

MEMORANDUM

DATE: May 8, 2023

TO: Jon Holland, PE, Brown and Caldwell

FROM: Dana Beckwith, PE, PTOE
Richard Martin, EIT

SUBJECT: Bull Run Filtration Facility – Construction Traffic Impact Analysis P18-035-000

This memorandum summarizes the analysis conducted to identify impacts from construction-related traffic for the Portland Water Bureau's (PWB) Bull Run Filtration Facility (the Filtration Facility) located within Multnomah County and adjacent to Clackamas County, Oregon. The study analyzes impacts to study intersections and roadways related to construction of the Filtration Facility and its associated pipelines (together, the Project).

The study uses projections of trips associated with construction and assumptions of how these trips will be distributed over time and over the surrounding road network. These projections and assumptions were made through collaboration with the construction managers/general contractors (CM/GCs) for both the Filtration Facility and pipelines. This study evaluates trips expected to be generated by trucks used for construction activities as well as "Commuter" trips (including site worker, staff, client and craft labor trips). The study concludes that the collective construction traffic will have minimal impacts on intersection and roadway operations, including during needed roadway closures for pipeline construction. Truck traffic causes no impact to intersection operations, and impacts from Commuter trips can be effectively mitigated through use of travel demand management (TDM) strategies.. This analysis is based on the standards established by Multnomah County and Clackamas County for each jurisdiction's roadways. The following intersections were evaluated in this analysis:

1. SE Oxbow Drive / SE Altman Road (Multnomah County)
2. SE Oxbow Drive / SE Hosner Road (Multnomah County)
3. SE Lusted Road / SE Altman Road (Multnomah County)
4. SE Lusted Road / SE Cottrell Road (Multnomah County)
5. SE Dodge Park Boulevard / SE Altman Road (Multnomah County)
6. SE Dodge Park Boulevard / SE Cottrell Road (Multnomah County)
7. SE Carpenter Lane / SE Altman Road (Multnomah County)
8. SE Carpenter Lane / SE Cottrell Road (Multnomah County)
9. SE Bluff Road / SE Altman Road (Clackamas County)
10. SE Bluff Road / SE Cottrell Road (Clackamas County)
11. SE Bluff Road / SE Proctor Road (Clackamas County)
12. SE Dodge Park Boulevard / SE Lusted Road (Clackamas County)
13. SE Lusted Road / SE Hudson Road (Clackamas County)
14. SE Lusted Road / SE 302nd Avenue (Multnomah County)
15. SE Bluff Road / SE Orient Drive (Multnomah County)
 - A. SE Carpenter Lane at Site Access A
 - B. SE Bluff Road at Site Access B

These intersections were chosen for the construction traffic study either (1) because Global Transportation Engineering determined them to be the most likely to be impacted by Project-generated

traffic or (2) because Multnomah County Transportation requested the analysis of additional intersections. Project-generated traffic has been categorized in this analysis either as “Commuter” traffic (including site worker, staff, client, and craft labor trips) or as “Truck” traffic (including materials import/export, concrete, and miscellaneous deliveries). For the Filtration Facility site, the analysis assumes one access onto SE Carpenter Lane (Site Access A) and one onto SE Bluff Road (Site Access B). The analysis was modeled for conservative traffic scenarios, meaning that all peak hour construction traffic was assumed to travel through the study intersections. Realistically, some traffic will disperse through other area roadways. This traffic impact analysis includes the following elements:

- Project Description
- Inventory and Existing Conditions Analysis
 - Safety Analysis of Physical Condition of Roadways and Intersections
- Traffic Data Evaluation
 - 2022 Existing Traffic Volumes
 - Background Growth Rate
 - Project-Generated Trips
- Traffic Impact Analysis
 - Intersection Performance
 - Pipeline Construction Lane and Roadway Closure Impacts
 - Full Closures
 - Pedestrian and Bicycle Accommodations
 - Mitigation Analysis
 - Agricultural Business Access
 - Haul Routes
 - Emergency Vehicles and Bus Routes
 - Schools
- Results

PROJECT DESCRIPTION

The Filtration Facility site is located on the property bounded by SE Carpenter Lane to the north, SE Dodge Park Boulevard to the northeast, private property in Clackamas County to the south, and private property to the west. The site is located within Multnomah County with access from Carpenter Lane in Multnomah County and Bluff Road in Clackamas County. The associated pipelines are located within Multnomah County.

Construction of the Filtration Facility is projected to begin in the third quarter (Q3) of 2023 and finish in 2028. Construction of the raw and finished water pipelines is projected to begin in Q1 of 2024 and finish in 2028. The Filtration Facility is scheduled to be operational by September 30, 2027.

Construction traffic is divided into two categories: construction commuter vehicles and trucks. Construction commuter vehicles are expected to travel to and from the Filtration Facility site and pipeline work areas during the AM and PM peak periods, while truck traffic is spread throughout the workday. Construction of the pipelines, located in the right of way, will involve partial and full roadway closures and local detours.

INVENTORY AND EXISTING CONDITIONS ANALYSIS

Roadway functional classification and existing transportation facilities were reviewed along all study roadways listed on Table 1 within the Project area in the vicinity of study intersections. All modes of travel including pedestrians, bicycles, transit, and motor vehicles were evaluated. The inventory and existing conditions collected are summarized in Table 1.

Table 1 shows that no available sidewalks, bike lanes, on-street parking, or transit routes are identified within the study area. SE Dodge Park Boulevard, Cottrell Road, Bluff Road, and Altman Road have been designated as freight routes with no restrictions on size of trucks in the Multnomah County Transportation System Plan. Study area roadways do not have a freight route designation within Clackamas County based on the Clackamas County Transportation System Plan.

Table 1: Existing Conditions Within Study Area

Roadway	Functional Classification	Posted Speed Limit	Sidewalks	Bike Lanes	Lane Geometry	On-Street Parking	Transit Route	Truck Route ⁴
SE Oxbow Drive	Collector ¹	55 mph ³	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Hosner Road	Local ¹	55 mph ³	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Lusted Road	Collector ¹	45 mph	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Pleasant Home Road	Local ¹	25 mph	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Carpenter Lane	Local ¹	25 mph	None	None	16-20 ft. cross-section	None	None	No
SE Dodge Park Boulevard	Collector ¹	55 mph ³	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Altman Road	Local ¹	55 mph ³	None	None	~ 18 ft. cross-section north of SE Bluff Rd; one 11 ft. travel lane in each direction south of SE Bluff Rd	None	None	Yes
SE Cottrell Road	Local ¹	55 mph ³	None	None	~ 24 ft. cross-section	None	None	Yes
SE Bluff Road	Collector ¹ / Minor Arterial ²	45 mph	None	None	One 11 ft. travel lane in each direction	None	None	Yes
SE Proctor Road	Minor Arterial ²	55 mph ³	None	None	~ 20 ft. cross-section with one travel lane in each direction	None	None	No
SE Hudson Road	Collector ²	55 mph ³	None	None	~ 20 ft. cross-section with one travel lane in each direction	None	None	No



SE 302 nd Avenue	Collector ¹	45 mph	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes
SE Orient Drive	Arterial ¹	35 mph	None	None	One 11-13 ft. travel lane in each direction	None	None	Yes

¹ Based on Multnomah County Transportation System Plan

² Based on Clackamas County Road Functional Classification Map

³ No posted speed limit along the roadway. 55 mph is assumed based on statutory speed limits established by ODOT for open rural highways. However, roadway is subject to the “Basic Speed Rule” in ORS 811.100 *et seq.*

⁴Based on Multnomah County Comp Plan Figure 17B and Clackamas County Comp Plan Map 5-9b.

Safety Analysis of the Physical Condition of Roadways and Intersections

A safety analysis was conducted on March 10, 2023 to examine existing conditions and evaluate any safety concerns along study roadways listed in Table 1. Most of the roadways and intersections showed an acceptable existing physical condition, regarding pavement conditions, lane and shoulder widths, and sight lines to adequately serve construction traffic. Areas of potential concern found within the study area are listed below, along with the needed mitigation, where applicable. This mitigation is incorporated into the Project.

An evaluation of the potential for pavement degradation caused by the Project traffic is being conducted under a separate analysis and memorandum.

Multnomah County maintains a Pavement Condition Index (PCI) score from 1-100 with 100 being the best for County roadways in the Master Road List under their Pavement Management Program. Multnomah County’s goal is to maintain pavement conditions at 70 or above but the County accepts a score of 50 and above for rural roadways. All roadways listed in Table 1 are considered rural roadways by the County. The Master Road List assigns roadway segments different grades based on condition. The current PCI score for each study roadway evaluated in the pavement degradation memorandum will be presented in that memorandum. The current PCI for each of the study segments observed on March 10, 2023 are listed in the below documentation for added context.

SE Lusted Road: SE Lusted Road shows fair-to-poor pavement conditions in the roadway curves east of SE Cottrell Road. The PCI score for this segment is 55/100.

This section of roadway is not planned to be utilized as a route for construction traffic associated with the Filtration Facility and pipelines. For this reason, no mitigation is recommended for this section of roadway.

SE Altman Road: No PCI score is available for SE Altman Road. SE Altman Road is narrow with unpaved shoulders and no pavement markings in the study area. The southbound stop-controlled approach to the intersection of SE Altman Road at SE Bluff Road has a steep incline grade that meets the superelevation of SE Bluff Road. This can create slow acceleration for large construction vehicles. SE Altman Road is not planned as a haul route between SE Dodge Park Boulevard and SE Bluff Road, so no mitigations are recommended for this segment. Segments north of Dodge Park can handle construction traffic within the posted speeds. No mitigation is recommended for Altman Road.

SE Carpenter Lane: SE Carpenter Lane is narrow and unmarked between SE Altman Road and the proposed Access A. The pavement is in poor condition with cracking and potholes. The PCI grade for Carpenter Lane between Altman Road and “End of Pavement” is 31.

