4.9 Transportation

This section provides an analysis of potential impacts on the vehicle transportation network.

4.9.1 Study Area

The study area for vehicle traffic and transportation encompasses the roadways, intersections, and at-grade railroad crossings that could be affected by construction and operations (Figure 4-60). For construction impacts, the study area consists of the roads and intersections that construction vehicles would use to access the proposed Project site. For operations impacts, the study area consists of the roads and intersections that vehicles moving to and from the proposed facility would use to access the proposed Project site.

Relevant Plans Policies and Regulations

Relevant policies and regulations related to transportation are summarized in Table 4-1.

Table 4-30. Regulations and Policies for Transportation

Laws and Regulations	Description
Federal	
Highway Safety Act and the Federal Railroad Safety Act	Gives the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) regulatory jurisdiction over safety at federal highway/rail grade crossings.
Manual on Uniform Traffic Control Devices (23 U.S.C. 109(d))	Provides standards and guidelines for traffic control devices.
State	
Transportation System Policy Goals (RCW 47.04.280)	Establishes the following goals for the transportation system in Washington State: economic vitality, preservation, safety, mobility, environment, and stewardship.
Motor Vehicles – Rules of the Road (RCW 46.61)	Establishes rules of the road for vehicle and rail crossings.
City Streets as Part of State Highways (RCW 47.24)	Regulates the maintenance and jurisdictional control for city streets that are part of state highways.
Local	
Traffic Regulations (PMC Title 10 and SMC Title 10)	Establishes regulations for vehicle traffic and emergency services in the City of Puyallup and City of Sumner.

4.7.1.3 Affected Environment

The affected environment includes 35 counted intersections and three safety study corridors. These are listed below and are shown in Table 4-31 and Figure 4-60.

Table 4-31. Intersections and Safety Study Corridors Evaluated

1. Traffic Avenue & Cannery Way
2. Traffic Avenue & State Street
3. Traffic Avenue & State Route (SR) 410 westbound (WB) ramps

17. E Pioneer Avenue & 25th Street SE
18. East Pioneer Avenue & 21st Street SE
19. E Pioneer Avenue & Shaw Road E
20. E Pioneer Avenue & 33rd Street SE

4. E Main Avenue & SR 410 eastbound (EB) ramps
5. E Main Avenue & 5th Avenue northeast (NE)
6. E Main Avenue & Shaw Road E
7. E Main Avenue & 15th Street SE
8. E Main Avenue & 5th Street NE
9. E Main Avenue & 2nd Street NE
10. North (N) Meridian Avenue & SR 167 northbound (NB)
11. N Meridian Avenue & SR 167 southbound (SB)
12. N Meridian Avenue & Valley Avenue NE
13. E Pioneer Avenue & SR 512 SB ramps
14. E Pioneer Avenue & SR 512 NB ramps
15. E Pioneer Avenue & 13th Street SE
16. E Pioneer Avenue & 15th Street SE
21. 8th Avenue SE & 33rd Street SE
22. Shaw Road E & Highlands Boulevard
23. Shaw Road E & 16th Avenue SE
24. Shaw Road E & 23rd Avenue SE
25. Shaw Road E & Forest Green Boulevard
26. Shaw Road E & Manorwood Drive
27. Shaw Road E & 39th Avenue SE
28. Shaw Road E & 5th Avenue SE
29. 33rd Street SE & 5th Avenue SE
30. Shaw Road E & Safeway driveway
31. 80th Street E & warehouse driveway
32. SR 162 & E Pioneer Avenue
33. SR 162 & 80th Street E
34. SR 162 & SR 410 EB ramps
35. SR 162 & SR 410 WB ramps

A. E Pioneer – between SR 512 and Shaw Road E
B. Shaw Road E – between E Pioneer and E Main Avenue
C. E Main Avenue – between Shaw Road E and White River

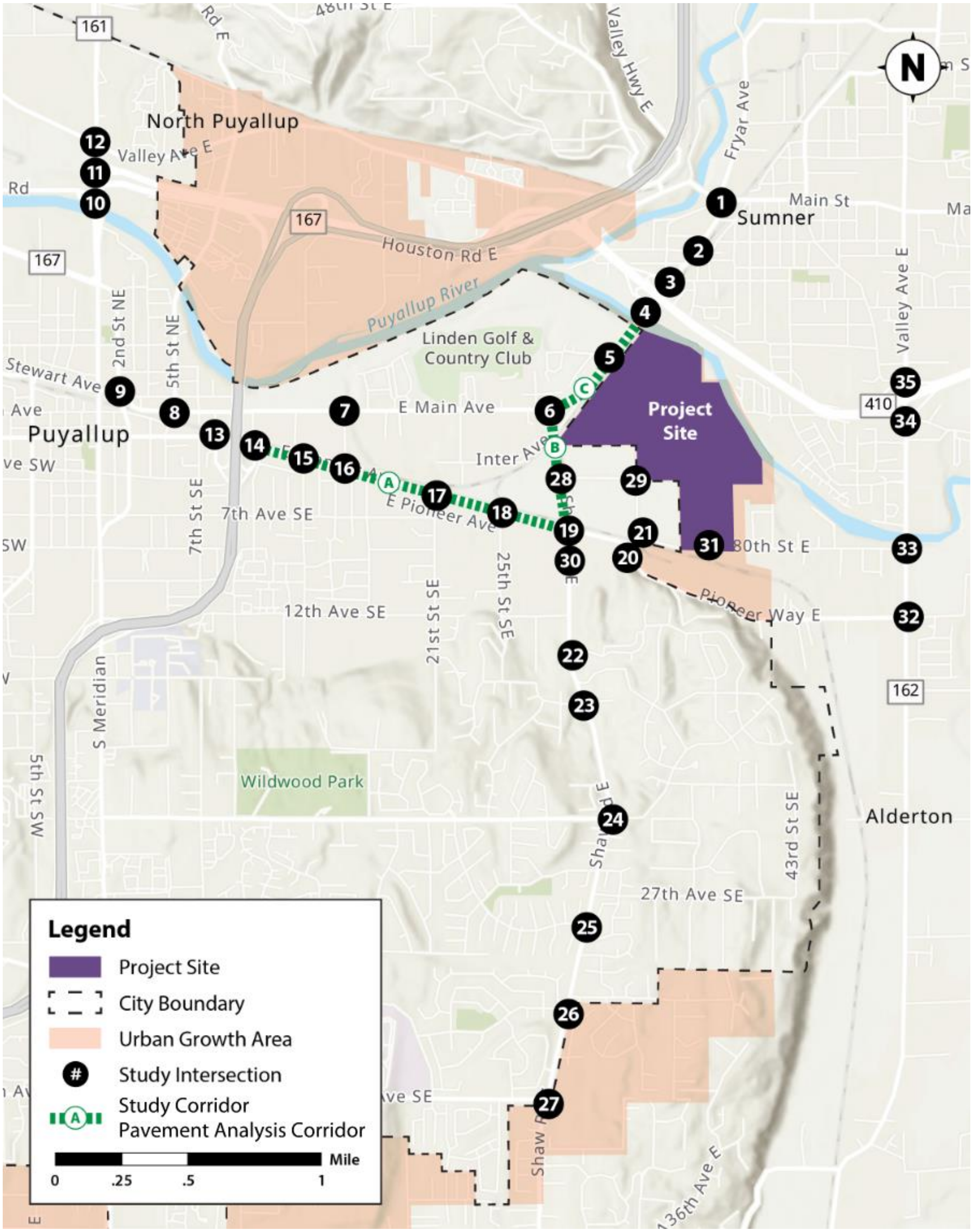

Figure 4-60. Intersections and Safety Study Corridors Evaluated

4.9.2 Scenarios Analyzed

The five build scenarios shown in Table 4-32 and a No Action scenario were considered and analyzed for the expected Project completion and operation year 2026.

Table 4-32. Build Scenarios Analyzed

Build Scenario	Total SF (in millions)	Total Daily Trips (vpd)	Total Heavy Vehicle Trips (vpd)	Total PM Peak Hour Trips (vph)	Total Peak Hour Heavy Vehicle Trips (vph)
A – Proposed Project	2.6	8,724	1,482	880	104
B – Rail scenario	2.6	8, 487	1,207	729	86
C – Proposed Project, with mitigation	2.6	8,724	1,482	880	104
D – Reduced land use scenario	1.73	5,844	998	590	70
E – Reduced land use scenario, with mitigation	1.73	5,844	998	590	70

Note: vpd = vehicles per day; vph = vehicles per hour

No Action Scenario

The No Action Scenario was included for equal evaluation in this study to facilitate the identification of impacts of other scenarios. Under the No Action Scenario, none of the facilities proposed to assist with Project traffic access would be constructed.

Scenario A: Proposed Project

The proposed Project is consistent with Institute of Transportation Engineers (ITE) Land Use Code 130. These facilities typically provide for storage and processing of shipped materials and/or goods that are reconstituted and packaged, and then shipped elsewhere. The development, as proposed by the applicant, would have 1,730 parking spaces for cars and 473 parking spaces for freight trailers.

In addition to these general definitions, a restrictive covenant has been agreed upon for Knutson Farms that will "… strictly prohibit 'High-Cube Fulfillment Center Warehouse – Sort,' ITE Land Use Code 155, and 'High Cube Parcel Hub Warehouse,' ITE Land Use Code 156, uses under the definitions established in the ITE Trip Generation Manual 11th Edition." The covenant also limits trips to a level consistent with Industrial Park use.

Scenario B: EIS Alternative 1, Rail Delivery

Scenario B was developed to analyze the potential to mitigate traffic impacts by shifting some Project-related truck traffic onto trains. Overall, Scenario B was meant to test the relative impact of the use of trains to bring as much freight onto the site as reasonably possible to lessen overall traffic impacts. The analysis assumed the increase in rail traffic may result in a train being present during the peak hour, which is not a typical occurrence today.

Scenario C: EIS Proposed Project with Traffic Mitigation

Scenario C was developed by making changes to the assumptions about transportation infrastructure based on the analysis results of Scenario A. These changes generally take the form of intersection capacity upgrades and other operational modifications that help the intersections process peak hour traffic more efficiently. Intersection mitigations were developed only for individual intersections at which traffic generated by the proposed Project would result in a degradation in LOS below the responsible agency's standard for LOS. More information about this measure is included in the next section.

Scenario D: EIS Alternative 2, Reduced Site Intensity

Scenario D represents a modification of Scenario A. Specifically, initial findings related to non-transportation resource impacts and associated mitigation resulted in the need to consider a scenario that would use less of the Knutson Farms site and therefore would accommodate a lower level of land use. To assess transportation effects for Scenario D, the amount of land use programmed was reduced by one-third from that assumed in Scenario A.

Scenario E: EIS Alternative 2 with Traffic Mitigation

The results of Scenario D analysis directly informed the mitigation needs that defined Scenario E. Because Knutson Farms land use is lower for Scenarios D and E, its traffic generation is also lower. As such, there are fewer locations indicating that traffic mitigation would be needed in Scenario E than in Scenario C.

4.9.3 Methods and Assumptions

The quantitative analysis of traffic operations for the Project was conducted using VISSIM traffic modeling software (microscopic simulation). This software was used to build the traffic models of the roadway network within the Project area. An existing year model was developed to determine a baseline calibrated model. The microsimulation models utilized input data from various sources including existing roadway configuration, traffic volume inputs, vehicle speed distributions, relevant recent traffic impact analyses, and vehicle static routing to develop the existing year model, No Action model, and the five scenario models.

Traffic Counts

Traffic counts were collected at intersections 1 through 27 on August 3, 2021. A need for additional traffic counts was identified to improve model calibration. Traffic counts for intersections 28 through 35 were collected on June 23, 2022. The field counts were adjusted for this analysis in two ways. First, an adjustment derived from Washington State Department of Transportation (WSDOT) data to reflect lower-than-typical traffic overall as a result of the Covid-19 pandemic. Second, because summertime counts can be higher than normal within this area, a seasonal adjustment factor was applied to produce volumes that reflect an annual average condition for each peak hour. The peak hours observed during the count period were 7:15–8:15 a.m. and 3:45–4:45 p.m. Site generated traffic volumes peak during traditional AM and PM peak periods and therefore midday traffic counts that coincide with school release were not collected.

Volumes from the East Town Crossing Traffic Impact Study, which used traffic counts collected between 4:00 and 5:00 p.m. on May 4, 2022, were used to validate the adjusted volumes described above. Comparing the adjusted volumes with the collected counts from the East Town Crossing Traffic Impact Study resulted in increased traffic volumes at the following intersections and inclusion of those higher volumes in the baseline model for the study:

- Shaw Road E and 23rd Avenue SE (7 percent increase)
- E Pioneer Avenue and Shaw Road E (11 percent increase)
- E Main Avenue and Shaw Road E (2 percent increase)

Simulation Model Calibration

Calibration is an iterative process that involves adjusting model parameters until the simulation reasonably replicates driver behavior, traffic flow patterns, and field-measured data. A synopsis of the calibration process follows, with emphasis placed on identifying the key decisions and assumptions made in the refinement process to achieve the calibration targets outlined in the technical traffic report (TTR). Documentation on the calibration parameters and results are provided in the Technical Traffic Report, see Appendix E.

Measures of Effectiveness for Scenario Comparisons

The VISSIM simulation model measures vehicle travel characteristics that are consistent with the way people determine how effectively the transportation system is working. The differences between the traffic measures of effectiveness (MOEs) from the “No Action” simulation and those from the simulations of Project action scenarios form the basis for determining the scenarios’ traffic impacts. The MOEs employed for this analysis were vehicle delay, LOS, 50th percentile and 95th percentile queue lengths, travel time, and volume-to-capacity (v/c) ratio. Note that LOS is assigned directly from vehicle delay.

