Traffic Impact Analysis

MJS INVESTORS PARCELS

Prepared for:
MJS Investors

December 2024

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Introduction

The purpose of this traffic impact analysis (TIA) is to identify potential transportation-related impacts to the surrounding street network associated with the development of the proposed MJS Investors Parcels development in Arlington, WA.

Project Description

The project site is located south of 172nd Street NE (State Route [SR] 531) west of SR 9 in Arlington (see Figure 1). The project is located within the Lindsay Sub area and constitutes the first phase of development within the planned area. The proposed project would consist of 177 single family homes. Access to the site is proposed via three access roads on 172nd Street NE:

- 79th Avenue NE will be paved as part of the project's construction process to provide access to the site. Full access will be permitted at 172nd Street NE.
- The main access road will be across from 80th Drive NE. The intersection with 172nd Street NE will be improved to provide a single-lane roundabout.
- A right-in/right-out access road at 172nd Street NE will be provided between 80th Drive NE and 85th Avenue NE.

Figure 2 illustrates the preliminary site plan. It is anticipated that the development would be constructed and operating by the end of 2029.

Study Scope

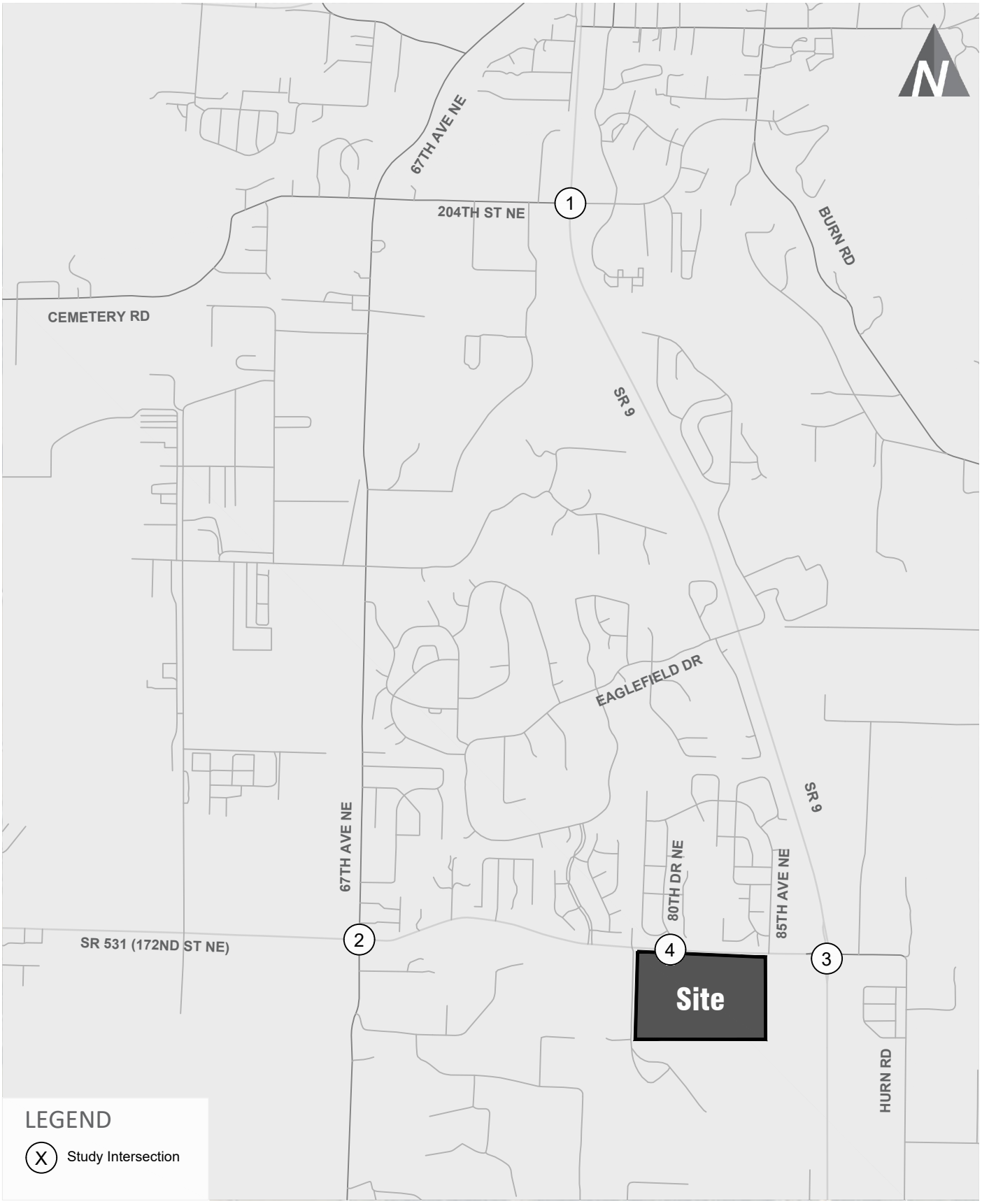
The scope of this analysis is based on coordination with City staff and consistent with the City of Arlington's *Traffic Analysis Procedures & Checklist (Revised 10/2013).* The following intersections were identified for study during the weekday PM peak hour by City staff:

1. 67th Avenue NE/172nd Street NE (SR 531)
2. 80th Drive NE-Project Access/172nd Street NE (SR 531)
3. SR 9/204th Street NE
4. SR 9/172nd Street NE (SR 531)

A. West Project Access (79th Avenue NE)/172nd Street NE (SR 531)

B. East Project Access/172nd Street NE (SR 531)

The analysis includes a review of existing conditions in the vicinity of the project site, including the street network, non-motorized facilities, transit service, existing and future (2029) without-project peak hour traffic volumes, traffic operations, and traffic safety. Future (2029) with-project conditions are evaluated by adding site-generated traffic to future (2029) without-project volumes and were then compared to future (2029) without-project conditions to identify the relative impacts the proposed project has on the surrounding transportation system.



Project Site Vicinity and Study Intersections

FIGURE 1

Lindsay Sub Area

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Project Site Plan

Lindsay Sub Area

FIGURE
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Existing & Future Without-Project Conditions

This section describes existing and future (2029) without-project conditions within the study area. Study area characteristics are provided for the existing street network, existing and future without-project peak hour traffic volumes, traffic operations, and traffic safety.

Street System

The following describes the existing street network within the vicinity of the proposed project and any anticipated changes resulting from planned improvements.

Existing Inventory

Existing characteristics of 67th Avenue NE, 80th Drive NE, SR 9, 204th Street NE, and 172nd Street NE (SR 531) near the project site are described below.

67th Avenue NE is a 3-lane roadway classified as a minor arterial with a posted speed limit of 35 mph. Sidewalks are provided on both sides of the roadway. No parking or bike lanes are available.

80th Drive NE is a local road with a posted speed limit of 25 mph. Sidewalks are provided in both sides of the roadway; however, no bike lanes are available.

SR-9 is a highway with a posted speed limit of 45 miles per hour close to the project site. Current channelization along SR-9 is predominantly 2 lanes with turn lanes at major intersections. This is the primary north/south roadway connection near the project site. Sidewalks and bike lanes are not available close to the site.

204th Street NE is classified as an arterial, with a posted speed limit is 20 mph east of SR-9 and 35 mph west of SR-9. Sidewalks are provided on both sides of the roadway. No bike lanes are available.

172nd Street NE (SR 531) is a highway of regional significance with a posted speed limit of 35 miles per hour. The current channelization along 172nd Street NE is predominantly 2 lanes east of 67th Avenue NE. There are no sidewalks, bike lanes, or on-street parking available on both sides along 172nd Street NE east of 67th Avenue NE.

Transit service in the study area is provided by Community Transit with service primarily along 172nd Street NE (SR 531) and Smokey Point Boulevard. The nearest bus stop to the project is located at Smokey Point Boulevard/172nd Street NE approximately 2.75 miles away and is served by routes 201 and 202. Routes 201 and 202 provide service between the Smokey Point Transit Center in Arlington and the Lynnwood Transit Center. Transit service for routes 201 and 202 is provided 7 days a week with AM and PM peak hour headways of approximately 40 minutes on weekdays and 60 minutes on weekends.

Planned Improvements

Based on a review of the *City of Arlington Comprehensive Plan's Six Year Transportation Improvement Plan (2024-2029)* and Washington Department of Transportation (WSDOT) 2024-2027 Statewide Transportation Program (STIP), there are two planned roadway improvements in the study area, which include:

- **172nd Street NE (SR 531) Widening, Phase I:** Widening of 172nd Street NE (SR 531) from 43rd Avenue NE to 67th Avenue NE to a four-lane facility with two travel lanes in each direction. The improvement project would install roundabouts at the 51st Avenue NE, 59th Avenue NE, and 67th Avenue NE intersections along 172nd Street NE (SR 531). The project is completely funded by WSDOT with construction beginning in 2025

and completed in 2026. The roundabout at 67th Avenue NE & 172nd St NE is assumed as part of the future without-project analysis.

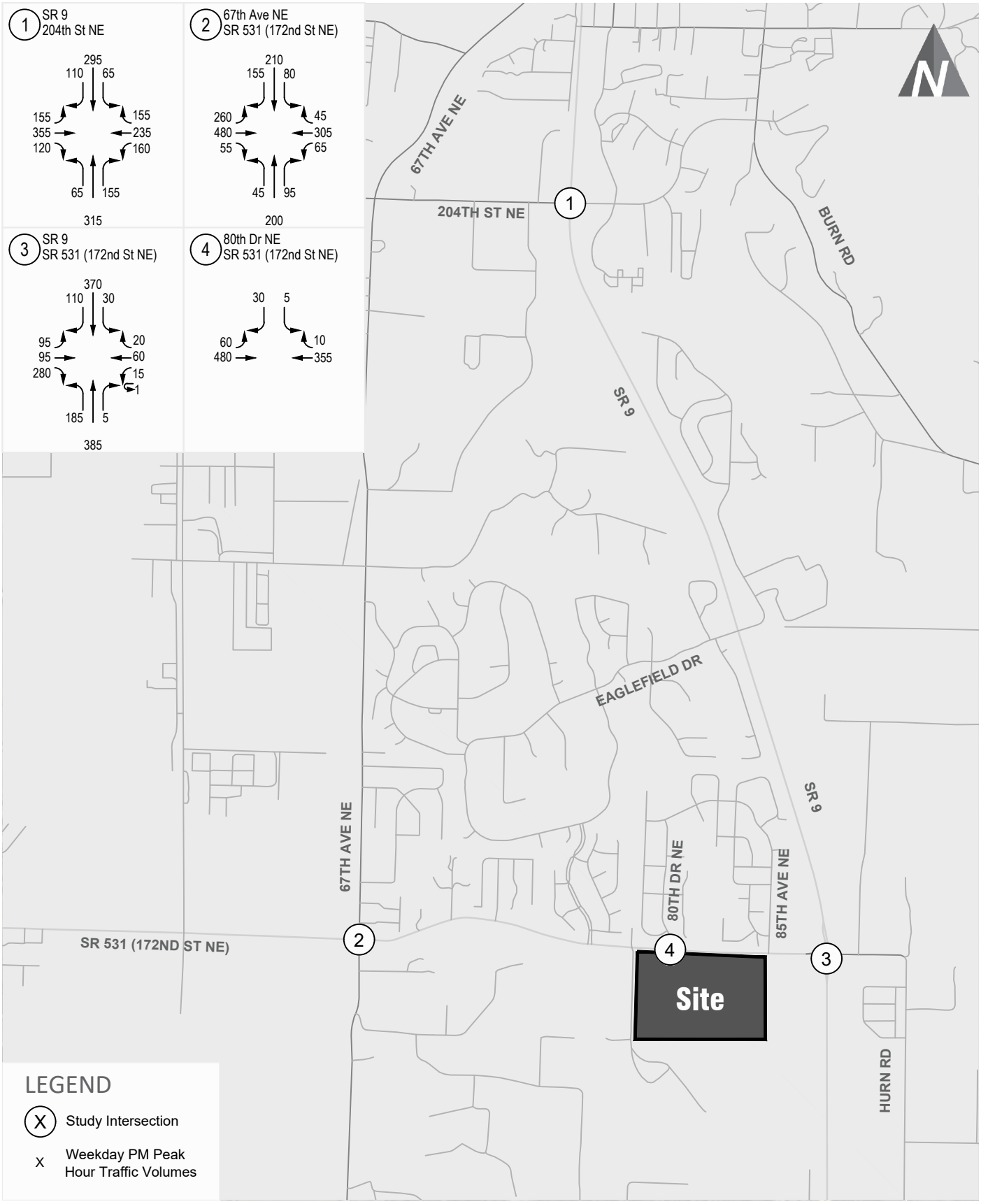
- **172nd Street NE (SR 531) Widening, Phase II:** Widening of 172nd Street NE (SR 531) between 67th Avenue NE and SR-9 to a four-lane facility with two travel lanes in each direction. The timing of this widening project is anticipated following the project's 2029 opening year, such that this improvement was not assumed in the future analysis.

Traffic Volumes

The following summarizes the traffic volumes for existing and future without-project conditions.

