MEMORANDUM

Date:	April 17, 2023	**TG:**	23054.00
To:	Maureen Bayer – Jordan Ramis		
From:	Bruce Haldors, John Duesing, John Lewis – Transpo Group		
CC:	David A. Rabbino – Jordan Ramis		
Subject:	I-205 Toll Project – ODOT EA and Model Review		

This memorandum provides a summary of Transpo's initial review of the modeling assumptions, methodology, and results for the I-205 Tolling Project EA and an assessment of the traffic related impacts associated with the tolling on I-205 to local West Linn roadways. It is important to note that Transpo received the model files on March 31, 2023. Due to the delay in being provided the model and other relevant data and information there was insufficient time to prepare a formal report regarding our review and evaluation of the modeling results included by ODOT in the Traffics and Benefits Section in Appendix C: I-205 Toll Project Transportation Report. As a result, we have prepared a brief summary review and included a set of key questions and comments that we believe ODOT needs to respond to as part of the public comment process. We believe our review has revealed significant deficiencies in the modeling work done, and as a result, in the modeling results as well. We do not believe they demonstrate the required analysis required to be completed under NEPA.

Summary Review

The EA purports to provide a detailed analysis of the transportation-related aspects of the proposed I-205 Toll Project. The report covers the anticipated impacts of the toll project on various transportation modes, such as vehicle travel time, transit service, bicycle and pedestrian access, and freight mobility. The Transportation section uses data to support its findings and recommendations. The report provides detailed data on traffic volume, travel patterns, and congestion levels, which are used to evaluate the project's impact.

The report covers a wide range of topics, including traffic modeling, toll pricing, and implementation strategies. Overall, the "I-205 Toll Project Transportation Technical Report" provides a detailed analysis of the transportation-related aspects of the proposed I-205 toll project. One of the central issues of the I-205 Toll Project is how much diversion and demand is affected by the tolling itself.

There are several factors that can influence the demand and diversion and it centers around toll pricing. The report describes congestion pricing which refers to the practice of setting toll prices higher during periods of peak demand, such as rush hour, and lower during periods of lower demand, such as overnight or on weekends. The goal of congestion pricing is to encourage drivers to shift their travel times to less congested periods or to alternative modes of transportation, thereby reducing traffic congestion and improving overall travel times.

In summary, while several factors can influence toll pricing, congestion pricing is typically the most important feature in determining toll rates.

The level of demand for a transportation facility can be determined by analyzing various data sources such as traffic counts, travel surveys, and demographic data. Here are some of the methods typically used to determine the level of demand for a transportation facility:

- Traffic counts: One of the simplest and most common methods is to conduct traffic counts using sensors, cameras, or manual counts. These counts can provide information on the volume and types of vehicles using the facility and their travel patterns.
- Travel surveys: Travel surveys can provide more detailed information about the travel behavior of users, such as their trip purposes, modes of transportation, and travel times. These surveys can be conducted through telephone interviews, mail surveys, or online surveys.
- Demographic data: Demographic data, such as population density, employment, and income levels, can provide insights into the potential demand for a transportation facility. For example, high population density and employment levels in a particular area may indicate a higher demand for public transportation.
- Modeling: Transportation models can be used to estimate the level of demand for a facility based on various inputs, such as population and employment data, land use patterns, and transportation network data. Two specific models were used for this project: the regional travel demand model (RTDM) and a more localized mesoscopic Dynamic Traffic Assignment (DTA) model.

Overall, the level of demand for a transportation facility can be determined through a combination of these methods. Travel demand models are complex mathematical models that attempt to predict the behavior of travelers in response to various factors, such as travel time, cost, and mode of transportation. To ensure the accuracy and reliability of travel demand models, several steps are typically taken to verify and validate their results. Here are some of the methods used to establish the trustworthiness of travel demand model results:

- Data calibration: The model calibrated real-world data such as traffic counts, travel surveys, and other relevant data sources. The calibration process involves adjusting the model's parameters and assumptions to match the observed data, which helps to improve the accuracy of the model's predictions.

- Sensitivity analysis: Sensitivity analysis involves testing the model's results against various scenarios and assumptions to evaluate their impact on the model's predictions. This can help to identify areas of uncertainty and potential sources of error in the model.

- Validation: Validation involves comparing the model's predictions against real-world data that was not used in the model's calibration. This can help to verify the accuracy of the model's predictions and identify areas where the model may need further refinement.