The segment between SE Altman Road and SE Cottrell Road is not planned for construction traffic. Therefore, no mitigation is recommended for that segment of SE Carpenter Road. Construction traffic will travel across the segment of SE Carpenter Lane between SE Cottrell Road and Access A at the northwest corner of the Filtration Facility. Therefore, pavement improvements to that segment of SE Carpenter Lane are recommended as mitigation to correct this condition and will be made as part of the Project prior to commencing construction truck traffic for materials import/export.

Based on the information available at the time of this report, with the incorporation into the Project of the recommended mitigation for Carpenter Lane, there are no concerns with the physical condition of study roadways and intersections being able to safely serve both construction traffic and existing background traffic during construction.

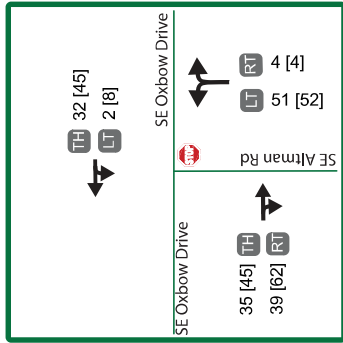
TRAFFIC DATA EVALUATION

2022 Existing Traffic Volumes

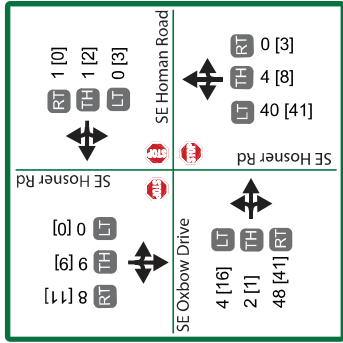
Turning movement count data was collected at study intersections during a typical weekday for the AM peak period of 7:00 AM to 9:00 AM and the PM peak period of 4:00 PM to 6:00 PM¹. Figure 1 shows the existing traffic volumes, traffic operations, and lane configurations within the study area.

Historic count data from 2019 was available for 7 of the 15 study intersections. The count data collected in 2022 was compared to this historic data to determine if the COVID-19 pandemic had significantly changed traffic patterns in the area, and whether the 2022 count data should be adjusted to reflect the impacts of the pandemic on traffic patterns. Some of the intersections showed a drop of up to 10% in the total number of vehicles moving through the intersection between 2019 and 2022. The count comparison, however, showed that many of the main arterial and collector level roadway commuter route volumes remained relatively consistent for both count periods, and some intersection volumes increased between 2019 and 2022. Because the data did not indicate that the COVID-19 pandemic had either a consistent or significant effect on traffic patterns in the area, changes in volumes between the two count periods will present negligible differences in the capacity analysis and for the sake of a consistent time frame across the study intersections, the 2022 volumes were used in the existing conditions analysis, unaltered. Historical and 2022 traffic count data are included in Appendix A.

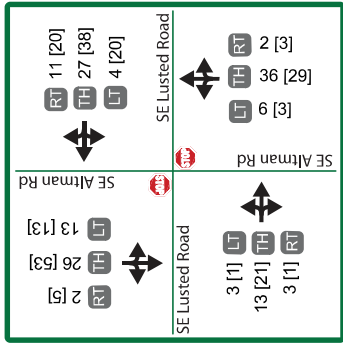
¹ Intersection turn movement counts were conducted by Quality Counts on Thursday, February 28, 2022 and Wednesday, March 15, 2023.



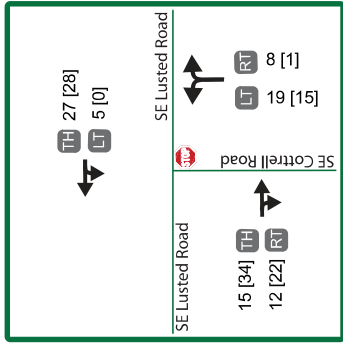
① SE Altman Road at SE Oxbow Drive



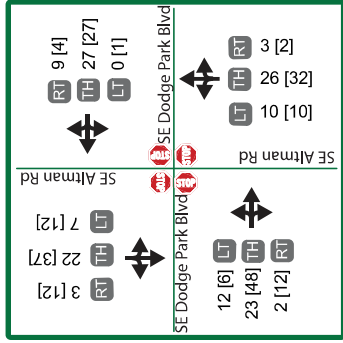
② SE Hosner Road at SE Oxbow Dr / SE Homan Rd



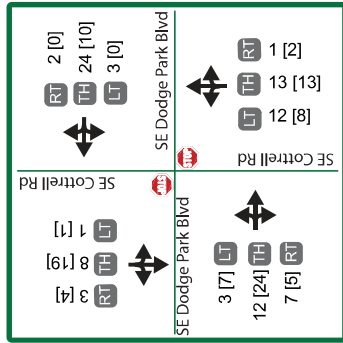
③ SE Altman Road at SE Lusted Road



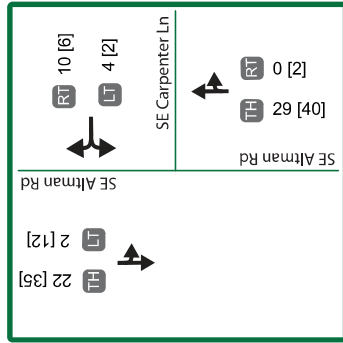
④ SE Cottrell Road at SE Lusted Road



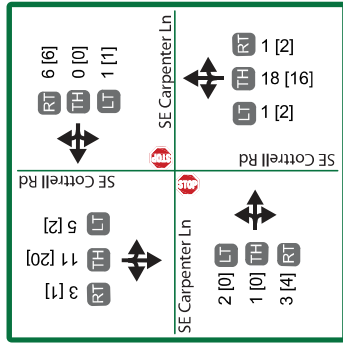
⑤ SE Altman Road at SE Dodge Park Boulevard



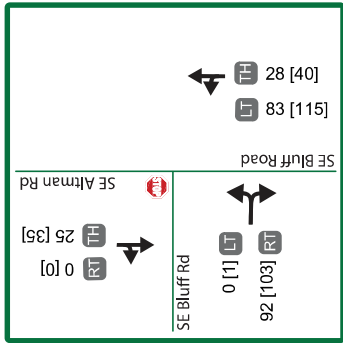
⑥ SE Cottrell Road at SE Dodge Park Boulevard



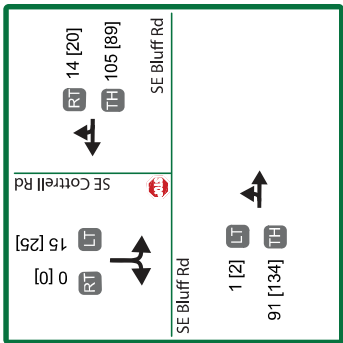
⑦ SE Altman Road at SE Carpenter Lane



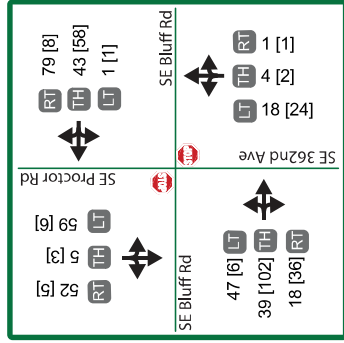
⑧ SE Cottrell Road at SE Carpenter Lane



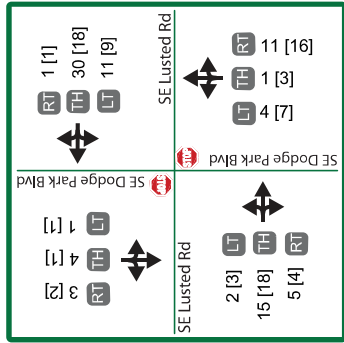
⑨ SE Altman Road at SE Bluff Road



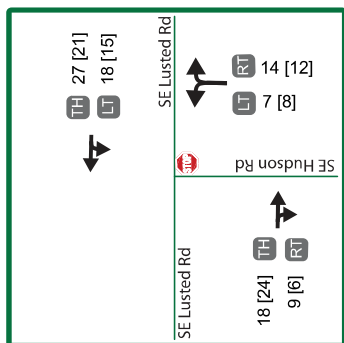
⑩ SE Cottrell Road at SE Bluff Road



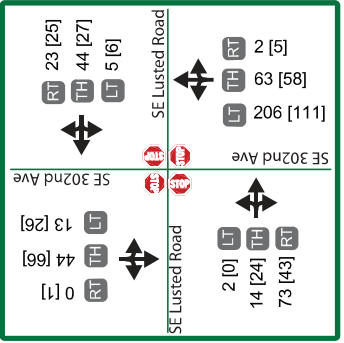
⑪ SE Bluff Road at SE Proctor Road



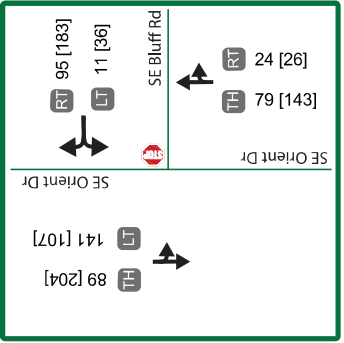
⑫ SE Dodge Park Boulevard at SE Lusted Road



⑬ SE Lusted Road at SE Hudson Road



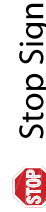
⑭ SE 302nd Avenue at SE Lusted Road



⑮ SE Orient Drive at SE Bluff Road



⊗ = Study Intersection
 ↙ = Lane Configuration
 LT TH RT = Left / Through / Right Turn
 AM [PM] = Peak Hour Traffic Volumes



Stop Sign

Figure 1: Traffic Volumes
 2022 Existing Conditions

Background Growth Rate

A 2% annual background traffic growth rate was assumed in this analysis and applied to existing traffic volumes.² This growth rate was used to develop future traffic volumes at the study intersections for all future scenarios.

Project-Generated Trips

Construction of the Filtration Facility and the associated pipelines will add new vehicle traffic to the local transportation network. Trips generated by the Project are expected to utilize various routes to and from the Filtration Facility and the associated pipeline work sites. Roadways including SE Dodge Park Boulevard, SE Oxbow Drive and SE Bluff Road are considered to be primary routes out of the project area since these roadways have wider lane widths; are classified as collectors; provide connections to the Portland, Gresham, Fairview, and Troutdale area via US 26 and other roadways; and are County-designated truck routes. SE Bluff Road also provides direct access to the City of Sandy. Although considered primary routes in modeling impacts, actual trips will be distributed across a greater number of routes than these depending on pipeline construction locations and actual trip origins.

