Authorization Ordinance

This ordinance allows support for light rail transit service along the SW Corridor, including downtown Tigard, expressly authorizes changes to land use regulations to accommodate siting and includes the information required by the City's Charter.

CITY OF TIGARD, OREGON
TIGARD CITY COUNCIL
ORDINANCE NO. 16-____

AN AUHORZATION ORDINANCE TO ALLOW SUPPORT FOR SITING OF A NEW HIGH-CAPACITY TRANSIT CORRIDOR FOR LIGHT RAIL TRANSIT SERVICE WHICH INCLUDES DOWNTOWN TIGARD, RELATED AMENDMENTS TO THE COMPREHENSIVE PLAN AND LAND USE REGULATIONS, PROVIDING REQUIRED INFORMATION AND OTHER ACTIONS.

WHEREAS, the City of Tigard City Charter, Section 53A. requires the City to oppose the construction of a new high-capacity transit corridor within the City boundary unless voter approval is first obtained; and

WHEREAS, the City of Tigard City Charter Section 53C. provides that the City may not amend its comprehensive plan or land use regulations to accommodate the siting of a new high-capacity transit corridor project, if the project has not first received voter approval at an election on an authorization ordinance; and

WHEREAS, a new high-capacity light rail transit service corridor is being considered by the region; and

WHEREAS, changes to land use regulations will be proposed to site and otherwise accommodate the new high-capacity transit corridor project to extend light rail service from Portland to Bridgeport, including to downtown Tigard; and

WHEREAS, the Tigard City Council desires to refer the authorization ordinance required under Charter Section 53C. to the voters of the City of Tigard for voter approval on November 8, 2016.

NOW, THEREFORE, THE CITY OF TIGARD ORDAINS AS FOLLOWS:

SECTION 1: A City of Tigard ordinance is hereby created as provided as follows:

NEW HIGH-CAPACITY TRANSIT CORRIDOR AUTHORIZATION ORDINANCE

SECTION A. City of Tigard support for a new high-capacity transit corridor in the City of Tigard boundary is allowed.

SECTION B. The City of Tigard is authorized to make changes to the comprehensive plan and land use regulations to allow light rail to cross wetlands with proper mitigation, site a light rail maintenance facility in all industrial zones, and add housing density.

SECTION C. The following describes aspects of the new high-capacity transit corridor project, which would extend light rail service from Portland to Bridgeport, including downtown Tigard ("Project") as required by City of Tigard City Charter, Section 53C.:

1. Road Capacity: The total change in road capacity as a result of the new high-capacity transit corridor as described in the attached Appendix A ("Roadway Capacity Reduction Analysis, May 31, 2016) and incorporated herein by reference.

2. Housing Density: Related to the Project, housing density will be increased within the Tigard downtown area.

3. Land Use Regulations and Comprehensive Plan: Changes are proposed to land use regulations or the comprehensive plan to site or otherwise accommodate the Project. Those changes include provisions to allow light rail to cross wetlands with proper mitigation, siting of a maintenance facility in any industrial zone, and increases in housing density in the Tigard downtown area.

4. Projected Public Cost: the current projected public cost of the entire Project is $2.0-2.4 billion.

SECTION 2: The City Council of the City of Tigard finds that this Authorization Ordinance satisfies the requirements of Tigard City Charter Section 53 and Ordinance _____.

SECTION 3: The sections, subsections, paragraphs and clauses of this ordinance are severable. The invalidity of one section, subsection, paragraph or clause shall not affect the validity of the remaining sections, subsections, paragraphs and clauses.

SECTION 4: This ordinance shall be effective upon certification by the County Elections official that it has received voter approval at a referendum election conducted on November 8, 2016.

PASSED: By _____ vote of all Council members present after being read by number and title only, this _____ day of _____, 2016.

_____
Carol A. Krager, City Recorder

APPROVED: By Tigard City Council this _____ day of _____, 2016.

_____
John L. Cook, Mayor

Approved as to form:

_____
City Attorney

_____
Date

APPENDIX A

Roadway Capacity Reduction Analysis
May 31, 2016

MEMORANDUM

720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

DATE: May 31, 2016

TO: **City of Tigard**

FROM: Peter L. Coffey, PE

SUBJECT: **Southwest Corridor Motor Vehicle Capacity Reduction Analysis** P#15038-003

This memorandum presents the results of a traffic analysis regarding the potential reduction in motor vehicle capacity with the Southwest Corridor Plan and its associated Light Rail transit project in southwest Portland that extends into Tigard and Tualatin. This memorandum addresses the motor vehicle capacity methodology adopted by Tigard Ordinance and its associated Appendix A including determining the *total amount of motor vehicle capacity that would be reduced by the new Light Rail transit corridor* within five miles of the City of Tigard.