- Peer review: The results of travel demand models are often subject to peer review by other transportation professionals and experts in the field. This can help to identify potential weaknesses in the model and provide feedback on areas for improvement.

Overall, to establish trust in the results of a travel demand model, it is important to follow a rigorous and transparent process that includes data calibration, sensitivity analysis, validation, and peer review. A typical peer review process would be iterative and for a project of this size many months would be necessary to understand the calibration process, any sensitivity analyses, and validation process. For the I-205 Toll Project, no local agency was involved in such a process, and none was documented in the report.

Review of RTDM/DTA Models

Based on our preliminary review several issues were identified:

1. From the information provided it appears that the models were calibrated using pre-Covid travel patterns which raises questions as to the accuracy of the data used to generate current and future travel patterns and tolling impacts. Additionally, while it appears a very comprehensive analysis of the Value of Time (VOT) and market segmentation was done, this was all based on pre-Covid information which raises questions about its validity and applicability in a post-Covid environment.

2. Any regional diversion to avoid the toll is based entirely on the regional macroscopic model (RTDM) and not the DTA model. This is because the DTA model is smaller in geographical scope and does not include the connection with I-5 in the north and therefore is incapable of allowing traffic to divert to I-205 or vice versa. See Figure 1 below). In addition, the two models have very different assignment (volume/delay) algorithms which affect the level of diversion associated with the toll. So, while the route choice model in the RTDM, (static assignment algorithm), determines the diversion potential for long trips that could use I-5 or I-205, the local diversion estimates are based on the DTA model and a different traffic assignment algorithm (DTA). This means that traffic diversion is likely different regionally and locally and could result in underestimation of impacts to local streets near the tolling. Sensitivity testing of this could provide further validation of model results, but we saw no such sensitivity testing in the report.

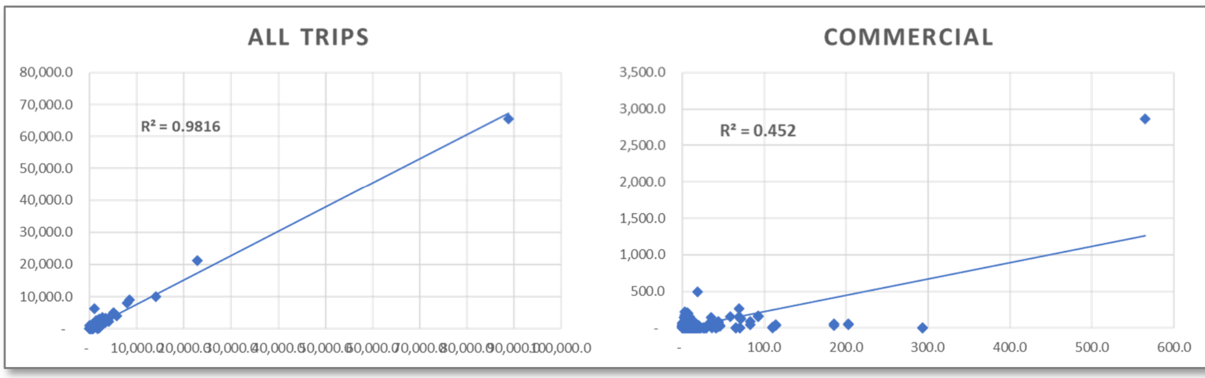
Figure 1 – Model Extents: RTDM (left) & DTA Model (right)

3. There are questions about how future intersection volumes were estimated. The report states *"In some locations the DTA model constrained demand so that a notable amount of unserved demand resulted. In these cases, the post-processed volumes when input to the Synchro or Vissim models did not reflect the expected level of constrained congestion. In these cases, unserved demand as captured by the DTA model was included in the DTA model volumes prior to post-processing. More details on this approach are contained in Appendix A."* This raises the question that if there are upstream bottlenecks that are

preventing the traffic to reach the intersection that are not being fixed, why include the unserved demand in the analysis. This post process adjustment method raises questions about the accuracy of the level of growth and validity of the intersection analyses.

4. Transpo used a provider of Location-based services (LBS), Replica, to assess the origin-destination patterns from the model for both personal vehicles and commercial vehicles. We found very good correlation between Replica and the model for personal vehicles (R-squared of 0.95) but a very low correlation (R-squared of 0.45) for commercial vehicles. This means truck and freight impacts could be significantly questioned. Trucks have a much larger impact on traffic operations. Underestimating the number of trucks could result in significantly underestimating the traffic impacts.