This section evaluates conditions when all roadways are open. During roadway closures for pipelines construction, other routes will be utilized. Roadway detour analyses are evaluated in the Detours section later in the report.

For this evaluation, construction traffic is divided into “Commuter” vehicles and “Truck” vehicles that haul materials to and from the Project. Commuter vehicles include site worker, staff, clients, and craft labor trips. Trucks include material import/export, concrete, and miscellaneous deliveries.

For a conservative estimate, Commuter vehicles are modeled to travel to and from the Filtration Facility site during the AM and PM peak periods, while Truck traffic is distributed across the typical workday hours of 7:00 AM to 6:00 PM. All Project traffic is modeled as traveling to and from the Filtration Facility, again for a conservative analysis, as this assumption will have the potential for the greatest concentration of impact and potential to trigger intersection performance issues. Realistically, trips traveling to the Filtration Facility will be lower than that assumed in this study, as much of the construction traffic traveling to and from the pipelines construction locations will travel directly to those locations and not actually travel to the Filtration Facility.

Coordination on the preliminary project schedule with the design and construction teams forecast that Project-related construction traffic will peak in 2025. Table 2 shows the trip generation for the construction of the Filtration Facility and pipelines, broken out into average construction traffic and peak construction traffic. Detailed trip generation tables are provided in Appendix B.

² This was based on Clackamas County Roadway Standards Chapter 295.12 and confirmed by Clackamas County staff. To provide consistency, this same growth rate was applied to Multnomah County intersections.

Table 2: Project Construction Traffic Trip Generation Summary

Category	Average Daily Trips	Peak Daily Trips
Filtration Facility Construction		
Commuters	270	445
Trucks	148	295
Pipelines Construction		
Commuters	85	130
Trucks	122	276

Truck trips will occur throughout the day, with a percentage of the total trips shown in Table 2 occurring during the peak hours. Bi-directional 24-hour volume counts were collected on SE Dodge Park Boulevard and SE Bluff Road to identify the percentages of daily traffic traveling along each roadway during the peak hour analysis periods. Based on this information and a minimum construction workday of 9 hours, a conservative value of 15% was selected for Trucks assumed to travel to and from the Project during both peak hours.

Tables 3 and 4 show the Project trip generation for the average and peak construction traffic scenarios.

Table 3: Average Construction Traffic Trip Generation Summary

Description	AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
Commuters						
Filtration Facility	270	0	270	0	270	270
Pipelines	85	0	85	0	85	85
Subtotal	355	0	355	0	355	355
Trucks						
Filtration Facility	23	23	46	23	23	46
Pipelines	19	19	38	19	19	38
Subtotal	42	42	84	42	42	84
Total						
Total	397	42	439	42	397	439

Table 4: Peak Construction Traffic Trip Generation Summary

Description	AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
Commuters						
Filtration Facility	445	0	445	0	445	445
Pipelines	130	0	130	0	130	130
Subtotal	575	0	535	0	575	535
Trucks						
Filtration Facility	45	45	90	45	45	90
Pipelines	42	42	84	42	42	84
Subtotal	87	87	174	87	87	174
Total						
Total	662	87	749	87	662	749

Trip distributions were developed for the peak daily Project traffic based on information provided by the CM/GCs. These distributions evaluate use of the two proposed accesses to the Filtration Facility site -

one to Carpenter Lane and the other to Bluff Road. Four trip distribution routes were modeled to make conservative assumptions of potential travel patterns. These are based on Commuter travel patterns as well as Truck trips to and from likely material disposal and import routes. Routes include the following:

- Site Access A via Dodge Park Boulevard (Route 1)
- Site Access A via Dodge Park Boulevard, Altman Road, and Oxbow Drive (Route 2)
- Site Access B via Orient Drive and Bluff Road (Route 3)
- Site Access B via Bluff Road (Route 4)

As there may be multiple actual material disposal and import sites over the construction period, traffic along the routes is likely to disperse more than these conservative estimates, resulting in fewer trips through study intersections.

For the Commuter trips, one distribution scenario was created based on population hubs, shortest-distance travel routes to/from the Filtration Facility site from various origins, and the collected turning movement count data. The distribution along each route is as follows:

- 55% of commuter trips were modeled on Route 1
- 15% on Route 2
- 15% on Route 3
- 15% on Route 4

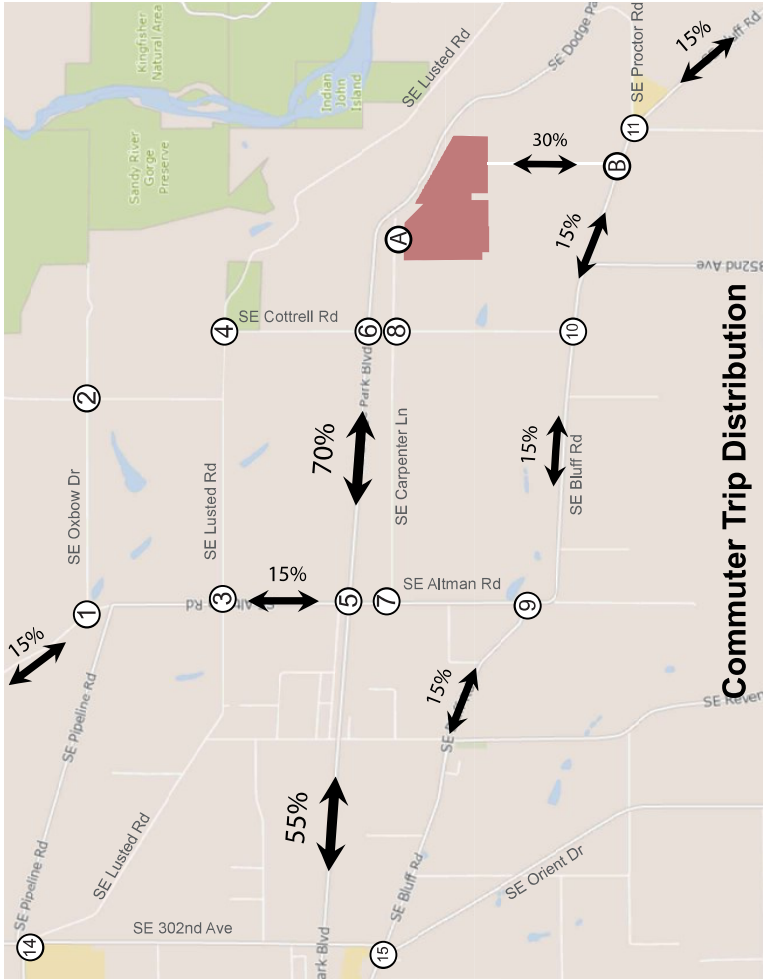
For the Truck trips, four scenarios were developed where 100% of Trucks were distributed along each route for a conservative analysis. Realistically, there are many import/export destinations in different directions from the Project work sites, and truck trips will likely disperse along various routes including County-designated freight routes not included in this analysis. These analyses show a worst-case scenario where all truck trips move along the same route to the same destinations. Figures for trip distributions for the Commuter traffic scenario and for the four Truck traffic scenarios are shown in Figure 2. Trip assignment for all scenarios is provided in Appendix B.

Total Project trip distribution estimates were developed for four scenarios by combining the Commuter traffic distribution scenario with the four Truck traffic scenarios:

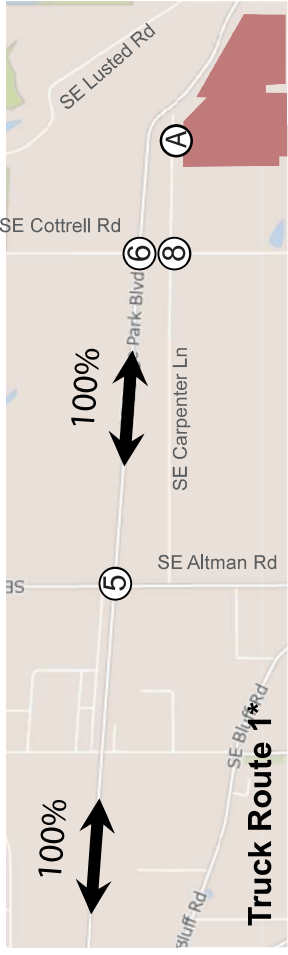
- 2025 Peak Construction Traffic Distribution Scenario 1 (100% of Trucks on Route 1)
- 2025 Peak Construction Traffic Distribution Scenario 2 (100% of Trucks on Route 2)
- 2025 Peak Construction Traffic Distribution Scenario 3 (100% of Trucks on Route 3)
- 2025 Peak Construction Traffic Distribution Scenario 4 (100% of Trucks on Route 4)

The trip assignment figures provided in Appendix B include only intersections where site trip traffic was distributed. Other study intersections that were not modeled as receiving site trip distribution were omitted from these figures.

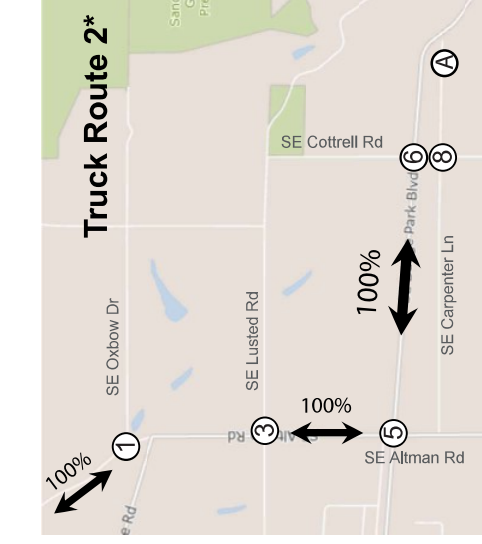
During roadway closures for pipeline construction, trip distribution routes will change as Commuters and Trucks are detoured. This is further discussed in the Pipeline Construction Lane and Roadway Closures section.



