C-16 Appeal Documents - TSI Technical Memo

Technical Memorandum

Transportation Solutions, Inc.

8250 - 165th Avenue NE
Suite 100
Redmond, WA 98052-6628
T 425-883-4134
F 425-867-0898
www.tsinw.com

October 4, 2019

TO: David Lee, PE
City Engineer, City of Sedro-Woolley

FROM: Andrew L. Bratlien, PE

SUBJECT: McGarigle Development TIA Review

This memorandum summarizes the findings of Transportation Solutions' peer review of the McGarigle Development Traffic Impact Analysis (TIA) dated September 2019. The TIA is provided as **Attachment 1**.

Transportation Solutions reviewed the TIA methods and assumptions, with specific consideration for PM peak hour traffic volume forecasts. As a reference check, the 2025 traffic forecasts in the TIA were compared to the 2036 traffic forecasts identified in the Jones/John Liner/Trail Rd Corridor Traffic Analysis, provided as **Attachment 2**. The Jones/John Liner/Trail Rd forecasts were developed using the Sedro-Woolley citywide travel demand model, which includes anticipated 2036 land use growth consistent with the Sedro-Woolley Comprehensive Plan.

This review indicated that the findings and recommendations of the TIA are generally consistent with the conclusions of the Jones/John Liner/Trail Rd corridor study.

- The intersection of John Liner Rd/McGarigle Rd and Township St (SR 9) will operate at LOS F without improvement in both without- and with-development scenarios.
- The planned single-lane roundabout at the intersection will allow the intersection to operate well at LOS A through the 2036 PM peak hour.
- The residential development does not exceed the total long-range growth forecasts identified in the Sedro-Woolley Comprehensive Plan.

Please contact me with any questions regarding this peer review.

Attachment 1. McGarigle Development Traffic Impact Analysis

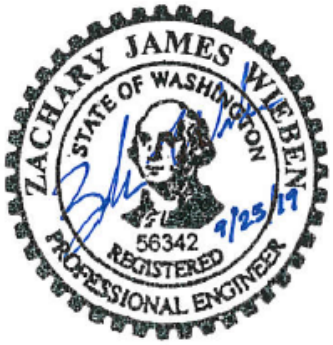
Attachment 2. Jones/John Liner/Trail Rd Corridor Projects Traffic Analysis; Updated 1/3/2019

Gibson Traffic Consultants
2813 Rockefeller Avenue
Suite B
Everett, WA 98201
425.339.8266

McGarigle Development
Traffic Impact Analysis

Jurisdiction: City of Sedro Woolley

September 2019



GTC #19-229

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ATTACHMENTS

1. INTRODUCTION

Gibson Traffic Consultants, Inc. (GTC) has been retained to provide an analysis of the impacts of the McGarigle development in the City of Sedro Woolley. The development is proposed to consist of 85 residential units. The McGarigle development is located on the south side of McGarigle Road, east of Carter Street. The development is proposed to have one access to McGarigle Road opposite of the existing Independence Boulevard/McGarigle Road intersection. A site vicinity map is included in Figure 1.

Zach Wieben, responsible for this report, is a licensed professional engineer (Civil) in the State of Washington and member of the Washington State section of the Institute of Transportation Engineers (ITE).

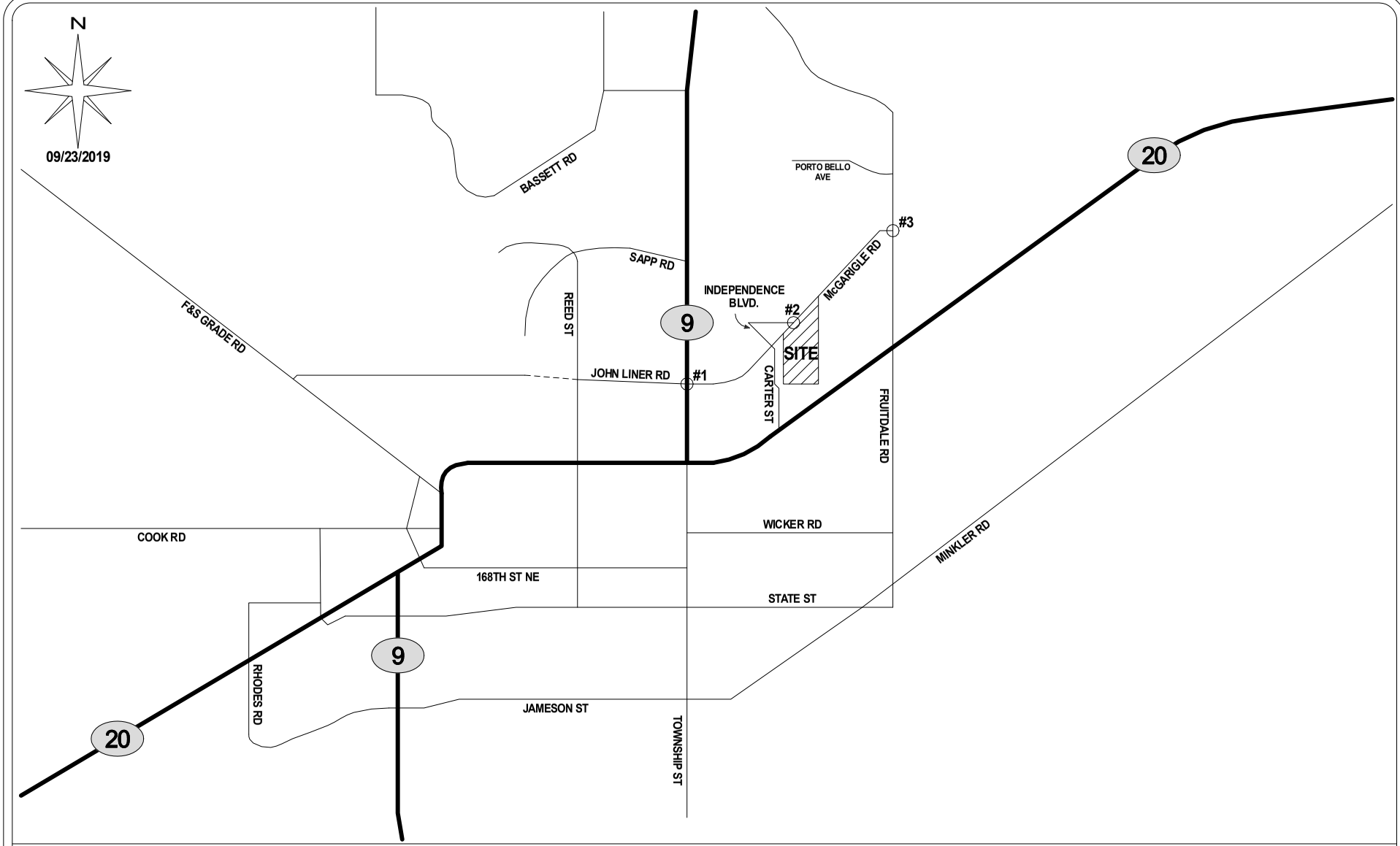
2. METHODOLOGY

Scoping discussions with the City of Sedro Woolley staff identified two off-site intersections to be analyzed. The proposed site access to McGarigle Road was also analyzed for level of service and channelization warrants under the future with development conditions. The three intersections analyzed during the PM peak-hour in this report are listed below.

1. SR-9 at John Liner Road/McGarigle Road
2. McGarigle Road at Independence Boulevard/Site Access
3. McGarigle Road at Fruitdale Road

The 85 residential units within the McGarigle Development may be age-restricted units for seniors 55 years and older; however, that determination has yet to be made. Intersection analysis for the off-site intersections and the site access were analyzed with no age restrictions for the development (i.e. a higher vehicle trip generation) to perform a conservative level of service analysis. Trip generation and traffic mitigation fee calculations for both the age-restricted and unrestricted development scenarios are included in the report.

Intersections were analyzed during the 4-6 PM typical afternoon commuter peak period. The existing count data at the study intersections is based on data collected by the independent count firm Traffic Data Gathering (TDG), collected in 2019. The trip generation calculations were performed using data from the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, *10th Edition (2017)*. The intersection analysis has been performed using existing channelization, phasing, intersection peak-hour factors, and intersection heavy vehicle factors from the existing turning movement counts. The intersection level of service has been reported for each study intersection.



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #19-229

McGARIGLE DEVELOPMENT
51 NEW DETACHED UNITS
34 NEW TOWNHOMES

CITY OF SEDRO WOOLLEY

LEGEND

DEVELOPMENT SITE

#X STUDY INTERSECTION

FUTURE ROAD

FIGURE 1

SITE VICINITY MAP

The peak-hour level of service (LOS) analysis calculations were completed using the *Synchro 10.2, Build 0* software for signalized and unsignalized intersections. This software applies the operational analysis methodology of the Highway *Capacity Manual 6th Edition (HCM)*. Traffic congestion is generally measured in terms of level of service. In accordance with the HCM 6th Edition, road facilities and intersections are rated between LOS A and LOS F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions. Analysis of the roundabouts was performed using *Sidra Intersection 8.0* software. It is important to note that the volumes included in the Sidra results printouts account for the peak-hour factor, the volumes in the printouts are not the input volumes. The results for the roundabout analysis have been evaluated based on volume-to-capacity (v/c) ratio and the level of service. WSDOT evaluates roundabouts on a pass/fail basis, with a v/c ratio of 0.92 on any approach being the threshold. The level of service criteria is summarized in Table 1. The level of service at two-way stop-controlled intersections is based on the average delay of the worst approach. The level of service at signalized and all-way stop-controlled intersections is based on the average delay for all approaches. Geometric characteristics and conflicting traffic movements are taken into consideration when determining level of service values.

Table 1: Level of Service Criteria for Intersections

Level of Service [1]	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	Signalized Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delays	>35 and ≤50	>55 and ≤80
F	Extreme Delays[2]	>50	>80

The City of Sedro Woolley's level of service standard for SR-20, SR-9, and principal arterials is LOS D. The City of Sedro Woolley's level of service standard for minor arterials and major collectors is LOS C.

[1] **Source:** *Highway Capacity Manual 6th Edition.*

LOS A: Free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).

LOS B: Generally stable traffic flow conditions.

LOS C: Occasional back-ups may develop, but delay to vehicles is short term and still tolerable.

LOS D: During short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).

LOS E: Intersections operate at or near capacity, with long queues developing on all approaches and long delays.

LOS F: Jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

[2] When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

3. TRIP GENERATION AND DISTRIBUTION

3.1 Trip Generation Calculations

The McGarigle development is proposed to consist of 85 residential units. The development is proposed to consist of 51 detached units and 34 attached townhome units. The development could be age-restricted for seniors 55 years and older or it could have no age restrictions. The ITE Land Use Codes (LUC) for the attached and detached units for both the age-restricted and unrestricted scenarios are shown in Table 2.

Table 2: ITE Land Use Codes

Unit Type	Number of Units	ITE Land Use Code	
		Age-Restricted (55+ Years)	Unrestricted
Detached	51	ITE LUC 251 Senior Housing Detached	ITE LUC 210 Single-Family Detached
Attached	34	ITE LUC 252 Senior Housing Attached	ITE LUC 220 Multifamily Low-Rise

Trip generation calculations for the age-restricted scenario are summarized in Table 3.

Table 3: Trip Generation Summary – Age-Restricted Scenario

Land Use	# Units	ADT	AM Peak-Hour			PM Peak-Hour		
			In	Out	Total	In	Out	Total
LUC 251, Senior Housing, Detached	51	218	4	8	12	9	6	15
LUC 252, Senior Housing, Attached	34	126	2	5	7	5	4	9
TOTAL		**344**	**6**	**13**	**19**	**14**	**10**	**24**

Trip generation calculations for the unrestricted scenario are summarized in Table 4.

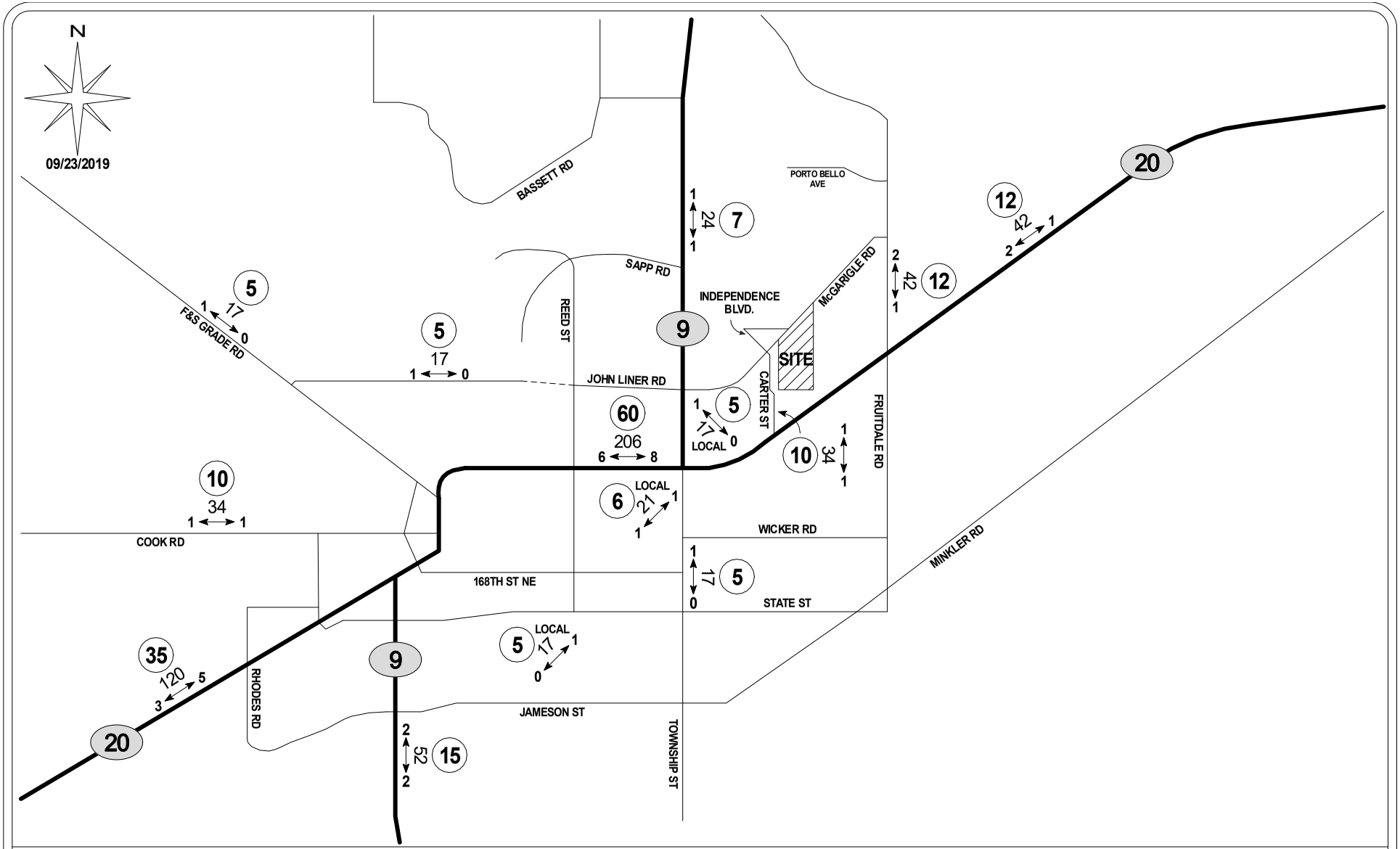
Table 4: Trip Generation Summary – Unrestricted Scenario

Land Use	# Units	ADT	AM Peak-Hour			PM Peak-Hour		
			In	Out	Total	In	Out	Total
LUC 210, Single-Family, Detached	51	481	9	28	37	32	19	51
LUC 220, Multifamily (Low-Rise)	34	249	4	12	16	12	7	19
TOTAL		**730**	**13**	**40**	**53**	**44**	**26**	**70**

As an age-restricted development, the McGarigle development would generate approximately 344 average daily trips, 19 AM peak-hour trips, and 24 PM peak-hour trips. As an unrestricted development, the McGarigle development would generate approximately 730 average daily trips, 53 AM peak-hour trips, and 70 PM peak-hour trips. Detailed trip generation calculations for each of the development scenarios are included in the attachments.

3.2 Trip Distribution

It is estimated that 72% of the development's trips will travel along SR-20, sixty percent to and from the west and twelve percent to and from the east. Approximately 12% of the development's trips are expected to travel along Township Street, five percent to and from the south and seven percent to and from the north. An additional 11% of the trips from the development are expected to travel to local destinations along Township Street between John Liner Road/McGarigle Road and Wicker Road. The remaining 5% of the trips from the development are anticipated to travel along John Liner Road. Detailed trip distributions for the age-restricted and unrestricted PM peak-hour are included in Figure 2 and Figure 3, respectively.



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TRAFFIC IMPACT STUDY
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McGARIGLE DEVELOPMENT
51 NEW DETACHED UNITS
34 NEW TOWNHOMES

CITY OF SEDRO WOOLLEY

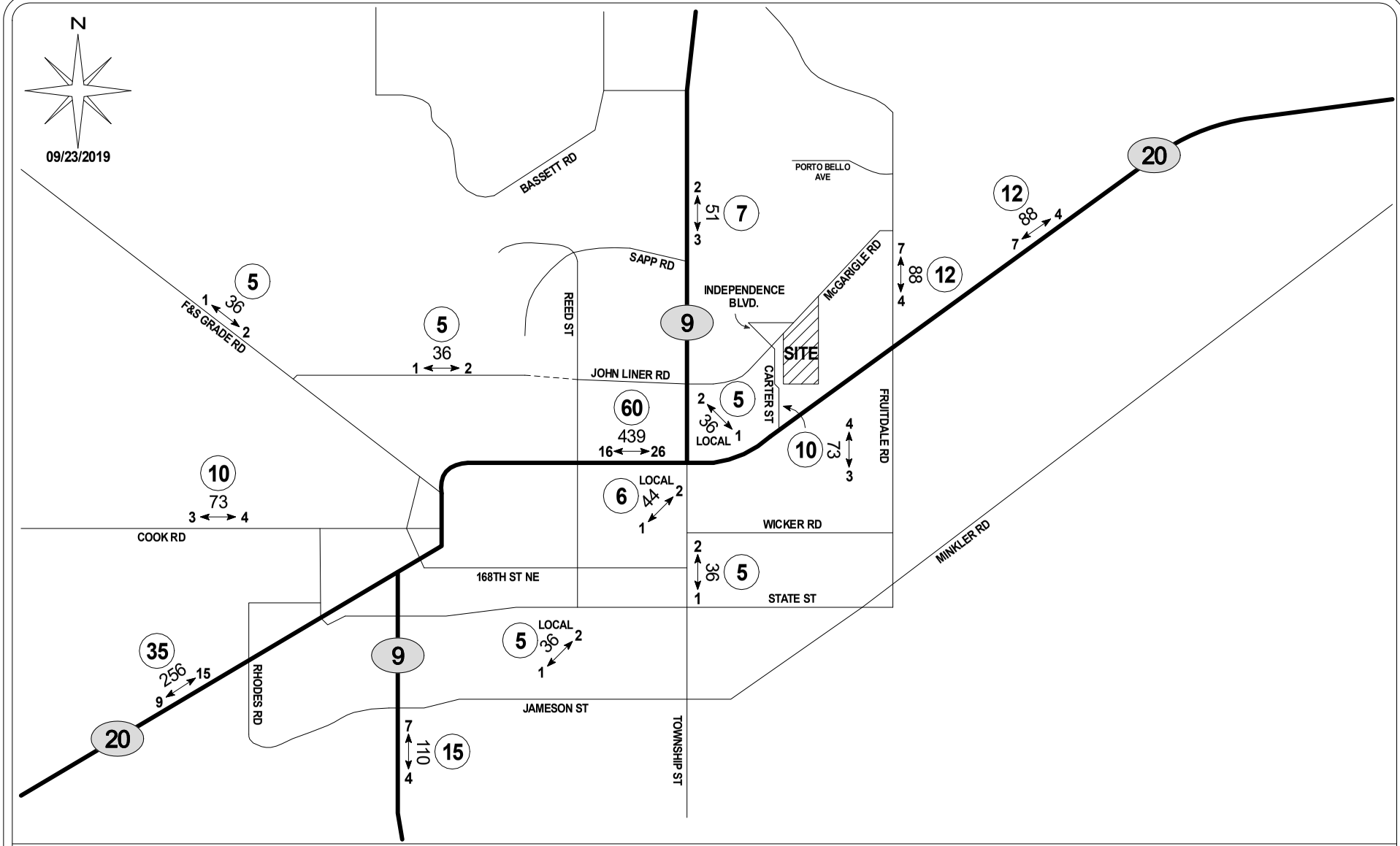
LEGEND

PM ↔ AWDT PEAK — NEW SITE TRAFFIC (DAILY/PEAK HOUR)

XX — TRIP DISTRIBUTION %

FIGURE 2

DEVELOPMENT TRIP DISTRIBUTION
PM PEAK-HOUR
AGE-RESTRICTED UNITS



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CITY OF SEDRO WOOLLEY

LEGEND

PM AWDT PEAK — NEW SITE TRAFFIC (DAILY/PEAK HOUR)

XX — TRIP DISTRIBUTION %

FIGURE 3

DEVELOPMENT TRIP DISTRIBUTION
PM PEAK-HOUR
UNRESTRICTED UNITS

4. WEEKDAY PM PEAK-HOUR ANALYSIS

The scope of the level of service analysis performed as part of this report is based on scoping discussions between GTC staff and City of Sedro Woolley staff. Level of service at the following intersections has been analyzed for the weekday PM peak-hour:

1. SR-9 at John Liner Rd/McGarigle Rd
2. McGarigle Road at Independence Blvd/Site Access
3. McGarigle Road at Fruitdale Road

Level of Service for each of the study intersections was performed for the following scenarios:

- 2019 Existing Conditions
- 2025 Baseline Conditions
- 2025 Future Conditions with Development

The level of service analysis was performed using development trips from the unrestricted scenario which has the higher expected trip generation of the two scenarios (age restricted vs. unrestricted). Using the higher of the two trip generation scenarios results in a conservative (higher average vehicle delay) level of service analysis for potential mitigation.

4.1 Turning Movement Calculations

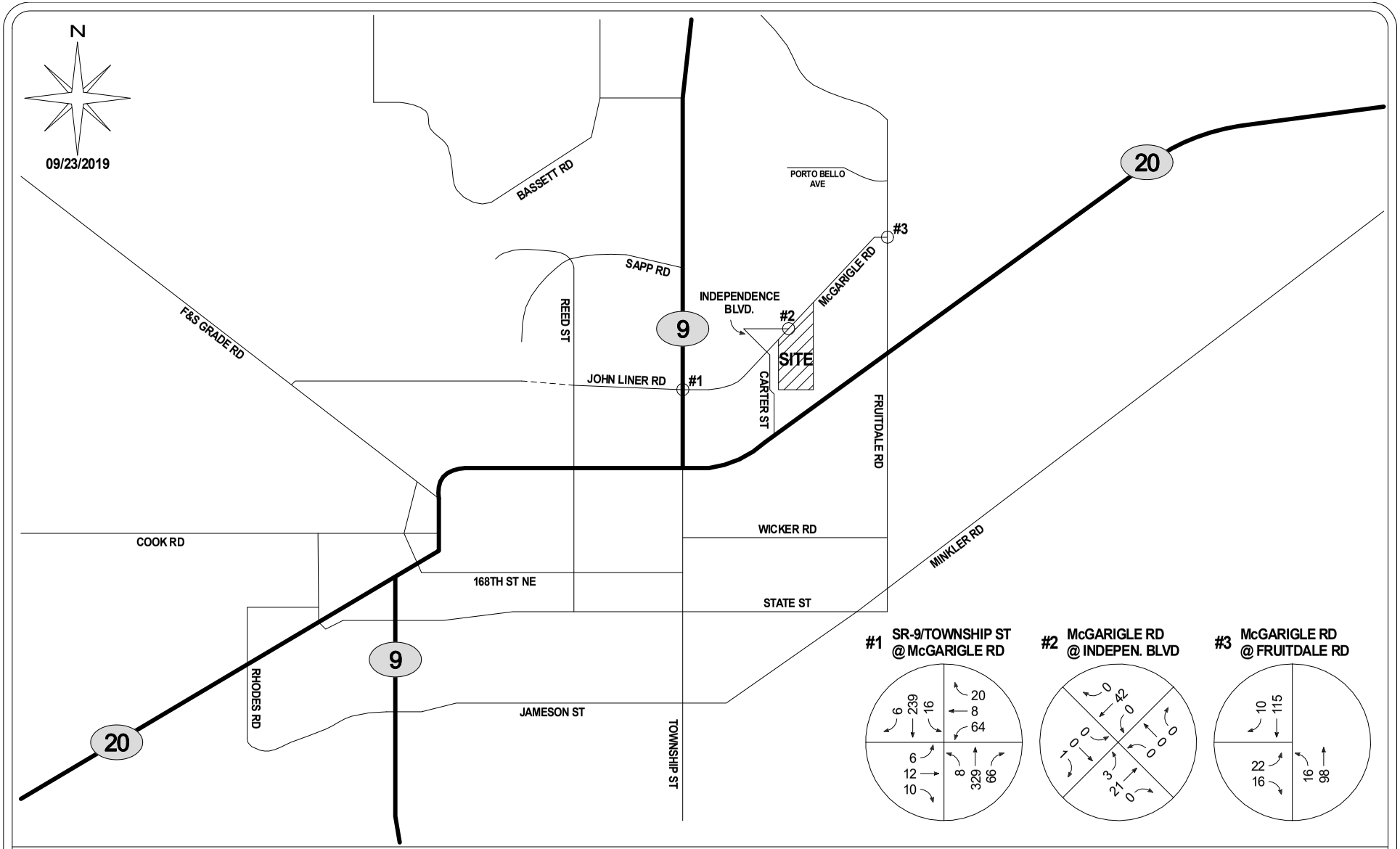
The 2019 existing turning movements at the study intersections are based on data collected by the independent traffic count firm Traffic Data Gathering. The 2019 existing volumes at the study intersections are shown in Figure 4.

The 2025 baseline volumes were calculated by applying a 2% annually compounding growth rate to the existing volumes as well as pipeline trips from the Northern State Campus Planned Action and diverting trips from the John Liner Road Corridor Project. Traffic volumes at the study intersections for the "High Intensity Site Development" were added from a draft version of the Northern State Campus Planned Action EIS completed in 2015 by TSI, Inc. City of Sedro Woolley staff were not able to provide a final analysis and therefore inclusion of trips from the Northern State Campus Planned Action should be considered conservative and preliminary.

Improvement projects identified in the City of Sedro Woolley's 2019-2024 TIP will construct roadway improvements creating a continuous arterial on John Liner Road/Jones Road from Township Street/SR-9 to F&S Grade Road. This new arterial will provide an alternative parallel route to SR-20 to help reduce congestion. Construction of intersection improvements at Township Street/SR-9 and John Liner Rd/McGarigle Road by WSDOT and the City of Sedro Woolley are expected to be complete in 2025 based on the City's 2019 TIP. A report completed by TSI, Inc. for the City of Sedro Woolley in January 2019 identified the preferred intersection improvement to be a single-lane roundabout at this location. The TSI report identified approximately 255 additional eastbound trips in the forecast year 2036 on John Liner Road west of Township Street/SR-9 as a result of the arterial and intersection improvements. These additional trips were

added to the 2025 background growth forecast for the McGarigle development analysis based on the 2036 eastbound turning movement splits in the TSI analysis. By including the additional growth expected on John Liner Road by the year 2036 in the 2025 forecast, the intersection volumes for the SR-9 and John Liner Road/McGarigle Road intersection should be considered conservatively high. The background improvement projects included in the 2025 future baseline analysis are either funded or included in the City of Sedro Woolley's Traffic Impact Fee (TIF) cost basis. The 2025 future baseline volumes are shown in Figure 5.

