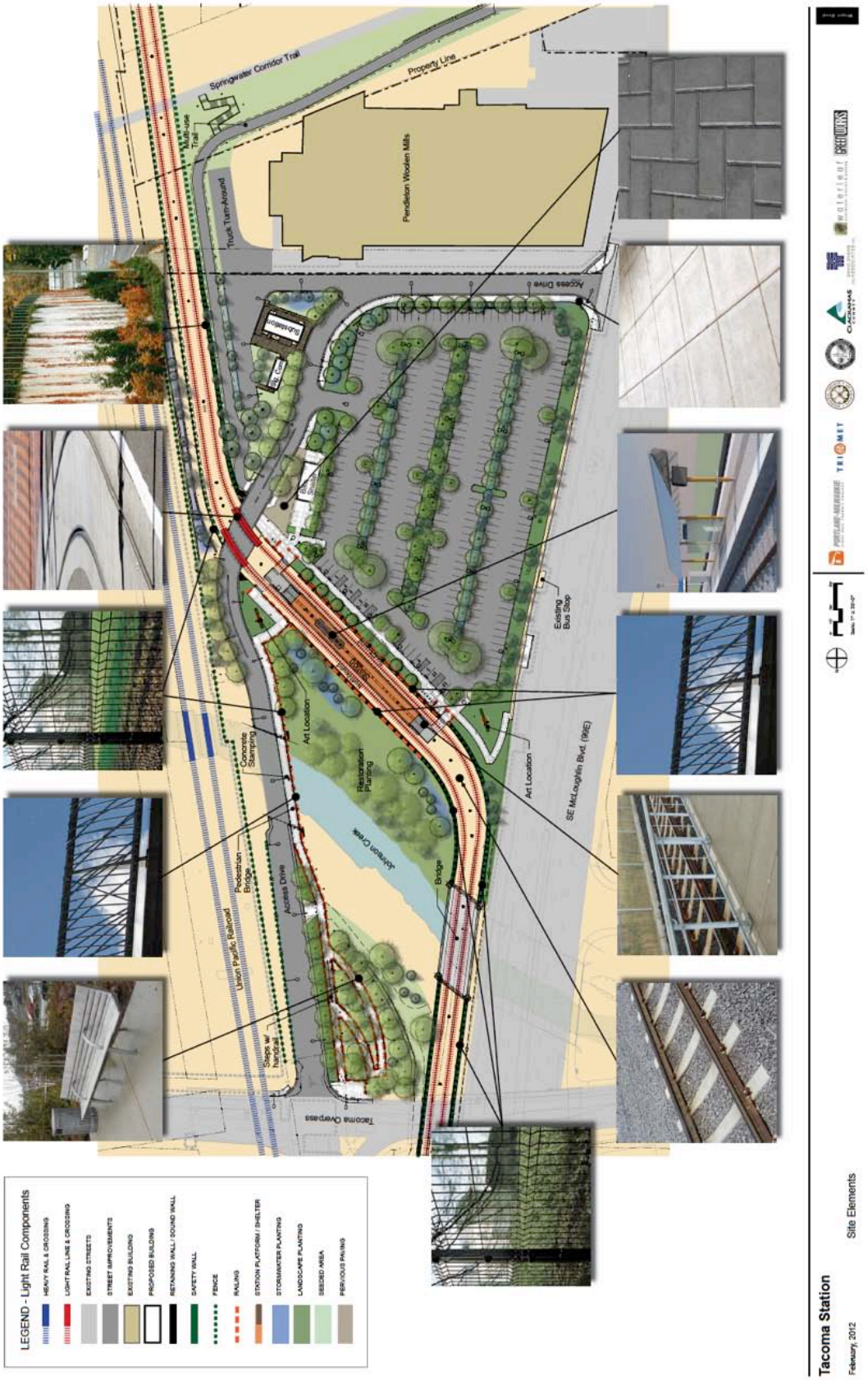

Figure 20: Tacoma Station Area Site Elements

Other projects, which are included in the financially constrained 2035 Regional Transportation Plan are shown in Table 6.

Table 6: Study Area RTP Financially Constrained Projects

Metro Project ID	Project/Program Name	Project Start Location (Identify starting point of project)	Project End Location (terminus of project)	Description	Estimated Cost ($2007)
10104	17th Ave. Trolley Trail Connector	17th Ave. & McLoughlin	17th Ave. & Ochoco	Construct sidewalks; improve bus stops; and correct gaps in bike lanes on 17th Ave. to provide connection between Trolley Trail and Springwater Corridor. Alternative alignment: multi-use path along Johnson Creek from Lava Drive to Ochoco.	$ 3,750,000
10112	Ochoco Sidewalks	19th Ave.	17th Ave.	Construct sidewalks, reconstruct bridge over Johnson Creek.	$ 1,500,000
11126	Milwaukie Town Center: Main/Harrison/21st	SE Scott and SE Main	SE Jackson and SE Main	Improvements include renovated block faces, two travel lanes, bike lanes, 15 foot sidewalks, planter strips, lighting, benches and ADA-compliant sidewalks.	$ 501,505
11174	29th/40th/42nd Bike Boulevard Intersection Improvements	Monroe	Springwater Trail	Construct street improvement from Springwater Trail to 28th; signage & striping improvements at minor intersections; major intersection improvements, such as bulbouts/medians at Harvey/32nd, Olsen/42nd, Harrison/40th; traffic calming along full corridor.	$ 2,742,000

Source: Metro 2035 Regional Transportation Plan

Note: Subsequent reports will include maps indicating the locations for these and/or other projects in the study area, and will note which are RTP projects.

Pedestrian Connectivity

Transit stations generally draw 75 to 85 percent of their pedestrian trips from an area 1/3 of a mile in all directions for the station entrances[11]. Improving connectivity within this catchment area provides potential connectivity for pedestrians. There are only a handful of residential properties within 1/3 of a mile of the station. However, outside this distance, there are several neighborhoods that could access the station from the existing sidewalk network. Figure 21 shows the current and planned provision of sidewalks within approximately 1,000 feet and 500 feet walking distances from the transit stations in this sub area, and Table 7 lists the identified pedestrian facility needs. The sidewalk network is well developed in the station vicinity. However, due to the presence of SE McLoughlin Boulevard to the west of the station and railroad tracks to the east, pedestrian access from the surrounding neighborhoods to either station is limited to SE Tacoma Street and the Springwater multi-use trail. Pedestrian facilities along the Tacoma Street access road currently do not exist, although sidewalks along this ramp are planned as part of the project. Alternately, ramp access to the station is available via the northern leg of this intersection and SE McLoughlin Boulevard northbound on/off-ramp.

[11] Information derived from *Mode of Access and Catchment Areas of Rail Transit*, prepared for the Transit Cooperative Research Program, Transportation Research board and the National Research Council, March 1996. The 1/3 mile radius from rail transit Stations would capture an 85% market share of the area for walking. That corresponds to 85% of the rail transit users at each Station would have walked to the transit station from 1/3 of a mile or less.

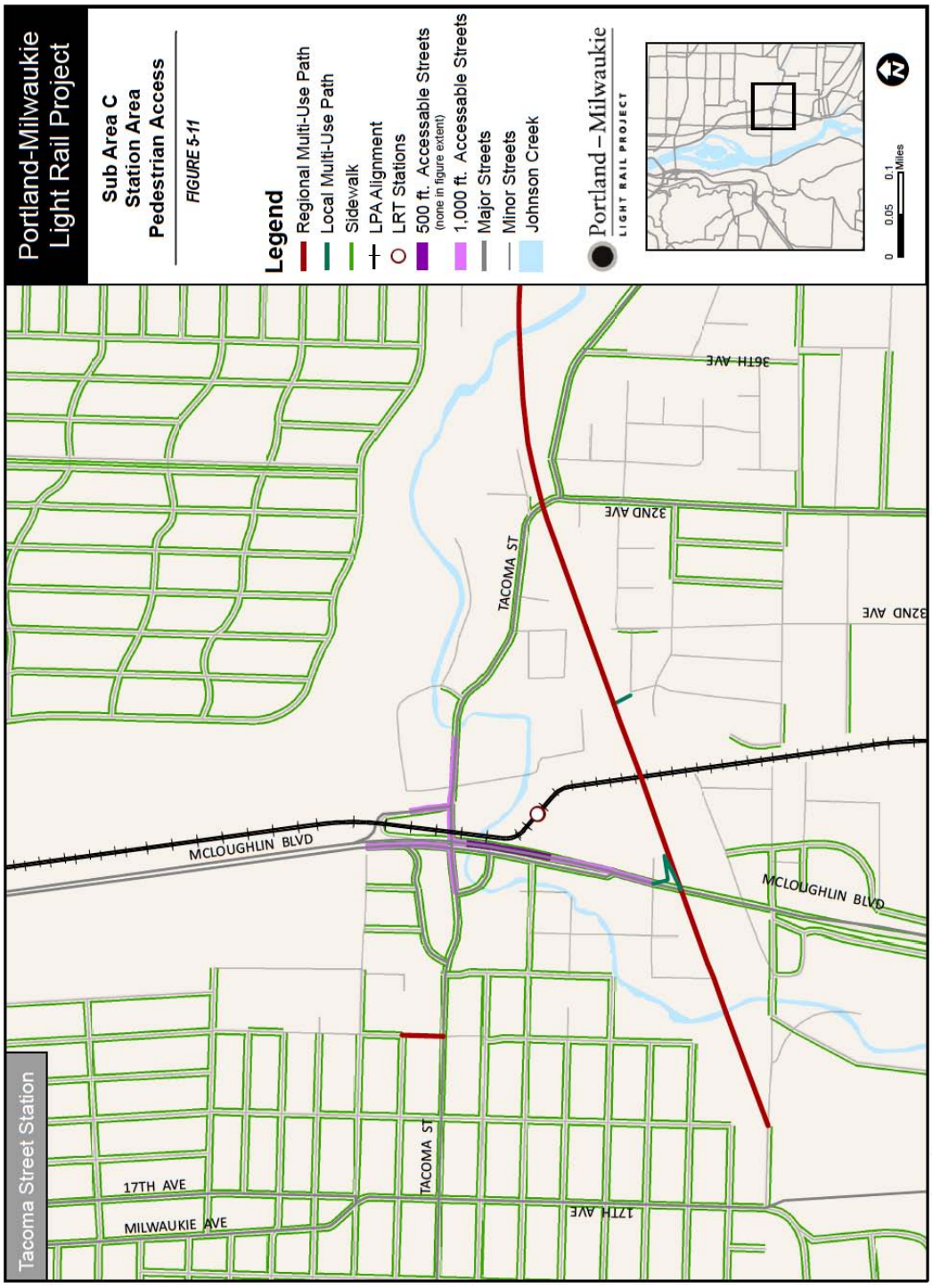

Figure 21: Station Area Pedestrian Access

Table 7: Study Area Pedestrian Access Needs

Station	Access Route	Access Need
Tacoma Street Station	SE Tacoma Street	Sidewalks available
	SE McLoughlin Boulevard	Sidewalks available
	Station Access Road	Between SE Tacoma Street and the Station
	Springwater multi-use trail	Sidewalks available

SOURCE: ***DKS*** *Associates*

Enhanced transit and employment in the study area will increase the volume of pedestrian traffic. Sidewalks are needed to fill the gaps in the network on 17th Avenue, Ochoco Street, McBrod Avenue, and Milport Road, as well as any new roadways that are constructed as part of the redevelopment. Pedestrian connections to the surrounding residential neighborhoods should be strengthened, and north-south connections between areas south of the Springwater Trail and the light rail station should be prioritized.