Southwest Corridor Plan

The Southwest Corridor Plan aims to provide a range of Light Rail transit, bicycle, roadway and pedestrian improvements to communities in southwest Portland and southeast Washington County. Light Rail Alternatives in the Southwest Corridor include options that extend roughly from downtown Portland along Barbur Boulevard and/or Interstate 5 to the Tigard City line, through the Tigard Triangle Area with a terminus near Bridgeport Village in Tualatin. Specifics about the particular alignment options can be found at http://www.oregonmetro.gov/public-projects/southwest-corridor-plan.

***Motor Vehicle Capacity* Definition**

***Motor vehicle capacity* on a signalized roadway is defined as** the maximum number of motor vehicles that can pass through critical intersections. Many factors affect *motor vehicle capacity* including lane width, number of lanes, lateral clearance (and rights-of-way), driver characteristics, vehicle types (cars, trucks, buses, etc), roadway alignment and geometry (curves, grades, super elevation, etc), existence of intersections (traffic signals, roundabouts, stop signs), green time allocation at traffic signals, flow speed, weather conditions, the presence of pedestrians, bicycles, on-street parking and other factors.

A major consideration in *motor vehicle capacity* is the design of intersections along arterial roadways (such as traffic signals) and interchanges along freeway segments (where weaving and merging conditions exist). Intersections and interchanges are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently (capacity) is generally diminished in their vicinities. The main consequence of a bottleneck is an immediate reduction in capacity of the roadway.

System Bottlenecks

There are several roadway system bottlenecks that constrains vehicle traffic along the Barbur Boulevard and Interstate 5 corridor between Tigard and downtown Portland including:

- Interstate 5 northbound between Interstate 205 and OR 217
- Interstate 5 northbound at the Terwilliger Boulevard Interchange and the Terwilliger Curves
- Interstate 5 northbound at the Marquam Bridge/I-84 interchange/I-405 interchange with US 26
- Interstate 5 southbound at the Hood Avenue on-ramp
- Interstate 5 southbound between Interstate 205 and OR 217
- Barbur Boulevard at Terwilliger Boulevard
- Barbur Boulevard at Capitol Highway
- Barbur Boulevard at Hamilton Street

The identification of multiple bottlenecks is important along the freeway section as there are periods of time when vehicle queuing and congestion from a downstream bottleneck, such as the Marquam Bridge (and areas to the north), extends to and through another bottleneck, such as the Terwilliger Curves section. In these cases multiple bottlenecks may link together on top of each other. Therefore it is difficult to quantify a *motor vehicle capacity* or maximum traffic flow obtainable for sections of the freeway without considering downstream, system influences. The *system motor vehicle capacity* and downstream bottlenecks must be considered in these situations. The identification and evaluation of these bottlenecks are key as additional capacity at these location influences system capacity. On the other hand, travel lanes could be added at "non-bottleneck" locations along the corridor, yet additional travel lanes in these locations would increase storage for back-ups, but they would not increase the *system motor vehicle capacity* along the corridor. This is true for both the arterial section of Barbur Boulevard and the Interstate 5 freeway section. Therefore, adding travel lanes or "theoretical capacity" at non-bottleneck locations does not increase the capacity of the corridor roadways.

Adding *Motor Vehicle Capacity* to Interstate 5 or Barbur Boulevard

There are many constraints to adding *motor vehicle capacity* to either Interstate 5 or Barbur Boulevard and the most significant constraint is a lack of right-of-way. Adding a travel lane along Interstate 5 would require widening the roadway for an additional travel lane, widening the shoulders on both sides of the roadway to bring them up to ODOT/US DOT standards, reconstruction of all interchanges, and possibly an adjustment to the roadway alignment to straighten out some of the curved sections to provide adequate sight distance meeting current standards. This would require ODOT to obtain additional right-of-way that they do not currently own. Simply adding another travel lane for short segments would not increase the *corridor motor vehicle capacity*.

Along Barbur Boulevard, improving capacity from today's conditions requires not only additional travel lanes at bottleneck locations, but the addition of standard-width sidewalks, bicycle facilities, ADA treatments, water quality facilities and other improvements to bring the roadway "up to standards". This level of improvement would again require additional right-of-way that is not available.