Existing Traffic Volumes

Existing weekday PM peak period (4-6 p.m.) traffic counts were collected in June 2024 and November 2024. Figure 3 illustrates the existing weekday peak hour traffic volumes at the study intersections. Volumes are rounded to the nearest 5 vehicles to account for the daily fluctuations in traffic volumes. Detailed traffic counts are provided in Appendix A.



Existing (2024) Peak Hour Volumes

Lindsay Sub Area

FIGURE
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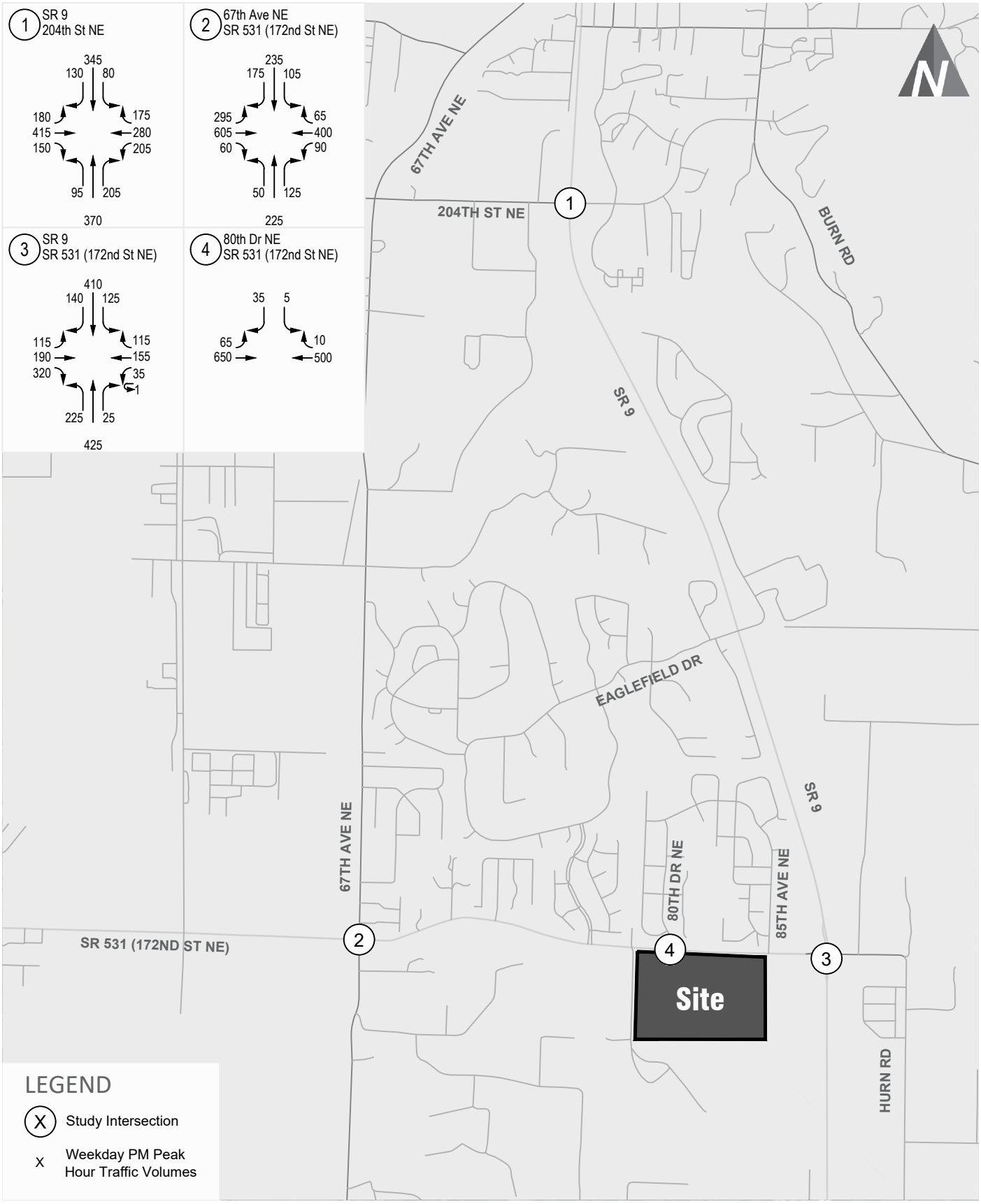
Future Without-Project Traffic Volumes

Future (2029) without-project PM peak hour traffic volumes were forecasted by applying an annual growth rate to existing traffic volumes and adding traffic from "pipeline" development projects that would also contribute traffic to study intersections. An annual growth rate of 2 percent was applied to existing study intersection traffic volumes to estimate 2029 horizon year background traffic growth, as coordinated with City of Arlington staff. Six pipeline projects were identified by the City to be included in the analysis which include:

- The **Allen Townhomes** development would construct 43 single-family attached residential units on the north side of 172nd Street NE, east of SR 9. The project is anticipated to be constructed and occupied by 2028.
- The **Amber Grove** development would construct 84 single-family attached residential units along the west side of SR-9, south of 204th Street NE and east of 74th Avenue NE. The project is anticipated to be constructed and occupied by 2028.
- The **Arlington Crossroads** development would construct a shopping center, a gas station, and a coffee/donut shop with a drive-through. The project is located at the northeast corner of the SR 9/172nd Street NE intersection. The project was planned to be constructed and occupied by 2023 but has not yet been constructed as of December 2024.
- The **Harmony at Arlington** development would construct 60 single-family townhomes. The project is located north of 204th Street NE on the west side of SR 9. The project is anticipated to be constructed and occupied by 2027.
- The **Wet Rabbit Car Wash** development would construct a car wash at the southeast corner of the SR 9/204th Street NE intersection. The project is anticipated to be constructed and occupied by the end of 2025.
- The **Zahradnik** development would construct 334 residential units with 51,500 square feet of commercial space. The project is located along the north side of 172nd Street NE between 85th Avenue NE and SR 9. The project is anticipated to be constructed and occupied by 2026.

The forecast future (2029) without-project weekday PM peak hour traffic volumes are shown in Figure 4.



Future (2029) Without-Project Peak Hour Volumes

Lindsay Sub Area

FIGURE 1

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Traffic Operations

The operational characteristics of an intersection are determined by calculating the intersection level of service (LOS). At signalized and roundabout intersections, LOS is measured in average control delay per vehicle and is typically reported using the intersection delay. At unsignalized side-street, stop-controlled intersections, LOS is measured by the average delay on the worst-movement of the intersection. Traffic operations and average vehicle delay for an intersection can be described qualitatively with a range of levels of service (LOS A through LOS F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Appendix B contains a detailed explanation of LOS criteria and definitions.

For the operations analysis of existing conditions at the signalized study intersections, signal timing and phasing information was obtained from the WSDOT and City of Arlington. Future (2029) analysis parameters such as channelization was maintained with the exception of the planned roundabout installation at the 67th Avenue NE/172nd Street NE intersection as noted above as well as signal timing optimization of splits (cycle lengths and offsets were maintained along corridors).

Weekday PM peak hour traffic operations for existing and future without-project conditions were evaluated at the study intersections based on the procedures identified in the *Highway Capacity Manual* 7th Edition, unless otherwise noted for signal timing constraints, and were evaluated using *Synchro 12*. *Synchro 12* is a software program that uses *HCM* methodology to evaluate intersection LOS and average vehicle delays. Roundabout controlled intersections were evaluated utilizing *Sidra 9.1* and the WSDOT methodology for analyzing roundabouts. Results for the existing and future without-project operations analyses are summarized in Table 1. Detailed LOS worksheets for each intersection analysis are included in Appendix C.

The City of Arlington and the WSDOT intersections have an LOS Standard of LOS D for the study area intersections. For the roundabout controlled intersections, a volume to capacity (v/c) ratio less than or equal to 0.90 is also generally targeted.

Table 1. Existing and Future (2029) Without-Project Weekday PM Peak Hour Intersection LOS Summary

		Existing			Future 2029 Without-Project		
Intersection	**Traffic Control (Existing/Future)**	**LOS[1]**	**Delay[2]**	**WM[3] or v/c[4]**	**LOS**	**Delay**	**WM or v/c**
1. SR 9/204th St NE	Signal	C	33	-	D	44	-
2. 67th Ave NE/172nd St NE (SR 531)	Signal/Roundabout[5]	D	47	-	A	8	0.59
3. SR 9/172nd St NE (SR 531)	Roundabout	A	7	0.32	A	8	0.48
4. 80th Dr NE/172nd St NE (SR 531)	TWSC	C	20	SBL	D	30	SBL

Note: TWSC = two-way stop controlled. **Bold** indicates the intersection is operating below standard.
1. Level of Service (A – F) as defined by the *Highway Capacity Manual* (HCM) 7th Edition (TRB).
2. Average delay per vehicle in seconds.
3. Worst movement reported for two-way stop-controlled intersections. SBL = southbound left movement.
4. Volume to capacity ratio reported for roundabouts.
5. Roundabout with planned improvements.

As shown in Table 1, all intersections operate at LOS D or better during the PM peak hour under both existing and future (2029) conditions, meeting the LOS standard.

Traffic Safety

Recent collision records were reviewed within the study area to identify existing traffic safety issues at the study intersections. The most recent complete five-year summary of accident data

from the WSDOT is for the period between January 1, 2019 and December 31, 2023. This information is summarized in Table 2.

Table 2. Five-Year Collision Summary – 2019 to 2023

Location	Number of Collisions					Total	Annual Average
	2019	2020	2021	2022	2023		
1. SR 9/204th St NE	6	5	4	6	2	23	4.60
2. 67th Ave NE/172nd St NE (SR 531)	8	4	8	2	5	27	5.40
3. SR 9/172nd St NE (SR 531)	2	2	3	2	0	9	1.80
4. 80th Dr NE/172nd St NE (SR 531)	1	0	0	0	0	1	0.20

Source: WSDOT, 2024
Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

As shown in Table 2, the study intersections had between 1 and 6 collisions reported per year on average during the review period. The collisions in the study area were primarily rear end collisions resulting in property damage only. One fatal collision was reported at the SR 9/204th St NE intersection, which involved a driver under the influence of alcohol striking 2 pedestrians. Additional non-fatal collisions involving a pedestrian or cyclist also occurred at SR 204th St NE and 67th Ave NE/SR 531.

As identified above, there are planned SR 531 corridor improvements that will result in widening between 43rd Avenue NE and 67th Avenue NE, as well as implementing a roundabout at the 67th Ave NE/NE 172nd St intersection. These changes are anticipated to relieve congestion by adding capacity, which is a common cause of rear-end collisions. Additionally, studies have shown that roundabouts result in reductions in the overall severity of collision relative to traditional signalized intersections. These reductions are achieved through lower travel speeds through roundabouts, yielding behavior of roundabouts, and one-way travel. As such, it is anticipated that the collision rate would improve at 67th Ave NE/NE 172nd St in the future. There are no current improvements planned at the SR 9/204th St NE intersection.

Project Impacts

This section of the report documents the proposed project's impacts on the surrounding street network and study intersections. First, estimated traffic volumes generated by the proposed project are distributed and assigned to adjacent streets and intersections within the study area for the weekday PM peak hour study period. Next, project trips are added to future without-project traffic volumes and any potential impact to traffic operations. Site specific items are also discussed.

Trip Generation

Trip generation for the proposed project was calculated based on trip rates using the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition, 2021). ITEs Single-Family Detached Housing (LU #215) was assumed for the proposed project. There is no existing use on the proposed site.

Table 3 shows the weekday vehicle trips generated by the proposed project. The detailed trip generation calculations are included in Appendix D.