Intersection Delay and LOS

After the simulation and the post-processing, the average of the delays experienced by all vehicles at each intersection (due to red light, stop sign, or other control feature) is determined, and each of these average delays is assigned a letter grade referred to as LOS, ranging from LOS A (best) to LOS F (worst). The grading scale for LOS is based on the guidelines from the HCM (Transportation Research Board (TRB) 2016). Table 4-33 shows the HCM peak hour delay performance indicators for signalized and unsignalized intersections.

Table 4-33. Delay Performance Indicators for Intersection LOS

LOS	Description	Average Delay Range (seconds/vehicle)	
		Signalized	Unsignalized
A	No congestion; nearly all drivers experience little to no delay	0 to 10.0	0 to 10.0
B	No congestion; most drivers experience little to no delay	10.1 to 20.0	10.1 to 15.0
C	Light congestion; most drivers experience minor delay	20.1 to 35.0	15.1 to 25.0
D	Moderate congestion; individual movements with high delay	35.1 to 55.0	25.1 to 35.0
E	Heavy congestion, with high delays on multiple movements	55.1 to 80.0	35.1 to 50.0
F	Extensive delays due to cycle failures at signals or sparse opportunities to make desired movements at unsignalized intersections	80.1 or more	50.1 or more

Source: TRB 2016.

The HCM delay performance indicators are used to assign LOS to the VISSIM delay results, but it should be noted that the method of measuring intersection vehicle delays in VISSIM is slightly different from the HCM method. With the HCM method, intersection delays are calculated based on traffic volume and the effects of traffic control devices (e.g., signals, stop signs; TRB 2016), whereas VISSIM directly measures the simulated total delay, which consists of control delay, delay due specifically to the presence of other vehicles, and other delay incurred in the vicinity of the traffic control device. In most cases, the differences between total delay and control delay are considered negligible. While the TRB does not endorse any specific software model to estimate intersection delay, the same LOS performance indicators are commonly applied in both cases.

Generally, LOS D is considered the worst acceptable condition for peak hour intersection traffic operations. LOS E is often characterized by unstable flow and high delays for lower-volume movements and can result in individual drivers choosing to change their travel patterns to avoid congested intersections. At LOS F, congestion is severe enough that the calculation of intersection delay using the HCM methodology breaks down, and very high delay results are not necessarily considered valid. For example, a delay estimate or measurement of 450 seconds for one intersection and 500 seconds for another might not lead to a reliable conclusion that the former intersection can be expected to perform “better” than the latter. For this reason, intersection delay estimates over 300 seconds per vehicle are truncated to “300+” for this study.

The City of Puyallup Comprehensive Plan contains the following policies regarding LOS:

> *“The City’s existing level of service policy sets the following standards for its roadways:*
>
> - *Volume to capacity (V/C) ratio of 0.85 for arterial and collector segments in the PM peak hour (page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015).*
>
> *T- 3.2 Develop a transportation system that achieves the following levels of service metrics:*

- *Vehicular LOS: Maintain standards that promote growth where appropriate while preserving and maintaining the existing transportation system. Set LOS D as the standard for PM peak hour intersection performance, with the exception of the Meridian, Shaw Road, and 9th Street SW corridors, where LOS E operations will be considered acceptable during PM period in recognition of the need to balance driver experience with other considerations, such as cost, right of way, and other modes.*
- *Pedestrian LOS: Provision of sidewalks, trails, and/or separated paths will be prioritized within pedestrian priority areas, as defined in Puyallup Moves.*
- *Bicycle LOS: Provision of bike lanes, separated paths, protected facilities, and bicycle boulevards, as defined in Puyallup Moves.*
- *Transit LOS: Partner with Pierce Transit, Sound Transit, and other transit operators to provide transit stop amenities and safe access to transit at major transit stops and park and ride facilities.*

T- 3.3 Improve the transportation system concurrently with increasing demands due to growth.

a. *Track transportation concurrency to ensure that infrastructure can accommodate growth and maintain level of service standards.*
b. *Require developers to perform a transportation impact analysis, at the discretion of the City Engineer, to demonstrate the effect of significant additional travel demand from their projects on the transportation network. In the event the analysis shows that the project would impact the level of service in the affected area, new development is responsible for improvements to the transportation system. If the existing vehicle level of service is below the standard, the developer shall mitigate impacts to the pre-developed level of service condition plus an allowable increase in delay of up to 15%.*

As indicated by City policy (see page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015 for v/c), the standard of acceptability for v/c on arterial and collector PM peak hour corridor segments is 0.85, and intersection LOS (D or better) is applied for PM peak hour conditions. Three corridors are subject to a lower standard (LOS E or better), and one of those, Shaw Road, is within the Knutson Farms study area. The analysis documented here applies that standard to AM peak hour operations as well. The SR 410 ramp terminal intersections in this study are under WSDOT jurisdiction and were subject to a LOS D standard for both peak hours.

Queue Lengths at Intersections

Queue estimates from VISSIM's node evaluation function were compiled for all turning movements modeled at the study area intersections. This function was used to tabulate the queue extent during each time step during the peak hour, and the calculated 50th and 95th percentile values for the hour were reported.

Travel Time

Travel time measurements over multiple roadway segments were coded in VISSIM and times were measured during each simulation run to capture overall vehicle performance at the corridor level. The travel time segments originally used during calibration were expanded somewhat for reporting purposes. Travel times are reported here for each scenario for the following three segments:

1. E Pioneer Avenue from 7th Street SE to 33rd Street SE
2. From E Main Avenue and 2nd Street NE to Traffic Avenue and State Street
3. Shaw Road E from E Main Avenue to 39th Street SE

Because the *2015 Puyallup Comprehensive Plan* (City of Puyallup 2015) does not provide policy on travel time measurements or standards, these results are presented as an optional way of interpreting traffic congestion information. No impact definitions are included for travel time.

Volume-to-Capacity (v/c) Ratio

The v/c ratio along certain segments within the Project area were used to compare the No Action Scenario with the build scenarios and the mitigated build scenarios. The v/c ratio identifies the capacity constraints along the corridor and how the traffic generated by the proposed Project would further impact the corridor capacity within the Project area. The capacity of the corridors was calculated by the City and used to determine the v/c ratios. The v/c ratio performance indicator for the City is 0.85 (page 7.21 and map figure 7-7, City of Puyallup Transportation Element, 2015). The proportional difference between the No Action Scenario and Scenarios A and D will be used to determine additional proportional mitigation required to address the reduction in corridor capacity caused by the traffic generated by the applicant.

Background Traffic Growth

Overall traffic volumes were grown from the existing counts collected in 2021 to the scenario comparison year of 2026 using an annual average growth rate. The traffic analysis team arrived at a consensus growth rate by considering similar traffic impact studies conducted in the area since 2017, in addition to the growth rate assumed for the SR 410/Traffic Avenue Interchange Improvements project.

The average of the annual growth rates quantified in the TTR is 1.94 percent. As a result of this comparison, an annual background traffic growth rate of 2 percent has been applied for this study. In addition to this annual growth, trips generated by the following specific large projects were added to background traffic at the City's direction:

- East Town Crossing
- Prologis Park Edgewood
- Puyallup Corporate Center
- Fitness Quest (previously known as the "Regional Wrestling Center")
- Shaw Heights
- ST Sumner Parking Garage

4.7.3.5 Project Trip Generation and Distribution

Project trip generation estimates were derived using the assumptions documented for the proposed warehousing land use as represented by ITE Land Use Code 130, Industrial Park, and land use that would be displaced by the Project, Land Use Code 210, Single Family Residential. The ITE Land Use Code 130 and Land Use Code 210 were used as inputs in the ITE Trip Generation tool. The relevant assumptions and calculation results are provided in the TTR.

Project trips were distributed to the immediate surrounding street network differently depending on whether they were heavy truck trips or passenger car/light-truck trips. Heavy trucks are not allowed to use the central site access (33rd Street SE, south of 5th Avenue E). The general distributions for these two types of trips are shown side-by-side in Figure 4-61 and Figure 4-62 for Scenario A/C and Scenario D/E, respectively.