The 2025 future with development turning movement volumes were calculated by adding the unrestricted development trips to the 2025 baseline volumes. The 2025 future with development volumes are shown in Figure 6.



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McGARIGLE DEVELOPMENT
51 NEW DETACHED UNITS
34 NEW TOWNHOMES

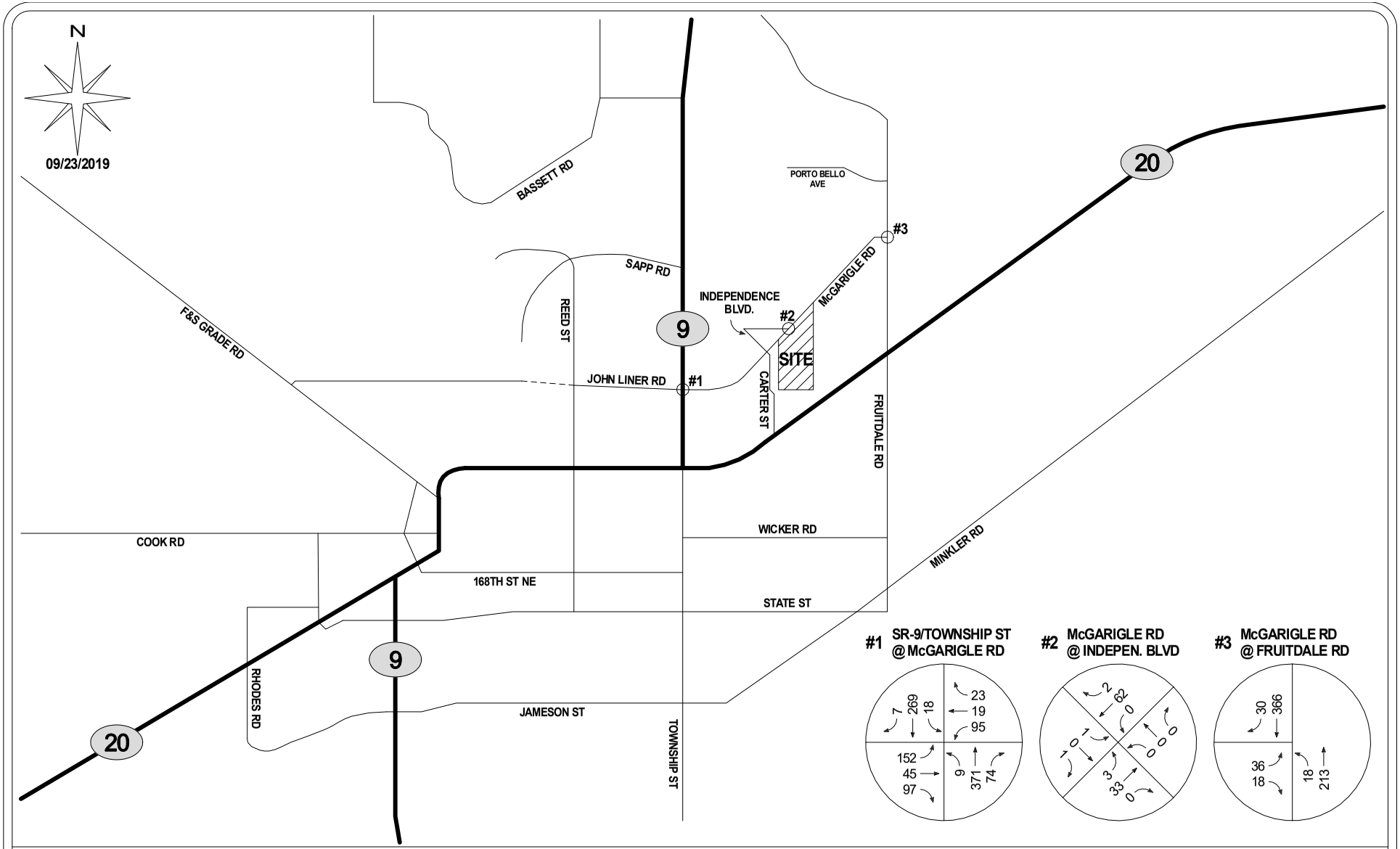
CITY OF SEDRO WOOLLEY

LEGEND

XX → PEAK HOUR TURNING MOVEMENT VOLUMES

FIGURE 4

EXISTING TURNING MOVEMENTS PM PEAK-HOUR



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McGARIGLE DEVELOPMENT
51 NEW DETACHED UNITS
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CITY OF SEDRO WOOLLEY

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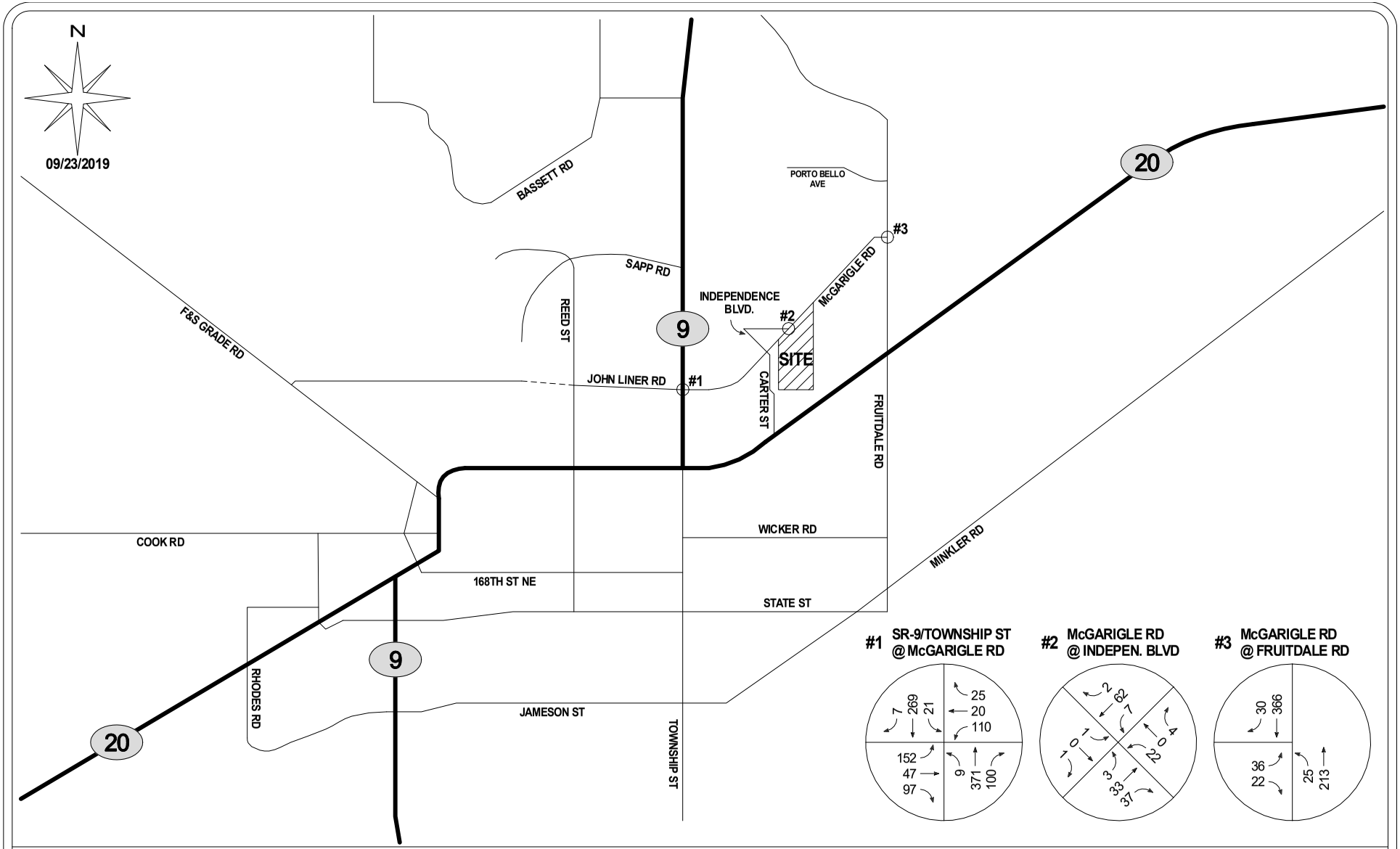
XX → PEAK HOUR TURNING MOVEMENT VOLUMES

FIGURE 5

2025 BASELINE TURNING MOVEMENTS PM PEAK-HOUR



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LEGEND

XX → PEAK HOUR TURNING MOVEMENT VOLUMES

FIGURE 6

2025 FUTURE W/ DEV. TURNING MOVEMENTS PM PEAK-HOUR

4.2 LOS Analysis

The McGarigle development is anticipated to be constructed and occupied by the year 2025. The level of service (LOS) analysis was conducted assuming the development would not have age restricted residential units (unrestricted), which represents the higher of the development's two trip generation scenarios. The 2019 existing, 2025 baseline and 2025 future with development level of service as well as the critical approaches are shown in Table 5.

Table 5: Intersection LOS Summary – PM Peak-Hour

Intersection	2019 Existing Conditions			2025 Baseline Conditions			2025 Future with Development Conditions		
	LOS	Delay	Critical Approach	LOS	Delay	Critical Approach	LOS	Delay	Critical Approach
1. SR-9/Township St @ John Liner Rd/McGarigle Rd	C	20.5 sec	Westbound	F	65.5 sec	Eastbound[3]	F	78.0 sec	Eastbound
Single-Lane Roundabout	-	-	-	A	6.9 sec	Northbound (0.42 v/c)	A	7.0 sec	Northbound (0.45 v/c)
2. McGarigle Rd @ Independence Blvd/Access	A	8.6 sec	Eastbound	A	9.1 sec	Eastbound	A	9.8 sec	Westbound
3. McGarigle Rd @ Fruitdale Road	B	10 sec	Eastbound	B	14.3 sec	Eastbound	B	14.4 sec	Eastbound

All study intersections are expected to operate at acceptable levels of service in the 2025 forecast year with planned improvement projects and with the higher trip generation scenario assumed for development trips. Additionally, the single-lane roundabout improvement is expected to operate acceptably at a volume-to-capacity (v/c) ratio below WSDOT's 0.92 threshold. No additional mitigation should therefore be required.

5. COLLISION DATA

WSDOT collision data from the five most recent years of collision data (2014-2018) was reviewed at the study intersections. The collision data is summarized in Table 6.

[3] Includes additional eastbound volume from arterial improvements but no intersection improvements

Table 6: 5-Year Collision Rate Calculation

Intersection	PM Peak-Hour Intersection Vol.	K-Factor	Total Collisions	Collision Rate[4]	Collision Frequency[5]
SR-9/Township St @ John Liner Rd/McGarigle Rd	804	10	4	0.27	0.80
McGarigle Rd @ Independence Blvd/Access	67	10	0	0.00	0.00
McGarigle Rd @ Fruitdale Road	277	10	0	0.00	0.00

Reported collisions only occurred at the intersection of SR-9/Township Street and John Liner Rd/McGarigle Rd. A total of four reported collisions occurred at the intersection over the five-year timeline which results in a collision frequency of 0.8 collisions per year. The existing PM peak-hour total intersection volume corresponds to a 5-year collision rate of 0.27 collisions per million entering vehicles. Both the collision frequency and collision rate are below the usual thresholds (5 collisions per year, 1.0 collisions per MEV) for unsignalized intersections where additional safety analysis may be advisable. As a result, there are no further safety recommendations at this time.

6. ACCESS ANALYSIS

The development's access to McGarigle Road will be located directly across from Independence Boulevard. McGarigle Road is a two-lane road with a 25-mph posted speed limit. There were no reported collisions along the development site's frontage.

Channelization warrants for left and right-turn channelization were performed based on warrants in WSDOT's 2018 Design Manual. No additional channelization is warranted for the McGarigle development access while assuming the higher unrestricted trip generation volumes. Channelization warrants are included in the attachments.

7. TRAFFIC MITIGATION FEES

The City of Sedro Woolley assesses traffic impact fees per PM peak-hour trip. The City's current fee per PM peak-hour trip for development's outside the CBD area is $2,407. The McGarigle development could have an age-restriction on its units for seniors 55 years and older, or the units could be unrestricted. These two scenarios result in a different trip generation calculation for the development and therefore would have different corresponding traffic impact fees. The age-restricted scenario is expected to generate 24 PM peak-hour trips and would have a corresponding traffic impact fee of $57,768, equivalent to $679.62 per unit. The unrestricted scenario is expected to generate 70 PM peak-hour trips and would have a corresponding traffic impact fee of $168,490, equivalent to $1,982.24 per unit. The development would pay its proportional share of

[4] The collision rate is based on Million Entering Vehicles.

[5] Collisions per year

improvement projects identified in the level of service analysis by paying the City's standard traffic impact fees because the projects are included in the fee's cost basis.

8. CONCLUSIONS

The McGarigle development is an 85-unit residential development that could either be age-restricted for seniors 55 years and older or could have no age restrictions. As an age-restricted development, the McGarigle development would generate approximately 344 average daily trips, 19 AM peak-hour trips, and 24 PM peak-hour trips. As an unrestricted development, the McGarigle development would generate approximately 730 average daily trips, 53 AM peak-hour trips, and 70 PM peak-hour trips. All the intersections analyzed would operate within acceptable level of service standards and the approaches would operate with acceptable delays in 2025 with planned roadway improvements by the City of Sedro Woolley. The development's access would not warrant any additional left or right-turn channelization.

City of Sedro Woolley traffic impact fees would differ depending on whether or not an age restriction was put in place for the units. An age-restricted community would have a proportional traffic impact fee of $57,768, equivalent to $679.62 per unit for the 85 total units. An unrestricted community would have a proportional traffic impact fee of $168,490, equivalent to $1,982.24 per unit for the 85 total units. Payment of the City's traffic impact fee should be considered the development's proportionate share contribution towards the cost of planned improvement projects because the projects are included in the City's fee cost basis.

Trip Generation Calculations

McGarigle Development
GTC #19-229

Trip Generation for: Development Peak Weekday
(a.k.a.): Average Weekday Daily Trips (AWDT)

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Senior Housing Detached	51 units	251	4.27	50%	50%	217.77	0%	0.00	217.77	0%	0.00	217.77	0.00	0.00	108.89	108.88
Senior Housing Attached	34 units	252	3.70	50%	50%	125.80	0%	0.00	125.80	0%	0.00	125.80	0.00	0.00	62.90	62.90
Total						343.57		0.00	343.57		0.00	343.57	0.00	0.00	171.79	171.78

McGarigle Development
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Trip Generation for: **Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 7 and 9 AM**
(a.k.a.): **Weekday AM Peak Hour**

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Senior Housing Detached	51 units	251	0.24	33%	67%	12.24	0%	0.00	12.24	0%	0.00	12.24	0.00	0.00	4.04	8.20
Senior Housing Attached	34 units	252	0.20	35%	65%	6.80	0%	0.00	6.80	0%	0.00	6.80	0.00	0.00	2.38	4.42
Total						19.04		0.00	19.04		0.00	19.04	0.00	0.00	6.42	12.62

McGarigle Development
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Trip Generation for: **Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 4 and 6 PM**
(a.k.a.): **Weekday PM Peak Hour**

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Senior Housing Detached	51 units	251	0.30	61%	39%	15.30	0%	0.00	15.30	0%	0.00	15.30	0.00	0.00	9.33	5.97
Senior Housing Attached	34 units	252	0.26	55%	45%	8.84	0%	0.00	8.84	0%	0.00	8.84	0.00	0.00	4.86	3.98
Total						24.14		0.00	24.14		0.00	24.14	0.00	0.00	14.19	9.95

McGarigle Development
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AM Peak-Hour

%	New ADT	New AM Peak Hour Trips		
		In	Out	Total
100%	344	6	13	19
1%	3.44	0.06	0.13	0.19
2%	6.87	0.13	0.25	0.38
3%	10.31	0.19	0.38	0.57
4%	13.74	0.26	0.50	0.76
5%	**17.18**	**0.32**	**0.63**	**0.95**
6%	20.61	0.39	0.76	1.14
7%	24.05	0.45	0.88	1.33
8%	27.49	0.51	1.01	1.52
9%	30.92	0.58	1.14	1.71
10%	**34.36**	**0.64**	**1.26**	**1.90**
11%	37.79	0.71	1.39	2.09
12%	41.23	0.77	1.51	2.28
13%	44.66	0.83	1.64	2.48
14%	48.10	0.90	1.77	2.67
15%	**51.54**	**0.96**	**1.89**	**2.86**
16%	54.97	1.03	2.02	3.05
17%	58.41	1.09	2.15	3.24
18%	61.84	1.16	2.27	3.43
19%	65.28	1.22	2.40	3.62
20%	**68.71**	**1.28**	**2.52**	**3.81**
21%	72.15	1.35	2.65	4.00
22%	75.59	1.41	2.78	4.19
23%	79.02	1.48	2.90	4.38
24%	82.46	1.54	3.03	4.57
25%	**85.89**	**1.61**	**3.16**	**4.76**
26%	89.33	1.67	3.28	4.95
27%	92.76	1.73	3.41	5.14
28%	96.20	1.80	3.53	5.33
29%	99.64	1.86	3.66	5.52
30%	**103.07**	**1.93**	**3.79**	**5.71**
31%	106.51	1.99	3.91	5.90
32%	109.94	2.05	4.04	6.09
33%	113.38	2.12	4.16	6.28
34%	116.81	2.18	4.29	6.47
35%	**120.25**	**2.25**	**4.42**	**6.66**
36%	123.69	2.31	4.54	6.85
37%	127.12	2.38	4.67	7.04
38%	130.56	2.44	4.80	7.24
39%	133.99	2.50	4.92	7.43
40%	**137.43**	**2.57**	**5.05**	**7.62**
41%	140.86	2.63	5.17	7.81
42%	144.30	2.70	5.30	8.00
43%	147.74	2.76	5.43	8.19
44%	151.17	2.82	5.55	8.38
45%	**154.61**	**2.89**	**5.68**	**8.57**
46%	158.04	2.95	5.81	8.76
47%	161.48	3.02	5.93	8.95
48%	164.91	3.08	6.06	9.14
49%	168.35	3.15	6.18	9.33
50%	**171.79**	**3.21**	**6.31**	**9.52**

%	New ADT	New AM Peak Hour Trips		
		In	Out	Total
100%	344	6	13	19
51%	175.22	3.27	6.44	9.71
52%	178.66	3.34	6.56	9.90
53%	182.09	3.40	6.69	10.09
54%	185.53	3.47	6.81	10.28
55%	**188.96**	**3.53**	**6.94**	**10.47**
56%	192.40	3.60	7.07	10.66
57%	195.83	3.66	7.19	10.85
58%	199.27	3.72	7.32	11.04
59%	202.71	3.79	7.45	11.23
60%	**206.14**	**3.85**	**7.57**	**11.42**
61%	209.58	3.92	7.70	11.61
62%	213.01	3.98	7.82	11.80
63%	216.45	4.04	7.95	12.00
64%	219.88	4.11	8.08	12.19
65%	**223.32**	**4.17**	**8.20**	**12.38**
66%	226.76	4.24	8.33	12.57
67%	230.19	4.30	8.46	12.76
68%	233.63	4.37	8.58	12.95
69%	237.06	4.43	8.71	13.14
70%	**240.50**	**4.49**	**8.83**	**13.33**
71%	243.93	4.56	8.96	13.52
72%	247.37	4.62	9.09	13.71
73%	250.81	4.69	9.21	13.90
74%	254.24	4.75	9.34	14.09
75%	**257.68**	**4.82**	**9.47**	**14.28**
76%	261.11	4.88	9.59	14.47
77%	264.55	4.94	9.72	14.66
78%	267.98	5.01	9.84	14.85
79%	271.42	5.07	9.97	15.04
80%	**274.86**	**5.14**	**10.10**	**15.23**
81%	278.29	5.20	10.22	15.42
82%	281.73	5.26	10.35	15.61
83%	285.16	5.33	10.47	15.80
84%	288.60	5.39	10.60	15.99
85%	**292.03**	**5.46**	**10.73**	**16.18**
86%	295.47	5.52	10.85	16.37
87%	298.91	5.59	10.98	16.56
88%	302.34	5.65	11.11	16.76
89%	305.78	5.71	11.23	16.95
90%	**309.21**	**5.78**	**11.36**	**17.14**
91%	312.65	5.84	11.48	17.33
92%	316.08	5.91	11.61	17.52
93%	319.52	5.97	11.74	17.71
94%	322.96	6.03	11.86	17.90
95%	**326.39**	**6.10**	**11.99**	**18.09**
96%	329.83	6.16	12.12	18.28
97%	333.26	6.23	12.24	18.47
98%	336.70	6.29	12.37	18.66
99%	340.13	6.36	12.49	18.85
100%	**343.57**	**6.42**	**12.62**	**19.04**

McGarigle Development
GTC #19-229

PM Peak-Hour

%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	344	14	10	24
1%	3.44	0.14	0.10	0.24
2%	6.87	0.28	0.20	0.48
3%	10.31	0.43	0.30	0.72
4%	13.74	0.57	0.40	0.97
5%	**17.18**	**0.71**	**0.50**	**1.21**
6%	20.61	0.85	0.60	1.45
7%	24.05	0.99	0.70	1.69
8%	27.49	1.14	0.80	1.93
9%	30.92	1.28	0.90	2.17
10%	**34.36**	**1.42**	**1.00**	**2.41**
11%	37.79	1.56	1.09	2.66
12%	41.23	1.70	1.19	2.90
13%	44.66	1.84	1.29	3.14
14%	48.10	1.99	1.39	3.38
15%	**51.54**	**2.13**	**1.49**	**3.62**
16%	54.97	2.27	1.59	3.86
17%	58.41	2.41	1.69	4.10
18%	61.84	2.55	1.79	4.35
19%	65.28	2.70	1.89	4.59
20%	**68.71**	**2.84**	**1.99**	**4.83**
21%	72.15	2.98	2.09	5.07
22%	75.59	3.12	2.19	5.31
23%	79.02	3.26	2.29	5.55
24%	82.46	3.41	2.39	5.79
25%	**85.89**	**3.55**	**2.49**	**6.04**
26%	89.33	3.69	2.59	6.28
27%	92.76	3.83	2.69	6.52
28%	96.20	3.97	2.79	6.76
29%	99.64	4.12	2.89	7.00
30%	**103.07**	**4.26**	**2.99**	**7.24**
31%	106.51	4.40	3.08	7.48
32%	109.94	4.54	3.18	7.72
33%	113.38	4.68	3.28	7.97
34%	116.81	4.82	3.38	8.21
35%	**120.25**	**4.97**	**3.48**	**8.45**
36%	123.69	5.11	3.58	8.69
37%	127.12	5.25	3.68	8.93
38%	130.56	5.39	3.78	9.17
39%	133.99	5.53	3.88	9.41
40%	**137.43**	**5.68**	**3.98**	**9.66**
41%	140.86	5.82	4.08	9.90
42%	144.30	5.96	4.18	10.14
43%	147.74	6.10	4.28	10.38
44%	151.17	6.24	4.38	10.62
45%	**154.61**	**6.39**	**4.48**	**10.86**
46%	158.04	6.53	4.58	11.10
47%	161.48	6.67	4.68	11.35
48%	164.91	6.81	4.78	11.59
49%	168.35	6.95	4.88	11.83
50%	**171.79**	**7.10**	**4.98**	**12.07**

%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	344	14	10	24
51%	175.22	7.24	5.07	12.31
52%	178.66	7.38	5.17	12.55
53%	182.09	7.52	5.27	12.79
54%	185.53	7.66	5.37	13.04
55%	**188.96**	**7.80**	**5.47**	**13.28**
56%	192.40	7.95	5.57	13.52
57%	195.83	8.09	5.67	13.76
58%	199.27	8.23	5.77	14.00
59%	202.71	8.37	5.87	14.24
60%	**206.14**	**8.51**	**5.97**	**14.48**
61%	209.58	8.66	6.07	14.73
62%	213.01	8.80	6.17	14.97
63%	216.45	8.94	6.27	15.21
64%	219.88	9.08	6.37	15.45
65%	**223.32**	**9.22**	**6.47**	**15.69**
66%	226.76	9.37	6.57	15.93
67%	230.19	9.51	6.67	16.17
68%	233.63	9.65	6.77	16.42
69%	237.06	9.79	6.87	16.66
70%	**240.50**	**9.93**	**6.97**	**16.90**
71%	243.93	10.07	7.06	17.14
72%	247.37	10.22	7.16	17.38
73%	250.81	10.36	7.26	17.62
74%	254.24	10.50	7.36	17.86
75%	**257.68**	**10.64**	**7.46**	**18.11**
76%	261.11	10.78	7.56	18.35
77%	264.55	10.93	7.66	18.59
78%	267.98	11.07	7.76	18.83
79%	271.42	11.21	7.86	19.07
80%	**274.86**	**11.35**	**7.96**	**19.31**
81%	278.29	11.49	8.06	19.55
82%	281.73	11.64	8.16	19.79
83%	285.16	11.78	8.26	20.04
84%	288.60	11.92	8.36	20.28
85%	**292.03**	**12.06**	**8.46**	**20.52**
86%	295.47	12.20	8.56	20.76
87%	298.91	12.35	8.66	21.00
88%	302.34	12.49	8.76	21.24
89%	305.78	12.63	8.86	21.48
90%	**309.21**	**12.77**	**8.96**	**21.73**
91%	312.65	12.91	9.05	21.97
92%	316.08	13.05	9.15	22.21
93%	319.52	13.20	9.25	22.45
94%	322.96	13.34	9.35	22.69
95%	**326.39**	**13.48**	**9.45**	**22.93**
96%	329.83	13.62	9.55	23.17
97%	333.26	13.76	9.65	23.42
98%	336.70	13.91	9.75	23.66
99%	340.13	14.05	9.85	23.90
100%	**343.57**	**14.19**	**9.95**	**24.14**

McGarigle Development
GTC #19-229

Trip Generation for: Development Peak Weekday
(a.k.a.): Average Weekday Daily Trips (AWDT)

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Single Family Detached	51 units	210	9.44	50%	50%	481.44	0%	0.00	481.44	0%	0.00	481.44	0.00	0.00	240.72	240.72
Multifamily Housing (Low-Rise)	34 units	220	7.32	50%	50%	248.88	0%	0.00	248.88	0%	0.00	248.88	0.00	0.00	124.44	124.44
Total						730.32		0.00	730.32		0.00	730.32	0.00	0.00	365.16	365.16

McGarigle Development
GTC #19-229

Trip Generation for: **Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 7 and 9 AM**
(a.k.a.): **Weekday AM Peak Hour**

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Single Family Detached	51 units	210	0.74	25%	75%	37.74	0%	0.00	37.74	0%	0.00	37.74	0.00	0.00	9.44	28.30
Multifamily Housing (Low-Rise)	34 units	220	0.46	23%	77%	15.64	0%	0.00	15.64	0%	0.00	15.64	0.00	0.00	3.60	12.04
Total						53.38		0.00	53.38		0.00	53.38	0.00	0.00	13.04	40.34

McGarigle Development
GTC #19-229

Trip Generation for: **Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 4 and 6 PM**
(a.k.a.): **Weekday PM Peak Hour**

									NET EXTERNAL TRIPS BY TYPE							
									IN BOTH DIRECTIONS				DIRECTIONAL ASSIGNMENTS			
			Gross Trips				Internal Crossover		TOTAL	PASS-BY		NEW	PASS-BY		NEW	
LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	Trips In+Out (Total)	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In+Out (Total)	In	Out	In	Out
Single Family Detached	51 units	210	0.99	63%	37%	50.49	0%	0.00	50.49	0%	0.00	50.49	0.00	0.00	31.81	18.68
Multifamily Housing (Low-Rise)	34 units	220	0.56	63%	37%	19.04	0%	0.00	19.04	0%	0.00	19.04	0.00	0.00	12.00	7.04
Total						69.53		0.00	69.53		0.00	69.53	0.00	0.00	43.81	25.72