Table 3. Estimated Weekday Vehicle Trip Generation

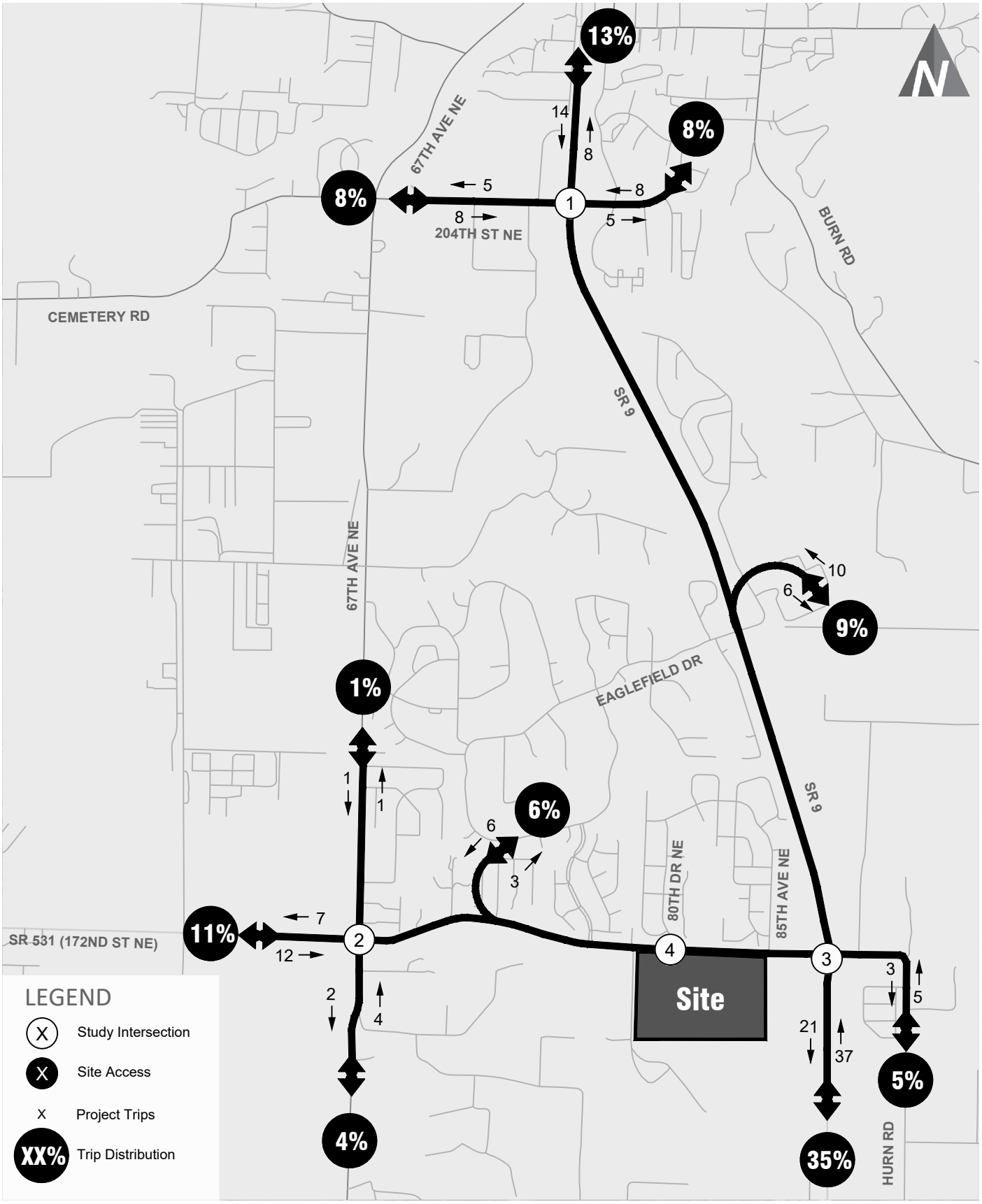
Land Use[1]	Size	Daily Trips	PM Peak Hour		
			In	Out	Total
Proposed					
Single-Family Detached Housing (LU #210)	177 du	1,706	105	61	166
Net New Total		**1,706**	**105**	**61**	**166**

Note: du = dwelling units, sf = square feet
1. Average trip rates and equations from ITE *Trip Generation Manual*, 11th Edition (2021).

As shown in Table 3, the proposed project is estimated to generate 1,706 weekday daily trips with 166 occurring in the PM peak hour.

Trip Distribution & Assignment

Trip distribution patterns developed for the project were based on existing travel patterns and coordination with City of Arlington staff. Figure 5 illustrates the vehicle trip distribution and assignment for the proposed project.



Project Trip Distribution and Assignment

FIGURE 5

Lindsay Sub Area

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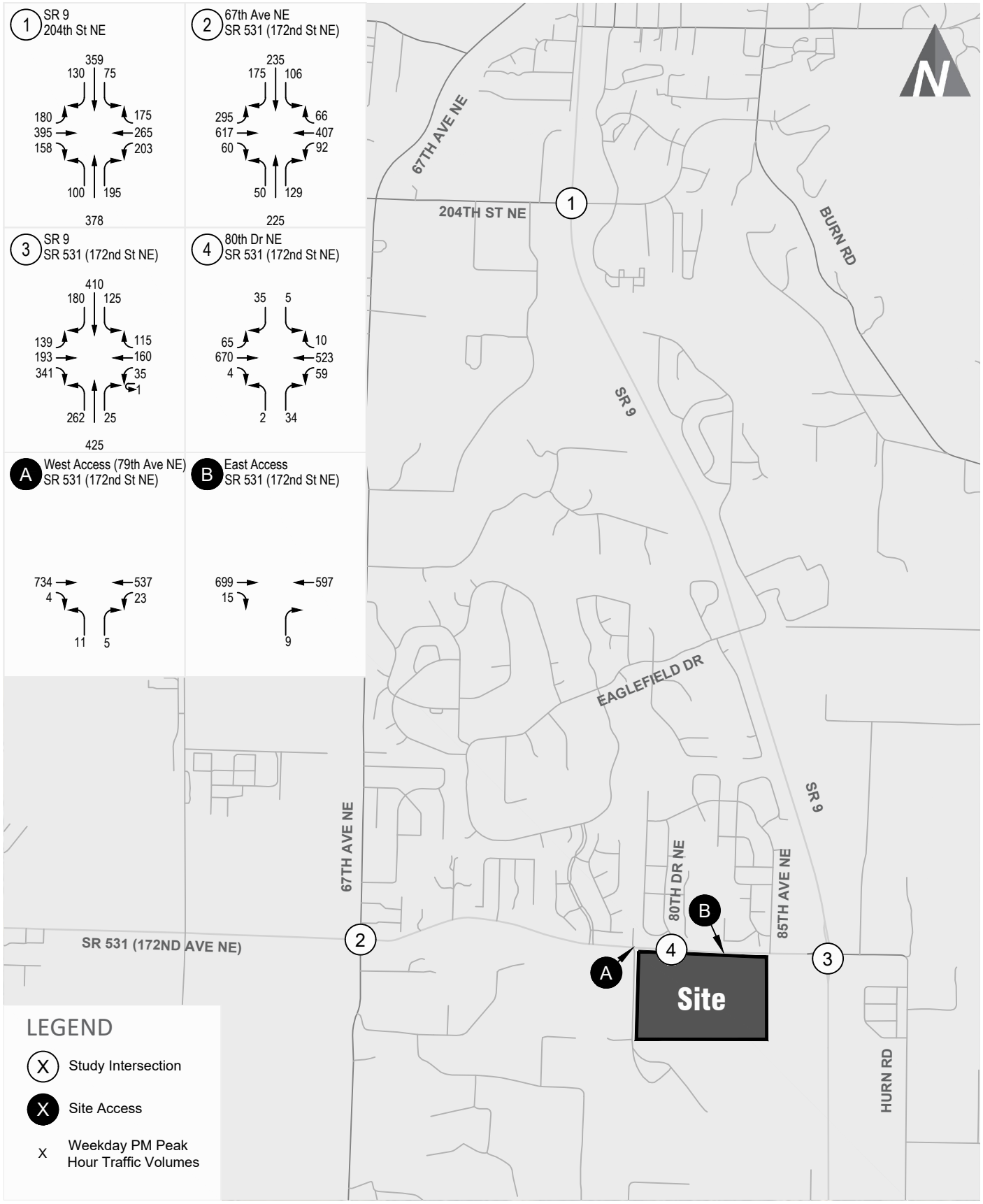
Traffic Volume Impact

The assigned project generated traffic was added to the future without-project weekday PM peak hour traffic volumes at the study intersections under future 2029 conditions. The future (2029) with-project weekday PM peak hour traffic volumes are shown in Figure 6. Table 4 summarizes the project share of traffic volumes at the study intersections during the weekday PM peak hour under the future 2029 conditions.

Table 4. Future (2029) Weekday PM Peak Hour Traffic Volume Impacts at Study Intersections

	PM Peak Hour Total Entering Vehicles			
Intersection	2029 Without-Project	Project Trips	2024 With-Project	Project Share
1. SR 9/204th St NE	2,565	48	2,613	1.8%
2. 67th Ave NE/172nd St NE (SR 531)	2,430	27	2,457	1.1%
3. SR 9/172nd St NE (SR 531)	2,281	130	2,411	5.4%
4. 80th Dr NE/172nd St NE (SR 531)	1,265	142	1,407	10.1%

As shown in Table 4, the proposed project is estimated to account for less than 6 percent of the total weekday PM peak hour traffic at the majority of study intersections, with the exception of the central site access at 80th Dr NE/172nd St NE, where the proposed project is estimated to account for approximately 10% of the total weekday PM peak hour traffic. Traffic volumes fluctuate day-to-day and the anticipated traffic increase at study intersections are within the range of typical daily traffic fluctuations.



Future (2029) With-Project Peak Hour Volumes

Lindsay Sub Area

FIGURE 6

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Traffic Operations

The following section summarizes the future with-project LOS at the study intersections relative to the without-project conditions to identify project-related impacts. Intersection parameters such as channelization and intersection control applied to the future with-project analyses were consistent with those used in the evaluation of future without-project conditions. A comparison of the future (2029) without-project and with-project weekday PM peak hour traffic operations are summarized in Table 5. Detailed LOS worksheets are provided in Appendix C.

Table 5. Future (2029) Weekday PM Peak Hour Intersection LOS Summary

Intersection	Traffic Control (Future/With-Project)	Future 2029 Without-Project			Future 2029 With-Project		
		LOS[1]	Delay[2]	WM[3] or v/c[4]	LOS	Delay	WM or v/c
1. SR 9/204th St NE	Signal	D	44	-	D	47	-
2. 67th Ave NE/172nd St NE (SR 531)	Roundabout	A	8	0.59	A	8	0.59
3. SR 9/172nd St NE (SR 531)	Roundabout	A	8	0.48	B	11	0.61
4. 80th Dr NE/172nd St NE (SR 531)	TWSC /Roundabout[5]	D	30	SBL	A	6	0.68
A. West Access (79th Ave NE)/172nd St NE (SR 531)	TWSC	-	-	-	C	17	NB
B. East Access/172nd St NE (SR 531)	TWSC	-	-	-	B	14	NB

Note: TWSC = two-way stop-controlled. **Bold** indicates the intersection is operating below standard.
1. Level of Service (A – F) as defined by the *Highway Capacity Manual* (HCM) 7th Edition (TRB)
2. Average delay per vehicle in seconds.
3. Worst movement reported for two-way stop-controlled intersections. SBL = southbound left movement.
4. Volume to capacity ratio reported for roundabouts.
5. Single-lane roundabout assumed at project completion.

As shown in Table 5, all study intersections continue functioning at an acceptable LOS under with-project conditions with increases in delay of 3 seconds or less. All roundabouts that are planned to be completed by 2029 function with an acceptable v/c ratio below 0.90.

Site Access

Access to the site is proposed via three driveways on the south side of 172nd Street NE. Full access on the western end of the site would be created along the existing 79th Ave NE, which would be paved as part of the project. A central access would be created as a south leg at the 80th Drive NE/172nd Street NE intersection, and a roundabout is planned at this intersection as part of this project. A third access point would be constructed at the east end of the site. This east access would be right in/right out access only.

The future (2029) with-project weekday PM peak hour traffic volumes at the site access are shown in Figure 7 which are assumed for the analysis. The traffic operations at the proposed project's site accesses are reviewed below.

Traffic Operations

As noted above, the west site access is assumed and evaluated as a full access driveway, while the east site access is assumed and evaluated as a right in/right out access only. The operations as summarized in Table 5 above show the west site access functioning at LOS C with 17 seconds of delay, and the east site access would function at LOS B with 14 seconds of delay.

80th Drive NE-Project Access/172nd Street Roundabout

Upon project completion, a roundabout is planned to be constructed at the 80th Drive NE/172nd Street intersection to provide full access. The roundabout will be constructed to have

one circulating lane, along with one inbound and outbound lane in each direction at the project opening.

Widening of 172nd Street to a 4-lane roadway is planned to be constructed after the project's estimated completion date of 2029. Frontage improvements will reflect the ultimate configuration of the roundabout as much as feasible to minimize the scope of reconstruction when the SR 531 Phase II improvements are constructed.

Mitigation

The project impacts to the surrounding transportation system would be mitigated through the City of Arlington, Snohomish County and WSDOT impact fee programs.

Transportation Mitigation Fees

To mitigate impacts of the proposal on the surrounding transportation system, the developer would be required to pay impact fees to three jurisdictions: the City of Arlington, Snohomish County, and WSDOT based on current interlocal agreements that have been established between these entities. The following provides an estimate only, the final fees will be calculated at time of permit issuance.

City of Arlington

The City of Arlington traffic mitigation fees are currently $3,355 per PM peak hour trip. Based on the anticipated trip generation of 166 primary trips the resulting City of Arlington impact fee would be **$556,930** ($3,355/trip x 166 trips). The fee rate is subject to annual increases and will be based on the adopted rates at the time of building permit issuance.

Snohomish County

Snohomish County has an interlocal agreement with the City of Arlington. Per the Snohomish County Traffic Worksheet and Traffic Study Requirements for Developments in the City of Arlington, the percentage of trips impacting County Streets was determined to be 70 percent. Per SCC 30.66B.330 the fee for residential uses within the urban growth area of TSA A is $185 per average daily trip (ADT). The resulting fee was estimated to be approximately **$220,927** (70% x 1,706 ADT x $185 per ADT). The fee rate is subject to annual increases and will be based on the adopted rates at the time of building permit issuance.

WSDOT

Per the interlocal agreement with WSDOT, project-related impacts can be mitigated through the payment of a flat fee of $36 per ADT or a proportional share based on the WSDOT projects currently planned. Based on the project distribution, the project would impact the WSDOT projects on 172nd Street NE (SR 531); however, those projects have been identified as funded. As such no impact fees would be paid to WSDOT.