There are locations along both Interstate 5 and Barbur Boulevard where additional travel lanes could be provided within the public rights-of-way. However, simply adding travel lanes does not mean that *motor vehicle capacity* or *system motor vehicle capacity* is increased, because in order to do so, the additional travel lanes need to be provided at bottleneck locations. Even if additional travel lanes are provided at traffic signals, to

improve *motor vehicle capacity* at a traffic signal, the additional lanes need to be designed in a way that ensure they are effectively used by motor vehicles on order to increase the capacity.

Background Traffic Analysis of Barbur Boulevard Corridor

TriMet and Metro have undertaken several traffic analysis of the Southwest Corridor based on current assumptions of Light Rail transit[1]. These analyses evaluate the corridor from downtown Portland to Tigard and Tualatin.

The traffic analysis prepared for TriMet and Metro demonstrate that based on current project assumptions, the intersection operations analysis showed that with the addition of LRT along Barbur Boulevard, the intersections would either continue to operate within mobility targets[2] or would not significantly worsen from the No-build conditions. The analysis also demonstrates that the removal of a portion of a travel lane does not necessarily reduce *motor vehicle capacity* when intersections and traffic signals are involved. If intersections and traffic signals can be designed and operated in a more efficient manner, improved operations and even increased capacity can result. This is demonstrated by the analysis of the Barbur Boulevard/Hamilton Street intersection[3]. There is also documented evidence that reducing access points on arterials and consolidating access points (including eliminating center left turn lanes) can not only result in improved safety but increased *motor vehicle capacity*.

Current concepts for Light Rail transit for the Southwest Corridor do not significantly reduce or increase the number of motor vehicle lanes along Barbur Boulevard or Interstate 5[4]. However, to accommodate multi-modal access of a transit corridor, some additional traffic signal green time needs to be reallocated from north-south Barbur Boulevard through movements to other minor movements or cross-streets to address pedestrian access needs resulting in a decrease in motor vehicle capacity along Barbur Boulevard. Even without a Light Rail Transit project along the corridor, planned improvements (i.e. Barbur Concept Plan) to accommodate multi-modal access will have an impact to *motor vehicle capacity* along the corridor.

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[1] *SW Corridor Supplemental Refinement Traffic Impact Analysis Executive Summary Traffic Report*, DKS Associates, March 16, 2016 and *Final SW Corridor Traffic Analysis and Operations Memorandum*, DKS Associates, July 29, 2014.
[2] Mobility targets measured through a volume to capacity ratio (v/c ratio).
[3] *SW Corridor Supplemental Refinement Traffic Impact Analysis Executive Summary Traffic Report*, DKS Associates, March 16, 2016, Table 2.1 and 2.2 documents that a four-lane Barbur Boulevard between Naito Parkway and Hamilton Street can operate with a lower volume to capacity ratio than the existing configuration with six lanes.
[4] Along Interstate 5, three through lanes remain in each direction and along Barbur Boulevard two through lanes remain in each direction.

Motor vehicle capacity Analysis of Barbur Boulevard Corridor

To determine key bottleneck locations along the Barbur Boulevard corridor, recent traffic analysis for the SW Corridor Plan were reviewed[5] with the intention of identifying bottleneck or critical intersections along the currently proposed Light Rail alignment with a future year (2035) volume to capacity ratio of greater than 0.90. The intersections that meet these criteria are:

- Barbur Boulevard and 60th Avenue (AM peak)
- Barbur Boulevard and CapitolHighway (AM and PM peak)
- Barbur Boulevard and 24th Avenue/I-5 SB Off-Ramp (AM peak)
- Barbur Boulevard and 19th Avenue/Capitol Hill Road (AM and PM peak)
- Barbur Boulevard and Terwilliger (AM and PM peak)
- Barbur Boulevard and Hamilton Street (AM peak)
- 4th Avenue and Caruthers/Broadway (AM peak)

Using the Highway Capacity Manual[6] analysis at the above identified signalized intersections, the 2035 No-Build and 2035 with Light Rail transit scenarios results in changes in motor vehicle capacity along Barbur Boulevard and are shown in Attachment 1. During the AM peak hour (future year conditions) traffic volumes are very directional on Barbur Boulevard with northbound volumes approximately two to four times greater than southbound traffic volumes. Volume to capacity ratios for the northbound through movements are also significantly higher than the southbound movements as well (see Attachment 1). Therefore, during the AM peak hour, capacity reductions were only considered in the northbound direction. During the PM peak hour (future year conditions) traffic volumes are very balanced in both directions and therefore capacity reductions were considered in both directions on Barbur Boulevard.