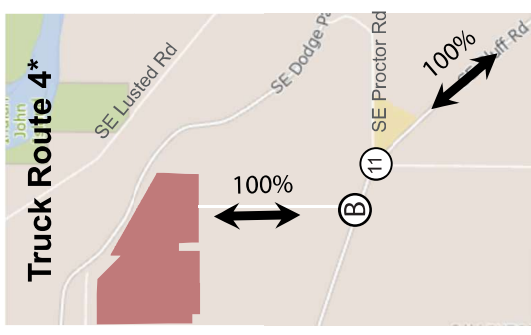
Commuter Trip Distribution



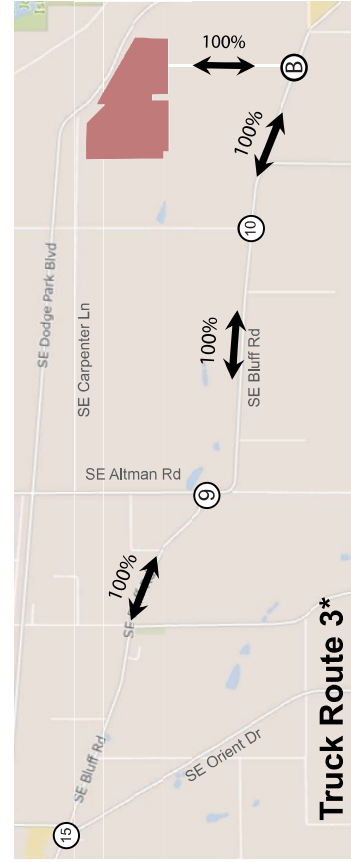
Truck Route 1*



Truck Route 2*



Truck Route 4*



Truck Route 3*

⊗ = Study Intersection

% = Percentage of Vehicles Traveling Along Route

*Truck percentages represent worst-case scenarios used for conservative evaluations. Actual trips will disperse across multiple routes.



Figure 2: Trip Distribution Peak Construction Traffic Commuter and Truck Routes

TRAFFIC IMPACT ANALYSIS

Intersection Performance

An intersection performance analysis was conducted for study intersections to determine the expected traffic impacts of the construction process for existing conditions and peak construction traffic conditions. The peak periods analyzed for this evaluation include the AM peak period (7:00 AM to 9:00 AM) and the PM peak period (4:00 PM to 6:00 PM). The intersection Level of Service (LOS) was analyzed based on procedures described in the Highway Capacity Manual 2000 (HCM). The analysis was performed for all study intersections.

Multnomah County Design Standards specify that facilities shall accommodate an LOS C or better during the design hour in rural areas.³ Clackamas County Comprehensive Plan utilizes LOS E or better for unsignalized intersections in rural areas during AM and PM peak hours.

The study area intersections were evaluated for the following scenarios:

- 2022 Existing Conditions
- 2025 Peak Construction Traffic Conditions
 - Distribution Scenario 1
 - Distribution Scenario 2
 - Distribution Scenario 3
 - Distribution Scenario 4

Synchro software (Version 11) was used to determine the delay, level of service, and volume to capacity (v/c) ratio for each scenario considered. Delay is the average delay per vehicle in seconds and is reported for the approach with the highest stop-control delay for minor-street stop-controlled intersections and the average delay for all-way stop-controlled intersections.

The v/c ratio is a conventional level-of-service measure for roadways, comparing vehicle volumes on a roadway with the roadway's carrying capacity. Table 5 shows intersection performance for the 2022 existing conditions. Table 6 shows the intersection performance for the four peak construction distribution scenarios. The analyses shown in Tables 5 and 6 are for scenarios where all roadways are open. Roadway closure scenarios are detailed in a later section. Detailed analysis results are included in Appendix C.

As shown in Table 5, all study intersections perform at acceptable levels of service with minimal delay under existing conditions.

³ Multnomah County Design Standards, Section 1.1.5

Table 5: Existing Conditions Intersection Performance Summary

#	Intersection	Peak Hour	2022 Existing Traffic		
			Delay	LOS	V/C
1	SE Oxbow Drive / SE Altman Road	AM	9.5	A	0.08
		PM	9.5	A	0.07
2	SE Oxbow Drive / SE Hosner Road	AM	8.2	A	0.08
		PM	7.9	A	0.07
3	SE Lusted Road / SE Altman Road	AM	9.7	A	0.06
		PM	10.4	B	0.12
4	SE Lusted Road / SE Cottrell Road	AM	9.1	A	0.04
		PM	9.1	A	0.02
5	SE Dodge Park Boulevard / SE Altman Road	AM	7.5	A	0.05
		PM	7.6	A	0.09
6	SE Dodge Park Boulevard / SE Cottrell Road	AM	9.4	A	0.04
		PM	9.3	A	0.03
7	SE Carpenter Lane / SE Altman Road	AM	8.6	A	0.01
		PM	8.9	A	0.01
8	SE Carpenter Lane / SE Cottrell Road	AM	9.2	A	0.01
		PM	8.5	A	0.01
9	SE Bluff Road / SE Altman Road	AM	9.9	A	0.04
		PM	10.5	B	0.06
10	SE Bluff Road / SE Cottrell Road	AM	10.0	A	0.03
		PM	10.2	B	0.04
11	SE Bluff Road / SE Proctor Road	AM	11.3	B	0.16
		PM	10.3	B	0.04
12	SE Dodge Park Boulevard / SE Lusted Road	AM	9.2	A	0.01
		PM	8.9	A	0.04
13	SE Lusted Road / SE Hudson Road	AM	9.0	A	0.03
		PM	8.8	A	0.03
14	SE Lusted Road / SE 302 nd Avenue	AM	14.9	B	0.34
		PM	8.5	A	0.31
15	SE Bluff Road / SE Orient Drive	AM	9.9	A	0.14
		PM	13.1	B	0.37
A	SE Carpenter Lane / Site Access A	AM	-	-	-
		PM	-	-	-
B	SE Bluff Road / Site Access B	AM	-	-	-
		PM	-	-	-

Table 6: 2025 Peak Construction Conditions Intersection Performance Summary

#	Intersection	Peak Hour	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	SE Oxbow Drive / SE Altman Road	AM	9.9	A	13.0	B	9.9	A	9.9	A
		PM	10.2	B	12.6	B	10.2	B	10.2	B
2	SE Oxbow Drive / SE Hosner Road	AM	8.2	A	8.2	A	8.2	A	8.2	A
		PM	7.9	A	7.9	A	7.9	A	7.9	A
3	SE Lusted Road / SE Altman Road	AM	10.4	B	12.3	B	10.4	B	10.4	B
		PM	11.2	B	14.2	B	11.2	B	11.2	B
4	SE Lusted Road / SE Cottrell Road	AM	9.1	A	9.1	A	9.1	A	9.1	A
		PM	9.1	A	9.1	A	9.1	A	9.1	A
5	SE Dodge Park Boulevard / SE Altman Road	AM	16.5	C	13.4	B	10.7	B	10.7	B
		PM	15.7	C	28.4	D	12.2	B	12.2	B
6	SE Dodge Park Boulevard / SE Cottrell Road	AM	16.0	C	16.0	C	12.3	B	12.3	B
		PM	22.9	C	22.9	C	14.2	B	14.2	B
7	SE Carpenter Lane / SE Altman Road	AM	8.7	A	8.7	A	8.7	A	8.7	A
		PM	9.0	A	9.0	A	9.0	A	9.0	A
8	SE Carpenter Lane / SE Cottrell Road	AM	51.9	F	51.9	F	26.2	D	26.2	D
		PM	13.3	B	13.3	B	11.2	B	11.2	B
9	SE Bluff Road / SE Altman Road	AM	10.7	B	10.7	B	12.6	B	10.7	B
		PM	11.5	B	11.5	B	13.8	B	11.5	B
10	SE Bluff Road / SE Cottrell Road	AM	10.7	B	10.7	B	12.6	B	10.7	B
		PM	11.2	B	11.2	B	13.1	B	11.2	B
11	SE Bluff Road / SE Proctor Road	AM	12.5	B	12.5	B	12.5	B	15.3	C
		PM	11.3	B	11.3	B	11.3	B	13.7	B
12	SE Dodge Park Boulevard / SE Lusted Road	AM	9.3	A	9.3	A	9.3	A	9.3	A
		PM	8.9	A	8.9	A	8.9	A	8.9	A
13	SE Lusted Road / SE Hudson Road	AM	9.0	A	9.0	A	9.0	A	9.0	A
		PM	8.8	A	8.8	A	8.8	A	8.8	A
14	SE Lusted Road / SE 302 nd Avenue	AM	10.6	B	10.6	B	10.6	B	10.6	B
		PM	8.6	A	8.6	A	8.6	A	8.6	A
15	SE Bluff Road / SE Orient Drive	AM	10.5	B	10.5	B	12.2	B	10.5	B
		PM	15.1	C	15.1	C	23.5	C	15.1	C
A	SE Dodge Park Boulevard / Site Access A	AM	10.9	B	10.9	B	0.0	A	0.0	A
		PM	14.4	B	14.4	B	11.3	B	11.3	B
B	SE Bluff Road / Site Access B	AM	3.8	A	3.8	A	9.7	A	19.3	C
		PM	10.6	B	10.6	B	13.7	B	14.3	B

Notes: **Bold** = Does not meet performance standard.

As shown in Table 6, all study intersections perform at acceptable levels of service with minimal delay except for SE Carpenter Lane / SE Cottrell Road for all scenarios and SE Dodge Park Boulevard / SE Altman Road for Scenario 2.

