HEATH & ASSOCIATES

Transportation Planning & Engineering

TRAFFIC IMPACT ANALYSIS

Vista Views At Black Lake

City of Tumwater, WA

PREPARED FOR:
Hatton Godat Pantier

Revised:
November 22, 2024

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VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

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October 22, 2024

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Sent via email to: avanaken@heathtraffic.com and chrisc@hattonpantier.com

RE: Vista Views At Black Lake Traffic Impact Analysis
City of Tumwater Transportation Concurrency Permit No. TUM-24-1449

The City of Tumwater has reviewed your Transportation Impact Analysis dated July 10, 2024, and has identified the following comments:

1. The report indicates that no non-motorized traffic was observed during the PM peak window of 4 to 6. However, because of the proximity to Black Lake Elementary School, the window for peak non-motorized traffic may be different than peak motorized traffic. Additional data should be collected during the drop off and pick up windows for the adjacent school to accurately determine non-motorized traffic and potential impacts.

   Response: Additional observations were conducted at the elementary school during school drop-off and pick-up times. Refer to Section 3.3 of the TIA for additional information.

2. Regarding the roadway improvements section, the I-5/Trosper Rd/Capitol Blvd Reconfiguration is complete. Tumwater also believes the Black Lake Belmore Rd Bridge Approach Repair is wrapping up or will be complete soon, this should be confirmed with the County.

   Response: Based on a November site visit, all construction/repair activity is completed.

3. The trip distribution shows trips through Miner Dr and onto Littlerock Rd. This route poses several delays to drivers such as lower speed limits, traffic calming measures, and a high amount of pedestrian traffic on or directly adjacent to the vehicle path. Tumwater feels that trips generated by this project will be more likely to avoid Miner Dr, and are more likely to take either Black Lake Belmore Rd to 66th Ave and then 70th Ave, or 54th Ave to Trosper Rd. If the transportation engineer agrees, then those trips assigned to Miner Dr should be distributed to other roadways.

   Response: A custom TAZ model was performed and calibrated to reflect the area conditions (e.g., speed limits, traffic calming, etc.). Trip assignments have been updated accordingly and are displayed in Figure 4. Little to no regular site-generated traffic is expected to use Miner Drive.

4. In the report it is indicated that no improvements are planned by Thurston County or Tumwater for the intersection of Black Lake Blvd and Blake Lake Belmore Rd. However, Tumwater's Transportation Comprehensive Plan does call for a future roundabout at this intersection. Currently the project proposes to reconfigure the intersection to address predicted level of service issues that would improve the intersection from LOS F to LOS C.

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The City is concerned that the proposed reconfiguration will be more of a short-term solution rather than a long term one and that shortly after completion the intersection will become LOS D again, which is considered failing by the City.

To aid the City in its decision on if the proposed reconfiguration will be appropriate or if a roundabout should be required per the City Comprehensive Plan, the horizon year should be increased to 6-years, rather than the current 5-year. The City municipal code does give the City the authority to assign a 6-year horizon for concurrency review. Using a 6-year horizon will provide the City with more data that will be used to make the determination on required mitigation. Based on current timelines that would be 2031 (project permitting and buildout by end of 2025, and 6-year horizon getting us to 2031).

Response: The horizon year was extended to 2031. It was confirmed that the City standard is LOS D. With the adjusted trip assignments, and 2031 horizon year, the intersection is projected to operate with LOS C conditions during the PM peak hour.

5. The TAZ Trip Distribution Map should be updated with an entrance onto 49th Ave and an entrance onto Black Lake Belmore Rd via 58th Ln, rather than one entrance at the intersection of Black Lake Belmore Rd and 49th Ave.

Response: The updated TAZ has two connector points to reflect two site accesses.

Please provide a response to these comments along with an updated Transportation Impact Analysis. If you have any questions please contact either myself via email at jcrews@ci.tumwater.wa.us or by calling 360.754.4140, or Brandon Hicks via email at bhicks@ci.tumwater.wa.us or by calling 360.754.4140.

Sincerely,

Jared Crews | Engineer II
City of Tumwater Transportation & Engineering

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

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FIGURES

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

1. INTRODUCTION

Heath & Associates has been retained to prepare a Traffic Impact Analysis (TIA) for the proposed Vista Views at Black Lake residential development. The purpose of this TIA is to evaluate the potential effects of the proposed development on the existing and future transportation network within the study area. This analysis provides a comprehensive assessment of the anticipated traffic generated by the project, identifies potential impacts on traffic flow, and recommends necessary mitigation measures to maintain acceptable mobility standards.

2. PROJECT DESCRIPTION

The Vista Views at Black Lake project is a proposed residential development comprised of up to 186 single-family dwelling units located within the city of Tumwater. The subject site, located northeast of the Black Lake Belmore Road SW & 58th Lane SW intersection, is situated on a cumulative 55.01-acres within tax parcel #'s: 1283231-0700; & -0800. All on-site structures are to be demolished prior to new construction.

Access to the proposed residential plat is planned via new public street connections to 49th Avenue SW (north) and 58th Lane SW (south). Future connectivity both east and west to the adjacent undeveloped parcels would also be provided. Refer to **Figure 1** on the following page for an aerial vicinity map of the subject site and surrounding roadway system. A conceptual site plan is depicted in **Figure 2**, illustrating site access and future points for potential internal connectivity.

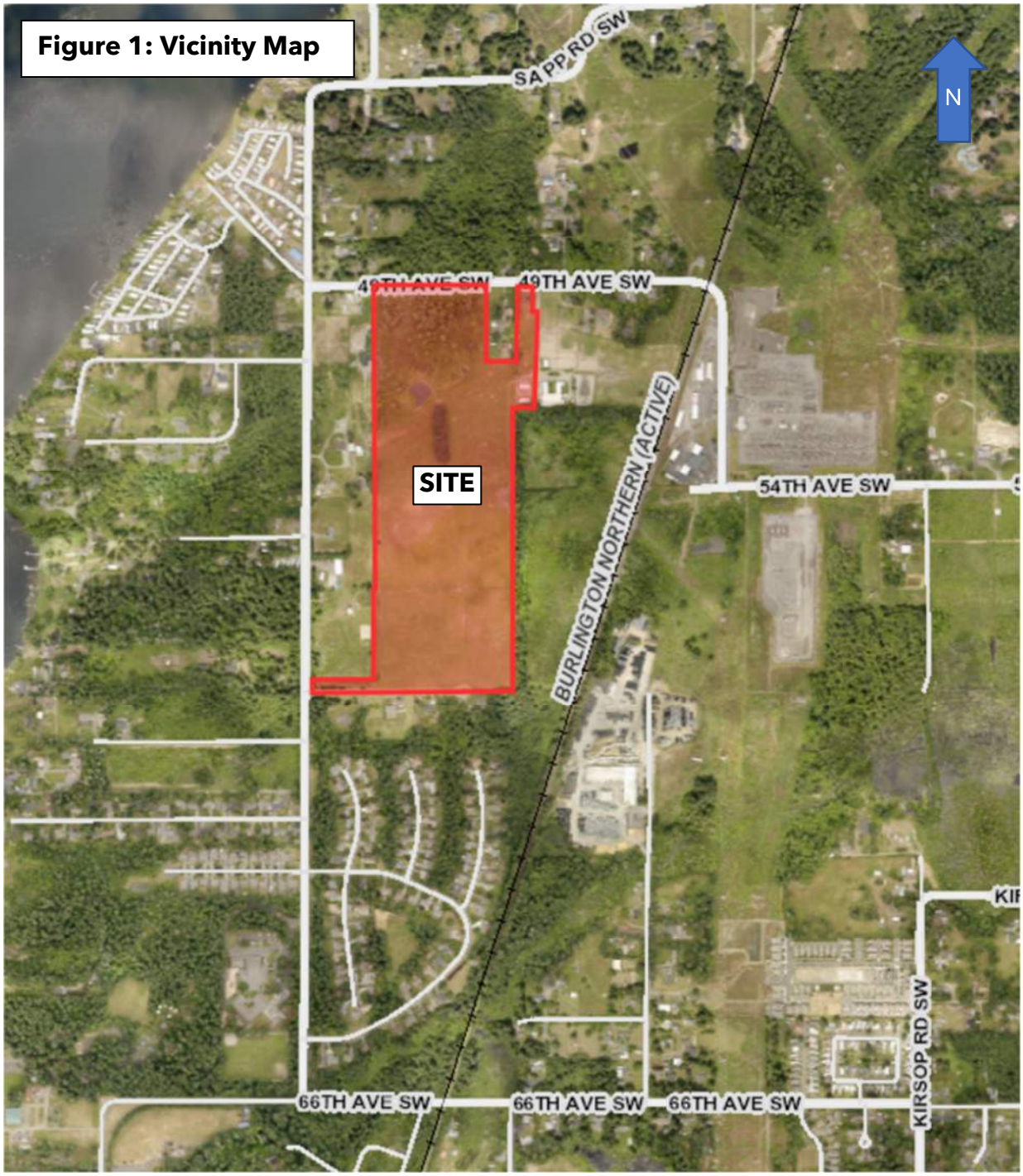
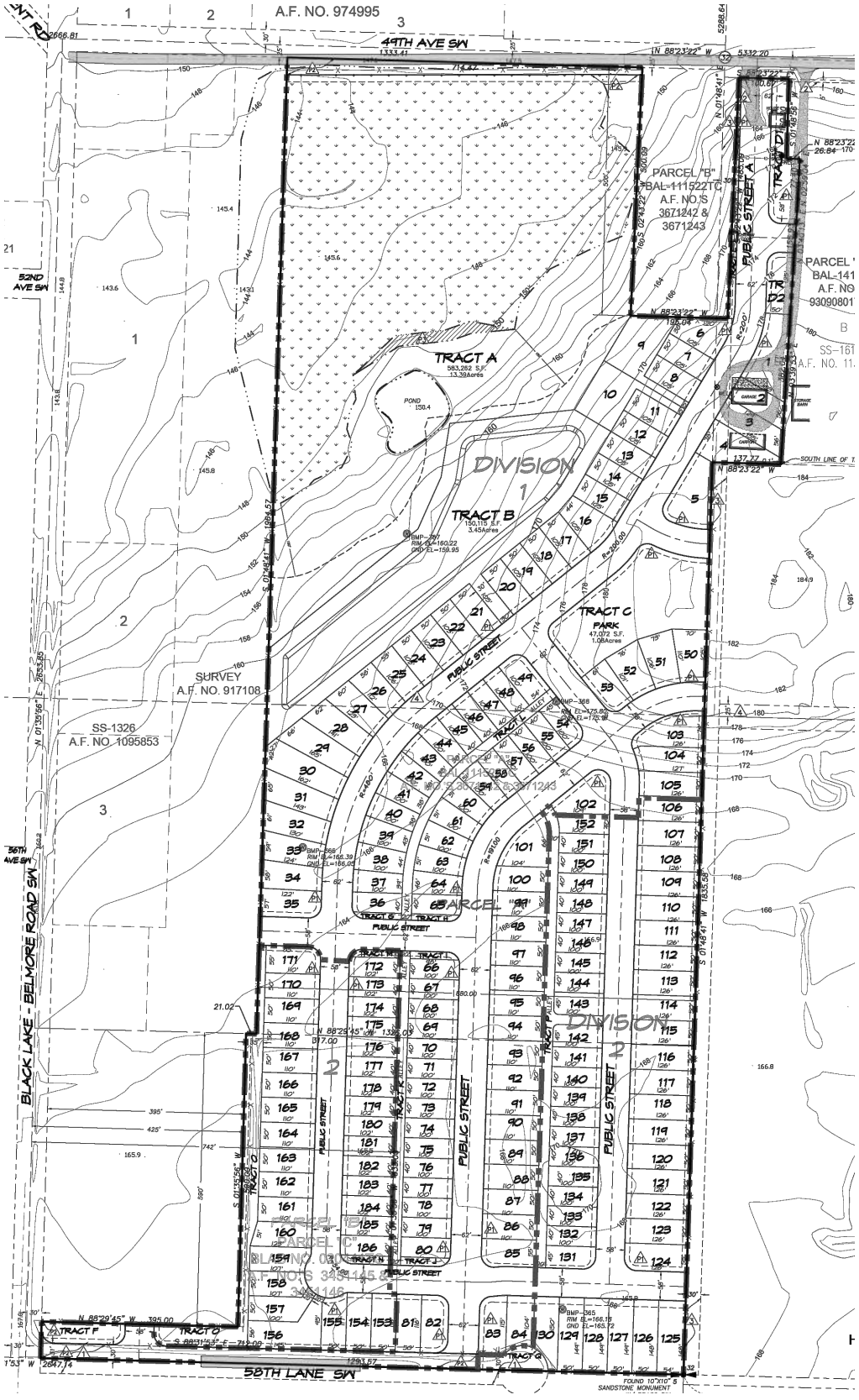


Figure 1: Vicinity Map
SAPP RD SW
N
49TH AVE SW
SITE
BURLINGTON NORTHERN (ACTIVE)
54TH AVE SW
KIRSOP RD SW
66TH AVE SW
66TH AVE SW
66TH AVE SW



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VISTA VIEWS AT BLACK LAKE

CONCEPTUAL SITE PLAN
FIGURE 2

3. EXISTING CONDITIONS

3.1 Existing Street System

The street network serving the proposed project consists of a variety of roadways. The major roadways and arterials defined in the study area are listed and described in **Table 1** below.

Table 1: Roadway Network

Functional Classification	Roadway	Speed Limit	Lanes	Street Parking	Sidewalk	Bike Facilities
Collector	Black Lake-Belmore Rd SW	35 mph	2	No	S/o 59th Ave SW (east side of road)	No
	49th Ave SW	40 mph	2	No	No	No
	54th Ave SW/ Trosper Rd SW	25 to 40 mph	2-3	No	No (discontinuous east of Lambskin St)	No
Local	58th Ln SW	Not Posted	2	No	No	No

3.2 Existing Peak Hour Volumes & Study Area

Traffic scoping was conducted with the City of Tumwater, Thurston County, and WSDOT to establish the study area. A total of 10 locations were targeted for evaluation. Turning movement counts were collected in April of 2024 between the PM peak period of 4:00-6:00.

Study Area

1. Black Lake Boulevard SW & US 101 SB/NB Ramps – Olympia/WSDOT
2. Black Lake Boulevard SW & Black Lake-Belmore Road SW – Thurston Co./Tumwater UGA
3. Sapp Road SW & Black Lake-Belmore Road SW – Thurston Co. /Tumwater UGA
4. 49th Avenue SW & Black Lake-Belmore Road SW – Thurston Co./Tumwater
5. 58th Lane SW & Black Lake-Belmore Road SW – Tumwater
6. 54th Avenue SW & Kirsop Road SW – Tumwater
7. 66th Avenue SW & Kirsop Road SW – Tumwater
8. 70th Avenue SW/Israel Road SW & Littlerock Road SW – Tumwater
9. Miner Road SW & Littlerock Road SW – Tumwater

A. 49th Avenue SW Through-Volumes at Access – Tumwater

The single hour exhibiting highest overall intersection volumes is then derived (peak hour) and is used for analysis. **Figure 3** and on the following page identifies existing PM peak hour volumes. Full count sheets have been attached in the appendix for reference for each study intersection.

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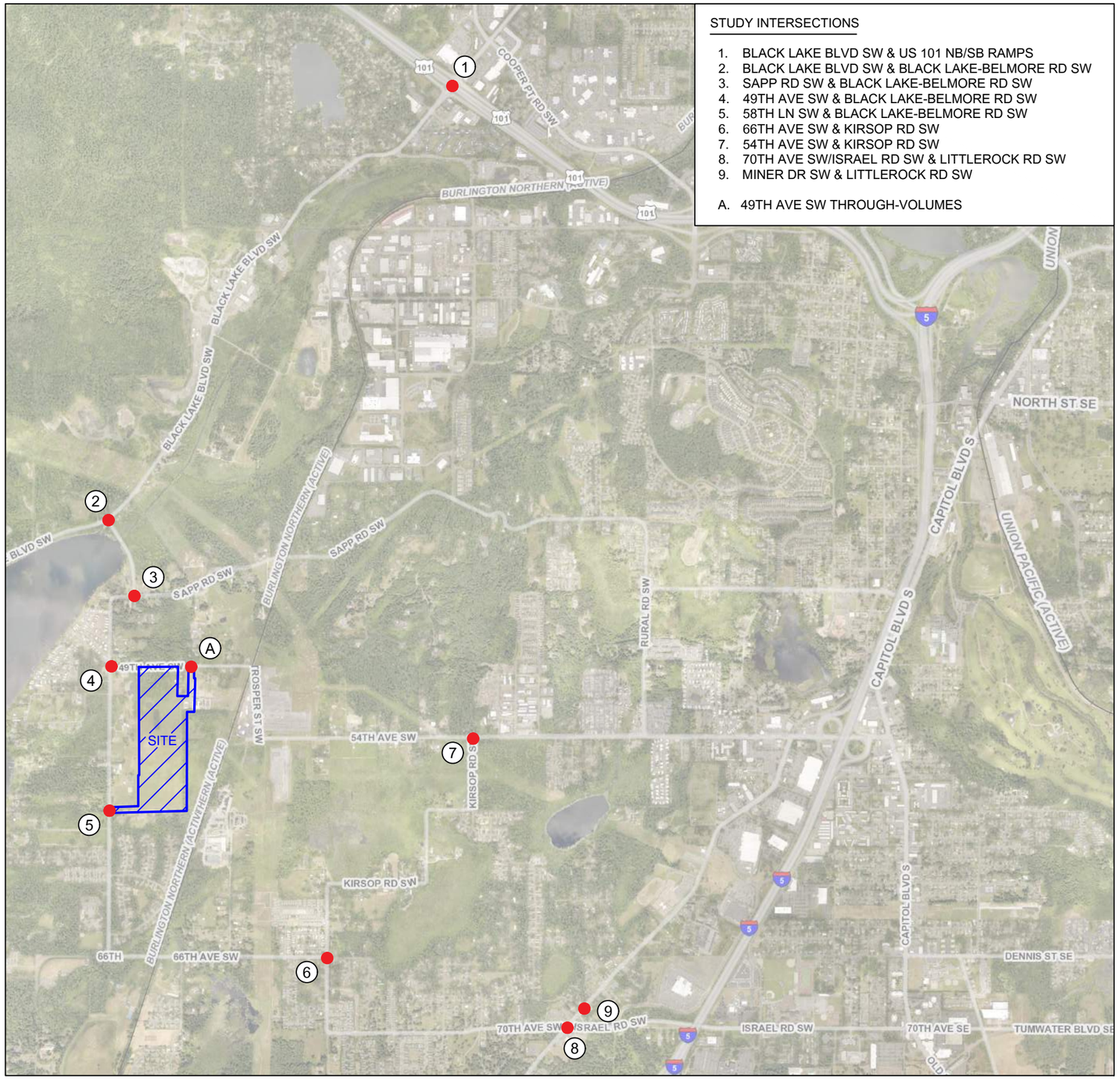

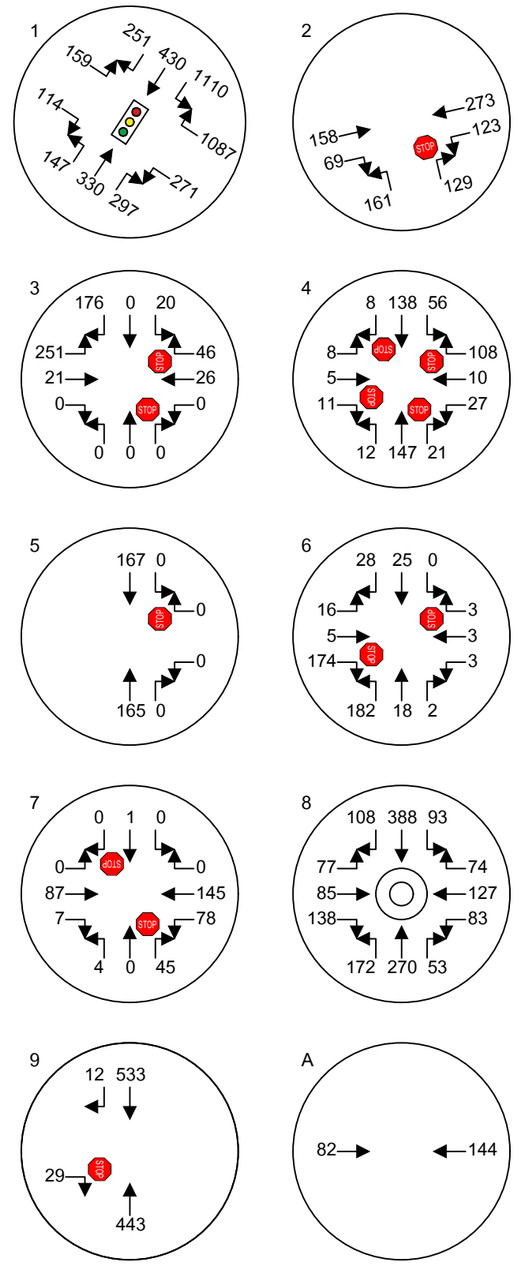

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VISTA VIEWS AT BLACK LAKE

EXISTING PM PEAK HOUR VOLUMES
FIGURE 3

3.3 Non-Motorist Infrastructure

During the PM peak hour of travel, no non-motorist volumes were observed at 58th Lane SW & Black Lake-Belmore Road SW or along 49th Avenue SW at the proposed subject site's primary access locations. The area in the vicinity of the subject site is rural in nature with limited non-motorist amenities. No non-motorist infrastructure is provided along the project frontage (49th Avenue SW) or along 58th Lane SE and 54th Avenue SW. However, south of 59th Avenue SW, sidewalk is available on the east side of Black Lake-Belmore Road SW. Vista Views at Black Lake would be responsible for constructing frontage improvements to current City standards. Moreover, all internal public roadways would also be constructed to current standards which would include non-motorist amenities.

School-aged children would likely attend Black Lake Elementary School or Tumwater Middle School. Black Lake Elementary School is located approximately one-half mile walking distance from the site access on 58th Lane SW. While children have access to a continuous sidewalk along the east side of Black Lake Belmore Road SW, there is an approximate 280-foot missing segment south of 58th Lane SW before connecting to the existing sidewalk. From there, a marked crosswalk at the elementary school's south driveway is available for east-west crossings on Black Lake Belmore Road SW. Reduced 20 mph "when flashing" school zone signs are posted both north and south of the school. To complete a Safe Walking Route to the local school, the development will complete the missing off-site sidewalk segment.

Tumwater Middle School is located more than 3.0 miles from the site. Therefore, middle school-aged children would likely utilize school bus services. Currently, school bus stops are available at Black Lake-Belmore Road SW & 60th Avenue SW. However, additional school bus stops may be incorporated if determined by the School District and City.

Per City comments, additional observations took place to review school activity associated with Black Lake Elementary school just south of the proposed development. Peak school AM activity was shown to occur from 8:30-9:00 AM with around 50 crossings along the marked crosswalk at the school entrance. The school PM peak activity occurred from 3:00-3:40 PM with around 70 crossings. Most crossings were due to vehicles

parking along the east shoulder and parents disembarking with their child(ren) and walking them to and from the school entrance. Given the proximity of the site to the school, and by constructing off-site sidewalk to complete a continuous walking route, no significant impact from the development is anticipated as most trips should be in the form of multi-modal. Vehicle congestion was short-lasted and no significant back-ups were recorded.

3.4 Transit Service

Th nearest transit service availability in relation to the subject site is located ~1.9-miles walking-distance east at Rural Road SW & Trosper Road SW. Refer to the Intercity Transit service schedule for more detailed information.

3.5 Roadway Improvements

The City of Tumwater's Six-Year Transportation Improvement Program 2024-2029 and Thurston County's Transportation Improvement Program (2024-2029) indicate that the following improvement projects are planned within the vicinity of the site.

Table 2: Transportation Improvement Projects

Name	Location	Improvement	Cost
Tumwater TIP (2024-2029)			
Tumwater Blvd Interchange (Map ID# 7)	I-5 Interchange at Tumwater Blvd	Design, acquire ROW, and construct improvements. Phased project with an interim signal constructed first to allow development to continue, followed by a roundabout on one side of the interchange, then a roundabout on the other side of the interchange, and then finally widening of the overpass. *This project is being coordinated with WSDOT.*	$31,500,000
I-5/Trosper Rd/Capitol Blvd Reconfiguration (Map ID# 8)	Interchange	Modify I-5 NB On & Off-Ramps; construct new 6th Ave btw W Lee St and Trosper Rd; construct RABs at Capitol Blvd/Trosper Rd, Trosper Rd/6th Ave and NB Ramp/6th Ave; extend Trosper Rd e/o Capitol Blvd, construct new local access road from Trosper Rd ext. to Linda St, and reconstruct Linda St from Capitol Blvd to new local access road. Based on the site visit, it appears that the improvement project is completed.	$17,947,000
Trosper Road Capacity Study (ST-26)	Littlerock Rd to I-5	Capacity study. Anticipating dual roundabout, one at Littlerock Rd and one at Tyee Dr/I-5 on/off ramp	$200,000
Thurston County TIP (2024-2029)			
Black Lake Belmore Rd Bridge Approach Repair (Project Rank #43)	Bridge	Construct a timber pile embankment to support roadway and bridge approach slabs from future settlement. The improvement project will be completed soon.	$3,700,000

3.6 Existing Level of Service

Intersection delays were determined using the *Highway Capacity Manual,* 7th Edition. Capacity analysis was conducted to determine level of service (LOS), an established measure of congestion for transportation facilities. Intersection LOS ranges[1] from LOS A, indicting free flow conditions and low driver delay, to LOS F, indicting saturated conditions and heavy control delays. Level of service calculations were performed using the *Synchro 12* and *SIDRA Intersection 9.1* (roundabouts) analysis programs.

It should be noted that Black Lake Boulevard SW & US 101 Northbound/ Southbound Ramps comprises a single-point urban interchange (SPUI) design. The City of Olympia's Synchro model was obtained from the City and utilized for LOS calculations at this intersection. All remaining locations, being outside city limits, were created and modeled under a separate file. Delays presented represent overall weighted average delays for roundabouts, signals and all-way stop-controlled (AWSC) intersections. For side-street, stop-controlled intersections (TWSC), LOS is determined by the approach with the highest delay. **Table 3** summarizes existing PM peak hour LOS delays for the intersections of study.

Table 3: Existing Weekday PM Peak Hour Level of Service

Delays given in seconds per vehicle

Ref. #	Intersection	Control	Movement	LOS	Delay
1	Black Lake Blvd SW & US 101 NB/SB Ramps	Signal	Overall	C	24.6
2	Black Lake Blvd SW & Black Lake-Belmore Rd SW	TWSC	NB	D	29.3
3	Sapp Rd SW & Black Lake-Belmore Rd SW	TWSC	SB	B	12.3
4	49th Ave SW & Black Lake-Belmore Rd SW	AWSC	Overall	A	9.0
5	58th Ln SW & Black Lake-Belmore Rd SW	TWSC	-[2]	-	-
6	54th Ave SW/Trosper Rd SW & Kirsop Rd SW	TWSC	SB	B	12.6
7	66th Ave SW & Kirsop Rd SW	TWSC	WB	B	12.8
8	70th Ave SW/Israel Rd SW & Littlerock Rd SW	RAB	Overall	A	7.8
9	Miner Rd SW & Littlerock Rd SW	TWSC	EB	B	12.9

TWSC: Side-Street Stop Control; AWSC: All-Way Stop Control; RAB: Roundabout

[1] *Signalized Intersections - Level of Service*

Level of Service	Control Delay per Vehicle (sec)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Stop Controlled Intersections – Level of Service

Level of Service	Control Delay per Vehicle (sec)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Highway Capacity Manual, 7th Edition

[2] No turning movements were recorded during the peak hour count. Therefore, there are no delays reported under existing conditions.

The City of Tumwater maintains a level of service standard of D or better at the intersections of study. At the Black Lake Boulevard SW Ramps, WSDOT maintains an LOS standard of D or better. Lastly, Black Lake-Belmore Road SW's intersections with Black Lake Boulevard SW and Sapp Road SW are situated within Thurston County's Tumwater Urban Growth Area, which comprises a standard of LOS D.

Existing PM peak hour delays at the study intersections are all shown to fall within the LOS D or better range, meeting the previously noted LOS requirements.

3.7 Safety Analysis

Collision History Analysis

A list of the recorded incident history for the five most recent full years (beginning of 2018 through end of 2022) for all study intersections was requested from WSDOT. Moreover, 49th Avenue SW within a 500-foot distance of the proposed access was reviewed. **Table 4** below outlines yearly incidents. Collisions were included within the dataset if WSDOT noted the collision's junction relationship to be "at intersection" or "intersection related."

Table 4: Collision History Overview

Intersection/Roadway Segment	2018	2019	2020	2021	2022	Total 5-Year	Avg/Yr
1. Black Lake Blvd SW & US 101 NB/SB Ramps	10	13	4	16	7	50	10
2. Black Lake Blvd SW & Black Lake-Belmore Rd SW	1	1	0	2	0	4	0.8
3. Sapp Rd SW & Black Lake-Belmore Rd SW	1	0	1	0	0	2	0.4
4. 49th Ave SW & Black Lake-Belmore Rd SW	0	0	1	0	2	3	0.6
5. 58th Ln SW & Black Lake-Belmore Rd SW	0	0	0	1	0	1	0.2
6. 54th Ave SW/Trosper Rd SW & Kirsop Rd SW	0	0	1	0	0	1	0.2
7. 66th Ave SW & Kirsop Rd SW	1	0	2	0	0	3	0.6
8. 70th Ave SW/Israel Rd SW & Littlerock Rd SW	4	4	4	3	1	16	3.2
9. Miner Rd SW & Littlerock Rd SW	0	1	0	0	0	1	0.2
A. 49th Ave SW +/- 500' of Access	0	1	0	0	2	3	0.6

A total of 84 collisions were recorded at the study intersections and within 500-feet of the proposed 49th Avenue SW project access—over half of which occurred at the Black Lake Boulevard SW & US 101 single-point urban interchange. The following sections analyze collision types, severity, and contributing factors in an effort to identify any potential trends.

Collision Type Analysis

Summaries of collision types that occurred at and/or related to each study intersection are provided in **Table 5** below.

Table 5: Collision History Crash Types

	Number of Crashes (2018-2022)									
Crash Type	**I/S #1**	**I/S #2**	**I/S #3**	**I/S #4**	**I/S #5**	**I/S #6**	**I/S #7**	**I/S #8**	**I/S #9**	**I/S #A**
Rear-end	15	1			1		2	6	1	
Entering at angle	13		1	3		1		6		1
Sideswipe	12							1		
From opp. dir. – all others	3									
From opp. dir. – one L, one straight	4									1
From opp. dir. – one L, one R	3									
From same dir. – one L, one straight							1	1		
From same dir. – all others								1		
Vehicle strikes fence/post/utility box/pole		3	1					1		1

1. Black Lake Boulevard SW & US 101 NB/SB Ramps: 50 collisions were recorded over the 5-year study timeframe, resulting in an average of 10 incidents per year. The collision types were listed as "rear-end" (15/50), "entering at angle" (13/50), "sideswipe" (12/50), "from opposite direction – one left turn, one straight" (4/50), "from opposite direction – all others" (3/50) and "from opposite direction – all others" (3/50).

2. Black Lake Boulevard SW & Black Lake-Belmore Road SW: 4 collisions were recorded over the 5-year study timeframe, resulting in an average of 0.8 incidents per year. The collision types were listed as "vehicle strikes fence/metal sign post" (3/4) and "rear-end" (1/4).

3. Sapp Road SW & Black Lake-Belmore Road SW: 2 collisions were recorded over the 5-year study timeframe, resulting in an average of 0.4 incidents per year. The collision types were listed as "entering at angle" (1/2) and "vehicle strikes utility box" (1/2).

4. 49th Avenue SW & Black Lake-Belmore Road SW: 3 collisions were recorded over the 5-year study timeframe, resulting in an average of 0.6 incidents per year. All collision types were listed as "entering at angle" (3/3).

5. 58th Lane SW & Black Lake-Belmore Road SW: a single incident was recorded over the 5-year study timeframe, resulting in an average of 0.2 collisions per year. The collision type was listed as "rear-end" (1/1).

6. 54th Avenue SW/Trosper Road SW & Kirsop Rd Road SW: a single incident was recorded over the 5-year study timeframe, resulting in an average of 0.2 collisions per year. The collision type was listed as "entering at angle" (1/1).

7. 66th Avenue SW & Kirsop Road SW: 3 incidents were recorded over the 5-year study timeframe, resulting in an average of 0.6 collisions per year. The collision types were listed as "rear-end" (2/3) and "from same direction – one left turn, one straight" (1/3).

8. 70th Avenue SW/Israel Road SW & Littlerock Road SW: 16 collisions were recorded over the 5-year study timeframe, resulting in an average of 3.2 incidents per year. The collision types were listed as "rear-end" (6/16), "entering at angle" (6/16), "sideswipe" (1/16), "from same direction – one left turn, one straight" (1/16), "from same direction – all others" (1/16) and "vehicle strikes street light pole" (1/16).

9. Miner Road SW & Littlerock Road SW: a single incident was recorded over the 5-year study timeframe, resulting in an average of 0.2 collisions per year. The collision type was listed as "rear-end" (1/1).

A. 49th Avenue SW within +/- 500' of Proposed Access: 3 collisions were recorded over the 5-year study timeframe, resulting in an average of 0.6 collisions per year. The collision types were listed as "entering at angle (1/3), "from opposite direction – one left turn, one straight" (1/3) and "vehicle strikes utility pole" (1/3).

Collision Severity, Contributing Factor Analysis & Trends

A collision severity summary associated with the study intersection is provided below in **Table 6**. **No fatalities or serious injuries were recorded at any of the study intersections**. Summaries of factors contributing to the collisions recorded at each respective intersection are subsequently outlined.

Table 6: Collision History Severity

	Number of Crashes (2018-2022)									
Crash Type	**I/S #1**	**I/S #2**	**I/S #3**	**I/S #4**	**I/S #5**	**I/S #6**	**I/S #7**	**I/S #8**	**I/S #9**	**I/S #A**
Fatal (K)										
Incapacitating Injury (A)										
Non-incapacitating Injury (B)	2									
Possible Injury (C)	8							1		
Property Damage Only (PDO)	40	4	2	3	1	1	3	15	1	3

1. Black Lake Boulevard SW & US 101 NB/SB Ramps: The majority of collisions resulted in "no apparent injury" (40/50), with remaining incidents resulting in "possible injury" (8/50) and "suspected minor injury" (2/50). Collision circumstances were contributed to "did not grant right of way to vehicle" (15/50), "inattention/ distraction" (10/50), "improper turn/merge" (5/50), "disregard signal" (4/50), "following too closely" (3/50), and "exceeding reasonably safe speed" (2/50), "driver ill" (1/50) and "driver under influence of alcohol" (1/50). The remaining incidents did not have contributing circumstances listed (9/50).

2. Black Lake Boulevard SW & Black Lake-Belmore Road SW: the recorded collisions resulted in "no apparent injury" (2/4) and "unknown" (2/4). Collision circumstances were contributed to driver error via "distraction" (1/4), "following too closely" (1/4) and "driver under influence of alcohol" (1/4). The remaining incident did not have a contributing circumstance listed (1/4).