The most difficult roadway for pedestrians to safely cross is McLoughlin Boulevard, with high volumes of vehicles travelling at high speeds. It is also a very long crossing that requires pedestrians to cross three to five lanes in each direction. A shared-use overcrossing for the Springwater Trail provides a more comfortable, safer location for pedestrians wishing to cross McLoughlin Boulevard near Ochoco Street.

Bicycle Connectivity

For this investigation, approximately a 1/3 mile access area surrounding the proposed station was analyzed for bicycle access.

SE Tacoma Street has bike lanes within the sub area, except for a short section east of SE 17th Avenue and second section east of SE McLoughlin Boulevard, where gaps exist. SE 17th Avenue has no bike lanes within the City of Portland. Within the City of Milwaukie, 17th Avenue has bike lanes, but a few gaps are present. The City of Milwaukie's TSP has proposed to build bike lanes along their section of SE 17th Avenue[12], and the City was awarded an MTIP grant in 2012 to design and construct the project. SE Main Street in the study area has bike lanes between downtown Milwaukie on the south and SE Moores Street, near the Springwater Trail, on the north. A connection between the station and the bike lanes on SE Main Street would be needed for this to be a viable bicycle access route. The current connection between SE Main Street and the Springwater Trail features a tight

[12] City of Milwaukie Transportation System Plan, 2007 Update, Figure 6-2, December, 2007

switchback that is difficult to maneuver, and it relies on the east sidewalk of McLoughlin Boulevard between SE Moores Street and the trail access. The sightlines for cyclists in this section are obstructed by the fence and building located between the trail and Moores Street.

Utilizing existing bike facilities, the Tacoma Station would be serviced by bicycle lanes on SE Tacoma Street/SE Johnson Creek Boulevard, and by the Springwater multi-use trail. The park and ride access roadway to the Tacoma Station from SE Tacoma Street (to the south) would provide direct access to the station as a shared bicycle and motor vehicle facility. Station access could also be provided along SE Main Street.

Other Bicycle Considerations

As part of the PMLR project, the Tacoma Station will include a 112-space bike-and-ride facility. This facility will provide secure parking, and is expected to take advantage of the Springwater Trail connection.

Perpendicular crossing of LRT tracks is an important safety issue for bicyclists, so that bike wheels do not get caught in the tracks, and is necessary for proper sight distance. This is key to the Tacoma Street Station, since bicyclists entering the station area will need to cross over the tracks to access the station platform.

Transit Access

A detailed description on station patronage and overall transit usage for the sub area can be found in the South Corridor Supplemental Draft Environmental Impact Statement. The introduction of light rail transit to the area has the potential to reduce motor vehicle trips, as discussed in the Mode Split section in this memorandum. However, coupled with the introduction of park-and-ride facilities at the Tacoma Street Station, the nearby area directly accessing the proposed park-and-ride site could see an increase in motor vehicle trips.

Various transit routes currently service the Tacoma Street Station study area. With construction of light rail and the Tacoma Station, bus service and routing will change significantly. Route 70 is planned to continue operation on SE 17th Avenue, but routes 31, 32, and 33 will no longer serve the area.[13]

Freight

The study area is an important hub of freight activity. Both redevelopment scenarios include mostly business/industrial use and McLoughlin Boulevard will continue to serve as a major truck route through the area. Freight routes and truck patterns in the future are expected to stay the same as today. In addition to truck traffic, the railroad lines and spurs will continue to operate. It is also reasonable to assume that freight movements will continue to operate

[13] *FEIS* 2030 Light Rail Alternative Transit Network

at off-peak times and not have major impacts on traffic operations during the evening peak hour.[14]

Future Operations

Three performance measure criteria were established to evaluate motor vehicle operations. These criteria focused on intersection operations related to delay, level of service (LOS) and volume-to-capacity ratio (v/c), as well as queuing and safety (warrants and access spacing). Each of these criteria is evaluated separately to determine if impacts occur for a transit alternative compared to those found in the No-Build conditions.

Intersection Operations

Future volumes were forecasted for the project's planning 2030 horizon year. The forecasted volume sets include the 2030 No-Build, 2008 LPA, LPA Phasing Option and MOS (Minimum Operable Segment) alternatives, and are displayed in Figures 11-14. These traffic volumes were developed from the Metro travel demand model. The 2008 LPA and LPA Phasing Option have very similar volume forecasts with the exception of intersections within close proximity of the park-and-ride. For that reason, intersection volumes were only forecasted for the LPA Phasing Option for those intersections where the impact of the park-and-ride would be most notable in comparison to the 2008 LPA. It is expected that operations and/or impacts would be similar to the 2008 LPA under the LPA Phasing Option for those intersections not forecasted.[15] Note that the northbound approach configuration for the SE Tacoma/99E NB Ramps intersection in the following figures should be a shared left turn/through lane and a right turn lane, and the eastbound approach should be a left turn lane, a through lane, and a right-turn lane.

[14] *Milwaukie North Industrial Land Use and Transportation Plan,* 2003.
[15] For a more detailed description of the forecasting methodology please refer to Chapter 2 of the *Portland-Milwaukie Light Rail Project Final Environmental Impact Statement* (2010).

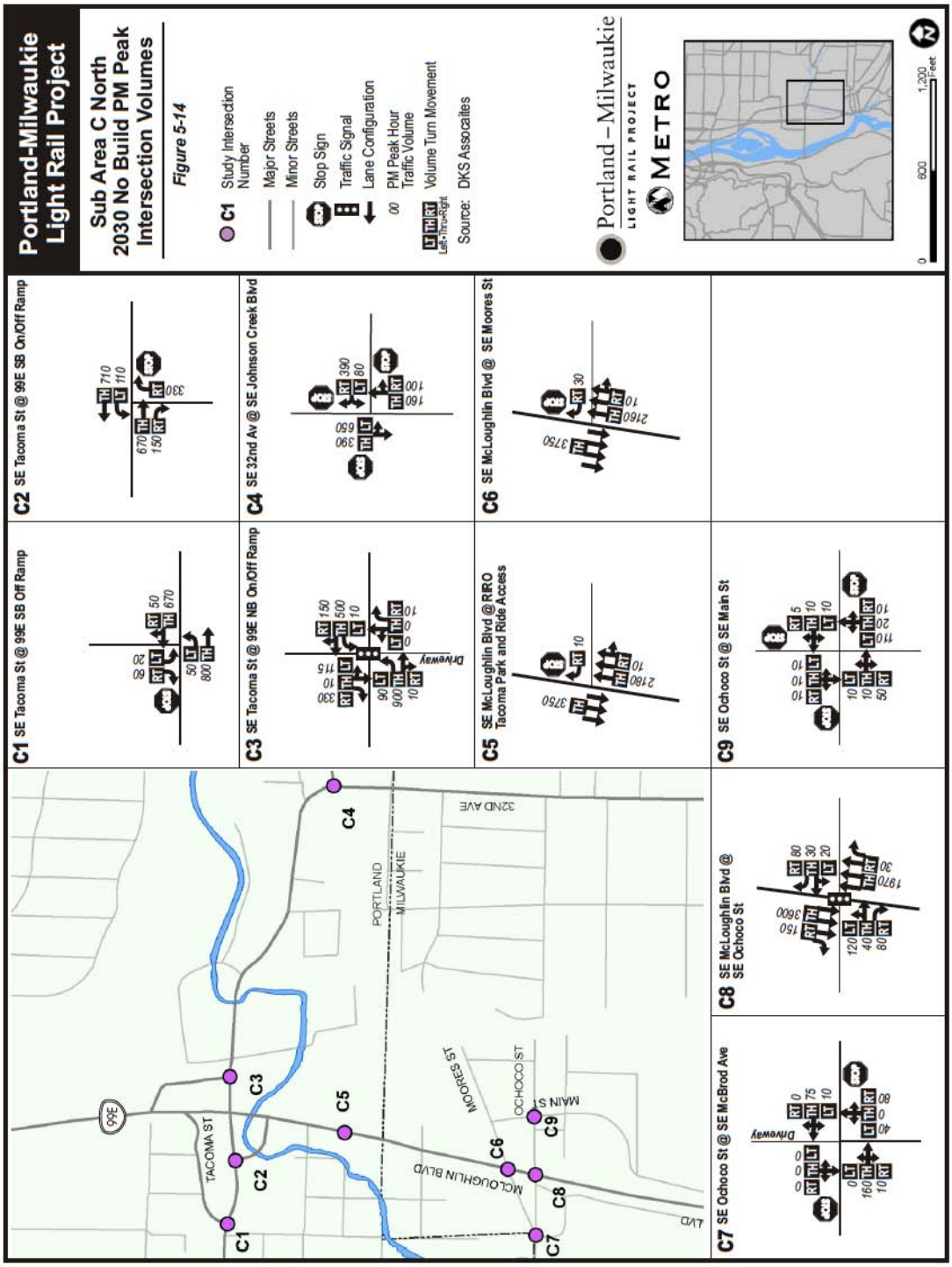

Figure 22: 2030 No-Build Motor Vehicle Volumes (Sub Area C North) (Note: the configuration shown for intersection C3 is in error. The eastbound approach should have separate left turn, through, and right turn lanes)