SE Carpenter Lane / SE Cottrell Road falls below standards due to delay created by the introduction of construction vehicles experienced by eastbound minor street vehicles during the AM peak hour, the approach for which is forecast to have less than five vehicles. These impacts are short term and without these vehicles, the intersection would operate at LOS B with a control delay of 10.8 seconds. The analysis is conservative for the worst-case trip distribution scenarios where all vehicles are modeled to travel to the Filtration Facility via the SE Carpenter Lane / Cottrell Road intersection. In reality, construction commuter and truck trips associated with the pipelines will travel directly to the

pipeline work area. This will allow the intersection to operate at an acceptable performance level rather than the level shown in Table 6. The TDM strategies for Commuter traffic recommended below in the Mitigation Analysis section will allow the intersection to operate at acceptable levels of service.

SE Dodge Park Boulevard / SE Altman Road meets performance standards for Scenarios 1, 3, and 4 that show Commuter traffic traveling through the intersection but falls below standards for Scenario 2 where 100 percent of the Truck traffic is added. A 15% reduction in truck traffic at the intersection will allow it to meet performance standards. Mitigation strategies outlined in the Mitigations Analysis section will also allow this intersection to meet performance standards.

With the TDM strategies described in the Mitigations Analysis section, all study intersections perform at acceptable levels of service with minimal delay even during peak construction conditions.

Pipeline Construction Lane and Roadway Closures

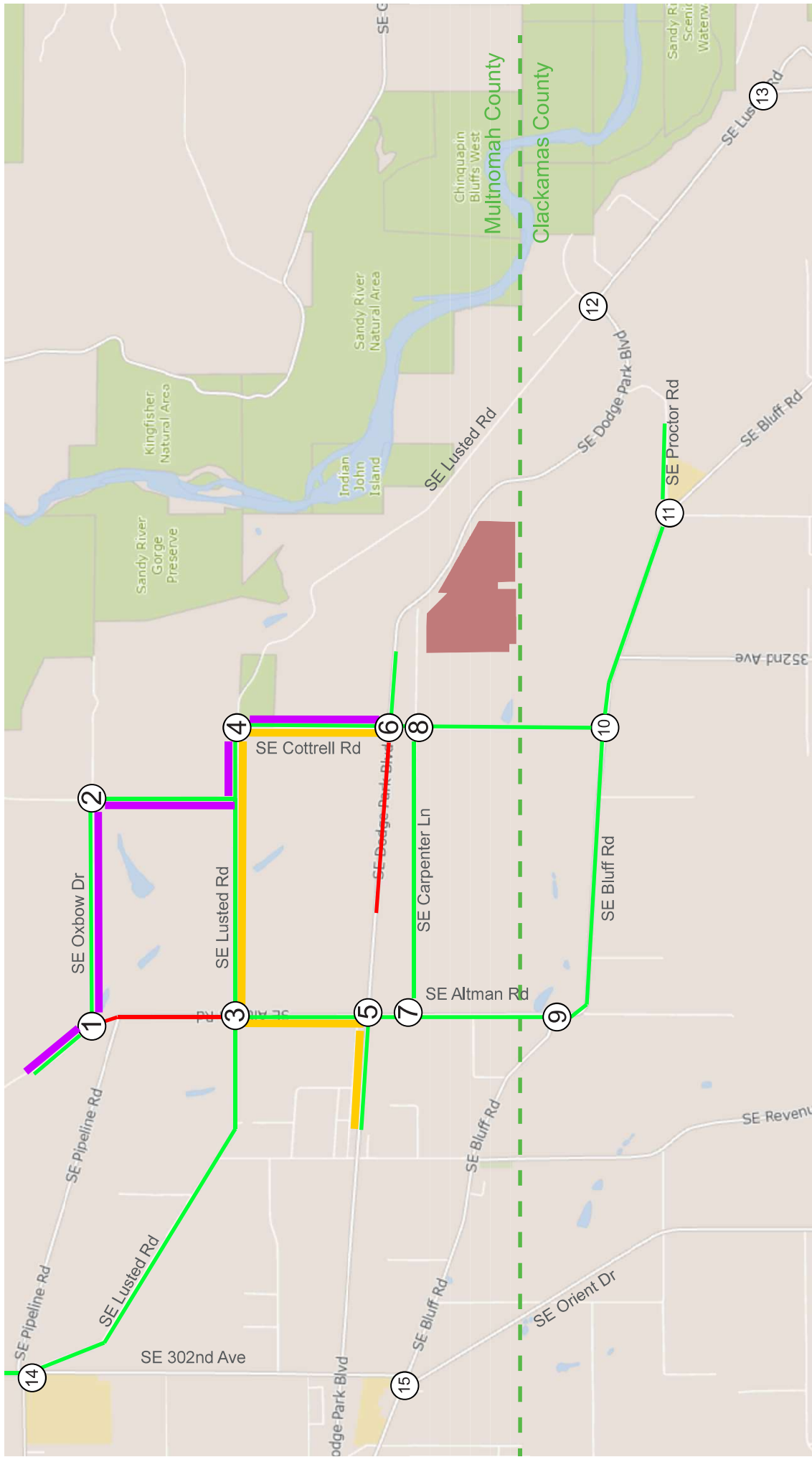
Partial and full roadway closures will be required to complete construction of the pipelines. Farm field access will be maintained and will incorporate seasonal constraints on closures to minimize impacts to agricultural operations. Most roadway closures will be partial in nature, during work hours only with one-way traffic controlled by flaggers, which will further reduce traffic impacts. Additionally, pedestrians and bicycles will be accommodated during these partial and full roadway closures.

Full Closures

Full closures are anticipated to have a short-term impact on traffic as construction vehicles and non-local vehicles will need to be detoured. Traffic for local residences, local agricultural and other businesses, and emergency vehicles will still be allowed local access during full closures.

Two analyses were conducted to determine the operational impacts for paired full closures of SE Dodge Park Boulevard / SE Altman Road and SE Lusted Road / SE Cottrell Road, as these roadway closures have the greatest potential for impacts, compared to single and partial closures. All other roadways will be kept fully open during these paired full closures. As described below, the study area roadways are shown to perform at acceptable levels of service during the paired full closures with management of Commuter routes, so all other single and partial closures will similarly perform at acceptable levels of service.

For each analysis, the traffic volumes for the 2025 Peak Construction Traffic Conditions Distribution Scenario 2 (henceforth referred to as “Scenario 2 volumes”) were used, with all vehicles detouring around the closed roadway sections. The detours outlined in this section send all vehicles previously utilizing the closed roadways through the next closest study intersections to get them back to their original path for a conservative analysis. Scenario 2 volumes were chosen for this analysis because it represents the scenario where the greatest number of vehicles are traveling through study intersections impacted by the roadway closures. Figures 3 and 4 show detour routes and roadways for the two closure scenarios. Figures showing the areas of closure and the detoured volumes for the roadway closure scenarios are provided in Appendix D.



- (X) = Study Intersection
- = Dodge Park/Altman Closure
- = Local Traffic Detour Roadways During Closures
- = Route 1 Construction Vehicle Detours During Closures
- = Route 2 Construction Vehicle Detours During Closures



Figure 3: Dodge/Altman Full Roadway Closure Construction Detour Routes

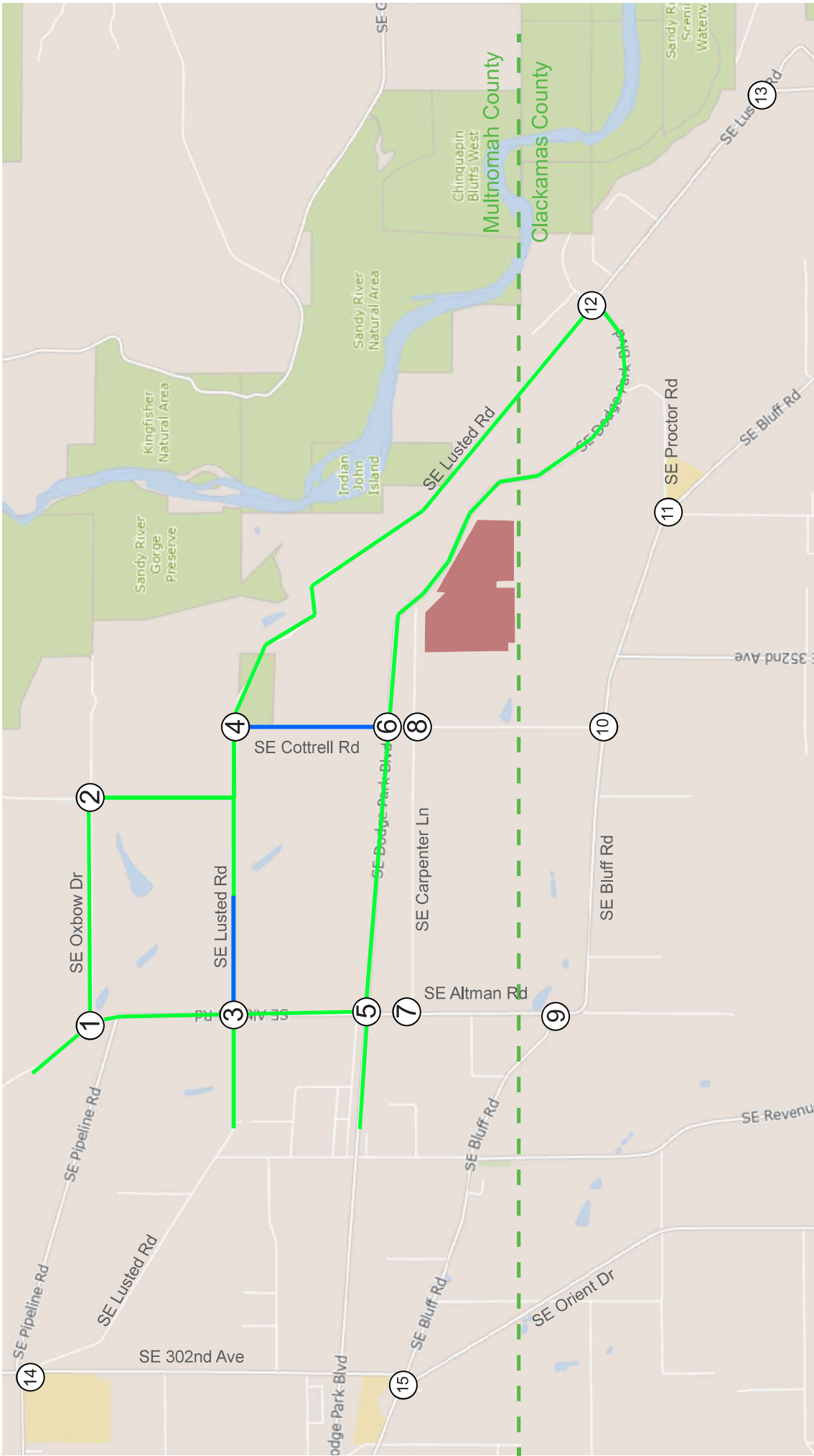


Figure 4: Lusted/Cottrell Full Roadway Closure Construction Detour Routes

- (X) = Study Intersection
- = Lusted/Cottrell Closure
- = Local Traffic Detour Roadways During Closures



Table 7 shows the intersection performance summaries for both paired closures. Detailed HCM reports for these results are provided in Appendix D. These capacity analyses reflect the worst-case scenarios for intersection operational and capacity impacts. As shown in Table 7, several study intersections operate below performance standards with the conservative detour routes. It is recommended that travel demand management strategies be implemented to reduce the demand for vehicles on Dodge Park Boulevard and Lusted Road. Alternative TDM measures are outlined in the Mitigations Analysis section.