3. Sapp Road SW & Black Lake-Belmore Road SW: the recorded collisions resulted in "no apparent injury" (1/2) and "unknown" (1/2). One collision circumstance can be contributed to driver error via "improper turn/merge" (1/2). No contributing circumstances were listed for the remaining incident (1/2).

4. 49th Avenue SW & Black Lake-Belmore Road SW: all 3 recorded collisions resulted in "no apparent injury" (3/3). Collision circumstances were contributed to "distraction" (1/3), "did not grant right of way to vehicle" (1/3) and "improper turn/merge" (1/3).

5. 58th Lane SW & Black Lake-Belmore Road SW: the single recorded collision resulted in "no apparent injury" (1/1) and the collision circumstances were listed as "follow too closely" (1/1).

6. 54th Avenue SW/Trosper Road SW & Kirsop Rd Road SW: the single recorded collision resulted in "no apparent injury" (1/1). Collision circumstances were contributed to driver error via "did not grant right of way to vehicle" (1/1).

7. 66th Avenue SW & Kirsop Road SW: the three recorded collisions resulted in "no apparent injury" (3/3). Collision circumstances were contributed to "operating defective equipment" (1/3) and "improper passing" (1/3). No contributing circumstances were listed for the remaining incident (1/3).

8. 70th Avenue SW/Israel Road SW & Littlerock Road SW: The majority of collisions resulted in "no apparent injury" (15/16), with the remaining incident resulting in "possible injury" (1/16). Collision circumstances were contributed to "following too closely" (4/16), "inattention/distraction" (4/16), "did not grant right of way to vehicle" (3/16) and "improper turn/merge" (2/16). The remaining incidents did not have contributing circumstances listed (3/16).

9. Miner Road SW & Littlerock Road SW: the single recorded collision resulted in "no apparent injury" (1/1) and the collision circumstances were listed as "distraction" (1/1).

A. 49th Avenue SW within +/- 500' of Proposed Access: the three recorded collisions resulted in "no apparent injury" (3/3). Collision circumstances were contributed to "driver asleep/fatigued" (1/3), "distraction" (1/3) and "improper backing" (1/3).

In review of overall trends, collisions were primarily property damage only and largely contributed to driver error/inattention. **No collisions involved non-motorists.**

4. FORECAST TRAFFIC DEMAND & ANALYSIS

4.1 Project Trip Generation

Trip generation is defined as the number of vehicle movements that enter or exit the respective project site during a designated time period such as the PM peak hour or an entire day. The magnitude of the anticipated vehicle trip generation for the proposed project was derived from the Institute of Transportation Engineers (ITE) publication, Trip Generation Manual, 11th Edition. The designated land use for this project is defined under Land Use Code (LUC) 210 – Single-Family Housing Detached. **Table 7** below summarizes the estimated project trip generation using ITE equations with dwelling units as the input variable. Included are the average weekday daily traffic (AWDT) and the AM and PM peak hours. Refer to the appendix for trip generation output.

Table 7: Project Trip Generation

Land Use	Dwelling Units	AWDT	AM Peak-Hour Trips			PM Peak-Hour Trips		
			In	Out	Total	In	Out	Total
Single-Family (LUC 210)	186	1786	33	98	**131**	112	66	**178**

The 186 single-family lots are estimated to generate 1786 total average weekday daily trips with 131 total trips (33 inbound / 98 outbound) occurring in the AM peak hour and 178 total trips (112 inbound / 66 outbound) occurring in the PM peak hour.

4.2 Distribution and Assignment

Trip distribution and assignment for the proposed Vista Views at Black Lake project was based on Thurston Regional Planning Council's (TRPC) Transportation Analysis Zone (TAZ) 494. The TAZ was calibrated to reflect site-specific conditions. Site access is to be provided via 49th Avenue SW, as well as via 58th Lane SW and subsequently Black Lake-Belmore Road SW. See **Figure 4** for PM peak hour trip distribution and assignment.

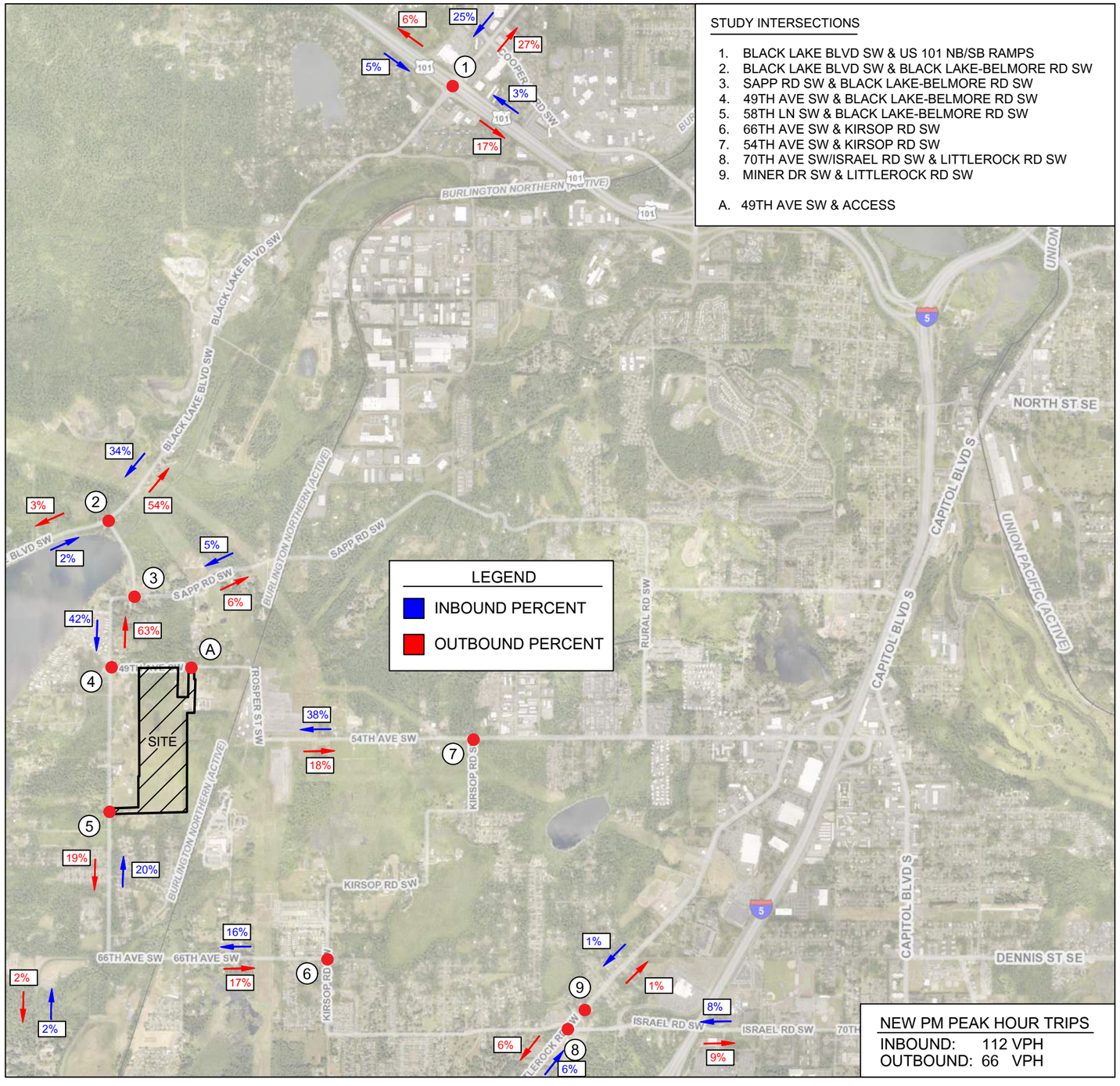
Lastly, project-generated trips anticipated to travel through the Tumwater I-5 Interchange to the south as identified from the TAZ 494 map are depicted in Figure A in the appendix. Approximately 6 AM and 8 PM peak hour project trips are identified to travel through the I-5 interchanges.

4.3 Future Peak Hour Volumes

A 7-year horizon of 2031 was used for the future traffic delay analysis. Forecasted background traffic volumes were derived according to the City of Tumwater's growth standards, applying a 4 percent compound annual growth rate to the existing PM peak hour volumes at all intersections along Littlerock Road SW (reference #'s 8 and 9). A 2 percent compound annual growth rate was applied to all remaining study intersections north of X Street. Moreover, pipeline volumes associated with the following projects were accounted for within forecast analysis: Aspen Apartments, Trestlewood, Belmont Flats, Bertsch Thurston County, Bishop Road Apartments, Kingswood Apartments, Kingswood Commercial, Kirsop Crossing, Littlerock Storage, L & I Training Center, New Market Apartments, Sienna I, Sienna II, OSOS Library Archive Building, Skyview Estates, South Sound Commerce Center, Tyee Landing Apartments, 6501 Capitol Boulevard Apartments, Littlerock Townhomes and Yorkshire. PM peak hour pipeline volumes are illustrated in **Figure 5.**

Forecast 2031 PM peak hour background volumes (pipeline and growth rate) are illustrated in **Figure 6**. Forecast 2031 PM peak hour volumes with project under full build-out conditions are outlined in **Figure 7**.

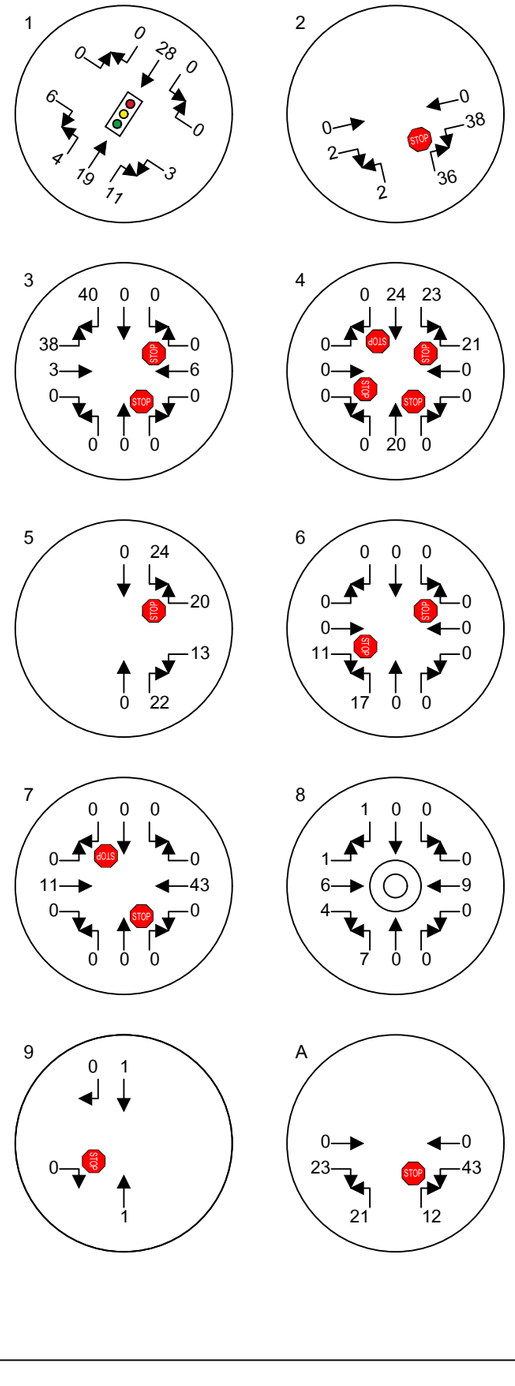
N



STUDY INTERSECTIONS

1. BLACK LAKE BLVD SW & US 101 NB/SB RAMPS
2. BLACK LAKE BLVD SW & BLACK LAKE-BELMORE RD SW
3. SAPP RD SW & BLACK LAKE-BELMORE RD SW
4. 49TH AVE SW & BLACK LAKE-BELMORE RD SW
5. 58TH LN SW & BLACK LAKE-BELMORE RD SW
6. 66TH AVE SW & KIRSOP RD SW
7. 54TH AVE SW & KIRSOP RD SW
8. 70TH AVE SW/ISRAEL RD SW & LITTLEROCK RD SW
9. MINER DR SW & LITTLEROCK RD SW

A. 49TH AVE SW & ACCESS



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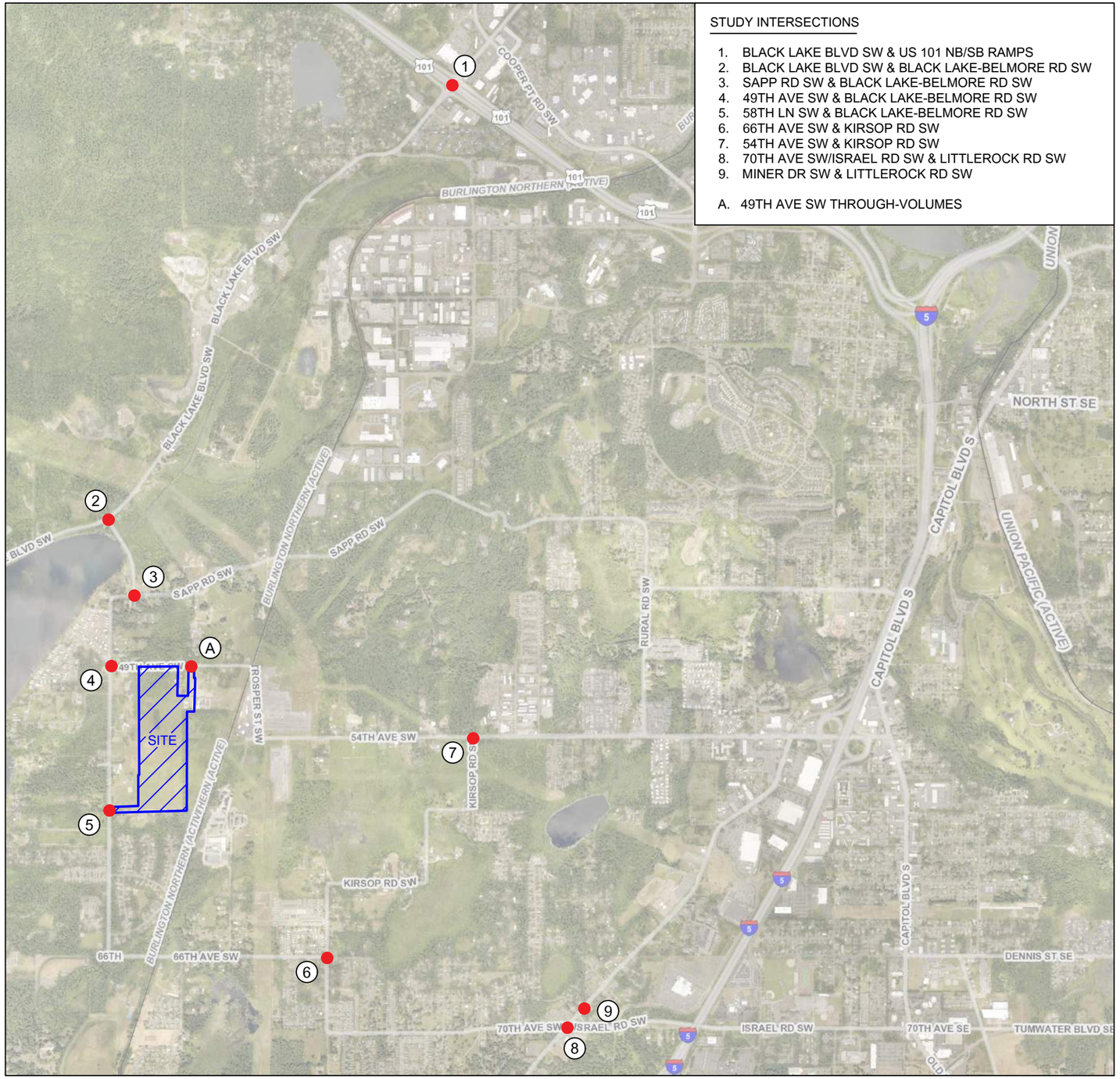
VISTA VIEWS AT BLACK LAKE

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 4

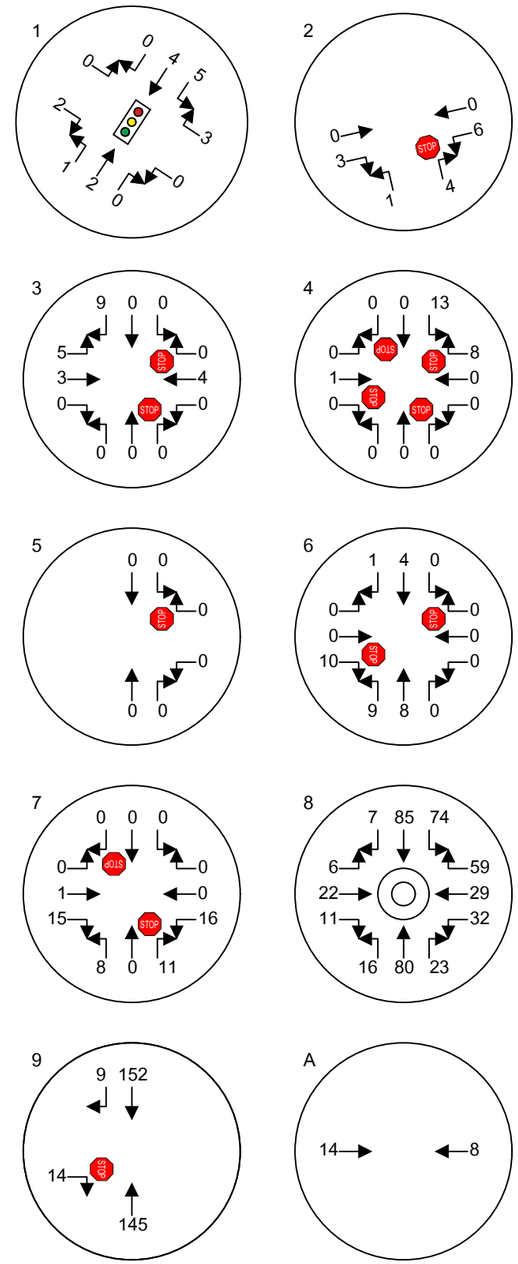
N



STUDY INTERSECTIONS

1. BLACK LAKE BLVD SW & US 101 NB/SB RAMPS
2. BLACK LAKE BLVD SW & BLACK LAKE-BELMORE RD SW
3. SAPP RD SW & BLACK LAKE-BELMORE RD SW
4. 49TH AVE SW & BLACK LAKE-BELMORE RD SW
5. 58TH LN SW & BLACK LAKE-BELMORE RD SW
6. 66TH AVE SW & KIRSOP RD SW
7. 54TH AVE SW & KIRSOP RD SW
8. 70TH AVE SW/ISRAEL RD SW & LITTLEROCK RD SW
9. MINER DR SW & LITTLEROCK RD SW

A. 49TH AVE SW THROUGH-VOLUMES



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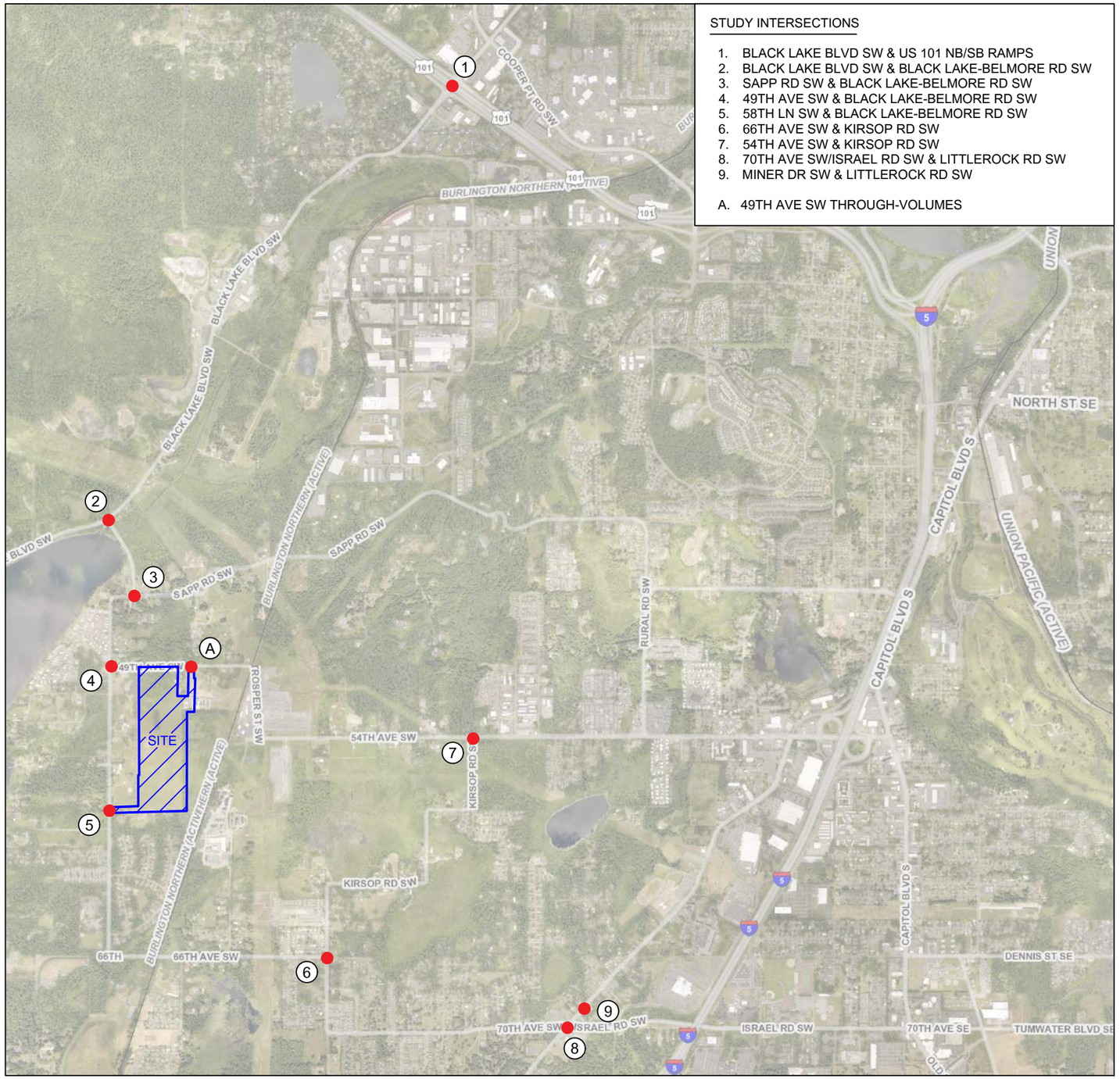
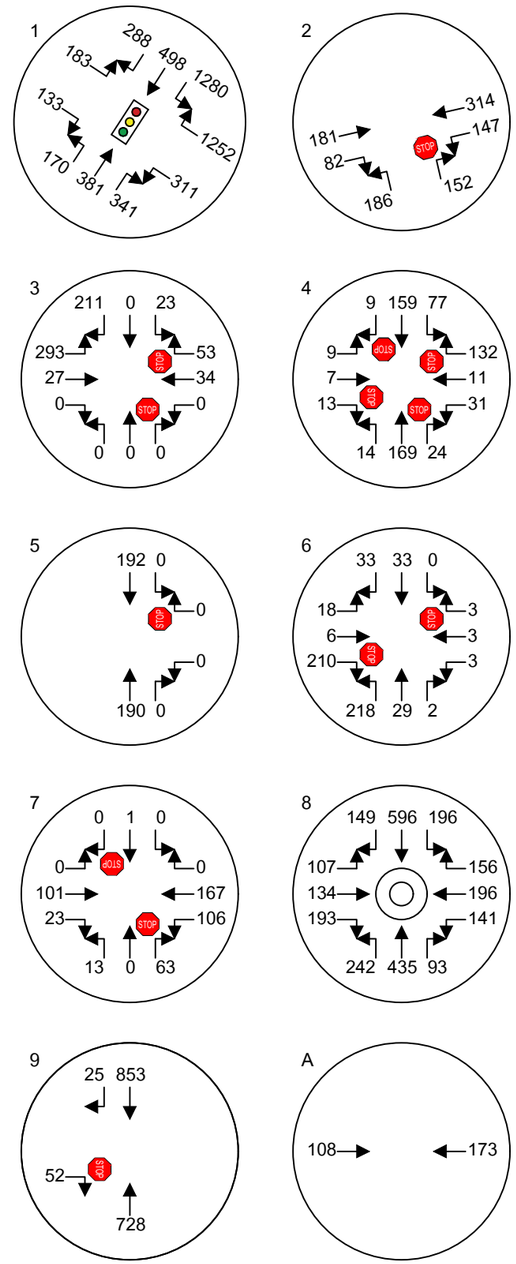
VISTA VIEWS AT BLACK LAKE

PM PEAK HOUR PIPELINE VOLUMES
FIGURE 5

N





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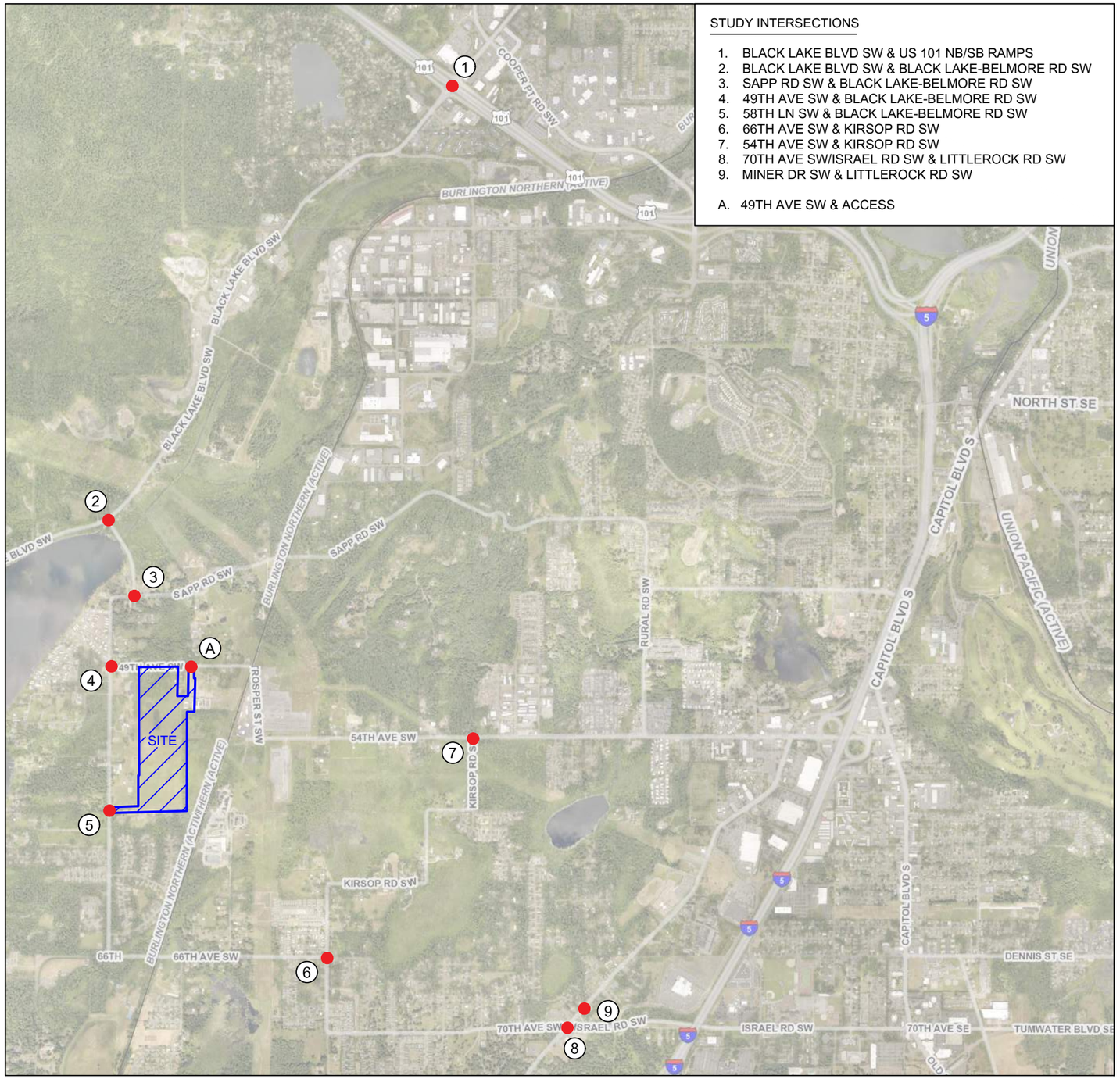
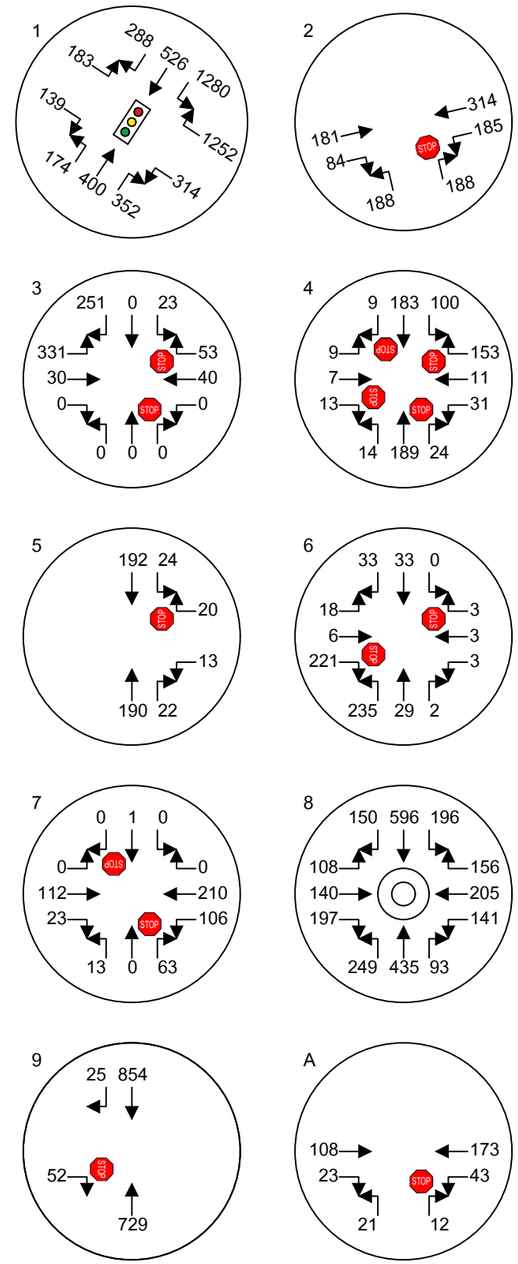
VISTA VIEWS AT BLACK LAKE

FORECAST 2031 PM PEAK HOUR VOLUMES WITHOUT PROJECT
FIGURE 6

N





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VISTA VIEWS AT BLACK LAKE

FORECAST 2031 PM PEAK HOUR VOLUMES WITH PROJECT
FIGURE 7

4.4 Future Level of Service

A level of service analysis was made of the future PM peak hour volumes without (background) and with project-generated trips. Results for intersection delay conditions were again determined using the *Synchro 12* and *SIDRA Intersection 9.1* analysis programs. Level of service outputs for the outlined analysis alternatives are provided in **Table 8** below.

Table 8: Forecast 2031 Weekday PM Peak Hour Level of Service

Delays given in seconds per vehicle

			Without Project		*With Project*	
Ref. #	**Intersection**	**Control**	**LOS**	**Delay**	**LOS**	**Delay**
1	Black Lake Blvd SW & US 101 NB/SB Ramps	Signal	C	29.0	C	29.2
2	Black Lake Blvd SW & Black Lake-Belmore Rd SW	TWSC	**F**	**68.4**	**F**	**123.6**
3	Sapp Rd SW & Black Lake-Belmore Rd SW	TWSC	B	13.6	B	14.7
4	49th Ave SW & Black Lake-Belmore Rd SW	AWSC	A	9.7	B	10.5
5	58th Ln SW & Black Lake-Belmore Rd SW	TWSC	--	--	B	10.8
6	54th Ave SW/Trosper Rd SW & Kirsop Rd SW	TWSC	B	14.2	C	15.0
7	66th Ave SW & Kirsop Rd SW	TWSC	B	14.3	C	15.0
8	70th Ave SW/Israel Rd SW & Littlerock Rd SW	RAB	B	13.1	B	13.6
9	Miner Rd SW & Littlerock Rd SW	TWSC	C	20.1	C	20.1
A	49th Ave SW & Access	TWSC	--	--	B	10.7

As summarizes in the table above, with the exception of Black Lake Boulevard SW & Black Lake-Belmore Road SW, all study intersections are shown to operate with acceptable LOS C or better conditions under forecast with project scenario. Moreover, the proposed access on 49th Avenue SW and 58th Lane SW & Black Lake-Belmore Road SW are shown to operate with acceptable LOS B delays.

Descriptions of the substandard study intersection are provided below.

Black Lake Boulevard SW & Black Lake-Belmore Road SW: was found to operate with LOS F conditions both without and with the proposed development under forecast peak hour conditions. There are currently no improvements outlined in the Tumwater or Thurston County Improvement Programs. In order to improve conditions and bring LOS within acceptable standards, mitigation measures are needed.

Mitigation Measures

Black Lake Boulevard SW & Black Lake-Belmore Road SW is currently a three-leg, stop-controlled intersection. The minor approach comprises a single lane for queuing before entering the major roadway. The major roadway features a dedicated westbound left-turn lane.

Black Lake-Belmore Road SW

Improvement: Construct separate northbound left- and right-turn lanes.

Description: There is a high number of left turns waiting to enter Black Lake Blvd SW. Left turns typically experience higher delays compared to right turns. In a single-lane configuration, vehicles waiting to turn left can block vehicles behind them that could otherwise turn right and bypass the queue.

Black Lake Boulevard SW

Improvement: Construct acceleration lane west of the intersection.

Description: Presently, a driver making a northbound left turn from Black Lake-Belmore Road SW must wait for gaps in both east/west directions. An acceleration lane allows a two-staged entry and can split the gap acceptance into two movements.

A conceptual design for the improvements is provided on the following page in **Figure 8**. It should be noted that lane widths, acceleration lane length and other design components illustrated in the figure are conceptual at this time and subject to modification. Coordination should be made with the County regarding final design. **Table 9** below summarizes forecast 2031 PM peak hour LOS with project for both existing and mitigated configurations.

Table 9: Forecast 2031 Weekday PM Peak Hour Operations

Ref. #	Intersection	Scenario (with Project)	LOS
2	Black Lake Blvd SW & Black Lake-Belmore Rd SW	Existing Configuration	F (123.6 sec.)
		Separate NB R/L Turn Lanes + Acceleration Lane	C (21.7 sec.)

As shown above, the mitigation measures would improve the intersection from LOS F to an acceptable LOS C and reduce the average delay be around 100 seconds less per vehicle.

N

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VISTA VIEWS AT BLACK LAKE

CONCEPTUAL INTERSECTION DESIGN
FIGURE 8

4.5 Left-Turn Warrant Analysis

Left-turn warrants were reviewed for both the site access intersection with 49th Avenue SW and at 58th Lane SW & Black Lake-Belmore Road SW using WSDOT's Design Manual (*Exhibit 1310-9 Left-Turn Storage Guidelines: Two-Lane, Unsignalized)*.