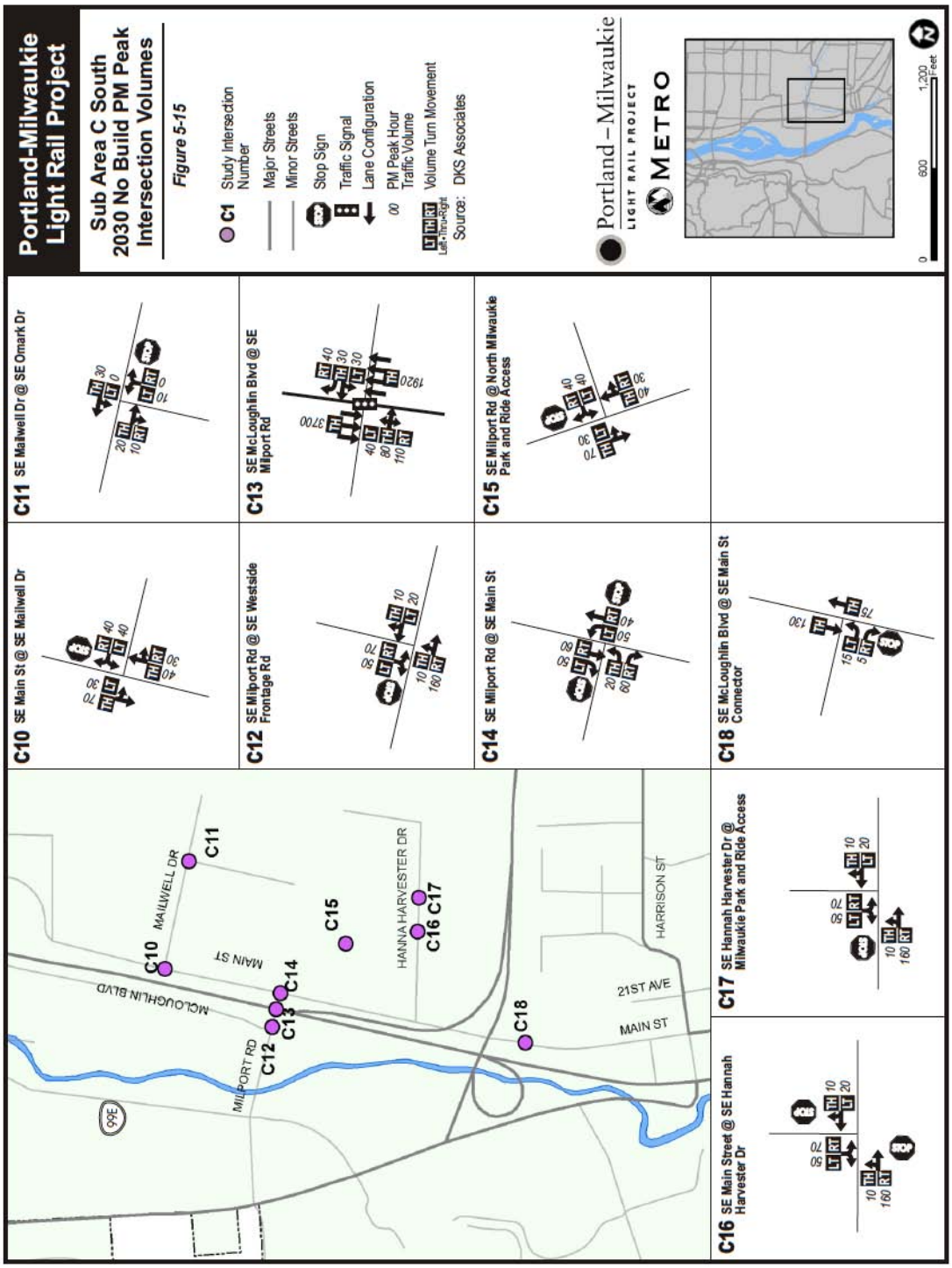

Figure 23: 2030 No-Build Motor Vehicle Volumes (Sub Area C South)

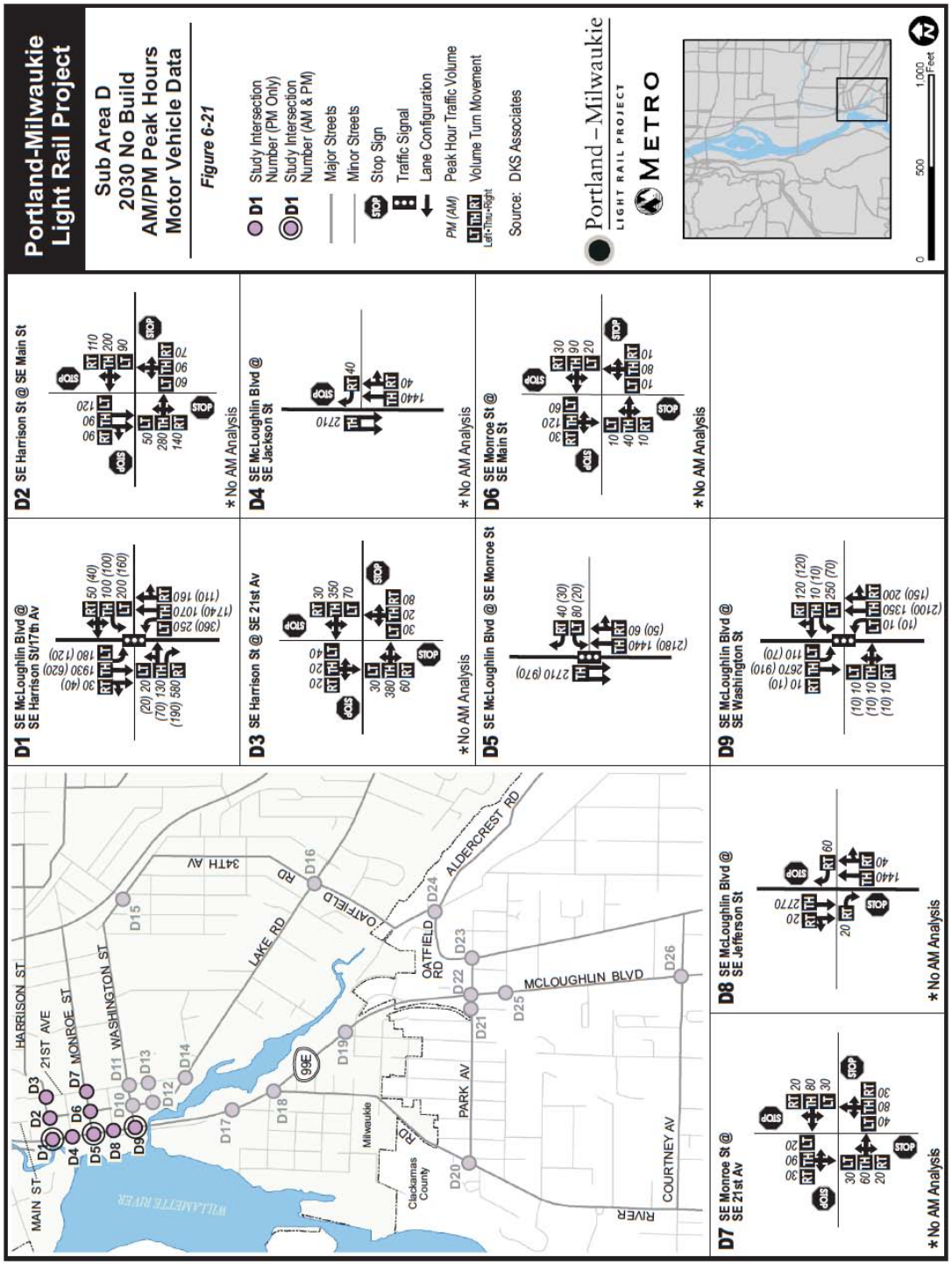

Figure 24: 2030 No-Build Motor Vehicle Volumes (Sub Area D)

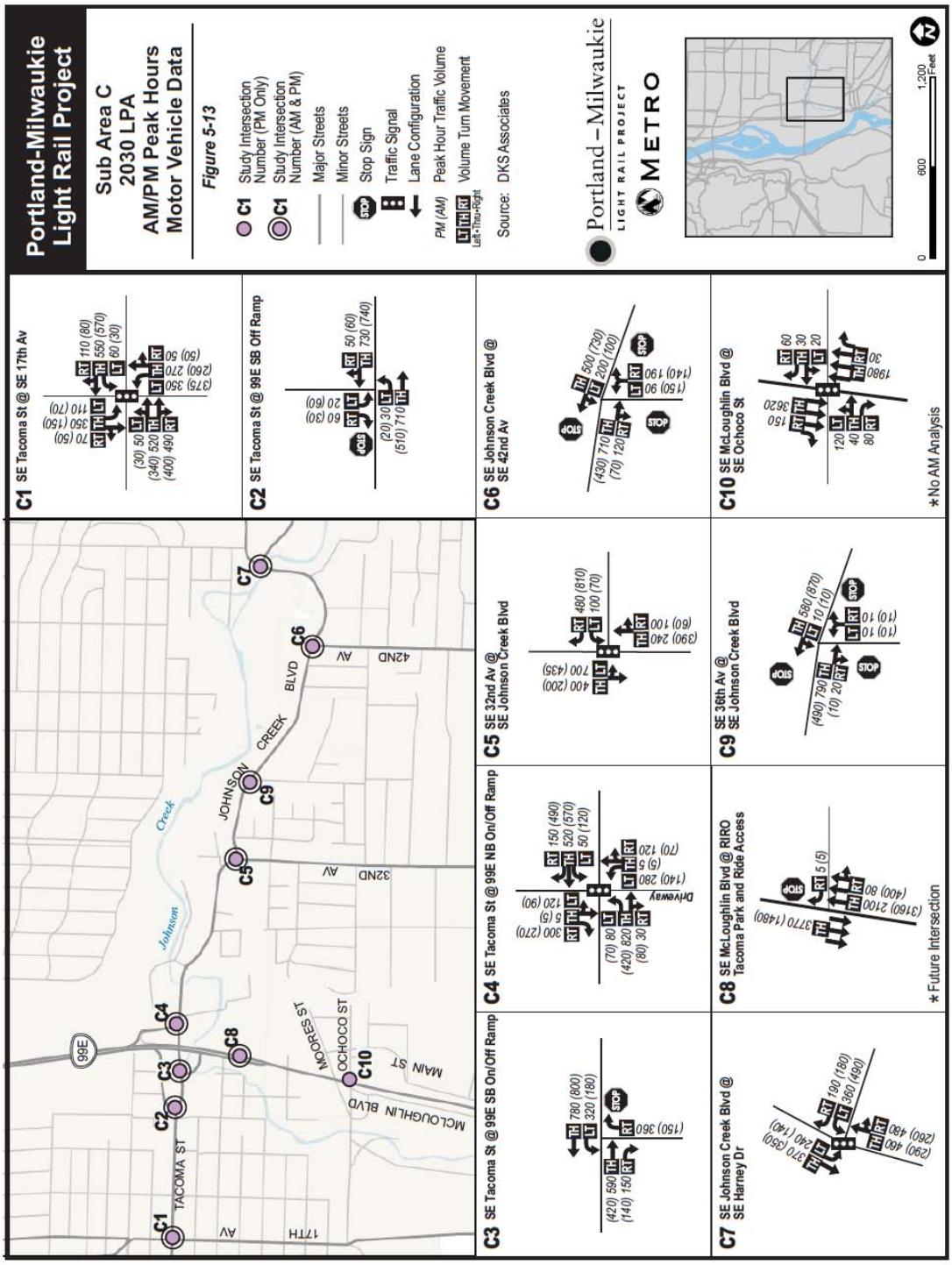

Figure 25: 2030 LPA Motor Vehicle Volumes (Sub Area C) (Note: the configuration shown for intersection C3 is in error. The northbound approach should have a shared left turn/through lane and a right turn lane, and the eastbound approach should have separate left turn, through, and right turn lanes)