Table 7: 2025 Peak Traffic Closure Scenarios Intersection Performance Summary (Without Mitigation by TDM Strategies)

#	Intersection	Peak Hour	Dodge / Altman Closures			Lusted / Cottrell Closures		
			Delay	LOS	V/C	Delay	LOS	V/C
1	SE Oxbow Drive / SE Altman Road	AM	0.0	A	0.19	15.7	C	0.39
		PM	0.0	A	0.12	16.7	C	0.42
2	SE Oxbow Drive / SE Hosner Road	AM	10.3	B	0.41	8.4	A	0.28
		PM	10.0	A	0.39	8.5	A	0.28
3	SE Lusted Road / SE Altman Road	AM	13.5	B	0.52	11.8	B	0.34
		PM	54.2	F	0.59	13.0	B	0.39
4	SE Lusted Road / SE Cottrell Road	AM	13.5	B	0.29	0.0	A	0.29
		PM	27.7	D	0.84	0.0	A	0.84
5	SE Dodge Park Boulevard / SE Altman Road	AM	11.7	B	0.45	14.1	B	0.56
		PM	15.1	C	0.39	28.4	D	0.53
6	SE Dodge Park Boulevard / SE Cottrell Road	AM	25.9	D	0.81	17.1	C	0.34
		PM	18.2	C	0.70	26.1	D	0.80
7	SE Carpenter Lane / SE Altman Road	AM	8.6	A	0.03	8.7	A	0.02
		PM	9.0	A	0.02	9.0	A	0.01
8	SE Carpenter Lane / SE Cottrell Road	AM	53.6	F	0.10	51.9	F	0.09
		PM	13.3	B	0.58	13.3	B	0.58
9	SE Bluff Road / SE Altman Road	AM	10.9	B	0.08	10.7	B	0.05
		PM	11.6	B	0.09	11.5	B	0.07
10	SE Bluff Road / SE Cottrell Road	AM	11.0	B	0.04	10.7	B	0.03
		PM	11.5	B	0.09	11.2	B	0.05
11	SE Bluff Road / SE Proctor Road	AM	12.8	B	0.05	11.7	B	0.20
		PM	11.4	B	0.05	11.3	B	0.05
12	SE Dodge Park Boulevard / SE Lusted Road	AM	9.3	A	0.01	9.4	A	0.01
		PM	8.9	A	0.04	9.0	A	0.07
13	SE Lusted Road / SE Hudson Road	AM	9.0	A	0.03	9.1	A	0.03
		PM	8.8	A	0.03	8.9	A	0.03
14	SE Lusted Road / SE 302 nd Avenue	AM	10.8	B	0.39	10.6	B	0.36
		PM	8.7	A	0.35	8.6	A	0.32
15	SE Bluff Road / SE Orient Drive	AM	10.5	B	0.16	10.5	B	0.16
		PM	15.1	C	0.51	15.1	C	0.51
A	SE Dodge Park Boulevard / Site Access A	AM	10.9	B	0.13	10.9	B	0.13
		PM	14.5	B	0.59	14.5	B	0.59
B	SE Bluff Road / Site Access B	AM	3.5	A	0.07	3.8	A	0.07
		PM	10.7	B	0.23	10.6	B	0.23

Notes: **Bold** = Does not meet performance standard

Pedestrian and Bicycle Accommodation During Construction

Pedestrians and bicycles will be accommodated through work zones during Project construction, equivalent to or exceeding the current accommodations. These accommodations will comply with all applicable Multnomah County and Clackamas County guidelines.

Currently, pedestrian access along study roadways is limited to the roadway and narrow gravel shoulders. SE Dodge Park Boulevard is the exception with typical 2-foot paved shoulders.

Through work zones where there are full roadway closures or one side of the road is closed, pedestrian access will remain open when there is ample room for passage around the work zone, with one exception described in the following paragraph. The typical approach to accommodating pedestrians and bicycles is to provide access on the side of the roadway opposite from the work zone. Pedestrian detour routes will be implemented such that pedestrians previously utilizing the closed side of the road will be detoured to the open side at either nearby intersections or at temporary crossings near the work zone. Striped shoulders and/or tubular markers will be used to provide temporary walkways for pedestrian access.

One work zone is proposed for a full roadway closure for Project-related activities where no vehicular, pedestrian or bike access will be provided through the work zone. This is a full closure of SE Altman Road between SE Pipeline Road and SE Oxbow Road for pipeline work. This is due to limited or no shoulder area, ditches along the west side of the road, and drop-offs along the east side of the road. No worn pedestrian paths are present in the area and there are no site access points along this segment of SE Altman Road, so no pedestrian traffic is anticipated. As an option, if pedestrian or bike access is deemed necessary by Multnomah County, a shuttle may be provided that can shuttle pedestrians and bikes around the work zone.

Bicycles currently share roadways with vehicle traffic along all study roadways. During lane closures, bicycles will continue to share the road in the same manor. If vehicle detours are present, bikes are anticipated to follow the same detour route. Temporary signs will be provided to warn drivers that bicycles will be sharing the roadway through work zones. Should it be necessary for bikes to share a pedestrian facility, the facility will be signed for bicyclists to walk their bikes through.

Mitigation Analysis

A mitigation analysis was conducted using the 2025 Peak Traffic Closure Scenarios volumes to determine if alternative Project trip distribution would allow for the intersections to perform at acceptable levels of service for peak construction conditions, including during the two paired-closure scenarios. As a first measure for mitigation, TDM strategies were explored. TDM measures that can be deployed to improve operations include:

- Direct half of the commuter traffic to use Access B, which will redirect traffic from Dodge Park Boulevard to Bluff Road at various intersections west of the Project sites. Because of the ample capacity on all study area roadways, detouring half of the construction commuter vehicles to SE Bluff Road will not create operational or capacity issues. The detailed analysis results and mitigations volumes figures are available in Appendix E.
- Provide a commuter shuttle.
- Offset commuter arrivals to the Filtration Facility.
- Develop a rideshare program.
- Develop an incentive program to encourage carpooling.

For this analysis, 190 commuter trips previously taking Route 1 from Dodge Park Boulevard to Site Access A were rerouted to Route 3 along Orient Drive and Bluff Road to Site Access B, resulting in a

new total trip allocation of 387 total trips (Commuter and Truck combined) utilizing Site Access A during both peak hours. Table 8 shows the results of the mitigation analysis.

Table 8: 2025 Peak Traffic Closure Scenarios Mitigation Analysis Intersection Performance Summary

#	Intersection	Peak Hour	Dodge / Altman Closures			Lusted / Cottrell Closures		
			Delay (sec)	LOS	V/C	Delay (sec)	LOS	V/C
1	SE Oxbow Drive / SE Altman Road	AM	0.0	A	0.19	15.7	C	0.39
		PM	0.0	A	0.12	16.7	C	0.42
2	SE Oxbow Drive / SE Hosner Road	AM	10.3	B	0.41	8.4	A	0.28
		PM	10.0	A	0.39	8.5	A	0.28
3	SE Lusted Road / SE Altman Road	AM	11.1	B	0.29	11.8	B	0.34
		PM	17.6	C	0.26	13.0	B	0.39
4	SE Lusted Road / SE Cottrell Road	AM	11.8	B	0.25	0.0	A	0.00
		PM	14.4	B	0.53	0.00	A	0.53
5	SE Dodge Park Boulevard / SE Altman Road	AM	8.7	A	0.34	11.2	B	0.46
		PM	9.8	A	0.28	13.4	B	0.43
6	SE Dodge Park Boulevard / SE Cottrell Road	AM	14.6	B	0.53	14.3	B	0.28
		PM	12.4	B	0.44	14.6	B	0.50
7	SE Carpenter Lane / SE Altman Road	AM	8.6	A	0.03	8.7	A	0.02
		PM	9.0	A	0.02	9.0	A	0.01
8	SE Carpenter Lane / SE Cottrell Road	AM	22.1	C	0.04	21.6	C	0.04
		PM	10.5	B	0.36	10.5	B	0.36
9	SE Bluff Road / SE Altman Road	AM	13.2	B	0.10	12.8	B	0.06
		PM	14.2	B	0.12	14.0	B	0.10
10	SE Bluff Road / SE Cottrell Road	AM	13.2	B	0.06	12.8	B	0.04
		PM	14.0	B	0.12	13.4	B	0.07
11	SE Bluff Road / SE Proctor Road	AM	12.8	B	0.05	12.5	B	0.05
		PM	11.4	B	0.05	11.3	B	0.05
12	SE Dodge Park Boulevard / SE Lusted Road	AM	9.3	A	0.01	9.4	A	0.01
		PM	8.9	A	0.04	9.0	A	0.07
13	SE Lusted Road / SE Hudson Road	AM	9.0	A	0.03	9.1	A	0.03
		PM	8.8	A	0.03	8.9	A	0.03
14	SE Lusted Road / SE 302 nd Avenue	AM	10.8	B	0.39	10.6	B	0.36
		PM	9.4	A	0.27	9.2	A	0.14
15	SE Bluff Road / SE Orient Drive	AM	12.5	B	0.20	12.5	B	0.20
		PM	24.1	C	0.78	14.8	B	0.50
A	SE Dodge Park Boulevard / Site Access A	AM	10.0	B	0.12	10.0	B	0.12
		PM	11.2	B	0.36	11.2	B	0.36
B	SE Bluff Road / Site Access B	AM	6.4	A	0.22	6.6	A	0.22
		PM	12.3	B	0.44	12.2	B	0.44

As shown in Table 8, distributing approximately 52% of Commuter traffic along Route 3 through Site Access B, while maintaining all other worst-case distributions for Commuters and Trucks, allows for all study intersections to perform at acceptable levels of service. A simple travel demand management strategy which assigns Commuters with specific entry and exit points (Access A or B) would achieve this distribution and mitigate the level of service issues which otherwise could be created by Project

traffic during peak construction conditions, including during the roadway closures necessary for pipeline construction.