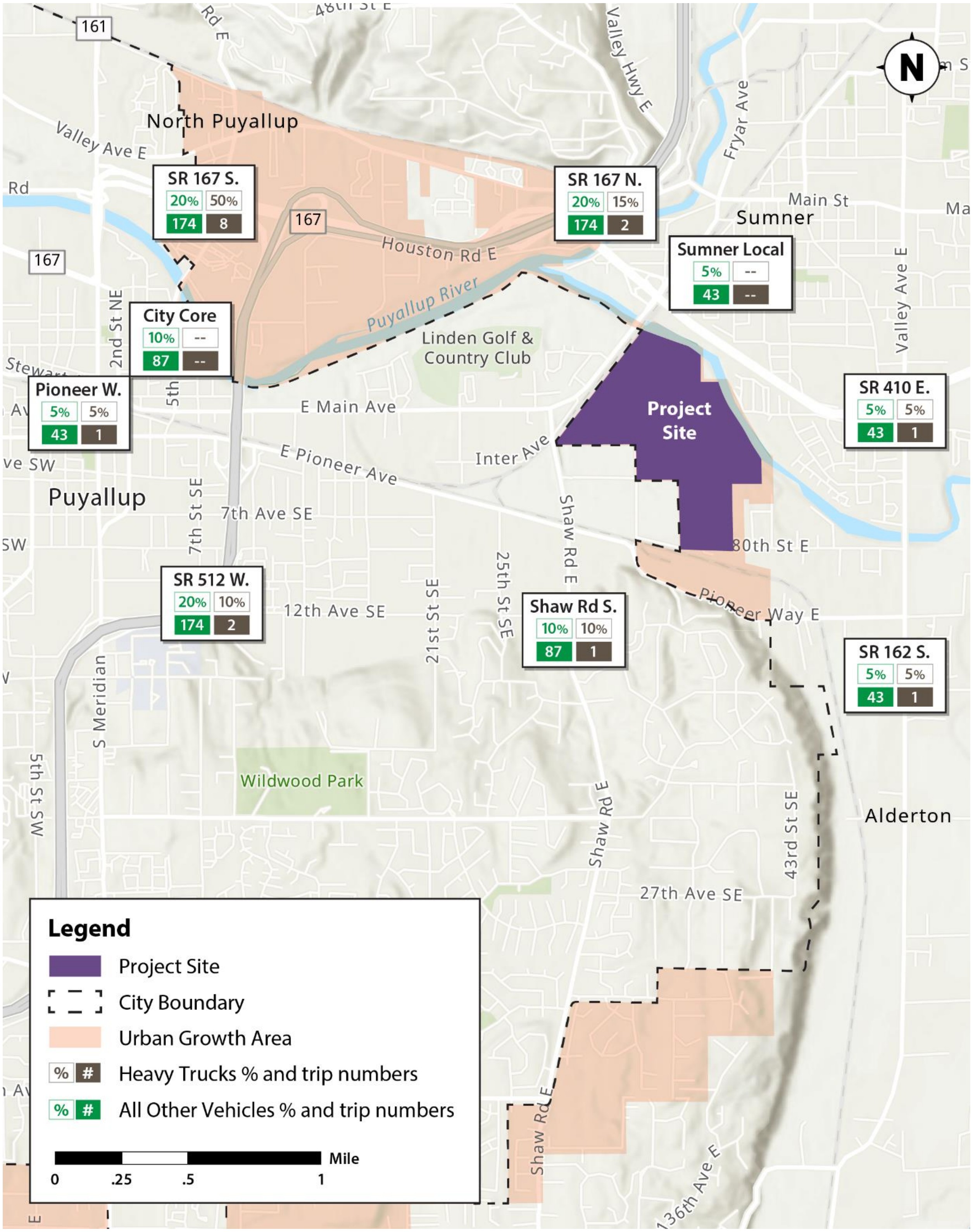

Figure 4-61. Scenarios A and C, PM Peak Distribution of Site-Generated Trips

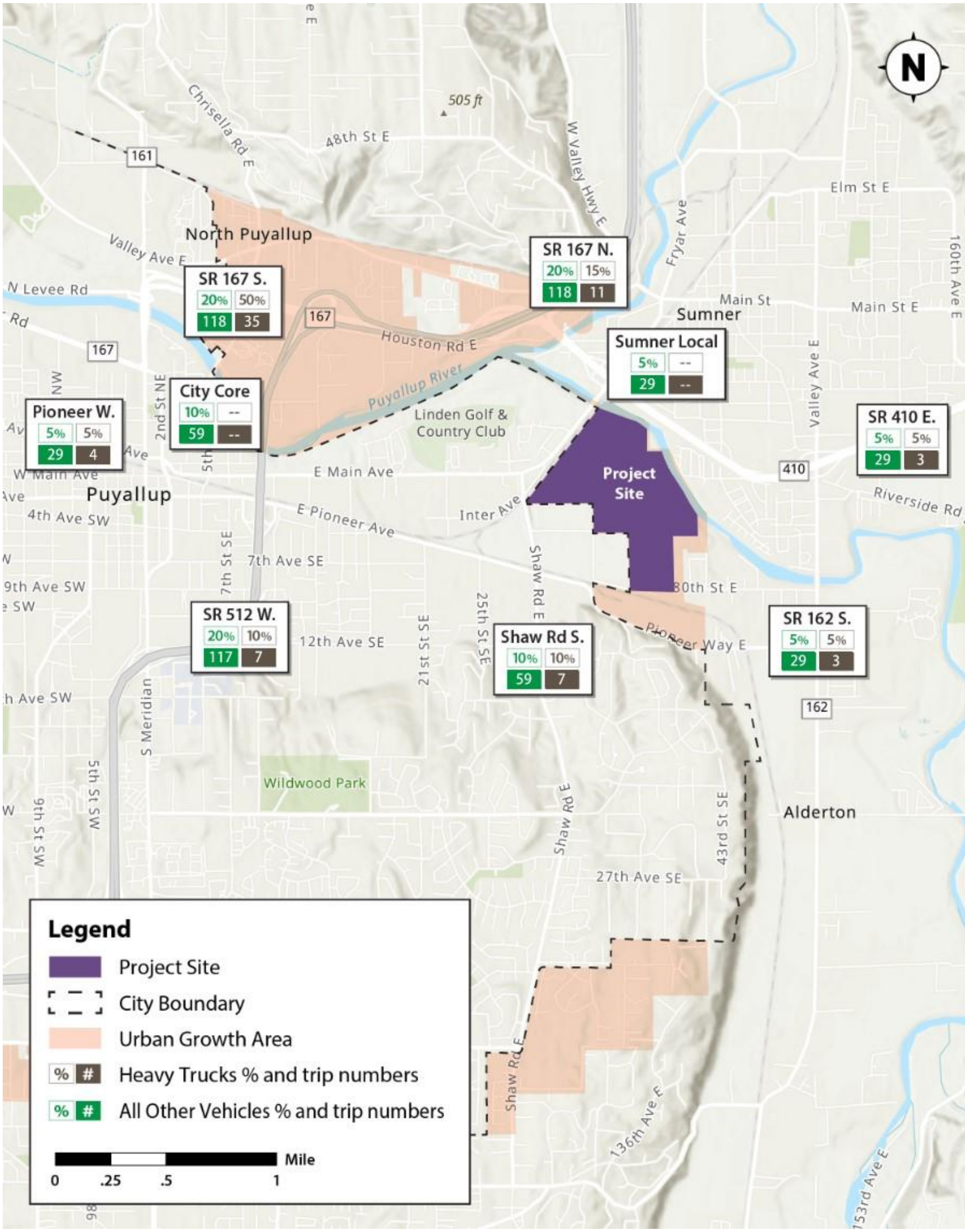

Figure 4-62. Scenarios D and E, PM Peak Distribution of Site-Generated Trips

Crash Analysis

Crash data for 31 out of the 35 study intersections and three study corridors indicated in the introduction to this report were collected for the 7 complete years 2015 through 2021 (WSDOT 2023). Those not included (#28 through #31) were all private driveway intersections: three that would carry Knutson Farms traffic almost exclusively and one a more lightly used shopping center ("Safeway Plaza") driveway.

WSDOT crash data were examined with respect to type, severity, and year, both in terms of raw crash counts and, in the case of intersections, the volume-weighted crash rate. WSDOT crash data includes police-reported vehicle crashes. Rates were not examined for the corridor crashes because crashes that occur within the influence area of an intersection are not counted in the "corridor" total. Corridor crashes occur between the study intersections. Note that the three corridors were selected for their relevance to the proposed Project, not as a sampling to represent the City of Puyallup.

Pavement Analysis

The Project would increase truck traffic on public streets near the site which is anticipated to have impacts to existing pavement. Pavement was analyzed to determine the potential impact of trucks on remaining pavement service life. Specifically, HWA GeoSciences Inc. (HWA) performed an investigation of the existing pavement on the designated truck routes within the Project vicinity: E Main Avenue, Shaw Road E, and E Pioneer Avenue. The investigation included drilling and retrieving pavement cores and falling weight deflectometer (FWD) testing. Pavement cores were performed at 28 locations along the three subject roadways. Existing asphaltic concrete (AC) pavement cores were retrieved, and the depth of crushed (aggregate) base was measured at each location. The FWD is a nondestructive test that is used to evaluate pavement component layer stiffness of existing pavement as well as condition and resilience of the subgrade material. The test simulates pavement loading by applying an impulse load to the pavement surface and measuring the pavement response by a series of sensors spaced linearly away from the loading plate. HWA used the FWD results to estimate the subgrade resilient modulus and the existing structural number using two different software programs.

In order to estimate the traffic loading on the existing pavement, the traffic volumes were converted into Equivalent Single-Axle Loads (ESALs). An ESAL is defined as equivalent to a single axle with dual wheels and a load of 18 kips (one kip, or kilopound, is equal to 1,000 pounds). The FHWA official Vehicle Classification set (FHWA 2014) is used in calculating ESALs for pavement design and is shown in Figure 4-63**.**

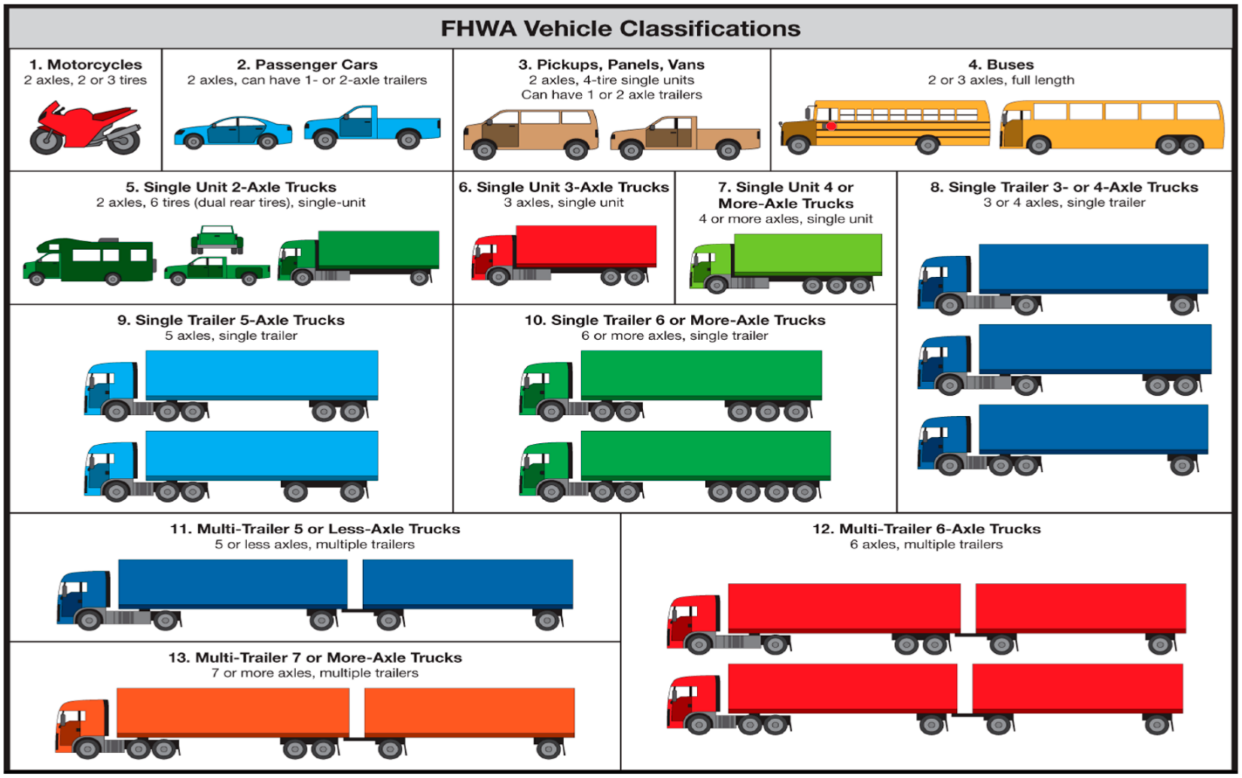

Figure 4-63. FHWA Vehicle Classifications

The traffic was grouped by IDAX Data Solutions into four vehicle groups (Class 1 through Class 4) that reflect groupings of the 13 FHWA Vehicle Classifications (FHWA 2014) as follows:

Class 1 (motorcycle, car, van, pickup) = Classifications 1 through 3
Class 2 (single-unit truck) = Classifications 4 through 7
Class 3 (double-unit truck) = Classifications 8 through 10
Class 4 (triple-unit truck) = Classifications 11 through 13

The use of truck data and conversion factors is important because comprehensive research has indicated that pavement damage from trucks is exponentially greater than damage from passenger cars.

Traffic volumes at the three locations were grown, and factors were applied for ESAL estimates. The change in ESAL from Scenario A was then evaluated for the potential to change the expected lifespan of the roadway (i.e., remaining service life).

4.9.4 Traffic Simulation Results

The traffic simulation results across all scenarios are tabulated together in this section. The measures of effectiveness include LOS, delay, queue lengths, travel times, and v/c ratio.

LOS is based on the HCM and uses average delay in seconds at an intersection. For signalized intersections, the average delay of all approaches is used to determine LOS. For unsignalized intersections, the greatest average delay of the stop-controlled movements is used to determine LOS. The LOS performance indicators are dependent on intersection control type, ranging between LOS A and

LOS F. The LOS performance indicators for signalized and unsignalized intersections were shown previously in Table 4-33.

Jurisdictional ownership of intersections varies between WSDOT, Pierce County, Sumner, and Puyallup in the Project study area; most of the affected intersections in the study area are City of Puyallup owned and managed. Jurisdictional owners may have different LOS standards. For this Project, the City of Puyallup LOS standard is LOS E or better at intersections on the Meridian Avenue and Shaw Road corridors and LOS D or better at all others. A standard of LOS D or better was applied for intersections outside Puyallup's jurisdiction. LOS and average delay results for each scenario are provided in the subsections below, and intersections that exceed the LOS standard are indicated with red text.

Queue length indicates operational issues such as lane blockage. The 95th percentile queue, which represents the measured queue length that is not exceeded during 95 percent of the signal cycles, is typically the storage length turn lanes are designed to provide. The 50th percentile queue represents the average queue length during the peak hour. When queue lengths become extensive and spillback to an adjacent intersection, the capacity impacts are no longer localized to a single intersection and congestion will extend along a corridor or throughout the network.

Travel time is used to understand how future congestion will impact certain origin-destination pairs. Travel time provides a good indication of whether a transportation network is over capacity, where congestion cripples the ability to progress traffic through the corridor.

A v/c ratio of 0.85 or less is the City's performance target. A v/c ratio of 1.0 is representative of a corridor at capacity. A v/c ratio that exceeds 1.0 is operating over capacity and usually corresponds with a degradation of MOEs described above. The v/c ratio will be used to estimate the proportion of corridor wide mitigation improvements, such as widening of Shaw Road E, triggered by the volume generated by the applicant. The proportional ratio is calculated by taking the difference in v/c ratio between the No Action Scenario and Scenario A and dividing it by the No Action Scenario v/c ratio. A second proportional ratio will be calculated for Scenario D.

Although each MOE is a useful metric independently, it is important to consider them together to gain a thorough understanding of how the transportation system is functioning. Results for each scenario are provided below along with a comparison of each MOE for all the scenarios.

Existing Conditions

LOS and Delay

For both the AM and PM peak periods, all intersections provide acceptable LOS and meet the LOS standards in the existing condition.

Queue Lengths

Excessive queueing was not reported during the AM or PM peak period, with a majority of the 95th percentile queue lengths ranging between 100 and 250 feet. Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, see Figure 4-64. Table 4-34 shown below provides existing travel times.

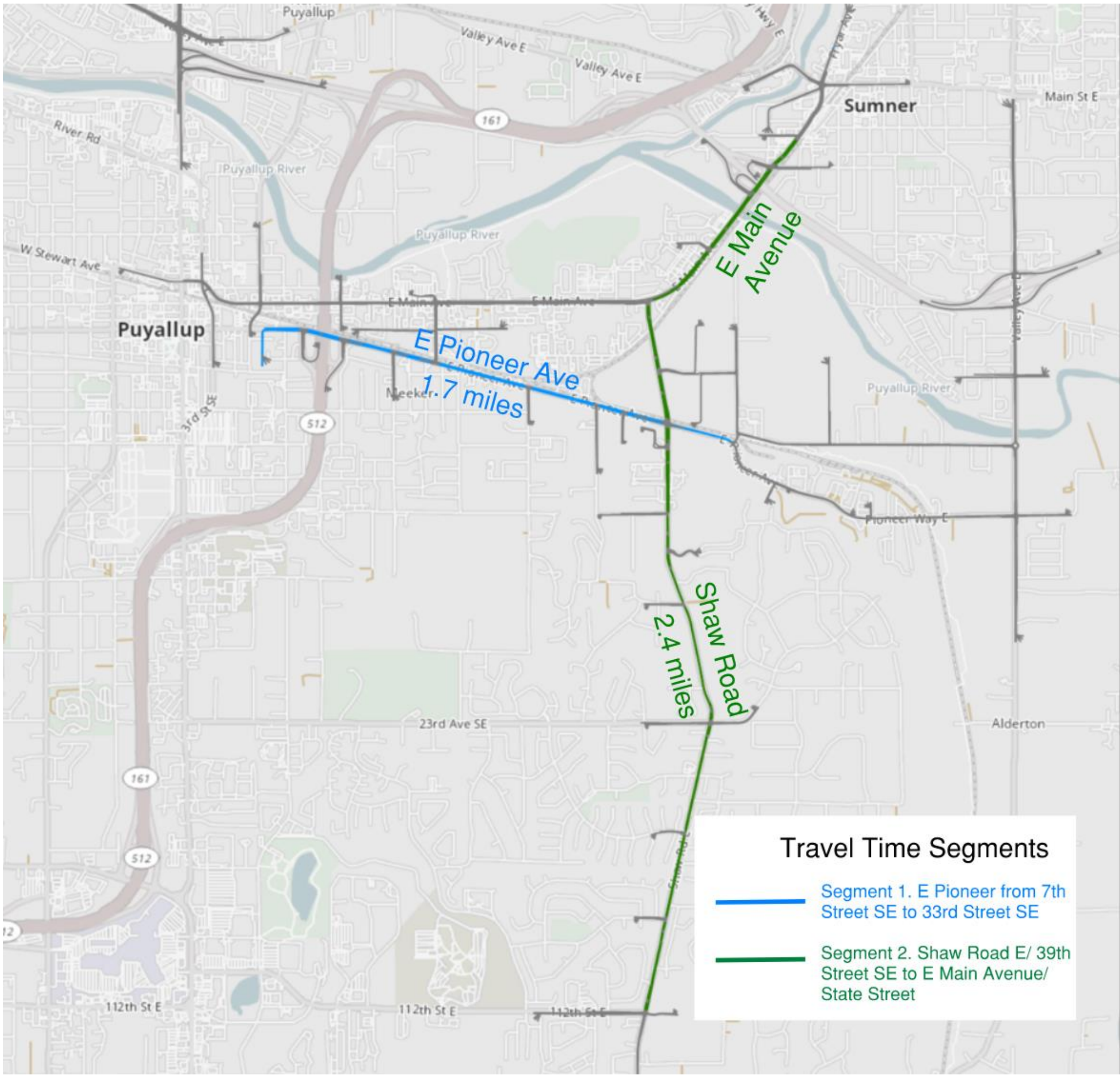

Figure 4-64. Reported Travel Time Segments

Table 4-34. AM and PM Peak Hour Travel Time

Segment	Travel Direction	Distance (miles)	2021 AM Peak Travel Time (min)	2022 PM Peak Travel Time (min)
E Pioneer Ave: 7th Ave to 33rd Ave	Eastbound	1.7	4.17	5.00
E Pioneer Ave: 33rd Ave to 7th Ave	Westbound	1.7	4.20	5.07
Shaw Road: 39th Ave to E Main Ave	Northbound	2.5	4.33	6.02
Shaw Road: 39th Ave to E Main Ave	Southbound	2.5	4.26	7.92

Note: min = minutes.

v/c Ratio

The v/c ratio was calculated using HCM methodology for key roadway segments within the Project area. Results are shown in Table 4-35 below. The v/c ratios shown in red exceed the 0.85 v/c ratio standard. During the PM peak period, the v/c ratio exceeds 1.0 for a majority of the segments studied.