The 4th Avenue/Caruthers/Broadway intersection in downtown Portland is controlled by downstream congestion at the 6th Avenue/Broadway intersection, the on-ramp to I-405 and other downstream congestion locations. The reconfiguration of this intersection does not impact the motor vehicle capacity of the roadway system in this area of closely spaced traffic signals.

Metro has defined a series of *Mobility Corridors*[7] for the region and for the Portland Central City to Tigard/Tualatin corridor (Mobility Corridor 2) which includes four parallel routes (including Barbur Boulevard) that would be considered part of the Mobility Corridor. The four routes are all contained within Metro's defined corridor and are listed below (see Attachment 2):

- Interstate 5 (blue in Attachment 2)

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[5] *SW Corridor Supplemental Refinement Traffic Impact Analysis Executive Summary Traffic Report*, DKS Associates, March 16, 2016 and *Final SW Corridor Traffic Analysis and Operations Memorandum*, DKS Associates, July 29, 2014.
[6] 2000 Highway Capacity Manual, Transportation Research Board, Washington DC, 2000.
[7] http://www.oregonmetro.gov/mobility-corridors-atlas

- SW Barbur Boulevard (99W), then along Pacific Highway and 72nd Avenue (red in Attachment 2)
- SW Macadam Avenue/OR 43/Boones Ferry Road (yellow in Attachment 2)
- SW Terwilliger Boulevard/Capitol Highway/Kerr Parkway/Forsberg Road/Carman Drive (green in Attachment 2)

Using Metro's Regional Transportation Model, corridor motor vehicle capacity was identified for different segments for each of the four routes (see Table 1). Each corridor's capacity is defined as the most constrained segment along its route.

Table 1 – Approximate Peak-Hour Directional Motor Vehicle Capacity for Portland Central City to Tigard/Tualatin Mobility Corridor (Based on Metro's Transportation Model and Highway Capacity Manual analysis)

Corridor Capacity (vehicles per hour) of routes as described (peak-hour directional vph)		North segment: Portland-Terwilliger	Mid-Barbur segment: Terwilliger - Crossroads	Tigard segment: Crossroads-OR217/Kruse	South segment: OR217/Kruse-Bridgeport Village
Red route	Barbur Blvd - Pacific Hwy - 72nd	1,600*	1,700*	900	900
Blue route	Interstate 5	6,300	6,300	6,300	7,200
Yellow route	Macadam/OR 43-Boones Ferry	1,200	700	1,400	1,400
Green route	Terwilliger-Capitol-Kerr-Forsberg-Carman	700	700	700	700
Total Corridor Capacity		**9,800**	**9,400**	**9,300**	**10,200**

Note: * Capacity based on Highway Capacity Manual analysis of corridor signalized intersections

There are portions of the corridor that experience no motor vehicle capacity reductions while other portions of the corridor experience slight reductions in motor vehicle capacity. Based on the corridor motor vehicle capacities shown in Table 1 and the motor vehicle capacity reductions shown in Attachment 1, the Project results in a zero to two percent reduction in motor vehicle capacity for the corridor.

Estimate of Unused Public ROW Impacts

The project expects to make use of unused public ROW in a number of locations along the various potential alignments. An analysis has been undertaken to determine if the public ROW currently not in use might be useful in the future to increase motor vehicle capacity in the potential Light Rail corridors under consideration.

As described earlier in this document, intersections and interchanges are typically the controlling bottlenecks of traffic flow and the ability of a motor vehicle system to carry traffic efficiently (capacity) is generally diminished in their vicinities. In order for the unused ROW to be useful for adding future motor vehicle capacity the unused ROW in question must be in the vicinity (leading up to and through) of existing bottlenecks and be physically accessible to motor vehicles in addition to accommodating other code required facilities.

Unused Public ROW available for additional auto capacity is defined as a segment of unused public ROW potentially constrained by a future Light Rail alignment which could otherwise provide adequate width for a travel lane in at least one direction leading up to and through a Critical intersection or bottleneck while also meeting State and City requirements for bicycle and pedestrian facilities.