Project Access & 49th Avenue SW: The newly proposed access intersection was found to not require a left-turn lane given warrant thresholds.

58th Lane SW & Black Lake-Belmore Road SW: The intersection falls under warrant thresholds per WSDOT criteria.

4.6 Project Access & Sight Distance

Access to the subject site is proposed via one new roadway extending north from 58th Lane SW and one new roadway extending south from 49th Avenue SW into the subject site (see Figure 2). Based on the 40-mph posted speed (50-mph design speed) on 49th Avenue SW, AASHTO standards recommend 555-feet of entering sight distance (ESD). Based on preliminary assessments, sight distance is available in excess of 555-feet looking both east and west at the 49th Avenue SW access. 49th Avenue SW is relatively flat and straight offering clear sight lines. No sight line deficiencies are identified with the proposed access intersection.

Moreover, the new access proposed to extend north from 58th Lane SW shall be constructed in accordance with City of Tumwater design standards.

5. CONCLUSIONS & MITIGATION

Vista Views at Black Lake is a proposed residential development comprised of 186 single-family dwelling units in the city of Tumwater. Development will take place within a cumulative 55.01-acres (tax parcel #'s: 1283231-0700; & -0800), which is bordered to the north by 49th Avenue SW. Access is proposed via one new roadway extending south from 49th Avenue SW and one new roadway extending north from 58th Lane SW. Refer to Figure 2, the conceptual site plan, for more details.

According to ITE data, 186 single-family dwelling units are expected to generate 1,786 daily trips, 131 AM peak hour trips (33 inbound / 98 outbound), and 178 PM peak hour trips (112 inbound / 66 outbound). The existing PM peak hour level of service (LOS) at the nine study intersections (refer to Table 3) currently operate with LOS D or better conditions—meeting the LOS D standards. Forecast LOS analysis was performed using a seven-year horizon which included a background growth rate, pipeline development and project-generated traffic added to the roadway network.

With the exception of Black Lake Boulevard SW & Black Lake-Belmore Road SW, forecast 2031 PM peak hour conditions are anticipated to operate with LOS C or better conditions at all other outlying study intersections, meeting Tumwater, Thurston County, and WSDOT service level standards. Forecast LOS at Black Lake Boulevard SW & Black Lake-Belmore Road SW is estimated to operate at LOS F under both without and with project scenarios. The access intersections were found to operate acceptably with LOS B conditions. Lastly, a left-turn lane was not found to be warranted at the 49th Avenue SW access or at 58th Lane SW & Black Lake-Belmore Road SW.

Based on the analysis above, the following mitigation is identified for the Vista Views at Black Lake project.

1. Substandard service levels (LOS F) are projected at the intersection of Black Lake Boulevard SW & Black Lake-Belmore Road SW both without and with project-generated traffic. To meet County standards for LOS conditions, the following improvements are recommended:

    a. Construct separate right and left turn lanes for the northbound approach.

    b. Construct a westbound receiving/acceleration lane west of the intersection for northbound left-turns to enter the roadway.

   Refer to Figure 8 for a conceptual design. Final intersection design shall be coordinated with the County for approval.

2. Construct frontage improvements as required by Code. Additionally, to complete the missing sidewalk segment and provide a continuous connection to and from the local elementary school, a new approximately 280-foot sidewalk/walking path is proposed on the east side of Black Lake-Belmore Road SW, south of 58th Lane SW.

3. Pay Traffic Impact Fees (TIF) as required by the City of Tumwater and SEPA mitigation fees. A summary of the expected TIF, along with the City's SEPA Mitigation Fee for trips entering the Tumwater Blvd/I-5 Interchange at a rate of $4,219.00 per PM peak hour trip, is provided below in Table 10. Trip totals through the Tumwater Blvd/I-5 Interchange are based on the TAZ 494 model.

Table 10: Traffic Impact Fees

Variable	Tumwater TIF	Total Tumwater TIF	Tumwater Blvd PM Trips	SEPA Fee (per Tumwater Blvd PM Trip)	Total SEPA Fee
186 Single-Family units	$4,401.78 per unit	**$818,731.08**	8 trips	$4,219.00	**$33,752.00**

No other mitigation is identified at this time.

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: INTERSECTION COUNT DATA

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PO Box 397 Puyallup, WA 98371

File Name : 5138spui
Site Code : 00005138
Start Date : 5/1/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Black Lake Blvd SW Southbound				US 101 W Off - E On Westbound			Black Lake Blvd SW Northbound				US 101 W On - E Off Eastbound			
Start Time	Right	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
04:00 PM	59	66	301	426	236	84	320	59	82	44	185	34	49	83	1014
04:15 PM	52	104	288	444	235	58	293	64	86	33	183	36	38	74	994
04:30 PM	61	79	269	409	263	61	324	58	87	49	194	26	46	72	999
04:45 PM	64	134	280	478	249	65	314	109	56	17	182	28	30	58	1032
Total	236	383	1138	1757	983	268	1251	290	311	143	744	124	163	287	4039
05:00 PM	68	100	272	440	294	90	384	73	91	45	209	26	50	76	1109
05:15 PM	58	117	289	464	281	55	336	57	96	36	189	34	33	67	1056
05:30 PM	56	87	269	412	237	68	305	69	88	31	188	28	34	62	967
05:45 PM	46	100	251	397	250	57	307	48	66	29	143	21	43	64	911
Total	228	404	1081	1713	1062	270	1332	247	341	141	729	109	160	269	4043
Grand Total	464	787	2219	3470	2045	538	2583	537	652	284	1473	233	323	556	8082
Apprch %	13.4	22.7	63.9		79.2	20.8		36.5	44.3	19.3		41.9	58.1		
Total %	5.7	9.7	27.5	42.9	25.3	6.7	32	6.6	8.1	3.5	18.2	2.9	4	6.9	
Passenger +	461	781	2185	3427	2026	521	2547	531	650	280	1461	220	321	541	7976
% Passenger +	99.4	99.2	98.5	98.8	99.1	96.8	98.6	98.9	99.7	98.6	99.2	94.4	99.4	97.3	98.7
Heavy	3	6	34	43	19	17	36	6	2	4	12	13	2	15	106
% Heavy	0.6	0.8	1.5	1.2	0.9	3.2	1.4	1.1	0.3	1.4	0.8	5.6	0.6	2.7	1.3

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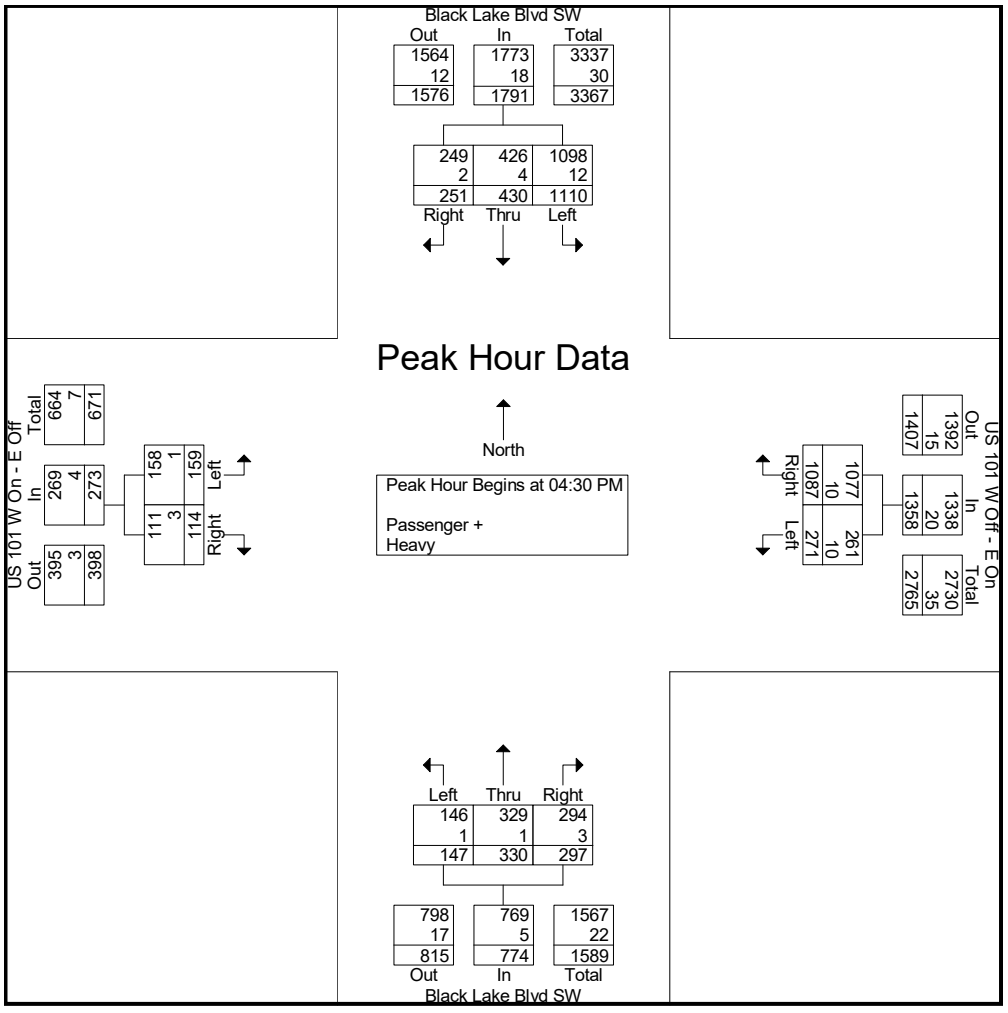
PO Box 397 Puyallup, WA 98371

File Name : 5138spui
Site Code : 00005138
Start Date : 5/1/2024
Page No : 2

	Black Lake Blvd SW Southbound				US 101 W Off - E On Westbound			Black Lake Blvd SW Northbound				US 101 W On - E Off Eastbound			
Start Time	Right	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 04:30 PM															
04:30 PM	61	79	269	409	263	61	324	58	87	**49**	194	26	46	72	999
04:45 PM	64	**134**	280	**478**	249	65	314	**109**	56	17	182	28	30	58	1032
05:00 PM	**68**	100	272	440	**294**	**90**	**384**	73	91	45	**209**	26	**50**	**76**	**1109**
05:15 PM	58	117	**289**	464	281	55	336	57	**96**	36	189	**34**	33	67	1056
Total Volume	251	430	1110	1791	1087	271	1358	297	330	147	774	114	159	273	4196
% App. Total	14	24	62		80	20		38.4	42.6	19		41.8	58.2		
PHF	.923	.802	.960	.937	.924	.753	.884	.681	.859	.750	.926	.838	.795	.898	.946
Passenger +	249	426	1098	1773	1077	261	1338	294	329	146	769	111	158	269	4149
% Passenger +	99.2	99.1	98.9	99.0	99.1	96.3	98.5	99.0	99.7	99.3	99.4	97.4	99.4	98.5	98.9
Heavy	2	4	12	18	10	10	20	3	1	1	5	3	1	4	47
% Heavy	0.8	0.9	1.1	1.0	0.9	3.7	1.5	1.0	0.3	0.7	0.6	2.6	0.6	1.5	1.1



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File Name : 5138d
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Black Lake Blvd SW Westbound			Black Lake Belmore Rd SW Northbound			Black Lake Blvd SW Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
04:00 PM	57	30	87	26	46	72	22	35	57	216
04:15 PM	65	25	90	29	40	69	22	35	57	216
04:30 PM	84	35	119	32	35	67	14	47	61	247
04:45 PM	54	35	89	36	40	76	17	27	44	209
Total	260	125	385	123	161	284	75	144	219	888
05:00 PM	65	26	91	24	46	70	13	45	58	219
05:15 PM	70	27	97	37	40	77	25	39	64	238
05:30 PM	60	22	82	26	22	48	18	48	66	196
05:45 PM	65	28	93	25	25	50	14	21	35	178
Total	260	103	363	112	133	245	70	153	223	831
Grand Total	520	228	748	235	294	529	145	297	442	1719
Apprch %	69.5	30.5		44.4	55.6		32.8	67.2		
Total %	30.3	13.3	43.5	13.7	17.1	30.8	8.4	17.3	25.7	
Passenger +	512	223	735	228	290	518	139	290	429	1682
% Passenger +	98.5	97.8	98.3	97	98.6	97.9	95.9	97.6	97.1	97.8
Heavy	8	5	13	7	4	11	6	7	13	37
% Heavy	1.5	2.2	1.7	3	1.4	2.1	4.1	2.4	2.9	2.2

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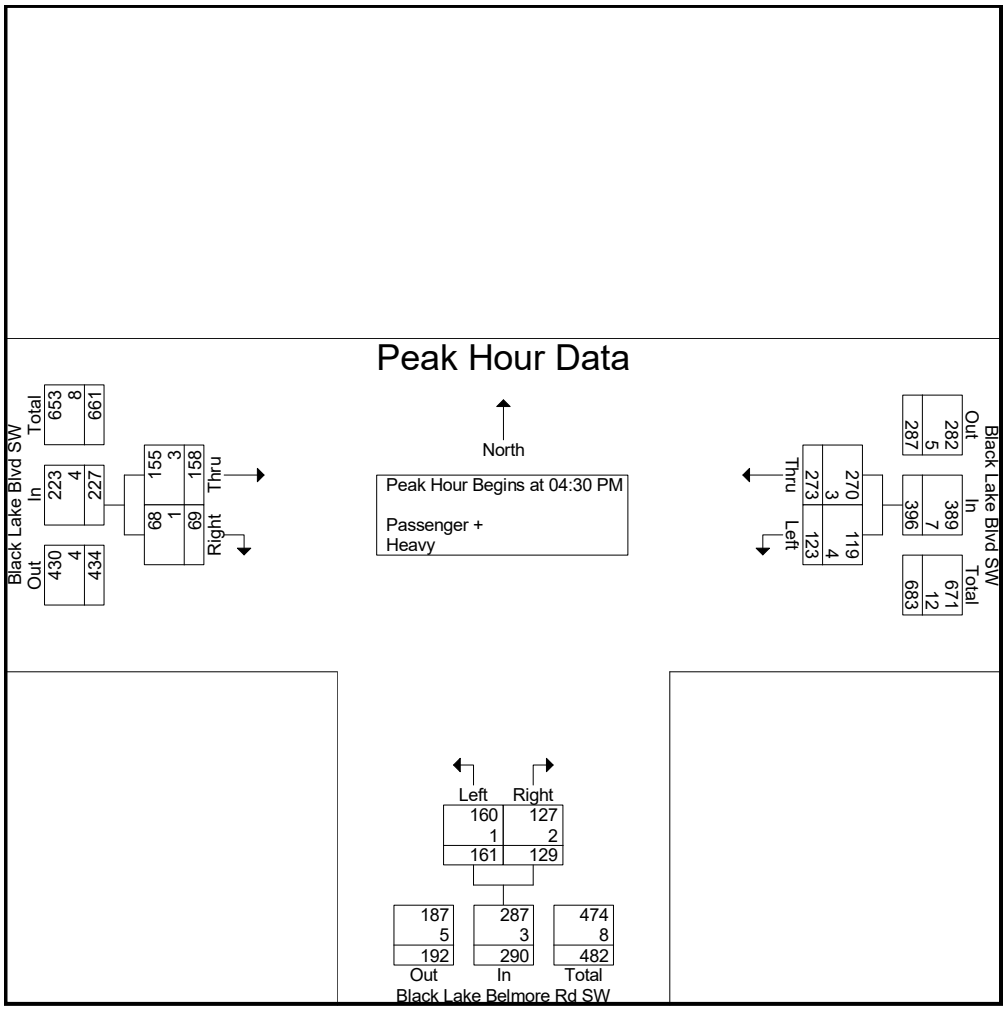
File Name : 5138d
Site Code : 00005138
Start Date : 4/30/2024
Page No : 2

	Black Lake Blvd SW Westbound			Black Lake Belmore Rd SW Northbound			Black Lake Blvd SW Eastbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	**84**	**35**	**119**	32	35	67	14	**47**	61	**247**
04:45 PM	54	35	89	36	40	76	17	27	44	209
05:00 PM	65	26	91	24	**46**	70	13	45	58	219
05:15 PM	70	27	97	**37**	40	**77**	**25**	39	**64**	238
Total Volume	273	123	396	129	161	290	69	158	227	913
% App. Total	68.9	31.1		44.5	55.5		30.4	69.6		
PHF	.813	.879	.832	.872	.875	.942	.690	.840	.887	.924
Passenger +	270	119	389	127	160	287	68	155	223	899
% Passenger +	98.9	96.7	98.2	98.4	99.4	99.0	98.6	98.1	98.2	98.5
Heavy	3	4	7	2	1	3	1	3	4	14
% Heavy	1.1	3.3	1.8	1.6	0.6	1.0	1.4	1.9	1.8	1.5



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File Name : 5138c
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Black Lake Belmore Rd SW Southbound				Sapp Rd SW Westbound				Old Fire Station Access Northbound				Sapp Rd SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	48	0	3	51	12	4	0	16	0	0	0	0	0	7	63	70	137
04:15 PM	37	0	3	40	10	8	0	18	0	0	1	1	0	2	54	56	115
04:30 PM	51	0	3	54	15	2	0	17	0	0	0	0	0	4	61	65	136
04:45 PM	50	0	4	54	8	6	0	14	0	0	0	0	0	5	66	71	139
Total	186	0	13	199	45	20	0	65	0	0	1	1	0	18	244	262	527
05:00 PM	29	0	6	35	12	15	0	27	0	0	0	0	0	7	62	69	131
05:15 PM	46	0	7	53	11	3	0	14	0	0	0	0	0	5	62	67	134
05:30 PM	37	0	3	40	9	2	0	11	0	0	0	0	0	4	40	44	95
05:45 PM	35	0	8	43	6	2	0	8	0	0	0	0	0	1	44	45	96
Total	147	0	24	171	38	22	0	60	0	0	0	0	0	17	208	225	456
Grand Total	333	0	37	370	83	42	0	125	0	0	1	1	0	35	452	487	983
Apprch %	90	0	10		66.4	33.6	0		0	0	100		0	7.2	92.8		
Total %	33.9	0	3.8	37.6	8.4	4.3	0	12.7	0	0	0.1	0.1	0	3.6	46	49.5	
Passenger +	323	0	36	359	82	42	0	124	0	0	1	1	0	33	444	477	961
% Passenger +	97	0	97.3	97	98.8	100	0	99.2	0	0	100	100	0	94.3	98.2	97.9	97.8
Heavy	10	0	1	11	1	0	0	1	0	0	0	0	0	2	8	10	22
% Heavy	3	0	2.7	3	1.2	0	0	0.8	0	0	0	0	0	5.7	1.8	2.1	2.2

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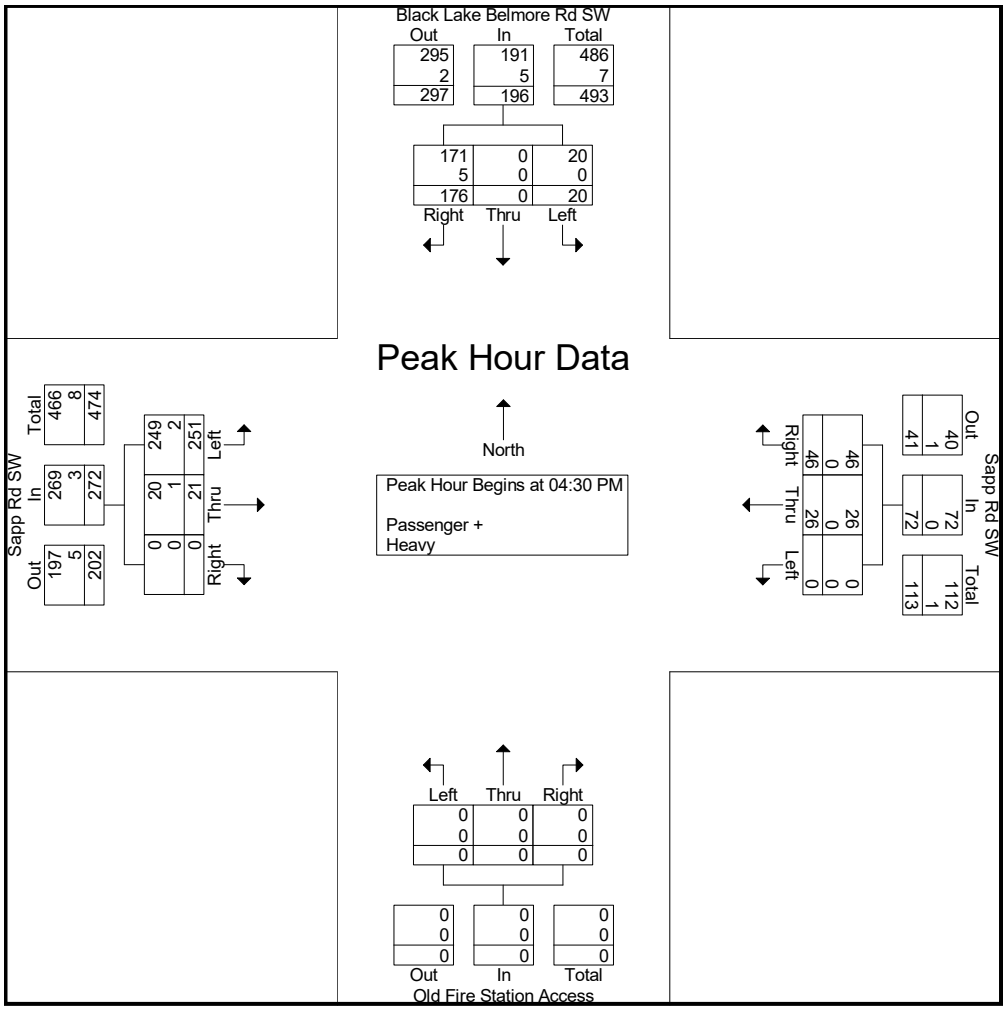
File Name : 5138c
Site Code : 00005138
Start Date : 4/30/2024
Page No : 2

	Black Lake Belmore Rd SW Southbound				Sapp Rd SW Westbound				Old Fire Station Access Northbound				Sapp Rd SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	**51**	0	3	**54**	**15**	2	0	17	0	0	0	0	0	4	61	65	136
04:45 PM	50	0	4	54	8	6	0	14	0	0	0	0	0	5	**66**	**71**	**139**
05:00 PM	29	0	6	35	12	**15**	0	**27**	0	0	0	0	0	**7**	62	69	131
05:15 PM	46	0	**7**	53	11	3	0	14	0	0	0	0	0	5	62	67	134
Total Volume	176	0	20	196	46	26	0	72	0	0	0	0	0	21	251	272	540
% App. Total	89.8	0	10.2		63.9	36.1	0		0	0	0		0	7.7	92.3		
PHF	.863	.000	.714	.907	.767	.433	.000	.667	.000	.000	.000	.000	.000	.750	.951	.958	.971
Passenger +	171	0	20	191	46	26	0	72	0	0	0	0	0	20	249	269	532
% Passenger +	97.2	0	100	97.4	100	100	0	100	0	0	0	0	0	95.2	99.2	98.9	98.5
Heavy	5	0	0	5	0	0	0	0	0	0	0	0	0	1	2	3	8
% Heavy	2.8	0	0	2.6	0	0	0	0	0	0	0	0	0	4.8	0.8	1.1	1.5



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PO Box 397 Puyallup, WA 98371

File Name : 5138b
Site Code : 00005138
Start Date : 4/30/2024
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Groups Printed- Passenger + - Heavy

	Black Lake Belmore Rd SW Southbound				49th Ave SW Westbound				Black Lake Belmore Rd SW Northbound				Dent Rd SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	2	30	14	46	25	1	7	33	6	46	6	58	6	0	1	7	144
04:15 PM	2	37	14	53	29	3	4	36	5	26	3	34	2	3	2	7	130
04:30 PM	0	38	14	52	27	5	6	38	3	36	0	39	2	2	1	5	134
04:45 PM	4	33	14	51	27	1	10	38	7	39	3	49	1	0	4	5	143
Total	8	138	56	202	108	10	27	145	21	147	12	180	11	5	8	24	551
05:00 PM	0	36	10	46	29	2	6	37	2	31	6	39	5	3	5	13	135
05:15 PM	6	30	5	41	31	1	5	37	7	28	0	35	2	0	7	9	122
05:30 PM	1	26	13	40	13	6	13	32	6	26	1	33	6	0	1	7	112
05:45 PM	4	23	8	35	25	1	1	27	6	18	2	26	0	2	2	4	92
Total	11	115	36	162	98	10	25	133	21	103	9	133	13	5	15	33	461
Grand Total	19	253	92	364	206	20	52	278	42	250	21	313	24	10	23	57	1012
Apprch %	5.2	69.5	25.3		74.1	7.2	18.7		13.4	79.9	6.7		42.1	17.5	40.4		
Total %	1.9	25	9.1	36	20.4	2	5.1	27.5	4.2	24.7	2.1	30.9	2.4	1	2.3	5.6	
Passenger +	19	245	90	354	201	19	50	270	40	246	20	306	21	10	22	53	983
% Passenger +	100	96.8	97.8	97.3	97.6	95	96.2	97.1	95.2	98.4	95.2	97.8	87.5	100	95.7	93	97.1
Heavy	0	8	2	10	5	1	2	8	2	4	1	7	3	0	1	4	29
% Heavy	0	3.2	2.2	2.7	2.4	5	3.8	2.9	4.8	1.6	4.8	2.2	12.5	0	4.3	7	2.9

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File Name : 5138b
Site Code : 00005138
Start Date : 4/30/2024
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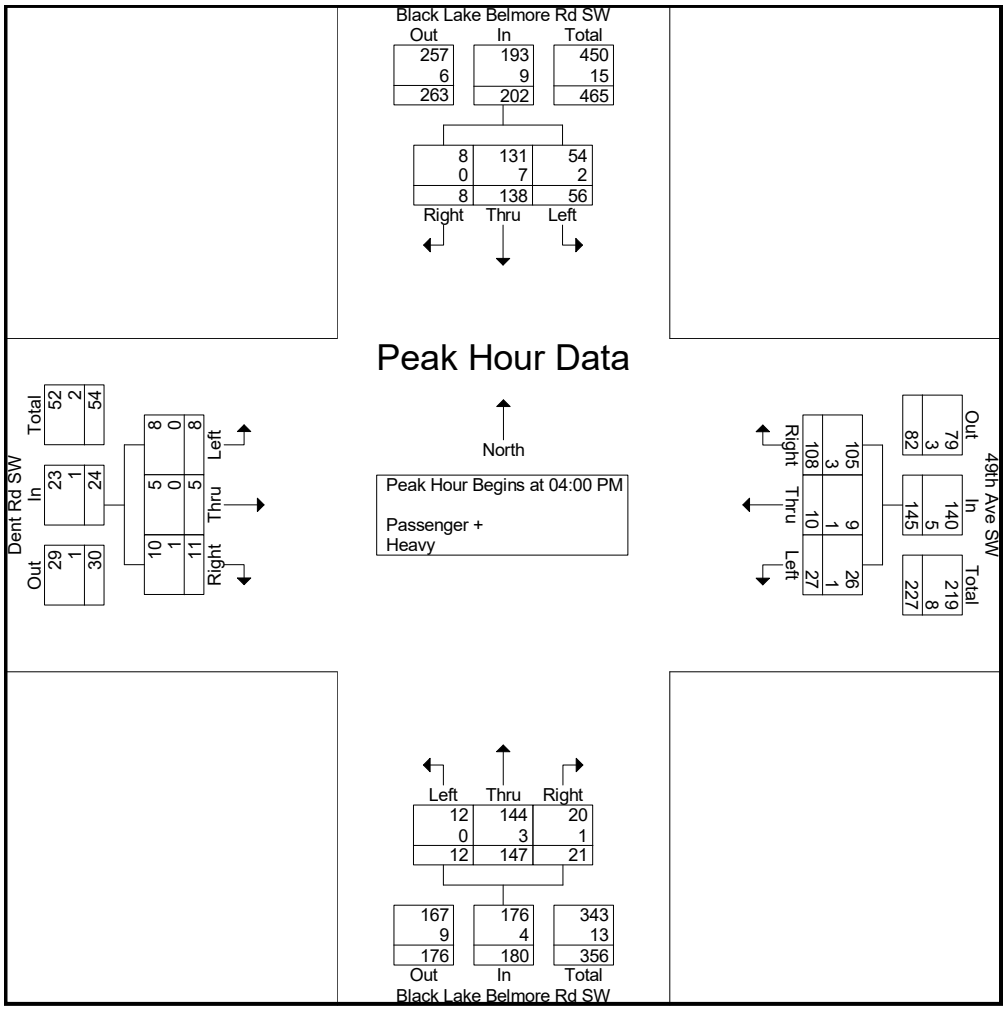
	Black Lake Belmore Rd SW Southbound				49th Ave SW Westbound				Black Lake Belmore Rd SW Northbound				Dent Rd SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	2	30	**14**	46	25	1	7	33	6	**46**	**6**	**58**	**6**	0	1	**7**	**144**
04:15 PM	2	37	14	**53**	**29**	3	4	36	5	26	3	34	2	**3**	2	7	130
04:30 PM	0	**38**	14	52	27	**5**	6	**38**	3	36	0	39	2	2	1	5	134
04:45 PM	**4**	33	14	51	27	1	**10**	38	**7**	39	3	49	1	0	**4**	5	143
Total Volume	8	138	56	202	108	10	27	145	21	147	12	180	11	5	8	24	551
% App. Total	4	68.3	27.7		74.5	6.9	18.6		11.7	81.7	6.7		45.8	20.8	33.3		
PHF	.500	.908	1.00	.953	.931	.500	.675	.954	.750	.799	.500	.776	.458	.417	.500	.857	.957
Passenger +	8	131	54	193	105	9	26	140	20	144	12	176	10	5	8	23	532
% Passenger +	100	94.9	96.4	95.5	97.2	90.0	96.3	96.6	95.2	98.0	100	97.8	90.9	100	100	95.8	96.6
Heavy	0	7	2	9	3	1	1	5	1	3	0	4	1	0	0	1	19
% Heavy	0	5.1	3.6	4.5	2.8	10.0	3.7	3.4	4.8	2.0	0	2.2	9.1	0	0	4.2	3.4



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PO Box 397 Puyallup, WA 98371

File Name : 5138a
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Black Lake Belmore Rd SW Southbound			58th Ln SW Westbound			Black Lake Belmore Rd SW Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
04:00 PM	44	0	44	0	0	0	0	53	53	97
04:15 PM	41	0	41	0	0	0	0	31	31	72
04:30 PM	44	0	44	0	0	0	0	42	42	86
04:45 PM	38	0	38	0	0	0	0	39	39	77
Total	167	0	167	0	0	0	0	165	165	332
05:00 PM	41	0	41	0	0	0	0	39	39	80
05:15 PM	27	0	27	0	0	0	0	32	32	59
05:30 PM	39	0	39	0	0	0	0	34	34	73
05:45 PM	24	0	24	0	0	0	0	26	26	50
Total	131	0	131	0	0	0	0	131	131	262
Grand Total	298	0	298	0	0	0	0	296	296	594
Apprch %	100	0		0	0		0	100		
Total %	50.2	0	50.2	0	0	0	0	49.8	49.8	
Passenger +	288	0	288	0	0	0	0	290	290	578
% Passenger +	96.6	0	96.6	0	0	0	0	98	98	97.3
Heavy	10	0	10	0	0	0	0	6	6	16
% Heavy	3.4	0	3.4	0	0	0	0	2	2	2.7

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File Name : 5138a
Site Code : 00005138
Start Date : 4/30/2024
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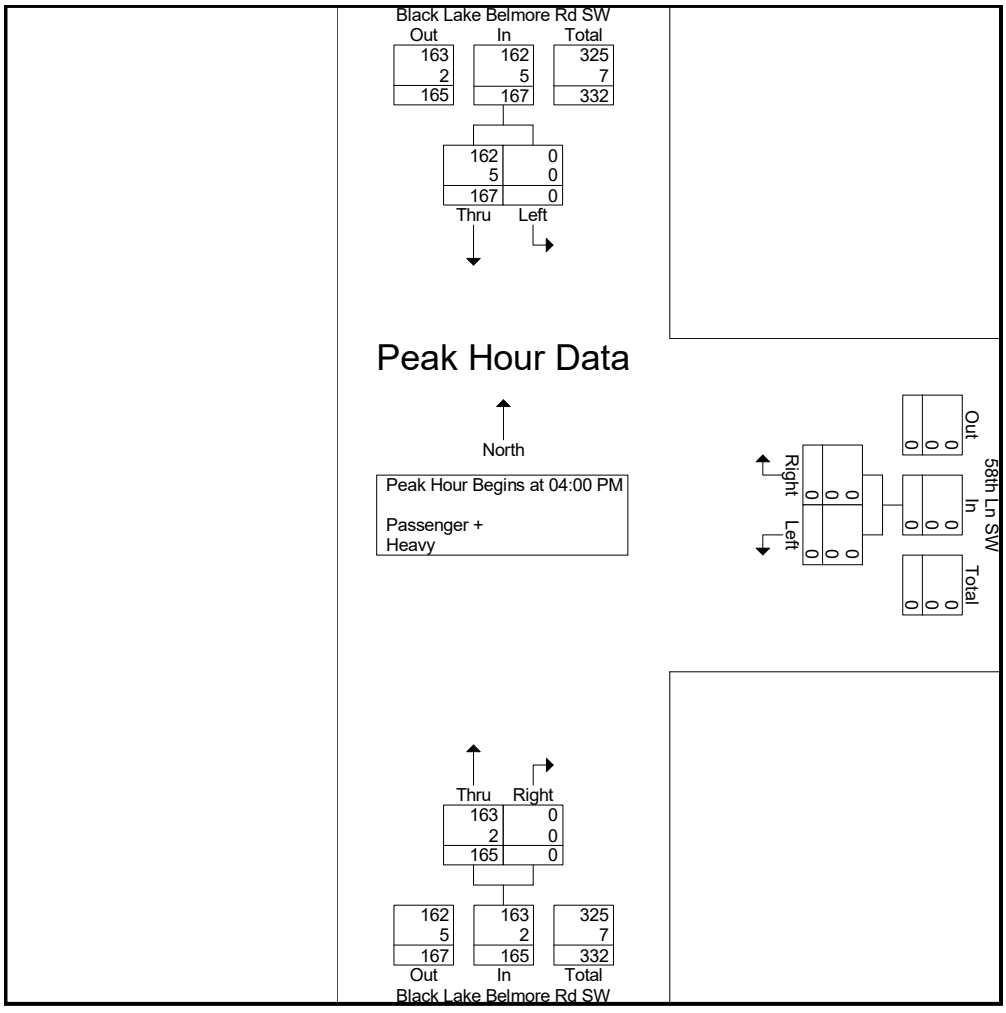
	Black Lake Belmore Rd SW Southbound			58th Ln SW Westbound			Black Lake Belmore Rd SW Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	**44**	0	**44**	0	0	0	0	**53**	**53**	**97**
04:15 PM	41	0	41	0	0	0	0	31	31	72
04:30 PM	44	0	44	0	0	0	0	42	42	86
04:45 PM	38	0	38	0	0	0	0	39	39	77
Total Volume	167	0	167	0	0	0	0	165	165	332
% App. Total	100	0		0	0		0	100		
PHF	.949	.000	.949	.000	.000	.000	.000	.778	.778	.856
Passenger +	162	0	162	0	0	0	0	163	163	325
% Passenger +	97.0	0	97.0	0	0	0	0	98.8	98.8	97.9
Heavy	5	0	5	0	0	0	0	2	2	7
% Heavy	3.0	0	3.0	0	0	0	0	1.2	1.2	2.1