Table 4-35. AM and PM Peak Hour Segmental v/c Ratio – Existing 2021 AM and 2022 PM

Roadway Segment	Travel Direction	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c Ratio	
			2021 AM	2022 PM	2021 AM	2022 PM
1. E Main Avenue – Shaw Road E to 5th Avenue NE	Westbound	1,445	472	1,620	0.33	1.12
	Eastbound	1445	1,001	843	0.69	0.58
2. E Main Avenue – 5th Avenue NE to SR 410	Westbound	1,445	503	1,614	0.35	1.12
	Eastbound	760	991	856	1.30	1.13
3. E Main Avenue – 23rd St to Shaw Road E	Westbound	1,615	372	803	0.23	0.50
	Eastbound	1,615	313	518	0.19	0.32
4. Shaw Road E – E Main Avenue to 5th Avenue SE	Northbound	1,445	893	658	0.62	0.46
	Southbound	1,445	305	1,151	0.21	0.80
5. E Pioneer – 21st Street SE to 25th Street SE	Westbound	1,445	454	626	0.31	0.43
	Eastbound	1,445	382	765	0.26	0.53
6. E Pioneer – Shaw Road E to SR 162	Westbound	560	356	324	0.64	0.58
	Eastbound	560	210	342	0.38	0.61
7. SR 162 – 143rd Avenue E to 80th Street E	Northbound	800	694	600	0.87	0.75
	Southbound	800	373	1,136	0.47	1.42
8. SR 162 – SR 410 to 143rd Avenue E	Northbound	840	694	600	0.83	0.71
	Southbound	840	373	1136	0.44	1.35
9. Shaw Road E - 12th Avenue SE to 16th Avenue SE	Northbound	560	848	597	1.51	1.07
	Southbound	560	277	1,170	0.49	2.09
10. Shaw Road E - 16th Avenue SE to 23rd Avenue SE	Northbound	560	796	560	1.42	1.00
	Southbound	560	270	1040	0.48	1.86
11. Shaw Road E – 23rd Avenue SE to 39th Avenue SE	Northbound	560	715	523	1.28	0.93
	Southbound	560	275	957	0.49	1.71

No Action Scenario

LOS and Delay

Without development activity at Knutson Farms, the changes affecting intersection LOS after 5 years follow normal trend lines for growth based on regional models. Other surrounding developments and standard expected traffic growth rates that are captured in the regional travel demand model used to develop future volumes would impact traffic flow and LOS without the proposed Project. Refer to the TTR for LOS and delay for the No Action Scenario AM and PM peak hours. Based on the future projected volumes, the following intersections are expected to exceed the LOS standard performance indicator during the 2026 PM peak period:

- Traffic Avenue/Fryar Avenue and Main Street/Cannery Way (Sumner city limits)
- E Main Avenue and SR 410 Westbound /Thompson Street (Sumner city limits)
- N Meridian Avenue and Valley Avenue NE (Puyallup city limits, WSDOT intersection)

Queue Lengths

Excessive queueing was reported during the AM and PM peak period. During the AM and PM peak periods, the intersections shown in Table 4-36 reported a 95th percentile queue length exceeding 1,000 feet.

Table 4-36. 2026 AM and PM Peak Hour Excessive Queue Length – No Action Scenario

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	705	1,157
1. Traffic Ave & Cannery Wy	AM	Northbound	Thru	320	782	1,163
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	410	1,346
1. Traffic Ave & Cannery Wy	PM	Eastbound	Thru	600	1,162	1,604
1. Traffic Ave & Cannery Wy	PM	Eastbound	Right	190	1,158	1,624
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Thru	1,640	1,636	1,682
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	500	1,147	1,633
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	989	1,529

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street; Wy = Way

Excessive queueing as shown in Table 4-36 is detrimental to overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing can also indicate inefficient signal timing and insufficient green time provided at signalized intersections.

Due to the large number of turning movements for which queue results were compiled, the tables showing the results of AM and PM peak hour queue extents across simulation scenarios have been placed in Attachment C.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-37.

Table 4-37. 2026 AM and PM Peak Hour Travel Time – No Action Scenario

Segment	Travel Direction	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer Ave: 7th Ave to 33rd Ave	Eastbound	1.68	4.52	5.34
E Pioneer Ave: 33rd Ave to 7th Ave	Westbound	1.68	4.26	4.68
Shaw Road E: 39th Ave SE to E Main Ave	Northbound	2.38	6.13	6.54
Shaw Road E: 39th Ave SE to E Main Ave	Southbound	2.38	5.96	9.00

v/c Ratio

Under the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c ratio standard, with some segments exceeding 2.0. Table 4-38 shows the volumes and calculated v/c ratios for the No Action Scenario. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-38. AM and PM Peak Hour Segmental v/c Ratio – No Action Scenario

Roadway Segment	Travel Direction	Calculated Directional Maximum Capacity	Volume (Vehicles)		v/c Ratio	
			AM	PM	AM	PM
E Main Ave – Shaw Road E to 5th Ave NE	Westbound	1,445	531	1885	0.37	1.31
	Eastbound	1,445	1,205	1,004	0.83	0.69
E Main Ave – 5th Avenue NE to SR 410	Westbound	1,445	566	1875	0.39	1.30
	Eastbound	760	1,191	1,018	1.57	1.34
E Main Ave – 23rd St SE to Shaw Road E	Westbound	1,615	439	919	0.27	0.57
	Eastbound	1,615	375	615	0.23	0.38
Shaw Road E – E Main Ave to 5th Ave SE	Northbound	1,445	1,079	786	0.75	0.54
	Southbound	1,445	341	1,363	0.24	0.94
E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	532	740	0.37	0.51
	Eastbound	1,445	460	869	0.32	0.60
E Pioneer Ave – Shaw Road E to SR 162	Westbound	560	386	361	0.69	0.64
	Eastbound	560	252	564	0.45	1.01
SR 162 – 143rd Ave E to 80th St E	Northbound	800	771	657	0.96	0.82
	Southbound	800	403	1,260	0.50	1.58
SR 162 – SR 410 to 143rd Ave E	Northbound	840	771	657	0.92	0.78
	Southbound	840	403	1,260	0.48	1.50
Shaw Road E – 12th Ave SE to 16th Ave SE	Northbound	560	948	707	1.69	1.26
	Southbound	560	346	1,350	0.62	2.41
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	931	666	1.66	1.19
	Southbound	560	337	1,201	0.60	2.14
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	816	592	1.46	1.06
	Southbound	560	348	1,042	0.62	1.86

Scenario A: EIS Proposed Project

LOS and Delay

In addition to the projected growth in traffic volumes developed for the No Action Scenario, Scenario A includes traffic generated from the proposed Project. Due to the traffic generated by the proposed Project, five intersections exceed the LOS standard performance indicators during the PM peak period, refer to the TTR, including:

- Traffic Ave/Fryar Avenue & Main Street/Cannery Way E Main Avenue & SR 410 Westbound /Thompson Street
- E Main Avenue & SR 410 Eastbound
- N Meridian Avenue & Valley Avenue NE
- SR 162 & 80th Street E

Comparing the No Action Scenario delay with Scenario A delay, a majority of the intersections within the study area are impacted by an increase in average delay. However, several intersections show a reduction in delay, which is counterintuitive to an increase in demand traffic. Congestion that develops at a failing intersection can meter traffic into downstream intersections. This can result in traffic arriving less frequently, reducing average delay.

Queue Lengths

Excessive queueing was reported during the AM and PM peak period. During the AM and PM peak hours, several intersection movements exhibited simulated 95th percentile queue length estimates exceeding 1,000 feet, as indicated in Table 4-39.

Table 4-39. 2026 AM and PM Peak Hour Excessive Queue Lengths – Scenario A

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Left	180	910	1,132
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	AM	Northbound	Thru	320	1,035	1,160
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	591	1,007
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,051	1,612
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	993	1,570
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	758	1,083
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572

Notes: Ave = Avenue; ft = feet; St = Street; Wy = Way

Excessive queueing as shown in the table above is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of inefficient signal timing and insufficient green time provided at the signalized intersections.

The traffic impacts of Scenario A (proposed Project) require mitigation to meet the LOS standard performance indicators of the City and other affected agencies. The Mitigation Scenarios subsection describes what mitigation is required and provides the results of implementing the mitigation.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-40.

Table 4-40. 2026 Scenario A – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, From 7th St to 33rd St SE	Eastbound	1.68	4.72	5.50
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.40	4.84
Shaw Road/39th Ave to E Main Ave/State Street	Northbound	2.38	7.44	7.71
Shaw Road/39th Ave to E Main Ave/State Street	Southbound	2.38	6.72	9.59

v/c Ratio

Under Scenario A, and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c target ratio, with some segments exceeding 2.0. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

The below table provides the volumes and calculated v/c ratios for the No Action Scenario and Scenario A and the percent difference in v/c ratio for each segment. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-41. 2026 Peak Hour Segmental v/c Ratio Comparison – No Action Scenario and Scenario A

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action Scenario	Scenario A	Percent Increase	No Action Scenario	Scenario A	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.52	41%	1.31	1.43	9
		Eastbound	0.83	0.90	8%	0.69	1.00	45
2. E Main Avee – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.54	38%	1.30	1.43	10
		Eastbound	1.57	1.69	8%	1.34	1.92	43
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.30	11%	0.57	0.72	26
		Eastbound	0.23	0.31	35%	0.38	0.44	16
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.85	13%	0.54	1.02	89
		Southbound	0.24	0.47	96%	0.94	1.15	22
5. E Pioneer – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.41	11%	0.51	0.73	43
		Eastbound	0.32	0.43	34%	0.60	0.70	17
6. E Pioneer – Shaw Rd E to SR 162	7,300	Westbound	0.69	0.71	3%	0.64	1.01	58
		Eastbound	0.45	0.50	11%	1.01	1.28	27
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	2%	0.82	0.90	10
		Southbound	0.50	0.54	8%	1.58	1.61	2
8. SR 162 – SR 410 to 143rd Avee E	2,000	Northbound	0.92	0.93	1%	0.78	0.85	9
		Southbound	0.48	0.52	8%	1.50	1.53	2
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.93	14%	1.26	1.29	2
		Southbound	0.62	0.66	6%	2.41	2.46	2
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.75	5%	1.19	1.27	7
		Southbound	0.60	0.64	7%	2.14	2.32	8
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.55	6%	1.06	1.09	3
		Southbound	0.62	0.64	3%	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; sec = second; St = Street; Wy = Way

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor wide improvements necessary to increase the capacity to be within the targeted 0.85 v/c ratio. The percent increase was weighted based on segment length and provides the proportional factor for each roadway corridor.

Table 4-42. Scenario A – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.324
Shaw Road	0.170
E Pioneer	0.122
SR 162	0.117

The proportional factor is to be applied to long-range estimates (LRE) for corridor-wide improvements including roadway widening, stormwater improvements, lighting, and typical infrastructure costs during construction such as mobilization, erosion control, and maintenance of traffic. LREs should also include soft project costs such as design management and engineering, construction management, and permitting and inspection. Below is an example of how the proportional factor would be applied. Costs shown are applied as an example and are not indicative of an actual LRE for the project mitigation.

Example: If the LRE for Shaw Road widening within the study area is determined to be $12 million (M) in construction costs, $2M in design and management costs, and $6M in construction management, permitting, and inspection, totaling $20M, the 0.17 proportional factor would be applied to the total construction cost of $20m. This would result in a $3.4M fee in lieu cost to the applicant.