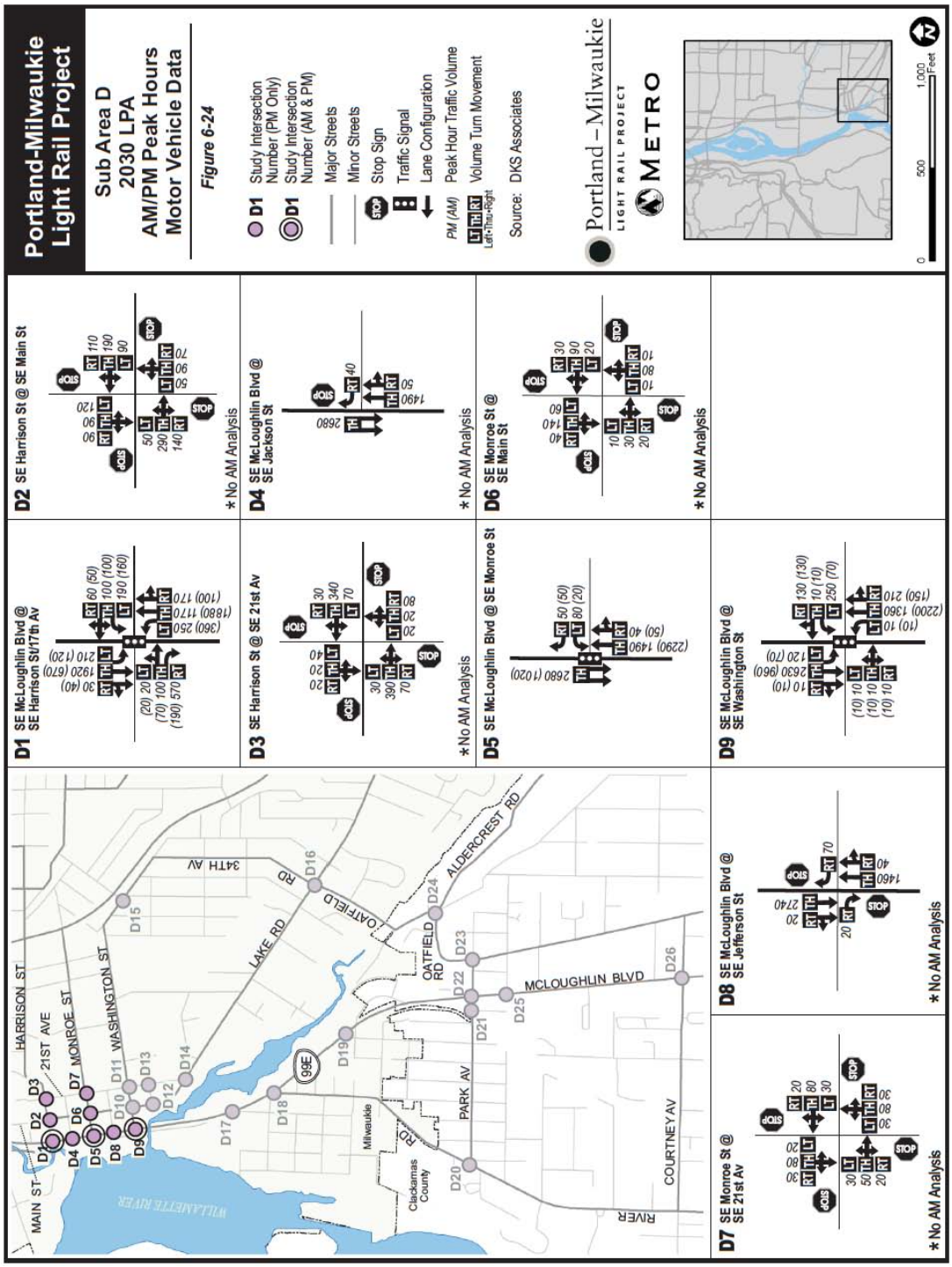

Figure 26: 2030 LPA Motor Vehicle Volumes (Sub Area D)

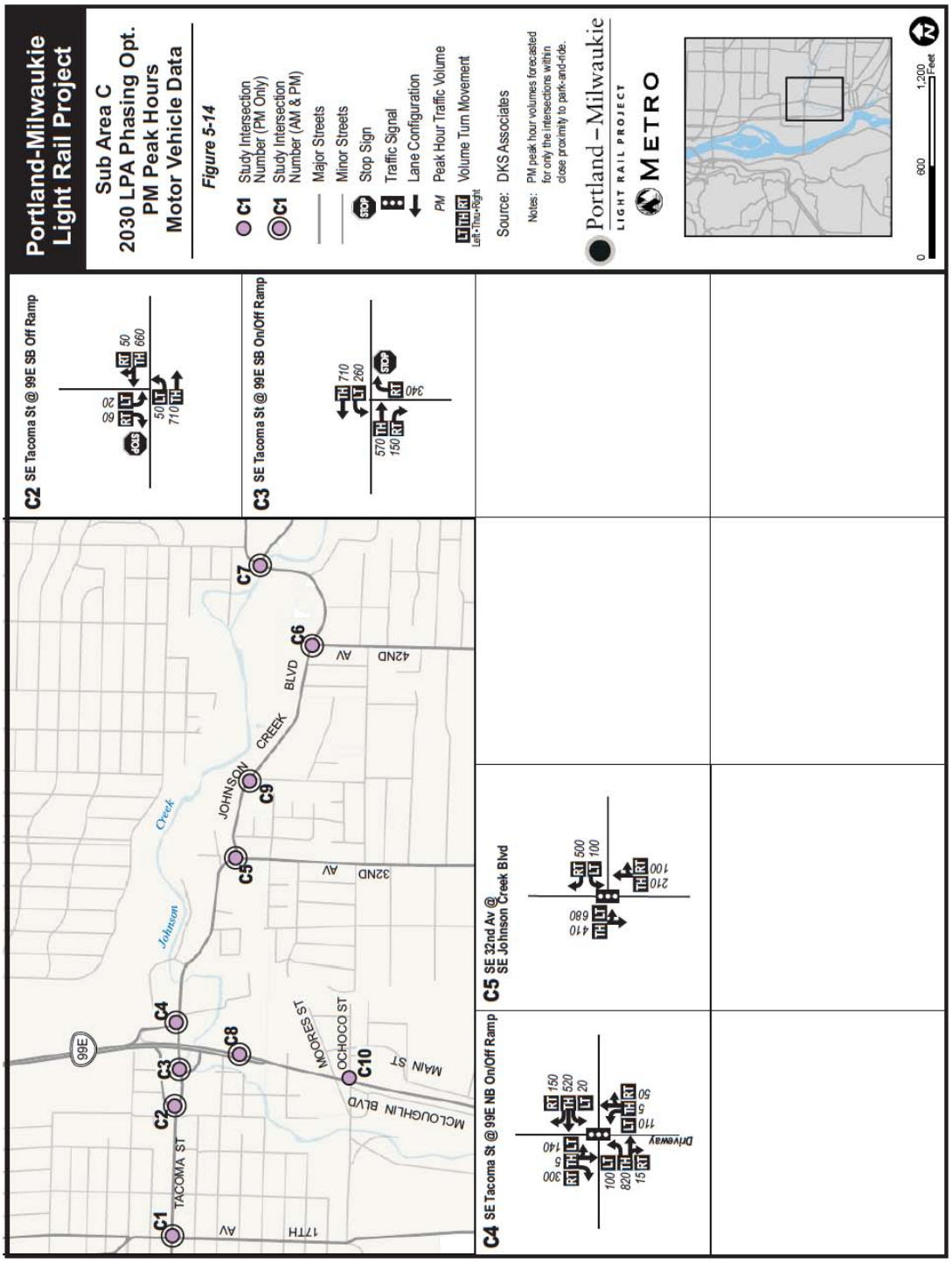

Figure 27: 2030 LPA Phasing Option Motor Vehicle Volumes (Note: the configuration shown for intersection C3 is in error. The northbound approach should have a shared left turn/through lane and a right turn lane, and the eastbound approach should have separate left turn, through, and right turn lanes)

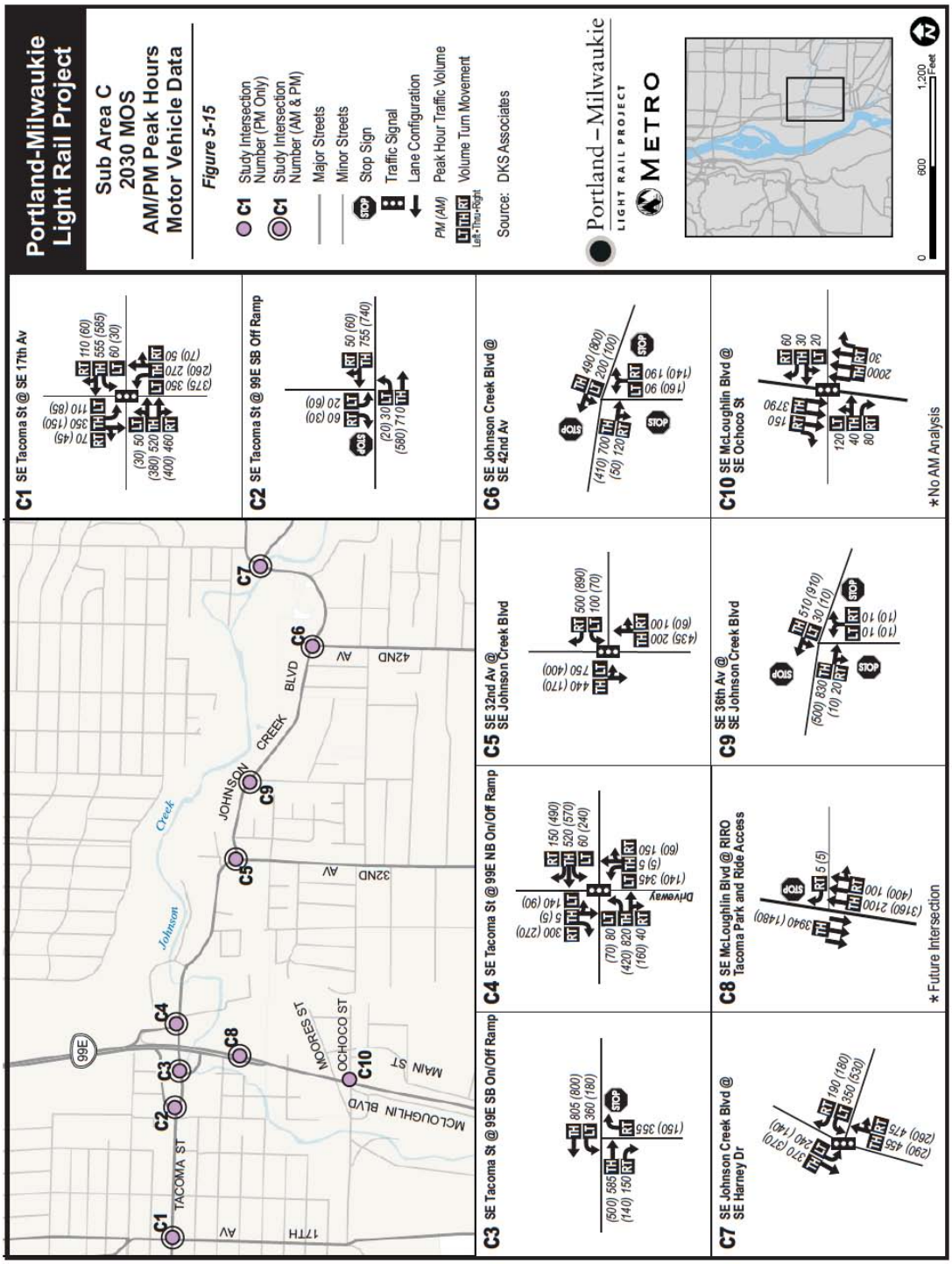

Figure 28: 2030 MOS Motor Vehicle Volumes (Sub Area C) (Note: the configuration shown for intersection C3 is in error. The northbound approach should have a shared left turn/through lane and a right turn lane, and the eastbound approach should have separate left turn, through, and right turn lanes)