Figure 2 – District to District Trip Comparison: Model vs Replica Data

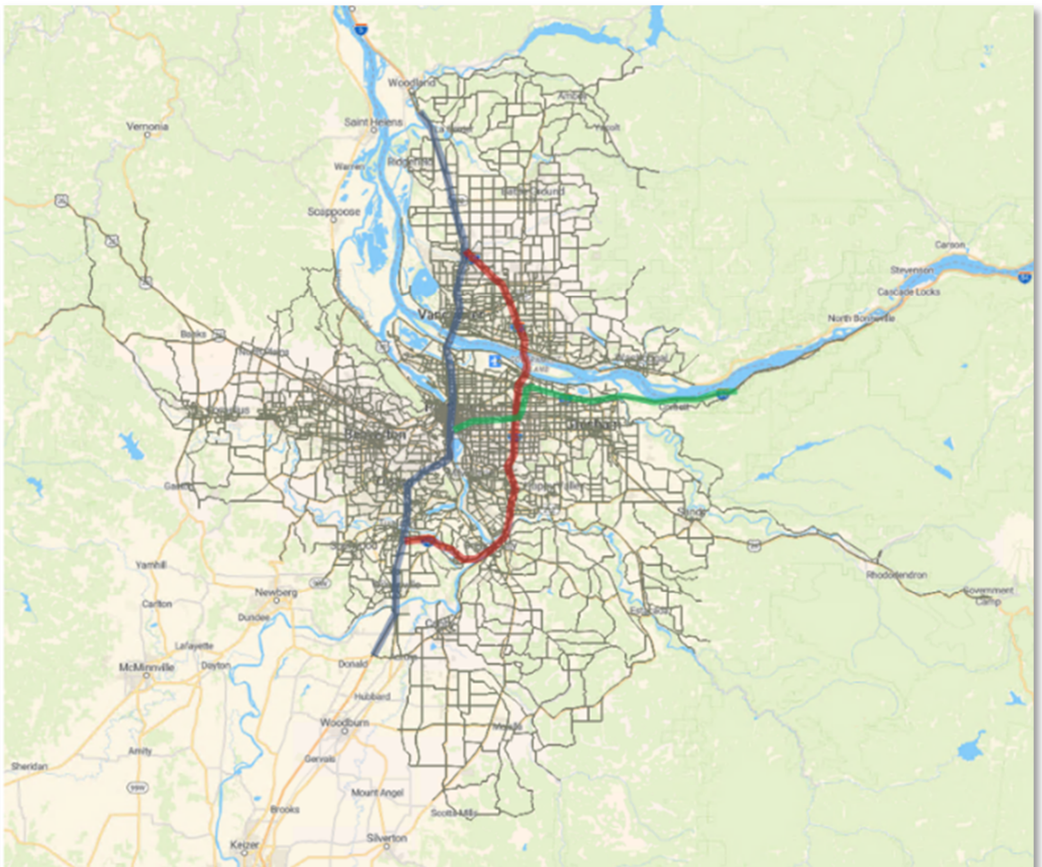


5. Only the Assignment component of the RTDM was provided. The EA document discusses shifts in mode (e.g., single occupant vehicles (SOV) to high-occupancy vehicles (HOV)) in response to the tolls, however, since the full model was not provided, there is no way to review the mode choice component that would determine these mode shifts. The full model should be provided for full review.

RTDM Model

The extent of the RTDM model is illustrated in Figure 3. The model covers the city of Portland, I-5, I-205 and other corridors and bridges which are included. This enables the model to cover alternative routes for the tolling analysis of the I-205 Bridge.

Figure 3 - EMME Model Extents



RTDM Model Summary

The following modeling databases were received and reviewed:

- Base Year - 2015
- Future Year - 2027: No Build, Build
- Future Year - 2045: No Build, Build

Scenarios

- Hourly Scenarios and Daily (24 hour) Scenarios were available.
- No transit alternatives mode or assignments are included in the model.

Trip Generation and Growth Comparison

- Truck volumes increase by 30-36% between 2015 and 2027, and between 2027 & 2045.
- Single Occupancy Vehicles (SOV) and High Occupancy vehicles (HOV) traffic volumes grow approximately 16-17% from 2015 to 2027 but grow by about 10% from 2027 to 2045.