McGarigle Development
GTC #19-229

AM Peak-Hour

%	New ADT	New AM Peak Hour Trips		
		In	Out	Total
100%	730	13	40	53
1%	7.30	0.13	0.40	0.53
2%	14.61	0.26	0.81	1.07
3%	21.91	0.39	1.21	1.60
4%	29.21	0.52	1.61	2.14
5%	**36.52**	**0.65**	**2.02**	**2.67**
6%	43.82	0.78	2.42	3.20
7%	51.12	0.91	2.82	3.74
8%	58.43	1.04	3.23	4.27
9%	65.73	1.17	3.63	4.80
10%	**73.03**	**1.30**	**4.03**	**5.34**
11%	80.34	1.43	4.44	5.87
12%	87.64	1.56	4.84	6.41
13%	94.94	1.70	5.24	6.94
14%	102.24	1.83	5.65	7.47
15%	**109.55**	**1.96**	**6.05**	**8.01**
16%	116.85	2.09	6.45	8.54
17%	124.15	2.22	6.86	9.07
18%	131.46	2.35	7.26	9.61
19%	138.76	2.48	7.66	10.14
20%	**146.06**	**2.61**	**8.07**	**10.68**
21%	153.37	2.74	8.47	11.21
22%	160.67	2.87	8.87	11.74
23%	167.97	3.00	9.28	12.28
24%	175.28	3.13	9.68	12.81
25%	**182.58**	**3.26**	**10.09**	**13.35**
26%	189.88	3.39	10.49	13.88
27%	197.19	3.52	10.89	14.41
28%	204.49	3.65	11.30	14.95
29%	211.79	3.78	11.70	15.48
30%	**219.10**	**3.91**	**12.10**	**16.01**
31%	226.40	4.04	12.51	16.55
32%	233.70	4.17	12.91	17.08
33%	241.01	4.30	13.31	17.62
34%	248.31	4.43	13.72	18.15
35%	**255.61**	**4.56**	**14.12**	**18.68**
36%	262.92	4.69	14.52	19.22
37%	270.22	4.82	14.93	19.75
38%	277.52	4.96	15.33	20.28
39%	284.82	5.09	15.73	20.82
40%	**292.13**	**5.22**	**16.14**	**21.35**
41%	299.43	5.35	16.54	21.89
42%	306.73	5.48	16.94	22.42
43%	314.04	5.61	17.35	22.95
44%	321.34	5.74	17.75	23.49
45%	**328.64**	**5.87**	**18.15**	**24.02**
46%	335.95	6.00	18.56	24.55
47%	343.25	6.13	18.96	25.09
48%	350.55	6.26	19.36	25.62
49%	357.86	6.39	19.77	26.16
50%	**365.16**	**6.52**	**20.17**	**26.69**

%	New ADT	New AM Peak Hour Trips		
		In	Out	Total
100%	730	13	40	53
51%	372.46	6.65	20.57	27.22
52%	379.77	6.78	20.98	27.76
53%	387.07	6.91	21.38	28.29
54%	394.37	7.04	21.78	28.83
55%	**401.68**	**7.17**	**22.19**	**29.36**
56%	408.98	7.30	22.59	29.89
57%	416.28	7.43	22.99	30.43
58%	423.59	7.56	23.40	30.96
59%	430.89	7.69	23.80	31.49
60%	**438.19**	**7.82**	**24.20**	**32.03**
61%	445.50	7.95	24.61	32.56
62%	452.80	8.08	25.01	33.10
63%	460.10	8.22	25.41	33.63
64%	467.40	8.35	25.82	34.16
65%	**474.71**	**8.48**	**26.22**	**34.70**
66%	482.01	8.61	26.62	35.23
67%	489.31	8.74	27.03	35.76
68%	496.62	8.87	27.43	36.30
69%	503.92	9.00	27.83	36.83
70%	**511.22**	**9.13**	**28.24**	**37.37**
71%	518.53	9.26	28.64	37.90
72%	525.83	9.39	29.04	38.43
73%	533.13	9.52	29.45	38.97
74%	540.44	9.65	29.85	39.50
75%	**547.74**	**9.78**	**30.26**	**40.04**
76%	555.04	9.91	30.66	40.57
77%	562.35	10.04	31.06	41.10
78%	569.65	10.17	31.47	41.64
79%	576.95	10.30	31.87	42.17
80%	**584.26**	**10.43**	**32.27**	**42.70**
81%	591.56	10.56	32.68	43.24
82%	598.86	10.69	33.08	43.77
83%	606.17	10.82	33.48	44.31
84%	613.47	10.95	33.89	44.84
85%	**620.77**	**11.08**	**34.29**	**45.37**
86%	628.08	11.21	34.69	45.91
87%	635.38	11.34	35.10	46.44
88%	642.68	11.48	35.50	46.97
89%	649.98	11.61	35.90	47.51
90%	**657.29**	**11.74**	**36.31**	**48.04**
91%	664.59	11.87	36.71	48.58
92%	671.89	12.00	37.11	49.11
93%	679.20	12.13	37.52	49.64
94%	686.50	12.26	37.92	50.18
95%	**693.80**	**12.39**	**38.32**	**50.71**
96%	701.11	12.52	38.73	51.24
97%	708.41	12.65	39.13	51.78
98%	715.71	12.78	39.53	52.31
99%	723.02	12.91	39.94	52.85
100%	**730.32**	**13.04**	**40.34**	**53.38**

McGarigle Development
GTC #19-229

PM Peak-Hour

%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	730	44	26	70
1%	7.30	0.44	0.26	0.70
2%	14.61	0.88	0.51	1.39
3%	21.91	1.31	0.77	2.09
4%	29.21	1.75	1.03	2.78
5%	**36.52**	**2.19**	**1.29**	**3.48**
6%	43.82	2.63	1.54	4.17
7%	51.12	3.07	1.80	4.87
8%	58.43	3.50	2.06	5.56
9%	65.73	3.94	2.31	6.26
10%	**73.03**	**4.38**	**2.57**	**6.95**
11%	80.34	4.82	2.83	7.65
12%	87.64	5.26	3.09	8.34
13%	94.94	5.70	3.34	9.04
14%	102.24	6.13	3.60	9.73
15%	**109.55**	**6.57**	**3.86**	**10.43**
16%	116.85	7.01	4.12	11.12
17%	124.15	7.45	4.37	11.82
18%	131.46	7.89	4.63	12.52
19%	138.76	8.32	4.89	13.21
20%	**146.06**	**8.76**	**5.14**	**13.91**
21%	153.37	9.20	5.40	14.60
22%	160.67	9.64	5.66	15.30
23%	167.97	10.08	5.92	15.99
24%	175.28	10.51	6.17	16.69
25%	**182.58**	**10.95**	**6.43**	**17.38**
26%	189.88	11.39	6.69	18.08
27%	197.19	11.83	6.94	18.77
28%	204.49	12.27	7.20	19.47
29%	211.79	12.70	7.46	20.16
30%	**219.10**	**13.14**	**7.72**	**20.86**
31%	226.40	13.58	7.97	21.55
32%	233.70	14.02	8.23	22.25
33%	241.01	14.46	8.49	22.94
34%	248.31	14.90	8.74	23.64
35%	**255.61**	**15.33**	**9.00**	**24.34**
36%	262.92	15.77	9.26	25.03
37%	270.22	16.21	9.52	25.73
38%	277.52	16.65	9.77	26.42
39%	284.82	17.09	10.03	27.12
40%	**292.13**	**17.52**	**10.29**	**27.81**
41%	299.43	17.96	10.55	28.51
42%	306.73	18.40	10.80	29.20
43%	314.04	18.84	11.06	29.90
44%	321.34	19.28	11.32	30.59
45%	**328.64**	**19.71**	**11.57**	**31.29**
46%	335.95	20.15	11.83	31.98
47%	343.25	20.59	12.09	32.68
48%	350.55	21.03	12.35	33.37
49%	357.86	21.47	12.60	34.07
50%	**365.16**	**21.91**	**12.86**	**34.77**

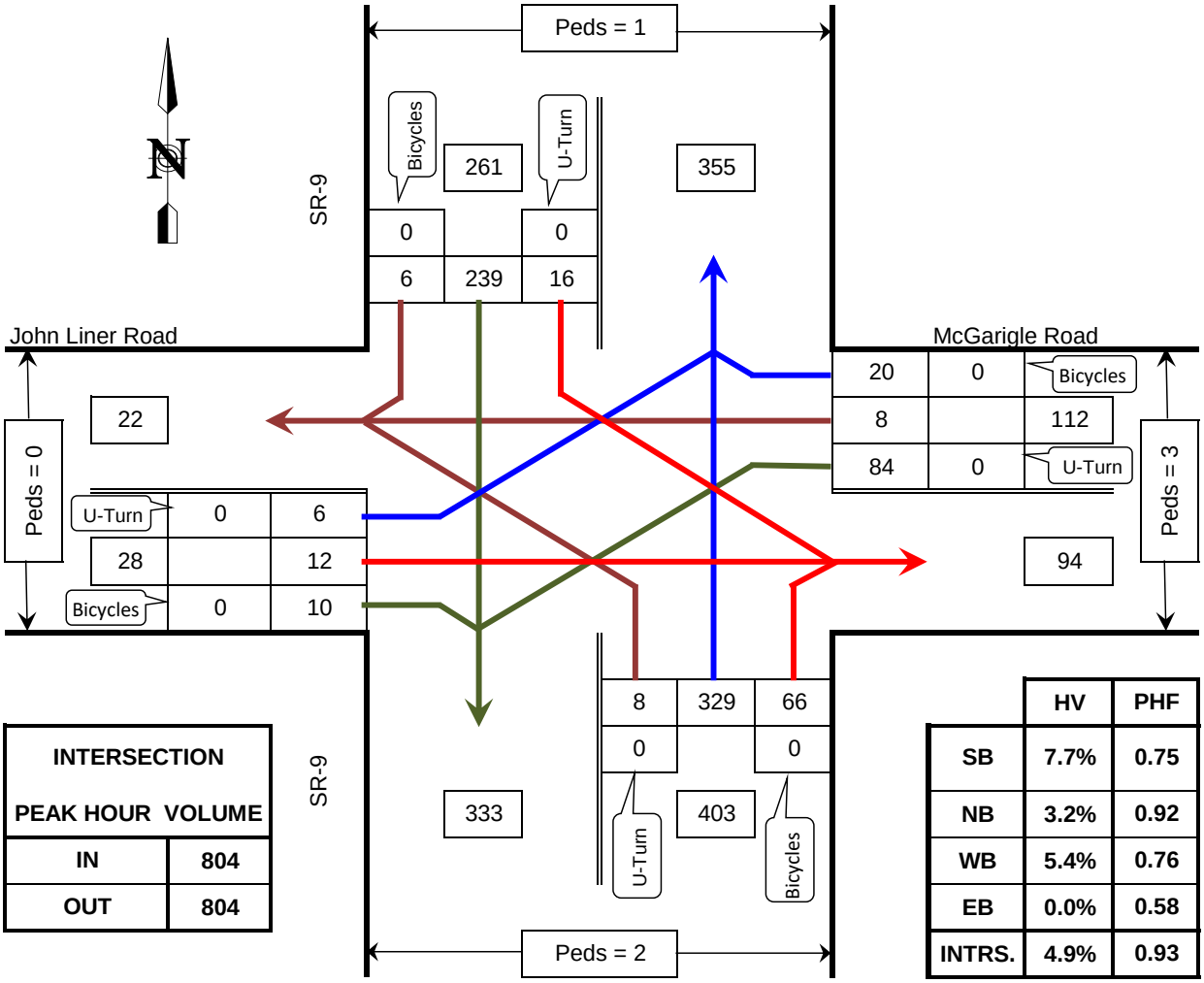
%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	730	44	26	70
51%	372.46	22.34	13.12	35.46
52%	379.77	22.78	13.37	36.16
53%	387.07	23.22	13.63	36.85
54%	394.37	23.66	13.89	37.55
55%	**401.68**	**24.10**	**14.15**	**38.24**
56%	408.98	24.53	14.40	38.94
57%	416.28	24.97	14.66	39.63
58%	423.59	25.41	14.92	40.33
59%	430.89	25.85	15.17	41.02
60%	**438.19**	**26.29**	**15.43**	**41.72**
61%	445.50	26.72	15.69	42.41
62%	452.80	27.16	15.95	43.11
63%	460.10	27.60	16.20	43.80
64%	467.40	28.04	16.46	44.50
65%	**474.71**	**28.48**	**16.72**	**45.19**
66%	482.01	28.91	16.98	45.89
67%	489.31	29.35	17.23	46.59
68%	496.62	29.79	17.49	47.28
69%	503.92	30.23	17.75	47.98
70%	**511.22**	**30.67**	**18.00**	**48.67**
71%	518.53	31.11	18.26	49.37
72%	525.83	31.54	18.52	50.06
73%	533.13	31.98	18.78	50.76
74%	540.44	32.42	19.03	51.45
75%	**547.74**	**32.86**	**19.29**	**52.15**
76%	555.04	33.30	19.55	52.84
77%	562.35	33.73	19.80	53.54
78%	569.65	34.17	20.06	54.23
79%	576.95	34.61	20.32	54.93
80%	**584.26**	**35.05**	**20.58**	**55.62**
81%	591.56	35.49	20.83	56.32
82%	598.86	35.92	21.09	57.01
83%	606.17	36.36	21.35	57.71
84%	613.47	36.80	21.60	58.41
85%	**620.77**	**37.24**	**21.86**	**59.10**
86%	628.08	37.68	22.12	59.80
87%	635.38	38.11	22.38	60.49
88%	642.68	38.55	22.63	61.19
89%	649.98	38.99	22.89	61.88
90%	**657.29**	**39.43**	**23.15**	**62.58**
91%	664.59	39.87	23.41	63.27
92%	671.89	40.31	23.66	63.97
93%	679.20	40.74	23.92	64.66
94%	686.50	41.18	24.18	65.36
95%	**693.80**	**41.62**	**24.43**	**66.05**
96%	701.11	42.06	24.69	66.75
97%	708.41	42.50	24.95	67.44
98%	715.71	42.93	25.21	68.14
99%	723.02	43.37	25.46	68.83
100%	**730.32**	**43.81**	**25.72**	**69.53**

Turning Movement Counts

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:00 PM TO 5:00 PM



INTERSECTION PEAK HOUR VOLUME	
IN	804
OUT	804

	HV	PHF
SB	7.7%	0.75
NB	3.2%	0.92
WB	5.4%	0.76
EB	0.0%	0.58
INTRS.	4.9%	0.93

PHF = Peak Hour Factor
HV = Heavy Vehicle

John Liner Road/McGarigle Road @ SR-9

Sedro Woolley, WA

COUNTED BY: TDG

DATE OF COUNT: Wed. 4/24/19

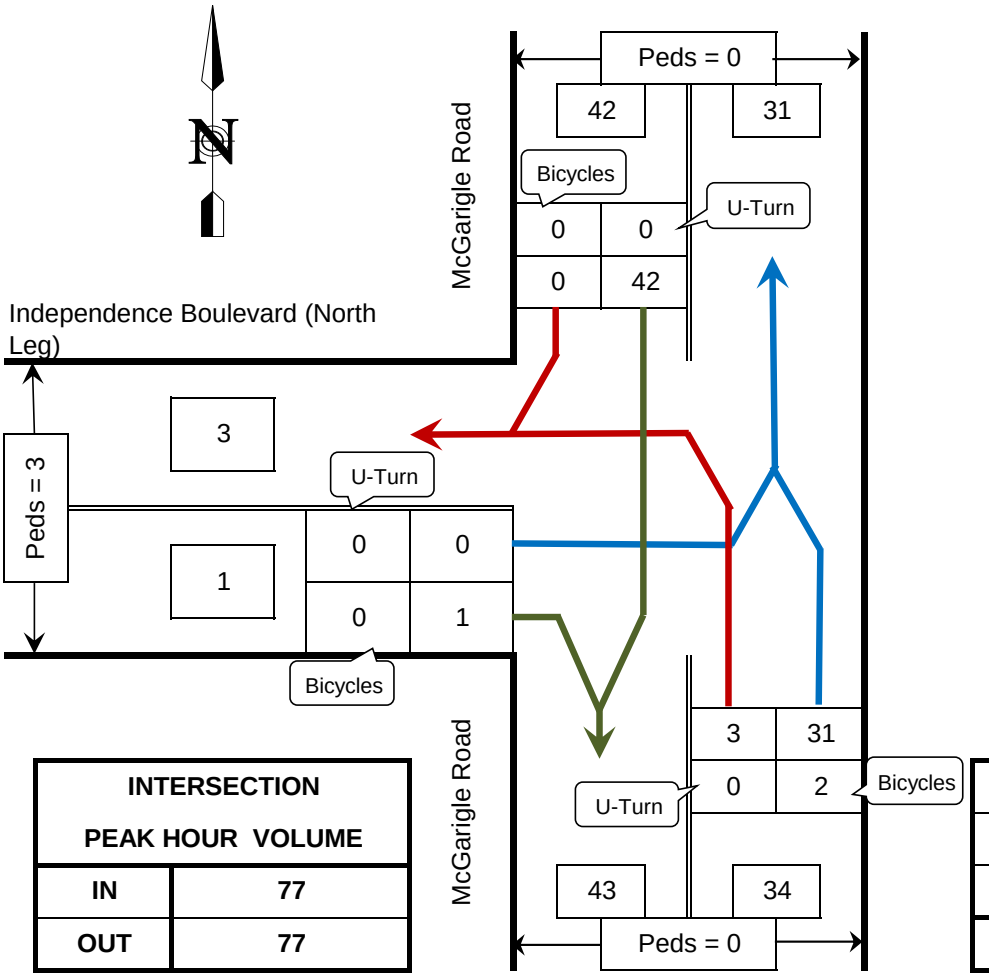
REDUCTION DATE: Thu. 4/25/19

TIME OF COUNT: 4:00 PM - 6:00 PM

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 5:00 PM TO 6:00 PM



INTERSECTION PEAK HOUR VOLUME	
IN	77
OUT	77

	HV	PHF
SB	2.4%	0.75
NB	8.8%	0.65
EB	0.0%	0.25
INTRS.	5.2%	0.71

HV = Heavy Vehicles
PHF = Peak Hour Factor

McGarigle Road @ Independence Boulevard (North Leg)

Sedro Woolley, WA

COUNTED BY: TDG

DATE OF COUNT: Wed. 9/18/19

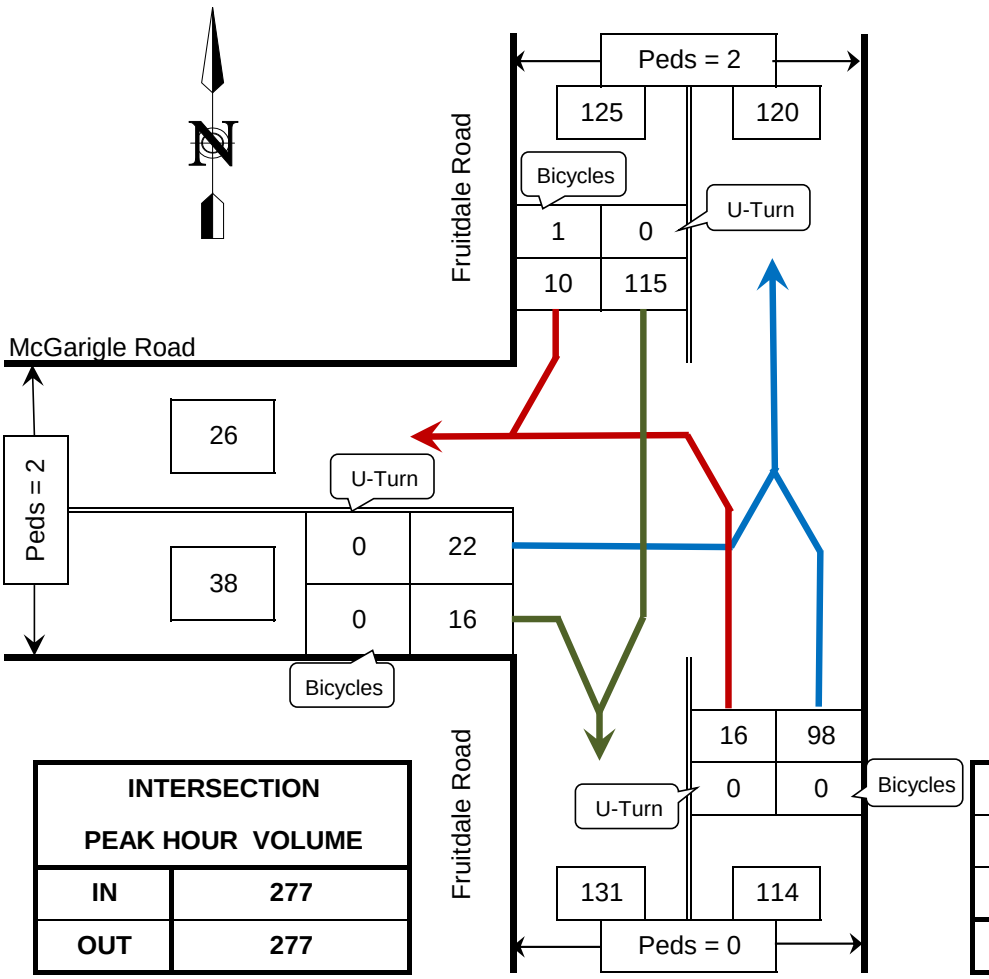
REDUCTION DATE: Sun. 9/22/19

TIME OF COUNT: 4:00 PM - 6:00 PM

TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:45 PM TO 5:45 PM



INTERSECTION PEAK HOUR VOLUME	
IN	277
OUT	277

	HV	PHF
SB	4.8%	0.84
NB	3.5%	0.75
EB	5.3%	0.63
INTRS.	4.3%	0.91

HV = Heavy Vehicles
PHF = Peak Hour Factor

McGarigle Road @ Fruitdale Road

Sedro Woolley, WA

COUNTED BY: TDG

DATE OF COUNT: Wed. 4/24/19

REDUCTION DATE: Thu. 4/25/19

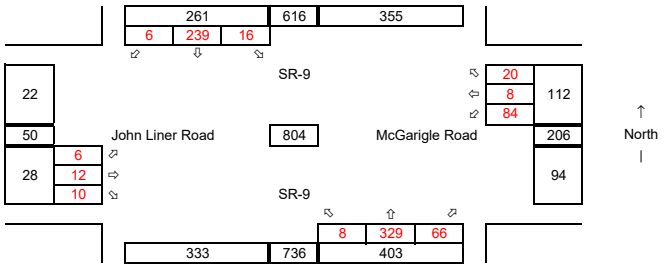
TIME OF COUNT: 4:00 PM - 6:00 PM

2025 Turning Movement Calculations

Synchro ID: 1
Existing
Average Weekday
PM Peak-Hour

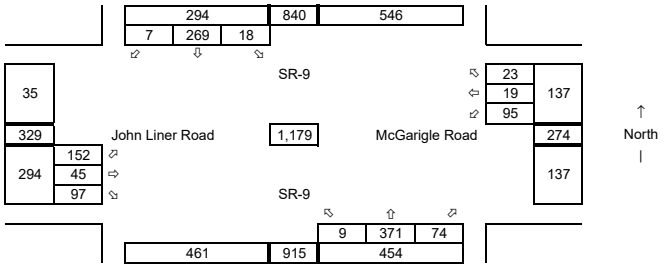
Year: **4/24/2019**

Data Source: **TDG**

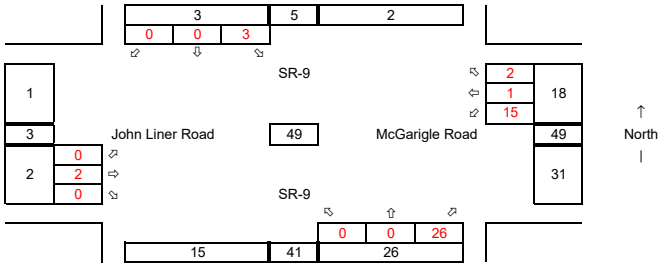


Future without Project
Average Weekday
PM Peak-Hour

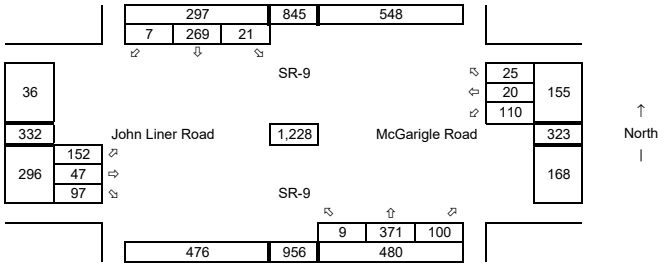
Future Year	2025
% Growth	2.0%
# of Years	6
Growth Rate	1.1262



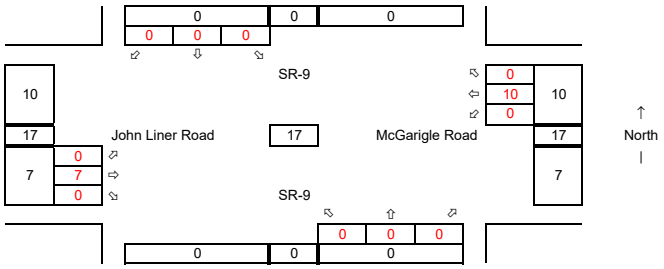
Total Project Trips
Average Weekday
PM Peak-Hour



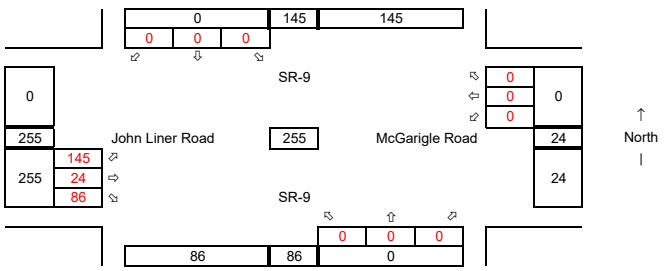
Future with Project
Average Weekday
PM Peak-Hour