This analysis shows that the bottlenecks (critical intersections) are already constrained by a lack of available ROW. The available ROW that is between the critical bottlenecks would not significantly contribute to increasing motor vehicle capacity without first fixing the bottlenecks.

The Table in Attachment 3 describes the percent change in lane miles of unused public right of way, excluding any sidewalks, bicycle or other code related facilities, compared to the existing Metro Mobility #2 Corridor lane miles. For all options the percentage reduction is 5% or less.

Summary

Motor vehicle capacity is defined as the maximum traffic flow obtainable on a given roadway. Many factors affect *motor vehicle capacity* and detailed analysis is required to consider all these factors. The identification of bottlenecks along both arterial roadways and freeways is important to determine the constraints of *roadway system capacity*. Simply adding or removing travel lanes on a roadway does not increase/decrease capacity unless it addresses a bottleneck location. For the Southwest Corridor, there are several bottlenecks that are constrained by existing right-of-way and could not deliver added *system motor vehicle capacity* without acquisition of additional right-of-way.

Outside the City of Tigard, to accommodate for multi-modal access for the Southwest Corridor project, some additional traffic signal green time needs to be transferred from north-south Barbur Boulevard through movements to the cross-streets to address pedestrian access needs resulting in a potential reduction in intersection capacity. Even without a Light Rail Transit project along the corridor, improvements to accommodate multi-modal access will have an impact to *motor vehicle capacity* along Barbur Boulevard.

This detailed traffic analysis indicates that Southwest Corridor Alignment options would result in a zero to two percent reduction of motor vehicle capacity for the corridor.

Along Pacific Highway in Tigard, the Southwest Corridor project does not impact facilities or motor vehicle capacity. In the Tigard Triangle area, the Southwest Corridor project adds Light Rail Transit without impacting current roadways while increasing motor vehicle capacity by building out several new connecting roads.

The analysis of unused ROW shows that the bottlenecks (critical intersections) are already constrained by a lack of available ROW. The available ROW that is between the critical bottlenecks would not significantly contribute to increasing motor vehicle capacity without first fixing the bottlenecks.

The analysis and findings presented herein does not supplant future additional traffic analysis that will be done for the Environmental Impact Statement and reviewed by local jurisdictions.

Please contact me if you have any questions.

Sincerely,

DKS *Associates*
A Corporation

Peter L. Coffey, PE
Principal

Attachment 1

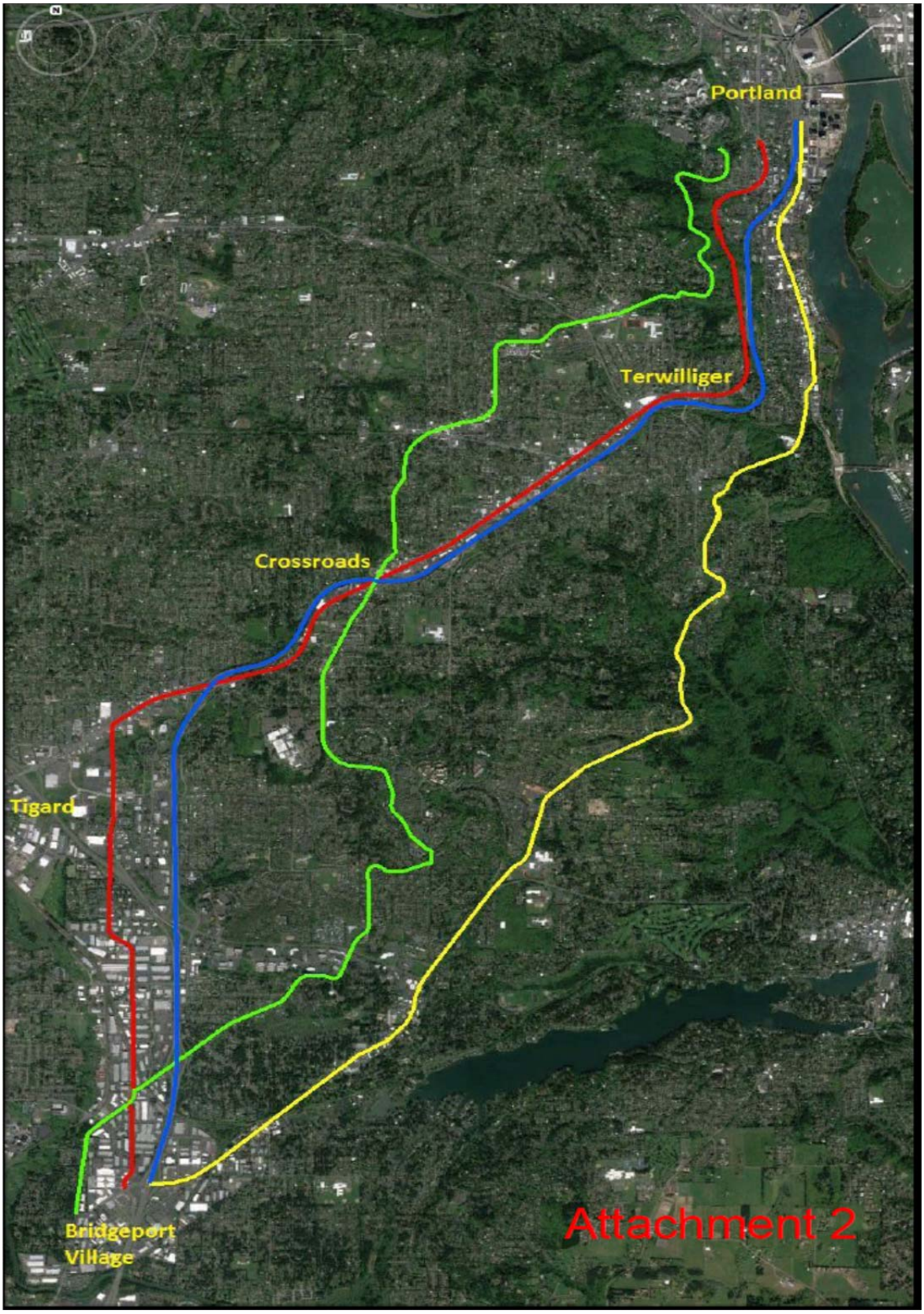
Attachment 1 - Through Movement Capacity Reduction Along Barbur Boulevard at Critical Intersections