- The growth projection factors seem reasonable but have not been confirmed due to time constraints.

Trip Distribution and Mode Choice

- Trip distribution and Mode Choice model components were not available in the received model file as the table below summarizes those trips.

Demand Class	AM Peak Hour				
	Trip Generation			Growth Factors	
	2016	2027	2045	2015 to 2027	2027 to 2045
SOV	240,924	279,737	302,203	16%	8%
HOV	110,140	124,350	135,646	13%	9%
Truck	6,702	8,801	11,949	31%	36%
Total	357,766	412,888	449,798	15%	9%

Demand Class	PM Peak Hour				
	Trip Generation			Growth Factors	
	2016	2027	2045	2015 to 2027	2027 to 2045
SOV	295,731	345,660	376,660	17%	9%
HOV	108,131	125,979	135,734	17%	8%
Truck	4,611	6,049	8,209	31%	36%
Total	408,473	477,688	520,603	17%	9%

Difference Network Analysis

A volume difference plot was produced to review the diversionary impact of the proposed toll on the I-205 bridge. Figure 4 illustrates the volume difference plot on a wider model extent whereas Figure 5 presents the volume difference plot for the network immediately around the I-205 bridge.

Observations:

As tolling is implemented on the I-205 bridge corridor, the following traffic diversions were observed:

- From I-205 To S Highway 99E the diversion appears to be significant.
- Local diversion to SE Borland Rd appears to be significant.

Figure 4 - PM Peak Traffic Volume Difference Plot (2045 Build – 2045 No Build) – Wider Model Context