Northern State Campus Pipeline Trips
Average Weekday
PM Peak-Hour



John Liner Corridor Diversion
Average Weekday
PM Peak-Hour



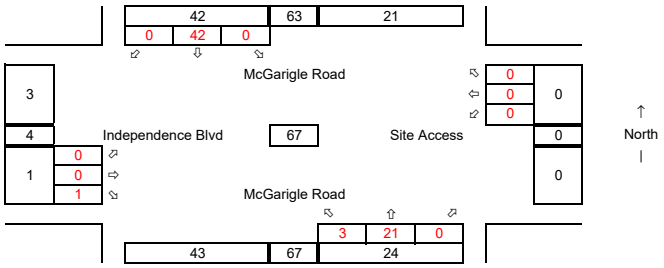
2 McGarigle Rd @ Site Access

Synchro ID: 2

Existing
Average Weekday
PM Peak-Hour

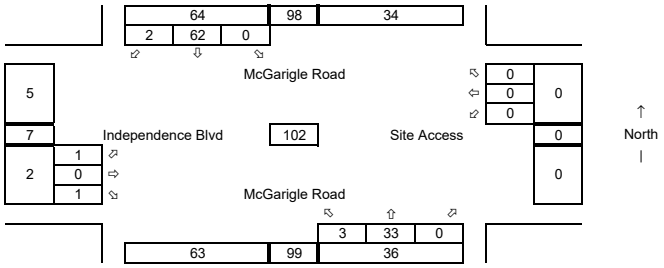
Year: **9/18/2019**

Data Source: **TDG**

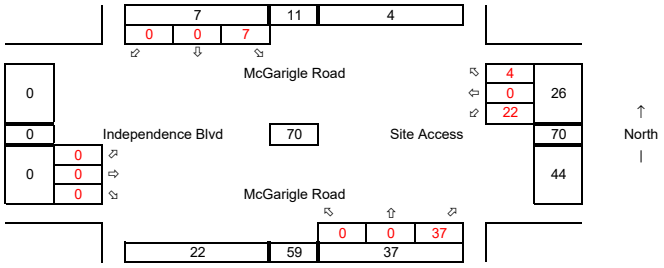


Future without Project
Average Weekday
PM Peak-Hour

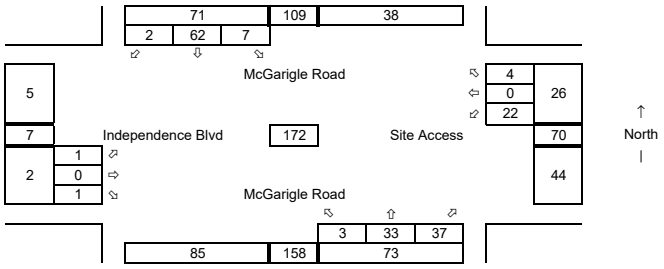
Future Year 2025
% Growth 2.0%
# of Years 6
Growth Rate 1.1262



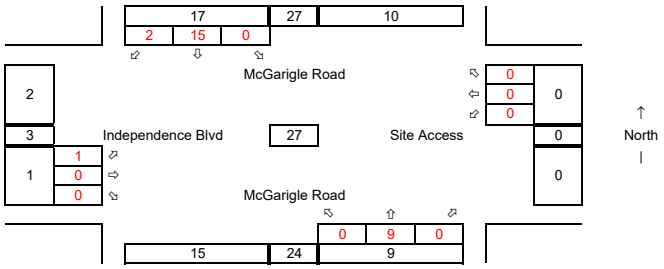
Total Project Trips
Average Weekday
PM Peak-Hour



Future with Project
Average Weekday
PM Peak-Hour

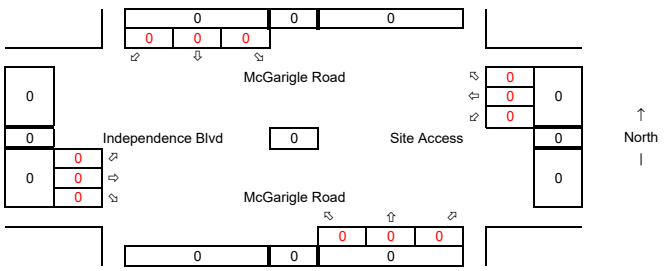


Northern State Campus Pipeline Trips
Average Weekday
PM Peak-Hour



John Liner Corridor Diversion

Average Weekday
PM Peak-Hour

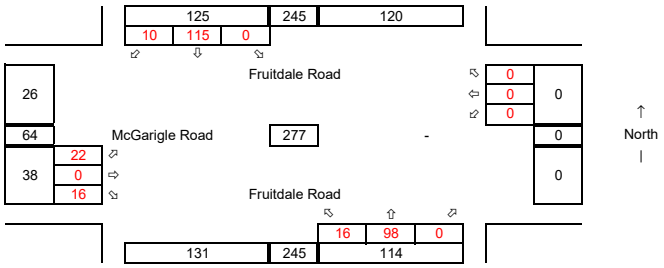


Synchro ID: 3

Existing
Average Weekday
PM Peak-Hour

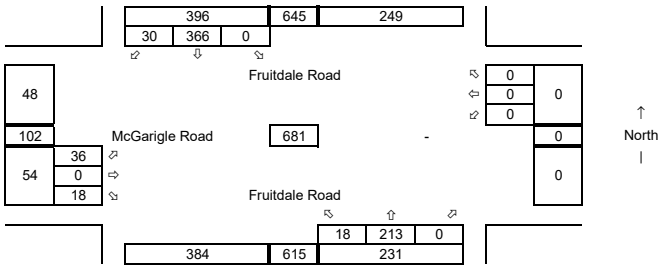
Year: **4/24/2019**

Data Source: **TDG**

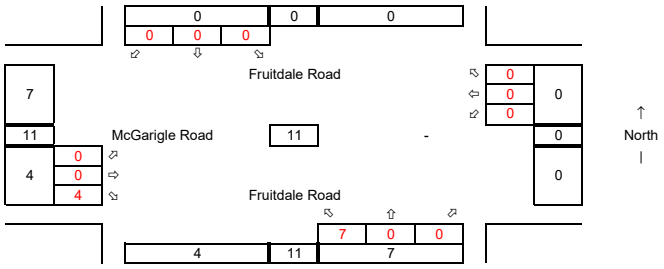


Future without Project
Average Weekday
PM Peak-Hour

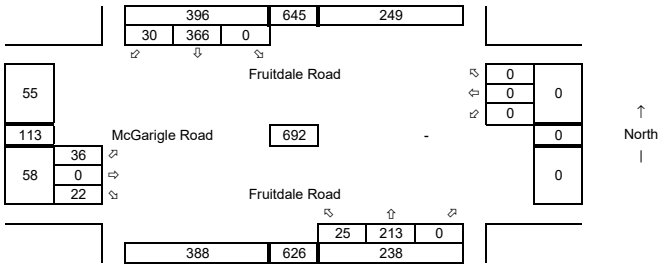
Future Year 2025
% Growth 2.0%
# of Years 6
Growth Rate 1.1262



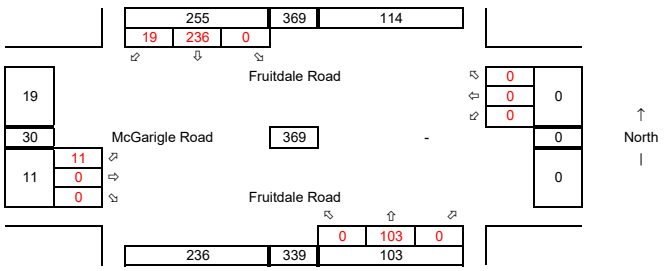
Total Project Trips
Average Weekday
PM Peak-Hour



Future with Project
Average Weekday
PM Peak-Hour

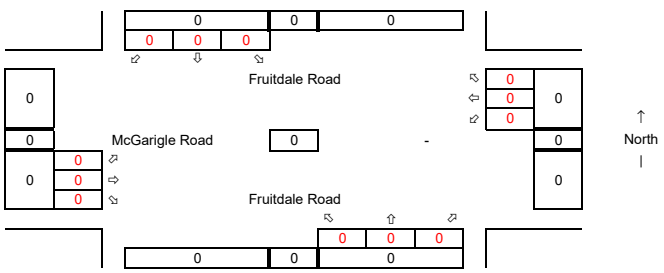


Northern State Campus Pipeline Trips
Average Weekday
PM Peak-Hour



John Liner Corridor Diversion

Average Weekday
PM Peak-Hour



Level of Service Calculations

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	6	12	10	84	8	20	8	329	66	16	239	6
Future Vol, veh/h	6	12	10	84	8	20	8	329	66	16	239	6
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	3	3	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	5	5	5	3	3	3	8	8	8
Mvmt Flow	6	13	11	90	9	22	9	354	71	17	257	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	718	740	262	719	708	394	263	0	0	428	0	0
Stage 1	294	294	-	411	411	-	-	-	-	-	-	-
Stage 2	424	446	-	308	297	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.13	-	-	4.18	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.227	-	-	2.272	-	-
Pot Cap-1 Maneuver	347	347	782	340	356	649	1295	-	-	1100	-	-
Stage 1	719	673	-	612	590	-	-	-	-	-	-	-
Stage 2	612	577	-	696	662	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	322	337	781	317	345	647	1295	-	-	1097	-	-
Mov Cap-2 Maneuver	322	337	-	317	345	-	-	-	-	-	-	-
Stage 1	713	661	-	605	583	-	-	-	-	-	-	-
Stage 2	577	570	-	660	650	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.3	20.5	0.2	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1295	-	-	418	351	1097	-	-
HCM Lane V/C Ratio	0.007	-	-	0.072	0.343	0.016	-	-
HCM Control Delay (s)	7.8	0	-	14.3	20.5	8.3	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	1.5	0	-	-

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	1	0	0	0	3	21	0	0	42	0
Future Vol, veh/h	0	0	1	0	0	0	3	21	0	0	42	0
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	2	2	2	9	9	9	2	2	2
Mvmt Flow	0	0	1	0	0	0	4	30	0	0	59	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	100	100	62	98	100	30	62	0	0	30	0	0
Stage 1	62	62	-	38	38	-	-	-	-	-	-	-
Stage 2	38	38	-	60	62	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.19	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.281	-	-	2.218	-	-
Pot Cap-1 Maneuver	886	794	1009	884	790	1044	1497	-	-	1583	-	-
Stage 1	954	847	-	977	863	-	-	-	-	-	-	-
Stage 2	982	867	-	951	843	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	882	789	1006	880	785	1044	1493	-	-	1583	-	-
Mov Cap-2 Maneuver	882	789	-	880	785	-	-	-	-	-	-	-
Stage 1	948	844	-	974	860	-	-	-	-	-	-	-
Stage 2	979	864	-	950	840	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.6	0	0.9	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1493	-	-	1006	-	1583	-	-
HCM Lane V/C Ratio	0.003	-	-	0.001	-	-	-	-
HCM Control Delay (s)	7.4	0	-	8.6	0	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	0	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	22	16	16	98	115	10
Future Vol, veh/h	22	16	16	98	115	10
Conflicting Peds, #/hr	2	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	5	5	4	4	5	5
Mvmt Flow	24	18	18	108	126	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	280	134	139	0	-	0
Stage 1	134	-	-	-	-	-
Stage 2	146	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.14	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.236	-	-	-
Pot Cap-1 Maneuver	704	907	1432	-	-	-
Stage 1	885	-	-	-	-	-
Stage 2	874	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	692	905	1429	-	-	-
Mov Cap-2 Maneuver	692	-	-	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	872	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1429	-	768	-	-
HCM Lane V/C Ratio	0.012	-	0.054	-	-
HCM Control Delay (s)	7.6	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection												
Int Delay, s/veh	21.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	152	45	97	95	19	23	9	371	74	18	269	7
Future Vol, veh/h	152	45	97	95	19	23	9	371	74	18	269	7
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	3	3	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	5	5	5	3	3	3	8	8	8
Mvmt Flow	163	48	104	102	20	25	10	399	80	19	289	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	814	833	295	871	797	443	297	0	0	482	0	0
Stage 1	331	331	-	462	462	-	-	-	-	-	-	-
Stage 2	483	502	-	409	335	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.13	-	-	4.18	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.227	-	-	2.272	-	-
Pot Cap-1 Maneuver	299	307	749	268	316	608	1259	-	-	1050	-	-
Stage 1	687	649	-	574	560	-	-	-	-	-	-	-
Stage 2	569	545	-	613	637	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	265	296	748	196	305	606	1259	-	-	1047	-	-
Mov Cap-2 Maneuver	265	296	-	196	305	-	-	-	-	-	-	-
Stage 1	679	635	-	566	552	-	-	-	-	-	-	-
Stage 2	519	537	-	476	623	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	65.5	43.4	0.2	0.5
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1259	-	-	344	234	1047	-	-
HCM Lane V/C Ratio	0.008	-	-	0.919	0.63	0.018	-	-
HCM Control Delay (s)	7.9	0	-	65.5	43.4	8.5	0	-
HCM Lane LOS	A	A	-	F	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	9.3	3.8	0.1	-	-

MOVEMENT SUMMARY

Site: 1 [SR-9 at John Liner Rd 2025 Baseline]

2025 Baseline
PM Peak-Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR-9 (NB)												
3	L2	10	3.0	0.424	11.0	LOS B	2.8	72.5	0.52	0.55	0.52	36.0
8	T1	399	3.0	0.424	5.3	LOS A	2.8	72.5	0.52	0.55	0.52	36.0
18	R2	80	3.0	0.424	5.4	LOS A	2.8	72.5	0.52	0.55	0.52	35.0
Approach		488	3.0	0.424	5.4	LOS A	2.8	72.5	0.52	0.55	0.52	35.9
East: John Liner Rd (WB)												
1	L2	102	5.0	0.167	12.5	LOS B	0.9	24.2	0.62	0.75	0.62	33.9
6	T1	20	5.0	0.167	6.9	LOS A	0.9	24.2	0.62	0.75	0.62	34.0
16	R2	25	5.0	0.167	6.9	LOS A	0.9	24.2	0.62	0.75	0.62	33.1
Approach		147	5.0	0.167	10.8	LOS B	0.9	24.2	0.62	0.75	0.62	33.8
North: SR-9 (SB)												
7	L2	19	8.0	0.268	10.4	LOS B	1.6	41.4	0.35	0.47	0.35	36.2
4	T1	289	8.0	0.268	4.7	LOS A	1.6	41.4	0.35	0.47	0.35	36.3
14	R2	8	8.0	0.268	4.8	LOS A	1.6	41.4	0.35	0.47	0.35	35.2
Approach		316	8.0	0.268	5.0	LOS A	1.6	41.4	0.35	0.47	0.35	36.3
West: John Liner Rd (EB)												
5	L2	163	5.0	0.316	11.9	LOS B	1.8	47.2	0.58	0.72	0.58	34.7
2	T1	48	5.0	0.316	6.3	LOS A	1.8	47.2	0.58	0.72	0.58	34.7
12	R2	104	5.0	0.316	6.3	LOS A	1.8	47.2	0.58	0.72	0.58	33.7
Approach		316	5.0	0.316	9.2	LOS A	1.8	47.2	0.58	0.72	0.58	34.4
All Vehicles		1268	5.0	0.424	6.9	LOS A	2.8	72.5	0.50	0.60	0.50	35.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	1	0	0	0	3	33	0	0	62	2
Future Vol, veh/h	1	0	1	0	0	0	3	33	0	0	62	2
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	2	2	2	9	9	9	2	2	2
Mvmt Flow	1	0	1	0	0	0	4	46	0	0	87	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	146	146	92	143	147	46	93	0	0	46	0	0
Stage 1	92	92	-	54	54	-	-	-	-	-	-	-
Stage 2	54	54	-	89	93	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.19	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.281	-	-	2.218	-	-
Pot Cap-1 Maneuver	827	749	971	826	744	1023	1458	-	-	1562	-	-
Stage 1	920	823	-	958	850	-	-	-	-	-	-	-
Stage 2	963	854	-	918	818	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	823	745	968	823	740	1023	1454	-	-	1562	-	-
Mov Cap-2 Maneuver	823	745	-	823	740	-	-	-	-	-	-	-
Stage 1	914	821	-	955	847	-	-	-	-	-	-	-
Stage 2	960	851	-	917	816	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	0	0.6	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1454	-	-	890	-	1562	-	-
HCM Lane V/C Ratio	0.003	-	-	0.003	-	-	-	-
HCM Control Delay (s)	7.5	0	-	9.1	0	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	18	18	213	366	30
Future Vol, veh/h	36	18	18	213	366	30
Conflicting Peds, #/hr	2	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	5	5	4	4	5	5
Mvmt Flow	40	20	20	234	402	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	697	421	437	0	-	0
Stage 1	421	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.14	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.236	-	-	-
Pot Cap-1 Maneuver	403	626	1112	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	393	625	1110	-	-	-
Mov Cap-2 Maneuver	393	-	-	-	-	-
Stage 1	641	-	-	-	-	-
Stage 2	762	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.3	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1110	-	448	-	-
HCM Lane V/C Ratio	0.018	-	0.132	-	-
HCM Control Delay (s)	8.3	0	14.3	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

Intersection												
Int Delay, s/veh	26.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	152	47	97	110	20	25	9	371	100	21	269	7
Future Vol, veh/h	152	47	97	110	20	25	9	371	100	21	269	7
Conflicting Peds, #/hr	1	0	2	2	0	1	0	0	3	3	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	5	5	5	3	3	3	8	8	8
Mvmt Flow	163	51	104	118	22	27	10	399	108	23	289	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	838	869	295	895	819	457	297	0	0	510	0	0
Stage 1	339	339	-	476	476	-	-	-	-	-	-	-
Stage 2	499	530	-	419	343	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.13	-	-	4.18	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.227	-	-	2.272	-	-
Pot Cap-1 Maneuver	288	292	749	258	307	597	1259	-	-	1025	-	-
Stage 1	680	643	-	564	552	-	-	-	-	-	-	-
Stage 2	557	530	-	606	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	252	280	748	185	294	595	1259	-	-	1022	-	-
Mov Cap-2 Maneuver	252	280	-	185	294	-	-	-	-	-	-	-
Stage 1	673	626	-	556	544	-	-	-	-	-	-	-
Stage 2	505	523	-	466	615	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	78	59.3	0.1	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1259	-	-	329	220	1022	-	-
HCM Lane V/C Ratio	0.008	-	-	0.967	0.758	0.022	-	-
HCM Control Delay (s)	7.9	0	-	78	59.3	8.6	0	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	10.3	5.2	0.1	-	-

MOVEMENT SUMMARY

Site: 1 [SR-9 at John Liner Rd 2025 Future With]

2025 Future With
PM Peak-Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR-9 (NB)												
3	L2	10	3.0	0.450	11.0	LOS B	3.1	79.2	0.54	0.56	0.54	36.0
8	T1	399	3.0	0.450	5.4	LOS A	3.1	79.2	0.54	0.56	0.54	36.0
18	R2	108	3.0	0.450	5.4	LOS A	3.1	79.2	0.54	0.56	0.54	35.0
Approach		516	3.0	0.450	5.5	LOS A	3.1	79.2	0.54	0.56	0.54	35.8
East: John Liner Rd (WB)												
1	L2	118	5.0	0.189	12.6	LOS B	1.1	27.9	0.63	0.76	0.63	33.9
6	T1	22	5.0	0.189	6.9	LOS A	1.1	27.9	0.63	0.76	0.63	33.9
16	R2	27	5.0	0.189	7.0	LOS A	1.1	27.9	0.63	0.76	0.63	33.0
Approach		167	5.0	0.189	10.9	LOS B	1.1	27.9	0.63	0.76	0.63	33.7
North: SR-9 (SB)												
7	L2	23	8.0	0.275	10.5	LOS B	1.6	42.7	0.38	0.49	0.38	36.1
4	T1	289	8.0	0.275	4.8	LOS A	1.6	42.7	0.38	0.49	0.38	36.2
14	R2	8	8.0	0.275	4.8	LOS A	1.6	42.7	0.38	0.49	0.38	35.1
Approach		319	8.0	0.275	5.2	LOS A	1.6	42.7	0.38	0.49	0.38	36.2
West: John Liner Rd (EB)												
5	L2	163	5.0	0.323	12.1	LOS B	1.9	48.8	0.59	0.73	0.59	34.6
2	T1	51	5.0	0.323	6.4	LOS A	1.9	48.8	0.59	0.73	0.59	34.7
12	R2	104	5.0	0.323	6.5	LOS A	1.9	48.8	0.59	0.73	0.59	33.7
Approach		318	5.0	0.323	9.3	LOS A	1.9	48.8	0.59	0.73	0.59	34.3
All Vehicles		1320	4.9	0.450	7.0	LOS A	3.1	79.2	0.52	0.61	0.52	35.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	1	22	0	4	3	33	37	7	62	2
Future Vol, veh/h	1	0	1	22	0	4	3	33	37	7	62	2
Conflicting Peds, #/hr	0	0	0	0	0	0	3	0	0	0	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	0	0	0	2	2	2	9	9	9	2	2	2
Mvmt Flow	1	0	1	31	0	6	4	46	52	10	87	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	195	218	92	189	193	72	93	0	0	98	0	0
Stage 1	112	112	-	80	80	-	-	-	-	-	-	-
Stage 2	83	106	-	109	113	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.19	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.281	-	-	2.218	-	-
Pot Cap-1 Maneuver	769	684	971	771	702	990	1458	-	-	1495	-	-
Stage 1	898	807	-	929	828	-	-	-	-	-	-	-
Stage 2	930	811	-	896	802	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	757	675	968	764	693	990	1454	-	-	1495	-	-
Mov Cap-2 Maneuver	757	675	-	764	693	-	-	-	-	-	-	-
Stage 1	893	799	-	926	826	-	-	-	-	-	-	-
Stage 2	922	809	-	888	794	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.2	9.8	0.3	0.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1454	-	-	850	792	1495	-	-
HCM Lane V/C Ratio	0.003	-	-	0.003	0.046	0.007	-	-
HCM Control Delay (s)	7.5	0	-	9.2	9.8	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	22	25	213	366	30
Future Vol, veh/h	36	22	25	213	366	30
Conflicting Peds, #/hr	2	0	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	5	5	4	4	5	5
Mvmt Flow	40	24	27	234	402	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	711	421	437	0	-	0
Stage 1	421	-	-	-	-	-
Stage 2	290	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.14	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.236	-	-	-
Pot Cap-1 Maneuver	395	626	1112	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	382	625	1110	-	-	-
Mov Cap-2 Maneuver	382	-	-	-	-	-
Stage 1	636	-	-	-	-	-
Stage 2	751	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.4	0.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1110	-	448	-	-
HCM Lane V/C Ratio	0.025	-	0.142	-	-
HCM Control Delay (s)	8.3	0	14.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

Collision Data

PRIMARY TRAFFICWAY	MILEPOST	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	FIRST COLLISION TYPE / OBJECT STRUCK	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1)
009	57.43	E406212	2015-03-04	08:31	No Apparent Injury	0	0	2	0	0	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle
009	57.43	E584580	2016-09-13	19:21	No Apparent Injury	0	0	2	0	0	Entering at angle	Inattention
009	57.43	3640550	2017-09-11	17:40	Suspected Minor Injury	5	0	2	0	0	Entering at angle	Did Not Grant RW to Vehicle
9	57.43	E773554	2018-02-13	14:23	Suspected Minor Injury	1	0	2	0	0	From same direction - both going straight - one stopped - rear-end	Driver Distractions Outside Vehicle

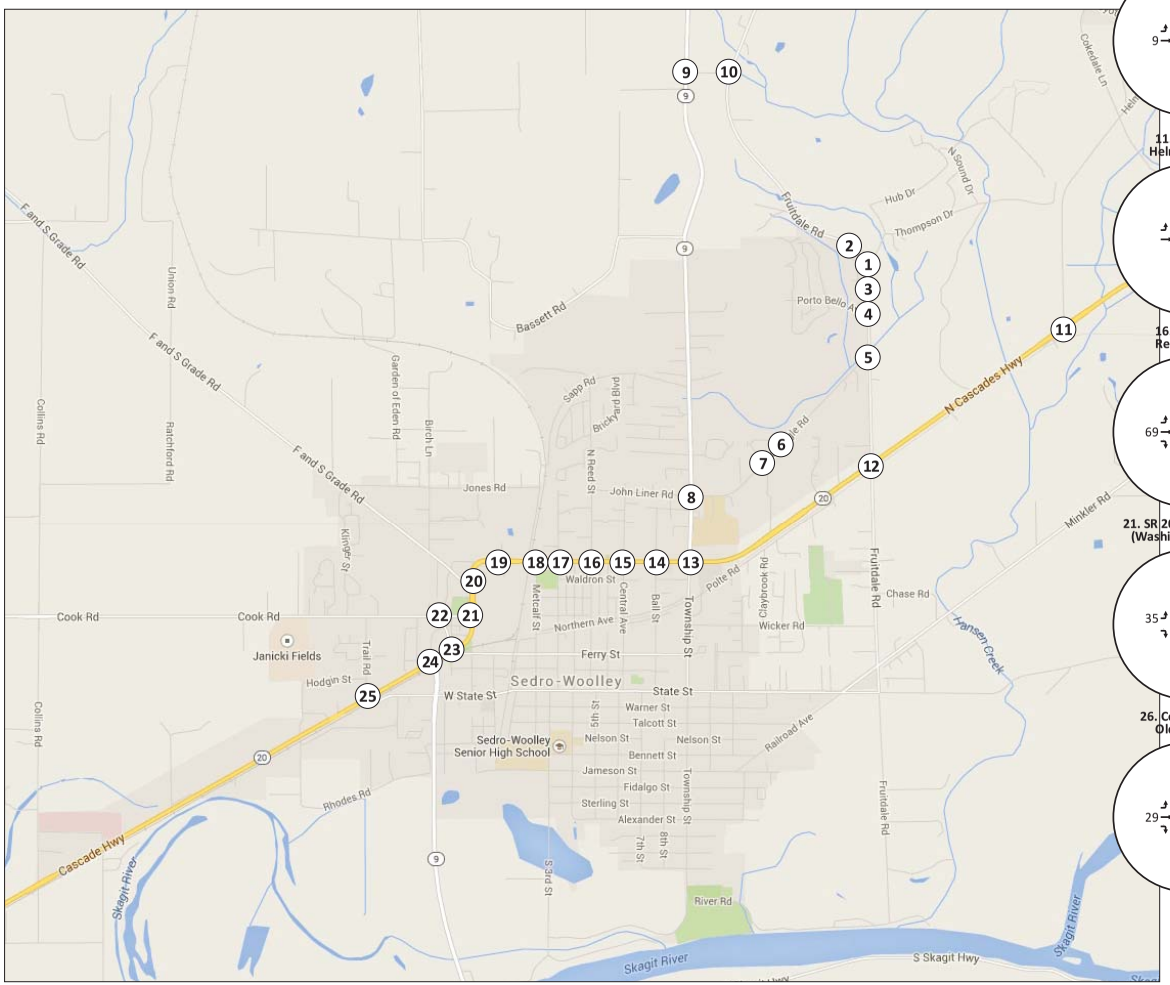
Collision Data Date Range

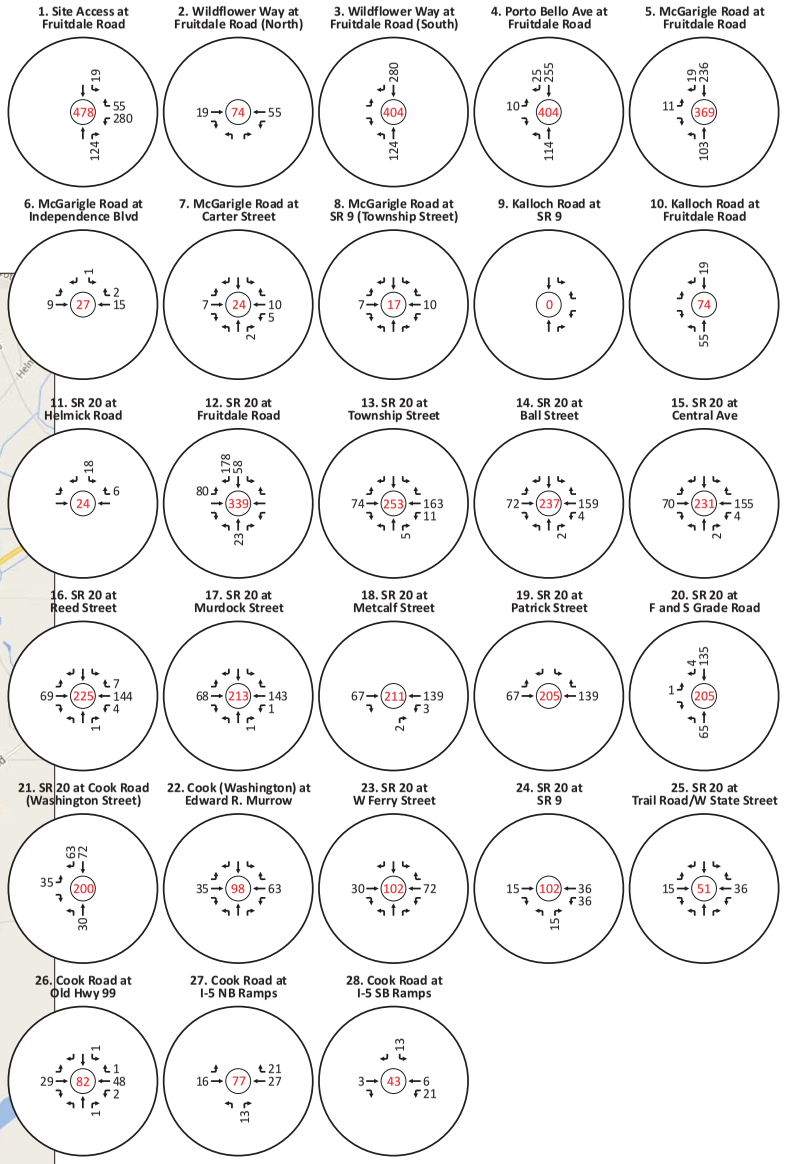
Start	1/1/2014
End	12/31/2018
Total Years	5.00