The results of the analysis may also be applied to a scenario where Site Access B is not available for some time during the construction period. For this scenario, a TDM measure that reduces the total number of vehicles utilizing Site Access A to 387 or fewer total vehicles (Commuter and Truck combined) will allow the study intersections to meet performance standards.

Agricultural Business Access

Roadways with field access impacts to agricultural businesses include SE Oxbow Drive, SE Lusted Road, SE Dodge Park Boulevard, SE Bluff Road, and SE Altman Road. Farm traffic will be maintained through work zone full closures when no alternative field access is possible. Pipeline construction will be sequenced to minimize farm detours and impacts during seasonal peaks for agricultural traffic.

Outreach to farmers by the CM/CG throughout construction will ensure their access needs will be addressed. Farmer outreach will include the following information:

- Farmers will be notified ahead of time when increased deliveries of construction supplies are planned.
- Farm, residential, and business accesses necessary to be maintained during the construction process.
- Which larger agricultural equipment and heavy vehicles need to be facilitated.
- Construction schedules.
- Agricultural vehicle routes between sites.

Haul Routes

Primary haul routes have been developed by the CM/GCs and are considered in the traffic analysis above as Truck Routes 1-4 (and corresponding Distribution Scenarios 1-4). As noted above, the Distribution Scenarios represent a conservative analysis by assuming that all Trucks are taking a single route, to ensure that even with 100% of Trucks on one of Routes 1-4, any issues are identified and addressed. This is a conservative analysis because Trucks will instead be dispersed among Routes 1-4 and because alternative haul routes exist that will disperse trucks through the transportation system. Examples of alternative haul route roadways include SE Pleasant Home Road, SE 352nd Avenue, SE Compton Road, and SE 282nd Avenue. For all Distribution Scenarios, no operational or capacity impacts were identified, and no mitigations are recommended with regard to Truck routes.

Emergency Vehicle and Bus Routes

During all lane and full roadway closures, emergency vehicle access will be maintained. For school bus routes, PWB and the CM/GCs will coordinate with the schools and districts on schedules, bus routes that need to be maintained, and bus routes that can be temporarily modified.

Schools

There are four schools along or near anticipated and possible Project construction traffic routes:

- Oregon Trail Academy – 36225 Proctor Rd, Boring, OR 97009
- Sam Barlow High School – 5105 SE 302nd Ave, Gresham, OR 97080

- West Orient Middle School – 29805 SE Orient Dr, Gresham, OR 97080
- East Orient Elementary School – 7431 SE 302nd Ave, Gresham, OR 97080

Sam Barlow High School and West Orient Middle School are located along (or are shown to have vehicle queueing along) roadways that are likely to be impacted by construction traffic. As such, queueing observations were conducted at these schools.

Oregon Trail Academy (OTA) is located along Bluff Road, with student drop-off/pick-up traffic queueing along SE Proctor Road to the east of Bluff Road. Proctor Road is not expected to have significant construction traffic. Because of the school's proximity to the proposed Site Access B location on SE Bluff Road, queueing observations were conducted at OTA.

East Orient Middle School is located on SE 302nd Avenue, which is not a primary truck route or commuter route and is not anticipated to have significant construction traffic. As such, this school was not observed for queueing.

CM/GCs will take note of start and end times for these schools (listed below) when developing delivery schedules for transporting materials to avoid impacting the schools and creating delays due to construction traffic. Contractors will allot an additional 20 minutes before school starts in the morning and an additional 20 minutes before and after school ends in the afternoon to allow for school-related traffic to dissipate. The start and end times as of May 2023 are as follows:

- Oregon Trail Academy – 7:45 AM and 2:45 PM
- Sam Barlow High School – 7:35 AM (8:35 AM Wednesday) and 2:30 PM
- West Orient Middle School – 9:05 AM (10:05 AM Wednesday) and 3:35 PM
- East Orient Elementary School – 8:35 AM and 3:05 PM

Queueing observations were conducted for the start and end times at Sam Barlow High School and West Orient Middle School in March 2023 and at Oregon Trail Academy in May 2023. The observations started 45 minutes before the start and end times for both schools and continued for 15 minutes after those designated times. These observations are summarized in the following subsections.

Oregon Trail Academy

At Oregon Trail Academy, drop-off and pick-up queueing was observed during the following periods:

- Morning – 7:15 AM to 8:00 AM
- Afternoon – 2:15 PM to 3:00 PM

During the morning observation period, vehicles began arriving at the school at 7:20 AM. Vehicles queueing to drop off students were observed to utilize a pass-through route on the school grounds on the south side of Proctor Road to double back on Proctor Road to reach the pick-up location in the drive aisles adjacent to the school building on the north side of the road. Some vehicles parked in the parking lot on the south side of Proctor Road to drop off students, who were then assisted across Proctor Road at a crosswalk by a crossing guard. No queues reached SE Bluff Road. Queues had completely cleared by 8:00 AM. The same queueing characteristics were seen during the afternoon pick-up period. Vehicles began arriving for pick-up at 2:15 PM. By 2:30 PM the three drive aisles on the north side of Proctor Road were full of queued vehicles. By 2:45 PM the drive aisle on the south

side of Proctor Road was full as well, and that is when students began departing. No queues reached Bluff Road. All queues cleared by 3:00 PM.

Since construction traffic is not anticipated on SE Proctor Road and since no queueing impacts were seen for SE Bluff Road, no mitigations are recommended.

Sam Barlow High School

At Sam Barlow High School, queueing involving cars and buses was observed to be present along SE Lusted Road and SE 302nd Avenue during the start time observation period consistent with students arriving to school by car and bus in the morning. Cars and buses arriving from the southeast along SE 302nd Avenue were observed to turn left onto SE Lusted Road and then left again into the school parking lot at the marked accesses 2 and 4. Cars and buses arriving from the west along SE Lusted Road turned right into accesses 2 and 4. Figure 5 shows the school driveways labeled with their driveway numbers and frontage road that wraps around the north and east sides of the school where buses queue.

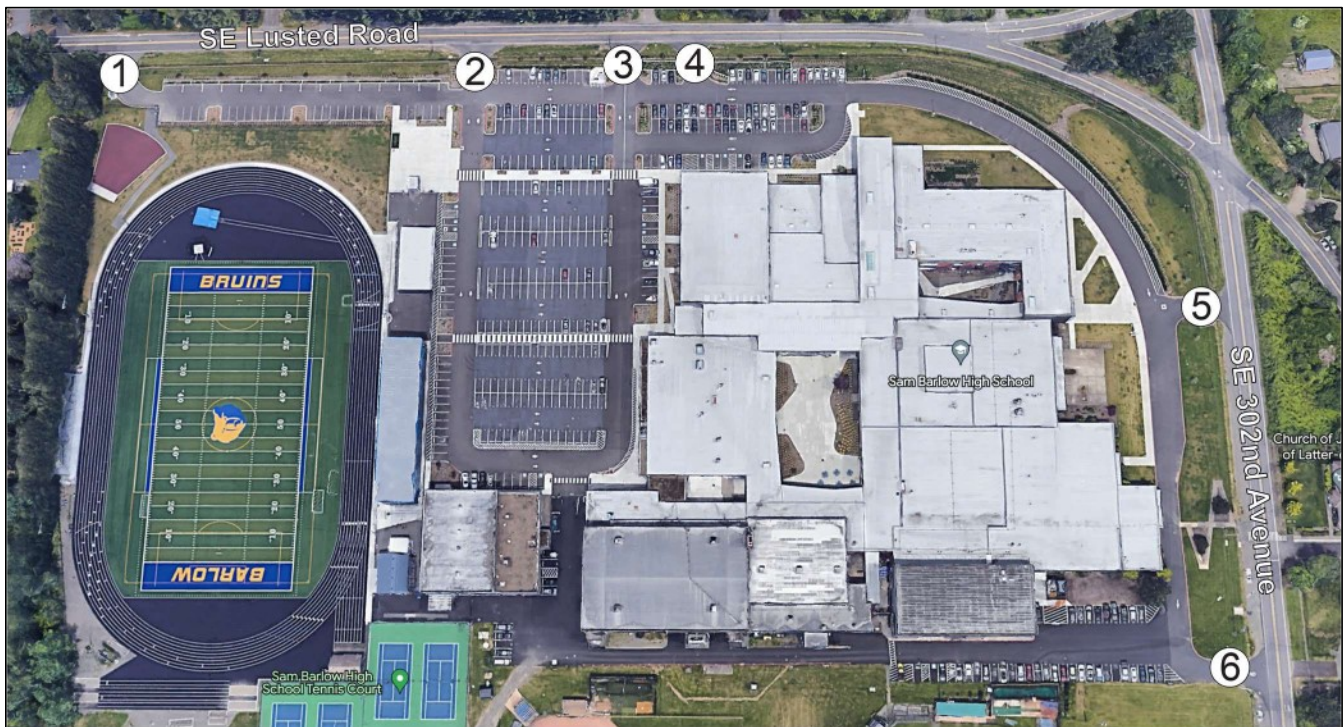


Figure 5: Sam Barlow School Accesses

Significant queueing from all directions began at 7:15 AM, 20 minutes before the first bell at 7:35AM. Queues for vehicles traveling westbound on SE Lusted Road stretched through the intersection at SE 302nd Avenue and back to approximately the driveway at 5100 SE 302nd Ave, Gresham, OR 97080, just north of the school's access 5. Eastbound queues on SE Lusted Road were observed to be up to 10 vehicles in length. Cars entering access 2 created a zipper-type control scenario where eastbound and westbound vehicles took turns entering the school parking lot. The longest queues took up to three minutes to dissipate. All queueing was dissipated by 7:35 AM. No significant queueing was observed east of SE 302nd Avenue on either SE Lusted Road or SE Pipeline Road.