Findings and Conclusions

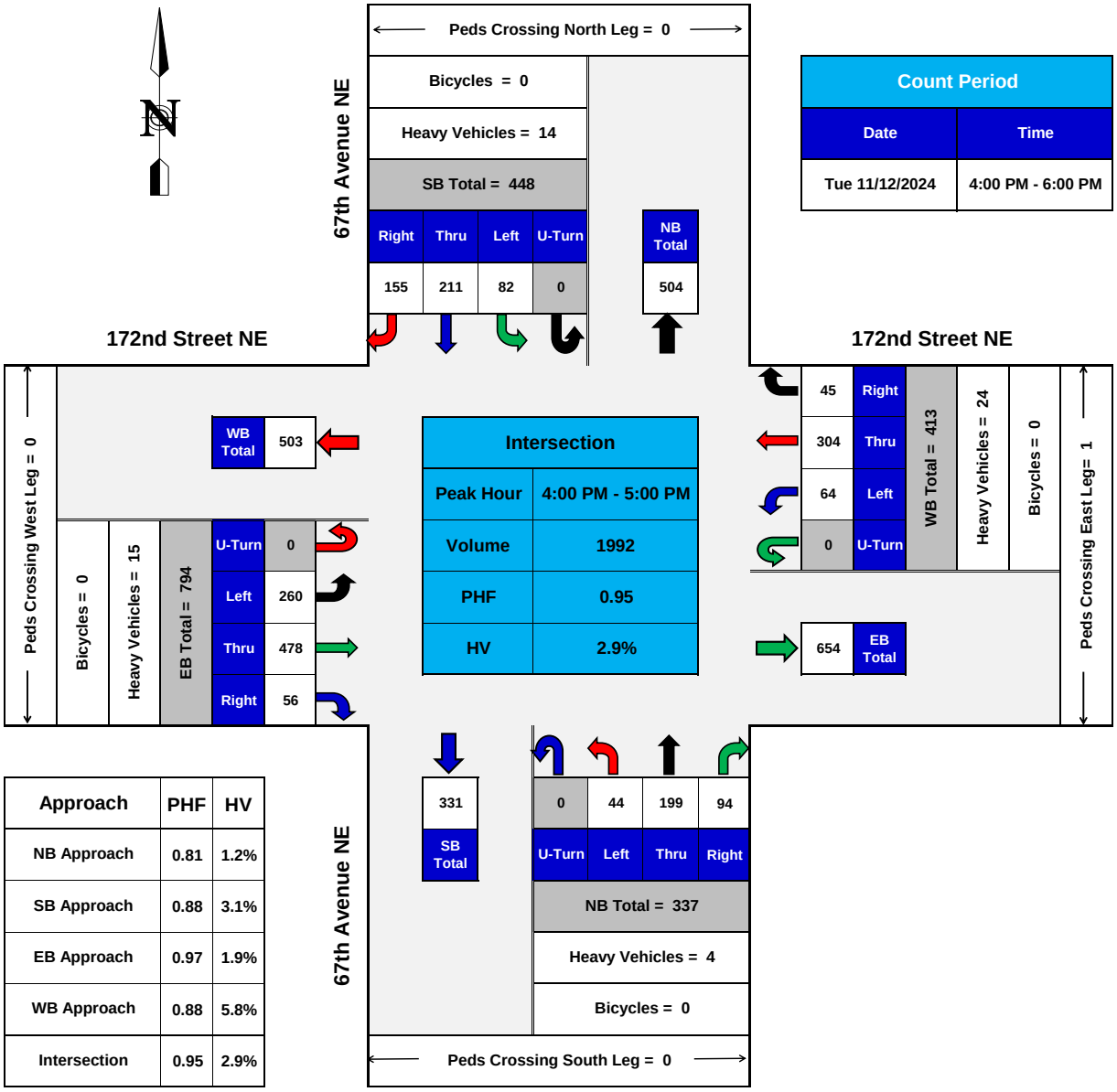
This transportation impact analysis summarizes the transportation impacts associated with the proposed MJS Investors Parcels development in Arlington, WA.

- The proposed project would consist of 177 single family homes and is estimated to generate 1,706 weekday daily trips with 166 occurring in the PM peak hour.
- Upon project completion, a roundabout is planned to be constructed at the 80th Drive NE/172nd Street intersection to provide full access. The roundabout will be constructed to have one circulating lane, along with one inbound and outbound lane in each direction at the project opening. Widening of 172nd Street to a 4-lane roadway is planned to be constructed after the project's estimated completion date of 2029. Frontage improvements will reflect the ultimate configuration of the roundabout as much as feasible to minimize the scope of reconstruction when the SR 531 Phase II improvements are constructed.
- Under future (2029) with-project PM peak hour conditions, all study intersections continue functioning at an acceptable LOS under with-project conditions with increases in delay of 3 seconds or less. Access to the site is proposed via three driveways on the south side of 172nd Street NE. All driveways are forecast to operate at an acceptable LOS.
- The developer would be required to pay transportation mitigation fees. The mitigation fees are estimated to total $777,857 (including both Arlington and Snohomish County). The final fees are calculated at the time of building permit issuance.

Appendix A: Traffic Counts

67th Avenue NE @ 172nd Street NE

Arlington, WA



Count Period	
Date	Time
Tue 11/12/2024	4:00 PM - 6:00 PM

Approach	PHF	HV
NB Approach	0.81	1.2%
SB Approach	0.88	3.1%
EB Approach	0.97	1.9%
WB Approach	0.88	5.8%
Intersection	0.95	2.9%

PHF = Peak Hour Factor
HV = Heavy Vehicles

TURNING MOVEMENTS DIAGRAM

PEAK HOUR SUMMARY

TRAFFIC DATA GATHERING

TRAFFIC DATA GATHERING

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: 67th Avenue NE @ 172nd Street NE
Arlington, WA

DATE OF COUNT: Tue. 11/12/2024
START OF COUNT: 4:00 PM
TIME OF COUNT: 4:00 PM - 6:00 PM

COUNTED BY: TDG
DATE OF REDUCTION: 11/14/2024
DURATION OF COUNT (Hrs): 2

TIME INTERVAL ENDING AT	FROM NORTH ON (Southbound) 67th Avenue NE							FROM SOUTH ON (Northbound) 67th Avenue NE							FROM EAST ON (Westbound) 172nd Street NE							FROM WEST ON (Eastbound) 172nd Street NE							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
04:15 PM	0	0	5	0	26	56	46	0	0	1	0	9	51	13	0	0	7	0	22	85	11	0	0	5	0	68	120	16	523
04:30 PM	0	0	5	0	17	41	39	0	0	3	0	12	60	32	0	0	5	0	13	74	11	0	0	4	0	58	112	13	482
04:45 PM	0	0	2	0	24	65	36	0	0	0	0	10	44	27	0	0	6	0	15	74	11	0	0	2	0	70	123	12	511
05:00 PM	0	0	2	0	15	49	34	0	0	0	0	13	44	22	1	0	6	0	14	71	12	0	0	4	0	64	123	15	476
05:15 PM	0	0	4	0	26	40	49	0	0	1	0	8	40	22	2	0	5	0	4	61	12	0	0	5	0	75	131	20	488
05:30 PM	0	0	3	0	16	36	39	0	0	0	0	7	43	22	0	0	3	0	12	65	14	0	0	3	0	64	137	13	468
05:45 PM	0	0	2	0	12	41	48	0	0	3	0	6	28	14	0	0	4	0	17	61	9	0	0	3	0	66	136	13	451
06:00 PM	0	0	4	0	10	29	40	0	0	0	0	4	33	14	0	0	2	0	5	74	7	0	0	4	0	61	122	15	414
PEAK HOUR TOTALS	**0**	**0**	**14**	**0**	**82**	**211**	**155**	**0**	**0**	**4**	**0**	**44**	**199**	**94**	**1**	**0**	**24**	**0**	**64**	**304**	**45**	**0**	**0**	**15**	**0**	**260**	**478**	**56**	**INTERSECTION**
ALL MOVEMENTS				**448**							**337**							**413**							**794**			**1992**
% HV			**3.1%**							**1.2%**							**5.8%**							**1.9%**				**2.9%**
PEAK HOUR FACTOR				**0.88**							**0.81**							**0.88**							**0.97**			**0.95**

HV = Heavy Vehicle
PHF = Peak Hour Factor

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

ROLLING HOUR COUNT

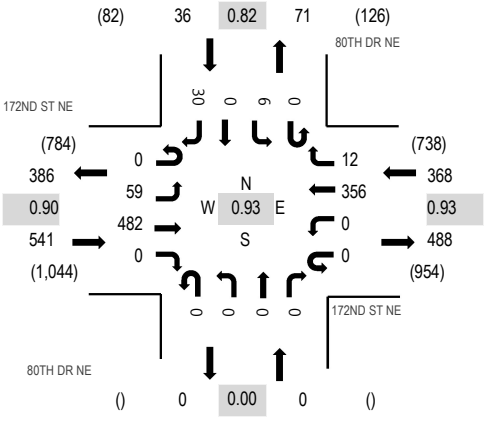
	FROM NORTH ON (Southbound) 67th Avenue NE							FROM SOUTH ON (Northbound) 67th Avenue NE							FROM EAST ON (Westbound) 172nd Street NE							FROM WEST ON (Eastbound) 172nd Street NE							INTERVAL TOTALS
TIME INTERVAL	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
4:00 PM - 5:00 PM	0	0	14	0	82	211	155	0	0	4	0	44	199	94	1	0	24	0	64	304	45	0	0	15	0	260	478	56	1992
4:15 PM - 5:15 PM	0	0	13	0	82	195	158	0	0	4	0	43	188	103	3	0	22	0	46	280	46	0	0	15	0	267	489	60	1957
4:30 PM - 5:30 PM	0	0	11	0	81	190	158	0	0	1	0	38	171	93	3	0	20	0	45	271	49	0	0	14	0	273	514	60	1943
4:45 PM - 5:45 PM	0	0	11	0	69	166	170	0	0	4	0	34	155	80	3	0	18	0	47	258	47	0	0	15	0	269	527	61	1883
5:00 PM - 6:00 PM	0	0	13	0	64	146	176	0	0	4	0	25	144	72	2	0	14	0	38	261	42	0	0	15	0	266	526	61	1821
4:00 PM - 6:00 PM Total:	0	0	27	0	146	357	331	0	0	8	0	69	343	166	3	0	38	0	102	565	87	0	0	30	0	526	1004	117	3813

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 80TH DR NE & 172ND ST NE PM
Date: Thursday, June 27, 2024
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:30 PM - 04:45 PM

Peak Hour

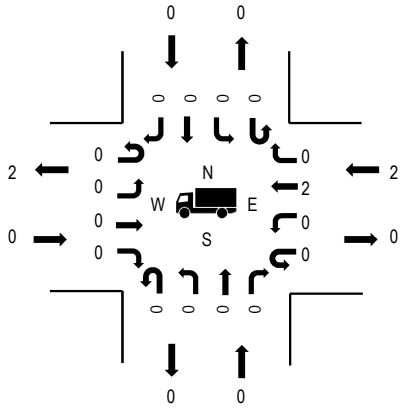
Motorized Vehicles



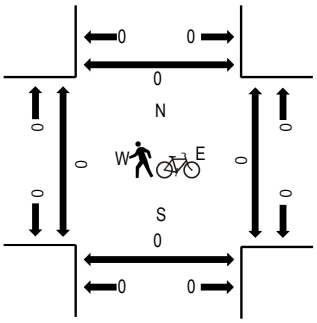
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.90
WB	0.5%	0.93
NB	0.0%	0.00
SB	0.0%	0.82
All	0.2%	0.93

Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Traffic Counts - Motorized Vehicles