Intersection	No. Collisions	No. Injury Collisions	Estimated ADT	Collisions per Year	Collisions per MEV
#1: SR-9 @ John Liner Rd/McGarigle Rd	4	2	8,040	0.8	0.27
#2: McGarigle Rd @ Independence Blvd/Access	0	0	670	0	0.00
#3: McGarigle Rd @ Fruitdale Rd	0	0	2,770	0	0.00

Pipeline Projects

(#) Intersection PM Peak Hour Trip Impact

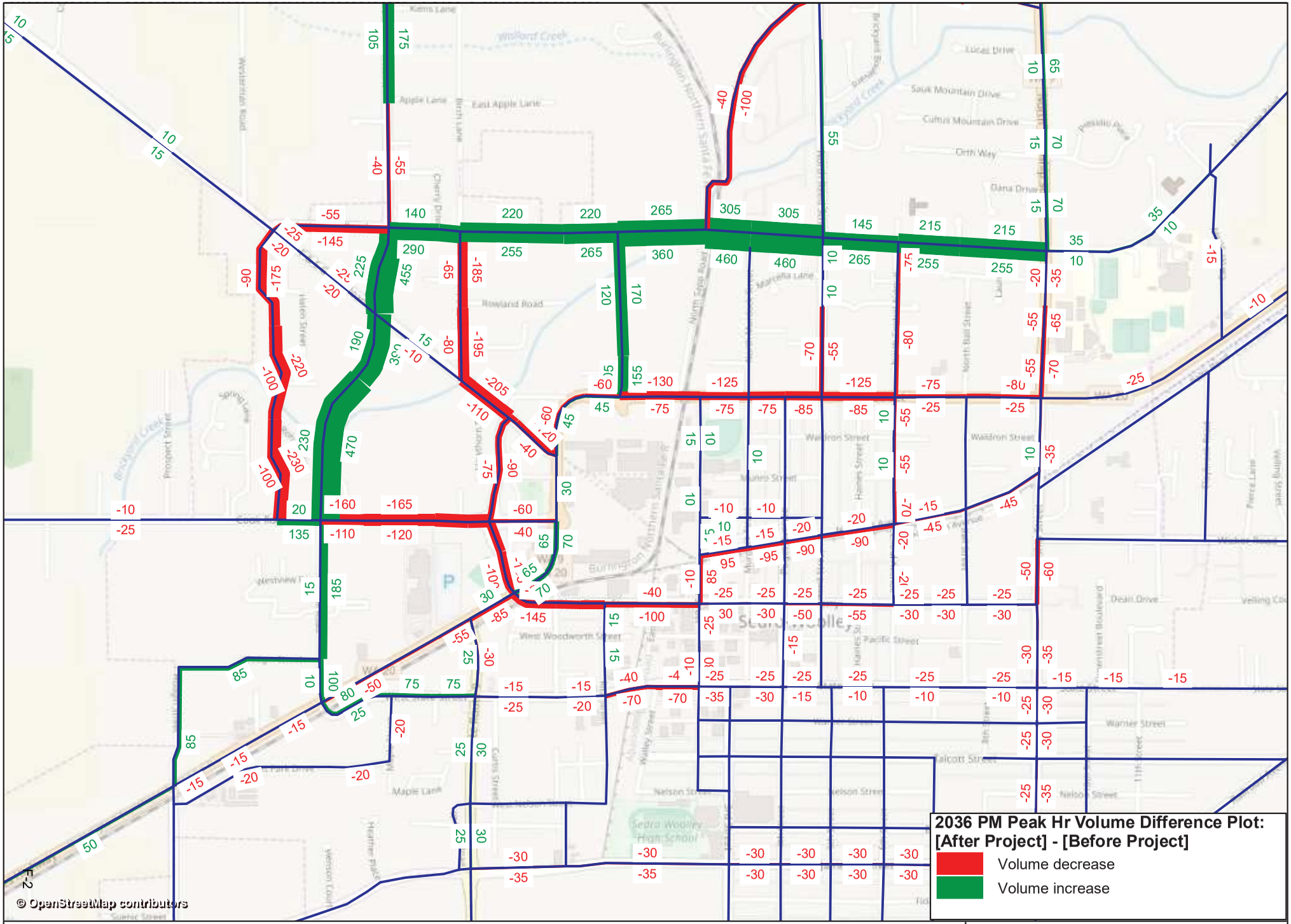




Northern State Campus
Planned Action EIS
Sedro-Wooley, WA

Figure 4.5. High Intensity Site Development Action (Alternative 3) Trip Assignment PM Peak Hour

TSI Transportation Solutions, Inc.



Volume Difference - 2036 Before and After Jones-John Liner Rd Improvements	1:13324
Transportation Solutions, Inc.	03.01.2019/10:47:21

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	185	30	110	65	70	35	80	350	50	15	240	150
Future Volume (veh/h)	185	30	110	65	70	35	80	350	50	15	240	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.97		0.98	1.00		0.98	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1743	1743	1900
Adj Flow Rate, veh/h	208	34	124	73	79	39	90	393	56	17	270	169
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	9	9	9
Cap, veh/h	499	108	395	454	371	183	454	781	111	451	495	310
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	1236	338	1234	1181	1158	572	933	1574	224	870	998	625
Grp Volume(v), veh/h	208	0	158	73	0	118	90	0	449	17	0	439
Grp Sat Flow(s),veh/h/ln	1236	0	1573	1181	0	1730	933	0	1799	870	0	1623
Q Serve(g_s), s	6.4	0.0	3.3	2.2	0.0	2.2	3.2	0.0	7.3	0.6	0.0	8.1
Cycle Q Clear(g_c), s	8.6	0.0	3.3	5.5	0.0	2.2	11.3	0.0	7.3	7.9	0.0	8.1
Prop In Lane	1.00		0.78	1.00		0.33	1.00		0.12	1.00		0.38
Lane Grp Cap(c), veh/h	499	0	503	454	0	554	454	0	893	451	0	806
V/C Ratio(X)	0.42	0.00	0.31	0.16	0.00	0.21	0.20	0.00	0.50	0.04	0.00	0.54
Avail Cap(c_a), veh/h	1040	0	1191	970	0	1310	1040	0	2023	998	0	1825
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.9	0.0	11.2	13.3	0.0	10.8	11.5	0.0	7.4	10.0	0.0	7.6
Incr Delay (d2), s/veh	0.6	0.0	0.4	0.2	0.0	0.2	0.2	0.0	0.4	0.0	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.1	0.0	2.6	1.3	0.0	1.9	1.5	0.0	6.5	0.3	0.0	6.6
LnGrp Delay(d),s/veh	14.5	0.0	11.5	13.4	0.0	11.0	11.7	0.0	7.8	10.0	0.0	8.2
LnGrp LOS	B		B	B		B	B		A	B		A
Approach Vol, veh/h		366			191			539			456	
Approach Delay, s/veh		13.2			11.9			8.5			8.2	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.6		17.9		25.6		17.9
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		49.0		33.0		49.0		33.0
Max Q Clear Time (g_c+I1), s		13.3		10.6		10.1		7.5
Green Ext Time (p_c), s		8.3		2.9		8.4		2.9

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

Table 7. Left-Turn Lane Analysis

Intersection	Approach Leg	Total DHV[1]	% Total DHV Turning Left	2036 PM LOS (Delay)[2]		Left-Turn Lane Warranted
				Without LT Lane	With LT Lane	
Trail Road & F&S Grade Road	West (EB)	50	10.0%	B (13.3)	B (14.7)	No
	East (WB)	125	24.0%	C (15.8)	B (14.5)	No
	South (NB)	665	0.8%	A (0.1)	A (0.1)	No
	North (SB)	645	3.1%	A (0.8)	A (0.8)	No
Trail Road & Jones Road	West (EB)	185	8.1%	A (1.1)	A (1.1)	No
	East (WB)	660	22.0%	A (4.5)	A (4.5)	**Yes**
	South (NB)	660	0.8%	D (27.1)	D (25.4)	No
	North (SB)	315	11.1%	D (32.7)	C (24.2)	No
Jones Road & Patrick Street	East (WB)	840	10.1%	A (2.1)	A (2.1)	**Yes**
	South (NB)	290	12.1%	B (16.1)	B (12.8)	No

[1]Design hourly volume (both directions)
[2]Average LOS and delay by approach

Left-turn lanes are warranted on the east (Jones Rd) approach of the Trail Road and Jones Road intersection, and the east (Jones Rd) approach of the Jones Road and Patrick Street intersection.

FINDINGS AND RECOMMENDATIONS

Findings and recommendations are summarized below.

- Single-lane roundabouts are the preferred intersection control alternative at the intersections of:
  - Cook Road and Trail Road
  - N Township Road (SR 9) and John Liner Road/McGarigle Road.
- A left-turn lane is warranted at the following two locations:
  - East (Jones Rd) approach of Trail Road and Jones Road intersection.
  - East (Jones Rd) approach of Jones Road and Patrick Street intersection.

Attachment 1. 2036 PM Peak Hour Volume With Jones/John Liner Road Corridor

Attachment 2. 2036 PM Peak Hour Volume Difference, Before and After Jones/John Liner Road Corridor

Attachment 3. Conceptual Roundabout Layouts

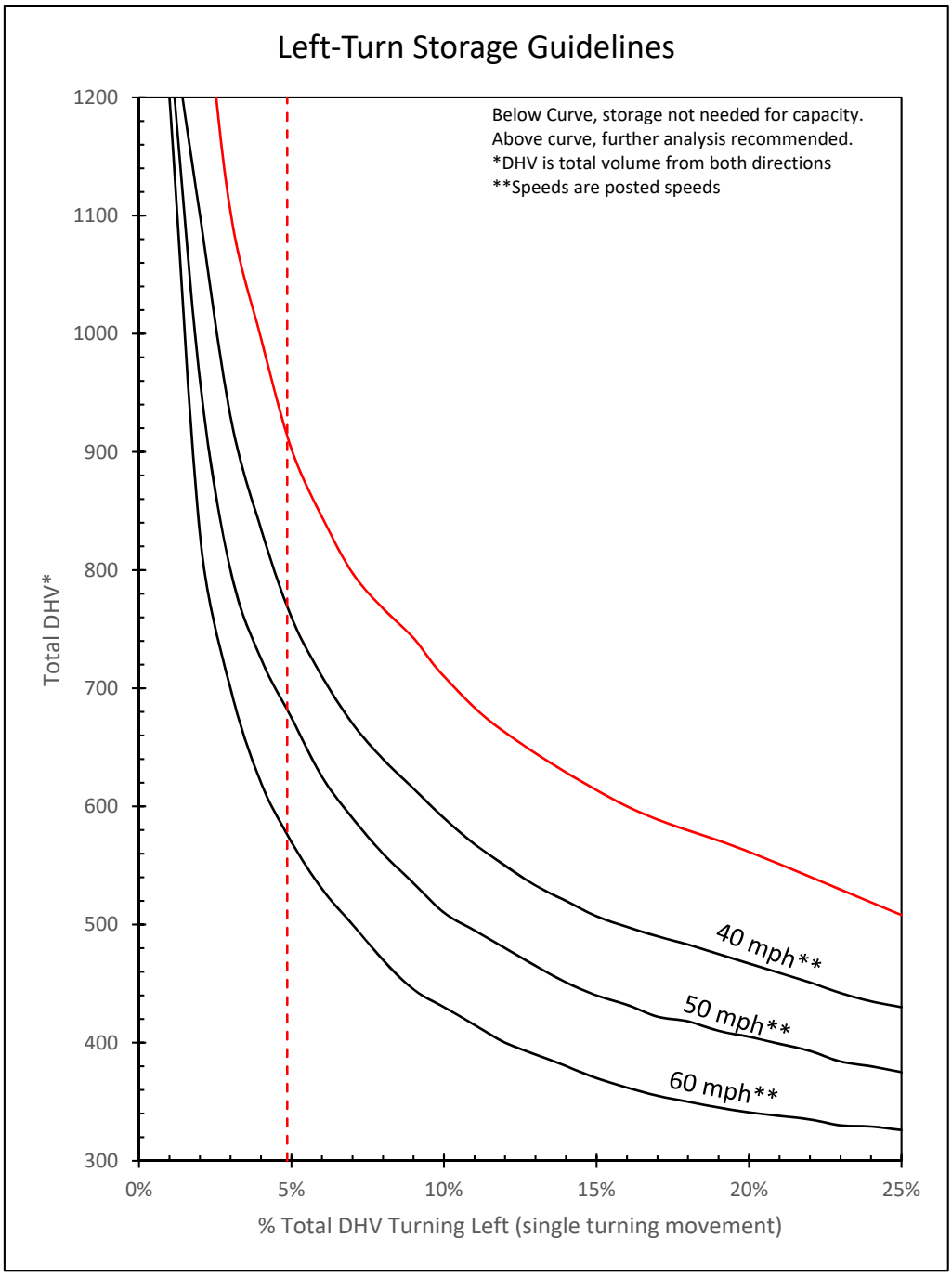
Attachment 4. Signal Warrant Reports

Attachment 5: Intersection LOS Reports

Attachment 6: Left-Turn Storage Guidelines

Channelization Warrants

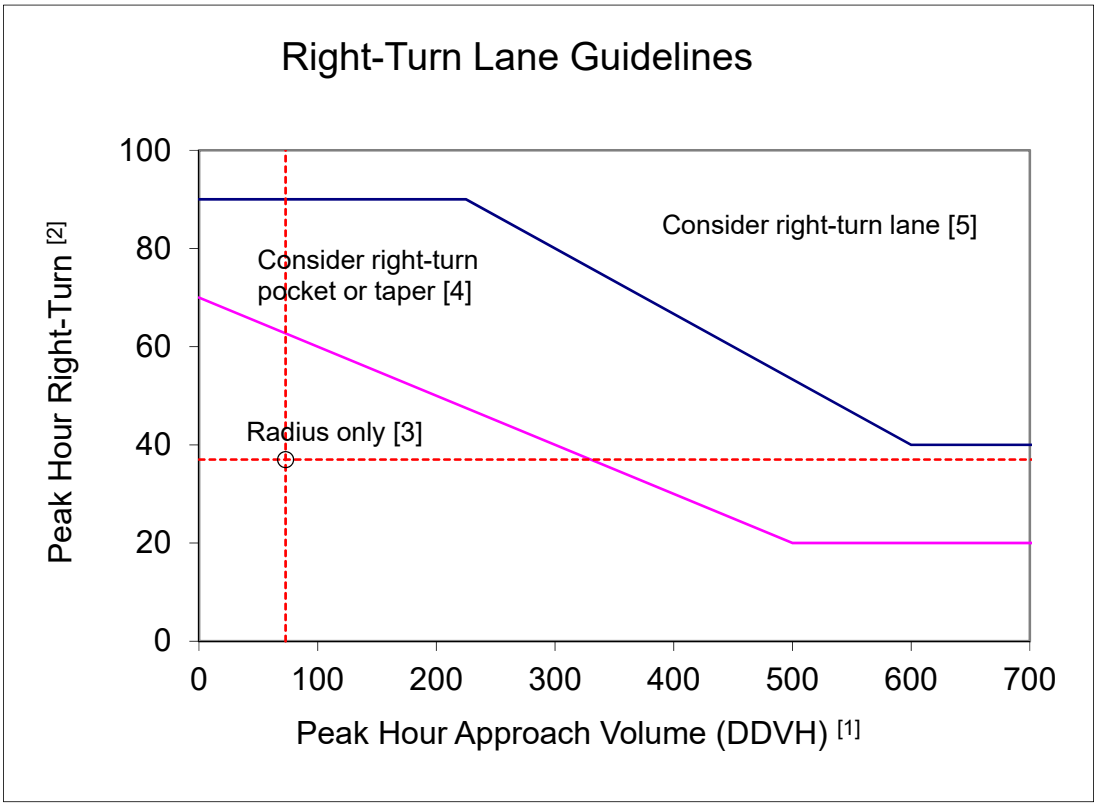
McGarigle Road @ Site Access



Total DHV:	144	Posted Speed:	25 mph
Left Turns:	7		
% Left:	4.9%		

Based on WSDOT July 2018 Design Manual: Exhibit 1310-7a, Page 1310-13.

McGarigle Road @ Site Access



Right Turn Volume:	37	[DDHV]	Posted Speed:	25 mph
Adjusted Right Turn Volume:	37	[DDHV]		
Pk Hr Curb Ln Approach Vol:	73	[DDHV]		

[1] For two-lane highways, use the peak hour DDHV (through + right turn).
For multilane, high speed highways (posted speed 45 mph or above), use the right-lane peak hour approach volume (through + right turn).

[2] When all three of the following conditions are met, reduce the right-turn DDHV by 20:
- The posted speed is 45 mph or less
- The right-turn volume is greater than 40 VPH
- The peak hour approach volume (DDHV) is less than 300 VPH.

[3] For right-turn corner design, see Exhibit 1310-6.
[4] For right-turn pocket or taper design, see Exhibit 1310-12.
[5] For right-turn lane design, see Exhibit 1310-13.

Based on WSDOT July 2018 Design Manual: Exhibit 1310-11, Page 1310-27.

Sedro Woolley Six-Year TIP

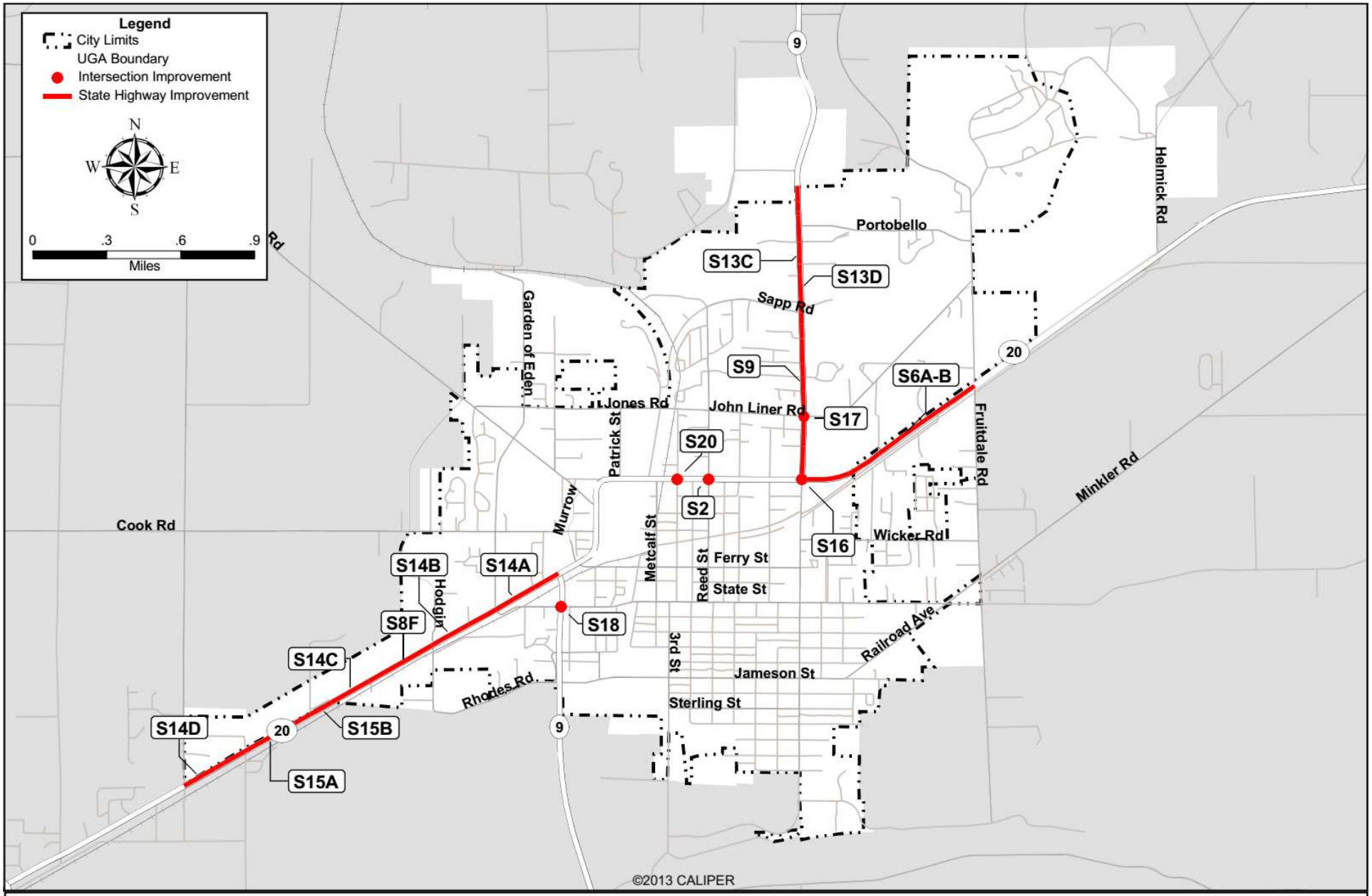


Figure 7

State Highway Improvement Projects - Corrected 5/3/2018

City of Sedro-Woolley

TSI Transportation Solutions, Inc.

CITY OF SEDRO-WOOLLEY GATEWAY TO THE NORTH CASCADES

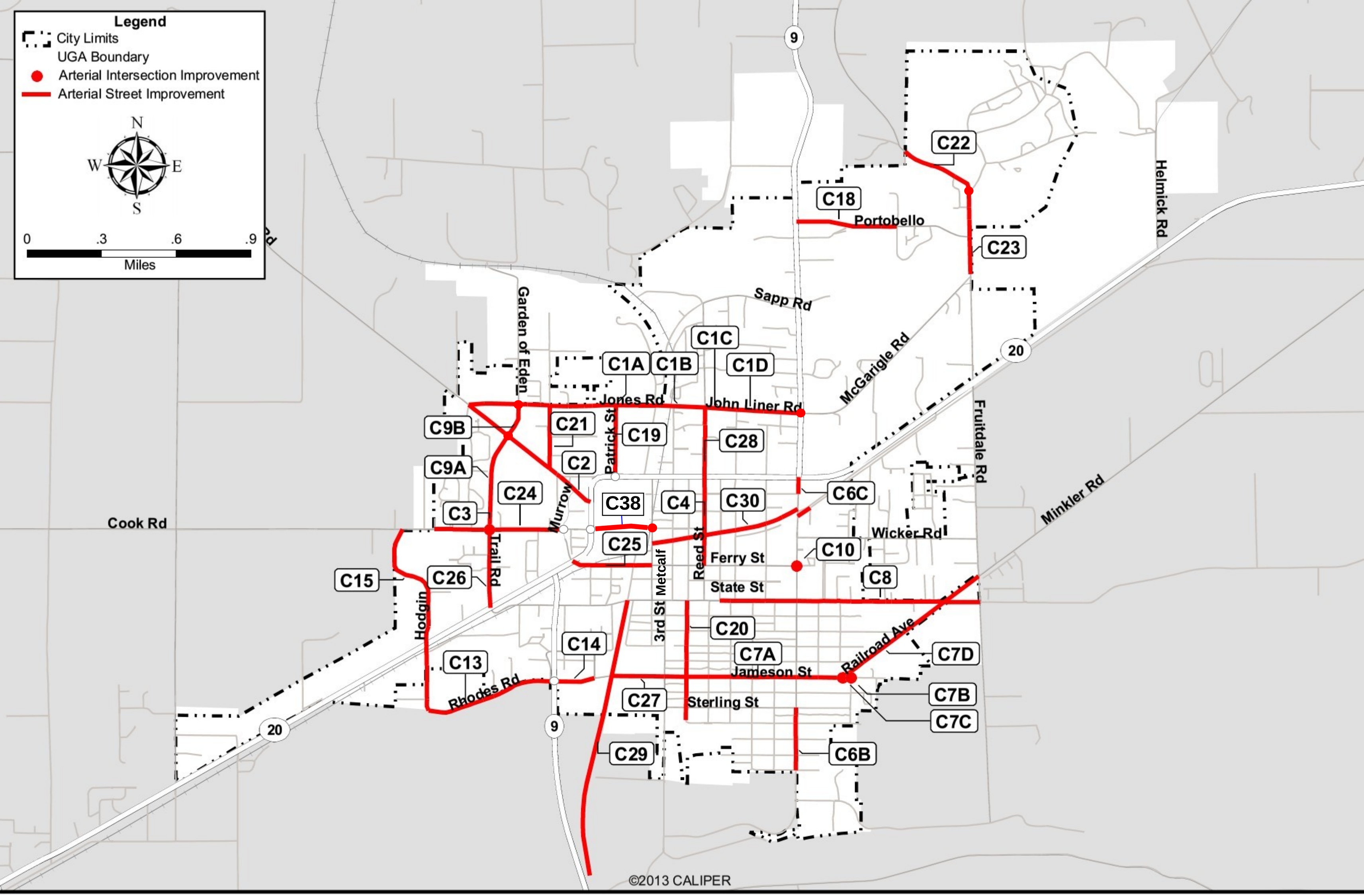


Figure 8

Arterial Improvement Projects - 2017 Update

City of Sedro-Woolley

2019-2024 TIP PROJECT LIST

REVISED: 5/3/2018

Sedro-Woolley Transportation Improvement Program and Projects

MAP ID [1]	2019 - 2024 TIP Project	2018 - 2023 TIP CN Year	2019 - 2024 TIP CN Year	2019 - 2024 TIP Priority No.	Project Name	Project Limits	Project Description	Priority	In Existing TIP (2018)? [2]	Total Cost 2018 ($1,000's) (3)(4)	Sedro-Woolley 2018 Cost ($1,000's) (3)	TIF Eligible (Y/N)	JONES-JOHN LINER-TRAIL RD CORRIDOR PROJECT
C1E	*SW53*	*2019*	*2019*	*1*	*Jones/John Liner/Trail Road Corridor Scoping Study*	*Cook Road to SR9 MP 57.43 John Liner Road*	*Planning level project to define the scope of the Jones/John Liner/Trail Road Corridor in order to establish an alternative east-west corridor to relieve congestion on SR20 between SR9 South and SR9 North.*	*High*	*Yes*	*200*	*125*	*Yes*	*200*
C1C	SW08A	2020	*2019*	2	John Liner Road, Reed to Township Bicycle/Pedestrian Improvements	Reed Street to SR9/Township Street (2,000 LF)	Construct sared use path on the north side of John Liner Road from Reed to Township, including drainage and illumination.	High	Yes	583	87	Yes	
C1B	SW06	2019	2019	3	Jones/John Liner RR Undercrossing	Sapp Road to Reed Street (1,000 lf)	New BNSF RR undercrossing and new major collector from East Jones Road to John Liner Road, including drainage, curbs, sidewalks, HMA, pavement markings and illumination.	High	Yes	7,700	1,925	Yes	7,700
S15B	*NEW SW58*	*2028*	*2019*	*4*	*SR20 West Lane Widening & Safety Improvements Project 1*	*Holtcamp Road / Hodgin Street*	*Improve and widen to 3 lanes (2,400 LF); add Brickyard Creek crossing.*	*High*	*Yes*	*600*	*150*	*Yes*	
C33B	SW49	2023	*2019*	5	Jameson Street Overlay Project 2	3rd Street to Township (2,800 LF)	*Grind and overlay; upgrade ADA Ramps.*	High	Yes	*476*	119	No	
C19	SW20	2020	2020	6	Patrick Street Arterial Extension	Michael Street to East Jones Road (1,200 LF)	New major collector with drainage, curbs, sidewalks, HMA, pavement markings, illumination.	Medium	Yes	2,100	2,100	Yes	2,100
C26	SW38	2019	*2020*	*7*	Trail Road Overlay	SR20 to Cook Road (1,600 LF)	Grind and overlay	High	Yes	*272*	41	No	
NEW C13A	*NEW SW54*	*NEW*	*2020*	8	*Rhodes Road Overlay*	*SR20 to City Limits (510 LF)*	*Grind and overlay*	*High*	*No*	*54*	*8*	*No*	
S16	SW33	2021	2021	9	SR20/SR9N-Township Intersection Improvements	SR20 MP 66.08; SR9 MP 57.17	Intersection channelization iImprovements to allow concurrent north-south left turns and improve signal sequencing, including sidewalk/path improvements.	High	Yes	828	207	Yes	-
S2	SW35	2021	2021	10	SR20 / Reed Street Intersection Improvements	SR20 MP 65.70 to 65.72	Intersection Improvements to restrict minor approach motions to right-in;right-out.	High	Yes	50	13	Yes	
C24	SW24	2020	*2021*	11	Cook Road Overlay	West City Limits to Crossroads (2,200 LF)	*Grind and overlay.*	High	Yes	*449*	67	No	
C3	SW25	2022	2022	12	Cook Road / Trail Road Intersection Improvements	Trail Road to Trail Road	Reconstruct intersection with traffic signal or Roundabout.	High	Yes	1,000	250	Yes	1,000
S14C	SW42	2023	*2022*	13	SR20/Cascade Trail West Extension Phase 2A Holtcamp Road to Hodgin Road	*SR20 MP 63.64 Holtcamp Rd to SR20 MP 64.21 Hodgin Road (3,000 LF)*	Construct a shared use path along the north side of SR20 from Holtcamp Road to Hodgin Road	Medium	Yes	840.5	78	Yes	
C28	SW40	2021	*2022*	14	North Reed Street Overlay Project 1	SR20 to John Liner Road (1,400 lf)	*Grind and overlay; upgrade ADA ramps..*	High	Yes	*315*	47	No	
C1A	SW07	2023	2023	15	Jones Road Arterial Improvements	F&S Grade Rd to Sapp Road (4,000 LF)	Reconstruct to major collector section including drainage, curbs, sidewalk, shared use path, HMA, pavement markings and illumination.	High	Yes	3,200	800	Yes	3,200
S18	SW45	2023	2023	16	SR 9 / W State Street Intersection Improvements	SR9 MP 55.75	Intersection Improvements to add a dedicated right turn lane to the west leg.	High	Yes	250	63	Yes	