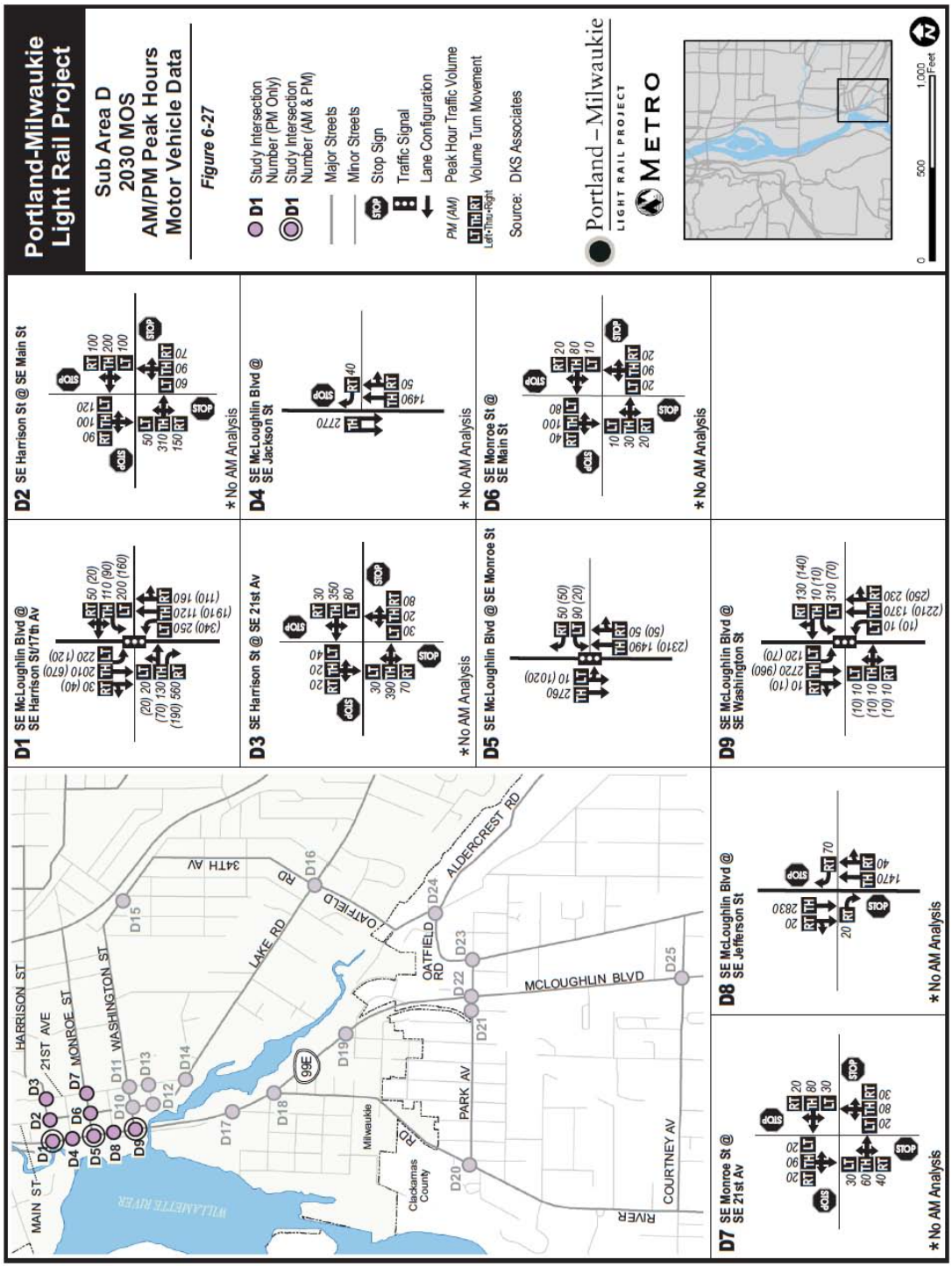

Figure 29: 2030 MOS Motor Vehicle Volumes (Sub Area D)

Utilizing the future forecasts developed for the study area for each transit alternative, the transportation operations have been summarized for all sub area intersections in Table 8 below. These are unmitigated operations, assuming all existing signal timing, phasing and geometry has been retained.

Under the baseline, three intersections would not operate within jurisdictional standards during the PM peak hour. Of these three intersections, only one, SE Johnson Creek Boulevard/SE 32nd Avenue, would require additional mitigation to allow for adequate operations during the AM peak hour. Another intersection, SE Tacoma Street/SE McLoughlin Boulevard southbound off-ramp, meets standards in the PM peak hour but not the AM peak hour. These intersections are discussed below.

SE Johnson Creek Boulevard/SE 32nd Avenue

Based on the future forecasts, the intersection of SE Johnson Creek Boulevard/SE 32nd Avenue (unsignalized) would not operate within jurisdictional standards during both the AM and PM peak hours. The intersection currently meets signal warrants and would continue to meet signal warrants in the future. Without construction of PMLR, there is no funding source identified for the construction of a signal by the city of Portland, so the No Build alternative assumes there will be no signal at this location in the future. Signalization of this intersection, along with the construction of a westbound right turn lane, would allow for it to meet jurisdictional operational requirements.

SE Tacoma Street/SE McLoughlin Boulevard southbound off-ramp

Based on the future forecasts, the unsignalized intersection of SE Tacoma Street/SE McLoughlin Boulevard southbound off-ramp would not operate within jurisdictional standards during the AM peak hour for the LPA, LPA Phasing Option16 and MOS alternatives. This intersection would not meet signal warrants; however, restriping SE Tacoma Street to allow for dual stage left turns onto the street would allow for adequate operations.

Alternately, constructing a signal at this intersection would allow it to operate within jurisdictional standards. This intersection, however, would not meet signal warrants with the current or projected traffic volume. Modifying the interchange to divert the southbound to eastbound traffic that currently uses the other Tacoma Street ramp would allow this intersection to meet signal preliminary warrants. A third option would be to do nothing and seek a design exception to allow this intersection to operate at a v/c ratio greater than 0.85.

[16] Assumed similar operations for the AM as the 2008 LPA Alternative.

Table 8: 2030 PM Peak Hour Intersection Operations

Jurisdiction / Intersection	Jurisdictional Standard	2008 LPA	LPA Phasing Option	Meets Standard?
ODOT (Standard = demand to capacity (d/c) Ratio)				
C2-SE Tacoma St/SE McLoughlin Blvd SB off-ramp	0.85	0.29	0.26	Yes
C3-SE Tacoma St/SE McLoughlin Blvd SB on-ramp	0.85	0.73	0.73	Yes
C4-SE Tacoma St/SE McLoughlin Blvd NB on/off ramp	0.85	0.86	0.72	No
C11-SE McLoughlin Blvd/SE Moores St	1.10	0.07	*	Yes
D1-SE McLoughlin Blvd/SE Harrison	1.10	1.15	*	No
C10-SE McLoughlin Blvd/SE Ochoco St	1.10	1.00	*	Yes
City of Portland (Standard = Level of Service)				
C5-SE 32nd Ave/SE Johnson Creek Blvd	E	F	F	No
City of Milwaukie (Standard = Level of Service)				
SE Ochoco/Frontage Road west of OR 99E	D	A/B	*	Yes
SE Ochoco/SE Main Street	D	A	*	Yes
SE Main Street/SE Mailwell Dr	D	A/B	*	Yes
SE Milport Road/Frontage Road west of 99E	D	A/B	*	Yes
SE Main St/SE Milport Rd (LPA)	D	A/B	*	Yes
SE Harrison St/SE Main St	D	E	*	Yes
SE Harrison St/SE 21st Ave	D	C	*	Yes

SOURCE: ***DKS*** *Associates*

Note: Bold indicates an intersection does not meet jurisdictional standard

V/C = Volume to Capacity ratio
LOS = Level of Service
Delay = Average delay per vehicle

Indicates an intersection that meets project mitigation criteria.

1. Indicates a new signalized intersection.

* Due to similar volume forecasts as 2008 LPA, similar or better operations assumed under LPA Phasing Option as the 2008 LPA Alternative.

SE Tacoma Street/SE McLoughlin Boulevard northbound on/off-ramp

Under the 2008 LPA and MOS alternatives, this intersection could be improved with restriping, as well as modifying the signal including timing adjustments. Operationally, the most improvement would come from restriping the northern leg of the intersection to have separate left, through, and right turn lanes. However, due to the limiting size of the intersection, restriping could likely only include a combined southbound left/through lane, and a right turn lane. Signal modification to allow for protected/permissive left turns from Tacoma Street onto the ramp and into the park-and-ride would also improve operations. Finally, signal timing adjustments to reflect increased volumes related to background traffic and the park-and-ride garage would further improve the operations at this intersection. Alternately, a design exception could be sought to allow the intersection to operate with a v/c ratio greater than 0.85.

Queuing Analysis

All study area intersections were evaluated for queuing to determine if transit alternatives create queues that would block adjacent signalized intersections compared to future No-Build conditions.[17] The 95th percentile queue was analyzed to determine whether queues spill back beyond the next signalized intersection upstream, creating a potential safety impact. To help predict this type of queuing additional analysis tools and measures of effectiveness were also used to help verify results. Figure 30 and Figure 31 summarize the queuing analysis results for the study area. Select intersections were chosen for queuing analysis for the LPA Phasing Option because at most intersections the volumes were similar to the 2008 LPA Alternative and would therefore have similar queues. However, for the intersections near the park-and-ride, where there was a noticeable difference in volumes forecasted, a 95th percentile queuing analysis was done for the LPA Phasing Option. All other intersection locations were assumed to have similar queuing results as the 2008 LPA Alternative.