Scenario B: EIS Alternative 1, Rail Delivery

LOS and Delay

Due to its nearly identical trip generation and street network assumptions, Scenario B would exhibit functionally identical LOS results as long as no train serving Knutson Farms is present. The traffic model demonstrated that at-grade rail crossings blocking these streets would cause significant additional delays beyond the at-grade crossings themselves. Other intersections around the site would not improve substantially as a result of the reduction (approximately 18.5 percent) in heavy truck trip generation from Knutson Farms because heavy trucks only form 16.9-percent of overall site traffic. Delays at some of the most congested intersections would be higher on days when a train blockage occurs than with Scenario A. Scenario B also results in intersections exceeding LOS standards during the AM peak period, which does not occur under the No Action Scenario or Scenario A. Seven intersections during the AM peak period and 13 intersections during the PM peak period exceed the LOS standard performance indicators (refer to the TTR). The intersections exceeding the LOS standard include:

AM Peak Period:

- E Main Avenue & SR 410 EB
- E Main Avenue & 5th Avenue NE
- N Meridian Avenue & SR 167 EB
- Shaw Road E & Highlands Boulevard
- Shaw Road E & 16th Avenue SE
- Shaw Road E & 5th Avenue SE
- Shaw Road E & Safeway Driveway

PM Peak Period:

- Traffic Avenue & Cannery Way
- Traffic Avenue & State Street
- E Main Avenue & SR 410 WB Ramps
- E Main Avenue & SR 410 EB Ramps
- E Main Avenue & NE 5th Avenue
- E Main Avenue & Shaw Road E
- N Meridian Avenue & Valley Avenue NE
- E Pioneer & Shaw Road E
- E Pioneer & 33rd Street SE
- 33rd Street SE & 8th Avenue SE
- Shaw Road E & Highlands Boulevard
- Shaw Road E & 23rd Avenue SE/Crystal Ridge Drive SE

Comparing the No Action Scenario delay with Scenario B delay, the majority of the intersections within the study area are impacted by a significant increase in average delay, mainly along the Shaw Road E corridor during the PM peak period.

Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak hours, several intersection movements simulated exhibited 95th percentile queue length estimates exceeding 1,000 feet, refer to the TTR and Table 4-43.

Table 4-43. 2026 AM and PM Peak Hour Excessive Queue Lengths – Scenario B

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	475	1,189
1.Traffic Ave & Cannery Way	AM	Northbound	Thru	320	552	1,194
3. E Main Ave & SR 410 EB Ramps	AM	Eastbound	Left	300	180	1,027
10. N Meridian Ave & SR 167 NB	AM	Westbound	Left	1,100	203	1,337
11. N Meridian Ave & SR 167 SB	AM	Westbound	Right	470	687	3,098
24. Shaw Rd E & 23rd Ave SE	AM	Northbound	Thru	190	255	1,464
34. SR 162 & SR 410 EB Ramps	AM	Northbound	Thru	450	149	1,206
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	971	1,657
1. Traffic Ave & Cannery Way	PM	Eastbound	Right	190	879	1,674
2. Traffic Ave & State St	PM	Southbound	Thru	1,020	629	1,209
3. Traffic Ave & State St	PM	Southbound	Right	1,020	599	1,168
4. E Main Ave & SR 410 EB Ramps	PM	Eastbound	Left	300	1,154	1,473
4. E Main Ave & SR 410 EB Ramps	PM	Northbound	Thru	750	978	1,388

Intersection	Peak Hour	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
5. E Main Ave & 5th Ave NE	PM	Northbound	Thru	1,000	630	1,406
5. E Main Ave & 5th Ave NE	PM	Southbound	Thru	1,000	354	1,225
5. E Main Ave & 5th Ave NE	PM	Southbound	Right	1,000	354	1,225
6. E Main Ave & Shaw Rd E	PM	Westbound	Left	460	800	1,621
6. E Main Ave & Shaw Rd E	PM	Northbound	Left	210	317	1,066
6. E Main Ave & Shaw Rd E	PM	Northbound	Right	210	247	1,034
SR 167 EB on/WB Left	PM	Northbound	Thru	230	248	1,661
10. N Meridian Ave & SR 167 NB	PM	Eastbound	Right	1,640	1,339	1,697
10. N Meridian Ave & SR 167 NB	PM	Westbound	Left	500	810	1,657
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Left	340	618	1,422
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Thru	750	739	1,434
19. E Pioneer Ave & Shaw Rd E	PM	Eastbound	Right	750	198	1,224
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Left	300	614	1,264
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Thru	300	495	1,270
19. E Pioneer Ave & Shaw Rd E	PM	Westbound	Right	300	506	1,300
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Thru	1,000	398	1,481
21. E Pioneer Ave & 33rd St SE	PM	Westbound	Right	1,000	380	1,461
22. Shaw Rd E & Highlands Blvd	PM	Southbound	Thru	650	1,421	1,685
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Thru	1,000	739	1,109
23. Shaw Rd E & 16th Ave SE	PM	Southbound	Right	1,000	739	1,109
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,321	1,669
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	672	1,619
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Left	250	689	1,507
28. Shaw Rd E & 5th Ave SE	PM	Westbound	Right	250	248	1,340
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Left	210	473	1,315
28. Shaw Rd E & 5th Ave SE	PM	Southbound	Thru	1,020	760	1,419
29. 33rd St & 5th Ave SE	PM	Southbound	Thru	550	1,035	1,693
29. 33rd St & 5th Ave SE	PM	Southbound	Right	550	1,044	1,689

Notes: Ave = Avenue; Blvd = Boulevard; Dr = Drive; ft = feet; Rd = Road; St = Street

Excessive queueing as shown in the table above is detrimental to the overall system performance. Although only three intersections reported LOS exceeding standard performance indicators, the congestion created by the excessive queueing meters traffic downstream into adjacent signals. Excessive queueing is also indicative of insufficient green time provided at the signalized intersections.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown below in Table 4-44. During the PM peak period, the impact of a train trip is significant along the Shaw Road E corridor, more than doubling the travel time compared to the No Action Scenario.

Table 4-44. 2026 Scenario B – AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.57	7.49
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.35	6.50
Shaw Rd/39th Ave to E Main Ave/State Street	Northbound	2.38	7.07	13.47
Shaw Rd/39th Ave to E Main Ave/State Street	Southbound	2.38	6.80	19.66

Under Scenario B and similar to the No Action Scenario, a majority of the specified segments exceed the 0.85 v/c target ratio, with some segments exceeding 2.0. Table 4-45 below provides the volumes and calculated v/c ratios for Scenario B. Segments exceeding the 0.85 standard performance v/c are shown in red.

Table 4-45. AM and PM Peak Hour Segmental v/c Ratio – Scenario B

Roadway Segment	Direction of Travel	Calculated Directional Maximum Capacity	Volume (vehicles)		v/c ratio	
			AM	PM	AM	PM
E Main Ave – Shaw Road E to 5th Ave NE	Westbound	1,445	748	1,929	0.52	1.34
	Eastbound	1,445	1,297	1,097	0.90	0.76
E Main Ave – 5th Ave NE to SR 410	Westbound	1,445	783	1,922	0.54	1.33
	Eastbound	760	1,284	1,109	1.69	1.46
E Main Ave – 23rd St to Shaw Road E	Westbound	1,615	491	979	0.30	0.61
	Eastbound	1,615	495	628	0.31	0.39
Shaw Road E – E Main Ave to 5th Ave SE	Northbound	1,445	1,224	991	0.85	0.69
	Southbound	1,445	677	1,472	0.47	1.02
E Pioneer Ave – 21st St SE to 25th St SE	Westbound	1,445	597	894	0.41	0.62
	Eastbound	1,445	614	705	0.42	0.49
E Pioneer Ave – Shaw Road E to SR 162	Westbound	560	399	547	0.71	0.98
	Eastbound	560	282	552	0.50	0.99
SR 162 – 143rd Ave E to 80th St E	Northbound	800	785	687	0.98	0.86
	Southbound	800	434	1,270	0.54	1.59
SR 162 – SR 410 to 143rd Ave E	Northbound	840	785	687	0.93	0.82
	Southbound	840	434	1,270	0.52	1.51
Shaw Road E – 12th Ave SE to 16th Ave SE	Northbound	560	1,107	690	1.98	1.23
	Southbound	560	400	1070	0.71	1.91
Shaw Road E – 16th Ave SE to 23rd Avenue SE	Northbound	560	981	678	1.75	1.21
	Southbound	560	359	1,001	0.64	1.79
Shaw Road E – 16th Ave SE to 23rd Ave SE	Northbound	560	869	602	1.55	1.08
	Southbound	560	340	842	0.61	1.50

This finding indicates that rail crossing delay impacts outweigh the potential benefits of removing a small number of trucks from the Knutson Farms Industrial Park site's delivery traffic stream.

Scenario C: Proposed Project with Traffic Mitigation

Scenario C mitigates the traffic impacts reported in Scenario A. Several mitigation strategies were implemented to address the delay, extensive queueing, and LOS exceeding City standard performance indicators. Some of the strategies are global, meaning they are applied throughout the network to improve the overall system performance. Other strategies are localized at the intersections exceeding City standard performance indicators previously described. The main strategies include:

- Global - Increase signal cycle length and coordinate signals
  - To improve signal progression and increase vehicular throughput at signalized intersections
- Localized - Increase left turn and/or right-turn-lane storage
  - Reduce the occurrence of queue spillback leading to blocking through-lanes
- Localized - Convert unsignalized intersection at SR 162 and 80th Street E to a roundabout
  - Improve minor approach access onto main approach
- Localized - Modify lane configuration at signalized intersections
  - Eliminate split-phase signal timing
  - Improve lane utilization, thus reducing queue lengths
- Proportionate Localized – Upgrade to roadways that do not meet current City standards
  - Roadway typical section improvements including widening, stormwater treatment, and lighting.
  - Pedestrian improvements to bring pedestrian facilities within Americans with Disabilities Act (ADA) standards
  - Improvements to transit stops along corridors identified for improvement using the proportional factor within the Project area including Stop #1301 on Shaw Road E

Proportionate localized mitigation compares the increase of v/c ratio between the No Action Scenario and Scenario C. Using the v/c ratios allows for a proportional factor to be developed accounting for the reduction of capacity attributed by the traffic generated by the applicant. The proportional factor is intended to be applied to the total infrastructure costs of bringing the No Action Scenario within City targets for LOS, delay, and queue lengths.

Table 4-46 describes the extent of mitigation at each location.

Table 4-46. 2026 Scenario C – Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceed City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceed City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection, and allowing EB and WB left turns to run concurrently	Yes, traffic analysis shows acceptable LOS and delay performance indicators
4. E Main Ave & SR 410 EB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
12. N Meridian Ave & Valley Ave NE	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	LOS and delay exceed City's performance indicators	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Ave to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario A increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

Notes: Ave = Avenue; Rd = Road; St = Street; Wy = Way

Below is a description of the mitigation treatments required at specific intersections. Figure 4-65 below also depicts the locations of the intersections needing mitigation.

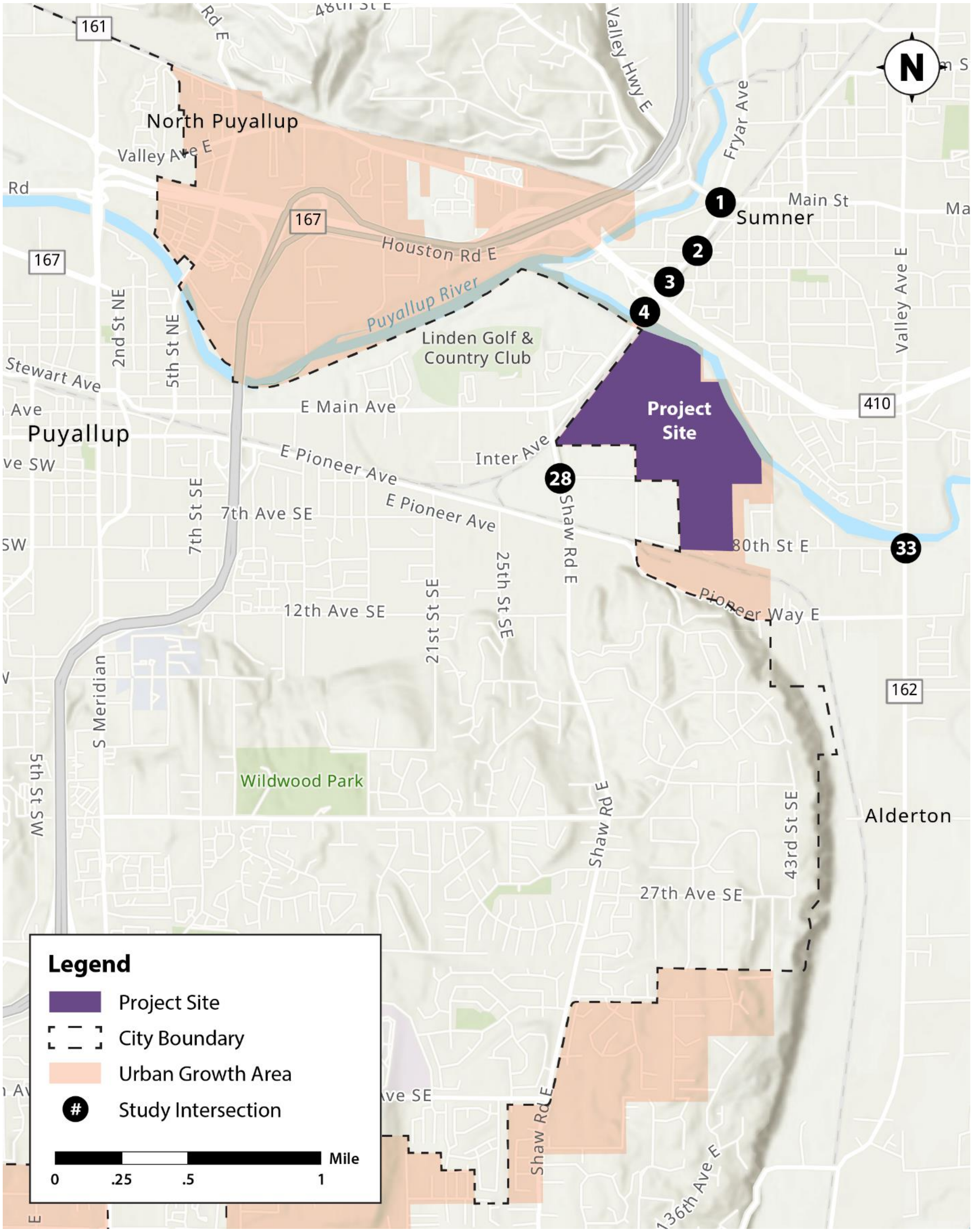

Figure 4-65. Intersection Mitigation Vicinity Map

Location #1 and Location #2. Traffic Avenue & Cannery Way, Traffic Avenue & State Street
Retiming these two signalized intersections to run coordinated with SR 410 improves vehicular throughput, reduces queue lengths, and reduces delay. It is recommended to retime the signal to 120-second cycle lengths and update the offset to align the green band with the SR 410 interchange.