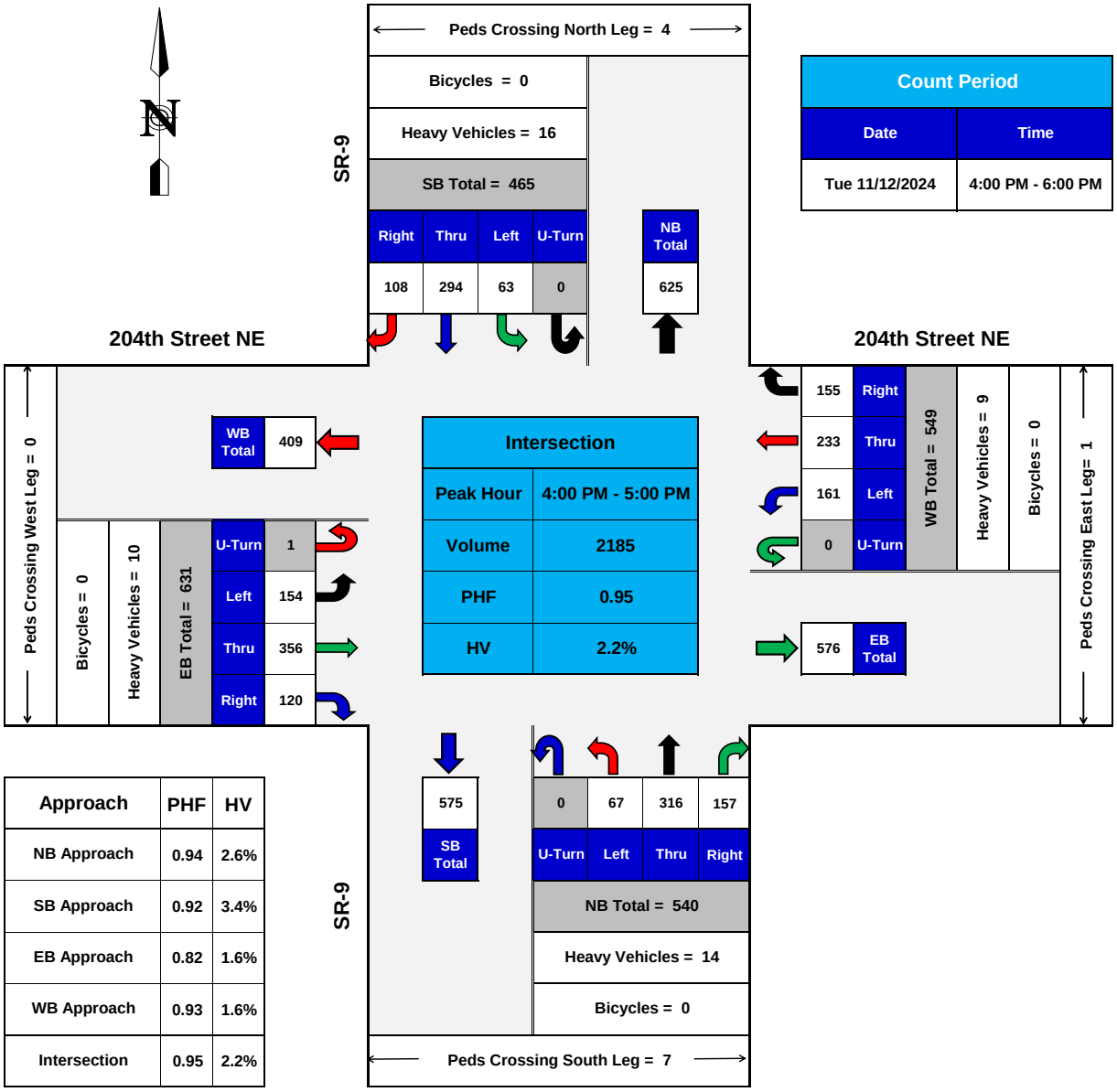
Interval Start Time	172ND ST NE Eastbound				172ND ST NE Westbound				80TH DR NE Northbound				80TH DR NE Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	13	110	0	0	0	89	0	0	0	0	0	0	2	0	7	221	945
4:15 PM	0	17	118	0	0	0	84	5	0	0	0	0	0	1	0	10	235	940
4:30 PM	0	17	134	0	0	0	93	4	0	0	0	0	0	1	0	4	253	937
4:45 PM	0	12	120	0	0	0	90	3	0	0	0	0	0	2	0	9	236	918
5:00 PM	0	6	109	0	0	0	87	3	0	0	0	0	0	1	0	10	216	919
5:15 PM	0	14	119	0	0	0	89	1	0	0	0	0	0	3	0	6	232	
5:30 PM	0	14	118	0	0	0	88	2	0	0	0	0	0	2	0	10	234	
5:45 PM	0	12	111	0	0	0	97	3	0	0	0	0	0	3	0	11	237	
Count Total	0	105	939	0	0	0	717	21	0	0	0	0	0	15	0	67	1,864	
Peak Hour	0	59	482	0	0	0	356	12	0	0	0	0	0	6	0	30	945	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:15 PM	0	0	1	0	1	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:45 PM	0	0	1	0	1	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:30 PM	0	0	1	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
Count Total	0	0	3	0	3	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	0	0	2	0	2	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

SR-9 @ 204th Street NE

Arlington, WA



Count Period	
Date	Time
Tue 11/12/2024	4:00 PM - 6:00 PM

Approach	PHF	HV
NB Approach	0.94	2.6%
SB Approach	0.92	3.4%
EB Approach	0.82	1.6%
WB Approach	0.93	1.6%
Intersection	0.95	2.2%

PHF = Peak Hour Factor
HV = Heavy Vehicles

TURNING MOVEMENTS DIAGRAM

PEAK HOUR SUMMARY

TRAFFIC DATA GATHERING

TRAFFIC DATA GATHERING

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: SR-9 @ 204th Street NE
Arlington, WA

DATE OF COUNT: Tue. 11/12/2024
START OF COUNT: 4:00 PM
TIME OF COUNT: 4:00 PM - 6:00 PM

COUNTED BY: TDG
DATE OF REDUCTION: 11/14/2024
DURATION OF COUNT (Hrs): 2

TIME INTERVAL ENDING AT	FROM NORTH ON (Southbound) SR-9							FROM SOUTH ON (Northbound) SR-9							FROM EAST ON (Westbound) 204th Street NE							FROM WEST ON (Eastbound) 204th Street NE							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
04:15 PM	3	0	8	0	9	87	31	1	0	7	0	14	85	37	1	0	2	0	41	64	39	0	0	3	0	43	101	23	574
04:30 PM	0	0	1	0	19	75	32	0	0	2	0	14	76	43	0	0	1	0	43	63	41	0	0	1	1	32	76	29	544
04:45 PM	0	0	4	0	24	56	23	0	0	1	0	22	75	30	0	0	3	0	34	64	36	0	0	6	0	43	111	38	556
05:00 PM	1	0	3	0	11	76	22	6	0	4	0	17	80	47	0	0	3	0	43	42	39	0	0	0	0	36	68	30	511
05:15 PM	0	0	4	0	11	76	19	0	0	0	0	19	75	33	0	0	0	0	33	60	22	0	0	1	0	27	97	34	506
05:30 PM	0	0	1	0	16	65	22	1	0	0	0	16	80	36	0	0	2	0	31	51	45	0	0	0	0	34	75	16	487
05:45 PM	0	0	1	0	16	53	27	0	0	0	0	7	81	36	0	0	1	0	33	50	31	0	0	1	0	26	68	16	444
06:00 PM	0	0	0	0	11	51	19	1	0	0	0	9	57	31	0	0	0	0	34	59	20	0	0	4	0	17	84	18	410
PEAK HOUR TOTALS	**4**	**0**	**16**	**0**	**63**	**294**	**108**	**7**	**0**	**14**	**0**	**67**	**316**	**157**	**1**	**0**	**9**	**0**	**161**	**233**	**155**	**0**	**0**	**10**	**1**	**154**	**356**	**120**	**INTERSECTION**
ALL MOVEMENTS				**465**							**540**							**549**							**631**			**2185**
% HV			**3.4%**							**2.6%**							**1.6%**							**1.6%**				**2.2%**
PEAK HOUR FACTOR				**0.92**							**0.94**							**0.93**							**0.82**			**0.95**

HV = Heavy Vehicle
PHF = Peak Hour Factor

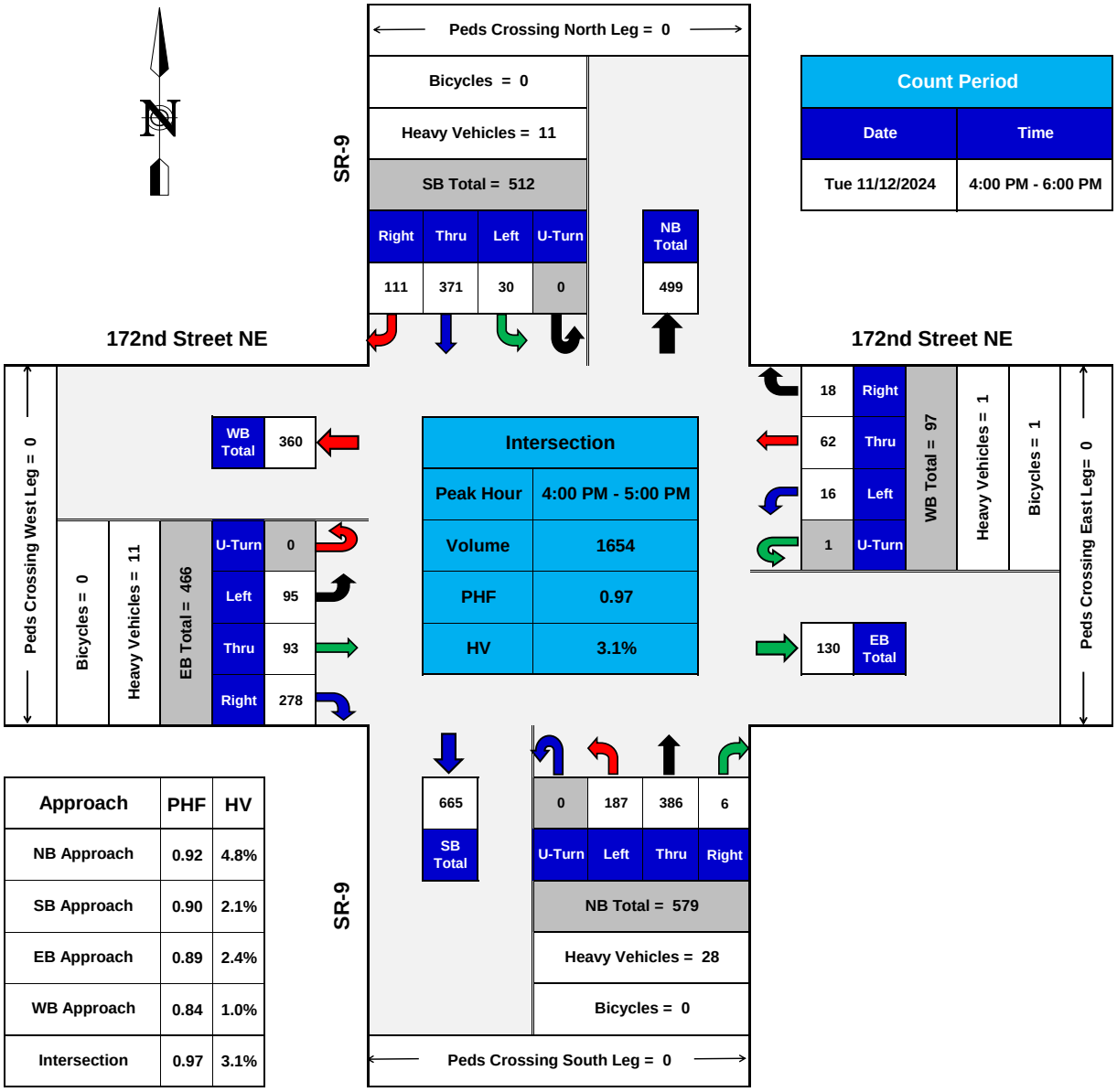
4:00 PM - 6:00 PM PEAK HOUR: 4:00 PM - 5:00 PM

ROLLING HOUR COUNT

	FROM NORTH ON (Southbound) SR-9							FROM SOUTH ON (Northbound) SR-9							FROM EAST ON (Westbound) 204th Street NE							FROM WEST ON (Eastbound) 204th Street NE							INTERVAL TOTALS
TIME INTERVAL	**Peds**	**Bicycle**	**HV**	**U-Turn**	**Left**	**Thru**	**Right**	**Peds**	**Bicycle**	**HV**	**U-Turn**	**Left**	**Thru**	**Right**	**Peds**	**Bicycle**	**HV**	**U-Turn**	**Left**	**Thru**	**Right**	**Peds**	**Bicycle**	**HV**	**U-Turn**	**Left**	**Thru**	**Right**	
4:00 PM - 5:00 PM	4	0	16	0	63	294	108	7	0	14	0	67	316	157	1	0	9	0	161	233	155	0	0	10	1	154	356	120	2185
4:15 PM - 5:15 PM	1	0	12	0	65	283	96	6	0	7	0	72	306	153	0	0	7	0	153	229	138	0	0	8	1	138	352	131	2117
4:30 PM - 5:30 PM	1	0	12	0	62	273	86	7	0	5	0	74	310	146	0	0	8	0	141	217	142	0	0	7	0	140	351	118	2060
4:45 PM - 5:45 PM	1	0	9	0	54	270	90	7	0	4	0	59	316	152	0	0	6	0	140	203	137	0	0	2	0	123	308	96	1948
5:00 PM - 6:00 PM	0	0	6	0	54	245	87	2	0	0	0	51	293	136	0	0	3	0	131	220	118	0	0	6	0	104	324	84	1847
4:00 PM - 6:00 PM Total:	4	0	22	0	117	539	195	9	0	14	0	118	609	293	1	0	12	0	292	453	273	0	0	16	1	258	680	204	4032

SR-9 @ 172nd Street NE

Arlington, WA



Count Period	
Date	Time
Tue 11/12/2024	4:00 PM - 6:00 PM

Approach	PHF	HV
NB Approach	0.92	4.8%
SB Approach	0.90	2.1%
EB Approach	0.89	2.4%
WB Approach	0.84	1.0%
Intersection	0.97	3.1%

PHF = Peak Hour Factor
HV = Heavy Vehicles

TURNING MOVEMENTS DIAGRAM

PEAK HOUR SUMMARY

TRAFFIC DATA GATHERING

TRAFFIC DATA GATHERING

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION: SR-9 @ 172nd Street NE
Arlington, WA