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File Name : 5138f
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Driveway Southbound				54th Ave SW Westbound				Kirsop Rd SW Northbound				54th Ave SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	0	0	0	0	0	27	8	35	11	0	2	13	1	22	0	23	71
04:15 PM	0	0	0	0	0	41	21	62	6	0	0	6	2	21	0	23	91
04:30 PM	0	0	0	0	0	35	22	57	20	0	2	22	1	24	0	25	104
04:45 PM	0	1	0	1	0	36	15	51	5	0	2	7	4	26	0	30	89
Total	0	1	0	1	0	139	66	205	42	0	6	48	8	93	0	101	355
05:00 PM	0	0	0	0	0	33	20	53	14	0	0	14	0	16	0	16	83
05:15 PM	0	0	0	0	0	37	19	56	16	0	2	18	0	14	0	14	88
05:30 PM	0	0	0	0	0	33	23	56	10	0	0	10	0	16	0	16	82
05:45 PM	0	0	0	0	0	29	9	38	14	1	1	16	1	20	0	21	75
Total	0	0	0	0	0	132	71	203	54	1	3	58	1	66	0	67	328
Grand Total	0	1	0	1	0	271	137	408	96	1	9	106	9	159	0	168	683
Apprch %	0	100	0		0	66.4	33.6		90.6	0.9	8.5		5.4	94.6	0		
Total %	0	0.1	0	0.1	0	39.7	20.1	59.7	14.1	0.1	1.3	15.5	1.3	23.3	0	24.6	
Passenger +	0	1	0	1	0	267	136	403	95	1	9	105	8	159	0	167	676
% Passenger +	0	100	0	100	0	98.5	99.3	98.8	99	100	100	99.1	88.9	100	0	99.4	99
Heavy	0	0	0	0	0	4	1	5	1	0	0	1	1	0	0	1	7
% Heavy	0	0	0	0	0	1.5	0.7	1.2	1	0	0	0.9	11.1	0	0	0.6	1

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File Name : 5138f
Site Code : 00005138
Start Date : 4/30/2024
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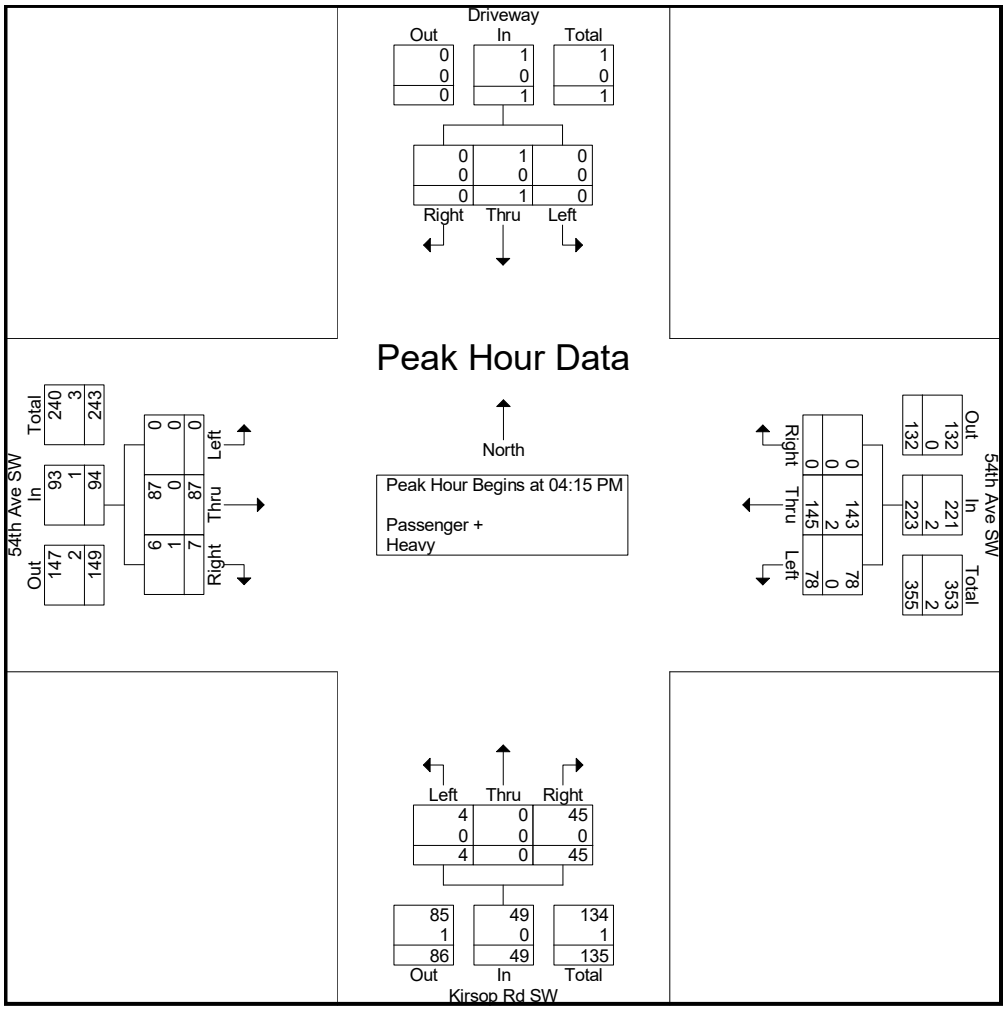
	Driveway Southbound				54th Ave SW Westbound				Kirsop Rd SW Northbound				54th Ave SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	0	0	0	**41**	21	**62**	6	0	0	6	2	21	0	23	91
04:30 PM	0	0	0	0	0	35	**22**	57	**20**	0	**2**	**22**	1	24	0	25	**104**
04:45 PM	0	**1**	0	**1**	0	36	15	51	5	0	2	7	**4**	**26**	0	**30**	89
05:00 PM	0	0	0	0	0	33	20	53	14	0	0	14	0	16	0	16	83
Total Volume	0	1	0	1	0	145	78	223	45	0	4	49	7	87	0	94	367
% App. Total	0	100	0		0	65	35		91.8	0	8.2		7.4	92.6	0		
PHF	.000	.250	.000	.250	.000	.884	.886	.899	.563	.000	.500	.557	.438	.837	.000	.783	.882
Passenger +	0	1	0	1	0	143	78	221	45	0	4	49	6	87	0	93	364
% Passenger +	0	100	0	100	0	98.6	100	99.1	100	0	100	100	85.7	100	0	98.9	99.2
Heavy	0	0	0	0	0	2	0	2	0	0	0	0	1	0	0	1	3
% Heavy	0	0	0	0	0	1.4	0	0.9	0	0	0	0	14.3	0	0	1.1	0.8



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File Name : 5138g
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Kirsop Rd SW Southbound				66th Ave SW Westbound				Kirsop Rd SW Northbound				66th Ave SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:00 PM	6	5	0	11	2	1	2	5	0	2	43	45	50	0	7	57	118
04:15 PM	6	6	0	12	1	2	0	3	1	5	40	46	50	0	2	52	113
04:30 PM	9	5	0	14	0	0	1	1	1	5	53	59	33	1	4	38	112
04:45 PM	7	9	0	16	0	0	0	0	0	6	46	52	41	4	3	48	116
Total	28	25	0	53	3	3	3	9	2	18	182	202	174	5	16	195	459
05:00 PM	8	4	0	12	0	0	2	2	0	9	48	57	43	0	4	47	118
05:15 PM	9	6	0	15	0	1	0	1	0	8	38	46	30	2	5	37	99
05:30 PM	6	5	2	13	0	0	0	0	0	7	55	62	37	1	4	42	117
05:45 PM	2	6	0	8	1	0	1	2	1	3	21	25	31	1	3	35	70
Total	25	21	2	48	1	1	3	5	1	27	162	190	141	4	16	161	404
Grand Total	53	46	2	101	4	4	6	14	3	45	344	392	315	9	32	356	863
Apprch %	52.5	45.5	2		28.6	28.6	42.9		0.8	11.5	87.8		88.5	2.5	9		
Total %	6.1	5.3	0.2	11.7	0.5	0.5	0.7	1.6	0.3	5.2	39.9	45.4	36.5	1	3.7	41.3	
Passenger +	53	46	2	101	4	4	4	12	2	45	338	385	303	9	31	343	841
% Passenger +	100	100	100	100	100	100	66.7	85.7	66.7	100	98.3	98.2	96.2	100	96.9	96.3	97.5
Heavy	0	0	0	0	0	0	2	2	1	0	6	7	12	0	1	13	22
% Heavy	0	0	0	0	0	0	33.3	14.3	33.3	0	1.7	1.8	3.8	0	3.1	3.7	2.5

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File Name : 5138g
Site Code : 00005138
Start Date : 4/30/2024
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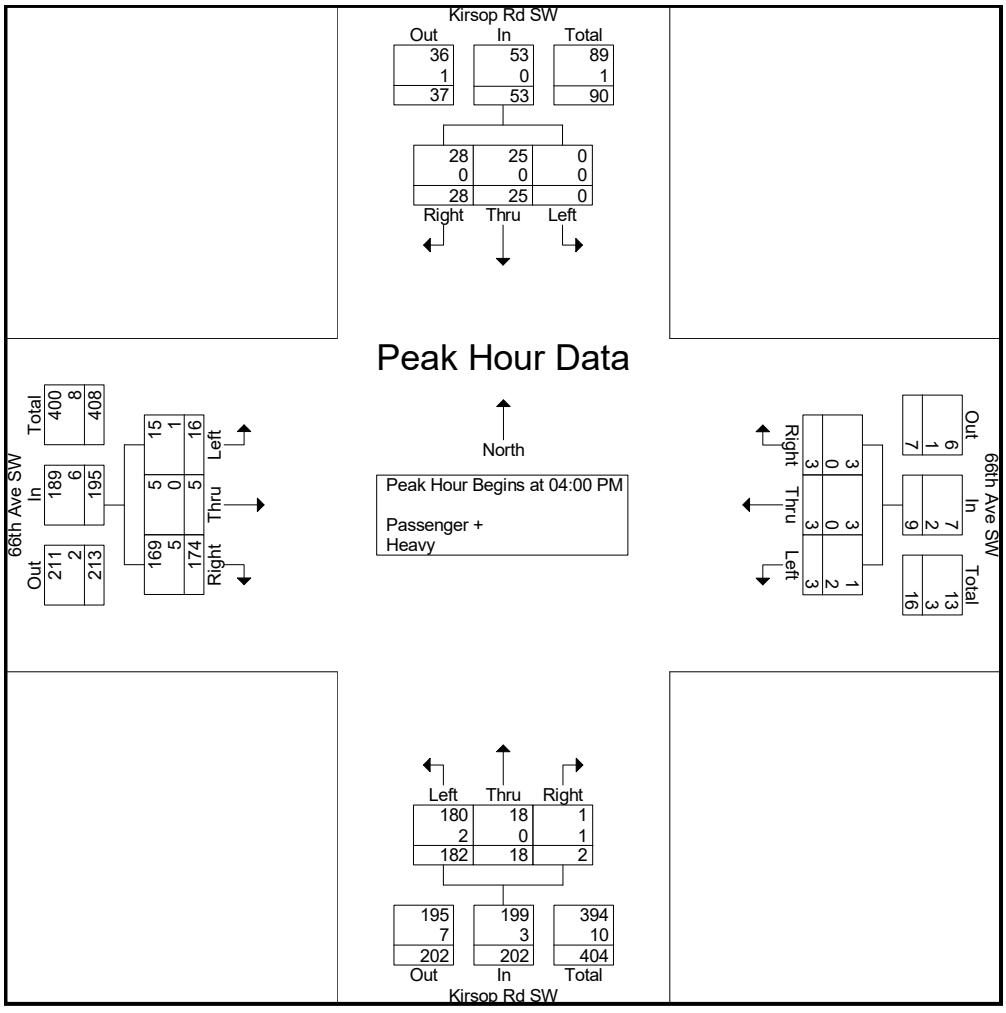
	Kirsop Rd SW Southbound				66th Ave SW Westbound				Kirsop Rd SW Northbound				66th Ave SW Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	6	5	0	11	**2**	1	**2**	**5**	0	2	43	45	**50**	0	**7**	**57**	**118**
04:15 PM	6	6	0	12	1	**2**	0	3	**1**	5	40	46	50	0	2	52	113
04:30 PM	**9**	5	0	14	0	0	1	1	1	5	**53**	**59**	33	1	4	38	112
04:45 PM	7	**9**	0	**16**	0	0	0	0	0	**6**	46	52	41	**4**	3	48	116
Total Volume	28	25	0	53	3	3	3	9	2	18	182	202	174	5	16	195	459
% App. Total	52.8	47.2	0		33.3	33.3	33.3		1	8.9	90.1		89.2	2.6	8.2		
PHF	.778	.694	.000	.828	.375	.375	.375	.450	.500	.750	.858	.856	.870	.313	.571	.855	.972
Passenger +	28	25	0	53	3	3	1	7	1	18	180	199	169	5	15	189	448
% Passenger +	100	100	0	100	100	100	33.3	77.8	50.0	100	98.9	98.5	97.1	100	93.8	96.9	97.6
Heavy	0	0	0	0	0	0	2	2	1	0	2	3	5	0	1	6	11
% Heavy	0	0	0	0	0	0	66.7	22.2	50.0	0	1.1	1.5	2.9	0	6.3	3.1	2.4



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File Name : 5138h
Site Code : 00005138
Start Date : 4/30/2024
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Groups Printed- Passenger + - Heavy

	Littlerock Rd SW Southbound			Littlerock Rd SW Northbound			Miner Dr SW Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
04:00 PM	5	114	119	0	0	0	2	0	2	121
04:15 PM	2	139	141	0	0	0	5	0	5	146
04:30 PM	6	148	154	0	0	0	11	0	11	165
04:45 PM	3	119	122	0	0	0	9	0	9	131
Total	16	520	536	0	0	0	27	0	27	563
05:00 PM	1	127	128	0	0	0	4	0	4	132
05:15 PM	5	110	115	0	0	0	3	0	3	118
05:30 PM	2	108	110	0	0	0	1	0	1	111
05:45 PM	2	109	111	0	0	0	7	0	7	118
Total	10	454	464	0	0	0	15	0	15	479
Grand Total	26	974	1000	0	0	0	42	0	42	1042
Apprch %	2.6	97.4		0	0		100	0		
Total %	2.5	93.5	96	0	0	0	4	0	4	
Passenger +	25	960	985	0	0	0	42	0	42	1027
% Passenger +	96.2	98.6	98.5	0	0	0	100	0	100	98.6
Heavy	1	14	15	0	0	0	0	0	0	15
% Heavy	3.8	1.4	1.5	0	0	0	0	0	0	1.4

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File Name : 5138h
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Start Date : 4/30/2024
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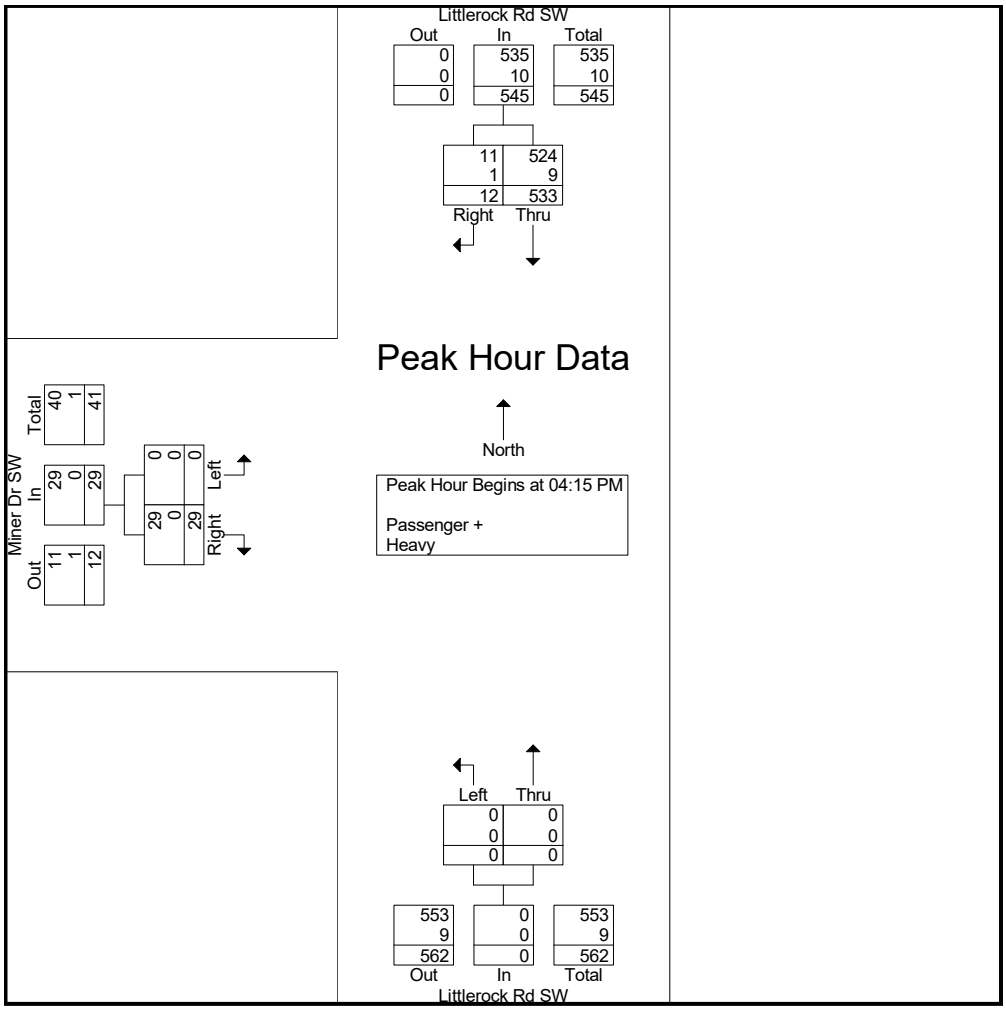
	Littlerock Rd SW Southbound			Littlerock Rd SW Northbound			Miner Dr SW Eastbound			
Start Time	Right	Thru	App. Total	Thru	Left	App. Total	Right	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	2	139	141	0	0	0	5	0	5	146
04:30 PM	**6**	**148**	**154**	0	0	0	**11**	0	**11**	**165**
04:45 PM	3	119	122	0	0	0	9	0	9	131
05:00 PM	1	127	128	0	0	0	4	0	4	132
Total Volume	12	533	545	0	0	0	29	0	29	574
% App. Total	2.2	97.8		0	0		100	0		
PHF	.500	.900	.885	.000	.000	.000	.659	.000	.659	.870
Passenger +	11	524	535	0	0	0	29	0	29	564
% Passenger +	91.7	98.3	98.2	0	0	0	100	0	100	98.3
Heavy	1	9	10	0	0	0	0	0	0	10
% Heavy	8.3	1.7	1.8	0	0	0	0	0	0	1.7



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PO Box 397 Puyallup, WA 98371

File Name : 5138i
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	Littlerock Rd SW Southbound					Israel Rd SW Westbound					Littlerock Rd SW Northbound					70th Ave SW Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
04:00 PM	26	82	16	5	129	16	25	12	2	55	17	47	51	3	118	31	15	11	0	57	359
04:15 PM	27	100	14	3	144	16	26	17	0	59	15	73	43	0	131	29	28	29	0	86	420
04:30 PM	28	100	22	6	156	24	33	26	0	83	11	49	47	0	107	31	26	12	1	70	416
04:45 PM	28	99	18	6	151	17	32	20	1	70	12	76	54	0	142	39	10	14	0	63	426
Total	109	381	70	20	580	73	116	75	3	267	55	245	195	3	498	130	79	66	1	276	1621
05:00 PM	25	89	15	9	138	17	36	19	0	72	15	72	28	0	115	39	21	20	1	81	406
05:15 PM	17	81	9	1	108	15	39	20	0	74	10	82	43	0	135	36	15	9	1	61	378
05:30 PM	13	88	15	2	118	11	46	16	0	73	18	58	37	0	113	24	18	14	2	58	362
05:45 PM	21	64	15	5	105	8	27	15	0	50	15	52	29	0	96	31	22	15	1	69	320
Total	76	322	54	17	469	51	148	70	0	269	58	264	137	0	459	130	76	58	5	269	1466
Grand Total	185	703	124	37	1049	124	264	145	3	536	113	509	332	3	957	260	155	124	6	545	3087
Apprch %	17.6	67	11.8	3.5		23.1	49.3	27.1	0.6		11.8	53.2	34.7	0.3		47.7	28.4	22.8	1.1		
Total %	6	22.8	4	1.2	34	4	8.6	4.7	0.1	17.4	3.7	16.5	10.8	0.1	31	8.4	5	4	0.2	17.7	
Passenger +	181	695	120	36	1032	118	260	145	3	526	110	505	323	2	940	243	151	122	6	522	3020
% Passenger +	97.8	98.9	96.8	97.3	98.4	95.2	98.5	100	100	98.1	97.3	99.2	97.3	66.7	98.2	93.5	97.4	98.4	100	95.8	97.8
Heavy	4	8	4	1	17	6	4	0	0	10	3	4	9	1	17	17	4	2	0	23	67
% Heavy	2.2	1.1	3.2	2.7	1.6	4.8	1.5	0	0	1.9	2.7	0.8	2.7	33.3	1.8	6.5	2.6	1.6	0	4.2	2.2

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File Name : 5138i
Site Code : 00005138
Start Date : 4/30/2024
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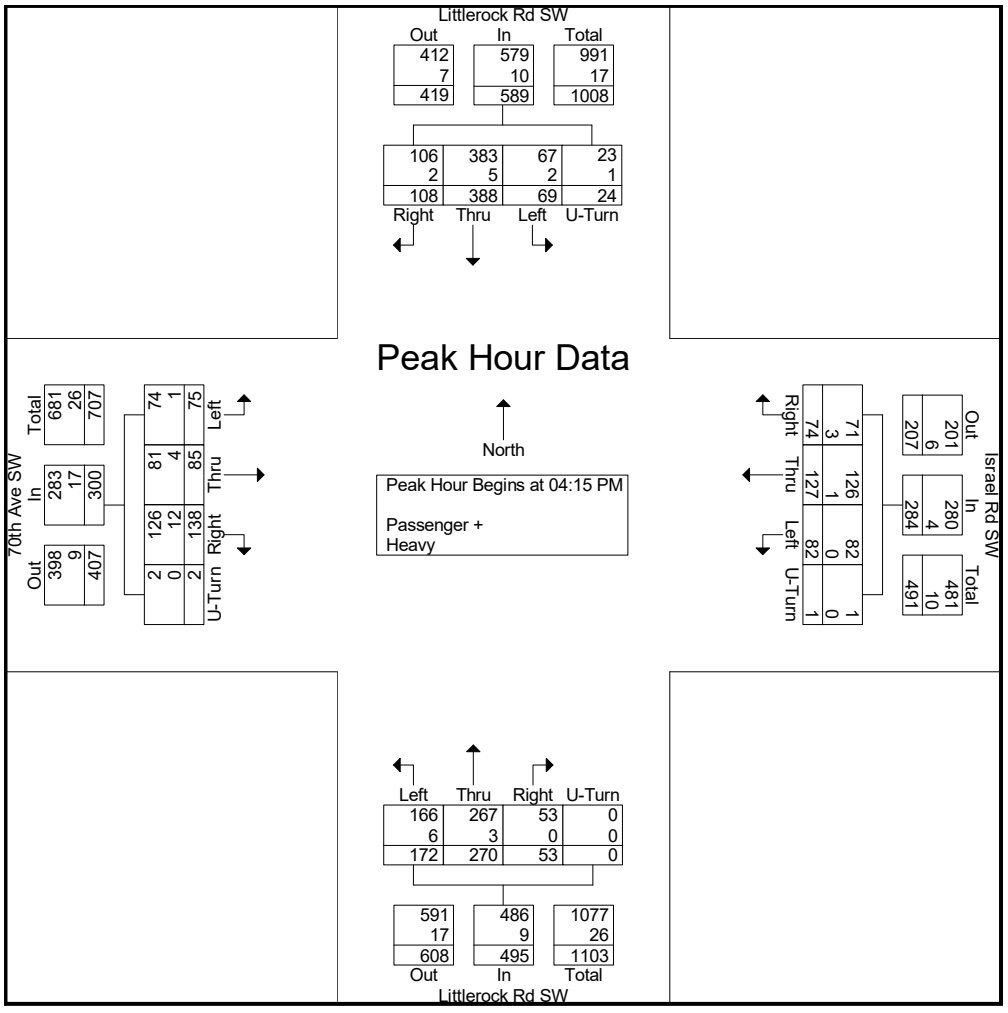
	Littlerock Rd SW Southbound					Israel Rd SW Westbound					Littlerock Rd SW Northbound					70th Ave SW Eastbound					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	27	**100**	14	3	144	16	26	17	0	59	**15**	73	43	0	131	29	**28**	**29**	0	**86**	420
04:30 PM	**28**	100	**22**	6	**156**	**24**	33	**26**	0	**83**	11	49	47	0	107	31	26	12	**1**	70	416
04:45 PM	28	99	18	6	151	17	32	20	**1**	70	12	**76**	**54**	0	**142**	**39**	10	14	0	63	**426**
05:00 PM	25	89	15	**9**	138	17	**36**	19	0	72	15	72	28	0	115	39	21	20	1	81	406
Total Volume	108	388	69	24	589	74	127	82	1	284	53	270	172	0	495	138	85	75	2	300	1668
% App. Total	18.3	65.9	11.7	4.1		26.1	44.7	28.9	0.4		10.7	54.5	34.7	0		46	28.3	25	0.7		
PHF	.964	.970	.784	.667	.944	.771	.882	.788	.250	.855	.883	.888	.796	.000	.871	.885	.759	.647	.500	.872	.979
Passenger +	106	383	67	23	579	71	126	82	1	280	53	267	166	0	486	126	81	74	2	283	1628
% Passenger +	98.1	98.7	97.1	95.8	98.3	95.9	99.2	100	100	98.6	100	98.9	96.5	0	98.2	91.3	95.3	98.7	100	94.3	97.6
Heavy	2	5	2	1	10	3	1	0	0	4	0	3	6	0	9	12	4	1	0	17	40
% Heavy	1.9	1.3	2.9	4.2	1.7	4.1	0.8	0	0	1.4	0	1.1	3.5	0	1.8	8.7	4.7	1.3	0	5.7	2.4



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File Name : 5138e
Site Code : 00005138
Start Date : 4/30/2024
Page No : 1

Groups Printed- Passenger + - Heavy

	49th Ave SW Westbound	49th Ave SW Eastbound	
Start Time	Thru	Thru	Int. Total
04:00 PM	31	20	51
04:15 PM	37	21	58
04:30 PM	39	17	56
04:45 PM	37	24	61
Total	144	82	226
05:00 PM	34	15	49
05:15 PM	39	14	53
05:30 PM	30	18	48
05:45 PM	24	16	40
Total	127	63	190
Grand Total	271	145	416
Apprch %	100	100	
Total %	65.1	34.9	
Passenger +	265	142	407
% Passenger +	97.8	97.9	97.8
Heavy	6	3	9
% Heavy	2.2	2.1	2.2

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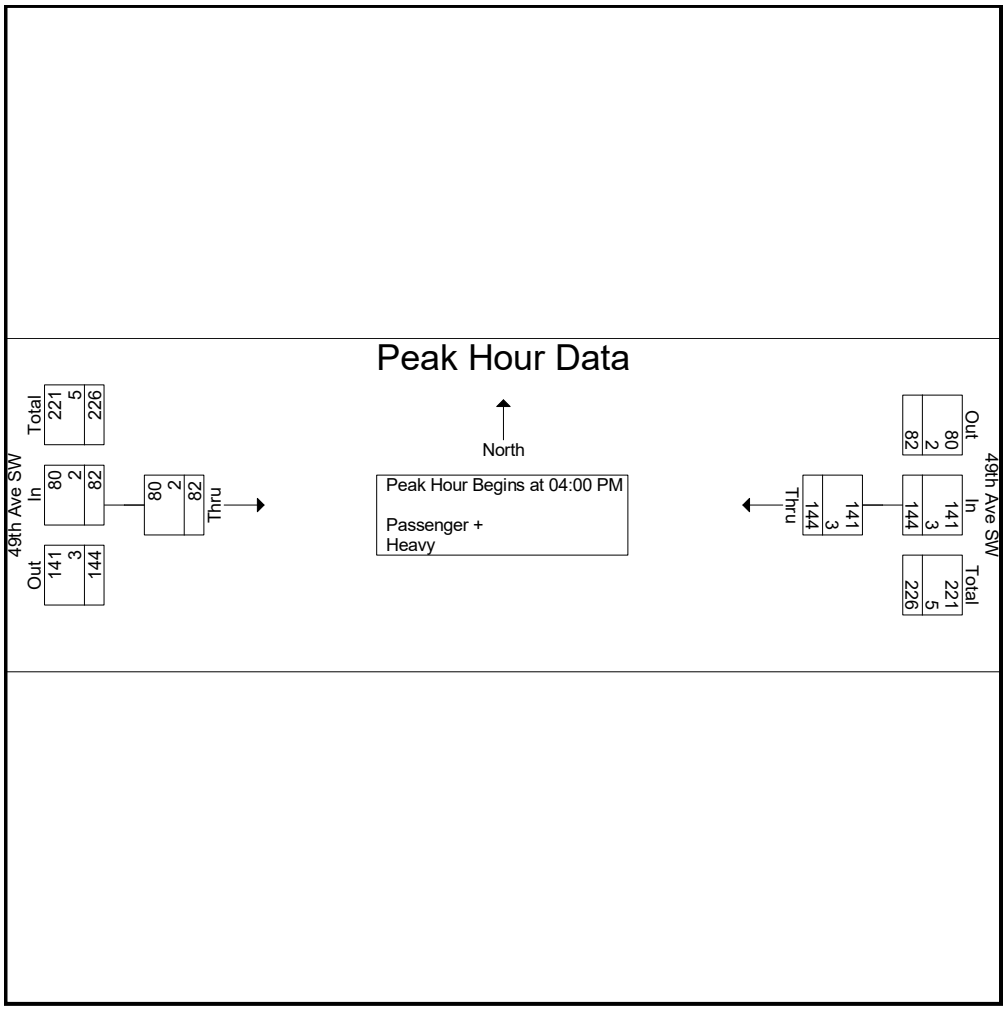
File Name : 5138e
Site Code : 00005138
Start Date : 4/30/2024
Page No : 2

	49th Ave SW Westbound		49th Ave SW Eastbound		
Start Time	Thru	App. Total	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1					
Peak Hour for Entire Intersection Begins at 04:00 PM					
04:00 PM	31	31	20	20	51
04:15 PM	37	37	21	21	58
04:30 PM	**39**	**39**	17	17	56
04:45 PM	37	37	**24**	**24**	**61**
Total Volume	144	144	82	82	226
% App. Total	100		100		
PHF	.923	.923	.854	.854	.926
Passenger +	141	141	80	80	221
% Passenger +	97.9	97.9	97.6	97.6	97.8
Heavy	3	3	2	2	5
% Heavy	2.1	2.1	2.4	2.4	2.2



VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: ITE TRIP GENERATION SHEETS
LUC 210: SINGLE-FAMILY DETACHED

Single-Family Detached Housing
(210)

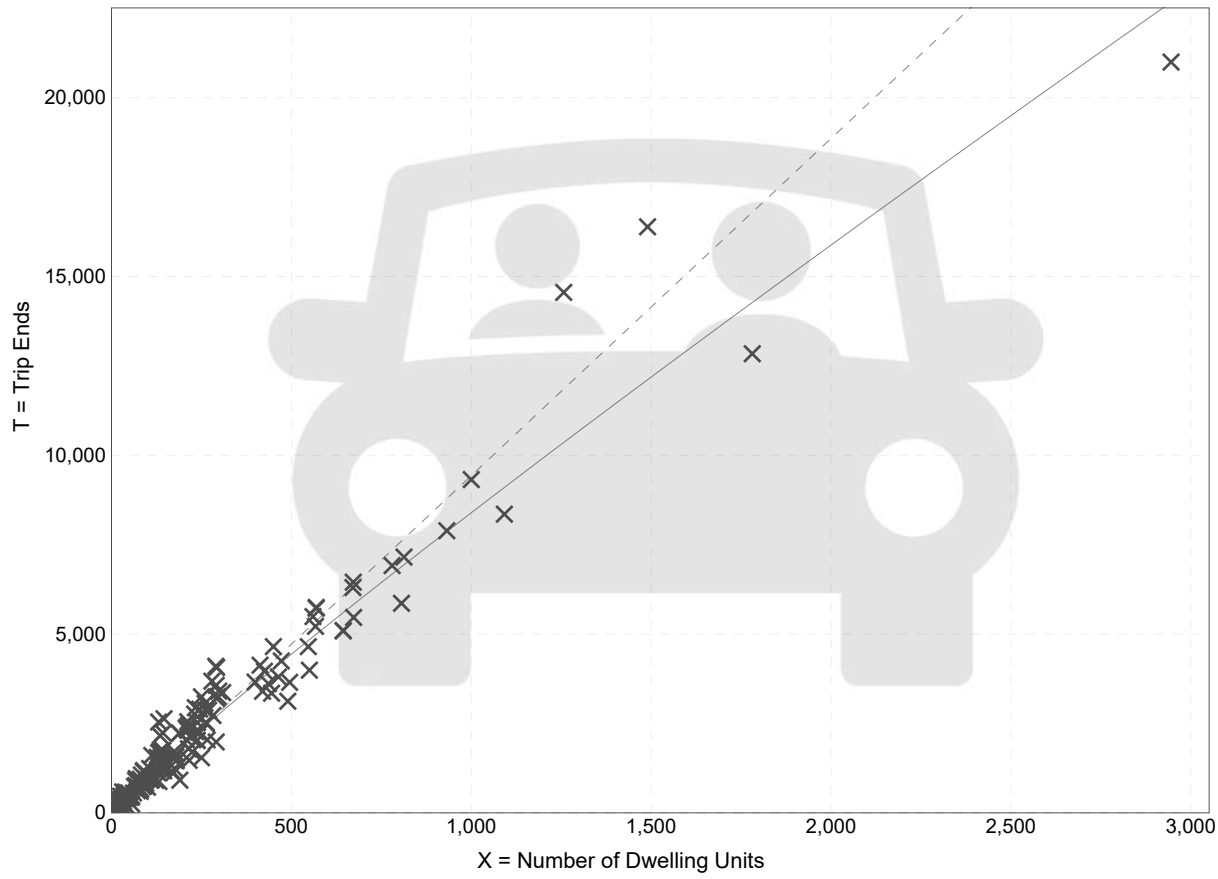
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