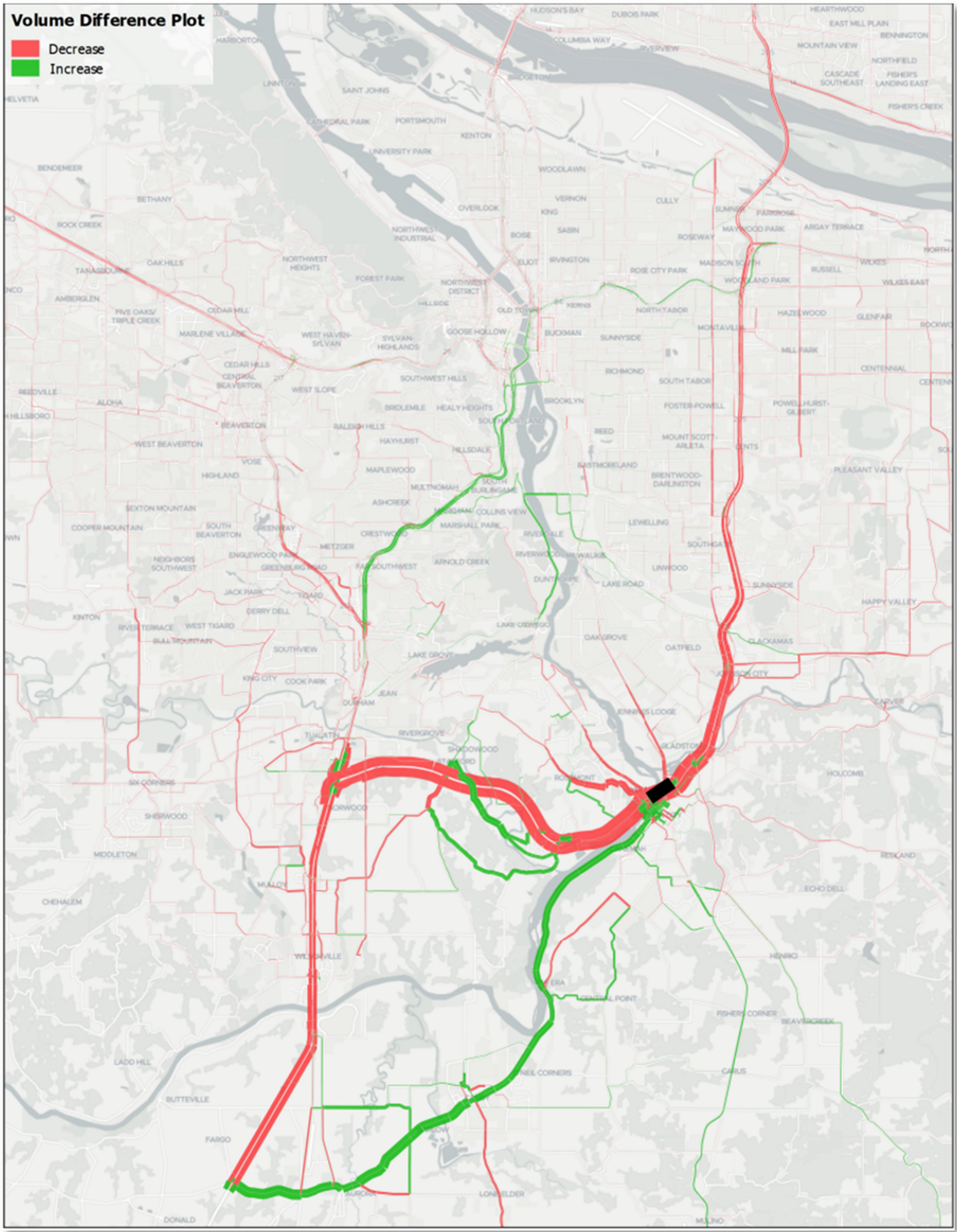
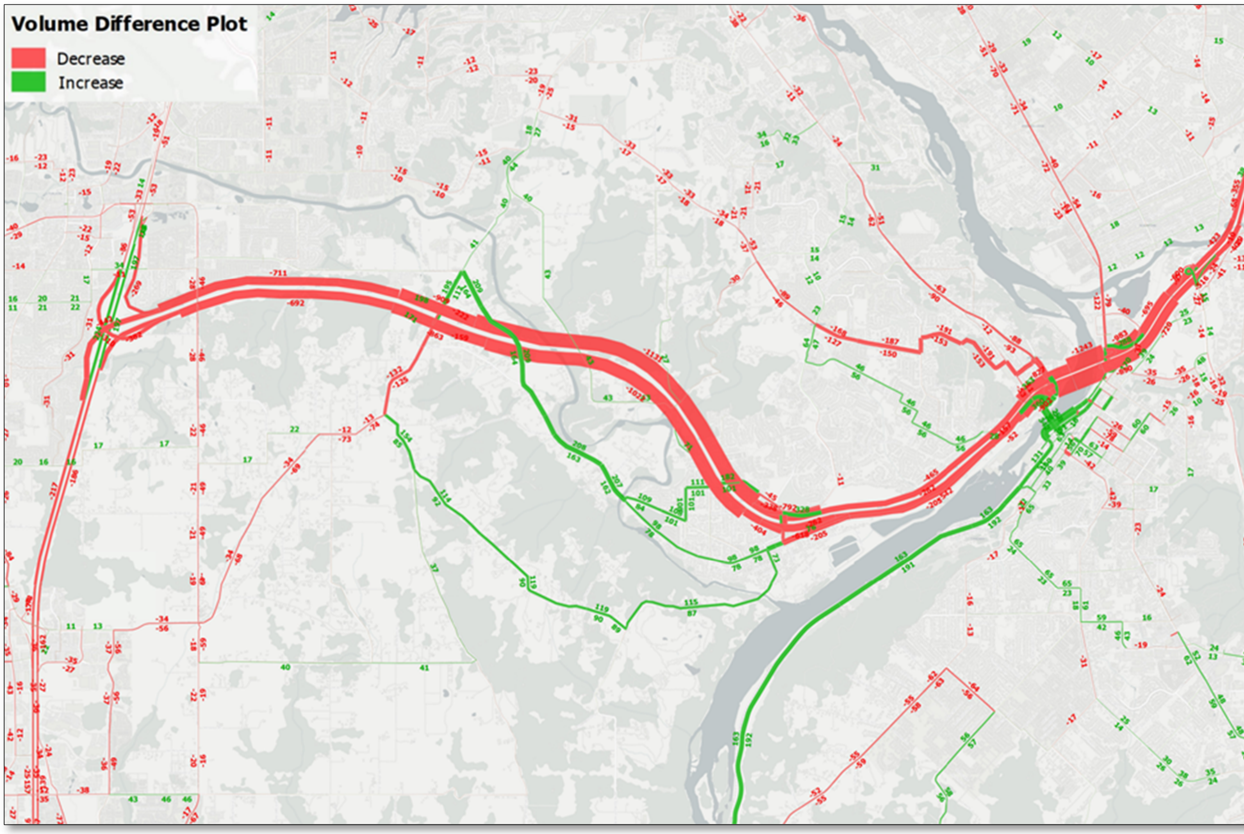


Figure 5 - PM Peak Traffic Volume Difference Plot (2045 Build – 2045 No Build) – Around I-205 Bridge



<u>Select Link Analysis on I-205</u>
A select link analysis was performed to understand the origin and destination of traffic using the I-205 toll bridge. Figure 6 illustrates the select link traffic volume plot on a wider model context whereas Figure 7 presents the select link plot for the network immediately around the I-205 bridge in the RTDM model.