H-3

2019-2024 TIP PROJECT LIST

REVISED: 5/3/2018

Sedro-Woolley Transportation Improvement Program and Projects

MAP ID [1]	2019 - 2024 TIP Project	2018 - 2023 TIP CN Year	2019 - 2024 TIP CN Year	2019 - 2024 TIP Priority No.	Project Name	Project Limits	Project Description	Priority	In Existing TIP (2018)? [2]	Total Cost 2018 ($1,000's) (3)(4)	Sedro-Woolley 2018 Cost ($1,000's) (3)	TIF Eligible (Y/N)	JONES-JOHN LINER-TRAIL RD CORRIDOR PROJECT
C18	SW21	2023	2023	17	Portobello Street Arterial Extension	SR9/N Township Street to Cascadia Drive (2,100 LF)	New major collector connecting Fruitdale to SR9/N Township, including drainage, curbs, sidewalks, HMA, pavement markings and illumination.	Medium	Yes	1,700	425	Yes	
C33A	SW48	2022	*2023*	*18*	Jameson Street Overlay Project 1	800' W of Batey to 3rd Street (800 LF)	*Grind and overlay; upgrade ADA ramps.*	High	Yes	*213*	32	No	
C9A	*NEW SW55*	*2024*	*2024*	*19*	*Trail Road Arterial Extension*	*Cook Rd to F&S Grade (2,200 LF)*	*Construct new major collector.*	*High*	*Yes*	*4,000*	*1,000*	*Yes*	*4,000*
C9B	*NEW SW56*	*2024*	*2024*	*20*	*Trail Rd - Garden of Eden Rd Extension*	*F&S Grade to Jones Rd (770 LF)*	*Construct new major collector.(Will require Functional Classification).*	*High*	*Yes*	*850*	*213*	*Yes*	*850*
C34	*NEW SW57*	*2024*	*2024*	*21*	*Sapp Road Overlay*	*Reed Street to SR 9/Township (2,000 LF)*	*Grind and overlay; upgrade ADA ramps*	*High*	*Yes*	*266*	*40*	*No*	
					SUBTOTAL 2019-2024 ALL PROJECTS					25,947	7,789		19,050
					SUBTOTAL 2019-2024 - TIF ELIGIBLE PROJECTS					23,902	7,435		
					SUBTOTAL 2019-2024 - OTHER PROJECTS					2,045	354		

H-4

2025-2038 TIP PROJECT LIST

REVISED: 5/1/2018

Sedro-Woolley Transportation Improvement Program and Programs

MAP ID [1]	2019 - 2024 TIP Project	2018 - 2023 TIP CN Year	2019 - 2024 TIP CN Year	2019 - 2024 TIP Priority No.	Project Name	Project Limits	Project Description	Priority	In Existing TIP (2018)? [2]	Total Cost 2018 ($1,000's) (3)(4)	Sedro-Woolley 2018 Cost ($1,000's) (3)	TIF Eligible (Y/N)	JONES-JOHN LINER-TRAIL RD CORRIDOR PROJECT
S17	SW41	2025	2025		SR9N/Township St & John Liner/McGarigle Intersection Improvements	SR9 MP 57.43	Intersection Improvements, including signalization or Single Lane Roundabout.	Medium	Yes	1,000	250	Yes	1,000
S13C	SW03B	2025	2025		SR9N Pedestrian/Bicycle Safety Improvements	West Side of SR9 M 57.99 Park Cottage to MP 58.30 North City Limits (1,240 LF)	Construct bicycle lane and sidewalk improvements on the west side of SR9 from Park Cottage Place to the North City Limits.	Medium	Yes	434	109	Yes	
C35		2025	2025		West State Street Overlay	SR 20 to SR 9 (1,500 LF x 30 LF)	Grind and overlay.	High	Yes	259	65	No	
C1D		2026	2026		John Liner Road Arterial Improvements	Reed Street to SR9/Township Street (2,000 LF)	Reconstruct John Liner Road to major collector section including drainage, curbs, sidewalk, shared use path, HMA, pavement markings and illumination.	Medium	Yes	1,600	400	Yes	1,600
C36		2026	2026		North Reed Street Overlay Project 2	John Liner Road to Sapp Road (2,200 LF)	Grind and overlay.	High	Yes	400	100	No	
C7A	SW27	2027	2027		Jameson St Arterial Improvements	600' E of Batey to Railroad St (4,500 LF)	Widen and rebuild Jameson St to secondary standards including 3 lanes, curb & gutter, bike lanes, planter strip, and sidewalks. Some right-of-way may be required.	Medium	Yes	3,600	900	Yes	
C7B	SW29	2027	2027		Jameson St / 11th St Intersection Improvements	Intersection	Change access on 11th St to right-in right-out	Medium	Yes	70	18	Yes	
C37 NEW		2027	2027		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
NEW-S15B		2028	2028		SR20 West Lane Widening & Safety Improvements	Holtcamp Road / Hodgin Street	Improve and widen to 3 lanes (2,400 LF)	High	Yes	600	150	Yes	
C7C	SW28	2028	2028		Railroad St / Jameson St Intersection Improvements	Intersection	Improve intersection. Construct roundabout.	Medium	Yes	750	188	Yes	
NEW		2028	2028		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C38		2029	2029		Cook Road Arterial Extension	SR20 to Metcalf Street (1,050 LF)	New major collector with drainage, curbs, sidewalks, HMA, pavement markings, illumination	Medium	Yes	825	206	Yes	
S15A		2029	2029		SR20 West Lane Widening & Safety Improvements	Hospital Drive / Holtcamp Road	Improve and widen to 3 lanes (1,300 LF)	Medium	Yes	325	81	Yes	
C7D		2029	2029		Railroad St Arterial Improvements	Jameson St to Fruitdale Rd (3,600 lf)	Widen and rebuild Railroad St to secondary arterial standards including 3 lanes, curb & gutter, bike lanes, planter strip, and sidewalks. Some right-of-way may be required.	Medium	Yes	2,880	720	Yes	
NEW		2029	2029		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C4	SW26	2030	2030		Reed Street Arterial Improvements	Ferry Street to SR 20 (1,800 LF)	Reconstruct street to arterial standards with new curbs, sidewalks, ADA facilities, HMA pavement and pavement markings.	Medium	Yes	1,440	360	Yes	

2025-2038 TIP PROJECT LIST

REVISED: 5/1/2018

Sedro-Woolley Transportation Improvement Program and Programs

MAP ID [1]	2019 - 2024 TIP Project	2018 - 2023 TIP CN Year	2019 - 2024 TIP CN Year	2019 - 2024 TIP Priority No.	Project Name	Project Limits	Project Description	Priority	In Existing TIP (2018)? [2]	Total Cost 2018 ($1,000's) (3)(4)	Sedro-Woolley 2018 Cost ($1,000's) (3)	TIF Eligible (Y/N)	JONES-JOHN LINER-TRAIL RD CORRIDOR PROJECT
NEW		2030	2030		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C2	SW09	2031	2031		F&S Grade Rd Arterial Improvements	SR 20 MP 65.16 to West City Limits/Jones Road (3,700 LF)	Reconstruct F&S Grade Road to arterial standards including drainage, curbs, sidewalk, combined bicycle/pedestrian path, HMA, pavement markings and illumination.	Medium	Yes	2,960	740	Yes	
S20	SW44	2031	2031		SR20/Central Ave Intersection Improvements	SR20 MP 65.83	Intersection imporfvements or RIRO	Medium	Yes	150	38	Yes	
NEW		2031	2031		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
S14D	SW43	2032	2032		SR20/Cascade Trail West Extension Phase 2B Collins Road to Holtcamp Road	SR20 MP 63.06 Collins Rd to MP 63.64 Holtcamp Rd (3,100 LF)	Construct a shared use path along the north side of SR20 from Collins Road to Holtcamp Road	Medium	Yes	620	155	Yes	
S8F	SW02F	2032	2032		SR 20 Stormwater Conveyance System Upgrade	SR20 MP 63.64 Holtcamp Road to MP 64.21 Hodgin Road (72 IN - 984 LF)	Upgrade the SR20 Stormwater Conveyance System from Holtcamp Road to Hodgin Road to correct existing capacity issues. Extends and completes undersized portions of the stormwater identified in the SR20/Cook road Realignment and	Medium	Yes	300	300	No	
NEW		2032	2032		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C8		2033	2033		State St Sidewalks	Haines to E City Limits (3,000 LF)	Construct sidewalks, ADA ramps, and other pedestrian improvements along north side of State St.	Low	Yes	540	135	Yes	
NEW		2033	2033		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C10		2034	2034		Township St / Ferry St Intersection Improvements	Intersection	Construct intersection improvements to include an all-way stop.	Medium	Yes	50	13	No	
C13		2034	2034		Rhodes Rd Arterial Improvements	SR 9 to SR 20 (4,000 LF)	Reconstruct roadway to secondary arterial standards including curb & gutter, bike lanes, sidewalks, and stormwater facilities. (City portion 500 LF; County portion 3,500 LF)	Low	Yes	3,200	800	Yes	
NEW		2034	2034		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C15		2035	2035		Hodgin Road Arterial Extension Project	SR 20 to Cook Rd (2,100 LF)	Construct new collector arterial including drainage, curbs, sidewalks, HMA, pavement markings and illumination.	Low	Yes	2,225	556	Yes	
NEW		2035	2035		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
C20		2036	2036		4th Street, Alexander to State Arterial	Alexander to State (1,600 LF)	Reconstruct to major collector standards to replace 3rd Street as N-S Arterial	Low	Yes	1,300	325	Yes	
NEW		2036	2036		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	

H-6

2025-2038 TIP PROJECT LIST

REVISED: 5/1/2018

Sedro-Woolley Transportation Improvement Program and Programs

MAP ID [1]	2019 - 2024 TIP Project	2018 - 2023 TIP CN Year	2019 - 2024 TIP CN Year	2019 - 2024 TIP Priority No.	Project Name	Project Limits	Project Description	Priority	In Existing TIP (2018)? [2]	Total Cost 2018 ($1,000's) (3)(4)	Sedro-Woolley 2018 Cost ($1,000's) (3)	TIF Eligible (Y/N)	JONES-JOHN LINER-TRAIL RD CORRIDOR PROJECT
S9		2037	2037		SR9/North Township St Arterial Improvements	SR 20 to city limits (5,900 LF)	Planning Phase - Reconstruct to minor arterial standards including 3 lanes, curb & gutter, bike lanes, planter strip, sidewalks. Some right-of-way may be required. 2016 RTIP EST CN $4.7 M	Medium	Yes	100	25	Yes	
C6B		2037	2037		South Township St Arterial Improvements Project	Dunlop to Sterling St (1,300 LF)	Reconstruct to major collector standards.	Low	Yes	1,040	260	No	
C21		2037	2037		Garden of Eden Rd Arterial Improvements	F&S Grade Road to Jones Road (1,300 LF)	Reconstruct to major collector standards.	Low	Yes	1,040	260	Yes	
C29		2037	2037		Centennial Trail South: County or BNSF RW	South City Limits to Ferry Street (3,700 LF)	County ROW south of Jameson - improve trail with gravel or pavement. BNSF ROW north of Jameson - remove abandoned rail and ties and improve as a trail. ROW acquision or easement required.	Medium	Yes	500	125	No	
C30		2037	2037		Cascade Trail East Extension	Metcalf Street to 400' East of Township Street (4,420 LF)	Construct a shared use path on former BNSF RW	Medium	Yes	100	25	No	
S13D		2037	2037		SR9N/Centennial Trail Pedestrian/Bicycle Safety Improvements	East Side of SR9 MP 57.59 Summer Meadows Place to MP 58.30 North City Limits (4,100 LF)	Construct bicycle lane and sidewalk improvements on the east side of SR9 from Summer Meadows Court to the North City Limits, including a pedestrian crossing bridge at Brickyard Creek.	Medium	Yes	1,700	425	Yes	
NEW		2037	2037		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
NEW		NEW	3038		NEW PROJECT TBD	TBD	TBD	Low		500	125		
NEW		NEW	3038		Annual Overlay Project	TBD	Grind and overlay.	High	Yes	400	100	No	
					SUBTOTAL 2025-2038 PROJECTS					**35,308**	**9,052**		**2,600**
					SUBTOTAL 2025-2038 - TIF ELIGIBLE PROJECTS					**28,259**	**28,259**		**-**
					SUBTOTAL 2025-2038 - OTHER PROJECTS					**7,049**	**1,987**		**-**

Sedro Woolley Traffic Impact Fee Documents

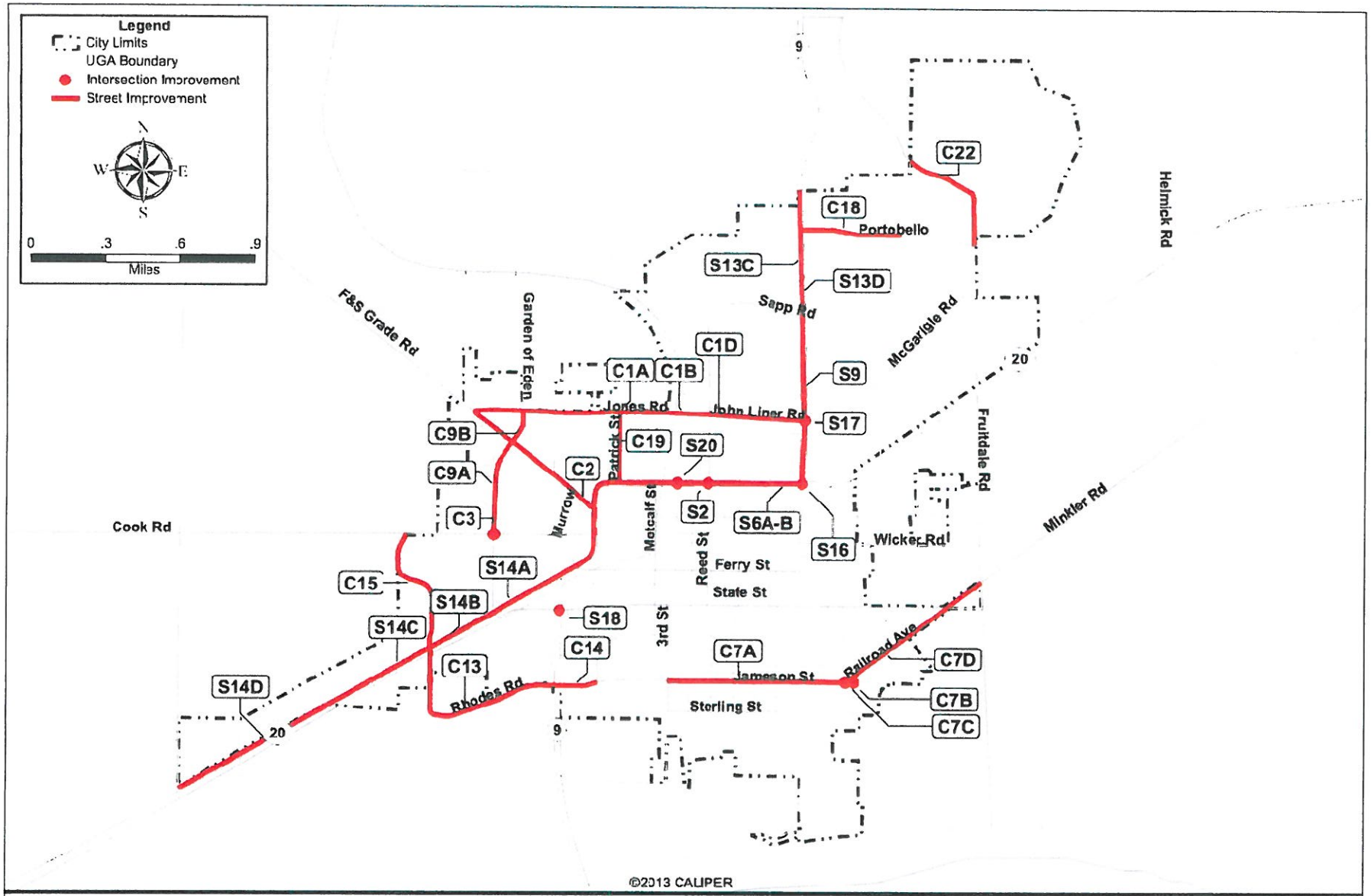


Figure 9

Impact Fee Eligible Projects

City of Sedro-Woolley

TSI Transportation Solutions, Inc.

Transportation Impact Fee Project List

ID	Project Name	Project Limits	Description	Total Est. Cost ($)
C14	Jameson Arterial Extension	SR 9 / Batey Rd	New arterial segment	3,020,000
S14A	SR20/Cascade Trail West Extension Ph.1A	Trail Rd / SR 9 South	Shared use path	575,000
S14B	SR20/Cascade Trail West Extension Ph.1B	Hodgin Rd / Trail Rd	Shared use path	288,000
C22	Fruitdale Rd Arterial Improvements	Portobello / North City Limit	Reconstruct to arterial standards incl. roundabout at Northern State Rd	2,320,000
C1B	Jones/John Liner RR Undecrossing	Sapp Rd / Reed St	New BNSF undercrossing and new arterial from E Jones Rd to John Liner Rd	7,700,000
C1C	John Liner Bike/Ped Impr	Redd St / SR 9	Complete Streets completion	555,000
C19	Patrick St Extension	Michael St/E Jones St	New major collector w/sidewalks	2,100,000
C1A	Jones Rd Improvements	F&S Grade Rd / Sapp Rd	Reconstruct to arterial section including sidewalk & shared use path	3,200,000
S16	SR20 & SR9 (Township) Intersection Impr.		Channelization and signal improvements	1,000,000
C18	Portobello Arterial Extension	Township / Cascadia	New major collector connecting Fruitdale w/ SR 9	1,700,000
S2	SR20 & Reed St Intersection Impr.		RIRO access restriction	50,000
S18	SR 9 / W State St Intersection Impr		Intersection improvements	250,000
C3	Cook Rd / Trail Rd Intersection Improvements		Intersection improvements	1,000,000
C9A	Trail Rd Arterial Extension	Cook Rd / F&S Grade	Construct new minor arterial	4,000,000
C9B	Trail Rd – Garden of Eden Rd Extension	F&S Grade / Jones Rd	Construct new minor arterial	850,000
S13C	SR9N Ped/Bike Safety Improvements	Park Cottage / N City Limits	Bike lane & sidewalk improvements	434,000
S17	Township St (SR 9) & John Liner/McGarigle Rd Intersection Improvements		Intersection improvements	1,000,000
C1D	John Liner Rd Arterial Improvements	Reed St / Township St	Reconstruct to arterial section	1,600,000
S6 A-B	SR 20 East Lane Widening & Safety Improvements	SR 9 / Fruitdale Rd	Improve and widen to 3 lanes	960,000
C7A	Jameson St Arterial Improvements	600' e/o Batey to Railroad St	Widen to arterial standards w/3 lanes, bike lane, sidewalk	3,600,000
C7B	Jameson / 11th St Intersection Improvements		Change access to RIRO	70,000
C7C	Railroad St / Jameson Intersection Improvements		Intersection improvements to include new roundabout	750,000
C7D	Railroad St Arterial Improvements	Jameson St / Fruitdale	Reconstruct to arterial standards incl. 3 lanes, bike lanes, sidewalks	2,880,000
C2	F&S Grade Rd Arterial Improvements	SR20 MP 65.16 / Jones Rd	Reconstruct to arterial standards	2,960,000
S14C	SR20/Cascade Trail West Extension Ph.2A	Holtcamp Rd/Hodgin Rd	Shared use path	600,000
S20	SR 20 / Central Ave Intersection Improvements		Intersection improvements or RIRO	150,000
S14D	SR20/Cascade Trail West Extension Ph.2B	Collins Rd/Holtcamp Rd	Shared use path	620,000

ID	Project Name	Project Limits	Description	Total Est. Cost ($)
C13	Rhodes Rd Arterial Impr	SR 9 / SR 20	Reconstruct to arterial standards incl. bike lanes, sidewalks	3,200,000
C15	Hodgin Rd Arterial Ext.	SR 20 / Cook	New collector arterial	2,225,000
S9	SR9/N Township St Arterial Improvements	SR 20 / City limits	Planning phase – reconstruct to arterial standards incl. 3 lanes, bike lanes, sidewalk	100,000
S13D	SR9 / Centennial Trail Ped/Bike Safety Improvements	Summer Meadows Pl / North City Limits	Construct bicycle lane and sidewalk improvements incl. ped crossing bridge at Brickyard Crk	1,700,000

TSI
Transportation Solutions, Inc.
8250 - 165th Avenue NE
Suite 100
Redmond, WA 98052-6628
T 425-883-4134
F 425-867-0898
www.tsinw.com

Technical Memorandum

January 3, 2019

TO: Mark A. Freiberger, PE, City of Sedro-Woolley

FROM: Andrew L. Bratlien, PE, TSI

COPY: Nathan Zylstra, PE, Reichhardt & Ebe Engineering, Inc.

SUBJECT: **JONES / JOHN LINER / TRAIL ROAD CORRIDOR PROJECTS**
TRAFFIC ANALYSIS; UPDATED 2019-01-03

The purpose of this memorandum is to document the traffic analysis for the Jones Road / John Liner Road / Trail Road corridor improvement projects in Sedro-Woolley, Washington.

PROJECT DESCRIPTION

The City of Sedro-Woolley 2018-2023 Six-Year Transportation Improvement Program identifies six projects, summarized in **Table 1**, which will create a new arterial corridor. The new corridor will consist of Trail Road, a north-south connection between SR 20 and Jones Road, and Jones Road / John Liner Road, an east-west connection from F&S Grade Road to N Township Road (SR 9). The corridor will include a new grade-separated railroad crossing east of the existing Jones Road terminus.

Table 1. Jones / John Liner / Trail Road Corridor Improvement Projects

TIP ID	Project Name	Project Limits	Description
C1A	Jones Rd Improvements	F&S Grade Rd / Sapp Rd	Reconstruct to arterial section, including sidewalk & shared use path
C1B	Jones/John Liner RR Undercrossing	Sapp Rd / Reed St	New BNSF undercrossing and new arterial from E Jones Rd to John Liner Rd
C1D	John Liner Rd Arterial Improvement	Reed St / Township St	Reconstruct to arterial section
C9A	Trail Rd Arterial Extension	Cook Rd / F&S Grade	Construct new minor arterial
C9B	Trail Rd – Garden of Eden Rd Extension	F&S Grade / Jones Rd	Construct new minor arterial
C19	Patrick St Extension	Michael St / E Jones St	New major collector w/sidewalks

This analysis will consider the impacts of intersection control alternatives at the intersections of:

- Cook Road and Trail Road
- N Township Street (SR 9) and John Liner Road/McGarigle Road

This analysis will also evaluate the following three intersections for possible left turn lane improvements:

- Trail Road / F&S Grade Road
- Trail Road / Jones Road
- Jones Road / Patrick Street

ANALYSIS METHODS AND ASSUMPTIONS

Analysis Software

Signalized and stop-controlled intersections were evaluated in Synchro 9 software using Highway Capacity Manual 2010 (HCM2010) methods. Roundabouts were evaluated in Sidra Intersection 7 software using the HCM6 capacity model and HCM2000 LOS thresholds, per Washington State Department of Transportation (WSDOT) policy guidance.

Travel Demand Forecasting

The travel demand forecasts used in this analysis were generated by the Sedro-Woolley 2036 citywide travel demand model, which includes all land use growth and transportation network improvements identified in the Sedro-Woolley 2016 Comprehensive Plan. Truck percentages are based on 2015 intersection turning movement counts.

The 2036 travel demand model forecasts traffic redistribution resulting from the improvement projects identified in Table 1. For the purposes of travel demand forecasting, the completed Jones/John Liner Road corridor was modeled as a fully built urban section.

By 2036, assuming completion of the corridor improvement projects, the Jones/John Liner Road corridor is anticipated to serve up to approximately 700 vehicles per hour (vph) during the PM peak hour, or approximately 7,000 vehicles per day (vpd) average daily traffic. Average daily traffic volume forecasts at each end of the corridor include:

- 7,000 vehicles per day (vpd) on Trail Road north of Cook Rd
- 6,300 vpd on John Liner Rd west of SR 9

By 2036, congestion along SR 20 through Sedro-Woolley will cause travel demand to spill over onto local east-west streets Ferry Street, State Street, and Jameson Road. The Jones/John Liner Road corridor will relieve congestion along SR 20 and through the local street network, reducing east-west demand by approximately 5,200 vpd.

By providing a continuous east-west connection, the Jones/John Liner Road corridor is also anticipated to reduce cross-street traffic along SR 20, improving safety and operations on the state route.