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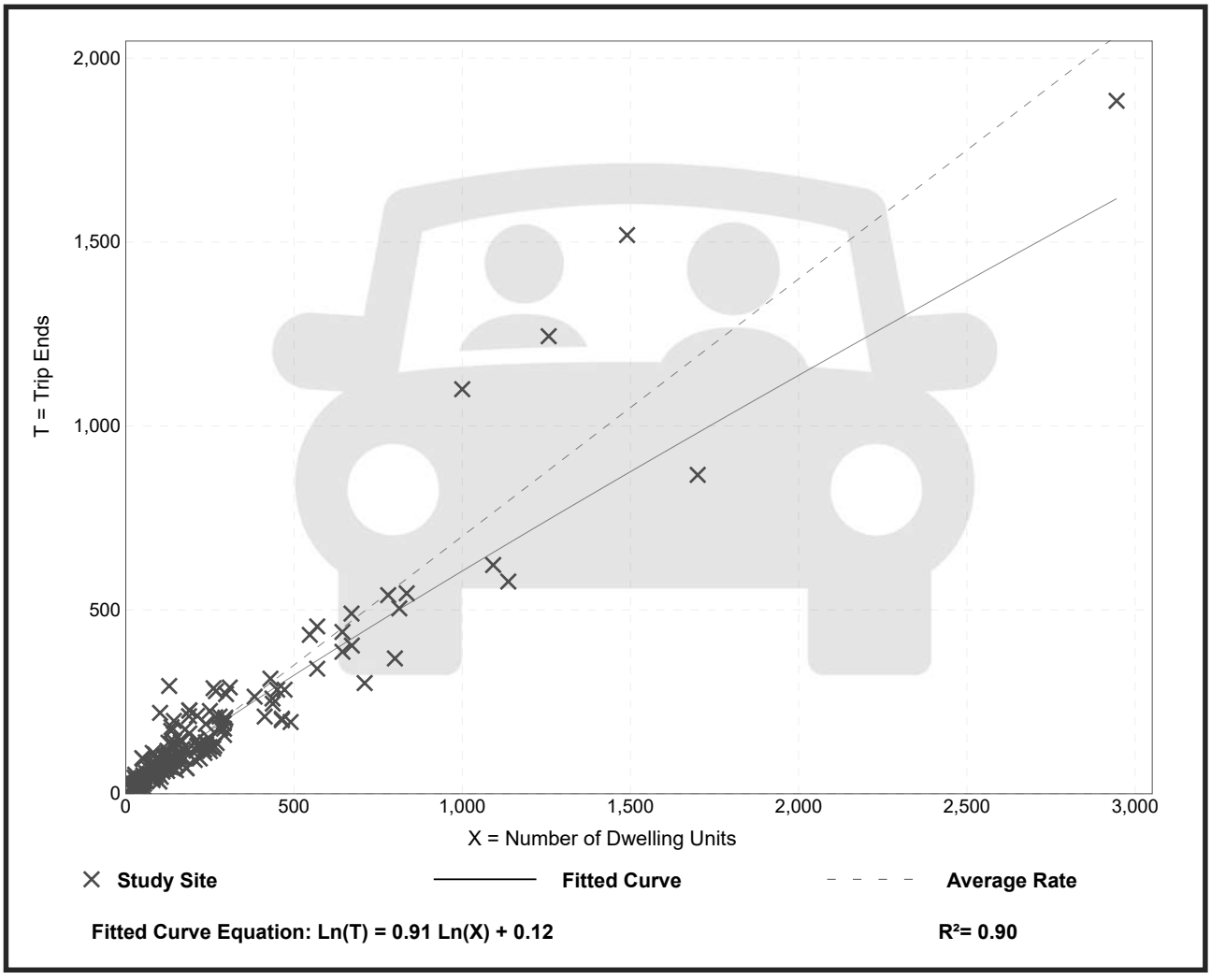
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



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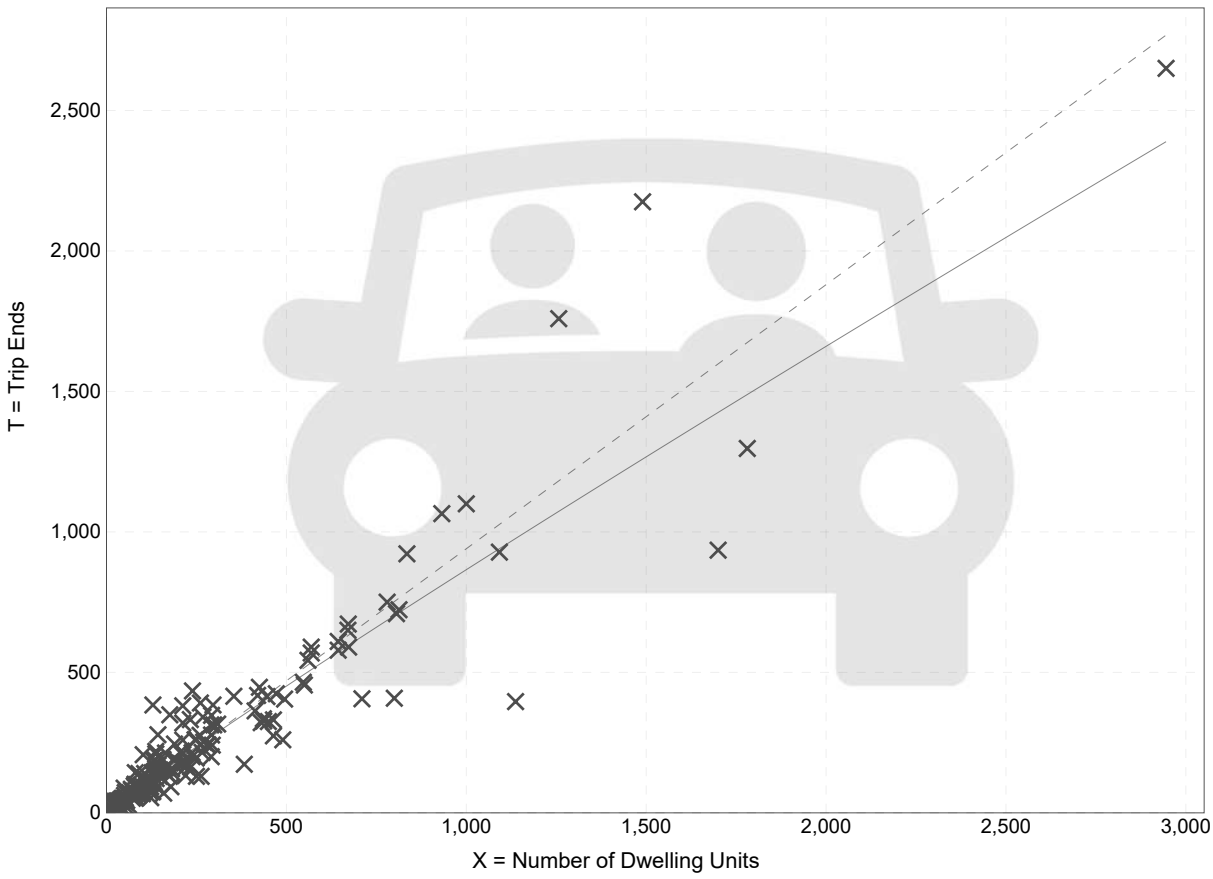
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.94 Ln(X) + 0.27 **R^2= 0.92**

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VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: PIPELINE DATA

1. Black Lake Boulevard SW & US 101 SB/NB Ramps

	Pipeline Projects												
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing		4						2	1	2		
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1			2	1								
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire	0	0	0	0	0	0	0	0	0	0	0	0
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments			3	2								
	Total	0	4	5	3	0	0	0	2	1	2	0	0

2. Black Lake Boulevard SW & Black Lake-Belmore Road SW

	Pipeline Projects												
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing						6	4			1		
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire									1	2		
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	6	4	0	1	3	0	0

3. Sapp Road SW & Black Lake-Belmore Road SW

	Pipeline Projects	↲	↓	↳	↑↳	←	⌜←	↱	↑	↰	⌝→	→	↳↑
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing	7				1						1	4
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire	2				3						2	1
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
		↲	↓	↳	↑↳	←	⌜←	↱	↑	↰	⌝→	→	↳↑
	Total	9	0	0	0	4	0	0	0	0	0	3	5

4. 49th Avenue SW & Black Lake-Belmore Road SW

	Pipeline Projects	↲	↓	↳	↑↳	←	⌜←	↱	↑	↰	⌝→	→	↳↑
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing			8	5								
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire			5	3							1	
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
		↲	↓	↳	↑↳	←	⌜←	↱	↑	↰	⌝→	→	↳↑
	Total	0	0	13	8	0	0	0	0	0	0	1	0

5. 58th Lane SW & Black Lake-Belmore Road SW

	Pipeline Projects												
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing	0	0	0	0	0	0	0	0	0	0	0	0
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire	0	0	0	0	0	0	0	0	0	0	0	0
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0

6. 66th Avenue SW & Kirsop Road SW

	Pipeline Projects												
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats									1	1		
3.	Bertch Thurston County								1	1	1		
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing	1	4						7				
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	1	1	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	1	1	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	1	1	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire									3	4		
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	1	1	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
	Total	1	4	0	0	0	0	0	8	9	10	0	0

7. 54th Avenue SW & Kirsop Road SW

	Pipeline Projects	↵	↓	↳	↰	←	⌜	↱	↑	↰	↴	→	↗
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing						10	6		5	9		
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments						1	1					
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments											1	
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire						5	4		3	6		
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
		↵	↓	↳	↰	←	⌜	↱	↑	↰	↴	→	↗
	Total	0	0	0	0	0	16	11	0	8	15	1	0

8. 70th Avenue SW/Israel Road SW & Littlerock Road SW

	Pipeline Projects	↵	↓	↳	↰	←	⌜	↱	↑	↰	↴	→	↗
1.	Trestlewood		9				2	2	5	1	1		
2.	Belmont Flats			24	18	5						7	
3.	Bertch Thurston County		8				4	7	23	4	2		
4.	Bishop Road Apartments		6				1	1	4		1		
5.	Kingswood Apartments	1	1	4	5				2				2
6.	Kingswood Commercial	2	2	11	11				2				2
7.	Kirsop Crossing	0	0	0	0	4	0	0	0	3	2	2	0
8.	Littlerock Storage		1	2	2				1				
9.	L&I Training Center	0	0	1	2	2	0	0	0	0	0	1	0
10.	New Market Apartments			3	2	2						3	
11	Sienna 1		8				1	1	4				
12	Sienna 2		37				14	8	23				
13	OSOS Library Archive Building	0	5	0	0	0	0	0	1	0	0	0	0
14.	Skyview Estates	4				3				4	2	1	2
15.	South Sound Commerce Center		4						7	2	1		
16.	6501 Capitol Blvd Apartments					1						1	
17.	Tyee Landing Apartments						6	2	5				
18.	Yorkshire			29	19	12						7	
19.	Littlerock Townhomes		2				4	2	2	2	2		
20	Aspen Apartments		2						1				
		↵	↓	↳	↰	←	⌜	↱	↑	↰	↴	→	↗
	Total	7	85	74	59	29	32	23	80	16	11	22	6

9. Miner Road SW & Littlerock Road SW

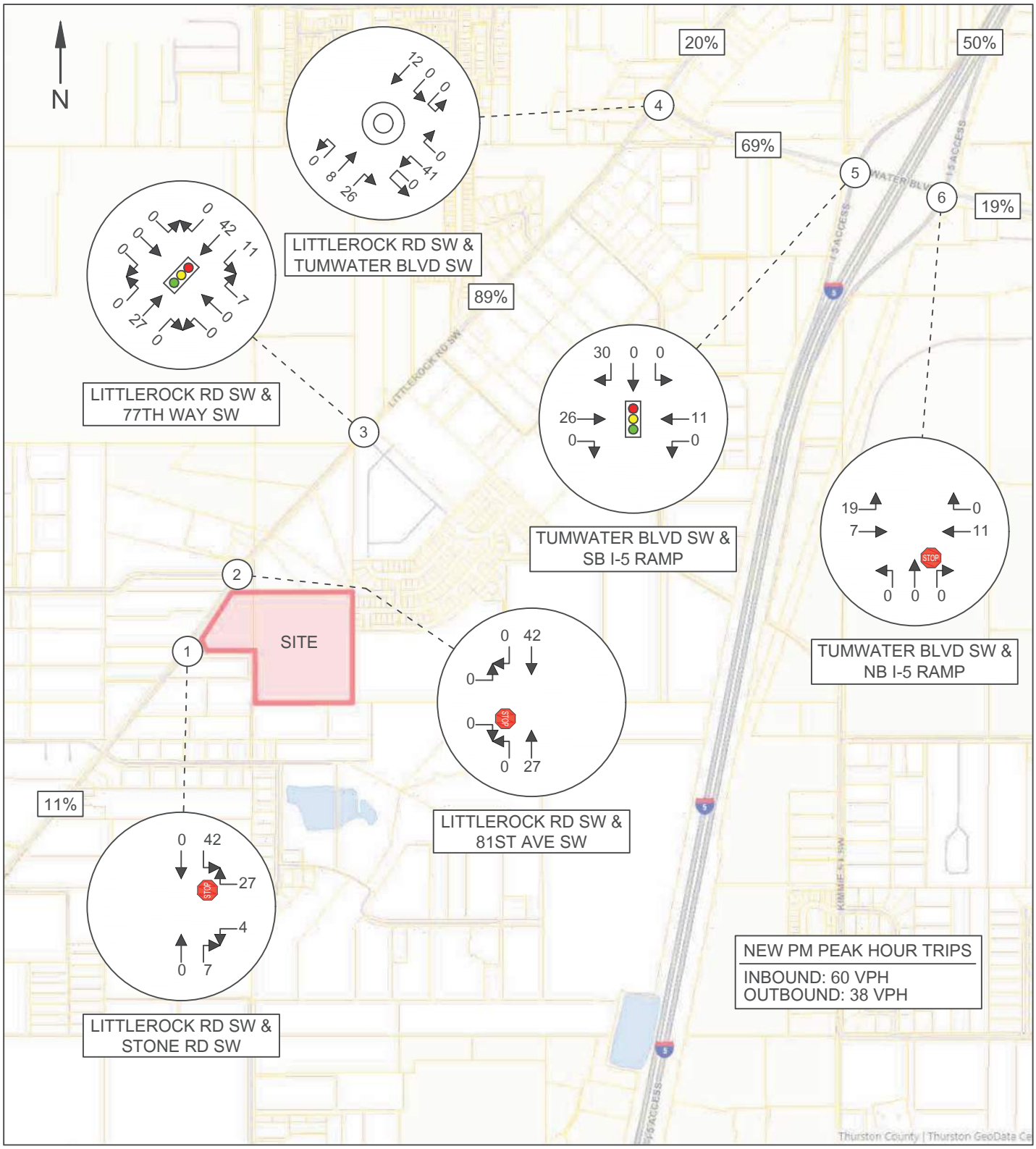
	Pipeline Projects												
1.	Trestlewood		9						5				
2.	Belmont Flats		24						18				
3.	Bertch Thurston County		8						23				
4.	Bishop Road Apartments		6						4				
5.	Kingswood Apartments		6						9				
6.	Kingswood Commercial		15						15				
7.	Kirsop Crossing	0	0	0	0	0	0	0	0	0	0	0	0
8.	Littlerock Storage		3						3				
9.	L&I Training Center		1						2				
10.	New Market Apartments	1	1						2		2		
11	Sienna 1	1	7						4		1		
12	Sienna 2		37						23				
13	OSOS Library Archive Building	0	5	0	0	0	0	0	1	0	0	0	0
14.	Skyview Estates	0	4	0	0	0	0	0	2	0	0	0	0
15.	South Sound Commerce Center		4						7				
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments								5				
18.	Yorkshire	7	18						19		11		
19.	Littlerock Townhomes		2						2				
20	Aspen Apartments		2						1				
	Total	9	152	0	0	0	0	0	145	0	14	0	0

A. 49th Avenue SW Through-Volumes at Access

	Pipeline Projects												
1.	Trestlewood	0	0	0	0	0	0	0	0	0	0	0	0
2.	Belmont Flats	0	0	0	0	0	0	0	0	0	0	0	0
3.	Bertch Thurston County	0	0	0	0	0	0	0	0	0	0	0	0
4.	Bishop Road Apartments	0	0	0	0	0	0	0	0	0	0	0	0
5.	Kingswood Apartments	0	0	0	0	0	0	0	0	0	0	0	0
6.	Kingswood Commercial	0	0	0	0	0	0	0	0	0	0	0	0
7.	Kirsop Crossing					5						8	
8.	Littlerock Storage	0	0	0	0	0	0	0	0	0	0	0	0
9.	L&I Training Center	0	0	0	0	0	0	0	0	0	0	0	0
10.	New Market Apartments	0	0	0	0	0	0	0	0	0	0	0	0
11	Sienna 1	0	0	0	0	0	0	0	0	0	0	0	0
12	Sienna 2	0	0	0	0	0	0	0	0	0	0	0	0
13	OSOS Library Archive Building	0	0	0	0	0	0	0	0	0	0	0	0
14.	Skyview Estates	0	0	0	0	0	0	0	0	0	0	0	0
15.	South Sound Commerce Center	0	0	0	0	0	0	0	0	0	0	0	0
16.	6501 Capitol Blvd Apartments	0	0	0	0	0	0	0	0	0	0	0	0
17.	Tyee Landing Apartments	0	0	0	0	0	0	0	0	0	0	0	0
18.	Yorkshire					3						6	
19.	Littlerock Townhomes	0	0	0	0	0	0	0	0	0	0	0	0
20	Aspen Apartments	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	8	0	0	0	0	0	14	0

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

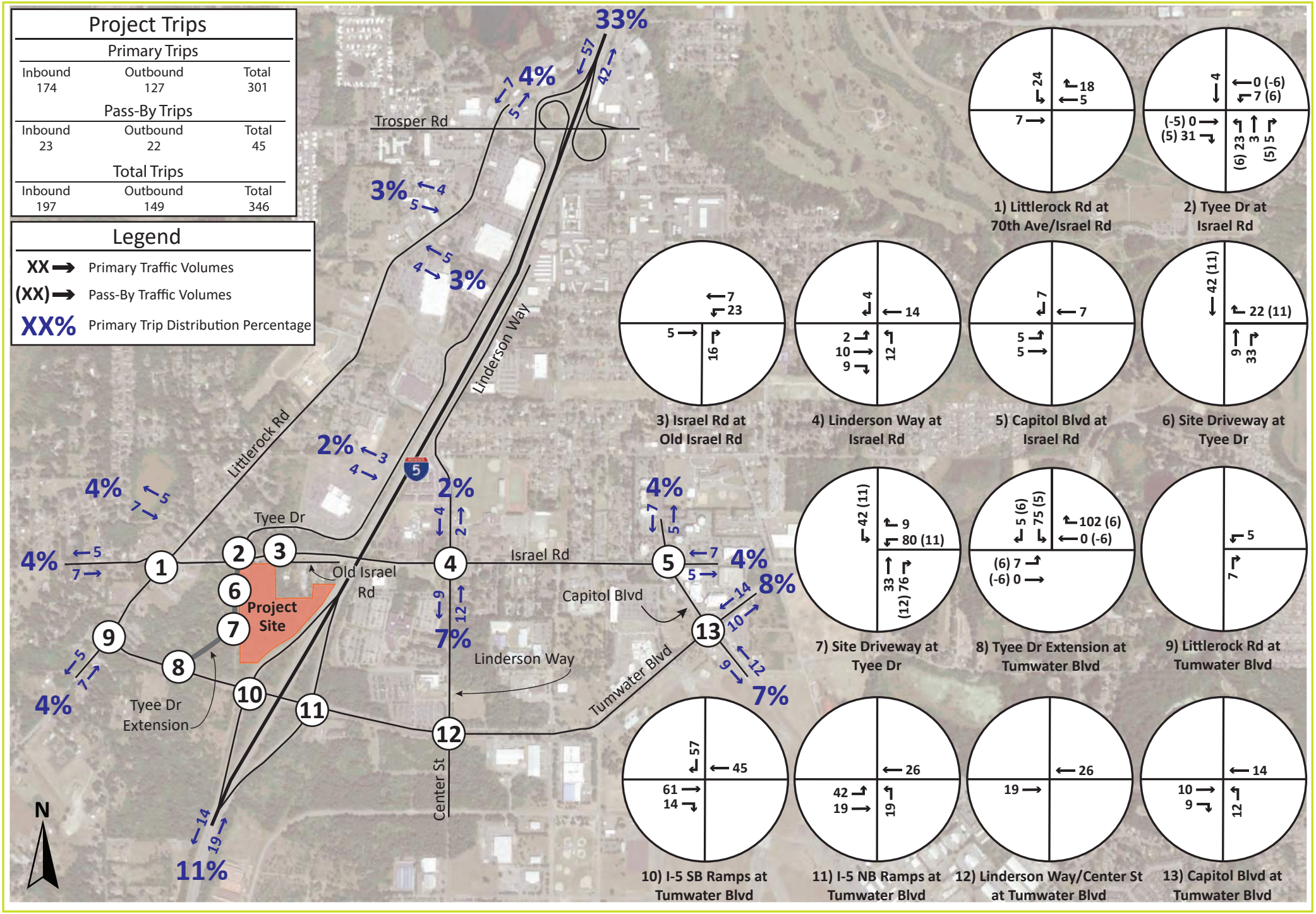
APPENDIX: PIPELINE TRIP DISTRIBUTION FIGURES



HEATH & ASSOCIATES
Transportation Planning & Engineering

TRESTLEWOOD TUMWATER

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 5



SCJ ALLIANCE
ENGINEERING AND PLANNING SERVICES

The Belmont Flats
Tumwater, Washington
Traffic Impact Analysis

Site-Generated Traffic Volumes
PM Peak Hour

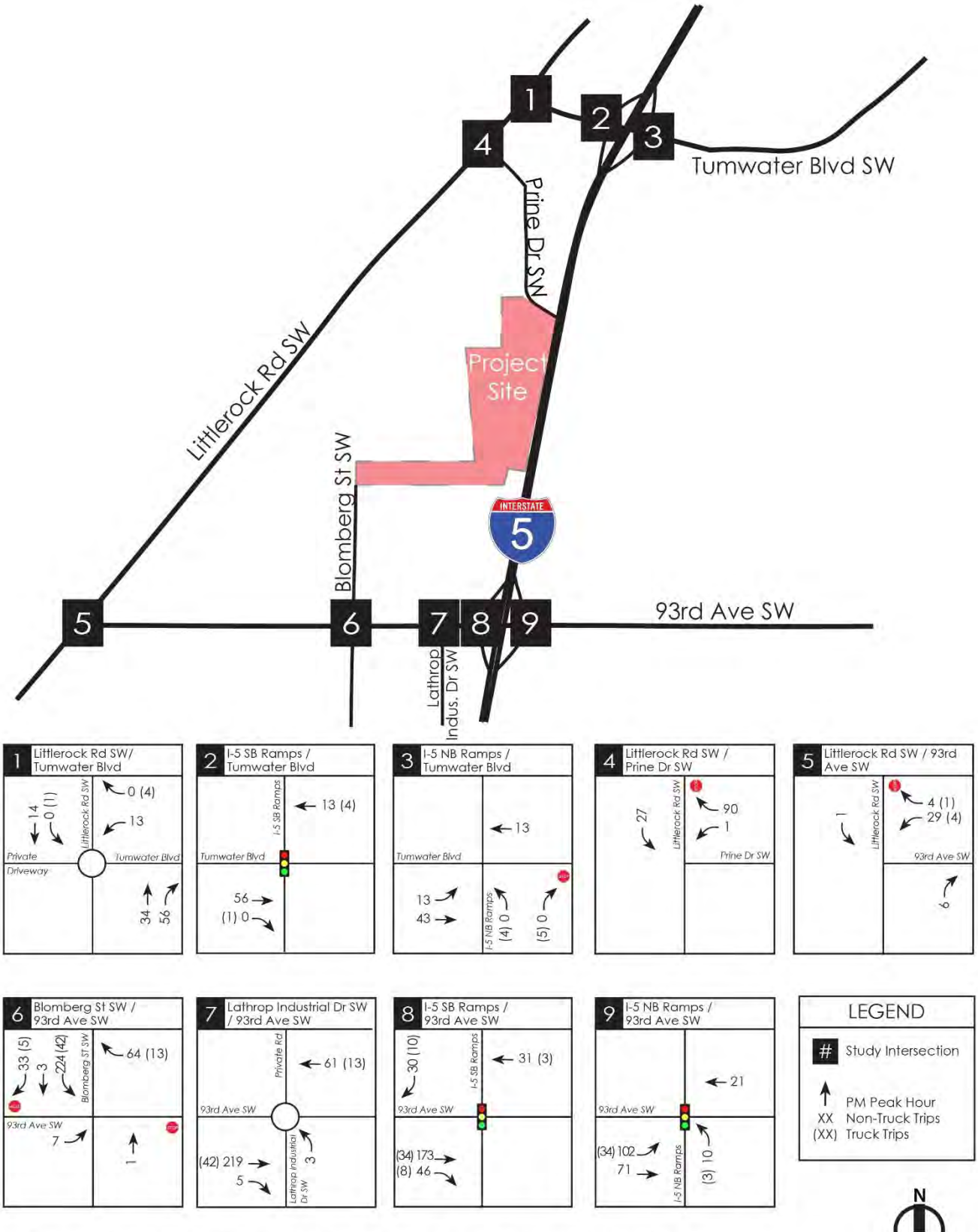
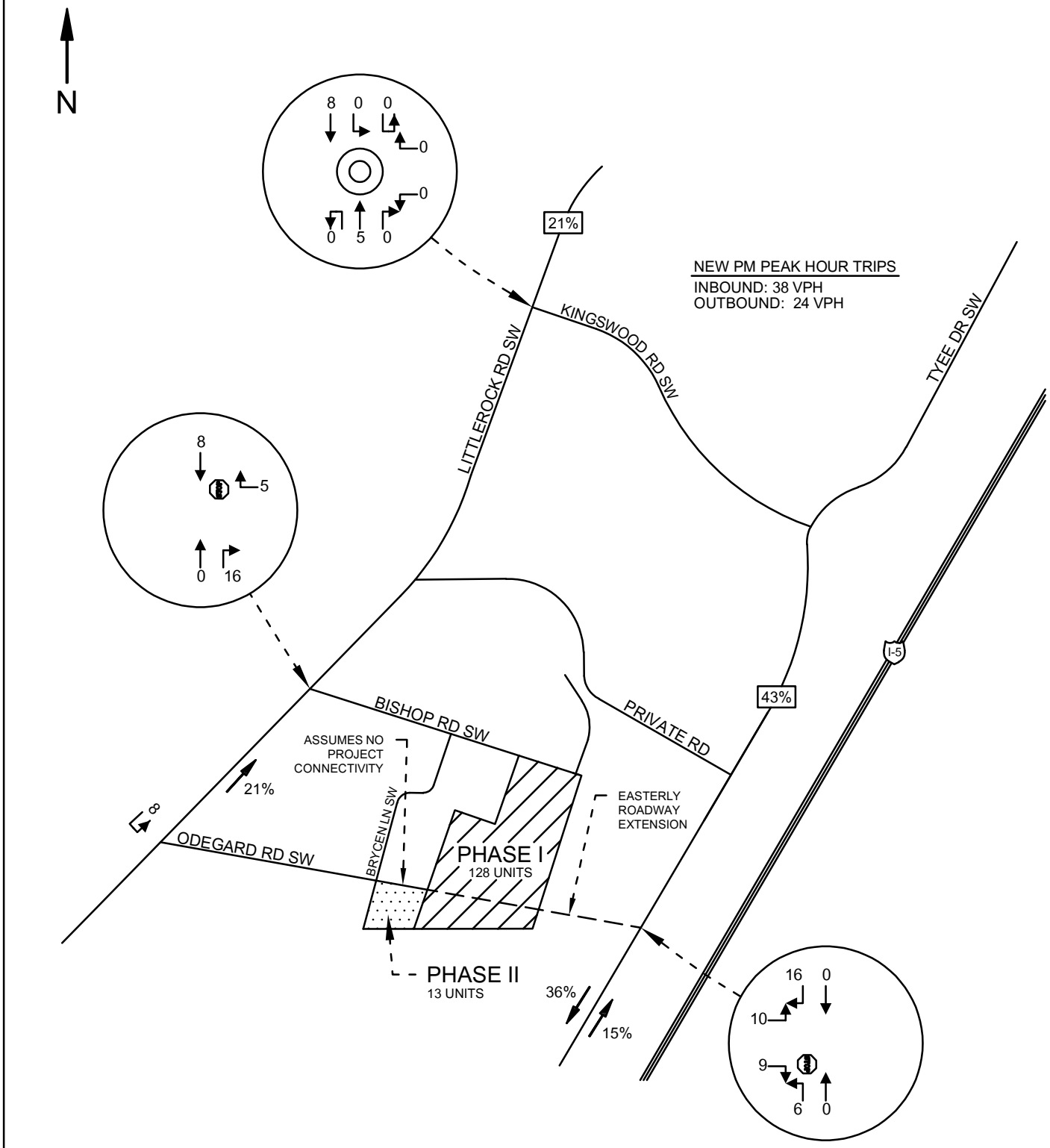


Figure 6: Weekday PM Peak Hour Project Trip Assignment

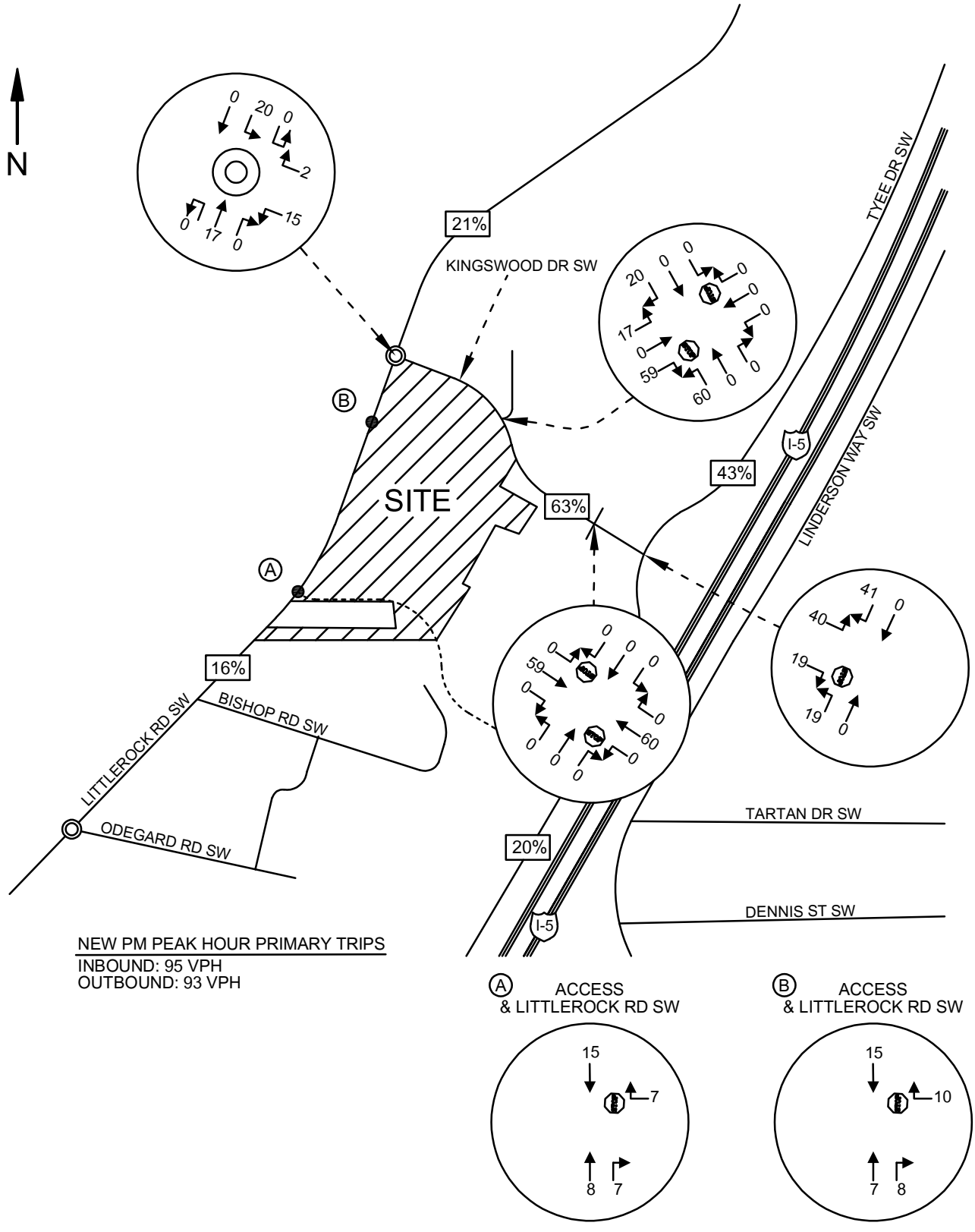


HEATH & ASSOCIATES

TRAFFIC AND CIVIL ENGINEERING

BISHOP ROAD APARTMENTS

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 2.1

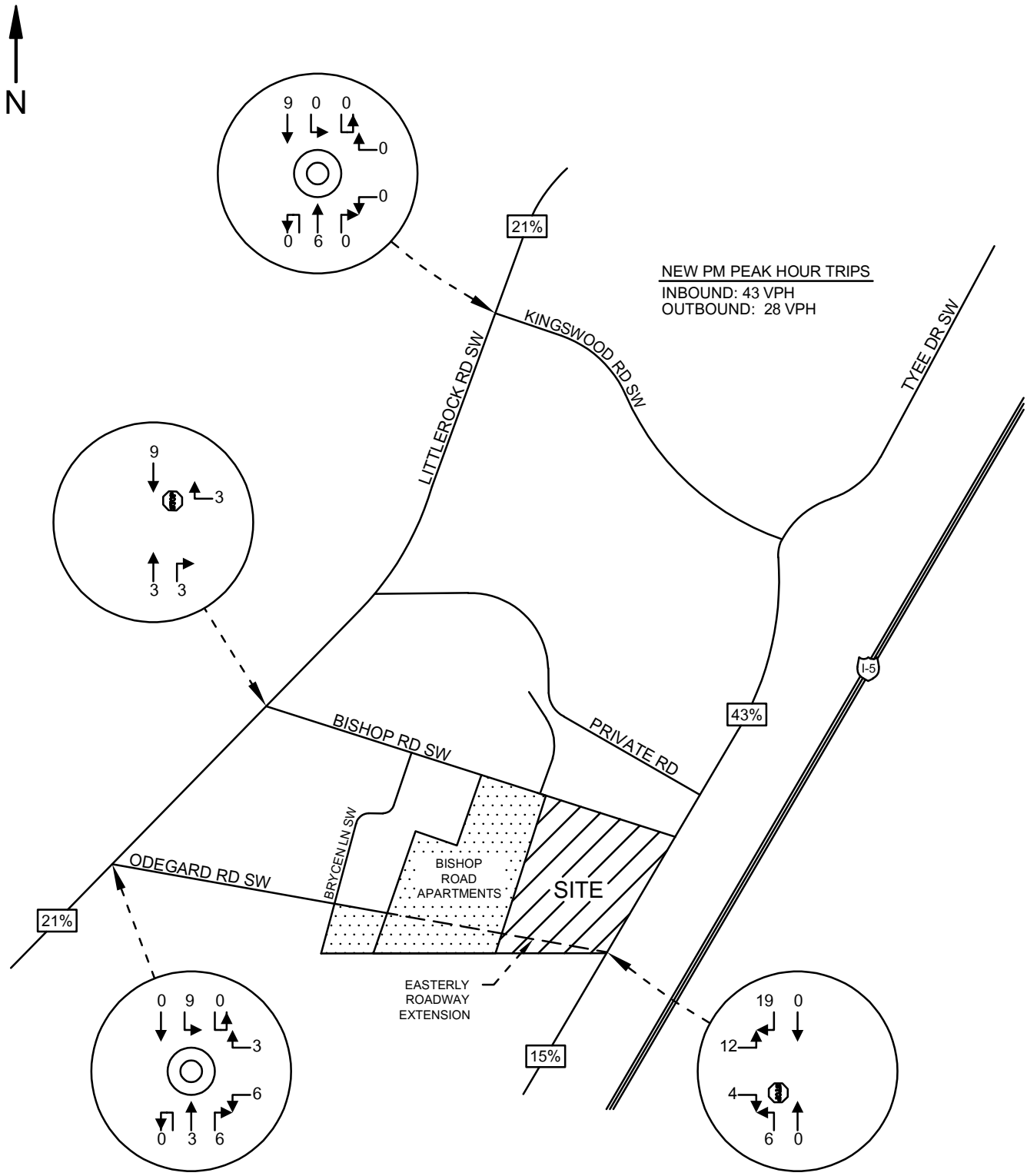


HEATH & ASSOCIATES

TRAFFIC AND CIVIL ENGINEERING

KINGSWOOD COMMERCIAL

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT (PRIMARY TRIPS)
FIGURE 4.1