Observations:

- Long distance traffic accounts for less than 50% of the traffic using the tolled I-205 bridge over the Willamette River. .
- **According to the select link analysis for the 2045 Build PM peak, over 50% (51 to 53%) of the traffic using the I-205 Bridge comes from the areas nearby the bridge corridor which suggests significant opportunity for diversion**. See Figure 5 for additional information.

Figure 6 - 2045 Build PM Peak Traffic Select Link Analysis for the I-205 Bridge – Wider Model Context

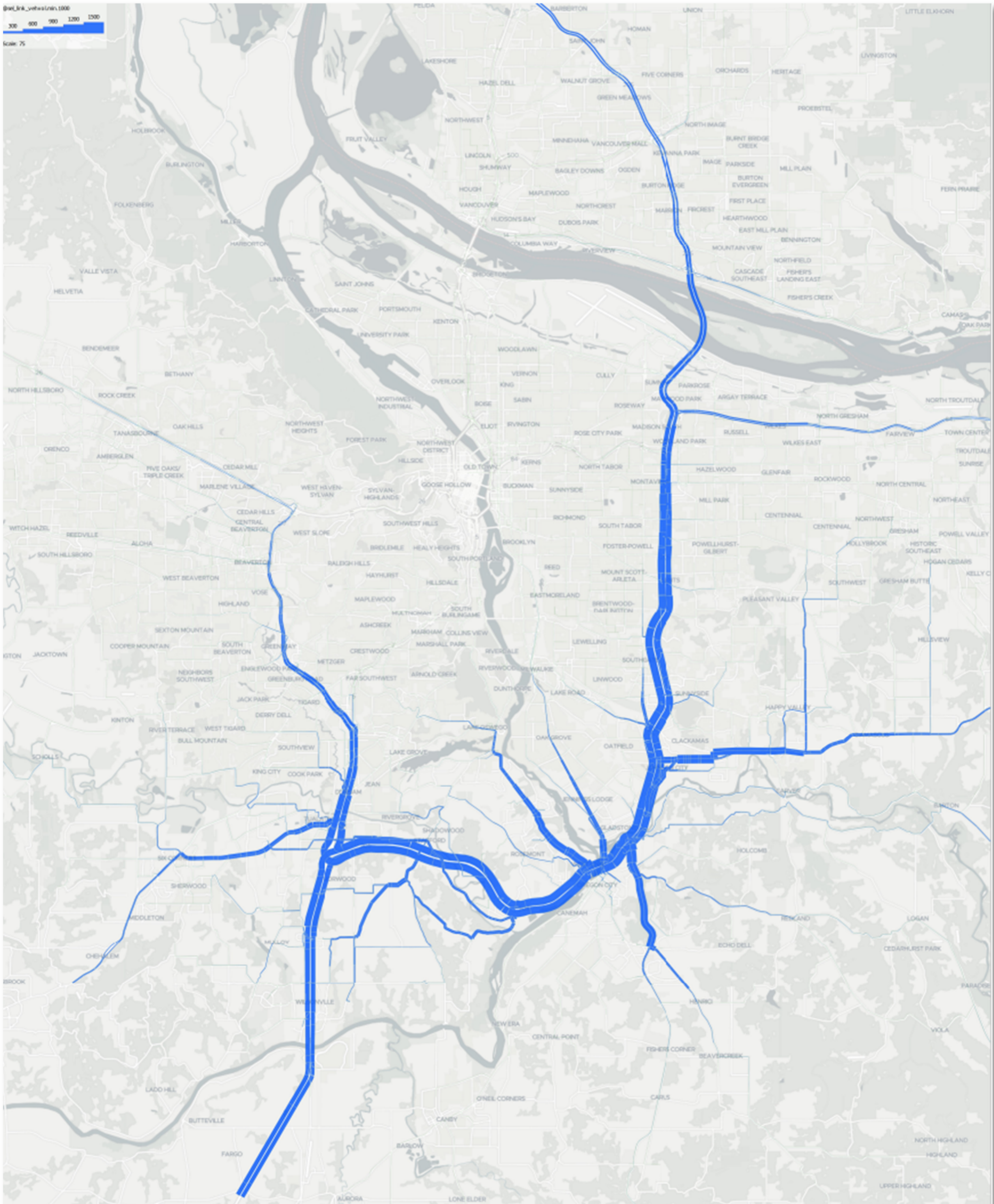
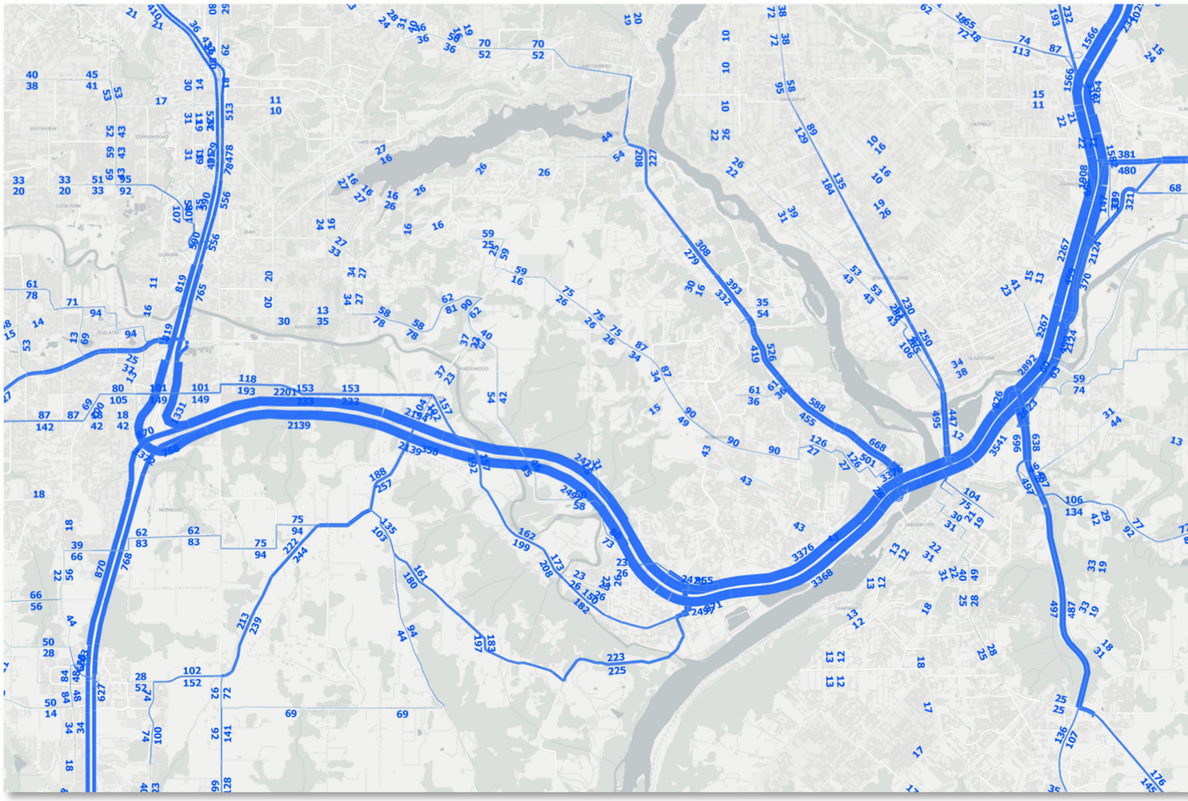


Figure 7 - Select Link Analysis for Vehicles Using the I-205 Bridge – 2045 Build PM Peak Traffic Volume



- **Unanswered questions regarding the RTDM**
  - Only the Assignment Model is available. Trip generation and Trip Distribution, Mode Choice Components were not found. The full model should be provided for full review.
  - Scenarios inside the 2027_NoBuild database are named “2045 Scenarios”; the naming nomenclature is not fully understood.