DATE OF COUNT: Tue. 11/12/2024
START OF COUNT: 4:00 PM
TIME OF COUNT: 4:00 PM - 6:00 PM

COUNTED BY: TDG
DATE OF REDUCTION: 11/14/2024
DURATION OF COUNT (Hrs): 2

TIME INTERVAL ENDING AT	FROM NORTH ON (Southbound) SR-9							FROM SOUTH ON (Northbound) SR-9							FROM EAST ON (Westbound) 172nd Street NE							FROM WEST ON (Eastbound) 172nd Street NE							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
04:15 PM	0	0	5	0	6	92	30	0	0	7	0	45	95	3	0	0	1	1	4	20	4	0	0	7	0	23	25	76	424
04:30 PM	0	0	1	0	7	113	22	0	0	6	0	53	103	2	0	0	0	0	4	13	4	0	0	1	0	17	23	67	428
04:45 PM	0	0	3	0	4	84	31	0	0	8	0	39	91	1	0	1	0	0	7	16	1	0	0	2	0	29	21	81	405
05:00 PM	0	0	2	0	13	82	28	0	0	7	0	50	97	0	0	0	0	0	1	13	9	0	0	1	0	26	24	54	397
05:15 PM	0	1	1	0	3	76	35	0	0	9	0	44	95	1	0	0	0	0	0	4	8	0	0	3	0	28	26	78	398
05:30 PM	0	0	2	0	5	93	21	0	0	2	0	51	83	5	0	0	0	0	2	12	0	0	0	1	0	29	29	61	391
05:45 PM	0	0	2	0	4	69	26	0	0	1	0	39	80	2	0	0	2	0	0	9	8	0	0	1	0	40	28	34	339
06:00 PM	0	0	0	1	6	48	23	0	0	3	0	45	76	4	0	0	0	0	0	13	6	0	0	2	0	29	20	41	312
PEAK HOUR TOTALS	**0**	**0**	**11**	**0**	**30**	**371**	**111**	**0**	**0**	**28**	**0**	**187**	**386**	**6**	**0**	**1**	**1**	**1**	**16**	**62**	**18**	**0**	**0**	**11**	**0**	**95**	**93**	**278**	**INTERSECTION**
ALL MOVEMENTS				**512**							**579**							**97**							**466**				**1654**
% HV			**2.1%**							**4.8%**							**1.0%**							**2.4%**				**3.1%**
PEAK HOUR FACTOR				**0.90**							**0.92**							**0.84**							**0.89**				**0.97**

HV = Heavy Vehicle
PHF = Peak Hour Factor

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

ROLLING HOUR COUNT

TIME INTERVAL	FROM NORTH ON (Southbound) SR-9							FROM SOUTH ON (Northbound) SR-9							FROM EAST ON (Westbound) 172nd Street NE							FROM WEST ON (Eastbound) 172nd Street NE							INTERVAL TOTALS
	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	Peds	Bicycle	HV	U-Turn	Left	Thru	Right	
4:00 PM - 5:00 PM	0	0	11	0	30	371	111	0	0	28	0	187	386	6	0	1	1	1	16	62	18	0	0	11	0	95	93	278	1654
4:15 PM - 5:15 PM	0	1	7	0	27	355	116	0	0	30	0	186	386	4	0	1	0	0	12	46	22	0	0	7	0	100	94	280	1628
4:30 PM - 5:30 PM	0	1	8	0	25	335	115	0	0	26	0	184	366	7	0	1	0	0	10	45	18	0	0	7	0	112	100	274	1591
4:45 PM - 5:45 PM	0	1	7	0	25	320	110	0	0	19	0	184	355	8	0	0	2	0	3	38	25	0	0	6	0	123	107	227	1525
5:00 PM - 6:00 PM	0	1	5	1	18	286	105	0	0	15	0	179	334	12	0	0	2	0	2	38	22	0	0	7	0	126	103	214	1440
4:00 PM - 6:00 PM Total:	0	1	16	1	48	657	216	0	0	43	0	366	720	18	0	1	3	1	18	100	40	0	0	18	0	221	196	492	3094

Appendix B: LOS Definitions

Highway Capacity Manual 7th Edition

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* 7th Edition (Transportation Research Board, 2022).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 7th Edition*, Transportation Research Board, 2022, respectively.
1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

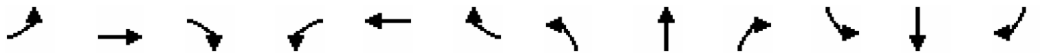
Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop controlled. All-way stop controlled intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 7th Edition*, Transportation Research Board, 2022, respectively.
1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Appendix C: LOS Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	355	120	160	235	155	65	315	155	65	295	110
Future Volume (veh/h)	155	366	120	160	235	155	65	315	155	65	295	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	163	385	126	168	247	163	68	332	163	68	311	116
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, %	2	2	2	2	2	2	3	3	3	3	3	3
Cap, veh/h	204	469	392	209	483	403	88	408	200	88	647	544
Arrive On Green	0.11	0.25	0.25	0.12	0.26	0.26	0.05	0.35	0.35	0.05	0.35	0.35
Sat Flow, veh/h	1781	1870	1563	1781	1870	1560	1767	1170	574	1767	1856	1561
Grp Volume(v), veh/h	163	385	126	168	247	163	68	0	495	68	311	116
Grp Sat Flow(s),veh/h/ln	1781	1870	1563	1781	1870	1560	1767	0	1744	1767	1856	1561
Q Serve(g_s), s	7.6	16.6	5.6	7.9	9.7	7.4	3.3	0.0	22.1	3.3	11.2	4.5
Cycle Q Clear(g_c), s	7.6	16.6	5.6	7.9	9.7	7.4	3.3	0.0	22.1	3.3	11.2	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	204	469	392	209	483	403	88	0	608	88	647	544
V/C Ratio(X)	0.80	0.82	0.32	0.80	0.51	0.40	0.77	0.00	0.81	0.77	0.48	0.21
Avail Cap(c_a), veh/h	539	566	473	530	548	457	320	0	1200	320	1276	1074
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.0	30.3	26.2	36.8	27.1	26.3	40.2	0.0	25.4	40.2	21.8	19.6
Incr Delay (d2), s/veh	7.0	8.5	0.6	7.0	1.0	0.8	13.1	0.0	3.8	13.1	0.8	0.3
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(50%),veh/ln	3.7	8.3	2.1	3.8	4.3	2.8	1.7	0.0	9.4	1.7	4.9	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	44.0	38.7	26.7	43.8	28.2	27.1	53.3	0.0	29.2	53.3	22.6	19.9
LnGrp LOS	D	D	C	D	C	C	D		C	D	C	B
Approach Vol, veh/h		674			578			563			495	
Approach Delay, s/veh		37.8			32.4			32.1			26.2	
Approach LOS		D			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	35.9	14.6	26.4	8.8	35.9	13.9	27.0
Change Period (Y+Rc), s	4.5	6.1	4.5	* 4.9	4.5	6.1	4.1	4.9
Max Green Setting (Gmax), s	15.5	58.9	25.5	* 26	15.5	58.9	25.9	25.1
Max Q Clear Time (g_c+I1), s	5.3	24.1	9.9	18.6	5.3	13.2	9.6	11.7
Green Ext Time (p_c), s	0.1	5.4	0.4	1.9	0.1	3.7	0.4	2.0

Intersection Summary	
HCM 7th Control Delay, s/veh	32.6
HCM 7th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	480	55	65	305	45	45	200	95	80	210	155
Future Volume (veh/h)	271	480	55	65	305	51	45	200	95	84	210	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1811	1811	1811	1885	1885	1885	1856	1856	1856
Adj Flow Rate, veh/h	285	505	58	68	321	54	47	211	100	88	221	163
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, %	2	2	2	6	6	6	1	1	1	3	3	3
Cap, veh/h	626	1129	957	472	829	140	98	239	113	165	217	160
Arrive On Green	0.08	0.60	0.60	0.03	0.55	0.55	0.03	0.20	0.20	0.05	0.22	0.22
Sat Flow, veh/h	1781	1870	1585	1725	1511	254	1795	1208	572	1767	991	731
Grp Volume(v), veh/h	285	505	58	68	0	375	47	0	311	88	0	384
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1725	0	1765	1795	0	1780	1767	0	1722
Q Serve(g_s), s	10.8	23.4	2.4	2.8	0.0	19.5	3.3	0.0	27.2	6.2	0.0	35.1
Cycle Q Clear(g_c), s	10.8	23.4	2.4	2.8	0.0	19.5	3.3	0.0	27.2	6.2	0.0	35.1
Prop In Lane	1.00		1.00	1.00		0.14	1.00		0.32	1.00		0.42
Lane Grp Cap(c), veh/h	626	1129	957	472	0	969	98	0	352	165	0	378
V/C Ratio(X)	0.46	0.45	0.06	0.14	0.00	0.39	0.48	0.00	0.88	0.53	0.00	1.02
Avail Cap(c_a), veh/h	815	1129	957	749	0	969	275	0	391	301	0	378
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	1.00	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	17.2	13.0	15.5	0.0	20.7	52.2	0.0	62.4	49.4	0.0	62.5
Incr Delay (d2), s/veh	0.5	1.3	0.1	0.1	0.0	1.2	3.6	0.0	20.2	2.7	0.0	50.5
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(50%),veh/ln	4.4	10.6	0.9	1.1	0.0	8.5	1.6	0.0	14.3	2.9	0.0	20.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	14.5	18.5	13.2	15.7	0.0	21.8	55.8	0.0	82.7	52.1	0.0	113.0
LnGrp LOS	B	B	B	B		C	E		F	D		F
Approach Vol, veh/h		848			443			358			472	
Approach Delay, s/veh		16.8			20.9			79.1			101.6	
Approach LOS		B			C			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.3	101.5	9.2	40.0	18.1	92.7	12.7	36.5
Change Period (Y+Rc), s	4.5	4.9	4.5	4.9	4.5	4.9	4.5	4.9
Max Green Setting (Gmax), s	30.5	55.1	20.5	35.1	30.5	55.1	20.5	35.1
Max Q Clear Time (g_c+I1), s	4.8	25.4	5.3	37.1	12.8	21.5	8.2	29.2
Green Ext Time (p_c), s	0.1	5.5	0.1	0.0	0.8	3.7	0.1	1.2

Intersection Summary	
HCM 7th Control Delay, s/veh	47.0
HCM 7th LOS	D

MOVEMENT SUMMARY

Site: 3 [3. SR 9/SR 531 (Site Folder: Existing 2024)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Existing (2024) PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: SR 9															
3	L2	All MCs	191	5.0	191	5.0	0.189	11.0	LOS B	0.9	22.4	0.38	0.64	0.38	32.1
8	T1	All MCs	397	5.0	397	5.0	0.319	5.0	LOS A	1.7	44.6	0.40	0.46	0.40	35.1
18	R2	All MCs	5	5.0	5	5.0	0.319	5.0	LOS A	1.7	44.6	0.40	0.46	0.40	34.8
Approach			593	5.0	593	5.0	0.319	6.9	LOS A	1.7	44.6	0.39	0.52	0.39	34.1
East: 172nd St NE															
1u	U	All MCs	1	1.0	1	1.0	0.107	14.2	LOS B	0.4	10.2	0.49	0.61	0.49	33.9
1	L2	All MCs	15	1.0	15	1.0	0.107	11.7	LOS B	0.4	10.2	0.49	0.61	0.49	33.9
6	T1	All MCs	62	1.0	62	1.0	0.107	5.9	LOS A	0.4	10.2	0.49	0.61	0.49	34.6
16	R2	All MCs	21	1.0	21	1.0	0.107	5.7	LOS A	0.4	10.2	0.49	0.61	0.49	34.3
Approach			99	1.0	99	1.0	0.107	6.8	LOS A	0.4	10.2	0.49	0.61	0.49	34.4
North: SR 9															
7	L2	All MCs	31	2.0	31	2.0	0.321	10.9	LOS B	1.7	42.6	0.41	0.49	0.41	34.3
4	T1	All MCs	381	2.0	381	2.0	0.321	5.1	LOS A	1.7	42.6	0.41	0.49	0.41	35.0
14	R2	All MCs	113	2.0	113	2.0	0.131	5.6	LOS A	0.5	13.7	0.39	0.55	0.39	35.1
Approach			526	2.0	526	2.0	0.321	5.5	LOS A	1.7	42.6	0.41	0.50	0.41	35.0
West: SR 531															
5	L2	All MCs	98	2.0	98	2.0	0.201	11.7	LOS B	1.0	25.1	0.51	0.64	0.51	33.1
2	T1	All MCs	98	2.0	98	2.0	0.201	5.9	LOS A	1.0	25.1	0.51	0.64	0.51	33.8
12	R2	All MCs	289	2.0	289	2.0	0.249	5.7	LOS A	1.3	34.0	0.51	0.58	0.51	34.8
Approach			485	2.0	485	2.0	0.249	7.0	LOS A	1.3	34.0	0.51	0.60	0.51	34.2
All Vehicles			1702	3.0	1702	3.0	0.321	6.5	LOS A	1.7	44.6	0.44	0.54	0.44	34.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 HCM.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