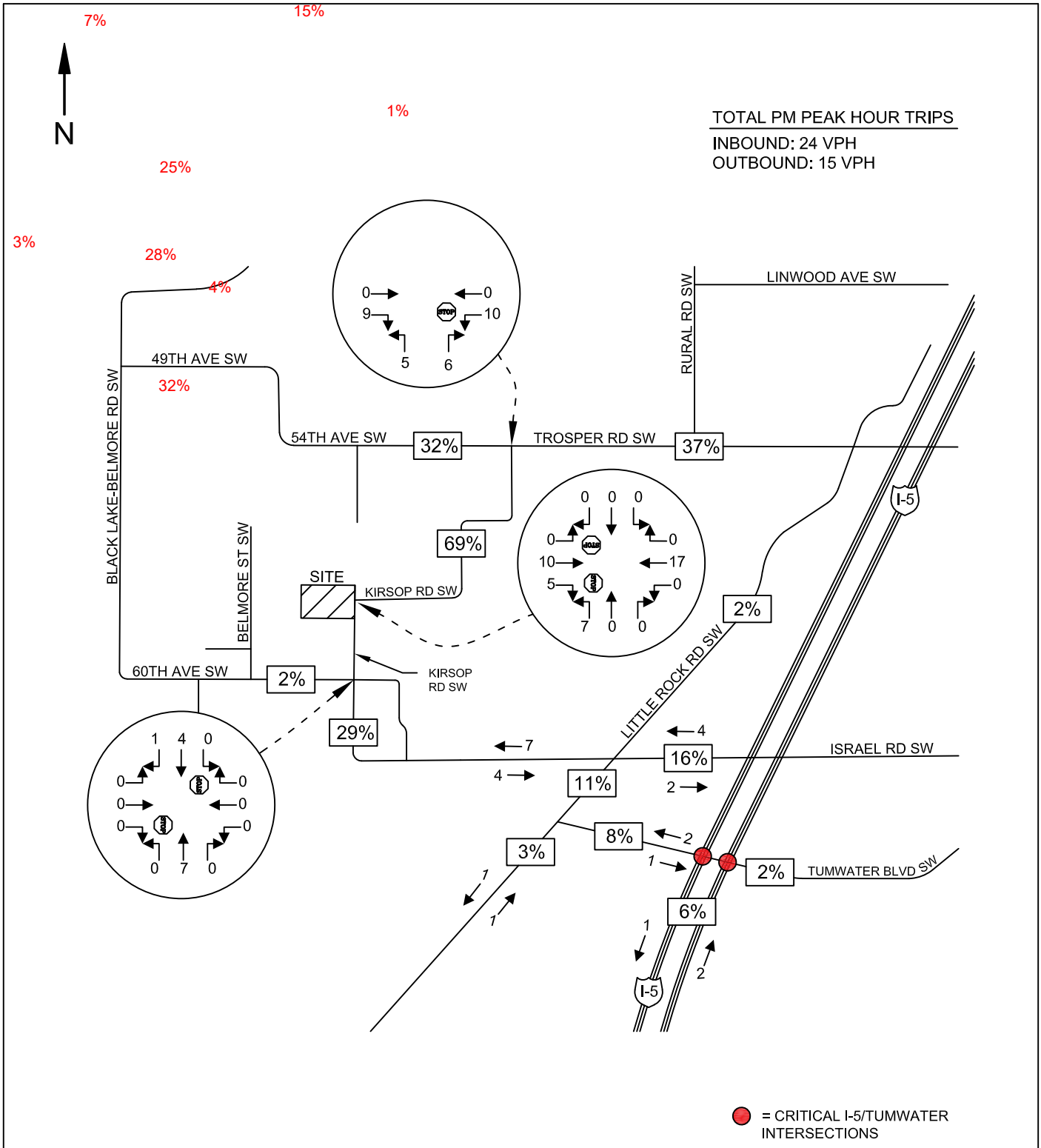


HEATH & ASSOCIATES

TRANSPORTATION PLANNING & ENGINEERING

KINGSWOOD APARTMENTS

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 3.2



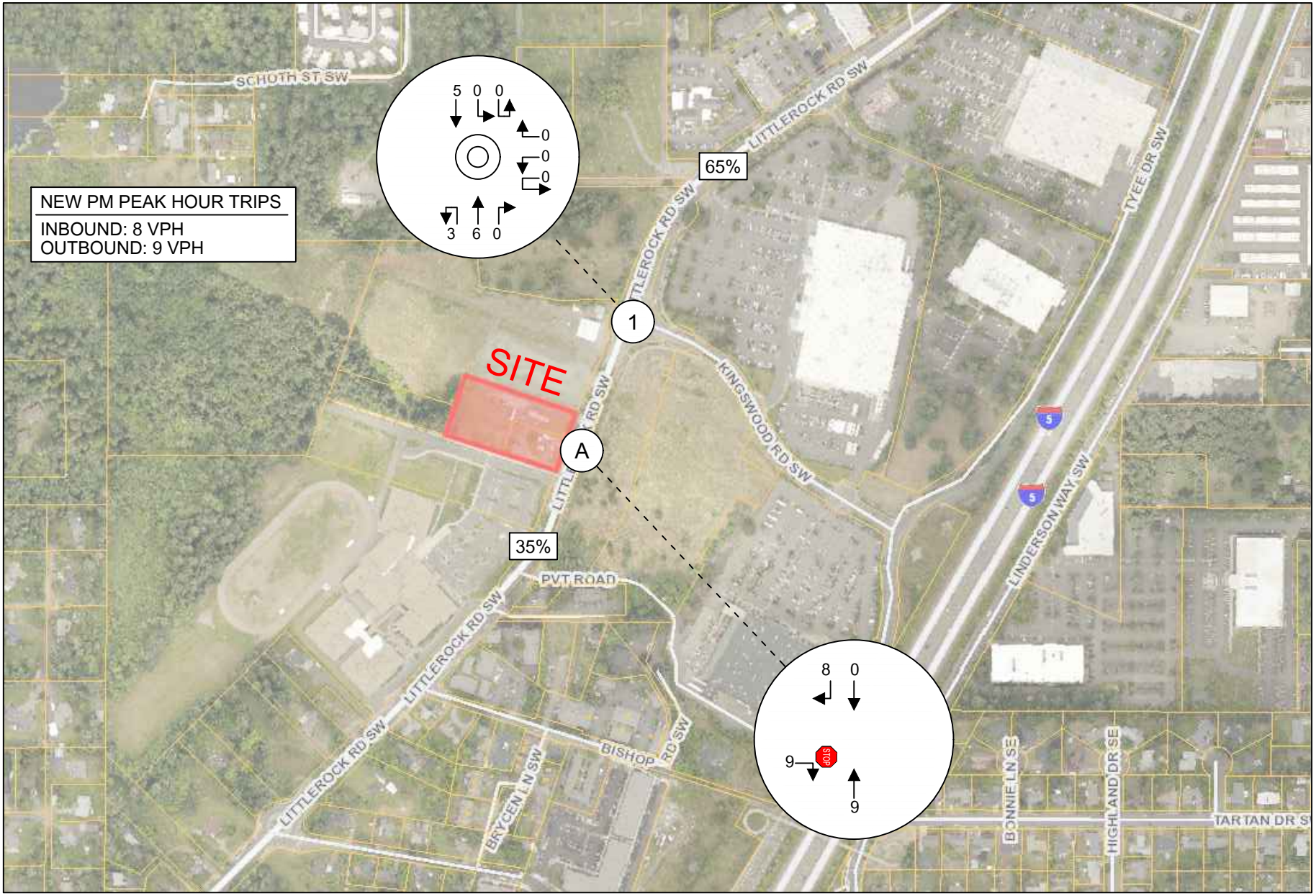
HEATH & ASSOCIATES

TRAFFIC AND CIVIL ENGINEERING

KIRSOP CROSSING

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT

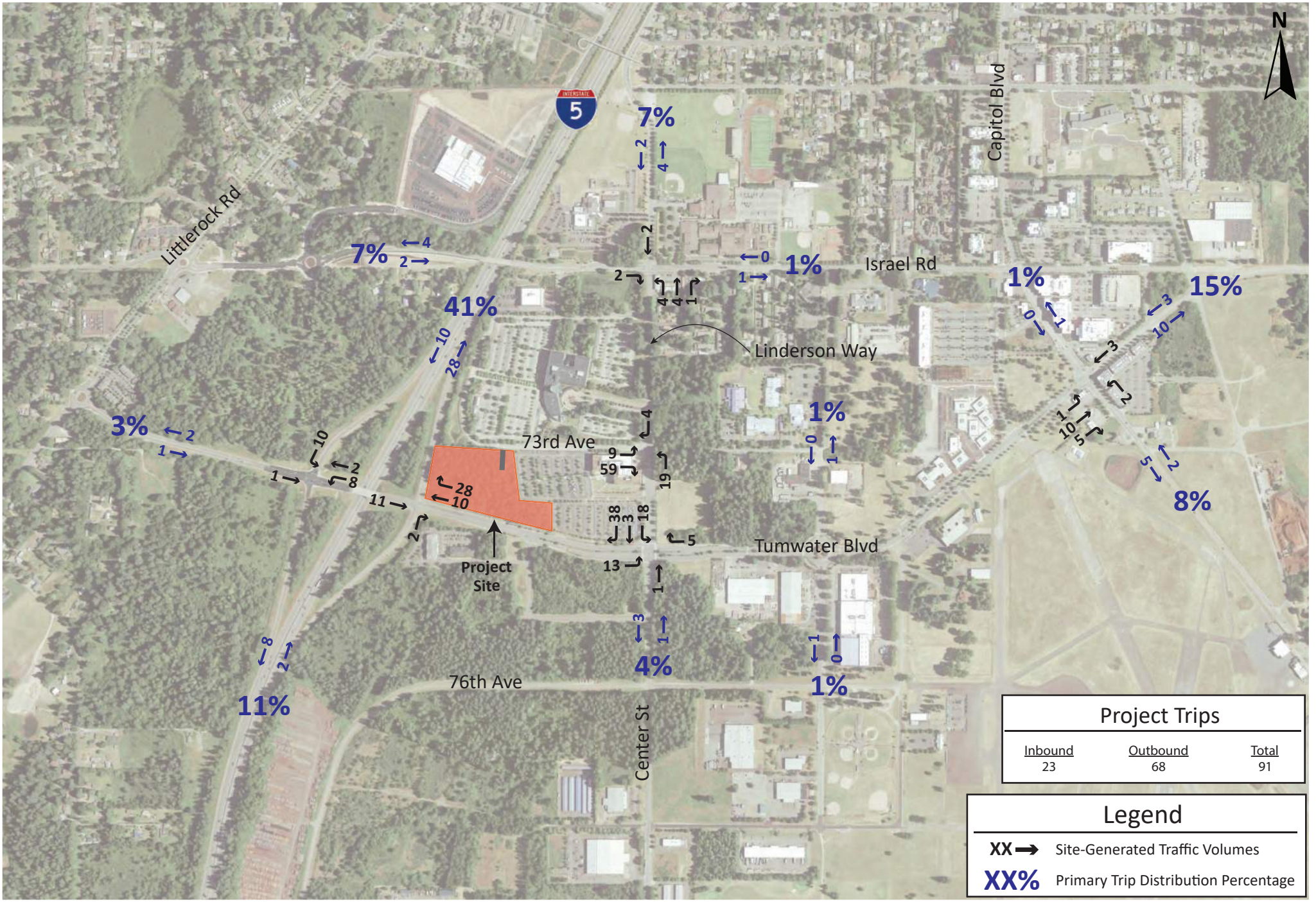
FIGURE 4



HEATH&ASSOCIATES
Transportation Planning & Engineering

LITTLEROCK STORAGE

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 4



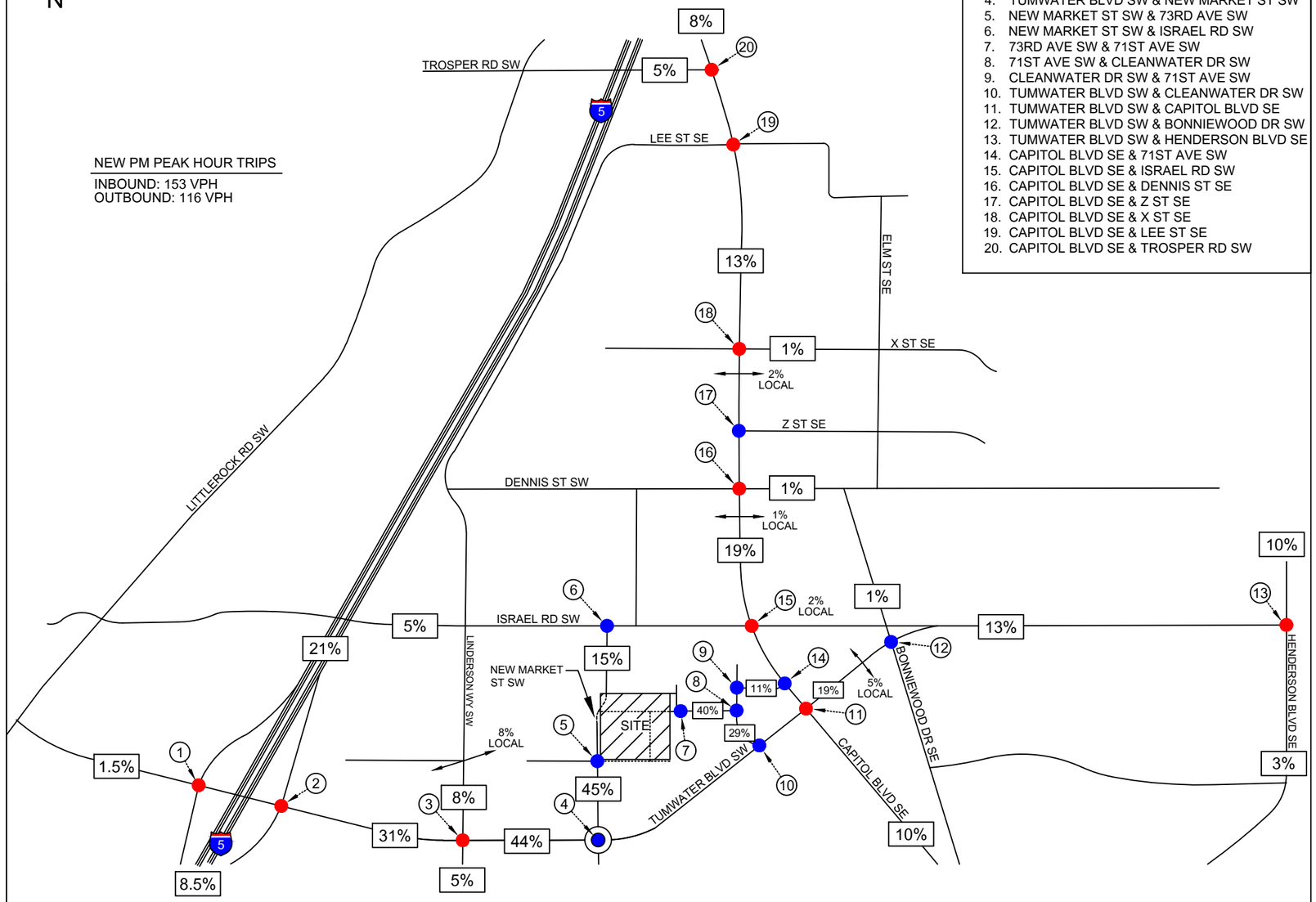
L&I/WSDA Safety & Health Lab and Training Center
Tumwater, Washinton
Traffic Impact Analysis

Figure 7
Site-Generated Traffic Volumes
PM Peak Hour

N

NEW PM PEAK HOUR TRIPS

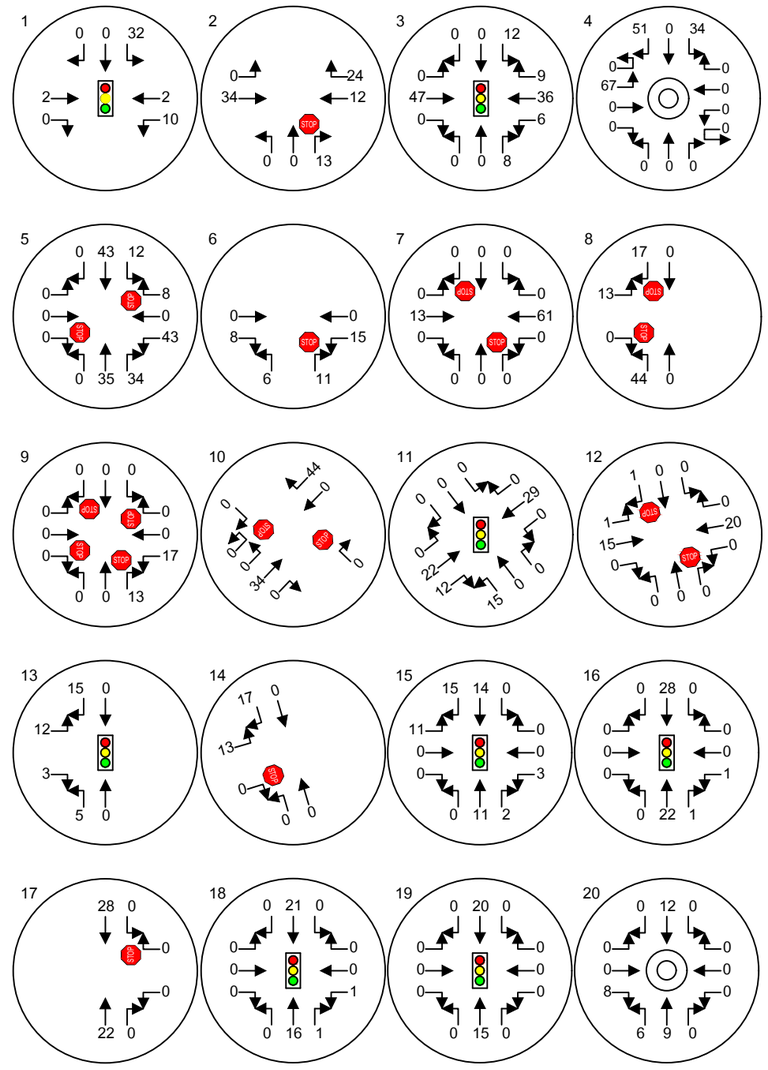
INBOUND: 153 VPH
OUTBOUND: 116 VPH



OUTLYING INTERSECTIONS OF STUDY

1. TUMWATER BLVD SW & SB I-5 RAMPS
2. TUMWATER BLVD SW & NB I-5 RAMPS
3. TUMWATER BLVD SW & LINDERSON WY SW
4. TUMWATER BLVD SW & NEW MARKET ST SW
5. NEW MARKET ST SW & 73RD AVE SW
6. NEW MARKET ST SW & ISRAEL RD SW
7. 73RD AVE SW & 71ST AVE SW
8. 71ST AVE SW & CLEANWATER DR SW
9. CLEANWATER DR SW & 71ST AVE SW
10. TUMWATER BLVD SW & CLEANWATER DR SW
11. TUMWATER BLVD SW & CAPITOL BLVD SE
12. TUMWATER BLVD SW & BONNIEWOOD DR SW
13. TUMWATER BLVD SW & HENDERSON BLVD SE
14. CAPITOL BLVD SE & 71ST AVE SW
15. CAPITOL BLVD SE & ISRAEL RD SW
16. CAPITOL BLVD SE & DENNIS ST SE
17. CAPITOL BLVD SE & Z ST SE
18. CAPITOL BLVD SE & X ST SE
19. CAPITOL BLVD SE & LEE ST SE
20. CAPITOL BLVD SE & TROSPER RD SW

OUTLYING STUDY INTERSECTIONS



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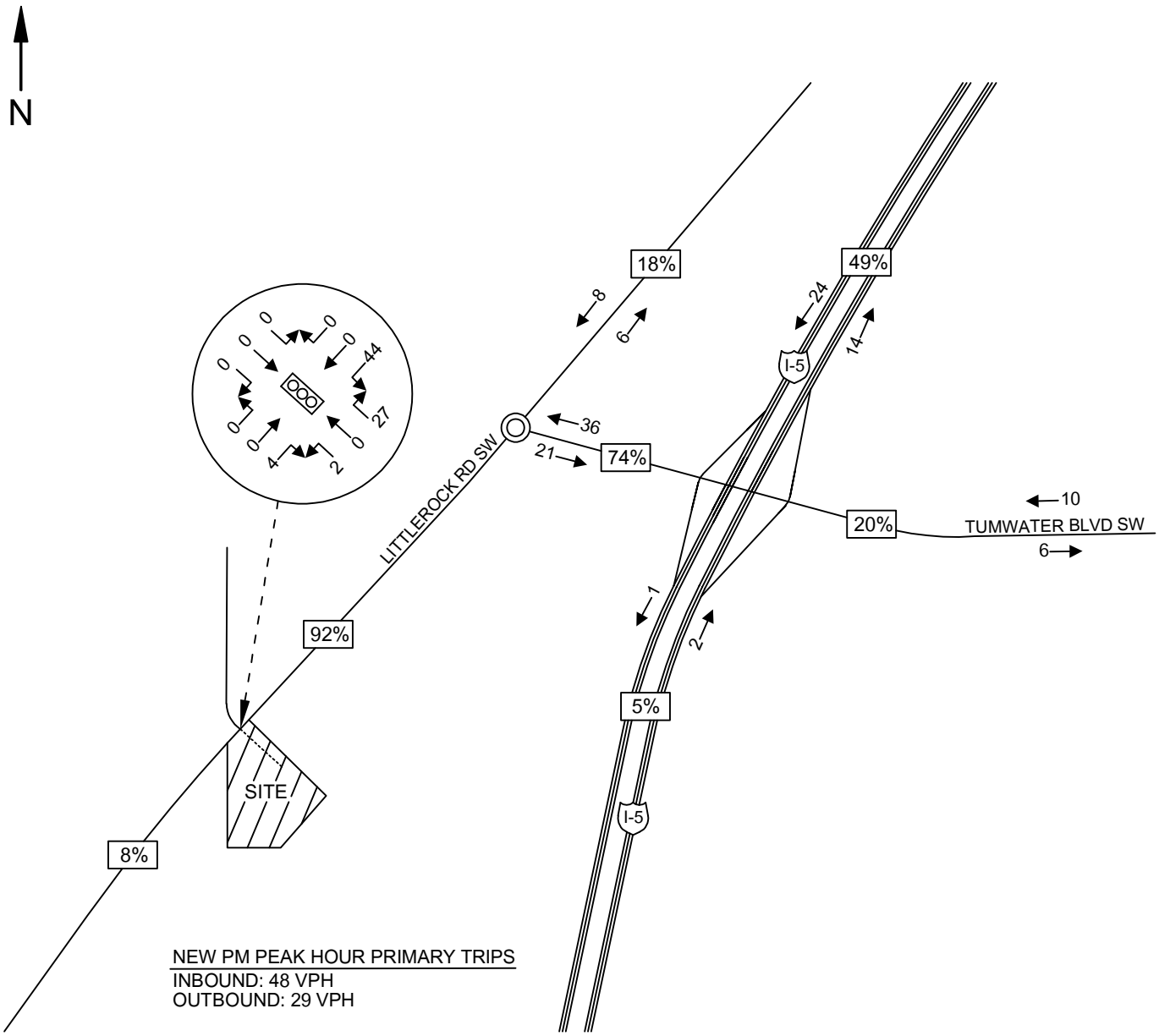
NEW MARKET APARTMENTS

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 7

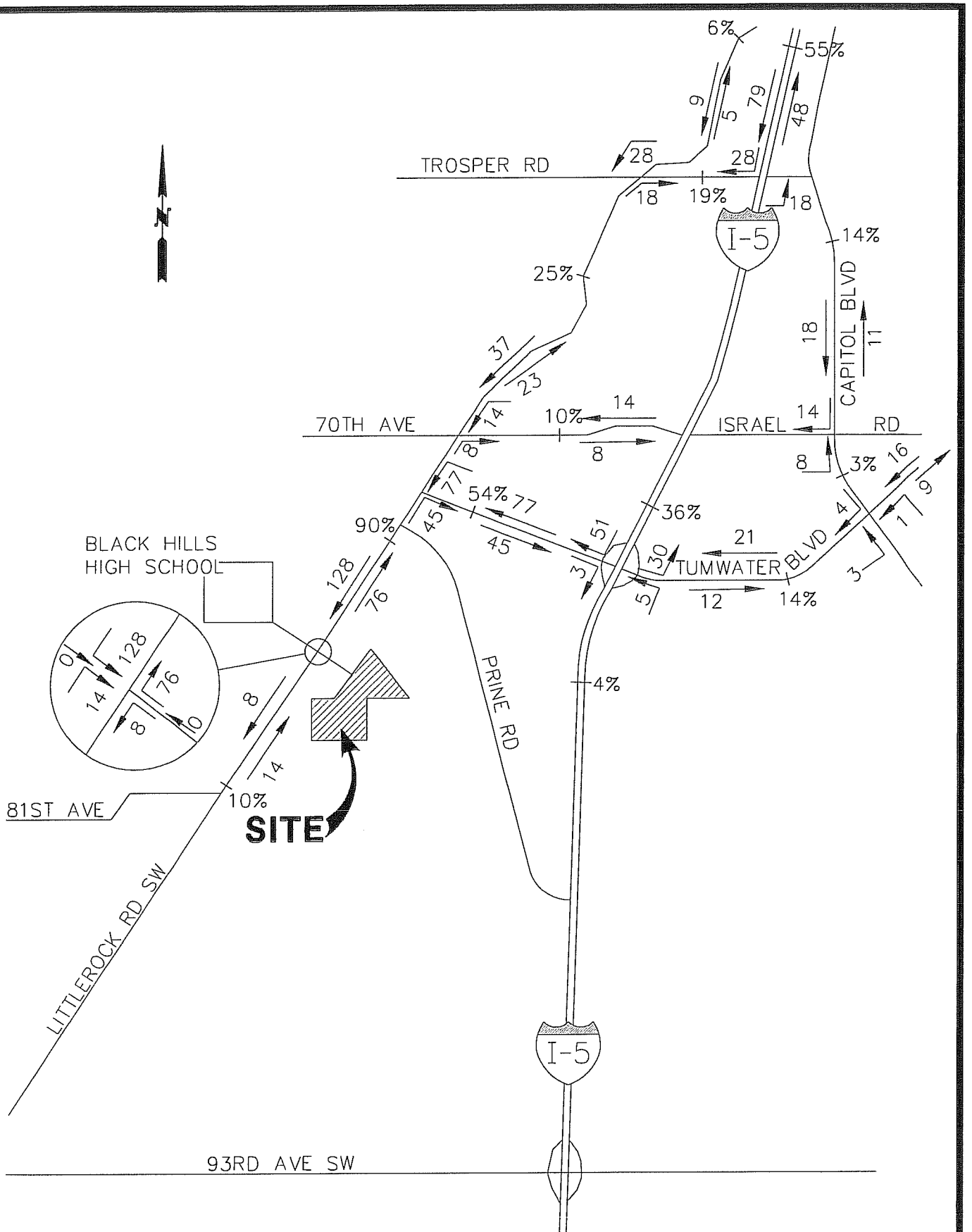


HEATH & ASSOCIATES

TRAFFIC AND CIVIL ENGINEERING

SIENNA 1 PLAT

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 3

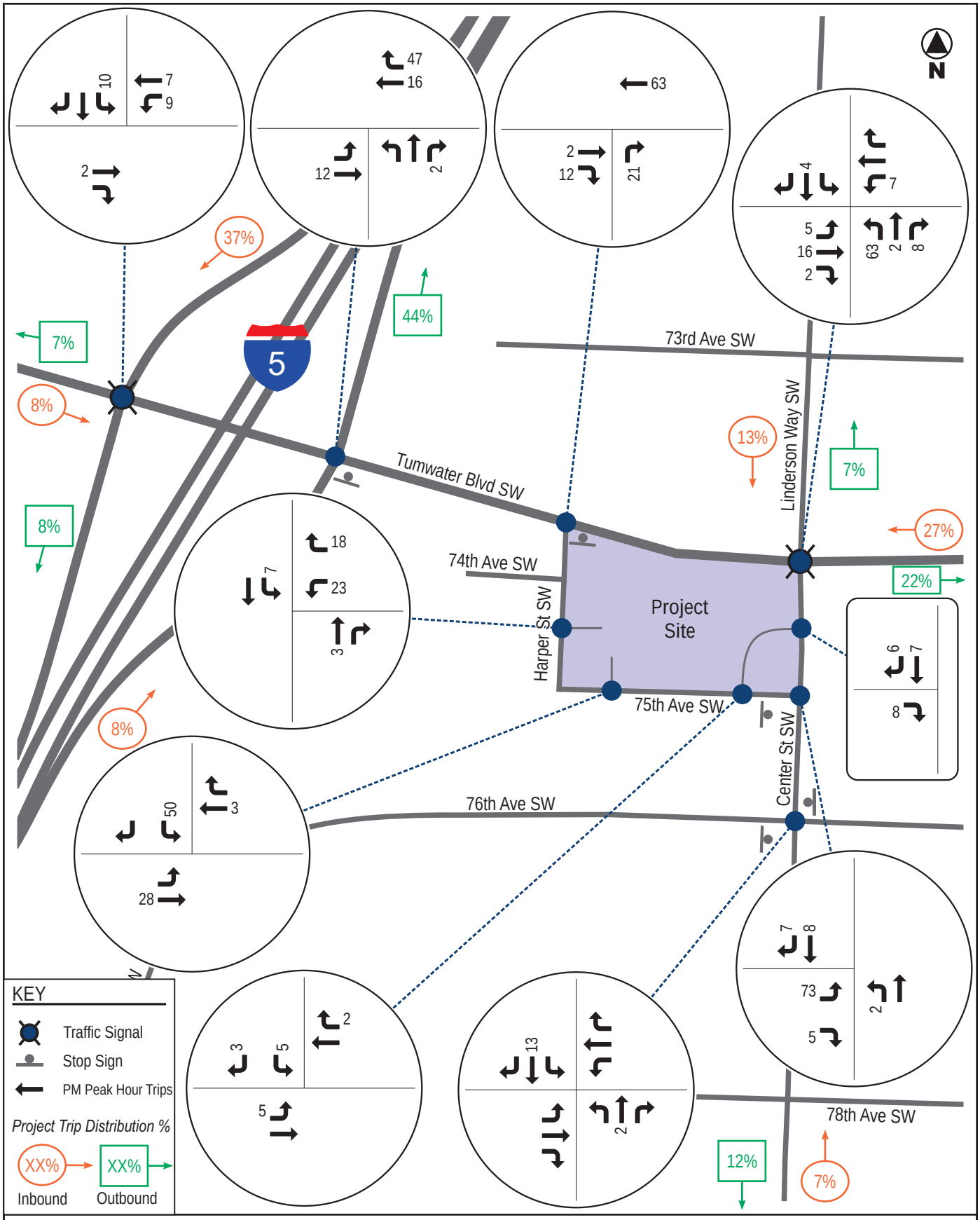


SKILLINGS CONNOLLY

PHASE 2 PM PEAK TRIP DISTRIBUTION
FIGURE 6

06419

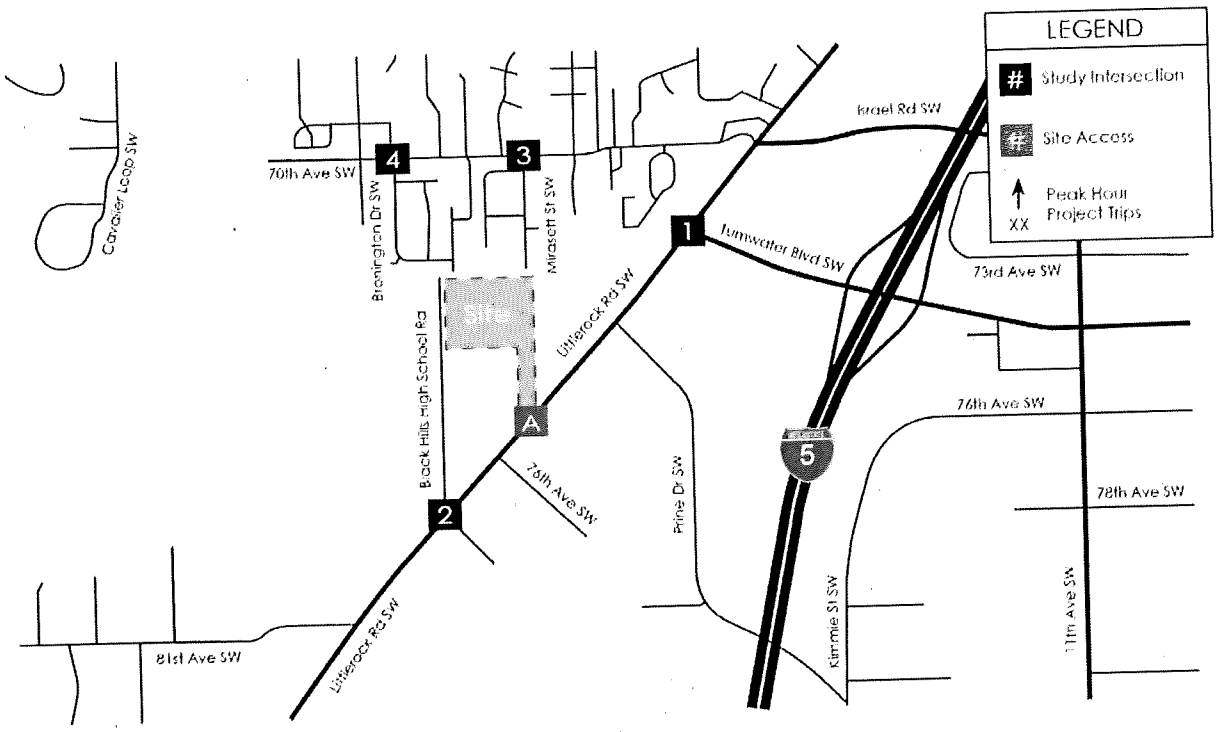
DWG#:Figure6_PM Trip Distribution.dwg 03/14/07 16:23 shouno