No queues on any of the public roadways were observed in the afternoon after school ended at 2:30 PM. Buses began arriving at the school to take students home at approximately 2:05 PM. All of the after-school queueing occurred along the school's on-site frontage road that wraps around the building, and within the parking lot. All vehicles that queued up to leave after school ended cleared the parking lot and the school vicinity by 2:45 PM.

During both the start and end of school observations, one student was observed walking along SE Lusted Road west of SE 302nd Avenue. Up to five students were observed walking along SE 302nd Avenue south of SE Lusted Road during both periods as well.

West Orient Middle School

At West Orient Middle School, queueing was observed along SE Orient Drive in the vicinity of the school during the morning drop-off and afternoon pick-up periods. Both periods showed similar queueing characteristics. The following start and end times for vehicle queueing were observed:

- Morning drop-off – 8:35 AM to 9:15 AM
- Afternoon pick-up – 3:00 PM to 3:45 PM

During both observation periods, cars carrying students to and from the school queued within a pull-through area adjacent to the school building on SE Orient Drive and the parking lot east of that pull-through area. Cars also queued on the side of the road on both sides of SE Orient Drive, partially or fully obstructing driveways and other accesses to neighboring properties between SE Short Road and the driveway at 29925 SE Orient Drive. During drop-off and pick-up, students crossed the street at the marked crosswalk at the east end of the school building with the aid of a crossing guard. While the crossing guard helped students cross, queues of up to 10 vehicles would form on SE Orient Drive.

To avoid impacting schools and to reduce construction traffic related delays, construction traffic will avoid SE Lusted Road and SE 302nd Avenue in the vicinity of Sam Barlow High School for 20 minutes before and after the start and end times of school; and construction traffic will avoid SE Orient Drive in the vicinity of West Orient Middle School for 20 minutes before and after the start and end times of school.

RESULTS

A traffic impact study was conducted for the construction traffic related to the development of the Filtration Facility and associated pipelines located in Multnomah County, Oregon. Two proposed site accesses and 15 existing intersections were identified for evaluation under this analysis:

1. SE Oxbow Drive / SE Altman Road (Multnomah County)
2. SE Oxbow Drive / SE Hosner Road (Multnomah County)
3. SE Lusted Road / SE Altman Road (Multnomah County)
4. SE Lusted Road / SE Cottrell Road (Multnomah County)
5. SE Dodge Park Boulevard / SE Altman Road (Multnomah County)
6. SE Dodge Park Boulevard / SE Cottrell Road (Multnomah County)
7. SE Carpenter Lane / SE Altman Road (Multnomah County)
8. SE Carpenter Lane / SE Cottrell Road (Multnomah County)
9. SE Bluff Road / SE Altman Road (Clackamas County)

10. SE Bluff Road / SE Cottrell Road (Clackamas County)
11. SE Bluff Road / SE Proctor Road (Clackamas County)
12. SE Dodge Park Boulevard / SE Lusted Road (Clackamas County)
13. SE Lusted Road / SE Hudson Road (Clackamas County)
14. SE Lusted Road / SE 302nd Avenue (Multnomah County)
15. SE Bluff Road / SE Orient Drive (Multnomah County)
- A. SE Carpenter Lane at Site Access A
- B. SE Bluff Road at Site Access B

A safety analysis was conducted to examine the existing physical conditions and evaluate safety concerns along study roadways and intersections. Most of the roadways and intersections showed acceptable pavement conditions, lane and shoulder widths, and sight lines to adequately serve construction traffic. As discussed above, areas of potential concern identified during the evaluation include:

- SE Lusted Road: SE Lusted Road shows fair-to-poor pavement conditions in the roadway curves east of SE Cottrell Road. The PCI score for this segment is 55/100. This section of roadway is not planned to be utilized as a route for Project construction traffic. For this reason, no mitigation is recommended for this section of roadway.
- SE Altman Road: No PCI score is available for SE Altman Road. SE Altman Road is narrow with unpaved shoulders and has no pavement markings in the study area. The southbound stop-controlled approach to the intersection of SE Altman Road at SE Bluff Road has a steep incline grade that meets the superelevation of SE Bluff Road. This can create slow acceleration for large construction vehicles. SE Altman Road is not planned as a haul route between SE Dodge Park Boulevard and SE Bluff Road, so no mitigations are recommended for this segment. Segments north of Dodge Park can handle construction traffic within the posted speeds. No mitigation is recommended for Altman Road.
- SE Carpenter Lane: SE Carpenter Lane is narrow and unmarked between SE Altman Road and the proposed Access A. The pavement is in poor condition with cracking and potholes. The PCI grade for Carpenter Lane between Altman Road and “End of Pavement” is 31.

The segment between SE Altman Road and SE Cottrell Road is not planned for construction traffic. Therefore, no mitigation is recommended for that segment of SE Carpenter Road. Construction traffic will use SE Carpenter Lane between SE Cottrell Road and Access A at the northwest corner of the Filtration Facility. Therefore, pavement improvements to that segment of SE Carpenter Lane are recommended as mitigation to correct this condition and will be made as part of the Project prior to commencing significant trucking for material import/export.

- Overall, with the incorporation into the Project of the recommended mitigation for SE Carpenter Lane, there are no concerns with the physical condition of study roadways and intersections being able to safely serve both construction traffic and existing background traffic during construction at the time of this report.

Trip generation and distribution analyses were completed for the peak construction traffic modeled for 2025 based on the anticipated construction peak year. Trip distribution for all Project site trips was modeled with two accesses: on SE Carpenter Lane and SE Bluff Road. Trip distribution results are provided in Appendix C. Intersection performance was analyzed for the following conditions:

- 2022 Existing Conditions
- 2025 Peak Construction Traffic Conditions
 - Distribution Scenario 1
 - Distribution Scenario 2
 - Distribution Scenario 3
 - Distribution Scenario 4

The intersection LOS was analyzed based on procedures described in the HCM. Multnomah County Design Standards specify that facilities shall be designed to accommodate LOS C or better during the design hour in rural areas. Clackamas County Comprehensive Plan utilizes LOS E or better for unsignalized intersections in rural areas during AM and PM peak hours.

This analysis shows that all study intersections will meet performance standards established by Multnomah and Clackamas counties for all Distribution Scenarios except for SE Carpenter Lane / SE Cottrell Road under all 2025 Peak Construction conditions and SE Dodge Park Boulevard / SE Altman Road for Scenario 2 only. SE Carpenter Lane / SE Cottrell Road falls below standards for the AM peak hour due to delays created by construction traffic experienced by the minor stop-controlled west leg of the intersection where fewer than five vehicles during the peak period will experience delays. SE Dodge Park Boulevard / SE Altman Road meets performance standards for Scenarios 1, 3, and 4 that show Commuter traffic traveling through the intersection but falls below standards for Scenario 2 where Truck traffic is added. The TDM strategies recommended in the Mitigation Analysis section above will alleviate these issues.

Partial and total roadway closures will be necessary to complete pipeline construction along several study roadways. The impacts of these closures were studied using volumes from the 2025 Peak Construction Traffic Conditions Distribution Scenario 2, and detour routes were identified for roadway closures along study roadways. Capacity analyses were conducted for the two paired roadway closure scenarios and showed that some study intersections fall below standards based on the worst-case local detours.

A Mitigation Analysis was conducted to determine if alternative trip distribution for the roadway closure scenarios will allow all study intersections to meet standards. Re-distributing Commuter vehicles such that 52% of all commuters utilize Route 3 (through Site Access B) while maintaining all other detoured peak hour trips allows for all intersections to meet performance standards. A simple TDM strategy that assigns Commuter vehicles in this manner between Accesses A and B will allow all intersections to meet standards for all analysis scenarios. If Site Access B is not available, other TDM strategies are available that will allow all intersections to meet standards during any analysis scenario.

Nearby schools, agricultural uses, and emergency vehicle needs were examined. Queueing observations were made during school drop-off and pick-up at Sam Barlow High School, West Orient Middle School, and Oregon Trail Academy. Most school-related queueing occurs within approximately a 40-minute window around drop-off and pick-up times. CM/GCs will be instructed to avoid roadway segments adjacent to Sam Barlow High School and West Orient Middle School for 20 minutes before and after the start and end times of school to reduce potential conflict with school vehicles and pedestrians and to reduce construction delays.

School bus routes may vary over the course of construction based on changes in ridership. These

routes are evaluated annually by the bussing companies. Coordination will be done to accommodate their routes and any adjustments needed within those routes.

The CM/GCs will coordinate with agricultural uses to maintain access to their fields.

All emergency vehicles will be accommodated throughout construction. Communication will be maintained throughout the duration of the Project to keep neighbors apprised of schedule updates and Project changes.

Overall, this study concludes that impacts to intersection and roadway operations due to construction traffic from the Project will be minimal even under conservative analysis assumptions, such as all Truck trips taking a single haul route, and during roadway closures needed for pipeline construction. The minimal potential impacts will be mitigated effectively by the Project's inclusion of TDM strategies outlined in the Mitigations Section. No other mitigation is recommended to ensure that study area roadways and intersections are able to meet standards and safely serve both Project traffic and existing background traffic during construction.