Location #3 and Location #4. E Main Ave & SR 410 WB and E Main Avenue & SR 410 EB
E Main Avenue & SR 410 is a critical bottleneck along the corridor due to the existing width of the bridge over SR 410. Increasing the capacity to meet the demand volume would require a full reconstruction of the interchange. Because WSDOT has jurisdictional control of the interchange and the recent improvements to the existing bridge over SR 410, the localized improvements at each ramp terminal considered only low-impact mitigation strategies. This includes retiming both signals to 120-second cycle lengths and adjusting offsets to improve vehicular throughput and reduce queue lengths. Modifications at E Main Avenue & SR 410 WB (see Figure 4-66) to eliminate the split-phase signal operations are required, including:

- Modify stop bar locations and restripe intersection to eliminate split-phase signalization and to eliminate path overlap of left-turn vehicles. Update signal phasing to operate with protected signal phasing.

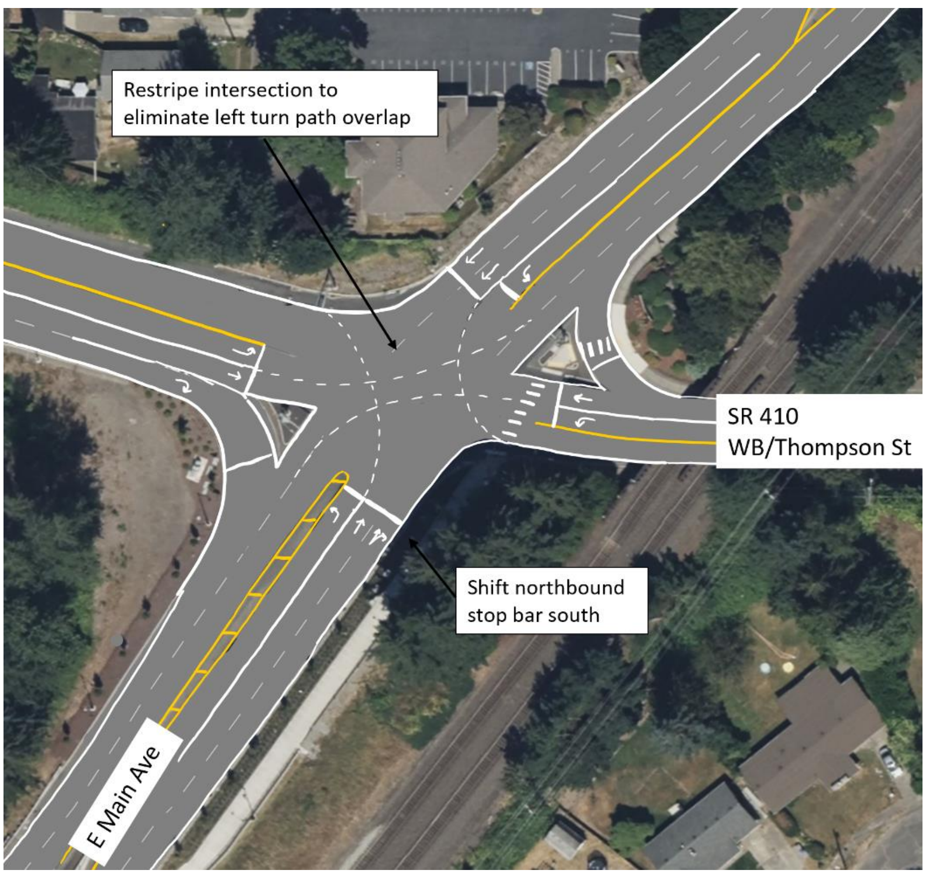

Figure 4-66. Mitigation Improvement at Location #3, E Main Avenue & SR 410 Westbound/Thompson Street

Location #12. N Meridian Avenue & NE Valley Avenue

Although this intersection exceeds mitigation performance indicators with the Project impacts, it already fails in the No Action Scenario. The operational results are tied to the SR 167 interchange, which falls under WSDOT jurisdictional control. Mitigation of traffic impacts at this intersection are not feasible without a full reconstruction of the SR 167 interchange.

Location #28. Shaw Road E & 5th Avenue SE

Widening 5th Avenue SE to provide dedicated westbound left- and right-turn lanes and converting the unsignalized intersection into a signalized intersection will reduce significant delay 5th Avenue SE approach (see Figure 4-67). The signal will also facilitate improved southbound left access onto 5th Avenue SE. Coordinating the signal to the adjacent signals will also improve vehicular flow along Shaw Road E. This will reduce queue lengths and improve travel time. Roadway modifications are also required, including providing a westbound right-turn lane. Due to topography, widening 5th Avenue SE will likely occur to the south, impacting approximately 6,400 feet of right-of-way and a driveway access point. To provide acceptable roadway geometry and the recommended lane configuration at the signal, 5th Avenue SE requires widening to three lanes between Shaw Road E and 33rd Street SE.

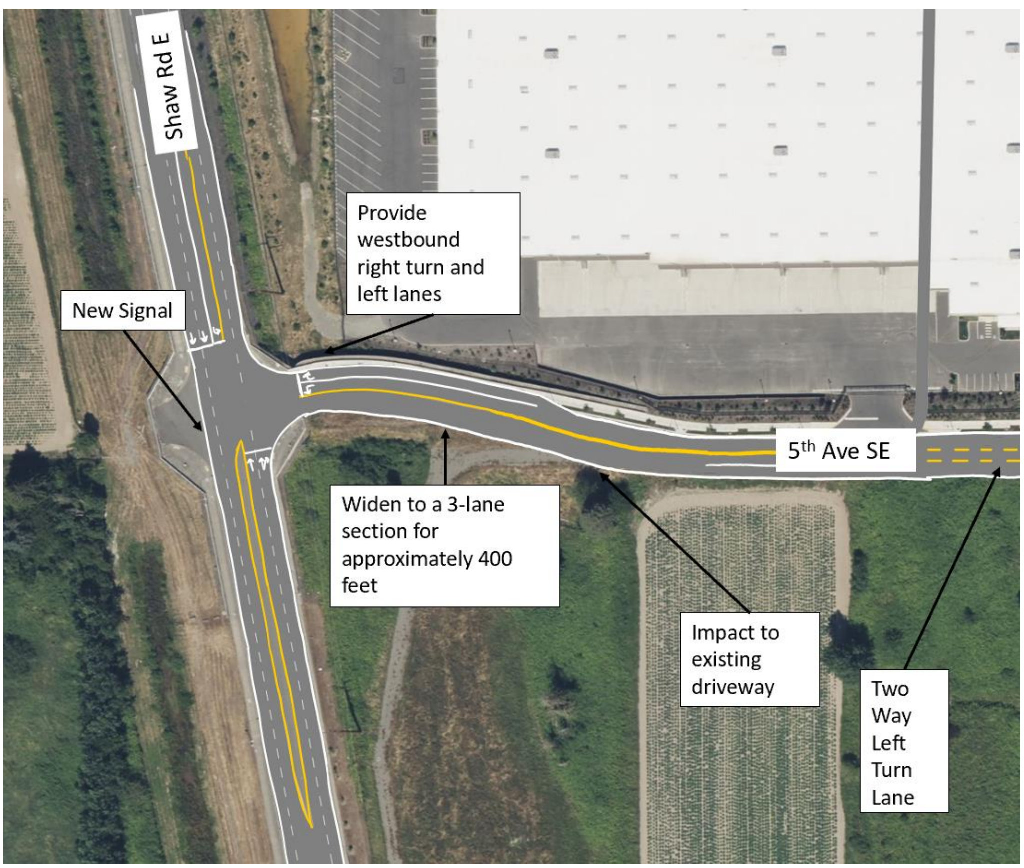

Figure 4-67. Mitigation Improvement at Location #28, Shaw Road E & 5th Avenue SE

Location #33 SR 162 & 80th Street E

Converting SR 162 and 80th Street E to a roundabout will provide a greater opportunity for the left-turning volume from 80th to complete their movement. Due to the increased traffic generated along SR 162, the left-turning vehicles from 80th experience significant delay waiting for a gap simultaneously in both directions. Providing a roundabout at SR 162 and 80th Street E will have significant right-of-way impacts on all adjacent parcels. There is also a utility pole that would need to be relocated (see Figure 4-68).

Figure 4-68. Mitigation Improvement at Location #33 SR 162 & 80th Street E

LOS and Delay

The mitigation strategies significantly improved the system performance; however, N Meridian Avenue and Valley Avenue NE still exceed LOS performance indicators, refer to the TTR. The following intersection still exceeds the LOS performance indicator:

- N Meridian Avenue & Valley Avenue NE (WSDOT)

The N Meridian Avenue intersection requires significant interchange reconstruction under WSDOT jurisdictional control. The mitigation strategies, however, did reduce overall delay and improve operations at these intersections compared to Scenario A.

Although the proposed roundabout at SR 162 and 80th Street approaches LOS F, a reduction in delay was realized. Other intersection control options were considered including a traditional signal and a continuous green-t intersection. The continuous green-t intersection was dismissed due to site specific constraints including adjacent bridges. Although a traditional signal may provide similar operations compared to the roundabout, it would not provide the same safety benefit of a roundabout. Similar to how LOS is determined at unsignalized intersections, a roundabout's minor approach delay is used to determine LOS. Due to the heavy southbound demand during the design year, delay along 80th Street E is still anticipated. The roundabout does reduce the delay and improve safety along the corridor by reducing the conflict points at the intersection and reducing the potential for severe and fatal crashes. Converting a two-way, stop-controlled intersection to a single-lane roundabout has a crash modification factor (CMF) of 0.22 for serious, minor injury, and possible injury crashes.[17] A 0.22 CMF suggest a 78 percent crash reduction.

Queue Lengths

The mitigation strategies implemented did not eliminate excessive 95th percentile queueing, which represents the queue length that is exceeded only 5 percent of the time. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spread throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than compare 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. The majority of 50th percentile queue lengths are less than the available storage length provided. Refer to the TTR for all excessive queue lengths reported.

Mitigating the excessive queue lengths requires adding capacity to each corridor. Considering that both the existing condition model and No Action Scenario have corridors that exceed the City's performance indicator of 0.85 v/c ratio, the proportional factors provided in Table 4-42 in Section 4.3.4 should be used to develop the mitigation cost required due to the proposed Project.

Travel Time

Average travel time was collected during the AM and PM peak period for specific routes within the Project area, shown in Table 4-47.

[17] CMF Clearinghouse, CMF ID: 234

Table 4-47. Scenario C – 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.44	5.23
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.37	4.41
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.78	6.09
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.37	9.62

v/c Ratio

The v/c ratio for Scenario C would be equivalent to that for Scenario A since both scenarios have the same demand volume.

Scenario D: EIS Alternative 2, Reduced Site Intensity

Scenario D does not generate as much Knutson Farms traffic due to a decrease in the site footprint. Compared to Scenario A, Scenario D generates 33 percent less site demand volume.

LOS and Delay

Although less site traffic volume is generated, Scenario D still has intersections that exceed the City's standard LOS performance indicator. Due to the traffic generated by the proposed Project, three intersections exceed the LOS standard performance indicators during the PM peak period, including:

- Traffic Avenue & Cannery Way
- E Main Avenue & SR 410 Westbound
- N Meridian Avenue & Valley Avenue NE

Queue Lengths

Excessive queueing was reported during the AM and PM peak periods. During the AM and PM peak periods, the several intersections reported a 95th percentile queue length exceeding 1,000 feet, as shown in Table 4-48.

Table 4-48. AM and PM Peak Hour Excessive Queue Lengths – Scenario D

Intersection Location	Peak Period	Approach	Movement	Available Storage (ft)	Queue Length (ft)	
					50th	95th
1. Traffic Ave & Cannery Way	AM	Northbound	Left	180	935	1,096
1. Traffic Ave & Cannery Way	AM	Northbound	Thru	320	1,004	1,137
1. Traffic Ave & Cannery Way	PM	Eastbound	Thru	600	1,183	1,598
4. E Main Ave & SR 410 EB	PM	Eastbound	Left	300	170	1,270
12. N Meridian Ave & Valley Ave NE	PM	Eastbound	Right	1,640	1,645	1,681
12. N Meridian Ave & Valley Ave NE	PM	Westbound	Left	500	1,066	1,572
24. Shaw Rd E & 23rd Ave SE	PM	Southbound	Thru	650	1,038	1,383
27. Shaw Rd E & 39th Ave SE	PM	Northbound	Left	330	1,074	1,656
27. Shaw Rd E & 39th Ave SE	PM	Southbound	Thru	530	1,043	1,217

Notes: Ave = Avenue; ft = feet; Rd = Road

The excessive queuing shown in the table above and the intersections performing outside City's standard LOS performance indicator require mitigation.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, shown in Table 4-49.

Table 4-49. Scenario D - 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.43	5.29
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.32	4.78
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.61	6.49
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	6.40	8.98

v/c Ratio

Although Scenario D generates less site volume than Scenario A, Scenario D does increase the v/c ratios along each segment compared to the No Action Scenario. Table 4-50 below compares the v/c ratios of the No Action Scenario and Scenario D showing the percent increase of v/c for each segment. The v/c ratios shown in red exceed the 0.85 v/c ratio standard.