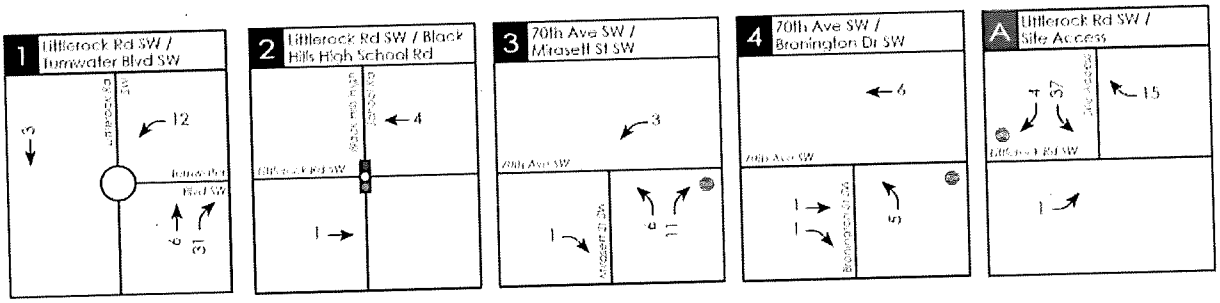
OSOS — LAB

Figure 5
Project Trip Distribution and Assignment
PM Peak Hour Traffic Volumes

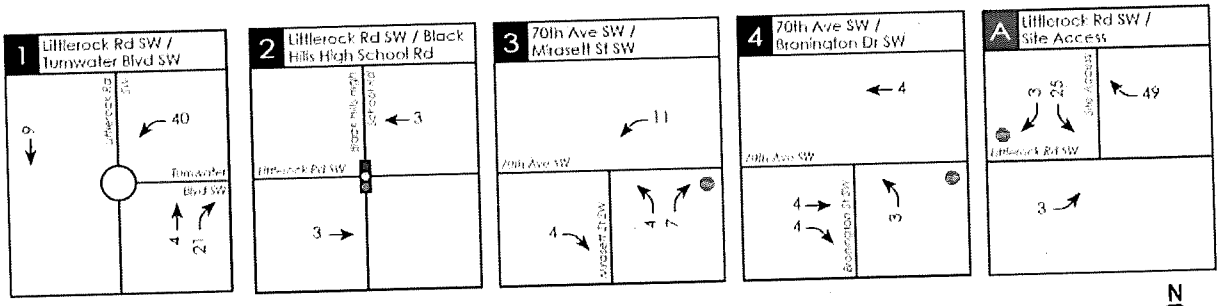
heffron transportation inc



AM Peak Hour:



PM Peak Hour:



N
NOT TO SCALE

Figure 4: Peak Hour Project Trip Assignment

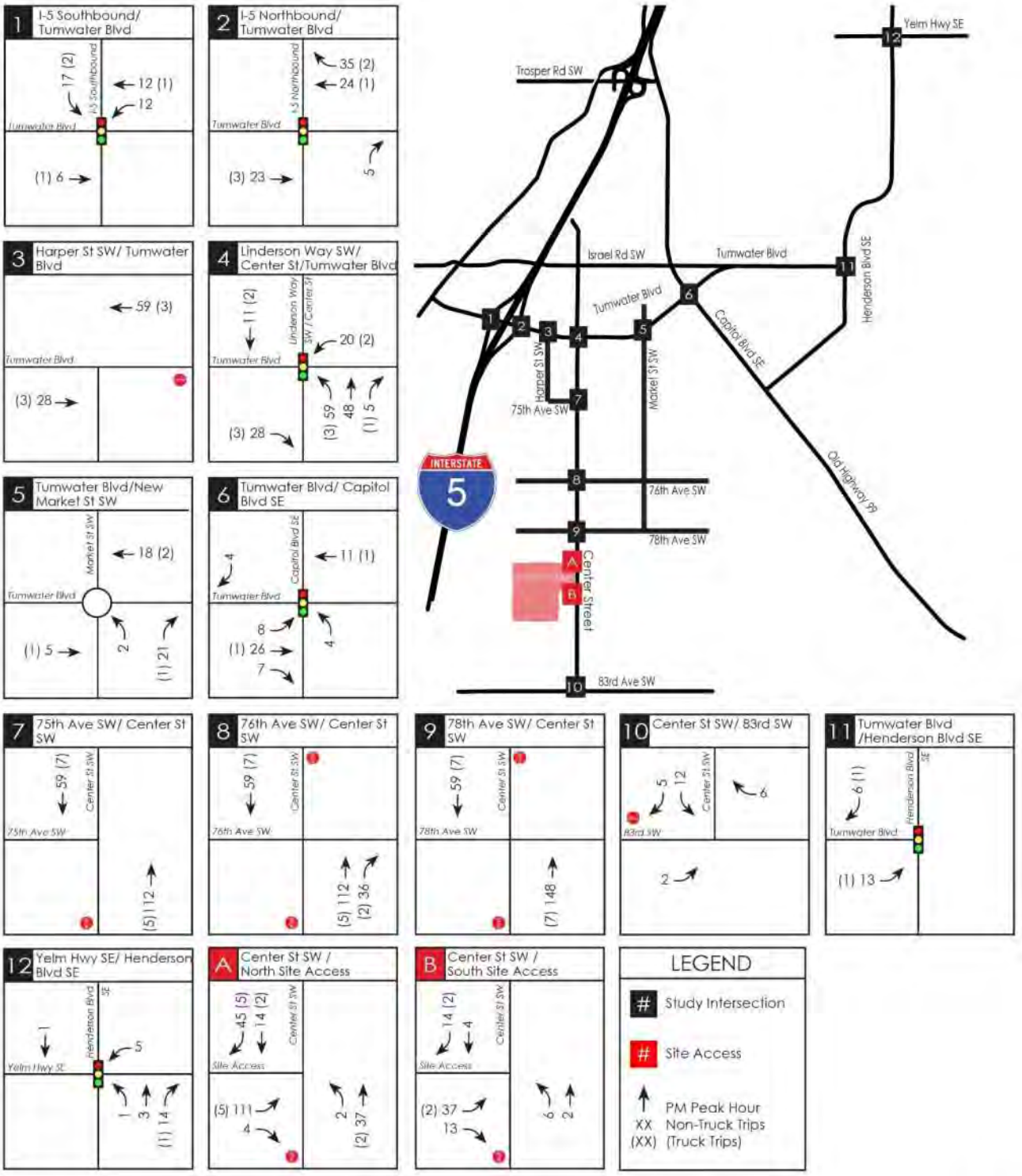
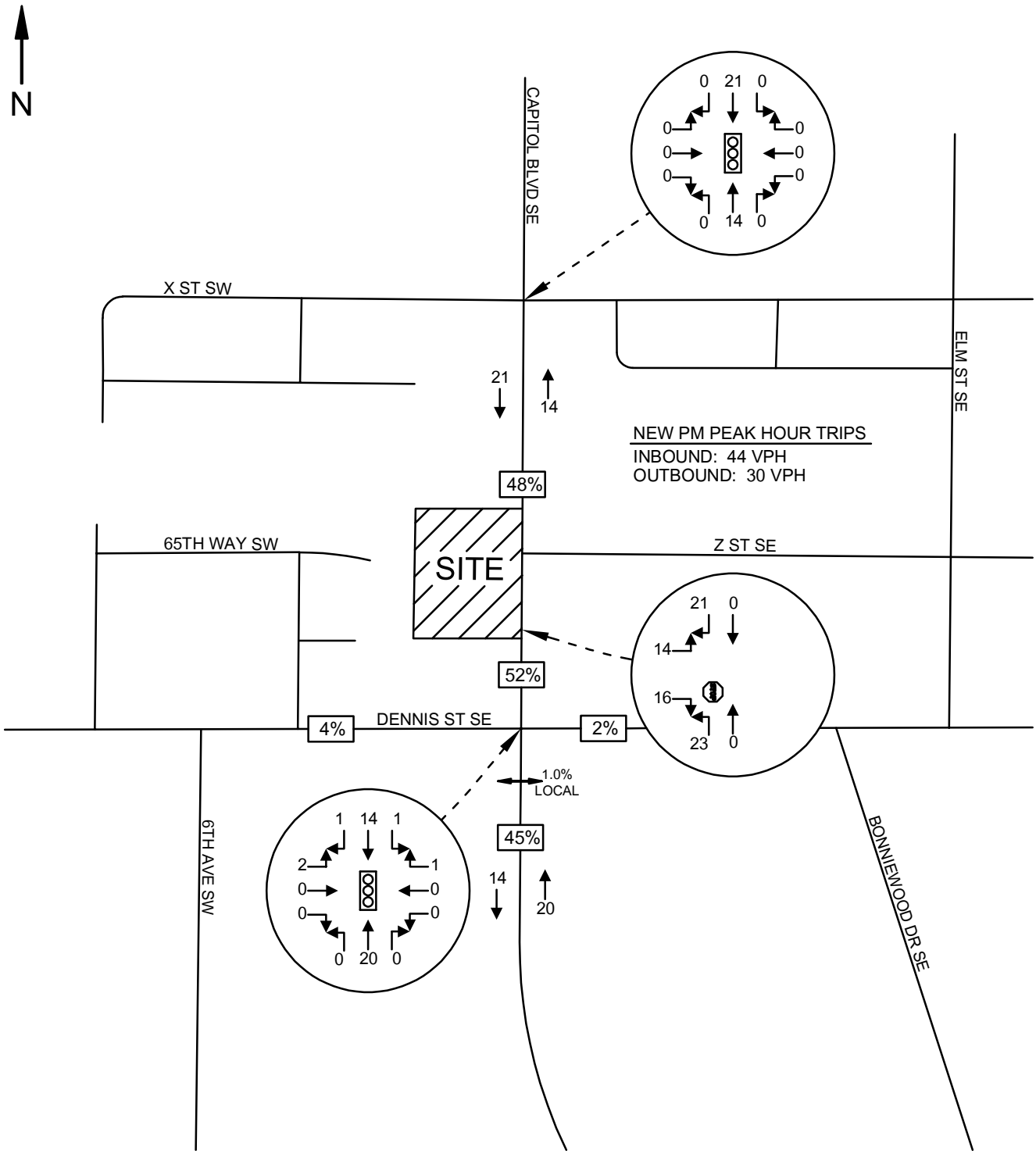


Figure 6: Weekday PM Peak Hour Project Trip Assignment

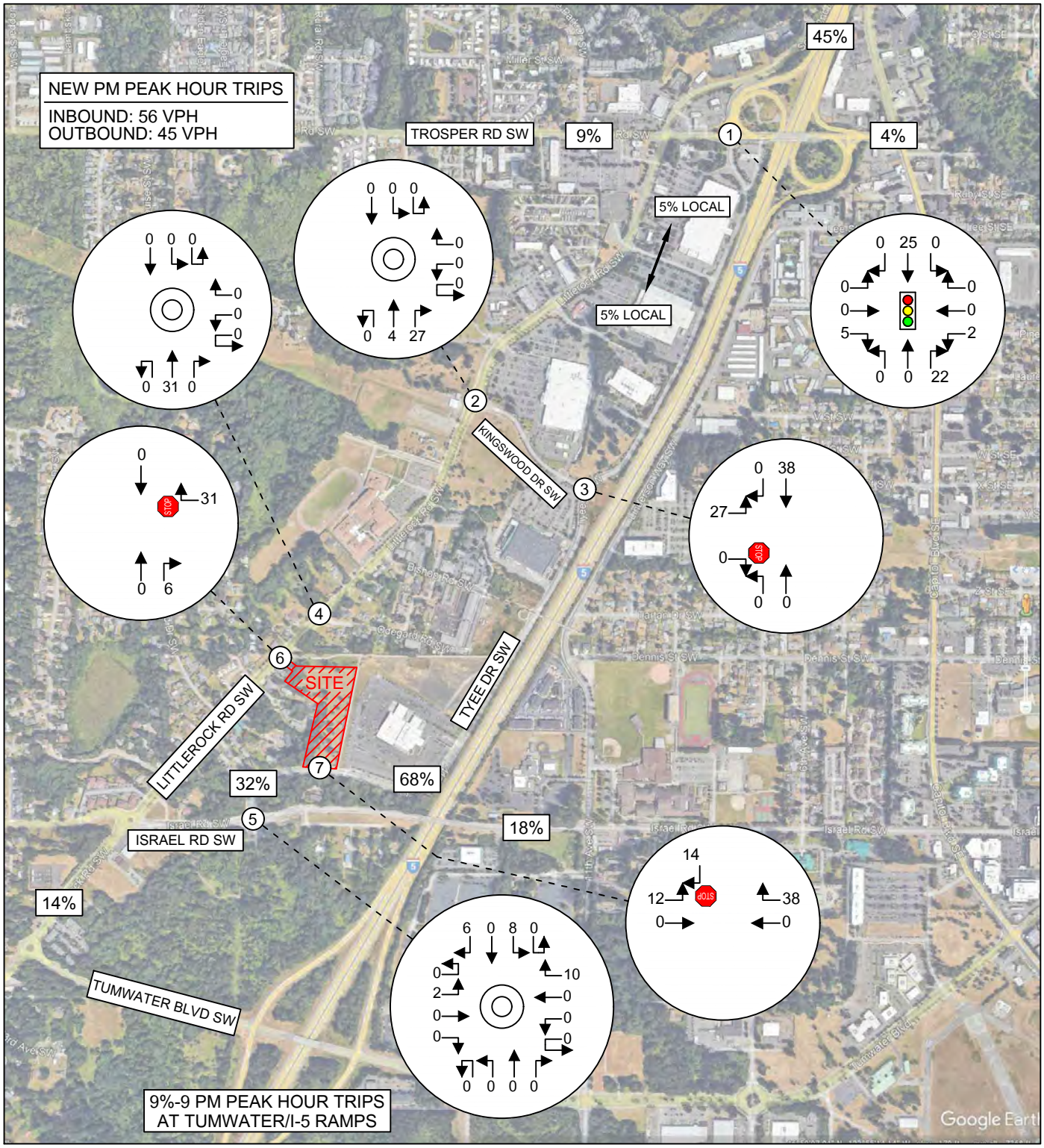


HEATH & ASSOCIATES

TRAFFIC AND CIVIL ENGINEERING

6501 CAPITOL BOULEVARD APARTMENTS

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 1.1



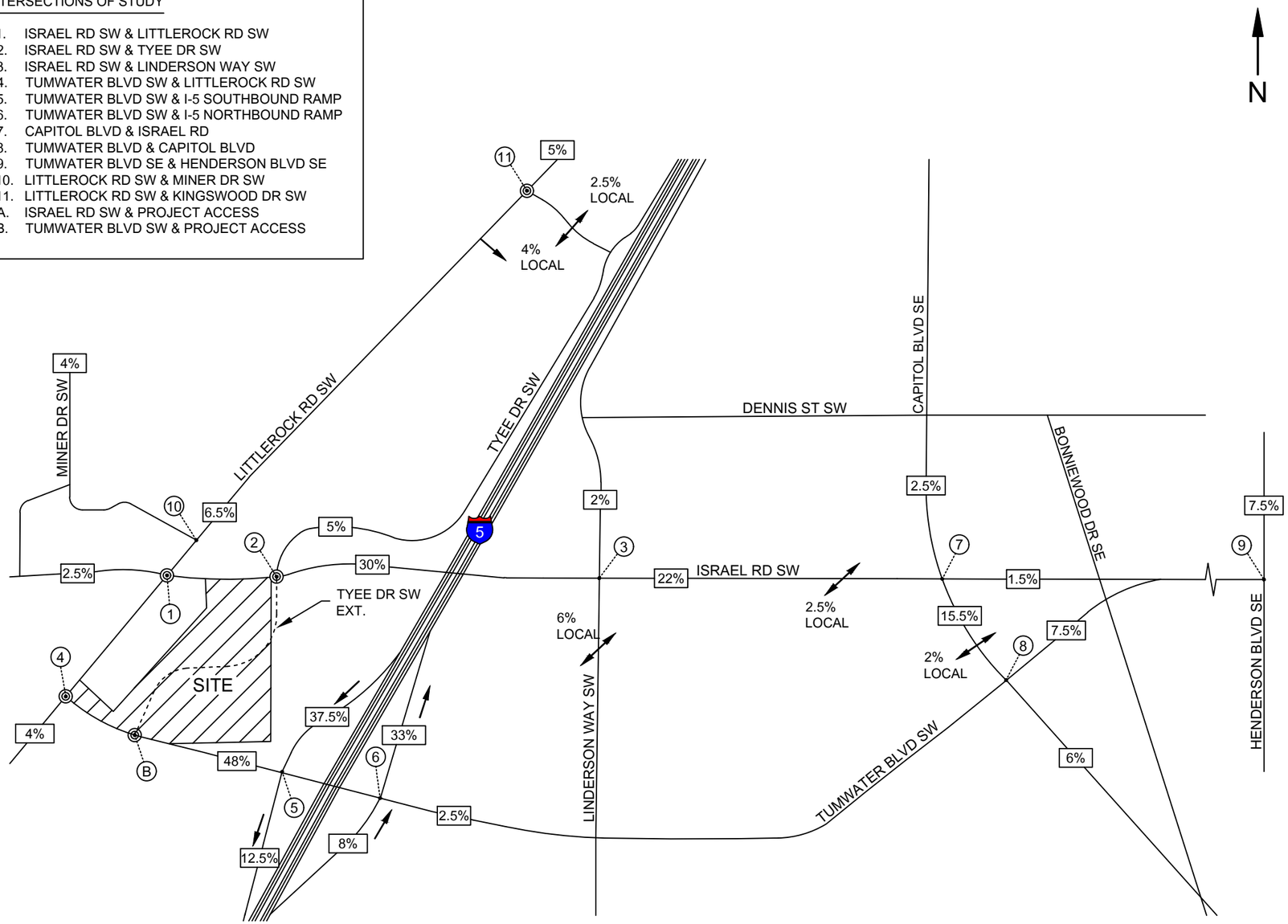
HEATH&ASSOCIATES
Transportation Planning & Engineering

TYEE LANDING APARTMENTS

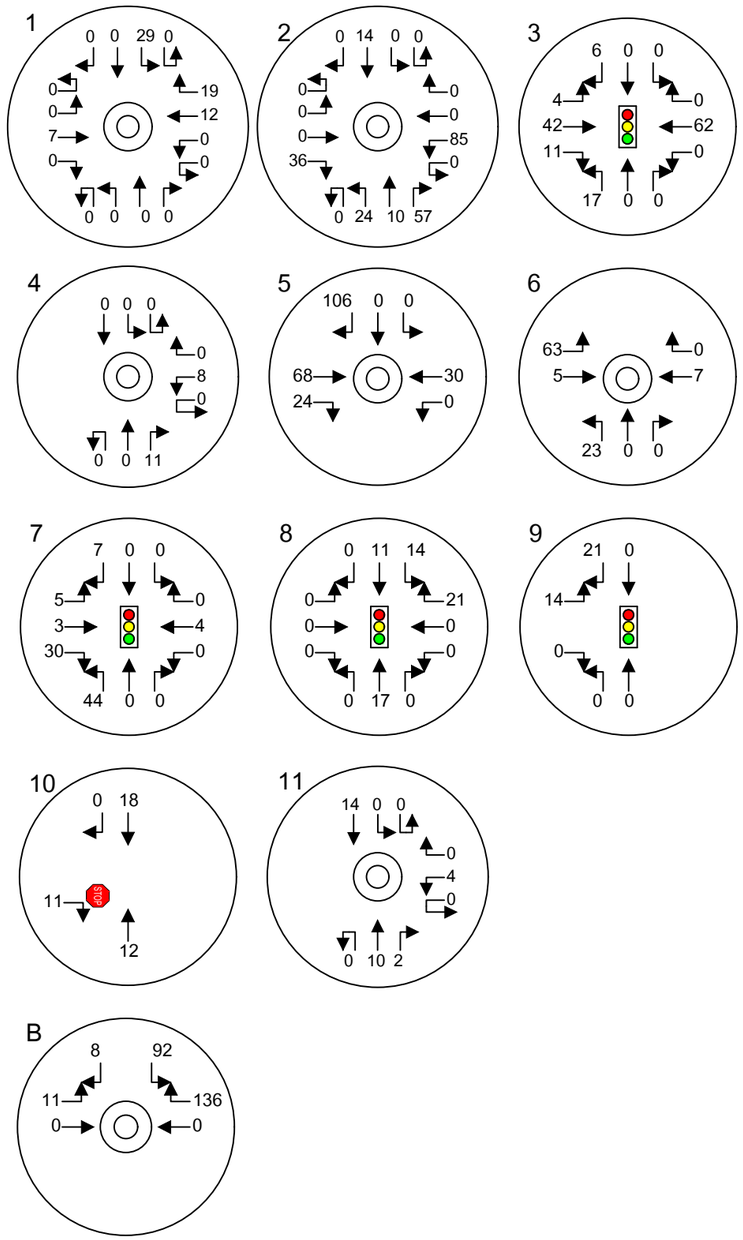
PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 4

INTERSECTIONS OF STUDY

1. ISRAEL RD SW & LITTLEROCK RD SW
2. ISRAEL RD SW & TYEE DR SW
3. ISRAEL RD SW & LINDERSON WAY SW
4. TUMWATER BLVD SW & LITTLEROCK RD SW
5. TUMWATER BLVD SW & I-5 SOUTHBOUND RAMP
6. TUMWATER BLVD SW & I-5 NORTHBOUND RAMP
7. CAPITOL BLVD & ISRAEL RD
8. TUMWATER BLVD & CAPITOL BLVD
9. TUMWATER BLVD SE & HENDERSON BLVD SE
10. LITTLEROCK RD SW & MINER DR SW
11. LITTLEROCK RD SW & KINGSWOOD DR SW
A. ISRAEL RD SW & PROJECT ACCESS
B. TUMWATER BLVD SW & PROJECT ACCESS



FULL BUILDOUT
NEW PM PEAK HOUR TRIPS
INBOUND: 282 VPH
OUTBOUND: 191 VPH



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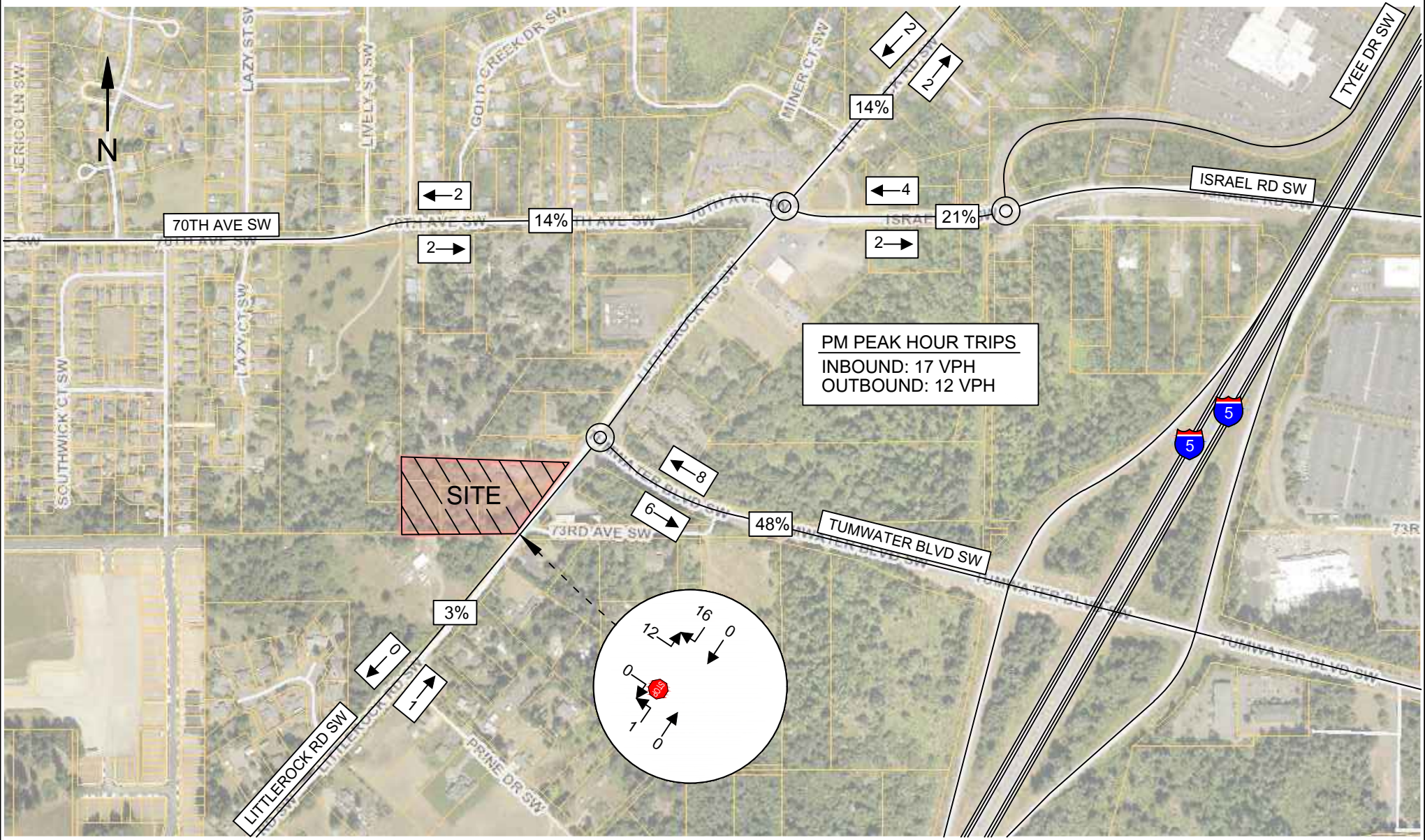
Transportation Planning & Engineering

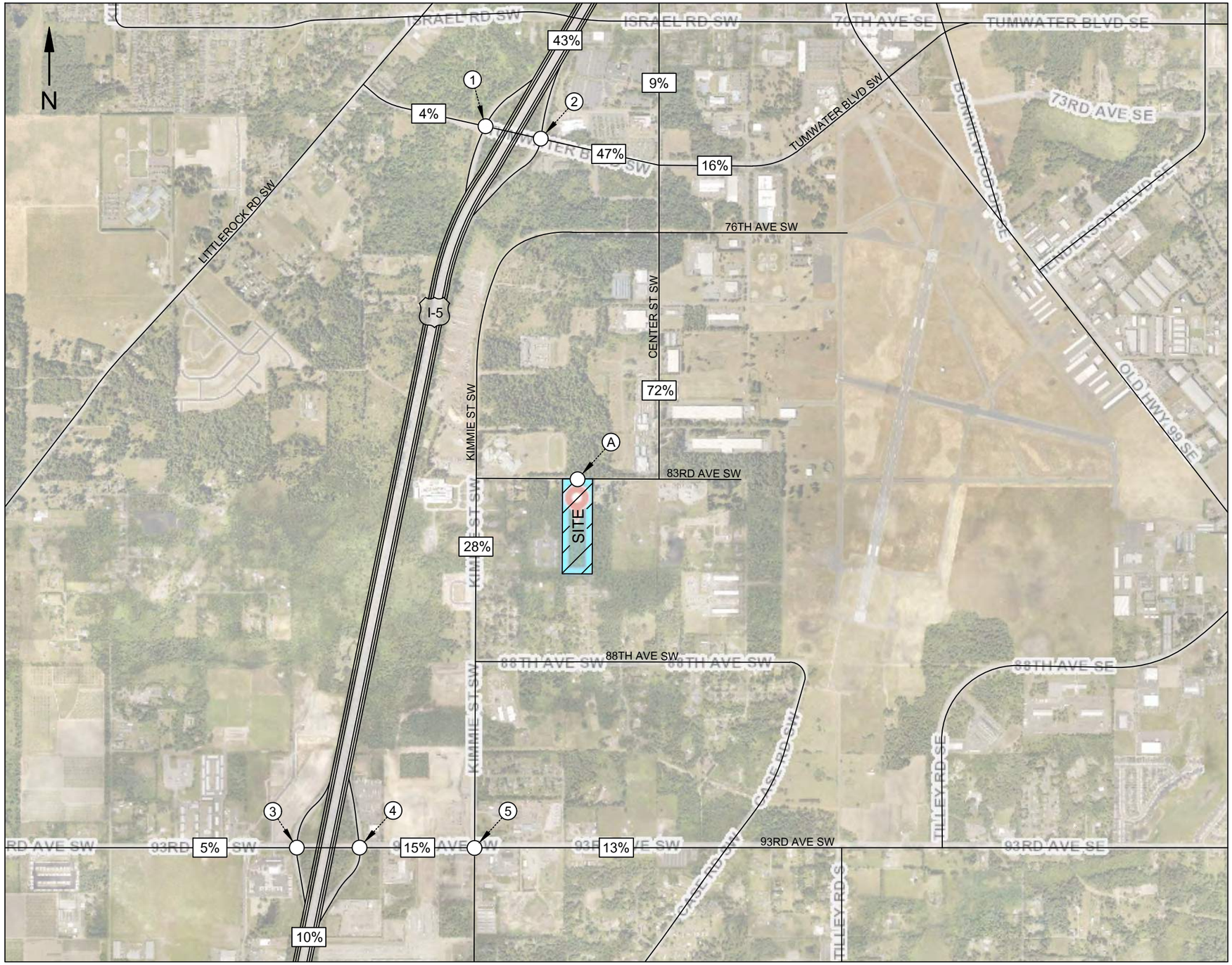
YORKSHIRE
FULL BUILD: PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 8



HEATH&ASSOCIATES
Transportation Planning & Engineering

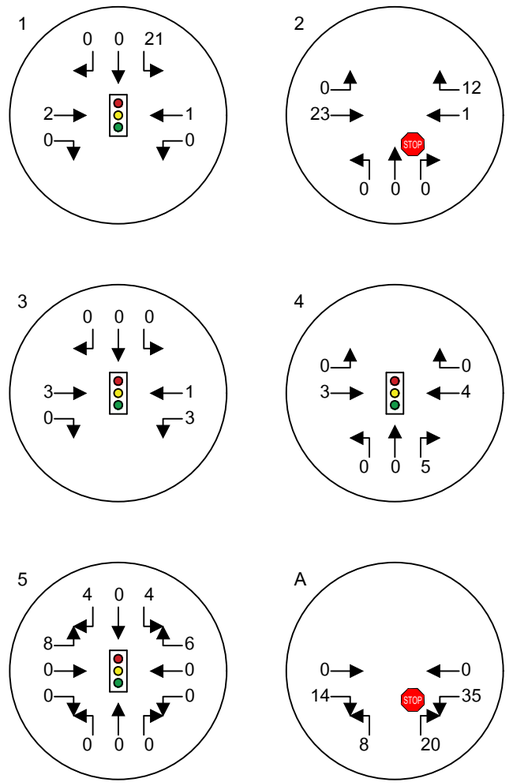
LITTLEROCK TOWNHOMES

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 3



NEW PM PEAK HOUR TRIPS

INBOUND: 49 VPH
OUTBOUND: 28 VPH



STUDY INTERSECTIONS

1. TUMWATER BLVD SW & I-5 SB RAMPS
2. TUMWATER BLVD SW & I-5 NB RAMPS
3. 93RD AVE SW (SR 121) & I-5 SB RAMPS
4. 93RD AVE SW (SR 121) & I-5 NB RAMPS
5. 93RD AVE SW (SR 121) & KIMMIE ST SW
A. 83RD AVE SW & ACCESS

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Transportation Planning & Engineering