[17] PMLR FEIS queuing analysis used a deterministic method, rather than simulation, for estimating queue lengths. Simulation performed for the PMLR design phase indicated that queues extending from the SE Johnson Creek Boulevard/SE 32nd Avenue intersection may spill back to the main line of SE McLoughlin Boulevard.

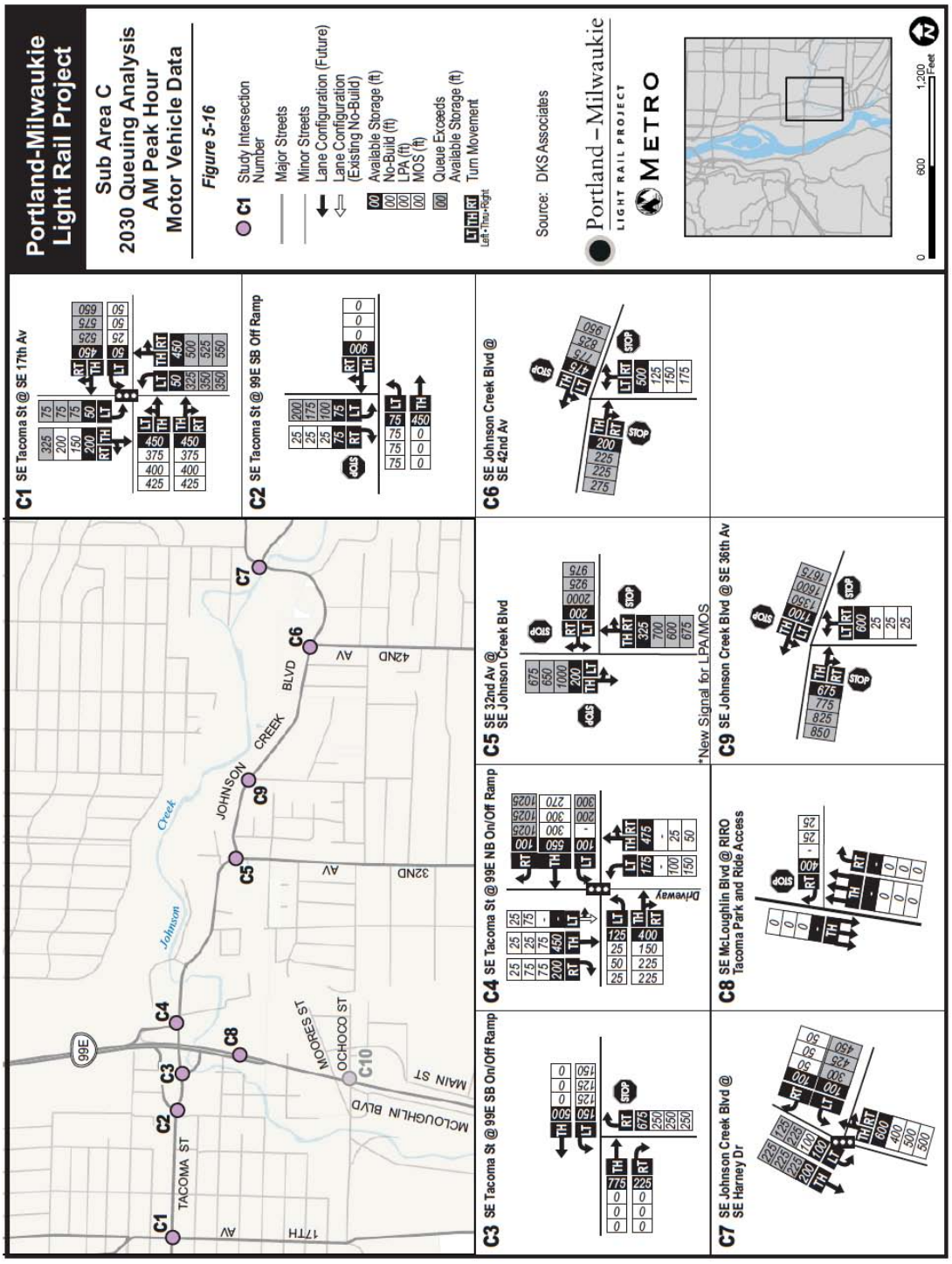

Figure 30: 2030 AM Peak Hour Queuing (Sub Area C)

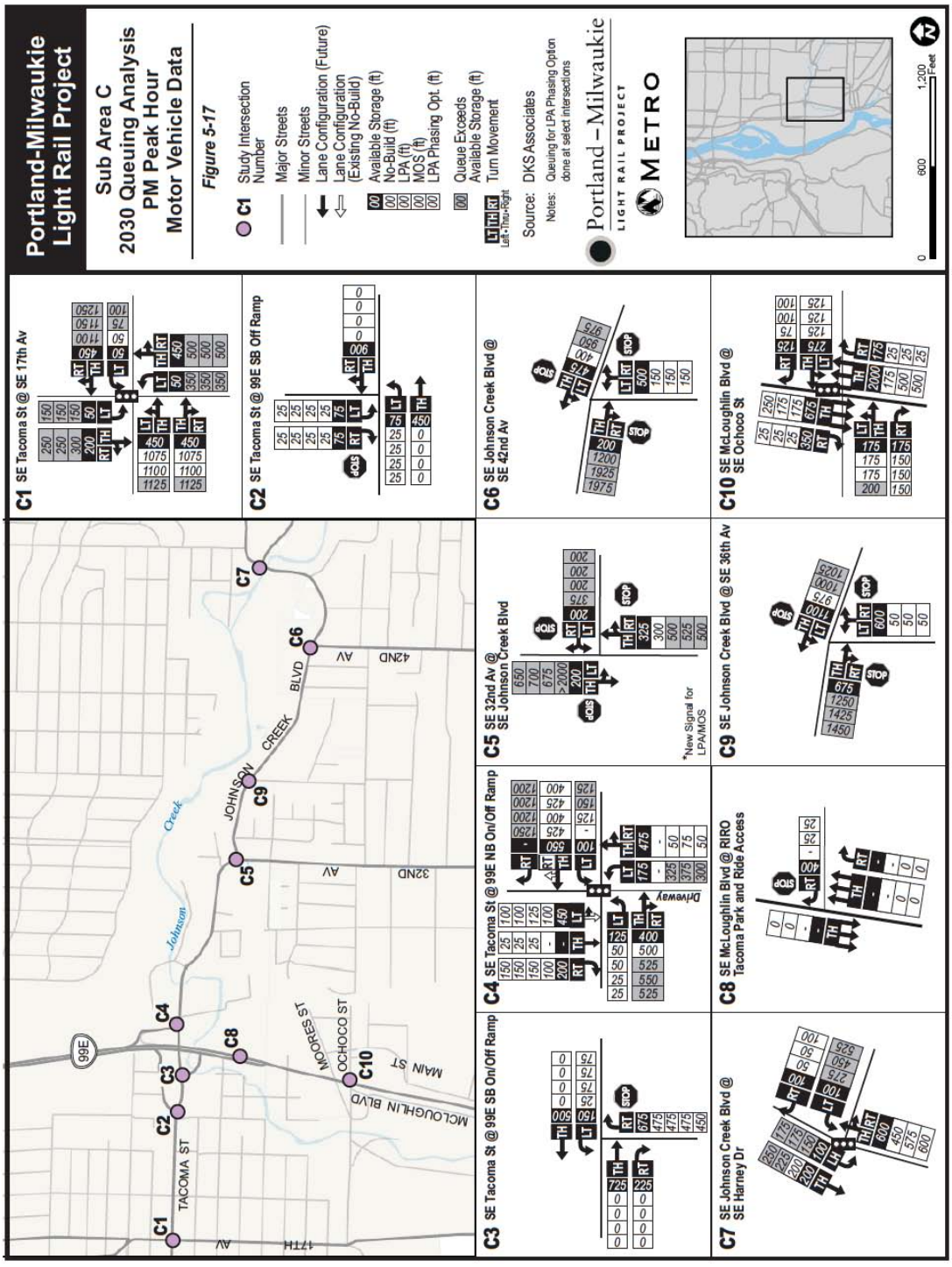

Figure 31: 2030 PM Peak Hour Queuing (Sub Area C)

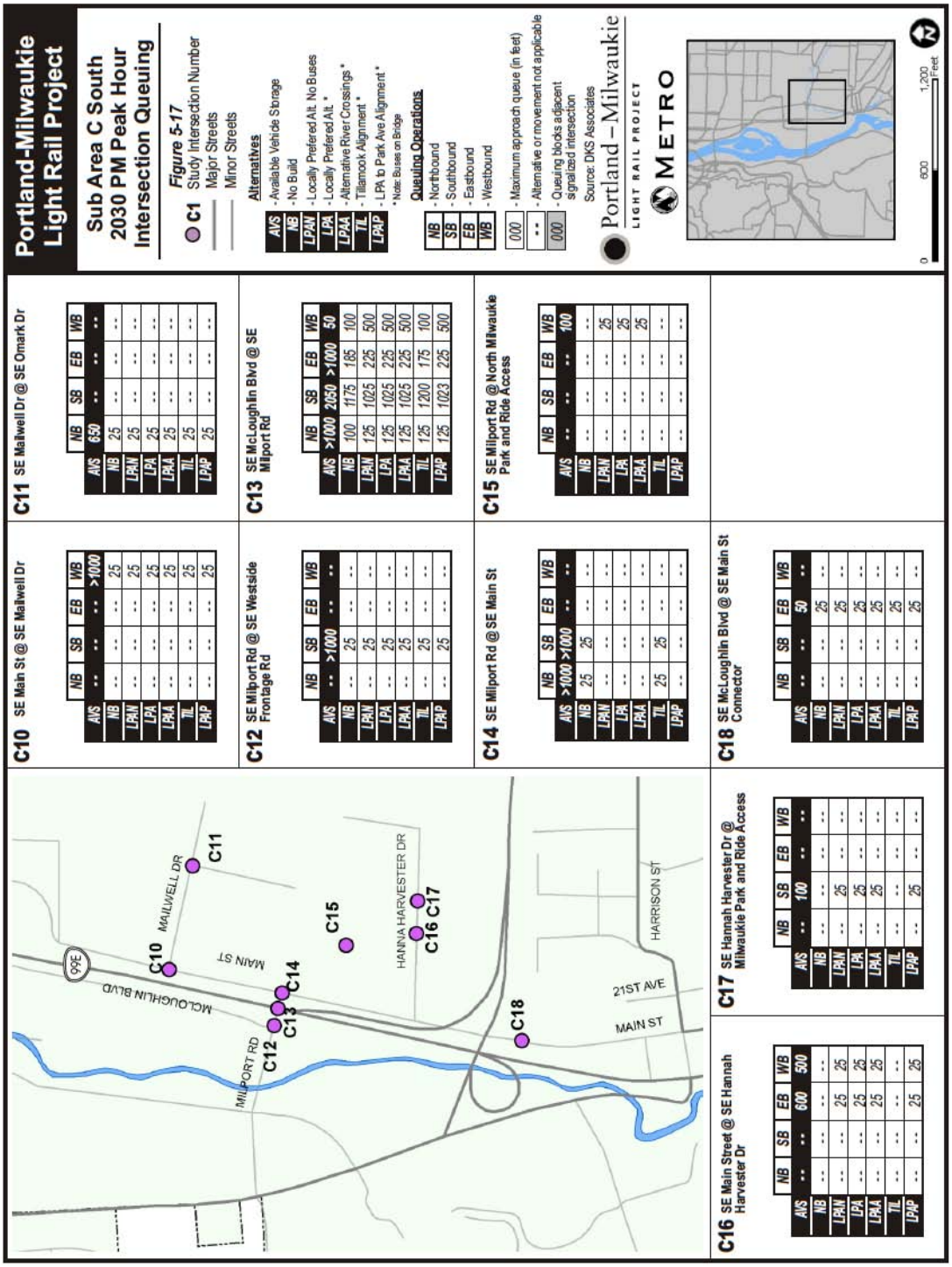

Figure 32: 2030 PM Peak Hour Queuing (Sub Area C South)