Table 4-50. 2026 Peak Hour Segmental v/c Ratio Comparison – No Action Scenario and Scenario D

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action	Scenario D	Percent Increase	No Action	Scenario D	Percent Increase
1. E Main Ave – Shaw Rd E to 5th Ave NE	1,600	Westbound	0.37	0.47	27%	1.31	1.39	7
		Eastbound	0.83	0.88	5%	0.69	0.89	28
2. E Main Ave – 5th Ave NE to SR 410	3,000	Westbound	0.39	0.49	26%	1.30	1.38	7
		Eastbound	1.57	1.65	5%	1.34	1.71	28
3. E Main Ave – 23rd St to Shaw Rd E	1,800	Westbound	0.27	0.29	8%	0.57	0.66	16
		Eastbound	0.23	0.28	21%	0.38	0.42	11
4. Shaw Rd E – E Main Ave to 5th Ave SE	1,400	Northbound	0.75	0.81	9%	0.54	0.85	56
		Southbound	0.24	0.39	66%	0.94	1.08	15
5. E Pioneer – 21st St SE to 25th St SE	1,350	Westbound	0.37	0.40	8%	0.51	0.65	27
		Eastbound	0.32	0.39	22%	0.60	0.67	12
6. E Pioneer – Shaw Rd E to SR 162	7,300	Westbound	0.69	0.70	2%	0.64	0.63	-3
		Eastbound	0.45	0.49	8%	1.01	0.97	-4
7. SR 162 – 143rd Ave E to 80th St E	1,350	Northbound	0.96	0.98	1%	0.82	0.87	6
		Southbound	0.50	0.53	5%	1.58	1.59	1
8. SR 162 – SR 410 to 143rd Ave E	2,000	Northbound	0.92	0.93	1%	0.78	0.83	6
		Southbound	0.48	0.50	5%	1.50	1.51	1

Roadway Segment	Segment Length (ft)	Direction of Travel	v/c Ratio					
			AM			PM		
			No Action	Scenario D	Percent Increase	No Action	Scenario D	Percent Increase
9. Shaw Rd E - 12th Ave SE to 16th Ave SE	1,800	Northbound	1.69	1.89	11%	1.26	1.37	8
		Southbound	0.62	0.65	5%	2.41	2.54	5
10. Shaw Rd E - 16th Ave SE to 23rd Ave SE	2,300	Northbound	1.66	1.72	4%	1.19	1.27	7
		Southbound	0.60	0.63	4%	2.14	2.25	5
11. Shaw Rd E – 23rd Ave SE to 39th Ave SE	7,550	Northbound	1.46	1.53	5%	1.06	1.14	7
		Southbound	0.62	0.60	-4%	1.86	2.02	9

Notes: Ave = Avenue; ft = feet; Rd = Road; St = Street

The weighted average of the percent increase for each roadway was calculated to be used as a proportional factor for corridor-wide improvements necessary to increase the capacity to be within the targeted 0.85 v/c ratio. The percent increase was weighted based on segment length. Table 4-51 provides the proportional factor for each roadway corridor.

Table 4-51. Scenario D – Roadway Proportional Factor

Roadway Segment	Proportional Factor
E Main Avenue	0.211
Shaw Road	0.083
E Pioneer	0.067
SR 162	0.065

Scenario E: EIS Alternative 2 with Traffic Mitigation

Scenario E mitigates the traffic impacts reported in Scenario D. Many of the same mitigation strategies implemented under Scenario C were deployed, including:

- Global - Increase signal cycle length and coordinate signals:
  - Improve signal progression and increase vehicular throughput at signalized intersections.
- Localized - Increase left-turn and/or right-turn lane storage:
  - Reduce the occurrence of queue spillback leading to blocking through-lanes.
- Localized - Convert an unsignalized intersection at SR 162 and 80th Street E to a roundabout:
  - Improve minor approach access onto main approach.
- Localized - Modify lane configuration at signalized intersections:
  - Eliminate split-phase signal timing.
  - Improve lane utilization, thus reducing queue lengths.

For the localized mitigation strategies, Table 4-52 describes the extent of mitigation at each location.

Table 4-52. 2026 Scenario E Traffic Impact Mitigation Applied

Intersection Location	Reason for Mitigation	Mitigation Applied	Does Mitigation Fully Address Impact?
1. Traffic Ave/Fryar Ave & Main St/ Cannery Wy	LOS and delay exceed City's performance indicators	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
2. Traffic Ave & State St	LOS and delay exceed City's performance indicators	Retime and coordinate signal; this intersection requires retiming even though it meets LOS thresholds due to proximity to SR 410	Yes, traffic analysis shows acceptable LOS and delay performance indicators
3. E Main Ave & SR 410 WB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing EB and WB left turns to run concurrently	Yes, traffic analysis shows acceptable LOS and delay performance indicators
4. E Main Ave & SR 410 EB	LOS and delay exceed City's performance indicators; queuing spillbacks to adjacent intersections	Retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
28. Shaw Rd E & 5th Ave SE	LOS and delay exceed City's performance indicators	Widen 5th Ave and convert unsignalized intersection to a signal with dedicated WB left- and right-turn lanes; widen 5th Avenue to a three-lane roadway section; retime and coordinate signal	Yes, traffic analysis shows acceptable LOS and delay performance indicators
33. SR 162 & 80th St	Traffic generated by Scenario D increases left turning volumes onto SR 162	Convert to roundabout	Yes, traffic analysis shows acceptable LOS and delay performance indicators

LOS and Delay

Similar to Scenario C, which mitigated the Scenario A traffic impacts, only the N Meridian Avenue and Valley Avenue NE intersection still exceeds the LOS performance indicators, refer to the TTR. Comparing the intersection delay between Scenario D and Scenario E, a majority of intersections saw a decrease in delay. Several intersections did see an increase in delay, mainly at unsignalized intersections. Due to the improved vehicular throughput along main corridors, fewer available gaps occur for the minor approach to complete their movement. Although the delay increases at some locations, the overall network performance is improved, as represented by the reduction in average delay at a majority of the intersections within the study area and overall reduction in queue lengths described below.

Queue Lengths

Similar to Scenario C, the mitigation strategies implemented did not eliminate excessive 95th percentile queueing. In fact, by improving traffic flow at the critical bottlenecks within the Project area, traffic platoons and congestion spreads throughout the network, increasing the number of locations where 1,000-foot queues develop. Rather than comparing 95th percentile queues with Scenario A, a more meaningful metric that shows an improvement to traffic flow is comparing the 50th percentile queue lengths. A majority of the 50th percentile queue lengths are less than the available storage length provided. Refer to the TTR for all excessive queue lengths reported.

Travel Time

Average travel time was collected during the AM and PM peak periods for specific routes within the Project area, as shown Table 4-53.

Table 4-53. Scenario E – 2026 AM and PM Peak Hour Travel Time

Segment	Direction of Travel	Distance (miles)	AM Peak Travel Time (min)	PM Peak Travel Time (min)
E Pioneer, 7th St to 33rd St SE	Eastbound	1.68	4.39	5.38
E Pioneer, 33rd St SE to 7th St	Westbound	1.68	4.16	4.68
Shaw Rd/39th Ave to E Main Ave/State St	Northbound	2.38	6.13	5.93
Shaw Rd/39th Ave to E Main Ave/State St	Southbound	2.38	5.91	8.53

v/c Ratio

The v/c ratio for Scenario E would be equivalent to the ratio for Scenario D because both scenarios have the same demand volume.

Travel Time Comparison

Travel time results from the simulations of all scenarios are provided for comparison in Table 4-54.

Table 4-54. Travel Time Comparison

Segment and Direction	Length (miles)	Travel Time (minutes)						
		Existing	No Action Scenario	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
AM Peak Hour								
Pioneer, 7th to 33rd, EB	1.68	4.17	4.52	4.72 (4%)	4.57 (1%)	4.44 (-2%)	4.43 (-2%)	4.39 (-3%)
Pioneer, 33rd to 7th, WB	1.68	4.20	4.26	4.40 (3%)	4.35 (2%)	4.37 (3%)	4.32 (1%)	4.15 (-3%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.33	6.13	7.44 (21%)	7.07 (15%)	6.78 (11%)	6.61 (8%)	6.13 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	4.26	5.96	6.72 (13%)	6.80 (14%)	6.37 (7%)	6.40 (7%)	5.91 (-1%)

PM Peak Hour								
Pioneer, 7th to 33rd, EB	1.68	5.0	5.34	5.50 (3%)	7.49 (40%)	5.23 (-2%)	5.29 (-1%)	5.38 (1%)
Pioneer, 33rd to 7th, WB	1.68	5.07	4.68	4.84 (3%)	6.50 (39%)	4.41 (-6%)	4.78 (2%)	4.68 (0%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	6.02	6.55	7.71 (18%)	13.47 (106%)	6.09 (-7%)	6.49 (-1%)	5.93 (-9%)
Shaw Rd/39th Ave to E Main Ave/State St	2.38	7.92	9.00	9.59 (7%)	19.66 (118%)	9.62 (7%)	8.98 (0%)	8.53 (-5%)

Note: Percentages represent increase over the No Action Scenario.

Scenario A sees a significant increase in travel time during the PM peak period compared to the No Action Scenario. The main reason for the increase in travel time is due to the failing signalized intersections and extensive queue lengths described previously in this section. Main Street, Shaw Road, and Pioneer Avenue are projected to be nearing capacity under the No Action Scenario. The increase in traffic generated by the Knutson Farms proposal pushes these corridors further over capacity, resulting in extensive queuing, congestion, and significant increase in travel times.

Scenario B results in network wide system breakdown during the PM peak period. This results in excessive increases in travel time along all corridors. The grid lock is due to the train call which results in excessive queue lengths.

Scenario C results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario C travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario A.

Scenario D results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Although not as significant as the traffic increase in Scenario A, the increase in traffic generated by Knutson Farms is anticipated to increase travel times along the corridors by less than 1-minute during the AM peak period and are relatively equivalent during the PM peak period.

Scenario E results in a decrease in travel time for some corridors and a slight increase in travel time for other corridors during the PM peak period compared to the No Action Scenario. Scenario E travel times indicate that the mitigation strategies implemented reduce the travel times through the transportation network when compared to Scenario D.

Additional Mitigation

As previously described, due to the roadway corridors exceeding capacity under the No Action Scenario, not all intersection LOS, v/c ratios, and queue lengths are able to be mitigated within target values. Large corridor-wide improvements would be needed, such as widening from a two-lane roadway section to a four or five-lane section. Weighting the added impact created by the volume generated by the proposed Project allows for proportionate mitigation costs to be incurred. Improvements that would be included in those costs include:

- Corridor widening improvements along Shaw Road E, E Main Avenue, SR 162, and E Pioneer Avenue
- Upgrading roadways within the Project area to City standards
- Upgrading pedestrian facilities to meet ADA standards
- Improvements to transit stops within the Project area, including Stop #1301

4.9.5 Crash Analysis Results

Crash History

A total of 836 crashes were reported at the study intersections (Intersections 1 through 27 and 31 through 35) and the corridor segments in the 7-year period between January 1, 2015, and December 31, 2021 (WSDOT 2023). The study intersections accounted for 757 of these. Refer to the TTR for a summary of intersection and segment crashes by type, severity, and year.

The majority of both intersection and corridor segment crashes were either angle or rear-end crashes. Angle crashes are those in which two vehicles approaching the intersection on intersecting streets collide. Such crashes, by definition, involve at least one of the two drivers failing to yield the right-of-way. Rear-end crashes tend to predominate on congested intersections and are almost always caused by inattention on the part of the second driver.

There were no fatal crashes during the study period at any of the intersections or corridor segments studied. “Unknown” severity is a simple lack of reporting and can indicate that a driver, passenger, cyclist, or pedestrian involved in a crash left the scene of the crash without the reporting officer being able to assess injury status or that the officer may have neglected to complete that part of the crash report. A total of only 10 crashes with suspected serious injuries were reported in 836 total reported crashes, which represents an uncommonly low degree of severity. Refer to the TTR for crash history type.

Crashes per year generally declined from 2015 to 2020 and then bounced back in 2021. The year 2020 could be considered something of an aberration, as the global pandemic reduced vehicle miles traveled for most of the year. Crash rates were generally lower on Shaw Road East between East Pioneer Avenue and 39th Street than at other intersections. No crash rates higher than 1.0 were observed for any study intersection. To illustrate relative crash intensity for study area intersections, a color-coded map is provided in Figure 4-69.