Review of Traffic Operations in Appendix C

1. The diversion impacts are measured using "jurisdictional mobility standards," (Section 5.4); Mobility Standards from 2013 Clackamas County Comprehensive Plan, 2011 Oregon Highway Plan, 2016 West Linn Transportation System Plan (TSP), 2013 Oregon City TSP, and 2017 Gladstone TSP.

    a. Given how dated some of the information is, some being a decade old, are these acceptable measures of effectiveness today?
    b. Secondly, should the mobility standards that are not met in the No-Build alternative, and subsequently worsen in the Build alternative, appropriately be considered as "no impact" because the mobility standard is already not being met?
    c. Were these standards reviewed and agreed upon by the project stakeholders, and if so, when was that review and agreement reached, and does it remain effective?

2. Future Year Intersection Operations (Years 2027 & 2045; AM & PM): - Tables 5-14, 5-15, 5-17 & 5-18 clearly indicate there are impacts to diversion routes/intersections due to increased traffic volumes related to the Build scenario in both 2027 and 2045. The tables show the intersection performance metrics under the No Build and Build conditions. The text summarizes the results by grouping the intersections as follows:
    a. Intersections that do not meet the "mobility standard" in both the No Build and Build alternatives. In some locations, the delay is already very significant (>300 seconds) in the No Build.
    b. Intersections that worsen under the Build alternative; and
    c. Intersections that do not meet the "mobility standard" under the No Build but do meet the standard under the Build condition.

    Are these intersections considered significantly impacted by the EA? While the document appears to be relatively thorough regarding the analysis and results, it does not specify whether the intersections that experience significant impacts (in our opinion) will require mitigation.

3. Also, it was noted that the software used for this analysis is Synchro 10/HCM2000. Why wasn't Synchro 11/HCM2010 utilized for the analysis? There are significant differences in how delay is handled from HCM 2000 and 2010 which could affect the outcome of the intersection analysis. A white paper prepared by Kittelson Associates (*Comparison of Urban Streets Methodologies in HCM 2010 and HCM 2000*) the initial summary states:

    It must be remembered that the methodology in HCM 2010 represents a fundamental change from that in HCM 2000. Hence, it should be expected that some differences in the predicted travel speed and level of service will occur for some facilities when using the new methodology. It should also be remembered that each of the methodological changes were developed through extensive research, calibrated with field data, validated, and reviewed by many professionals.

Queuing and Blocking Report
Future Build 06/20/2022

Intersection: 1: Stafford & SW Borland Rd

Movement	EB	EB	WB	NB	NB	B163	SB	SB	B160	B159	B157
Directions Served	LT	R	LTR	LT	TR	T	LT	TR	T	T	T
Maximum Queue (ft)	738	240	338	334	256	230	573	533	1173	873	244
Average Queue (ft)	441	106	167	189	66	109	341	262	466	261	62
95th Queue (ft)	904	294	492	354	253	613	667	590	1700	1151	306
Link Distance (ft)	707		657	329	329	1026	492	492	1781	1371	436
Upstream Blk Time (%)	41		12	12	9	7	27	7	19	15	10
Queuing Penalty (veh)	0		0	53	40	66	194	52	270	211	148
Storage Bay Dist (ft)		215									
Storage Blk Time (%)	55	1									
Queuing Penalty (veh)	74	2									

4. We did not have time to go through all the queuing analysis performed. However, we did notice in some instances (Stafford and Borland for example above) that there are queues of 600+ feet with storage blocked 55% of the time. This is the disadvantage of using Synchro/Sim Traffic over a true microsimulation model software in that the queues and their impacts on other downstream and upstream intersections are not considered. How these react in a systems traffic analysis may result in impacts between intersections that are not realized by using HCM/Synchro Methodologies.

5. Proposed mitigations are listed in Table 6-1.
   The proposed mitigation(s) are listed in terms of traffic operation and safety. Our question(s) are about traffic operations.
   a. How were these mitigations developed? There is no discussion or reporting of conditions after the proposed mitigations were implemented. Where are the results?
   b. Are the short term (2027) mitigations a part of the project? i.e., included in the project and budgeted for?
   c. Long term monitoring is mentioned for the 2045 mitigation treatments and implementation if warranted. Is there another agreement stating this and who will be responsible for developing the mitigation plan? Again, were these mitigation plans analyzed?

As mentioned, we have not been able to review many things thoroughly, but the above review concentrated on issues and questions that we believe are most critical to the project. If there is need, we can take a deeper dive into the models and analysis. In the meantime, if you have any questions or need additional information, please feel free to contact us. Thank you.