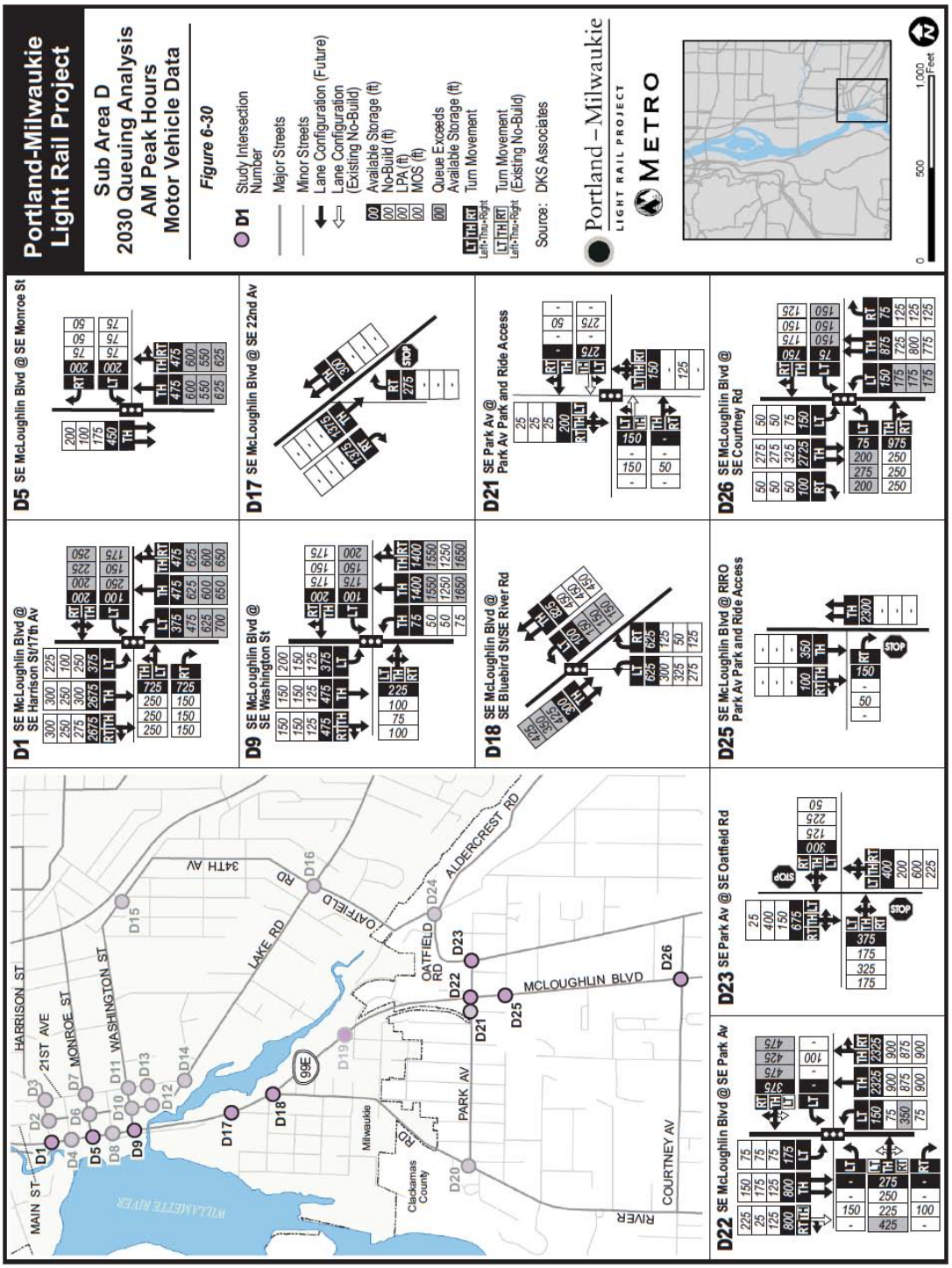

Figure 33: 2030 AM Peak Hour Queuing (Sub Area D)

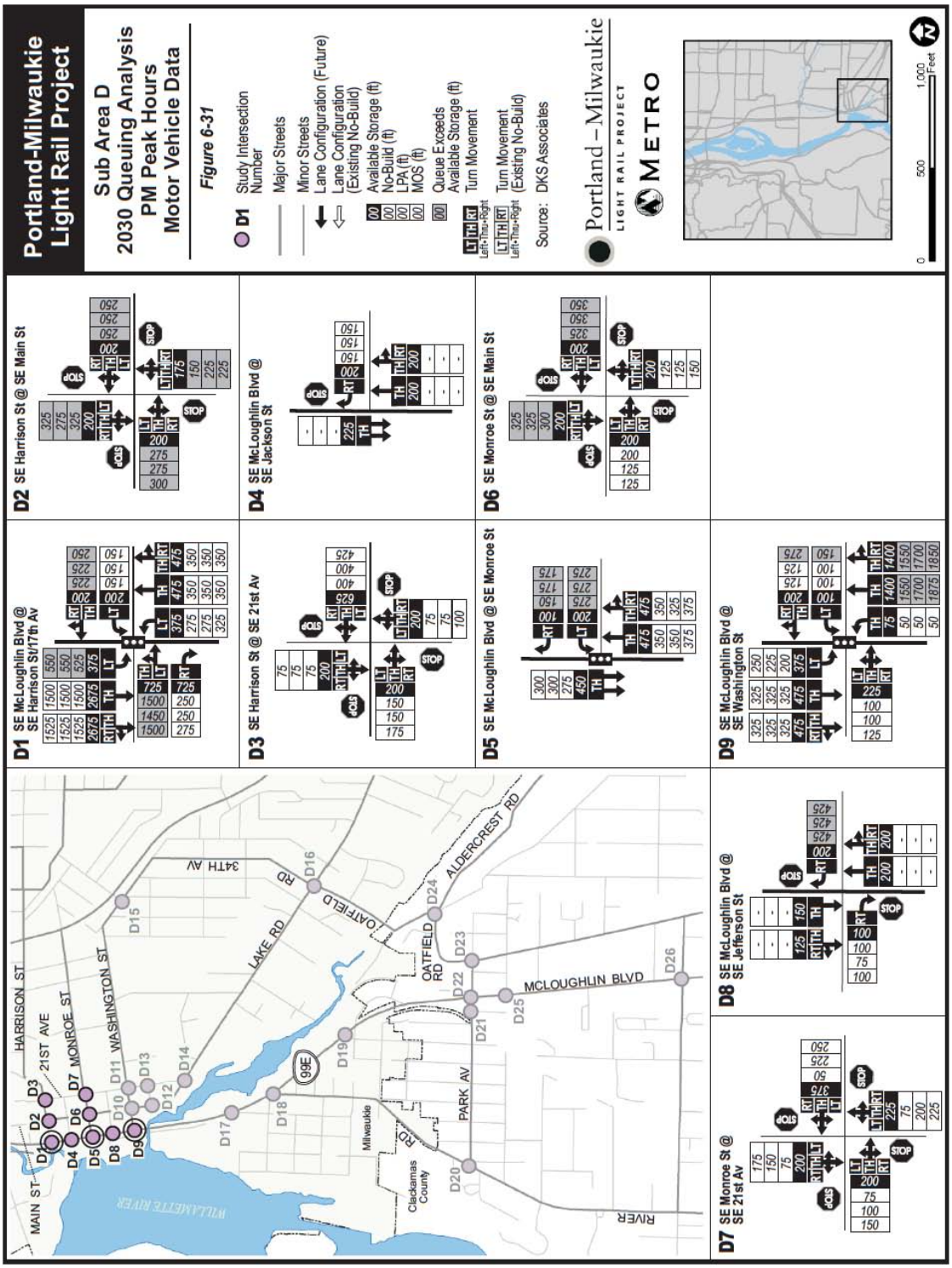

Figure 34: 2030 PM Peak Hour Queuing (Sub Area D)

Key Queuing Locations

SE Johnson Creek Boulevard Corridor

In the No-Build alternative there would be heavy westbound traffic volume demand in the AM peak hour and heavy eastbound traffic volume demand in the PM peak hour. The use of all-way stop control intersections restricts the flow of vehicles along SE Johnson Creek Boulevard, and is the source of long queues. The improvements listed in the above section, if implemented, would improve queuing at the study intersections.

LPA, LPA Phasing Option and MOS Alternatives

Under the 2008 LPA, LPA Phasing Option and MOS alternative the available storage would be exceeded at seven of the study intersections.

- SE Tacoma Street/SE 17th Avenue
- SE Tacoma Street/SE McLoughlin Boulevard Southbound off-ramp
- SE Tacoma Street/SE McLoughlin Boulevard Northbound off-ramp
- SE Johnson Creek Boulevard/SE 32nd Avenue
- SE Johnson Creek Boulevard/SE 36th Avenue
- SE Johnson Creek Boulevard/SE 42nd Avenue
- SE Johnson Creek Boulevard/SE Harney Drive

The intersections listed above would continue to have queues that exceed the available storage. Queuing along SE Johnson Creek Boulevard would increase due to the addition of park-and-ride traffic and remain long during both the AM and PM peak hours. The addition of the park-and-ride traffic would require additional mitigation at three intersections, discussed below.