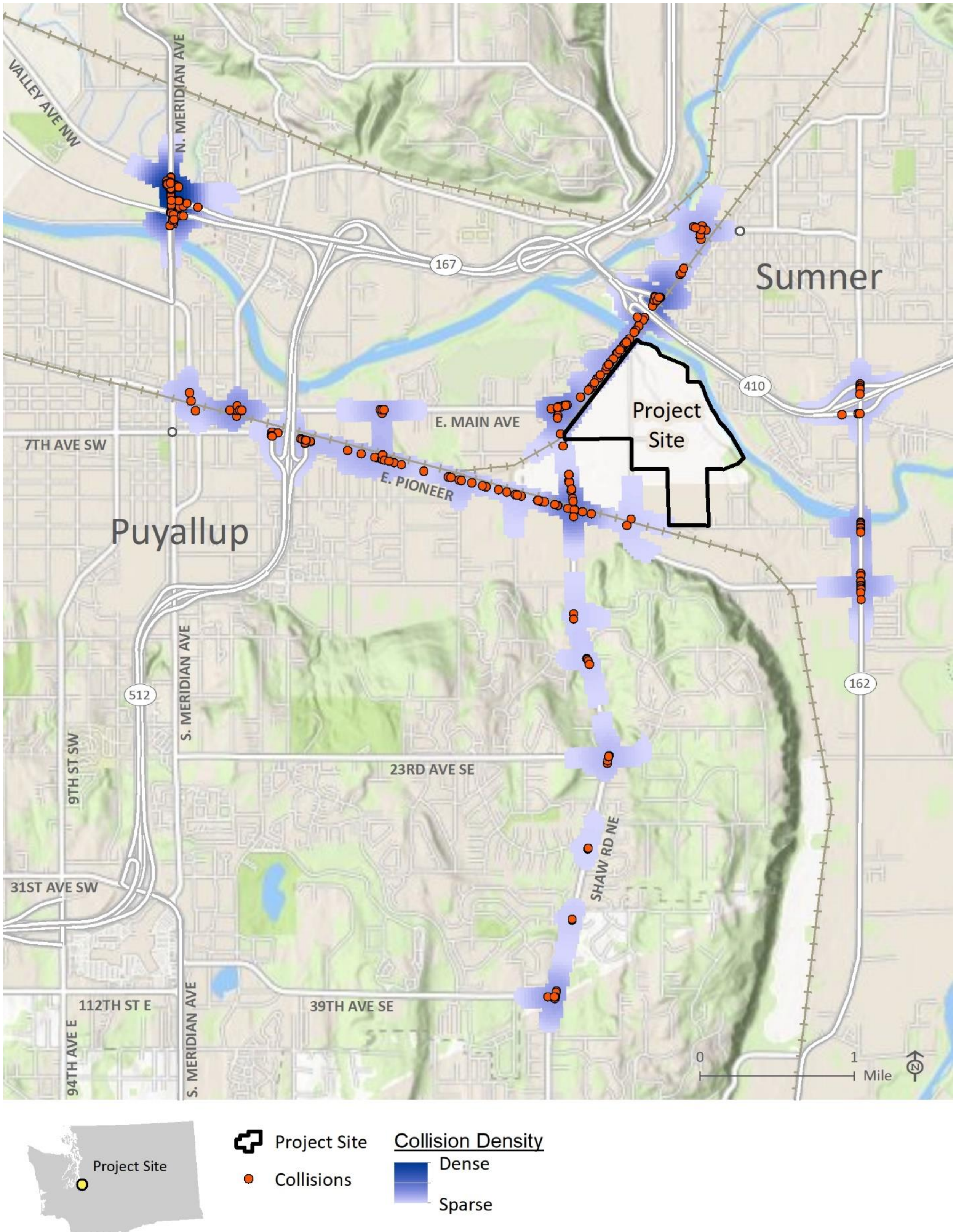

Figure 4-69. Relative Crash Intensity for Study Intersections

Traffic Safety Performance Impacts of Future Scenarios

Intersection crash rates (crashes per million entering vehicles) can reasonably be expected to remain similar in the Project year of opening (2026) unless one or more of the following occurrences influences them:

- Abnormal weather results in more hazardous conditions than have been observed in the study area in the recent past
- Industrywide improvements in vehicle technology associated with crash avoidance are implemented in enough of the vehicle fleet that overall crashes are reduced; and/or
- Project improvements are made at specific intersections that reduce crash risk, such as improvements to lighting, sight distance, or intersection geometry.

Comparisons here are based on an assumption that such factors would either not be substantive or would effectively cancel each other out.

No Action Scenario

The No Action Scenario would experience more crashes per year than the 6-year average from 2015–2020, but type and severity patterns would not be expected to change. No significant safety impacts are expected to result from the No Action Scenario.

Scenario A: Proposed Project

Scenario A would result in significant increases in traffic volume at study intersections and along study segments. With the assumption that relationship of crashes to volume remains the same, the Project would come with an anticipated corresponding increase in crashes and impacts to overall public safety. As shown earlier, Scenario A would, for the most part, also result in more peak hour congestion, which could reasonably be expected to affect crash likelihood.

Additional traffic congestion could affect safety performance both positively and negatively. On the positive side, lower speeds could give drivers more time to react to other road users. Shaw Road has documented high speeds as shown in City plans, such as the Safe Routes to Schools Plan. However, drivers could also become frustrated by delays and attempt to make more aggressive movements to compensate, such as changing lanes more often or accepting smaller gaps when entering or crossing conflicting traffic.

During congested or lower-speed conditions, crash type distribution could be different from when drivers are freer to choose their desired speeds. More congestion is likely to correspond to more sideswipe and rear-end crashes due to increased lane-changing or other aggressive/impatient driving. Both lower speeds and more of these types of crashes are often associated with lower severity (fewer injuries) than the head-on, angle, and fixed-object crashes that typically occur when there is little or no congestion. No significant safety impacts are expected to result from Scenario A.

Scenario B: Rail Delivery

With similar levels of congestion relative to Scenario A, Scenario B would be expected to have safety impacts similar to those outlined for Scenario A. While the very low speeds of proposed trains on crossings near the site for Scenario B indicate that new safety impacts due to rail crossing activity would not be significant, additional active rail crossings would not make Scenario B safer than the No Action Scenario or Scenario A. No significant safety impacts are expected to result from Scenario B.

Scenario D: Reduced Land Use

The characteristics of the safety impacts under Scenario D are similar to those under Scenario A. However, the magnitude of the impacts is expected to be lower, since the traffic volumes associated with Scenario D are lower than those associated with Scenario A.

4.9.6 Pavement Analysis Results

Existing Condition

As presented in Attachment B, the pavement analysis determined average remaining life of the existing pavement on the subject roadways. It was determined E Main Avenue has 9 percent remaining life, Shaw Road E has 38 percent remaining life, and E Pioneer Avenue has 38 percent remaining life. See Table 4-55 for the estimated remaining life at current condition.

No Action Scenario

Under the No Action Scenario, pavement would continue to deteriorate at its current rate, with slight potential acceleration due to increasing traffic.

Scenarios A and D

Due to the increase in truck volumes and the ESALs (see Section Pavement Analysis) under Scenarios A and D, the subject roadways would reach their end of life faster than under the No Action Scenario. Table 4-55 shows the percent increase in ESALs from the No Action Scenario to Scenario A and Scenario D. These percent increases indicate how much sooner the roadways would reach their end of life. For example, on East Main Avenue, pavement condition under Scenario A would reach end of its life 9.4 percent sooner than under the No Action Scenario. A pavement analysis for Scenario B was not conducted due to the operational impacts and lack of viability of that scenario.

Typical mitigation measures for pavements include a full repave and a grind-and-inlay. Within reasonable range, it is recommended for applicant to share 5 to 10 percent of the cost of the mitigation.

Table 4-55. Pavement Remaining Life and Percent Increase in ESAL

Roadway	Estimated Remaining Life at Current Condition	Scenario A % Increase in ESAL	Scenario D % Increase in ESAL
East Main Avenue	0 to 23% (9% Average)	9.4	6.5
Shaw Road East	18 to 68% (38% average)	5.3	3.6
East Pioneer Avenue	8 to 63% (32% average)	6.8	4.7

Other mitigation to incorporate:

- Transit stop pavement improvements on E Main Avenue (bus shelter for closest stop location 2728 E Main Avenue)

- Roadway pavement improvements on 33rd Street (between 5th Avenue and 8th Avenue, full street improvements)
- Pedestrian safety for trail crossings – 80th Street (from Meeker trailhead to the new on-site trail – rapid flashing beacons), intersection crossing at 33rd Street/Pioneer Avenue (improved safety of crossing, such as rapid flashing beacons)

4.9.7 Mitigation Measures

As outlined in the City of Puyallup Comprehensive Plan, developers are required to mitigate for impacts to LOS in the affected area through improvements to the transportation system. For the significant impacts identified in this analysis where LOS has degraded to below LOS D, or below LOS E along Shaw Road, Meridian, or the 9th Street Corridors as a result of the Project, the applicant would be required to identify effective mitigation measures, see Figure 4-56. If the LOS without the Project is not meeting the City standard, the developer shall be required to mitigate impacts to the pre-developed level of service condition plus an allowable increase in delay of up to 15 percent.

The City's Comprehensive Plan policies on intersection LOS only address mitigations for PM peak hour impacts because both (a) trip generation for most land uses and (b) overall background traffic is higher than in the AM peak hour. As such, only PM model runs were used to test the effectiveness of mitigation measures even though there would be AM peak hour benefits as well. In other words, the significant impacts identified for AM peak hour conditions are expected to be addressed by the same mitigation measures.

The proposed Project, either Scenario A or the reduced footprint Scenario D, will result in operational degradation of the transportation system within the Project area. Several intersections within the Project area exceed LOS performance indicator, triggering the need for mitigation at specific intersections including restriping, roadway widening and new signals, and construction of a roundabout.

Table 4-56. Required Mitigation Summary

Intersection/Corridor	Required Mitigation By Scenario	
	Scenario A	Scenario D
1. Traffic Ave/Fryar Ave & Main St/Cannery Wy	Retime and coordinate signal	Retime and coordinate signal
2. Traffic Ave & State St	Retime and coordinate signal; this intersection requires retiming even though it meets LOS performance indicators due to proximity to SR 410	Retime and coordinate signal; this intersection requires retiming even though it meets LOS performance indicators due to proximity to SR 410
3. E Main Ave & SR 410 WB	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing eastbound and westbound left turns to run concurrently	Retime and coordinate signal length, eliminate split phase signal operations by restriping intersection and allowing eastbound and westbound left turns to run concurrently
4. E Main Ave & SR 410 EB	Retime and coordinate signal	Retime and coordinate signal
12. N Meridian Ave & Valley Ave NE	No mitigation applied, see below for discussion	No mitigation applied, see below for discussion
28. Shaw Rd E & 5th Ave SE	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated westbound left and right turn lanes. Widen 5th Avenue to a 3-lane roadway section	Widen 5th Avenue and convert unsignalized intersection to a signal with dedicated westbound left and right turn lanes. Widen 5th Avenue to a 3-lane roadway section
33. SR 162 & 80th St	Convert to roundabout	Convert to roundabout
Proportional Factor		
E Main Avenue	0.324	0.211
Shaw Road E	0.170	0.083
E Pioneer	0.122	0.067
SR 162	0.117	0.065

In addition to global mitigation strategies, a proportional factor was developed for each major corridor within the Project area. The proposed Project would reduce the available capacity any proposed corridor-wide capacity improvement would provide. In order to determine a fee-in-lieu cost, the weighted factor is developed to quantify the total fee-in-lieu cost that is equivalent to the reduction in available capacity due to the proposed Project. The proportional factor is to be applied to corridor-wide capacity improvements long-range estimates to determine the appropriate capacity usage fee.

The proposed Project would require unavoidable upgrades to the transportation network within the Project area. These improvements include:

- Improve existing roadways to meet ADA requirements. Areas impacted by associated mitigation would need to provide associated upgrades to street right-of-way facilities to meet all current ADA regulations, best practices, and guidelines. This would apply globally under each mitigation scenario.
- Improve existing transit stations. The Project would generate substantial employment on site that would necessitate transit stop improvements meant to serve the site employees. In

consultation with Pierce Transit, the EIS team and City have identified one current bus stop (stop #1301, at the NE corner of Shaw Road and East Main Avenue) that would require full improvement with a bus stop shelter. This would apply globally under each mitigation scenario.

- Widen existing roadways to meet current City and County standards. Due to the substandard nature of the immediate public roadways serving the development site and the total daily vehicle trips documented on those roads, upgrades to the following roadways would be required:
  - 5th Avenue SE. Completing cross section improvements from Shaw to 33rd Street in accordance with City standards. This mitigation is needed to address the increased demand from impacts generated by the site development. This would apply globally under each mitigation scenario.
  - 33rd Street SE. Complete full street cross section improvements to 33rd Street SE from 5th Avenue SE to East Pioneer Avenue, including intersection improvements at 8th Avenue SE/33rd Street SE and 33rd Street SE/E Pioneer Avenue. The existing 33rd Street SE, from 5th Avenue to E Pioneer Avenue, is substandard; the majority of the roadway is 15 to 17 feet in width paved, with no pedestrian facilities. This roadway is designated in the City's Comprehensive Plan as a future arterial. A major community park facility (Van Lierop Park) and a large non-profit (Step by Step) serving at risk mothers and youth exist on this road, and both plan major improvement in the future. The road would need to be improved to serve the demand and impacts generated by site development. Without this mitigation, the impacts to the City transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.
  - 80th Street E/8th Avenue SE. Complete full street cross section improvements to 80th Street E (Pierce County) and 8th Avenue SE (City) from the eastern-most portion of the Project site frontage to the 8th Avenue SE/33rd Street SE intersection. Similar to the above analysis regarding street impacts and substandard nature of these local roads, improvements to serve the demand and impacts generated by site development are required. Without this mitigation, the impacts to the City and County transportation network safety would be significant. Per the City Comprehensive Plan (policy T-3.3 (b.)), development that causes impacts to the City transportation network are required to make improvements. This would apply globally under each mitigation scenario.

Construction-Related Impacts

Traffic and Traffic Safety

To mitigate for potential impacts related to traffic and traffic safety due to an increase in vehicle traffic on local roads and a minor traffic safety risk associated with construction traffic, the applicant would be required to develop and implement a traffic management plan for all construction traffic.

Pavement Conditions

Vehicle trips associated with construction would contribute to deterioration of local roads; however, the applicant would be required to repair any damage and restore roadways to a condition similar to or better than that prior to construction.

Operations-Related Impacts

Traffic

Several intersections would see peak hour LOS exceed the City standards with implementation of the proposed Project. Most of these cases would represent significant impacts resulting from implementation of the proposed Project. Several mitigation strategies were proposed and tested in the traffic simulation models to address these impacts. The mitigation strategies are outlined in Section 4.9.4 (Scenario C and Scenario E).