Attachment 1 shows raw 2036 PM peak hour volume after construction of the Jones/John Liner Road corridor improvements. Attachment 2 shows 2036 PM peak hour volume difference before and after construction of the corridor improvement projects. The volumes in Attachments 1 and 2 represent raw travel demand model volumes. These volumes were post-processed using observed traffic volumes for the purposes of this analysis.

Analysis Period

Travel demand forecasts represent the PM peak hour, defined as the highest four consecutive 15-minute intervals from 4:00 – 6:00 PM.

INTERSECTION CONTROL ANALYSIS

Existing Conditions

Cook Road and Trail Road

Cook Road is an east-west three-lane minor arterial within city limits. It connects I-5 to the west with SR 20 within city limits. Posted speed limit is 35 mph within city limits. Cook Road currently serves approximately 13,000 vehicles per day.

Trail Road is currently a three-lane north-south major collector which connects SR 20 with Cook Road. Existing volume is approximately 4,300 vehicles per day.

The intersection of Cook Road and Trail Road currently includes stop control on the northbound (Trail Road) approach and a continuous two-way left-turn lane through the intersection along Cook Road.

N Township Street (SR 9) and John Liner Road / McGarigle Road

N Township Street (State Route 9) is a two-lane north-south principal arterial in the vicinity of John Liner Road. SR 9 connects Sedro-Woolley with Mount Vernon to the south and with Whatcom County to the north. SR 9 is classified a Highway of Statewide Significance (HSS) by WSDOT. The route is also a designated school zone in the vicinity of John Liner Road. Posted speed limit is 20 mph during school hours and 35 mph during non-school hours. N Township Street serves approximately 8,000 vehicles per day.

John Liner Road is a two-lane east-west major collector which begins at N Reed Street to the west. The street becomes McGarigle Road at the N Township Street intersection. John Liner Road includes a 24-foot paved width with unpaved shoulders. No sidewalk or curb & gutter currently exist. John Liner Road serves approximately 700 vehicles per day. Posted speed is 25 mph.

McGarigle Road is an east-west major collector which continues from John Liner Road at N Township Street to connect to Fruitdale Road to the east. McGarigle Road consists of two 12-foot paved travel lanes with curb and gutter on both sides, a five-foot sidewalk on the south side, and a 11-foot multi-use path on the north side. McGarigle Road serves approximately 2,000 vpd. Posted speed is 25 mph.

The intersection of SR 9 and John Liner Road / McGarigle Road includes stop control on the east and west approaches.

Crash History

A collision history was compiled from incidents reported between January 1, 2013 and December 31, 2017 at both intersections.

Cook Road and Trail Road

Collision data for the intersection of Cook Road and Trail Road is summarized in **Table 2**. From 2013 through 2017, there were 13 collisions reported at the intersection. Two collisions resulted in possible injuries. No pedestrian or bicycle injuries and no fatalities were reported. The predominant collision type at the intersection is vehicles entering at angle.

Table 2. Cook Road & Trail Road Crash History, 2013-2017

Year	Fixed Object	Rear-End	Enter at Angle	Side-swipe	Backing	Ped/ Bike	PDO	Injury	Fatal	Total
2013	0	1	2	0	1	0	4	0	0	4
2014	0	0	2	0	1	0	3	0	0	3
2015	0	0	0	0	0	0	0	0	0	0
2016	0	0	2	1	0	0	2	1	0	3
2017	1	2	0	0	0	0	2	1	0	3
5-yr Total	**1**	**3**	**6**	**1**	**2**	**0**	**11**	**1**	**0**	**13**
Avg. Annual	**0.2**	**0.6**	**1.2**	**0.2**	**0.4**	**0**	**2.2**	**0.2**	**0**	**2.6**

N Township Street (SR 9) and John Liner Road / McGarigle Road

Collision data for the intersection of N Township Street and John Liner Road / McGarigle Road is summarized in **Table 3**. From 2013 through 2017, there were 2 collisions reported at the intersection. Both collisions were related to vehicles entering at angle.

Table 3. N Township St (SR 9) & John Liner Road / McGarigle Road Road Crash History, 2013-2017

Year	Fixed Object	Rear-End	Enter at Angle	Side-swipe	Backing	Ped/ Bike	PDO	Injury	Fatal	Total
2013	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0
2016	0	0	1	0	0	0	1	0	0	1
2017	0	0	1	0	0	0	0	1	0	1
5-yr Total	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**1**	**0**	**2**
Avg. Annual	**0**	**0**	**0.4**	**0**	**0**	**0**	**0.2**	**0.2**	**0**	**0.4**

Intersection Control Alternatives

Three future alternatives were studied at each intersection. All future alternatives assume construction of new street connections identified along the Trail Road / Jones Road / John Liner Road corridor, including Trail Road (Cook Road to Jones Road) and the Jones Road undercrossing.

Travel demand was assumed to be consistent across each of the alternatives, with only intersection control changing. Alternatives included:

- No Build (existing minor approach stop control)
- Roundabout
- Signal

No Build

The No Build Alternative assumes no change in intersection channelization or control. No Build delay and 95th percentile queues are summarized in **Table 4.**

Table 4. Queuing and LOS, No Build Alternative (2036 PM Peak Hour)

Intersection	Eastbound		Westbound		Northbound		Southbound		Overall[1]
	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	LOS (Delay)
Cook Rd & Trail Rd	25	A (9.1)	0	A (8.6)	1,450	F* (>999)	800	F* (>999)	F* (>999)
SR 9 & John Liner	775	F (691)	250	F (175)	0	A (8.7)	0	A (8.5)	F (691)

[1]For TWSC intersections, overall LOS and delay represent the worst (highest delay) movement. For all other intersection control types, overall LOS and delay represent the intersection average.
[2]Control delay in seconds per vehicle
*Delay exceeds the limits of the HCM2010 methodology

Both intersections will operate with LOS F on the worst movement. Northbound and southbound delay at the intersection of Cook Road and Trail Road will exceed the limits of the Highway Capacity Manual delay calculation methodology. At SR 9 and John Liner Road, eastbound (John Liner Road) delay will exceed 11 minutes per entering vehicle. These delays will limit access to and from the new corridor during most of the PM peak hour.

Roundabout

The Roundabout alternative assumed single-lane roundabouts at both intersections. Roundabout analysis assumed a 120-foot inscribed circle diameter with a single 20-foot circulating lane for each roundabout. Conceptual roundabout layouts for each intersection are attached.

Under roundabout control, the intersection of Cook Road and Trail Road will operate at LOS B with 10.1 seconds of delay per vehicle. The intersection of SR 9 and John Liner Road will operate at LOS A with 7.2 seconds of delay per vehicle. 95th percentile queues will measure 150 feet (6 vehicles) or less on all approaches of both intersections. Roundabout delay and queueing for each intersection are summarized in **Table 5.**

Table 5. Queuing and LOS, Roundabout Alternative (2036 PM Peak Hour)

Intersection	Eastbound		Westbound		Northbound		Southbound		Overall[1]
	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	LOS (Delay)
Cook Rd & Trail Rd	125	A (7.6)	125	A (11.6)	150	B (13.9)	50	A (7.8)	B (10.1)
SR 9 & John Liner	50	A (9.1)	50	A (5.6)	75	A (6.3)	75	A (9.8)	A (7.2)

[1]For TWSC intersections, overall LOS and delay represent the worst (highest delay) movement. For all other intersection control types, overall LOS and delay represent the intersection average.
[2]Control delay in seconds per vehicle

The intersection of Cook Road and Trail Road will satisfy Manual on Uniform Traffic Control Devices Signal Warrant 1 (Eight Hour Volume), Signal Warrant 2 (Four Hour Volume), and Signal Warrant 3 (Peak Hour). The intersection of N Township Road (SR 9) and John Liner Road/McGarigle Road will satisfy MUTCD Signal Warrants 2 and 3. Signal warrant reports are attached.

Intersection capacity analysis for the Signal alternative assumed widening of the SR 9 and John Liner Road intersection to provide left-turn lanes on all approaches. At the Cook Road and Trail Road intersection, analysis indicated that left-turn lanes on the north and south (Trail Road) approaches are not warranted.

Delay and queueing for each signalized intersection are summarized in **Table 6.** The intersection of Cook Road and Trail Road operates at LOS B while the intersection of SR 9 and John Liner Road/McGarigle Road operates at LOS A.

Table 6. Queuing and LOS, Signal Alternative (2036 PM Peak Hour)

Intersection	Eastbound		Westbound		Northbound		Southbound		Overall[1]
	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	95th Q (ft)	LOS (Delay)[2]	LOS (Delay)
Cook Rd & Trail Rd	L: 275 Th: 275	B (18.3)	L: 75 Th: 225	B (13.8)	400	C (26.6)	175	B (17.0)	B (19.1)
SR 9 & John Liner	L: 100 Th: 75	B (13.2)	L: 50 Th: 50	B (11.9)	L: 50 Th: 175	A (8.5)	L: 0 Th: 175	A (8.2)	A (9.9)

[1]For TWSC intersections, overall LOS and delay represent the worst (highest delay) movement. For all other intersection control types, overall LOS and delay represent the intersection average.
[2]Control delay in seconds per vehicle

TURN LANE ANALYSIS

Left-turn lane warrants were analyzed for each of three planned stop-controlled intersections along the future Trail Road / Jones Road / John Liner Road corridor:

- Trail Road and F&S Grade Road (stop control on north and south approaches)
- Trail Road and Jones Road (stop control on east and west approaches)
- Jones Road and Patrick Street (stop control on south approach)

WSDOT Design Manual left-turn lane warrants (attached) were evaluated for each of the three intersections identified above. The turn lane analysis is summarized in **Table 7**.

Table 7. Left-Turn Lane Analysis

Intersection	Approach Leg	Total DHV[1]	% Total DHV Turning Left	2036 PM LOS (Delay)[2]		Left-Turn Lane Warranted
				Without LT Lane	With LT Lane	
Trail Road & F&S Grade Road	West (EB)	50	10.0%	B (13.3)	B (14.7)	No
	East (WB)	125	24.0%	C (15.8)	B (14.5)	No
	South (NB)	665	0.8%	A (0.1)	A (0.1)	No
	North (SB)	645	3.1%	A (0.8)	A (0.8)	No
Trail Road & Jones Road	West (EB)	185	8.1%	A (1.1)	A (1.1)	No
	East (WB)	660	22.0%	A (4.5)	A (4.5)	**Yes**
	South (NB)	660	0.8%	D (27.1)	D (25.4)	No
	North (SB)	315	11.1%	D (32.7)	C (24.2)	No
Jones Road & Patrick Street	East (WB)	840	10.1%	A (2.1)	A (2.1)	**Yes**
	South (NB)	290	12.1%	B (16.1)	B (12.8)	No

[1]Design hourly volume (both directions)
[2]Average LOS and delay by approach

Left-turn lanes are warranted on the east (Jones Rd) approach of the Trail Road and Jones Road intersection, and the east (Jones Rd) approach of the Jones Road and Patrick Street intersection.

FINDINGS AND RECOMMENDATIONS

Findings and recommendations are summarized below.

- Single-lane roundabouts are the preferred intersection control alternative at the intersections of:
  - Cook Road and Trail Road
  - N Township Road (SR 9) and John Liner Road/McGarigle Road.
- A left-turn lane is warranted at the following two locations:
  - East (Jones Rd) approach of Trail Road and Jones Road intersection.
  - East (Jones Rd) approach of Jones Road and Patrick Street intersection.

Attachment 1. 2036 PM Peak Hour Volume With Jones/John Liner Road Corridor

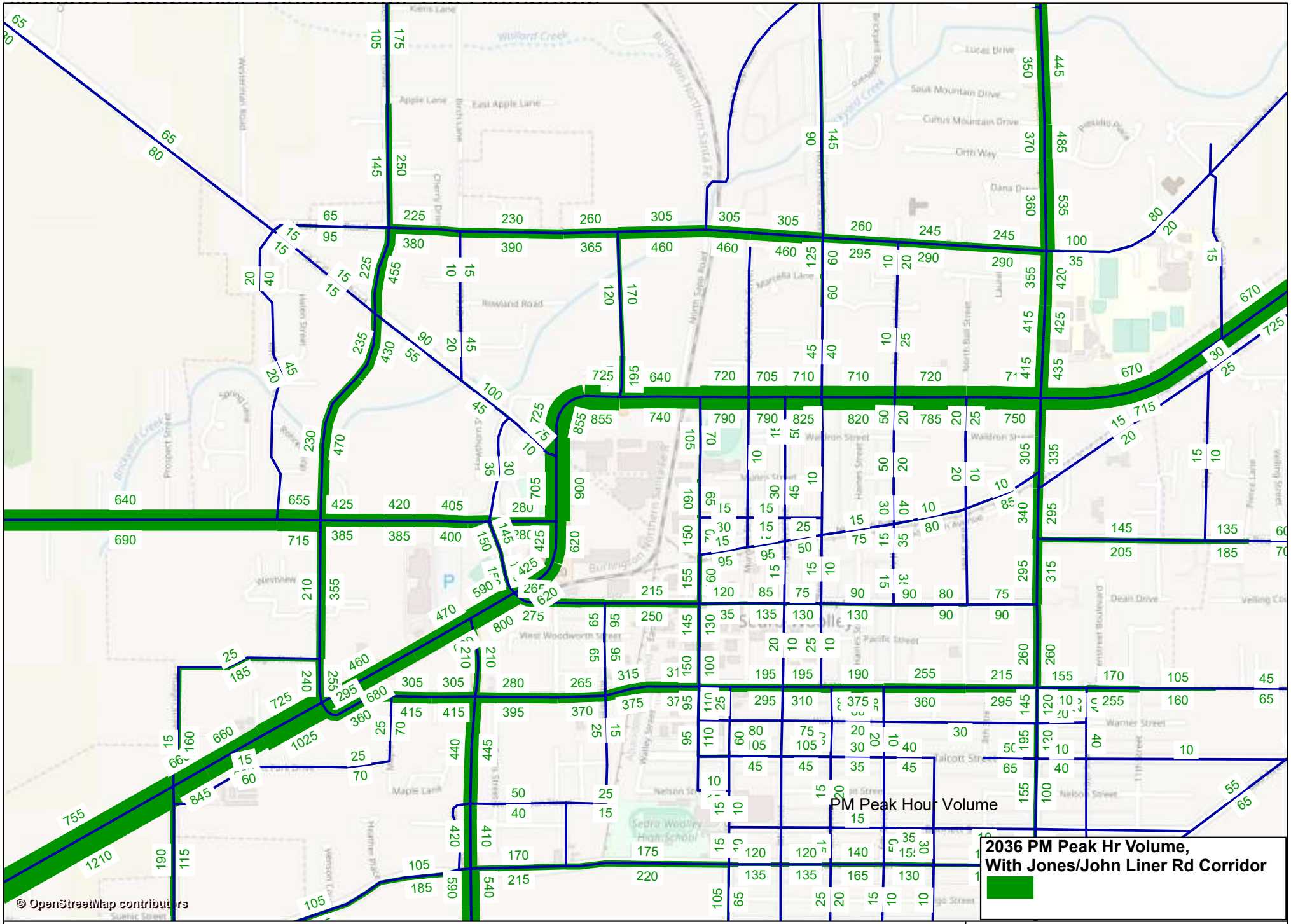
Attachment 2. 2036 PM Peak Hour Volume Difference, Before and After Jones/John Liner Road Corridor

Attachment 3. Conceptual Roundabout Layouts

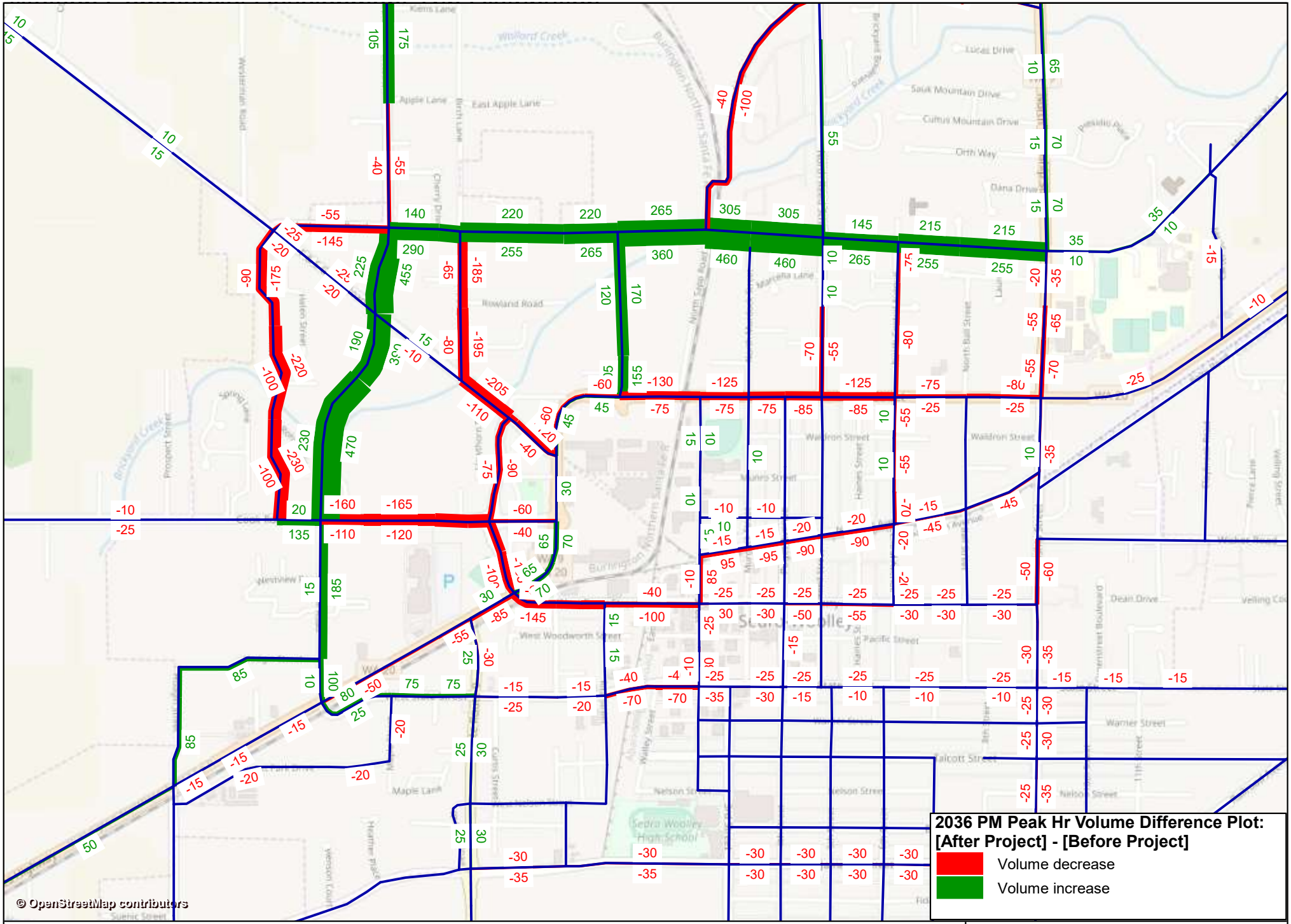
Attachment 4. Signal Warrant Reports

Attachment 5: Intersection LOS Reports

Attachment 6: Left-Turn Storage Guidelines



Total PM Peak Hour Volume with Jones/John Liner Rd Connection	1:13324
Transportation Solutions, Inc.	03.01.2019/10:54:59

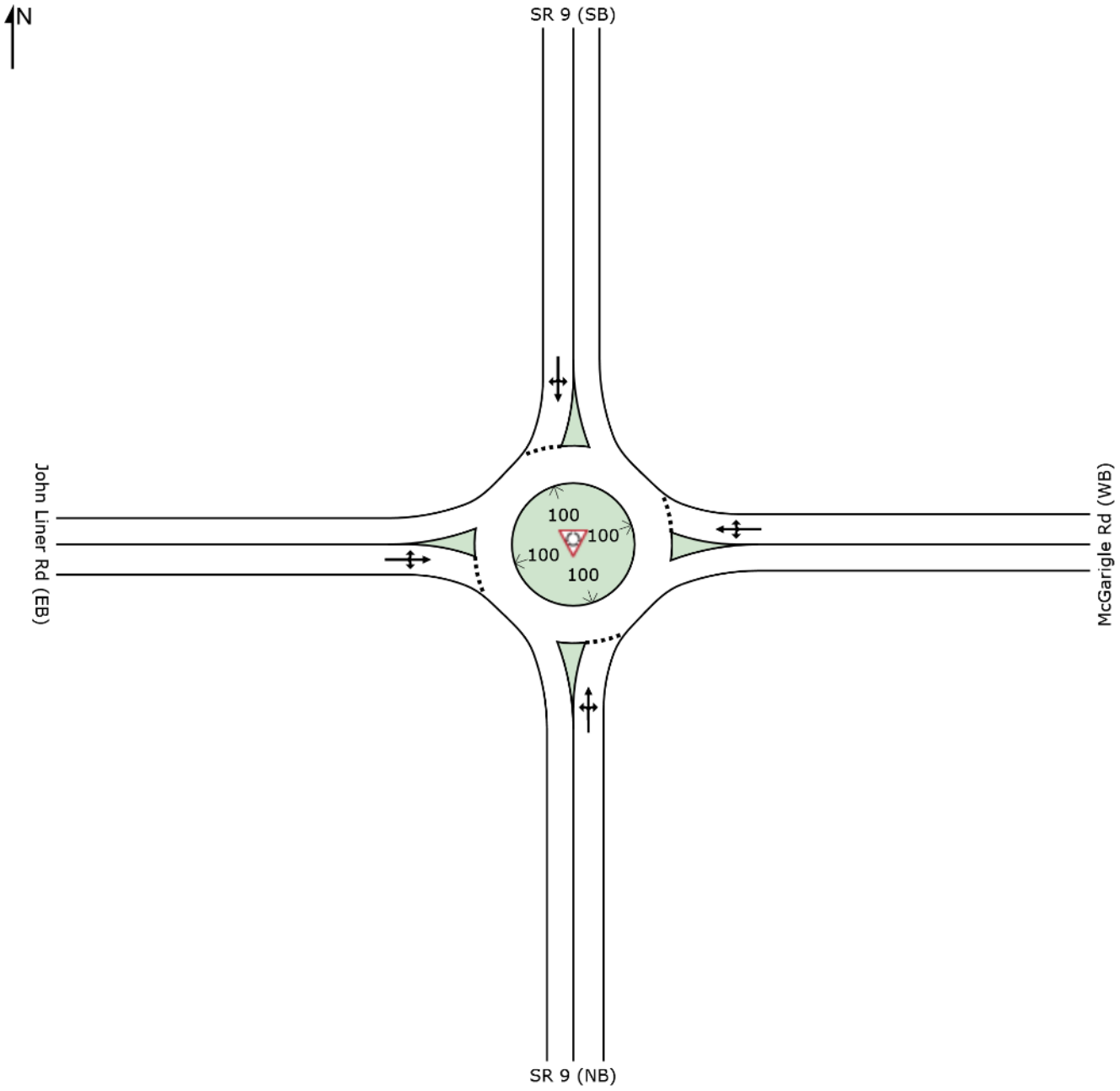


Volume Difference - 2036 Before and After Jones-John Liner Rd Improvements	1:13324
Transportation Solutions, Inc.	03.01.2019/10:47:21

SITE LAYOUT

Site: [208. SR 9 & John Liner Rd]

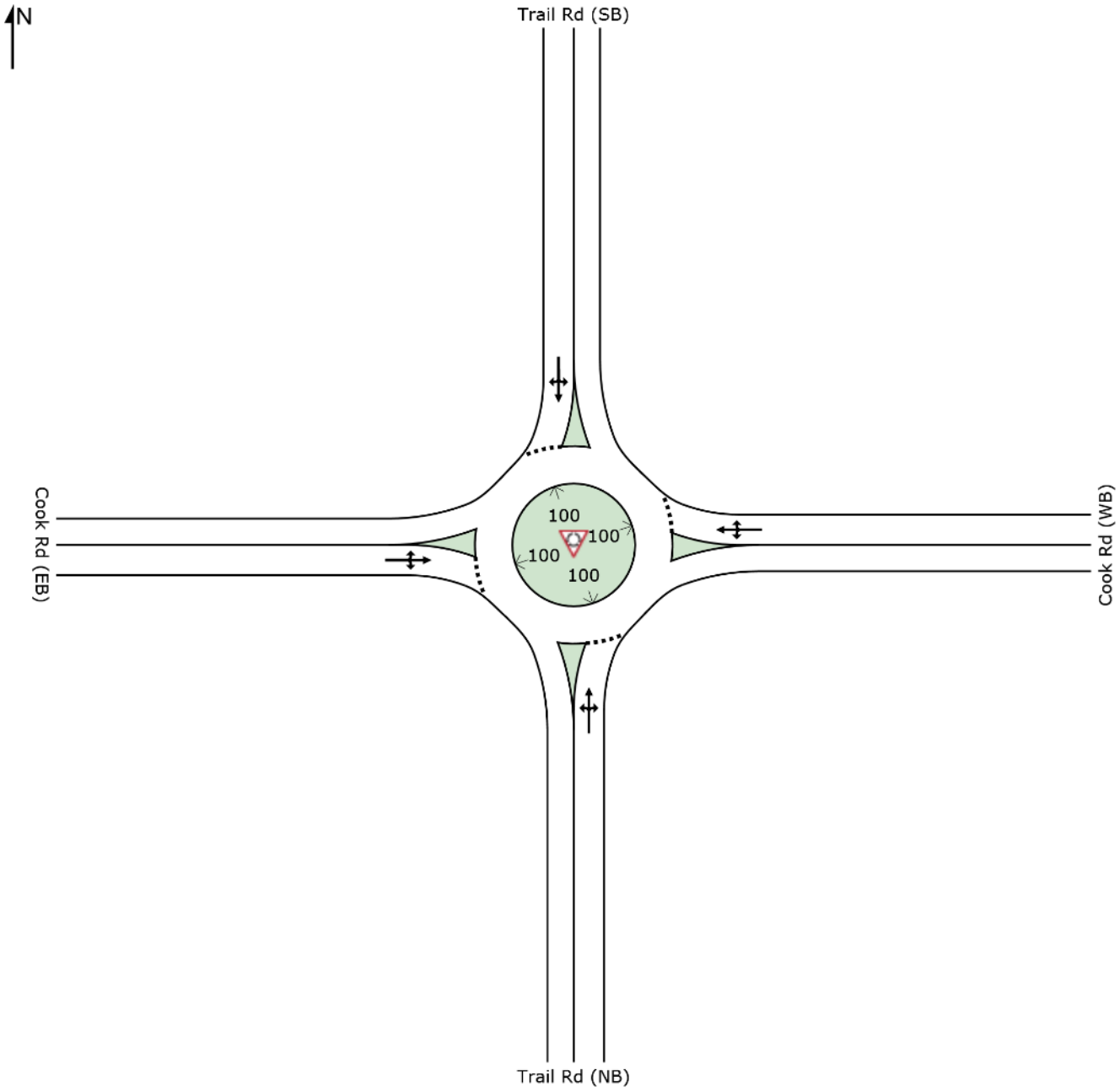
2036 With Improvement
Roundabout



SITE LAYOUT

Site: [303. Cook Rd & Trail Rd]

2036 With Improvement
Roundabout



Signal Warrants Report For Intersection 1: Cook Rd & Trail Rd

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	Yes
#2	Four Hour Vehicular Volume	Yes
#3	Peak Hour	Yes

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S, N
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	S	N
1	430	740	450	225
2	413	710	432	216
3	404	696	423	212
4	344	592	360	180
5	327	562	342	171
6	292	503	306	153
7	271	466	284	142
8	258	444	270	135
9	206	355	216	108
10	194	333	203	101
11	194	333	203	101
12	185	318	194	97
13	168	289	176	88
14	155	266	162	81
15	155	266	162	81
16	151	259	158	79
17	86	148	90	45
18	47	81	50	25
19	43	74	45	23
20	17	30	18	9
21	13	22	14	7
22	13	22	14	7
23	9	15	9	5
24	9	15	9	5