SE Tacoma Street/SE McLoughlin Boulevard Northbound off-ramp

The addition of the park-and-ride traffic entering the station at this intersection causes the westbound left-turn queue to exceed the available storage. Restriping would allow for adequate queue storage. Queues for the eastbound direction would extend back past the SE Tacoma Street/Se McLoughlin Boulevard southbound on/off-ramp intersection and cause queues to further propagate onto SE McLoughlin Boulevard. Signal timing adjustments would have the benefit of minimizing queue spillback over the adjacent intersections. However, improvements to all of the study intersections along SE Johnson Creek Boulevard corridor are needed to help reduce the queue build at this intersection and along the corridor.

SE Johnson Creek Boulevard/SE 32nd Avenue

With the addition of park-and-ride trips in the 2008 LPA, LPA Phasing Option and MOS alternatives, eastbound queues from the intersection of SE Johnson Creek Boulevard/SE 32nd Avenue would spill over the SE McLoughlin Boulevard/SE Tacoma Street interchange.

The cascading effect of these queues would result in stopped vehicles on the ramps and mainline of SE McLoughlin Boulevard and represent a serious safety hazard to the roadway users. Signalization and the construction of a westbound right turn lane at the intersection of SE Johnson Creek Boulevard/SE 32nd Avenue would improve the queuing, so that the eastbound queues no longer block the SE McLoughlin Boulevard/SE Tacoma Street interchange.

SE Johnson Creek Boulevard/SE 36th Avenue

With the addition of park-and-ride trips in the 2008 LPA, LPA Phasing Option and MOS alternatives, eastbound queues from the intersection of SE Johnson Creek Boulevard/SE 36th Avenue would spill over the newly signalized intersection of SE Johnson Creek Boulevard/SE 32nd Avenue. The installation of an actuated-coordinated signal at this location would improve queuing and operations along SE Johnson Creek Boulevard. This signal would need to be coordinated with the proposed signal at SE Johnson Creek Boulevard/SE 32nd Avenue for the benefit of signalization to be recognized. However, since future motor vehicle volumes are not great enough to warrant signalization, a design exception would need to be sought for the installation. Alternately, a design exception could be sought for the option of leaving the intersection under all-way stop control as it exists today.

Freight Impacts

The purpose of analyzing potential freight impacts and constraints is to quantify the possible increase in delay or out of direction travel on designated freight routes or near industrial areas.

Increased delay under the No-Build and unmitigated build alternatives could impact freight operations along the SE Tacoma Street/SE Johnson Creek Boulevard and SE McLoughlin Boulevard corridors. Under the No-Build Alternative, the increased delay is a result of background traffic growth, while under the build scenarios, the increased delay is a result of background traffic growth as well as the addition of vehicles from the Tacoma Park and ride.

The Johnson Creek Boulevard corridor is designated as a weight restricted minor (local preferred) freight route. The weight restriction on this corridor is in place because of the Johnson Creek Bridge north of SE 32nd Avenue, which limits the number and size of heavy vehicles on this corridor. Without intersection mitigation, increased intersection delay at the study intersections between 17th Avenue and SE Harney Drive would impede all vehicles at these locations.

Increased delay could also impact freight operations at the intersection of SE McLoughlin Boulevard/SE Ochoco Road. The overall intersection delay could increase as a result of the additional vehicles from the Tacoma park-and-ride in the 2008 LPA and MOS Alternative. Aside from the slight (3 second) increase in delay as a result of the additional park-and-ride trips, no further impact to freight transportation is expected.

Additional Considerations

Tacoma Street Station Bicycle and Pedestrian Mitigation

While pedestrian and bicycle access is currently shown in the PMLR final design drawings as set along SE McLoughlin Boulevard from the transit station to and from SE Tacoma Street, the project should also evaluate the potential connection for pedestrian and bicycle access along the station access ramp from SE Tacoma Street. This may include a multiuse path along the north edge of the Tacoma park-and-ride connecting the access road to the Tacoma Station. It is not expected that the project would provide pedestrian/bicycle access along both of these potential connections, but would select the connection that provides the safest and most direct connections for users. Table 5-11 summarizes potential improvement strategies for these other modes.

Build-Out Potential

This section describes the reasonable worst-case scenario for vehicle trips under the existing zoning in the Tacoma Station area. This establishes the trip threshold under current zoning that would require no mitigation without applying Transportation Planning Rule exceptions under TPR 660-012-0060.

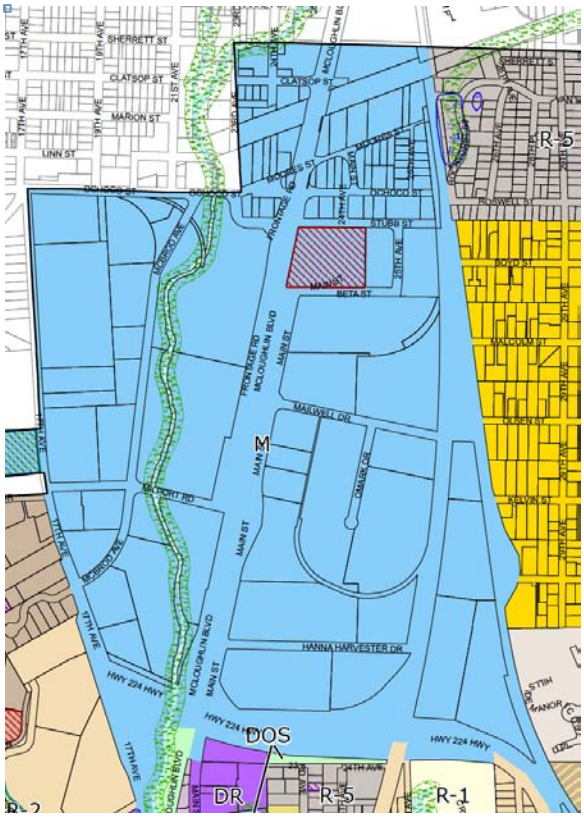

Figure 35: Zoning for Tacoma Station Area

Zoning and Assumed Land Uses

Within the City of Milwaukie, the project area for the Tacoma Station Area Plan is zoned Manufacturing (M) (see Figure 35). Zone M permits a combination of manufacturing, office, and/or commercial uses. To create a reasonable worst-case scenario, this analysis assigns the highest allowable percentage of floor area, based on Section 19.315 of the City's Zoning Ordinance[18], to the highest trip-generating uses. Table 9 shows two scenarios for proposed land use mix, with percentage allocations based on percent of leasable square feet, not percentage of site acreage:

[18] Milwaukie Municipal Code, Title19

Table 9: Land Use Mix Scenarios

Scenario 1	Scenario 2
25% Industrial	25% Industrial
65-70% Office	75% Office
5-10% Retail (supportive of primary uses)*	

* Not to exceed the allowable square footages on any parcel per Section 19.315

The Zoning Ordinance requires a minimum of 25% of every project consist of Industrial uses, as described under Subsection 19.315.1.B. Both scenarios allocate the maximum amount of land allowed to non-Industrial uses, in or order to create a worst-case scenario. Scenario 2 assumes that any retail is accessory to a permitted office use.

Buildable Acreage

The analysis for reasonable worst-case scenario assumes reductions in buildable lands for significant historic resources and for right-of-way needed for roadway and rail infrastructure.

- 25% of the study area is assumed to be devoted to roadway or other infrastructure. Because the project area also includes freight rail spurs, the right-of-way for all existing roadway and rail infrastructure was measured in GIS to see if the existing amount of infrastructure is greater than the 25% assumption. Measurement showed that existing right-of-way takes up about 20.5% (about 23 out of 112 acres) of the study area, so the 25% figure will be deducted from the gross acreage to determine the net buildable acreage. This 25% figure does not include the landscaping or setback requirements of Zone M.
- Within the project area, a designated Significant Historic Resource, covering approximately 4.5 acres, exists along SE McLoughlin Boulevard between SE Stubb Street and SE Beta Street. This area is not included as part of the Zone M calculations described in this memorandum for a reasonable worst-case scenario, but can be added back as office or retail use, as needed.

Given these considerations, the net buildable acreage is derived as shown in Table 10.

Table 10: Buildable Acreage Calculation

	Acres
Study Area Gross Acreage	111.73
25% Right-of-Way Assumption	(27.93)
Significant Historic Resource	(4.49)
Net Buildable Acreage	**79.31**

Source: DKS Associates, 2012

FAR Assumptions

For trip generation purposes, Floor Area Ratio (FAR) refers to total floor area of the structures on a parcel expressed as a percentage of the parcel area. For example, a two-story

building with two floors of 3,000 square feet each on a 10,000 square foot lot would have a FAR of:

$$\frac{2\times 3{,}000}{10{,}000} = 0.60$$

The reasonable worst-case analysis relies on observed FARs for areas with comparable uses and locations within the Portland Region[19]. The analysis uses the following FARs for the assumed land uses, with comparable areas noted:

- Manufacturing: 0.20 (Rivergate Industrial Area, 0.21)
- Office: 0.35 (Tigard Employment Area, 0.33)
- Retail: 0.25 (Division Main Street, 0.26)

When applied to the buildable acreage with leasable square footage in the proportions shown in Table 9, the following square footage totals are derived:

Table 11: Leasable Square Feet by Land Use

Scenario 1	Area (1000 sf)	Scenario 2	Area (1000 sf)
Industrial	248.2	Industrial	254.6
Office	670.2	Office	763.8
Retail	74.4		
TOTAL	**992.9**	**TOTAL**	**1,018.2**

ITE Land Uses

The following ITE codes were used for estimating reasonable worst-case trip generation for each of the land uses.[20] Trip rates reflect the p.m. peak hour of adjacent street traffic, including General Office, for which the peak hour of the trip generator coincides with the peak hour of adjacent street traffic.

- **Manufacturing.** ITE Code 110, Light Industrial, 0.97 p.m. peak hour trips per KSF
- **Office.** ITE Code 710, General Office, 1.49 p.m. peak hour trips per KSF
- **Retail.** ***Split between two uses.*** ITE Code 932, Sit-Down Restaurant, 11.15 p.m. peak hour trips per KSF; ITE Code 492, Health/Fitness Club, 3.53 p.m. peak hour trips per KSF

The General Office (710) use meet the ITE guidelines for using the given fitted curve equation rather than rates. All other land uses relied on rates per 1,000 square feet. For the Sit-Down Restaurant (932) use, it is appropriate to apply a reduction for "pass-by" trips

[19] Metro Employment Density Study, 1999
[20] *Trip Generation: An ITE Informational Report.* 8th Edition. Institute of Transportation Engineers, 2008.

(trips attracting motorists who are already on the street). This reduction applied for this land use is 43%.[21] Final p.m. peak hour trip generation is shown in Table 12.

Table 12: P.M. Peak Hour Trip Generation

Scenario 1	PM Peak Hour Trips	Scenario 2	PM Peak Hour Trips
Light Industrial	240	Light Industrial	247
General Office	830	General Office	934
Sit-Down Restaurant	237		
Health/Fitness Club	132		
TOTAL	**1,439**	**TOTAL**	**1,181**

[21] *Trip Generation Handbook*, Second Edition. Institute of Transportation Engineers, 2004.