Critical Intersections	NB Thru Movement Capacity				SB Thru Movement Capacity				Through Movement Capacity Reduction		Through Movement Capacity Reduction Including Reduction for fewer buses	
	No-Build w/Low Peds	No-Build v/c ratio for NB Thru	LRT w/ Moderate Peds	LRT v/c ratio for NB Thru	No-Build w/Low Peds	No-Build v/c ratio for NB Thru	LRT w/ Moderate Peds	LRT v/c ratio for NB Thru	NB Thru No-Build Minus LRT	SB Thru No-Build Minus LRT	NB Thru No-Build Minus LRT	SB Thru No-Build Minus LRT
PM Peak Hour 2035												
SW Barbur Blvd (Hwy 99W) & SW Capitol Hwy	1638	0.61	1866	0.49	2692	0.64	2605	0.81	(228)	87	(252)	63
SW Barbur Blvd (Hwy 99W) & SW Capitol Hill Rd/SW 19th Ave	1886	0.86	1694	0.97	1825	0.83	1642	0.93	192	183	168	159
SW Barbur Blvd (Hwy 99W) & SW Terwilliger Blvd	1334	1.07	1140	1.13	1604	0.76	1424	0.82	194	180	170	156
AM Peak Hour 2035												
SW Barbur Blvd (Hwy 99W) & 60th	1534	0.91	1504	0.92		0.38		0.36	30		6	
SW Barbur Blvd (Hwy 99W) & SW Capitol Hwy	1521	0.89	1504	0.90		0.70		0.70	17		(7)	
SW Barbur Blvd (Hwy 99W) & 24th/I-5 Off-Ramp	2397	0.90	2410	0.90		0.43		0.41	(13)		(37)	
SW Barbur Blvd (Hwy 99W) & SW Capitol Hill Rd/SW 19th Ave	1866	0.95	1656	1.05		0.45		0.48	210		186	
SW Barbur Blvd (Hwy 99W) & SW Terwilliger Blvd	1657	1.00	1592	0.86		0.30		0.32	65		41	
SW Barbur Blvd (Hwy 99W) & SW Hamilton Sreet	2616	1.22	2492	1.02		0.25		0.34	124		100	

Note: Capacity redutions from multiple intersections are not additive.

Note: assumes with LRT, there will be a reduction of 12 buses in each direction along Barbur Boulevard. 1 bus equals approximately 2 motor vehicles from a capacity perspective.

Attachment 2



Attachment 3

Reduced Future Moto Vehicle Capacity of Unused Public Right of Way Table