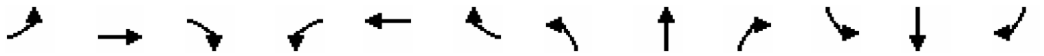
Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	60	480	355	10	5	30
Future Vol, veh/h	60	480	355	10	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	225	-	-	-	0	160
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	65	516	382	11	5	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	392	0	-	0	1032	387
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	645	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1177	-	-	-	260	665
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	526	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1177	-	-	-	246	665
Mov Cap-2 Maneuver	-	-	-	-	246	-
Stage 1	-	-	-	-	653	-
Stage 2	-	-	-	-	526	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.92	0	12.01
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1177	-	-	-	246	665
HCM Lane V/C Ratio	0.055	-	-	-	0.022	0.048
HCM Control Delay (s/veh)	8.2	-	-	-	20	10.7
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	395	150	195	265	175	95	370	190	75	345	130
Future Volume (veh/h)	180	395	150	195	265	175	95	370	190	75	345	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	189	416	158	205	279	184	100	389	200	79	363	137
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, %	2	2	2	2	2	2	3	3	3	3	3	3
Cap, veh/h	223	444	371	240	468	390	126	445	229	102	692	582
Arrive On Green	0.13	0.24	0.24	0.13	0.25	0.25	0.07	0.39	0.39	0.06	0.37	0.37
Sat Flow, veh/h	1781	1870	1562	1781	1870	1560	1767	1150	591	1767	1856	1562
Grp Volume(v), veh/h	189	416	158	205	279	184	100	0	589	79	363	137
Grp Sat Flow(s),veh/h/ln	1781	1870	1562	1781	1870	1560	1767	0	1742	1767	1856	1562
Q Serve(g_s), s	11.3	23.7	9.3	12.2	14.3	10.9	6.1	0.0	34.1	4.8	16.6	6.6
Cycle Q Clear(g_c), s	11.3	23.7	9.3	12.2	14.3	10.9	6.1	0.0	34.1	4.8	16.6	6.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.34	1.00		1.00
Lane Grp Cap(c), veh/h	223	444	371	240	468	390	126	0	674	102	692	582
V/C Ratio(X)	0.85	0.94	0.43	0.86	0.60	0.47	0.79	0.00	0.87	0.78	0.52	0.24
Avail Cap(c_a), veh/h	424	445	372	418	468	390	252	0	943	252	1005	846
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.5	40.7	35.2	46.0	35.9	34.7	49.7	0.0	30.9	50.6	26.6	23.5
Incr Delay (d2), s/veh	8.5	27.6	0.9	8.5	2.3	1.1	10.5	0.0	7.8	11.9	0.9	0.3
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(50%),veh/ln	5.5	14.2	3.6	6.0	6.8	4.2	3.0	0.0	15.4	2.5	7.4	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	55.0	68.3	36.1	54.5	38.2	35.7	60.2	0.0	38.8	62.5	27.5	23.7
LnGrp LOS	E	E	D	D	D	D	E		D	E	C	C
Approach Vol, veh/h		763			668			689			579	
Approach Delay, s/veh		58.3			42.5			41.9			31.4	
Approach LOS		E			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.8	48.2	19.1	30.7	12.3	46.6	17.7	32.1
Change Period (Y+Rc), s	4.5	6.1	4.5	* 4.9	4.5	6.1	4.1	4.9
Max Green Setting (Gmax), s	15.5	58.9	25.5	* 26	15.5	58.9	25.9	25.1
Max Q Clear Time (g_c+I1), s	6.8	36.1	14.2	25.7	8.1	18.6	13.3	16.3
Green Ext Time (p_c), s	0.1	6.0	0.4	0.1	0.1	4.4	0.4	1.8

Intersection Summary	
HCM 7th Control Delay, s/veh	44.4
HCM 7th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

MOVEMENT SUMMARY

Site: 2 [2. SR 531/67th Avenue NE (Site Folder: Baseline 2029)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Future (2029) Without-Project PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: 67th Ave NE															
3	L2	All MCs	53	1.0	53	1.0	0.574	13.6	LOS B	3.2	80.6	0.74	0.88	0.91	33.0
8	T1	All MCs	237	1.0	237	1.0	0.574	8.3	LOS A	3.2	80.6	0.74	0.88	0.91	33.7
18	R2	All MCs	132	1.0	132	1.0	0.574	8.4	LOS A	3.2	80.6	0.74	0.88	0.91	33.3
Approach			421	1.0	421	1.0	0.574	9.0	LOS A	3.2	80.6	0.74	0.88	0.91	33.5
East: SR 531 (172nd St NE)															
1	L2	All MCs	95	6.0	95	6.0	0.308	13.3	LOS B	1.8	48.2	0.69	0.69	0.69	32.5
6	T1	All MCs	421	6.0	421	6.0	0.308	7.5	LOS A	2.0	53.1	0.69	0.65	0.69	33.7
16	R2	All MCs	68	6.0	68	6.0	0.308	7.0	LOS A	2.0	53.1	0.69	0.63	0.69	33.8
Approach			584	6.0	584	6.0	0.308	8.4	LOS A	2.0	53.1	0.69	0.65	0.69	33.5
North: 67th Ave NE															
7	L2	All MCs	111	3.0	111	3.0	0.588	12.1	LOS B	3.2	82.4	0.61	0.75	0.71	33.3
4	T1	All MCs	247	3.0	247	3.0	0.588	6.8	LOS A	3.2	82.4	0.61	0.75	0.71	34.0
14	R2	All MCs	184	3.0	184	3.0	0.588	6.9	LOS A	3.2	82.4	0.61	0.75	0.71	33.7
Approach			542	3.0	542	3.0	0.588	7.9	LOS A	3.2	82.4	0.61	0.75	0.71	33.8
West: SR 531 (172nd St NE)															
5	L2	All MCs	311	2.0	311	2.0	0.455	12.4	LOS B	3.1	79.5	0.70	0.69	0.70	32.2
2	T1	All MCs	637	2.0	637	2.0	0.455	6.6	LOS A	3.4	85.9	0.68	0.62	0.68	33.8
12	R2	All MCs	63	2.0	63	2.0	0.455	6.3	LOS A	3.4	85.9	0.68	0.60	0.68	33.9
Approach			1011	2.0	1011	2.0	0.455	8.4	LOS A	3.4	85.9	0.69	0.64	0.69	33.3
All Vehicles			2558	3.0	2558	3.0	0.588	8.4	LOS A	3.4	85.9	0.68	0.71	0.73	33.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 HCM.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 3 [3. SR 9/SR 531 (Site Folder: Baseline 2029)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Future (2029) Without-Project PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: SR 9															
3	L2	All MCs	232	5.0	232	5.0	0.273	12.3	LOS B	1.4	36.2	0.56	0.71	0.56	31.7
8	T1	All MCs	438	5.0	438	5.0	0.431	6.2	LOS A	2.7	69.9	0.62	0.58	0.62	34.4
18	R2	All MCs	26	5.0	26	5.0	0.431	6.3	LOS A	2.7	69.9	0.62	0.58	0.62	34.0
Approach			696	5.0	696	5.0	0.431	8.2	LOS A	2.7	69.9	0.60	0.62	0.60	33.4
East: 172nd St NE															
1u	U	All MCs	1	1.0	1	1.0	0.376	15.1	LOS B	1.8	45.8	0.64	0.70	0.66	33.7
1	L2	All MCs	36	1.0	36	1.0	0.376	12.6	LOS B	1.8	45.8	0.64	0.70	0.66	33.7
6	T1	All MCs	160	1.0	160	1.0	0.376	6.8	LOS A	1.8	45.8	0.64	0.70	0.66	34.3
16	R2	All MCs	119	1.0	119	1.0	0.376	6.6	LOS A	1.8	45.8	0.64	0.70	0.66	34.1
Approach			315	1.0	315	1.0	0.376	7.4	LOS A	1.8	45.8	0.64	0.70	0.66	34.2
North: SR 9															
7	L2	All MCs	129	2.0	129	2.0	0.478	11.9	LOS B	3.0	76.7	0.60	0.61	0.60	33.4
4	T1	All MCs	423	2.0	423	2.0	0.478	6.1	LOS A	3.0	76.7	0.60	0.61	0.60	34.0
14	R2	All MCs	144	2.0	144	2.0	0.192	6.7	LOS A	0.9	21.8	0.52	0.62	0.52	34.7
Approach			696	2.0	696	2.0	0.478	7.3	LOS A	3.0	76.7	0.59	0.61	0.59	34.0
West: SR 531															
5	L2	All MCs	119	2.0	119	2.0	0.364	12.9	LOS B	2.2	56.4	0.69	0.69	0.69	32.8
2	T1	All MCs	196	2.0	196	2.0	0.364	7.1	LOS A	2.2	56.4	0.69	0.69	0.69	33.4
12	R2	All MCs	330	2.0	330	2.0	0.332	6.7	LOS A	2.1	53.4	0.68	0.65	0.68	34.4
Approach			644	2.0	644	2.0	0.364	8.0	LOS A	2.2	56.4	0.68	0.67	0.68	33.8
All Vehicles			2352	2.8	2352	2.8	0.478	7.8	LOS A	3.0	76.7	0.62	0.64	0.63	33.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 HCM.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

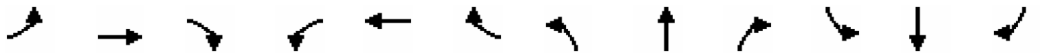
Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	65	650	500	10	5	35
Future Vol, veh/h	65	650	500	10	5	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	225	-	-	-	0	160
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	70	699	538	11	5	38

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	548	0	-	0	1382	543
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	839	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1031	-	-	-	160	544
Stage 1	-	-	-	-	586	-
Stage 2	-	-	-	-	428	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1031	-	-	-	149	544
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	428	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0.79	0	14.35
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1031	-	-	-	149	544
HCM Lane V/C Ratio	0.068	-	-	-	0.036	0.069
HCM Control Delay (s/veh)	8.7	-	-	-	30	12.1
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	395	158	203	265	175	100	378	195	75	359	130
Future Volume (veh/h)	180	395	158	203	265	175	100	378	195	75	359	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	1.00		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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	189	416	166	214	279	184	105	398	205	79	378	137
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, %	2	2	2	2	2	2	3	3	3	3	3	3
Cap, veh/h	223	434	362	248	467	389	132	451	233	101	697	587
Arrive On Green	0.12	0.23	0.23	0.14	0.25	0.25	0.07	0.39	0.39	0.06	0.38	0.38
Sat Flow, veh/h	1781	1870	1561	1781	1870	1560	1767	1150	592	1767	1856	1562
Grp Volume(v), veh/h	189	416	166	214	279	184	105	0	603	79	378	137
Grp Sat Flow(s),veh/h/ln	1781	1870	1561	1781	1870	1560	1767	0	1742	1767	1856	1562
Q Serve(g_s), s	11.6	24.6	10.2	13.1	14.7	11.2	6.5	0.0	35.9	4.9	17.8	6.7
Cycle Q Clear(g_c), s	11.6	24.6	10.2	13.1	14.7	11.2	6.5	0.0	35.9	4.9	17.8	6.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.34	1.00		1.00
Lane Grp Cap(c), veh/h	223	434	362	248	467	389	132	0	684	101	697	587
V/C Ratio(X)	0.85	0.96	0.46	0.86	0.60	0.47	0.80	0.00	0.88	0.78	0.54	0.23
Avail Cap(c_a), veh/h	413	434	362	407	467	389	245	0	918	245	978	823
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.9	42.4	36.9	47.1	37.0	35.7	50.9	0.0	31.5	52.0	27.3	23.9
Incr Delay (d2), s/veh	8.7	32.9	1.1	10.2	2.3	1.1	10.5	0.0	8.8	12.0	0.9	0.3
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(50%),veh/ln	5.7	15.2	4.0	6.5	7.0	4.4	3.3	0.0	16.4	2.5	8.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	56.6	75.3	38.0	57.2	39.3	36.8	61.3	0.0	40.3	64.0	28.3	24.2
LnGrp LOS	E	E	D	E	D	D	E		D	E	C	C
Approach Vol, veh/h		771			677			708			594	
Approach Delay, s/veh		62.7			44.3			43.5			32.1	
Approach LOS		E			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.9	50.0	20.0	30.8	12.8	48.1	18.1	32.8
Change Period (Y+Rc), s	4.5	6.1	4.5	* 4.9	4.5	6.1	4.1	4.9
Max Green Setting (Gmax), s	15.5	58.9	25.5	* 26	15.5	58.9	25.9	25.1
Max Q Clear Time (g_c+I1), s	6.9	37.9	15.1	26.6	8.5	19.8	13.6	16.7
Green Ext Time (p_c), s	0.1	5.9	0.4	0.0	0.1	4.6	0.4	1.8

Intersection Summary	
HCM 7th Control Delay, s/veh	46.6
HCM 7th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 7th computational engine requires equal clearance times for the phases crossing the barrier.