Warrant Analysis by Hour

Hour	Major Lanes		Minor Lanes		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	4	1170	2	675	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	4	1123	2	648	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	4	1100	2	635	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	4	936	2	540	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	4	889	2	513	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
6	4	795	2	459	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
7	4	737	2	426	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
8	4	702	2	405	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No
9	4	561	2	324	No	Yes	Yes	Yes	No	No	No	Yes	No	No
10	4	527	2	304	No	Yes	Yes	Yes	No	No	No	Yes	No	No
11	4	527	2	304	No	Yes	Yes	Yes	No	No	No	Yes	No	No
12	4	503	2	291	No	Yes	Yes	Yes	No	No	No	No	No	No
13	4	457	2	264	No	No	Yes	Yes	No	No	No	No	No	No
14	4	421	2	243	No	No	Yes	Yes	No	No	No	No	No	No
15	4	421	2	243	No	No	Yes	Yes	No	No	No	No	No	No
16	4	410	2	237	No	No	No	Yes	No	No	No	No	No	No
17	4	234	2	135	No	No	No	No	No	No	No	No	No	No
18	4	128	2	75	No	No	No	No	No	No	No	No	No	No
19	4	117	2	68	No	No	No	No	No	No	No	No	No	No
20	4	47	2	27	No	No	No	No	No	No	No	No	No	No
21	4	35	2	21	No	No	No	No	No	No	No	No	No	No
22	4	35	2	21	No	No	No	No	No	No	No	No	No	No
23	4	24	2	14	No	No	No	No	No	No	No	No	No	No
24	4	24	2	14	No	No	No	No	No	No	No	No	No	No
Hours Met					8	12	15	16	4	7	8	11	8	5

Warrant 3 Condition A

Orientation	S	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	7302.8	10000
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	912:50	625:00
Delay Condition Met	Yes	Yes
Volume on Minor Street Approach During Same Hour	450	225
High Minor Volume Condition Met	Yes	Yes
Total Entering Volume on All Approaches During Same Hour	1845	1845
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	Yes	Yes
Warrant Met for Intersection	**Yes**	

Signal Warrants Report For Intersection 2: SR 9 & John Liner Rd

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	Yes
#3	Peak Hour	Yes

Intersection Warrants Parameters

Major Approaches	S, N
Minor Approaches	E, W
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	S	N	E	W
1	480	405	170	325
2	461	389	163	312
3	451	381	160	306
4	384	324	136	260
5	365	308	129	247
6	326	275	116	221
7	302	255	107	205
8	288	243	102	195
9	230	194	82	156
10	216	182	77	146
11	216	182	77	146
12	206	174	73	140
13	187	158	66	127
14	173	146	61	117
15	173	146	61	117
16	168	142	59	114
17	96	81	34	65
18	53	45	19	36
19	48	41	17	33
20	19	16	7	13
21	14	12	5	10
22	14	12	5	10
23	10	8	3	7
24	10	8	3	7

Warrant Analysis by Hour

Hour	Major Lanes		Minor Lanes		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	2	885	2	495	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
2	2	850	2	475	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
3	2	832	2	466	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
4	2	708	2	396	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No
5	2	673	2	376	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No
6	2	601	2	337	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No
7	2	557	2	312	No	Yes	Yes	Yes	No	No	No	Yes	No	No
8	2	531	2	297	No	Yes	Yes	Yes	No	No	No	Yes	No	No
9	2	424	2	238	No	No	Yes	Yes	No	No	No	No	No	No
10	2	398	2	223	No	No	No	Yes	No	No	No	No	No	No
11	2	398	2	223	No	No	No	Yes	No	No	No	No	No	No
12	2	380	2	213	No	No	No	Yes	No	No	No	No	No	No
13	2	345	2	193	No	No	No	Yes	No	No	No	No	No	No
14	2	319	2	178	No	No	No	No	No	No	No	No	No	No
15	2	319	2	178	No	No	No	No	No	No	No	No	No	No
16	2	310	2	173	No	No	No	No	No	No	No	No	No	No
17	2	177	2	99	No	No	No	No	No	No	No	No	No	No
18	2	98	2	55	No	No	No	No	No	No	No	No	No	No
19	2	89	2	50	No	No	No	No	No	No	No	No	No	No
20	2	35	2	20	No	No	No	No	No	No	No	No	No	No
21	2	26	2	15	No	No	No	No	No	No	No	No	No	No
22	2	26	2	15	No	No	No	No	No	No	No	No	No	No
23	2	18	2	10	No	No	No	No	No	No	No	No	No	No
24	2	18	2	10	No	No	No	No	No	No	No	No	No	No
Hours Met					6	8	9	13	0	3	5	8	4	0

Warrant 3 Condition A

Orientation	E	W
Total Stopped Delay Per Vehicle on Minor Approach (s)	128.8	551.6
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	6:04	49:47
Delay Condition Met	Yes	Yes
Volume on Minor Street Approach During Same Hour	170	325
High Minor Volume Condition Met	Yes	Yes
Total Entering Volume on All Approaches During Same Hour	1380	1380
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	Yes	Yes
Warrant Met for Intersection	**Yes**	

MOVEMENT SUMMARY

Site: [208. SR 9 & John Liner Rd]

2036 With Improvement
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: SR 9 (NB)											
3	L2	90	3.0	0.464	11.3	LOS B	3.2	82.4	0.55	0.57	35.9
8	T1	393	3.0	0.464	5.3	LOS A	3.2	82.4	0.55	0.57	35.8
18	R2	56	3.0	0.464	5.4	LOS A	3.2	82.4	0.55	0.57	34.7
Approach		539	3.0	0.464	6.3	LOS A	3.2	82.4	0.55	0.57	35.7
East: McGarigle Rd (WB)											
1	L2	73	3.0	0.228	13.5	LOS B	1.4	35.7	0.71	0.77	34.6
6	T1	79	3.0	0.228	7.5	LOS A	1.4	35.7	0.71	0.77	34.6
16	R2	39	3.0	0.228	7.6	LOS A	1.4	35.7	0.71	0.77	33.6
Approach		191	3.0	0.228	9.8	LOS A	1.4	35.7	0.71	0.77	34.4
North: SR 9 (SB)											
7	L2	17	9.0	0.410	11.3	LOS B	2.6	70.1	0.51	0.56	36.2
4	T1	270	9.0	0.410	5.3	LOS A	2.6	70.1	0.51	0.56	36.2
14	R2	169	9.0	0.410	5.4	LOS A	2.6	70.1	0.51	0.56	35.1
Approach		455	9.0	0.410	5.6	LOS A	2.6	70.1	0.51	0.56	35.8
West: John Liner Rd (EB)											
5	L2	208	3.0	0.339	11.7	LOS B	2.0	52.4	0.57	0.70	34.9
2	T1	34	3.0	0.339	5.7	LOS A	2.0	52.4	0.57	0.70	34.9
12	R2	124	3.0	0.339	5.8	LOS A	2.0	52.4	0.57	0.70	33.8
Approach		365	3.0	0.339	9.1	LOS A	2.0	52.4	0.57	0.70	34.5
All Vehicles		1551	4.8	0.464	7.2	LOS A	3.2	82.4	0.56	0.62	35.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [303. Cook Rd & Trail Rd]

2036 With Improvement
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Trail Rd (NB)											
3	L2	214	7.0	0.601	17.1	LOS B	5.7	150.0	0.89	1.01	32.7
8	T1	141	7.0	0.601	11.1	LOS B	5.7	150.0	0.89	1.01	32.7
18	R2	115	7.0	0.601	11.2	LOS B	5.7	150.0	0.89	1.01	31.8
Approach		469	7.0	0.601	13.9	LOS B	5.7	150.0	0.89	1.01	32.5
East: Cook Rd (WB)											
1	L2	89	5.0	0.559	16.3	LOS B	5.0	128.8	0.86	0.96	33.8
6	T1	333	5.0	0.559	10.4	LOS B	5.0	128.8	0.86	0.96	33.8
16	R2	26	5.0	0.559	10.4	LOS B	5.0	128.8	0.86	0.96	32.8
Approach		448	5.0	0.559	11.6	LOS B	5.0	128.8	0.86	0.96	33.8
North: Trail Rd (SB)											
7	L2	21	2.0	0.278	13.2	LOS B	1.8	45.9	0.74	0.76	35.7
4	T1	57	2.0	0.278	7.3	LOS A	1.8	45.9	0.74	0.76	35.6
14	R2	156	2.0	0.278	7.3	LOS A	1.8	45.9	0.74	0.76	34.5
Approach		234	2.0	0.278	7.8	LOS A	1.8	45.9	0.74	0.76	34.9
West: Cook Rd (EB)											
5	L2	323	2.0	0.610	11.0	LOS B	5.2	132.7	0.55	0.59	35.4
2	T1	339	2.0	0.610	5.1	LOS A	5.2	132.7	0.55	0.59	35.3
12	R2	109	2.0	0.610	5.1	LOS A	5.2	132.7	0.55	0.59	34.2
Approach		771	2.0	0.610	7.6	LOS A	5.2	132.7	0.55	0.59	35.2
All Vehicles		1922	3.9	0.610	10.1	LOS B	5.7	150.0	0.73	0.80	34.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	10	5	30	10	35	5	405	20	20	190	5
Future Vol, veh/h	5	10	5	30	10	35	5	405	20	20	190	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	5	33	11	38	5	440	22	22	207	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	740	726	210	723	717	451	212	0	0	462	0	0
Stage 1	254	254	-	461	461	-	-	-	-	-	-	-
Stage 2	486	472	-	262	256	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	333	351	830	342	355	608	1358	-	-	1099	-	-
Stage 1	750	697	-	581	565	-	-	-	-	-	-	-
Stage 2	563	559	-	743	696	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	299	343	830	326	346	608	1358	-	-	1099	-	-
Mov Cap-2 Maneuver	299	343	-	326	346	-	-	-	-	-	-	-
Stage 1	747	683	-	579	563	-	-	-	-	-	-	-
Stage 2	516	557	-	712	682	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	14.5	0.1	0.8
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1358	-	-	299	426	326	520	1099	-	-
HCM Lane V/C Ratio	0.004	-	-	0.018	0.038	0.1	0.094	0.02	-	-
HCM Control Delay (s)	7.7	-	-	17.3	13.8	17.3	12.6	8.3	-	-
HCM Lane LOS	A	-	-	C	B	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.3	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	16.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	85	5	145	65	40	5	150	290	35	65	10
Future Vol, veh/h	15	85	5	145	65	40	5	150	290	35	65	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	92	5	158	71	43	5	163	315	38	71	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	114	0	0	97	0	0	577	557	95	775	538	93
Stage 1	-	-	-	-	-	-	127	127	-	409	409	-
Stage 2	-	-	-	-	-	-	450	430	-	366	129	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1475	-	-	1496	-	-	428	439	962	315	450	964
Stage 1	-	-	-	-	-	-	877	791	-	619	596	-
Stage 2	-	-	-	-	-	-	589	583	-	653	789	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1475	-	-	1496	-	-	334	388	962	131	398	964
Mov Cap-2 Maneuver	-	-	-	-	-	-	334	388	-	131	398	-
Stage 1	-	-	-	-	-	-	867	782	-	612	533	-
Stage 2	-	-	-	-	-	-	452	521	-	344	780	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	4.5	25.4	24.2
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	334	639	1475	-	-	1496	-	-	131	432
HCM Lane V/C Ratio	0.016	0.748	0.011	-	-	0.105	-	-	0.29	0.189
HCM Control Delay (s)	16	25.5	7.5	-	-	7.7	-	-	43.4	15.3
HCM Lane LOS	C	D	A	-	-	A	-	-	E	C
HCM 95th %tile Q(veh)	0.1	6.7	0	-	-	0.4	-	-	1.1	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	185	30	110	65	70	35	80	350	50	15	240	150
Future Volume (veh/h)	185	30	110	65	70	35	80	350	50	15	240	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.97		0.98	1.00		0.98	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1845	1845	1900	1743	1743	1900
Adj Flow Rate, veh/h	208	34	124	73	79	39	90	393	56	17	270	169
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	9	9	9
Cap, veh/h	499	108	395	454	371	183	454	781	111	451	495	310
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	1236	338	1234	1181	1158	572	933	1574	224	870	998	625
Grp Volume(v), veh/h	208	0	158	73	0	118	90	0	449	17	0	439
Grp Sat Flow(s),veh/h/ln	1236	0	1573	1181	0	1730	933	0	1799	870	0	1623
Q Serve(g_s), s	6.4	0.0	3.3	2.2	0.0	2.2	3.2	0.0	7.3	0.6	0.0	8.1
Cycle Q Clear(g_c), s	8.6	0.0	3.3	5.5	0.0	2.2	11.3	0.0	7.3	7.9	0.0	8.1
Prop In Lane	1.00		0.78	1.00		0.33	1.00		0.12	1.00		0.38
Lane Grp Cap(c), veh/h	499	0	503	454	0	554	454	0	893	451	0	806
V/C Ratio(X)	0.42	0.00	0.31	0.16	0.00	0.21	0.20	0.00	0.50	0.04	0.00	0.54
Avail Cap(c_a), veh/h	1040	0	1191	970	0	1310	1040	0	2023	998	0	1825
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.9	0.0	11.2	13.3	0.0	10.8	11.5	0.0	7.4	10.0	0.0	7.6
Incr Delay (d2), s/veh	0.6	0.0	0.4	0.2	0.0	0.2	0.2	0.0	0.4	0.0	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.1	0.0	2.6	1.3	0.0	1.9	1.5	0.0	6.5	0.3	0.0	6.6
LnGrp Delay(d),s/veh	14.5	0.0	11.5	13.4	0.0	11.0	11.7	0.0	7.8	10.0	0.0	8.2
LnGrp LOS	B		B	B		B	B		A	B		A
Approach Vol, veh/h		366			191			539			456	
Approach Delay, s/veh		13.2			11.9			8.5			8.2	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.6		17.9		25.6		17.9
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		49.0		33.0		49.0		33.0
Max Q Clear Time (g_c+I1), s		13.3		10.6		10.1		7.5
Green Ext Time (p_c), s		8.3		2.9		8.4		2.9

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

HCM 2010 analysis cannot be performed with phasing conflicts.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	147	437	70	70	450	99	275	305	150	72	70	125
Future Volume (veh/h)	147	437	70	70	450	99	275	305	150	72	70	125
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1810	1810	1900	1792	1792	1900	1810	1810	1810
Adj Flow Rate, veh/h	155	460	74	74	474	104	289	321	158	76	74	132
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	4	4	4	5	5	5	6	6	6	5	5	5
Cap, veh/h	264	625	100	281	537	118	549	370	182	213	402	342
Arrive On Green	0.07	0.41	0.41	0.04	0.37	0.37	0.15	0.33	0.33	0.05	0.22	0.22
Sat Flow, veh/h	1740	1536	247	1723	1438	316	1707	1135	559	1723	1810	1538
Grp Volume(v), veh/h	155	0	534	74	0	578	289	0	479	76	74	132
Grp Sat Flow(s),veh/h/ln	1740	0	1783	1723	0	1754	1707	0	1694	1723	1810	1538
Q Serve(g_s), s	4.7	0.0	22.4	2.3	0.0	27.2	10.9	0.0	23.5	3.0	2.9	6.4
Cycle Q Clear(g_c), s	4.7	0.0	22.4	2.3	0.0	27.2	10.9	0.0	23.5	3.0	2.9	6.4
Prop In Lane	1.00		0.14	1.00		0.18	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	264	0	725	281	0	655	549	0	552	213	402	342
V/C Ratio(X)	0.59	0.00	0.74	0.26	0.00	0.88	0.53	0.00	0.87	0.36	0.18	0.39
Avail Cap(c_a), veh/h	273	0	788	288	0	715	604	0	710	213	512	436
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.7	0.0	22.2	18.2	0.0	25.9	19.7	0.0	28.0	26.1	27.9	29.2
Incr Delay (d2), s/veh	3.1	0.0	3.3	0.5	0.0	11.8	0.8	0.0	9.1	1.0	0.2	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.4	0.0	17.2	2.0	0.0	21.7	8.9	0.0	18.1	2.7	2.7	5.1
LnGrp Delay(d),s/veh	22.8	0.0	25.5	18.7	0.0	37.7	20.5	0.0	37.0	27.1	28.1	29.9
LnGrp LOS	C		C	B		D	C		D	C	C	C
Approach Vol, veh/h		689			652			768			282	
Approach Delay, s/veh		24.9			35.5			30.8			28.7	
Approach LOS		C			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	32.8	7.6	39.9	17.2	23.6	10.5	37.0
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	4.0	37.0	4.0	39.0	16.0	25.0	7.0	36.0
Max Q Clear Time (g_c+I1), s	5.0	25.5	4.3	24.4	12.9	8.4	6.7	29.2
Green Ext Time (p_c), s	0.0	3.3	0.0	6.3	0.3	4.0	0.0	3.8

Intersection Summary	
HCM 2010 Ctrl Delay	30.1
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	404	0	0	416	434	20	0	255	0	0	0
Future Vol, veh/h	75	404	0	0	416	434	20	0	255	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	4	4	0	0	7	7	7	0	7	0	0	0
Mvmt Flow	84	454	0	0	467	488	22	0	287	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	955	0	-	-	-	0	1333	1577	454
Stage 1	-	-	-	-	-	-	622	622	-
Stage 2	-	-	-	-	-	-	711	955	-
Critical Hdwy	4.14	-	-	-	-	-	6.47	6.5	6.27
Critical Hdwy Stg 1	-	-	-	-	-	-	5.47	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.47	5.5	-
Follow-up Hdwy	2.236	-	-	-	-	-	3.563	4	3.363
Pot Cap-1 Maneuver	712	-	0	0	-	-	166	111	596
Stage 1	-	-	0	0	-	-	526	482	-
Stage 2	-	-	0	0	-	-	478	339	-
Platoon blocked, %		-			-	-			
Mov Cap-1 Maneuver	712	-	-	-	-	-	140	0	596
Mov Cap-2 Maneuver	-	-	-	-	-	-	140	0	-
Stage 1	-	-	-	-	-	-	443	0	-
Stage 2	-	-	-	-	-	-	478	0	-

Approach	EB	WB	NB
HCM Control Delay, s	1.7	0	17.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	140	596	712	-	-	-
HCM Lane V/C Ratio	0.161	0.481	0.118	-	-	-
HCM Control Delay (s)	35.6	16.5	10.7	0	-	-
HCM Lane LOS	E	C	B	A	-	-
HCM 95th %tile Q(veh)	0.6	2.6	0.4	-	-	-

Intersection	
Int Delay, s/veh	74.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	250	5	324	107	0	0	0	0	229	0	20
Future Vol, veh/h	0	250	5	324	107	0	0	0	0	229	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	5	5	9	9	0	0	0	0	3	0	3
Mvmt Flow	0	269	5	348	115	0	0	0	0	246	0	22

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	274	0	0	1083	1085	115
Stage 1	-	-	-	-	-	-	811	811	-
Stage 2	-	-	-	-	-	-	272	274	-
Critical Hdwy	-	-	-	4.19	-	-	6.43	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	5.43	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.43	5.5	-
Follow-up Hdwy	-	-	-	2.281	-	-	3.527	4	3.327
Pot Cap-1 Maneuver	0	-	-	1250	-	0	~ 239	218	935
Stage 1	0	-	-	-	-	0	435	396	-
Stage 2	0	-	-	-	-	0	771	687	-
Platoon blocked, %		-	-		-				
Mov Cap-1 Maneuver	-	-	-	1250	-	-	~ 168	0	935
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 168	0	-
Stage 1	-	-	-	-	-	-	435	0	-
Stage 2	-	-	-	-	-	-	542	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	6.8	267.1
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1250	-	168	935
HCM Lane V/C Ratio	-	-	0.279	-	1.466	0.023
HCM Control Delay (s)	-	-	9	0	289.7	8.9
HCM Lane LOS	-	-	A	A	F	A
HCM 95th %tile Q(veh)	-	-	1.1	-	15.7	0.1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	310	325	105	85	320	25	205	135	110	20	55	150
Future Volume (veh/h)	310	325	105	85	320	25	205	135	110	20	55	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1810	1810	1900	1900	1776	1900	1900	1863	1900
Adj Flow Rate, veh/h	323	339	109	89	333	26	214	141	115	21	57	156
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	5	5	5	7	7	7	2	2	2
Cap, veh/h	477	676	217	398	834	65	298	172	131	80	191	441
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	1018	1343	432	911	1657	129	586	436	331	75	483	1116
Grp Volume(v), veh/h	323	0	448	89	0	359	470	0	0	234	0	0
Grp Sat Flow(s),veh/h/ln	1018	0	1775	911	0	1787	1353	0	0	1675	0	0
Q Serve(g_s), s	22.7	0.0	13.2	5.6	0.0	9.8	17.5	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	32.5	0.0	13.2	18.8	0.0	9.8	25.3	0.0	0.0	7.8	0.0	0.0
Prop In Lane	1.00		0.24	1.00		0.07	0.46		0.24	0.09		0.67
Lane Grp Cap(c), veh/h	477	0	894	398	0	900	601	0	0	711	0	0
V/C Ratio(X)	0.68	0.00	0.50	0.22	0.00	0.40	0.78	0.00	0.00	0.33	0.00	0.00
Avail Cap(c_a), veh/h	534	0	994	449	0	1000	720	0	0	851	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	22.2	0.0	13.0	19.2	0.0	12.1	21.9	0.0	0.0	16.8	0.0	0.0
Incr Delay (d2), s/veh	2.9	0.0	0.4	0.3	0.0	0.3	4.7	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.0	0.0	10.6	2.6	0.0	8.5	15.4	0.0	0.0	6.5	0.0	0.0
LnGrp Delay(d),s/veh	25.2	0.0	13.4	19.5	0.0	12.4	26.6	0.0	0.0	17.0	0.0	0.0
LnGrp LOS	C		B	B		B	C			B		
Approach Vol, veh/h		771			448			470			234	
Approach Delay, s/veh		18.3			13.8			26.6			17.0	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		35.0		43.6		35.0		43.6
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		38.0		44.0		38.0		44.0
Max Q Clear Time (g_c+I1), s		27.3		34.5		9.8		20.8
Green Ext Time (p_c), s		3.8		5.1		5.8		8.4

Intersection Summary	
HCM 2010 Ctrl Delay	19.1
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	3	0	3	0	0	3	3	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	94	90	94	90	94	94	94	94	90
Heavy Vehicles, %	2	2	2	0	2	0	2	4	4	1	1	2
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	4	4	4	7	4	6	1	0	0	3	0	0
Stage 1	1	1	-	3	3	-	-	-	-	-	-	-
Stage 2	3	3	-	4	1	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	1017	891	1080	1018	891	1083	1622	-	-	1626	-	-
Stage 1	1022	895	-	1025	893	-	-	-	-	-	-	-
Stage 2	1020	893	-	1024	895	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	1015	889	1078	1013	889	1078	1622	-	-	1622	-	-
Mov Cap-2 Maneuver	1015	889	-	1013	889	-	-	-	-	-	-	-
Stage 1	1022	895	-	1023	891	-	-	-	-	-	-	-
Stage 2	1018	891	-	1022	895	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1622	-	-	-	-	1622	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0	-	-

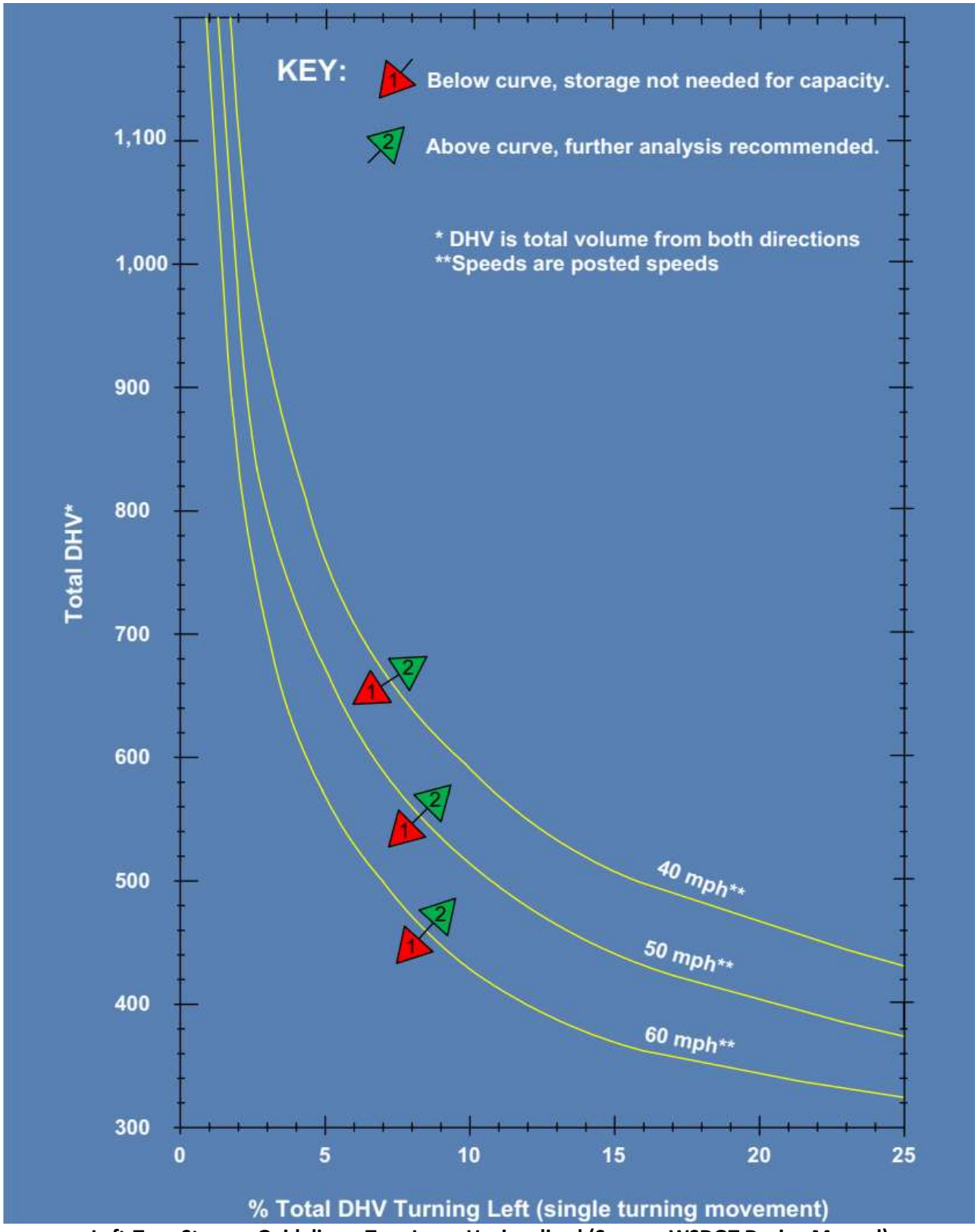
Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	365	40	85	260	35	130
Future Vol, veh/h	365	40	85	260	35	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	150	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	397	43	92	283	38	141

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	440	0	886	419
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	467	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1120	-	315	634
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	631	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1120	-	289	634
Mov Cap-2 Maneuver	-	-	-	-	413	-
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	579	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	413	634	-	-	1120	-
HCM Lane V/C Ratio	0.092	0.223	-	-	0.082	-
HCM Control Delay (s)	14.6	12.3	-	-	8.5	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.8	-	-	0.3	-



Left-Turn Storage Guidelines: Two-Lane, Unsignalized (Source: WSDOT Design Manual)