MOVEMENT SUMMARY

Site: 2 [2. 172nd Street NE/67th Avenue NE (Site Folder: WP 2029)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Future (2029) With-Project PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: 67th Ave NE															
3	L2	All MCs	53	1.0	53	1.0	0.586	13.7	LOS B	3.3	83.4	0.75	0.89	0.93	33.0
8	T1	All MCs	237	1.0	237	1.0	0.586	8.5	LOS A	3.3	83.4	0.75	0.89	0.93	33.6
18	R2	All MCs	136	1.0	136	1.0	0.586	8.6	LOS A	3.3	83.4	0.75	0.89	0.93	33.3
Approach			425	1.0	425	1.0	0.586	9.2	LOS A	3.3	83.4	0.75	0.89	0.93	33.4
East: SR 531 (172nd St NE)															
1	L2	All MCs	97	6.0	97	6.0	0.313	13.4	LOS B	1.9	49.3	0.70	0.69	0.70	32.5
6	T1	All MCs	428	6.0	428	6.0	0.313	7.5	LOS A	2.1	54.3	0.69	0.65	0.69	33.7
16	R2	All MCs	69	6.0	69	6.0	0.313	7.1	LOS A	2.1	54.3	0.69	0.63	0.69	33.8
Approach			595	6.0	595	6.0	0.313	8.4	LOS A	2.1	54.3	0.69	0.66	0.69	33.5
North: 67th Ave NE															
7	L2	All MCs	112	3.0	112	3.0	0.592	12.2	LOS B	3.3	83.8	0.62	0.75	0.72	33.3
4	T1	All MCs	247	3.0	247	3.0	0.592	6.9	LOS A	3.3	83.8	0.62	0.75	0.72	34.0
14	R2	All MCs	184	3.0	184	3.0	0.592	7.0	LOS A	3.3	83.8	0.62	0.75	0.72	33.6
Approach			543	3.0	543	3.0	0.592	8.0	LOS A	3.3	83.8	0.62	0.75	0.72	33.7
West: SR 531 (172nd St NE)															
5	L2	All MCs	311	2.0	311	2.0	0.462	12.5	LOS B	3.2	81.5	0.70	0.69	0.70	32.2
2	T1	All MCs	649	2.0	649	2.0	0.462	6.6	LOS A	3.5	87.9	0.69	0.63	0.69	33.8
12	R2	All MCs	63	2.0	63	2.0	0.462	6.4	LOS A	3.5	87.9	0.69	0.61	0.69	33.8
Approach			1023	2.0	1023	2.0	0.462	8.4	LOS A	3.5	87.9	0.69	0.65	0.69	33.3
All Vehicles			2586	3.0	2586	3.0	0.592	8.4	LOS A	3.5	87.9	0.69	0.71	0.74	33.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 HCM.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 3 [3. SR 9/SR 531 (Site Folder: WP 2029)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: SR 9															
3	L2	All MCs	270	5.0	270	5.0	0.335	8.3	LOS A	1.4	36.4	0.57	0.46	0.57	29.5
8	T1	All MCs	438	5.0	438	5.0	0.535	11.4	LOS B	3.8	97.8	0.67	0.64	0.97	30.9
18	R2	All MCs	26	5.0	26	5.0	0.535	11.4	LOS B	3.8	97.8	0.67	0.64	0.97	30.7
Approach			734	5.0	734	5.0	0.535	10.3	LOS B	3.8	97.8	0.63	0.57	0.82	30.4
East: 172nd St NE															
1u	U	All MCs	1	1.0	1	1.0	0.494	13.2	LOS B	2.6	66.3	0.72	0.79	1.05	29.5
1	L2	All MCs	36	1.0	36	1.0	0.494	13.2	LOS B	2.6	66.3	0.72	0.79	1.05	29.5
6	T1	All MCs	165	1.0	165	1.0	0.494	13.2	LOS B	2.6	66.3	0.72	0.79	1.05	30.0
16	R2	All MCs	119	1.0	119	1.0	0.494	13.2	LOS B	2.6	66.3	0.72	0.79	1.05	29.8
Approach			321	1.0	321	1.0	0.494	13.2	LOS B	2.6	66.3	0.72	0.79	1.05	29.9
North: SR 9															
7	L2	All MCs	129	2.0	129	2.0	0.608	12.8	LOS B	5.4	138.2	0.72	0.73	1.16	29.4
4	T1	All MCs	423	2.0	423	2.0	0.608	12.8	LOS B	5.4	138.2	0.72	0.73	1.16	29.9
14	R2	All MCs	186	2.0	186	2.0	0.222	6.6	LOS A	0.9	22.4	0.53	0.42	0.53	32.7
Approach			737	2.0	737	2.0	0.608	11.3	LOS B	5.4	138.2	0.67	0.66	1.00	30.5
West: SR 531															
5	L2	All MCs	143	2.0	143	2.0	0.455	10.9	LOS B	2.6	64.9	0.67	0.65	0.88	29.8
2	T1	All MCs	199	2.0	199	2.0	0.455	10.9	LOS B	2.6	64.9	0.67	0.65	0.88	30.3
12	R2	All MCs	352	2.0	352	2.0	0.428	9.7	LOS A	2.2	57.1	0.64	0.59	0.80	31.3
Approach			694	2.0	694	2.0	0.455	10.3	LOS B	2.6	64.9	0.66	0.62	0.84	30.7
All Vehicles			2486	2.8	2486	2.8	0.608	10.9	LOS B	5.4	138.2	0.66	0.64	0.91	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
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: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 4 [4. SR 531/80th Dr NE (Site Folder: WP 2029)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Project Driveway															
3	L2	All MCs	2	0.0	2	0.0	0.064	14.0	LOS B	0.4	9.0	0.72	0.73	0.72	32.9
8	T1	All MCs	1	0.0	1	0.0	0.064	9.1	LOS A	0.4	9.0	0.72	0.73	0.72	33.5
18	R2	All MCs	37	0.0	37	0.0	0.064	9.0	LOS A	0.4	9.0	0.72	0.73	0.72	33.2
Approach			40	0.0	40	0.0	0.064	9.3	LOS A	0.4	9.0	0.72	0.73	0.72	33.2
East: SR 531 (172nd St NE)															
1	L2	All MCs	64	1.0	64	1.0	0.550	9.9	LOS A	4.5	113.9	0.37	0.46	0.37	34.2
6	T1	All MCs	568	1.0	568	1.0	0.550	5.0	LOS A	4.5	113.9	0.37	0.46	0.37	34.9
16	R2	All MCs	11	1.0	11	1.0	0.550	4.9	LOS A	4.5	113.9	0.37	0.46	0.37	34.5
Approach			643	1.0	643	1.0	0.550	5.5	LOS A	4.5	113.9	0.37	0.46	0.37	34.8
North: 80th Dr NE															
7	L2	All MCs	5	0.0	5	0.0	0.060	12.6	LOS B	0.3	7.6	0.62	0.68	0.62	33.4
4	T1	All MCs	1	0.0	1	0.0	0.060	7.7	LOS A	0.3	7.6	0.62	0.68	0.62	34.1
14	R2	All MCs	38	0.0	38	0.0	0.060	7.6	LOS A	0.3	7.6	0.62	0.68	0.62	33.8
Approach			45	0.0	45	0.0	0.060	8.2	LOS A	0.3	7.6	0.62	0.68	0.62	33.7
West: SR 531 (172nd St NE)															
5	L2	All MCs	71	0.0	71	0.0	0.678	10.1	LOS B	7.0	174.8	0.45	0.46	0.45	34.0
2	T1	All MCs	728	0.0	728	0.0	0.678	5.2	LOS A	7.0	174.8	0.45	0.46	0.45	34.7
12	R2	All MCs	4	0.0	4	0.0	0.678	5.1	LOS A	7.0	174.8	0.45	0.46	0.45	34.4
Approach			803	0.0	803	0.0	0.678	5.6	LOS A	7.0	174.8	0.45	0.46	0.45	34.6
All Vehicles			1532	0.4	1532	0.4	0.678	5.8	LOS A	7.0	174.8	0.42	0.47	0.42	34.6

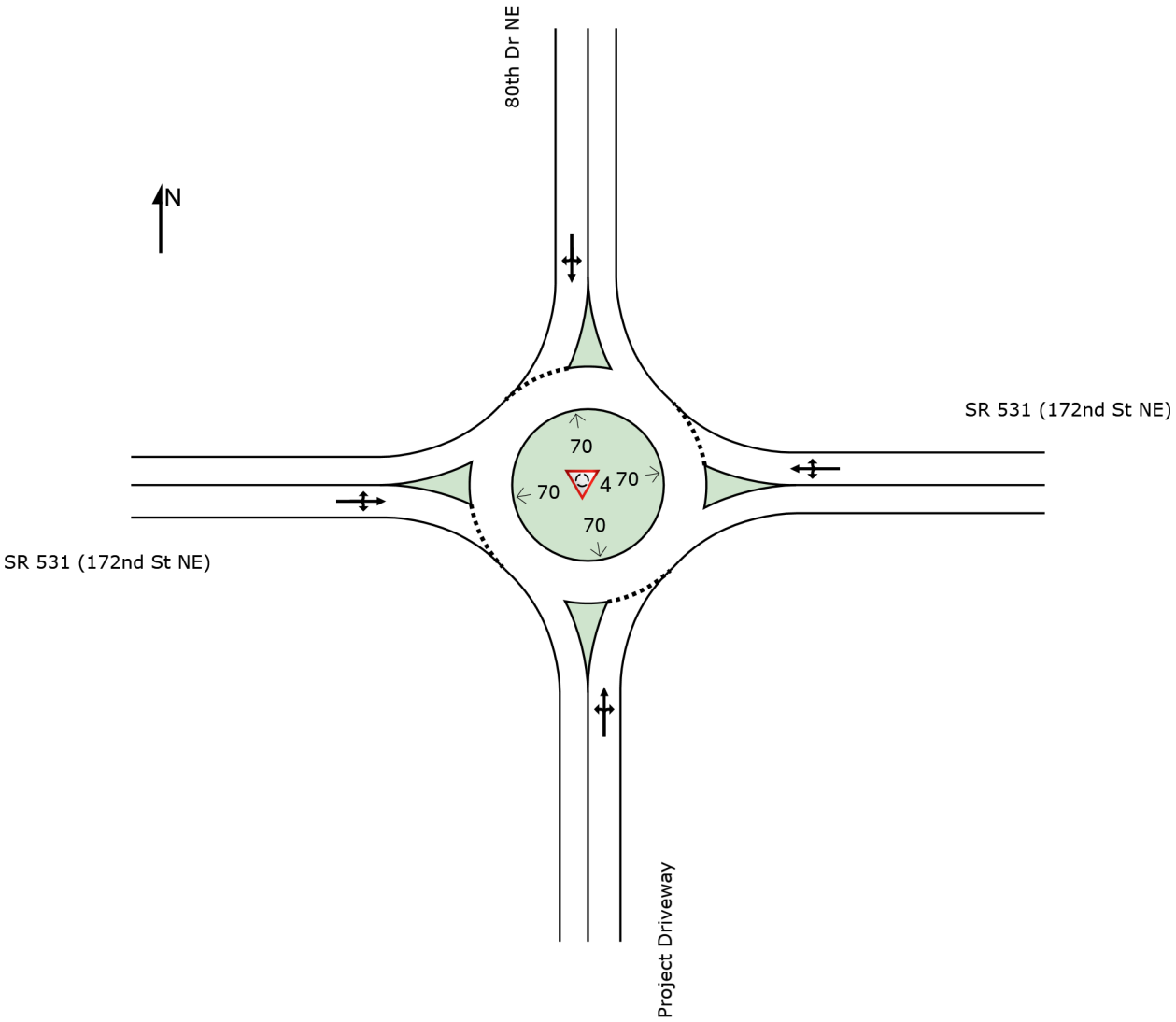
Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA HCM.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: 4 [4. SR 531/80th Dr NE (Site Folder: WP 2029)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	734	4	23	537	11	5
Future Vol, veh/h	734	4	23	537	11	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	798	4	25	584	12	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	802	0	1434	800
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	634	-
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	-	-	821	-	148	385
Stage 1	-	-	-	-	442	-
Stage 2	-	-	-	-	529	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	821	-	143	385
Mov Cap-2 Maneuver	-	-	-	-	281	-
Stage 1	-	-	-	-	442	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.39	17.42
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	307	-	-	821	-
HCM Lane V/C Ratio	0.057	-	-	0.03	-
HCM Control Delay (s/veh)	17.4	-	-	9.5	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	699	15	0	597	0	9
Future Vol, veh/h	699	15	0	597	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	760	16	0	649	0	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	768
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	-	0	402
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	402
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0	14.19
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	402	-	-	-
HCM Lane V/C Ratio	0.024	-	-	-
HCM Control Delay (s/veh)	14.2	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Appendix D: Detailed Trip Generation

1.24222 Lindsay Sub-Area (MJS Parcels)

MJS Investors Parcels Only										
								Gross Trips		
Land Use	**Setting**	**Size**	**Units**	**Model**	**Equation**	**Rate**	**Inbound %**	**Inbound**	**Outbound**	**Subtotal**
Single Family Homes (LU 210)		**177**	du							
Daily	General Urban/Suburban			Equation (log)	Ln(T) = 0.92 Ln(X) + 2.68	-	50%	853	853	1,706
PM Peak Hour	General Urban/Suburban			Rate	-	0.94	63%	105	61	166

Notes:

1. Trip rates based on Institute of Transportation Engineers' (ITE) *Trip Generation Manual (*11th Edition) equation and average trip rates as shown above.