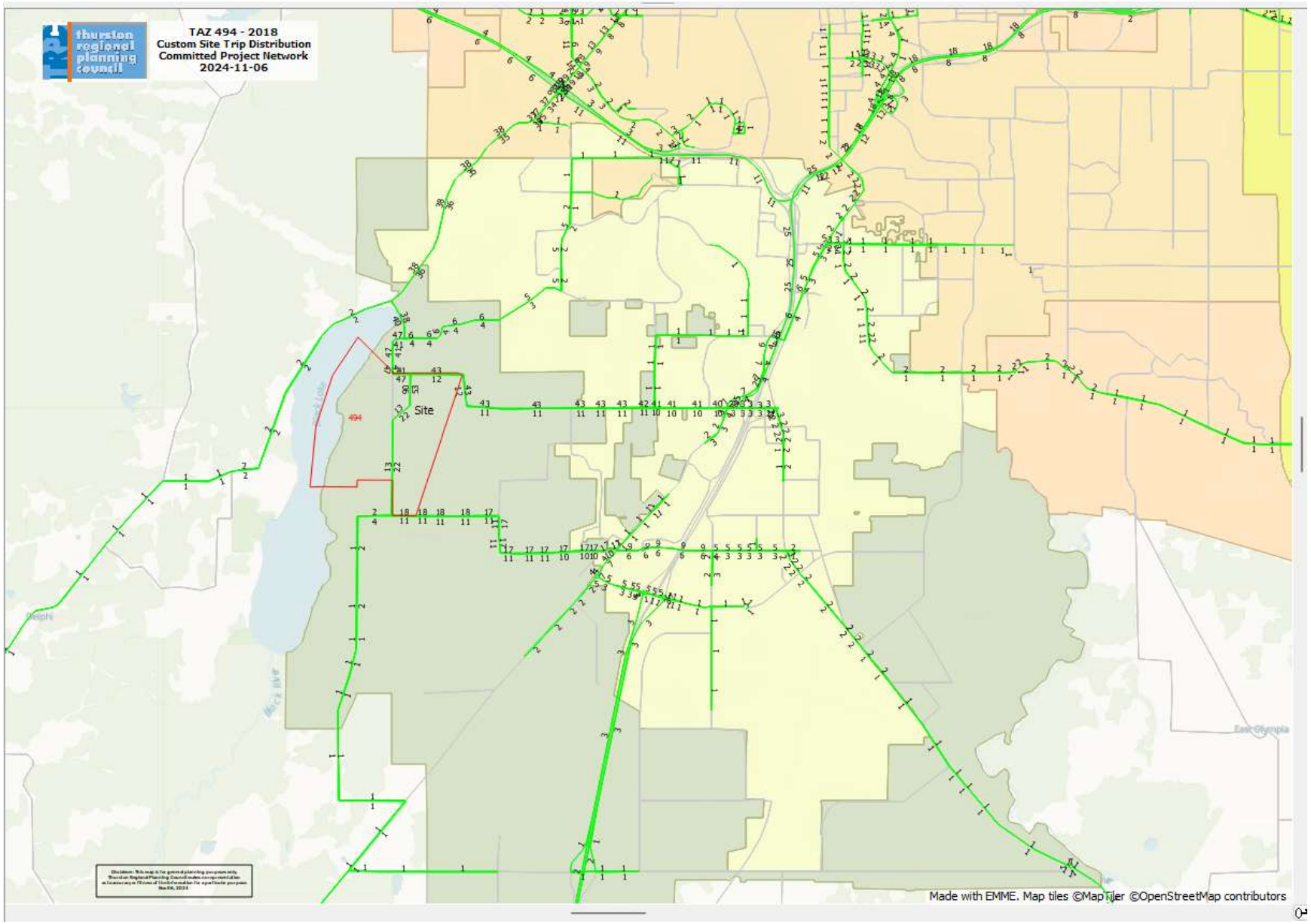
ASPEN APARTMENTS

PM PEAK HOUR TRIP DISTRIBUTION & ASSIGNMENT
FIGURE 6

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: TRPC TAZ 494 MODELING

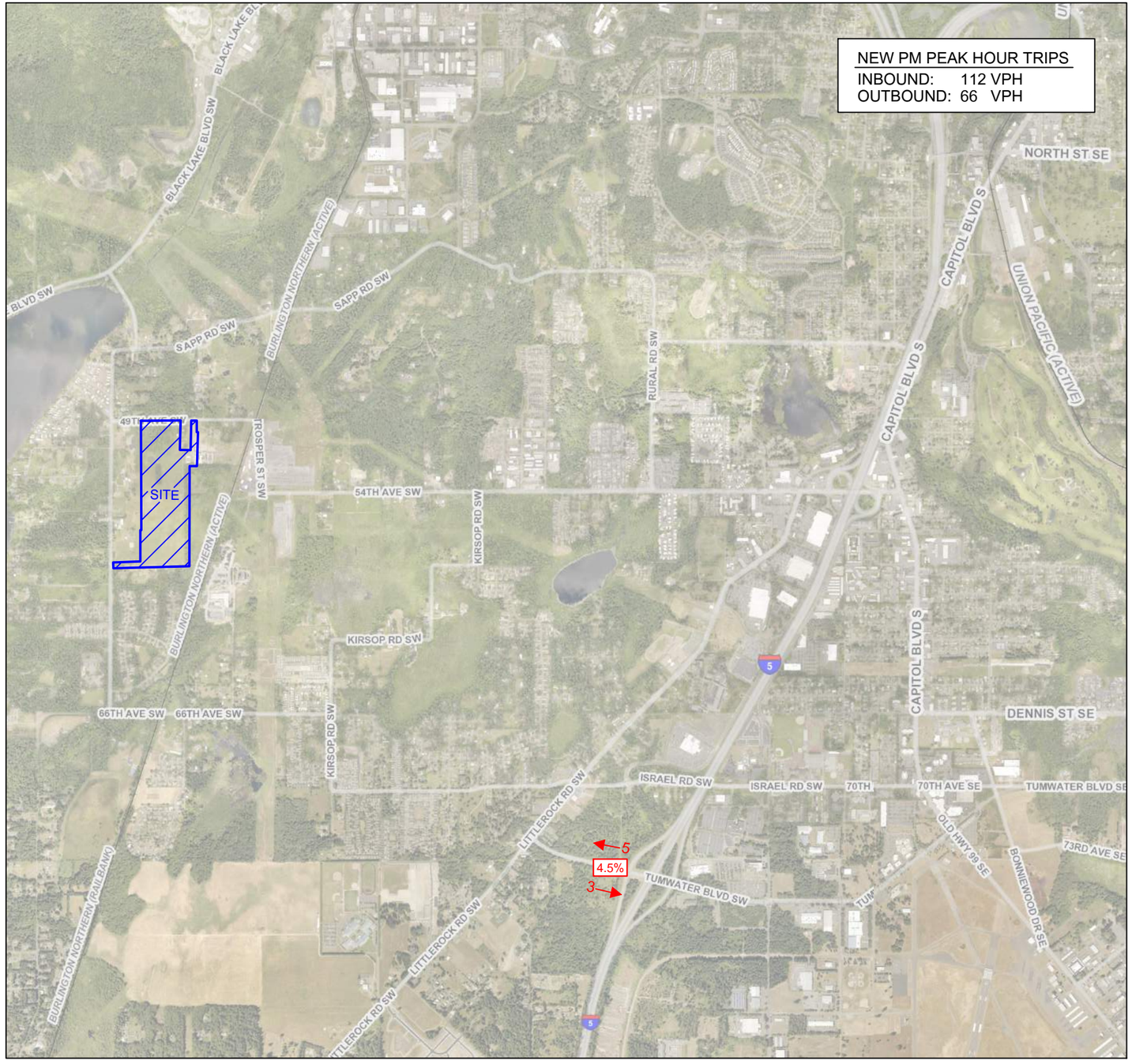
Site Trip Distribution



VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: FIGURE A – I-5/TUMWATER INTERCHANGE
PM PEAK HOUR TRIP GENERATION

N



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VISTA VIEWS AT BLACK LAKE

PM PEAK HOUR TRIPS ENTERING I-5/TUMWATER INTERCHANGE
FIGURE A

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: EXISTING PM PEAK HOUR LEVEL OF SERVICE

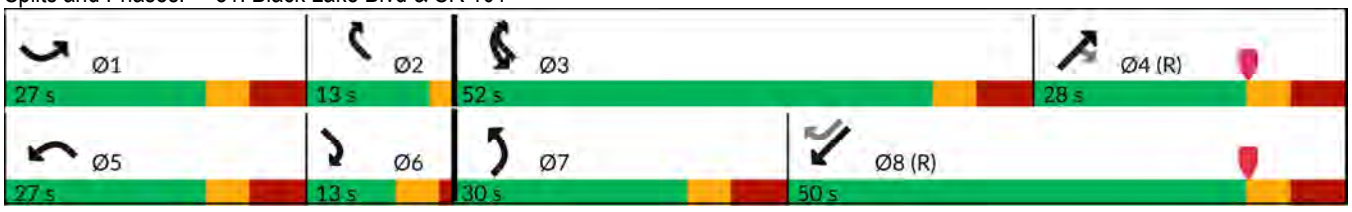
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	159	0	114	271	0	1087	147	330	297	1110	430	251
Future Volume (vph)	159	0	114	271	0	1087	147	330	297	1110	430	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	400		0	100		300	400		300
Storage Lanes	1		1	2		2	1		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300			401			313			264
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			801			605			1075	
Travel Time (s)		13.9			18.2			13.8			24.4	
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
Heavy Vehicles (%)	1%	1%	3%	4%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	167	0	120	285	0	1144	155	347	313	1168	453	264
Shared Lane Traffic (%)												
Lane Group Flow (vph)	167	0	120	285	0	1144	155	347	313	1168	453	264
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			20			20	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Prot	Prot		pt+ov	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1		6	5		2 3	7	4		3	8	
Permitted Phases			6						4			8
Detector Phase	1		6	5		2 3	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0		3.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0		8.0	13.0			24.0	26.0	26.0	13.0	26.0	26.0
Total Split (s)	27.0		13.0	27.0			30.0	28.0	28.0	52.0	50.0	50.0
Total Split (%)	22.5%		10.8%	22.5%			25.0%	23.3%	23.3%	43.3%	41.7%	41.7%
Maximum Green (s)	18.0		8.0	18.0			21.0	19.0	19.0	43.0	41.0	41.0
Yellow Time (s)	4.0		4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	5.0		1.0	5.0			5.0	5.0	5.0	5.0	5.0	5.0
Lost Time Adjust (s)	-5.0		-2.0	-6.0			-6.0	-5.0	-6.0	-6.0	-6.0	-6.0
Total Lost Time (s)	4.0		3.0	3.0			3.0	4.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead		Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5		2.5	2.5			2.5	2.5	2.5	3.0	2.5	2.5
Recall Mode	None		None	None			None	C-Min	C-Min	None	C-Min	C-Min

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	13.0
Total Split (s)	13.0
Total Split (%)	11%
Maximum Green (s)	11.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)							7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)							8.0	10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)							0	0	0		0	0
Act Effct Green (s)	20.4		14.1	21.2		69.2	21.7	22.4	23.4	49.3	50.9	50.9
Actuated g/C Ratio	0.17		0.12	0.18		0.58	0.18	0.19	0.20	0.41	0.42	0.42
v/c Ratio	0.59		0.28	0.51		0.68	0.51	0.56	0.58	0.88	0.32	0.34
Control Delay (s/veh)	54.4		1.6	47.8		13.7	49.4	43.6	8.1	29.5	21.3	1.8
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	54.4		1.6	47.8		13.7	49.4	43.6	8.1	29.5	21.3	1.8
LOS	D		A	D		B	D	D	A	C	C	A
Approach Delay (s/veh)		32.3			20.5			31.1			23.7	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	119		0	103		222	101	125	0	318	110	3
Queue Length 95th (ft)	190		0	144		327	151	160	47	m334	m132	m11
Internal Link Dist (ft)		531			721			525			995	
Turn Bay Length (ft)	400			400			100		300	400		300
Base Capacity (vph)	319		436	628		1684	375	667	558	1329	1416	785
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	0
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	0
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	0
Reduced v/c Ratio	0.52		0.28	0.45		0.68	0.41	0.52	0.56	0.88	0.32	0.34

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 48 (40%), Referenced to phase 4:NET and 8:SWT, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay (s/veh): 24.6		Intersection LOS: C	
Intersection Capacity Utilization 66.0%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 81: Black Lake Blvd & SR 101



Lane Group	Ø2
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay (s/veh)	
Queue Delay	
Total Delay (s/veh)	
LOS	
Approach Delay (s/veh)	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	10.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	158	69	123	273	161	129
Future Vol, veh/h	158	69	123	273	161	129
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	1	3	1	1	2
Mvmt Flow	172	75	134	297	175	140

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	247	0	773	209
Stage 1	-	-	-	-	209	-
Stage 2	-	-	-	-	564	-
Critical Hdwy	-	-	4.13	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.227	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	1313	-	369	831
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	571	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1313	-	331	831
Mov Cap-2 Maneuver	-	-	-	-	331	-
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	2.5	29.34
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	452	-	-	1313	-
HCM Lane V/C Ratio	0.697	-	-	0.102	-
HCM Control Delay (s/veh)	29.3	-	-	8.1	-
HCM Lane LOS	D	-	-	A	-
HCM 95th %tile Q(veh)	5.3	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	21	251	0	0	176	20	0	0	0	46	0	26
Future Vol, veh/h	21	251	0	0	176	20	0	0	0	46	0	26
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	5	1	1	1	3	1	1	1	1	1	1	1
Mvmt Flow	22	259	0	0	181	21	0	0	0	47	0	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	202	0	0	259	0	0	484	504	259	494	494	192
Stage 1	-	-	-	-	-	-	302	302	-	192	192	-
Stage 2	-	-	-	-	-	-	181	202	-	302	302	-
Critical Hdwy	4.15	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.245	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1352	-	-	1312	-	-	495	472	782	487	478	852
Stage 1	-	-	-	-	-	-	709	666	-	812	744	-
Stage 2	-	-	-	-	-	-	823	736	-	709	666	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1352	-	-	1312	-	-	471	463	782	478	469	852
Mov Cap-2 Maneuver	-	-	-	-	-	-	471	463	-	478	469	-
Stage 1	-	-	-	-	-	-	696	654	-	812	744	-
Stage 2	-	-	-	-	-	-	797	736	-	696	654	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.59	0	0	12.28
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	139	-	-	1312	-	-	568
HCM Lane V/C Ratio	-	0.016	-	-	-	-	-	0.131
HCM Control Delay (s/veh)	0	7.7	0	-	0	-	-	12.3
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.4

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	5	11	27	10	108	12	147	21	56	138	8
Future Vol, veh/h	8	5	11	27	10	108	12	147	21	56	138	8
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
Heavy Vehicles, %	1	1	9	4	10	3	1	2	5	4	5	1
Mvmt Flow	8	5	11	28	10	113	13	153	22	58	144	8
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	8	8.6	8.9	9.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	33%	19%	28%
Vol Thru, %	82%	21%	7%	68%
Vol Right, %	12%	46%	74%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	180	24	145	202
LT Vol	12	8	27	56
Through Vol	147	5	10	138
RT Vol	21	11	108	8
Lane Flow Rate	188	25	151	210
Geometry Grp	1	1	1	1
Degree of Util (X)	0.235	0.033	0.189	0.27
Departure Headway (Hd)	4.507	4.815	4.502	4.616
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	795	741	796	776
Service Time	2.543	2.863	2.538	2.651
HCM Lane V/C Ratio	0.236	0.034	0.19	0.271
HCM Control Delay, s/veh	8.9	8	8.6	9.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	0.1	0.7	1.1

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	165	0	0	167
Future Vol, veh/h	0	0	165	0	0	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	1	1	3
Mvmt Flow	0	0	192	0	0	194

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	386	192	0	-	192	0
Stage 1	192	-	-	-	-	-
Stage 2	194	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	619	852	-	0	1388	-
Stage 1	843	-	-	0	-	-
Stage 2	841	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	619	852	-	-	1388	-
Mov Cap-2 Maneuver	619	-	-	-	-	-
Stage 1	843	-	-	-	-	-
Stage 2	841	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1388	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s/veh)	-	0	0	-
HCM Lane LOS	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	87	7	78	145	0	4	0	45	0	1	0
Future Vol, veh/h	0	87	7	78	145	0	4	0	45	0	1	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	14	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	99	8	89	165	0	5	0	51	0	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	165	0	0	107	0	0	445	445	103	441	449	165
Stage 1	-	-	-	-	-	-	103	103	-	342	342	-
Stage 2	-	-	-	-	-	-	343	342	-	99	107	-
Critical Hdwy	4.11	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1420	-	-	1490	-	-	525	509	955	528	507	882
Stage 1	-	-	-	-	-	-	906	812	-	675	640	-
Stage 2	-	-	-	-	-	-	675	640	-	910	809	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1420	-	-	1490	-	-	489	476	955	467	474	882
Mov Cap-2 Maneuver	-	-	-	-	-	-	489	476	-	467	474	-
Stage 1	-	-	-	-	-	-	906	812	-	631	598	-
Stage 2	-	-	-	-	-	-	629	598	-	861	809	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0	2.65	9.34	12.62
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	886	1420	-	-	630	-	-	474
HCM Lane V/C Ratio	0.063	-	-	-	0.059	-	-	0.002
HCM Control Delay (s/veh)	9.3	0	-	-	7.6	0	-	12.6
HCM Lane LOS	A	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	0

Intersection	
Int Delay, s/veh	7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	16	5	174	3	3	3	182	18	2	0	25	28
Future Vol, veh/h	16	5	174	3	3	3	182	18	2	0	25	28
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	6	1	3	67	1	1	1	1	50	1	1	1
Mvmt Flow	16	5	179	3	3	3	188	19	2	0	26	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	436	436	40	423	449	20	55	0	0	21	0	0
Stage 1	40	40	-	395	395	-	-	-	-	-	-	-
Stage 2	395	396	-	28	55	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.51	6.23	7.77	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.009	3.327	4.103	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	524	515	1028	444	506	1061	1557	-	-	1602	-	-
Stage 1	964	863	-	519	606	-	-	-	-	-	-	-
Stage 2	622	606	-	845	851	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	456	452	1028	318	445	1061	1557	-	-	1602	-	-
Mov Cap-2 Maneuver	456	452	-	318	445	-	-	-	-	-	-	-
Stage 1	964	863	-	455	533	-	-	-	-	-	-	-
Stage 2	541	532	-	694	851	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	10.11	12.75	6.87	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1539	-	-	905	474	1602	-	-
HCM Lane V/C Ratio	0.121	-	-	0.222	0.02	-	-	-
HCM Control Delay (s/veh)	7.6	0	-	10.1	12.8	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.8	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	29	0	443	533	12
Future Vol, veh/h	0	29	0	443	533	12
Conflicting Peds, #/hr	0	0	0	0	0	0
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	87	87	87	87	87	87
Heavy Vehicles, %	1	1	1	1	2	8
Mvmt Flow	0	33	0	509	613	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	620	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.21	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.309	-	-	-	-
Pot Cap-1 Maneuver	0	490	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	490	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s/v	12.88	0	0
HCM LOS	B		

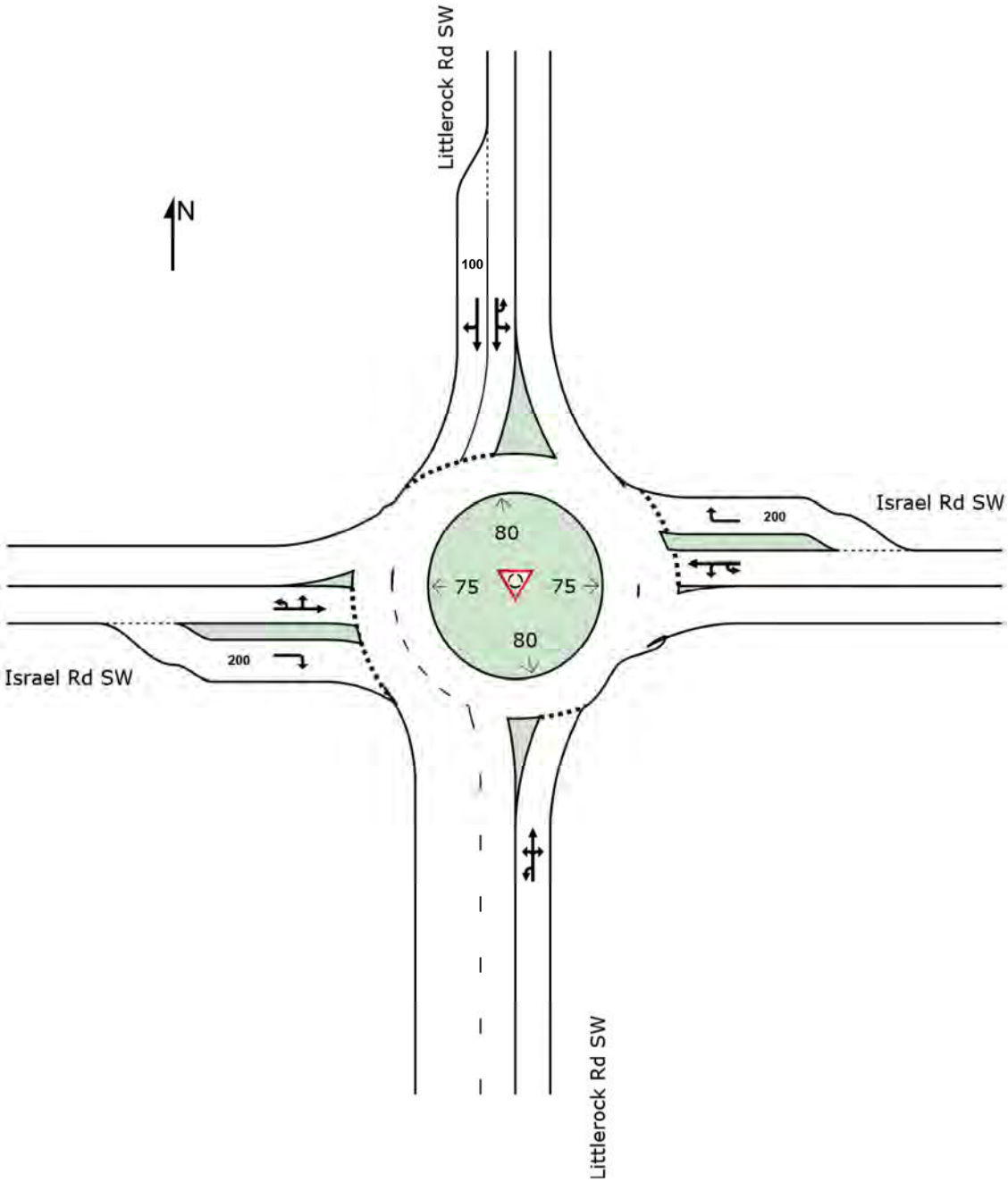
Minor Lane/Major Mvmt	NET	EBLn1	SWT	SWR
Capacity (veh/h)	-	490	-	-
HCM Lane V/C Ratio	-	0.068	-	-
HCM Control Delay (s/veh)	-	12.9	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.2	-	-

SITE LAYOUT

Site: [Existing PM Peak Hour Volumes (Site Folder: 1)]

Israel Rd SW & Littlerock Rd SW
Site Category: NA
Roundabout

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



MOVEMENT SUMMARY

Site: [Existing PM Peak Hour Volumes (Site Folder: 1)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Israel Rd SW & Littlerock Rd SW
Site Category: NA
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: Littlerock Rd SW															
3u	U	All MCs	1	1.0	1	1.0	0.453	12.0	LOS B	2.9	73.6	0.53	0.61	0.53	19.7
3	L2	All MCs	176	4.0	176	4.0	0.453	10.1	LOS B	2.9	73.6	0.53	0.61	0.53	19.7
8	T1	All MCs	276	1.0	276	1.0	0.453	7.6	LOS A	2.9	73.6	0.53	0.61	0.53	19.7
18	R2	All MCs	54	1.0	54	1.0	0.453	5.8	LOS A	2.9	73.6	0.53	0.61	0.53	19.7
Approach			506	2.0	506	2.0	0.453	8.3	LOS A	2.9	73.6	0.53	0.61	0.53	19.7
East: Israel Rd SW															
1u	U	All MCs	1	1.0	1	1.0	0.244	14.0	LOS B	1.2	30.2	0.57	0.67	0.57	33.1
1	L2	All MCs	84	1.0	84	1.0	0.244	11.8	LOS B	1.2	30.2	0.57	0.67	0.57	33.1
6	T1	All MCs	130	1.0	130	1.0	0.244	6.4	LOS A	1.2	30.2	0.57	0.67	0.57	33.8
16	R2	All MCs	76	4.0	76	4.0	0.127	7.7	LOS A	0.5	13.3	0.54	0.68	0.54	34.0
Approach			290	1.8	290	1.8	0.244	8.3	LOS A	1.2	30.2	0.56	0.67	0.56	33.7
North: Littlerock Rd SW															
7u	U	All MCs	24	4.0	24	4.0	0.268	14.2	LOS B	1.7	42.3	0.60	0.63	0.60	32.8
7	L2	All MCs	70	3.0	70	3.0	0.268	11.8	LOS B	1.7	42.3	0.60	0.63	0.60	32.8
4	T1	All MCs	396	1.0	396	1.0	0.268	6.6	LOS A	1.8	44.4	0.58	0.59	0.58	34.0
14	R2	All MCs	110	2.0	110	2.0	0.268	6.2	LOS A	1.8	44.4	0.58	0.57	0.58	34.1
Approach			601	1.5	601	1.5	0.268	7.4	LOS A	1.8	44.4	0.58	0.59	0.58	33.8
West: Israel Rd SW															
5u	U	All MCs	2	1.0	2	1.0	0.169	12.8	LOS B	0.6	14.5	0.42	0.65	0.42	33.3
5	L2	All MCs	77	1.0	77	1.0	0.169	10.6	LOS B	0.6	14.5	0.42	0.65	0.42	33.3
2	T1	All MCs	87	5.0	87	5.0	0.169	5.8	LOS A	0.6	14.5	0.42	0.65	0.42	33.8
12	R2	All MCs	141	9.0	141	9.0	0.165	6.5	LOS A	0.5	14.2	0.43	0.66	0.43	34.0
Approach			306	5.8	306	5.8	0.169	7.4	LOS A	0.6	14.5	0.42	0.65	0.42	33.8
All Vehicles			1703	2.5	1703	2.5	0.453	7.8	LOS A	2.9	73.6	0.53	0.62	0.53	27.8

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.

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: FORECAST 2031 PEAK HOUR LEVEL OF SERVICE WITHOUT PROJECT

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	183	0	133	311	0	1252	170	381	341	1280	498	288
Future Volume (vph)	183	0	133	311	0	1252	170	381	341	1280	498	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	400		0	100		300	400		300
Storage Lanes	1		1	2		2	1		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300			348			341			288
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			801			605			1075	
Travel Time (s)		13.9			18.2			13.8			24.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	3%	4%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	183	0	133	311	0	1252	170	381	341	1280	498	288
Shared Lane Traffic (%)												
Lane Group Flow (vph)	183	0	133	311	0	1252	170	381	341	1280	498	288
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			20			20	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Prot	Prot		pt+ov	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1		6	5		2 3	7	4		3	8	
Permitted Phases			6						4			8
Detector Phase	1		6	5		2 3	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0		3.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0		8.0	13.0			24.0	26.0	26.0	13.0	26.0	26.0
Total Split (s)	27.0		13.0	27.0			30.0	28.0	28.0	52.0	50.0	50.0
Total Split (%)	22.5%		10.8%	22.5%			25.0%	23.3%	23.3%	43.3%	41.7%	41.7%
Maximum Green (s)	18.0		8.0	18.0			21.0	19.0	19.0	43.0	41.0	41.0
Yellow Time (s)	4.0		4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	5.0		1.0	5.0			5.0	5.0	5.0	5.0	5.0	5.0
Lost Time Adjust (s)	-5.0		-2.0	-6.0			-6.0	-5.0	-6.0	-6.0	-6.0	-6.0
Total Lost Time (s)	4.0		3.0	3.0			3.0	4.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead		Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5		2.5	2.5			2.5	2.5	2.5	3.0	2.5	2.5
Recall Mode	None		None	None			None	C-Min	C-Min	None	C-Min	C-Min

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	13.0
Total Split (s)	13.0
Total Split (%)	11%
Maximum Green (s)	11.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)							7.0	7.0	7.0		7.0	7.0
Flash Don't Walk (s)							8.0	10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)							0	0	0		0	0
Act Effct Green (s)	21.0		13.9	21.9		68.7	22.5	22.3	23.3	49.0	49.8	49.8
Actuated g/C Ratio	0.18		0.12	0.18		0.57	0.19	0.19	0.19	0.41	0.42	0.42
v/c Ratio	0.63		0.31	0.54		0.76	0.54	0.62	0.60	0.97	0.36	0.37
Control Delay (s/veh)	55.6		1.8	48.0		17.7	49.8	45.0	8.4	40.8	22.7	2.0
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	55.6		1.8	48.0		17.7	49.8	45.0	8.4	40.8	22.7	2.0
LOS	E		A	D		B	D	D	A	D	C	A
Approach Delay (s/veh)		33.0			23.7			31.9			31.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	130		0	112		313	110	136	0	414	127	4
Queue Length 95th (ft)	208		0	157		428	166	181	49	m444	m152	m12
Internal Link Dist (ft)		531			721			525			995	
Turn Bay Length (ft)	400			400			100		300	400		300
Base Capacity (vph)	319		434	628		1652	375	667	580	1321	1383	787
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	0
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	0
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	0
Reduced v/c Ratio	0.57		0.31	0.50		0.76	0.45	0.57	0.59	0.97	0.36	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 48 (40%), Referenced to phase 4:NET and 8:SWT, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay (s/veh): 29.0		Intersection LOS: C	
Intersection Capacity Utilization 74.5%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Black Lake Blvd & SR 101

Lane Group	Ø2
Walk Time (s)	
Flash Don't Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay (s/veh)	
Queue Delay	
Total Delay (s/veh)	
LOS	
Approach Delay (s/veh)	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	22.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	181	82	147	314	186	152
Future Vol, veh/h	181	82	147	314	186	152
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	1	3	1	1	2
Mvmt Flow	197	89	160	341	202	165

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	286	0	902	241
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	661	-
Critical Hdwy	-	-	4.13	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.227	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	1271	-	309	798
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	515	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1271	-	270	798
Mov Cap-2 Maneuver	-	-	-	-	270	-
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	451	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	2.63	68.34
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	385	-	-	1271	-
HCM Lane V/C Ratio	0.955	-	-	0.126	-
HCM Control Delay (s/veh)	68.3	-	-	8.2	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	10.7	-	-	0.4	-

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	27	293	0	0	211	23	0	0	0	53	0	34
Future Vol, veh/h	27	293	0	0	211	23	0	0	0	53	0	34
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	5	1	1	1	3	1	1	1	1	1	1	1
Mvmt Flow	28	302	0	0	218	24	0	0	0	55	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	241	0	0	302	0	0	575	599	302	587	587	229
Stage 1	-	-	-	-	-	-	358	358	-	229	229	-
Stage 2	-	-	-	-	-	-	218	241	-	358	358	-
Critical Hdwy	4.15	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.245	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1308	-	-	1265	-	-	430	417	740	423	423	812
Stage 1	-	-	-	-	-	-	662	630	-	776	716	-
Stage 2	-	-	-	-	-	-	787	708	-	662	630	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1308	-	-	1265	-	-	401	406	740	412	412	812
Mov Cap-2 Maneuver	-	-	-	-	-	-	401	406	-	412	412	-
Stage 1	-	-	-	-	-	-	645	614	-	776	716	-
Stage 2	-	-	-	-	-	-	753	708	-	645	614	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.66	0	0	13.56
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	152	-	-	1265	-	-	510
HCM Lane V/C Ratio	-	0.021	-	-	-	-	-	0.176
HCM Control Delay (s/veh)	0	7.8	0	-	0	-	-	13.6
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	0.6

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	7	13	31	11	132	14	169	24	77	159	9
Future Vol, veh/h	9	7	13	31	11	132	14	169	24	77	159	9
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
Heavy Vehicles, %	1	1	9	4	10	3	1	2	5	4	5	1
Mvmt Flow	9	7	14	32	11	138	15	176	25	80	166	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	8.4	9.2	9.6	10.3
HCM LOS	A	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	31%	18%	31%
Vol Thru, %	82%	24%	6%	65%
Vol Right, %	12%	45%	76%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	207	29	174	245
LT Vol	14	9	31	77
Through Vol	169	7	11	159
RT Vol	24	13	132	9
Lane Flow Rate	216	30	181	255
Geometry Grp	1	1	1	1
Degree of Util (X)	0.28	0.042	0.236	0.338
Departure Headway (Hd)	4.67	5.061	4.686	4.765
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	765	701	761	750
Service Time	2.724	3.135	2.741	2.817
HCM Lane V/C Ratio	0.282	0.043	0.238	0.34
HCM Control Delay, s/veh	9.6	8.4	9.2	10.3
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	1.1	0.1	0.9	1.5

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	101	23	106	167	0	13	0	63	0	1	0
Future Vol, veh/h	0	101	23	106	167	0	13	0	63	0	1	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	14	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	115	26	120	190	0	15	0	72	0	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	141	0	0	559	559	128	545	572	190
Stage 1	-	-	-	-	-	-	128	128	-	431	431	-
Stage 2	-	-	-	-	-	-	431	431	-	115	141	-
Critical Hdwy	4.11	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1390	-	-	1448	-	-	441	439	925	450	432	855
Stage 1	-	-	-	-	-	-	878	792	-	605	585	-
Stage 2	-	-	-	-	-	-	604	585	-	892	782	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1390	-	-	1448	-	-	399	398	925	377	392	855
Mov Cap-2 Maneuver	-	-	-	-	-	-	399	398	-	377	392	-
Stage 1	-	-	-	-	-	-	878	792	-	549	530	-
Stage 2	-	-	-	-	-	-	547	530	-	823	782	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0	2.99	10.38	14.22
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	755	1390	-	-	699	-	-	392
HCM Lane V/C Ratio	0.114	-	-	-	0.083	-	-	0.003
HCM Control Delay (s/veh)	10.4	0	-	-	7.7	0	-	14.2
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.3	-	-	0

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	6	210	3	3	3	218	29	2	0	33	33
Future Vol, veh/h	18	6	210	3	3	3	218	29	2	0	33	33
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	6	1	3	67	1	1	1	1	50	1	1	1
Mvmt Flow	19	6	216	3	3	3	225	30	2	0	34	34

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	532	532	51	518	548	31	68	0	0	32	0	0
Stage 1	51	51	-	480	480	-	-	-	-	-	-	-
Stage 2	481	481	-	37	68	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.51	6.23	7.77	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.009	3.327	4.103	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	452	454	1014	380	445	1046	1540	-	-	1587	-	-
Stage 1	952	854	-	462	556	-	-	-	-	-	-	-
Stage 2	559	555	-	836	840	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	381	387	1014	251	379	1046	1540	-	-	1587	-	-
Mov Cap-2 Maneuver	381	387	-	251	379	-	-	-	-	-	-	-
Stage 1	952	854	-	393	473	-	-	-	-	-	-	-
Stage 2	471	473	-	653	840	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	10.74	14.31	6.77	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1512	-	-	867	396	1587	-	-
HCM Lane V/C Ratio	0.146	-	-	0.278	0.023	-	-	-
HCM Control Delay (s/veh)	7.7	0	-	10.7	14.3	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	1.1	0.1	0	-	-

MOVEMENT SUMMARY

Site: [Forecast 2031 PM Without Project (Site Folder: 1)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Israel Rd SW & Littlerock Rd SW
Site Category: NA
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: Littlerock Rd SW															
3u	U	All MCs	1	1.0	1	1.0	0.844	21.4	LOS C	13.5	343.5	0.99	1.05	1.52	18.3
3	L2	All MCs	247	4.0	247	4.0	0.844	19.7	LOS B	13.5	343.5	0.99	1.05	1.52	18.3
8	T1	All MCs	444	1.0	444	1.0	0.844	17.0	LOS B	13.5	343.5	0.99	1.05	1.52	18.3
18	R2	All MCs	95	1.0	95	1.0	0.844	15.2	LOS B	13.5	343.5	0.99	1.05	1.52	18.3
Approach			787	1.9	787	1.9	0.844	17.7	LOS B	13.5	343.5	0.99	1.05	1.52	18.3
East: Israel Rd SW															
1u	U	All MCs	1	1.0	1	1.0	0.589	19.8	LOS B	5.0	125.5	0.92	0.91	1.15	30.8
1	L2	All MCs	144	1.0	144	1.0	0.589	17.5	LOS B	5.0	125.5	0.92	0.91	1.15	30.8
6	T1	All MCs	200	1.0	200	1.0	0.589	12.1	LOS B	5.0	125.5	0.92	0.91	1.15	31.4
16	R2	All MCs	159	4.0	159	4.0	0.367	10.9	LOS B	2.1	54.3	0.81	0.83	0.86	32.4
Approach			504	1.9	504	1.9	0.589	13.3	LOS B	5.0	125.5	0.89	0.88	1.06	31.5
North: Littlerock Rd SW															
7u	U	All MCs	30	4.0	30	4.0	0.549	18.3	LOS B	5.0	126.0	0.87	0.81	1.02	31.0
7	L2	All MCs	200	3.0	200	3.0	0.549	15.9	LOS B	5.0	126.0	0.87	0.81	1.02	31.0
4	T1	All MCs	608	1.0	608	1.0	0.549	9.8	LOS A	5.3	133.7	0.87	0.77	0.99	32.8
14	R2	All MCs	152	2.0	152	2.0	0.549	9.2	LOS A	5.3	133.7	0.87	0.75	0.97	33.1
Approach			990	1.6	990	1.6	0.549	11.2	LOS B	5.3	133.7	0.87	0.78	0.99	32.4
West: Israel Rd SW															
5u	U	All MCs	2	1.0	2	1.0	0.344	14.1	LOS B	1.6	39.8	0.67	0.76	0.69	32.7
5	L2	All MCs	109	1.0	109	1.0	0.344	11.9	LOS B	1.6	39.8	0.67	0.76	0.69	32.7
2	T1	All MCs	137	5.0	137	5.0	0.344	7.2	LOS A	1.6	39.8	0.67	0.76	0.69	33.1
12	R2	All MCs	197	9.0	197	9.0	0.335	8.3	LOS A	1.4	37.5	0.66	0.82	0.70	33.3
Approach			445	5.8	445	5.8	0.344	8.9	LOS A	1.6	39.8	0.67	0.79	0.69	33.1
All Vehicles			2726	2.5	2726	2.5	0.844	13.1	LOS B	13.5	343.5	0.87	0.88	1.11	26.4

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.

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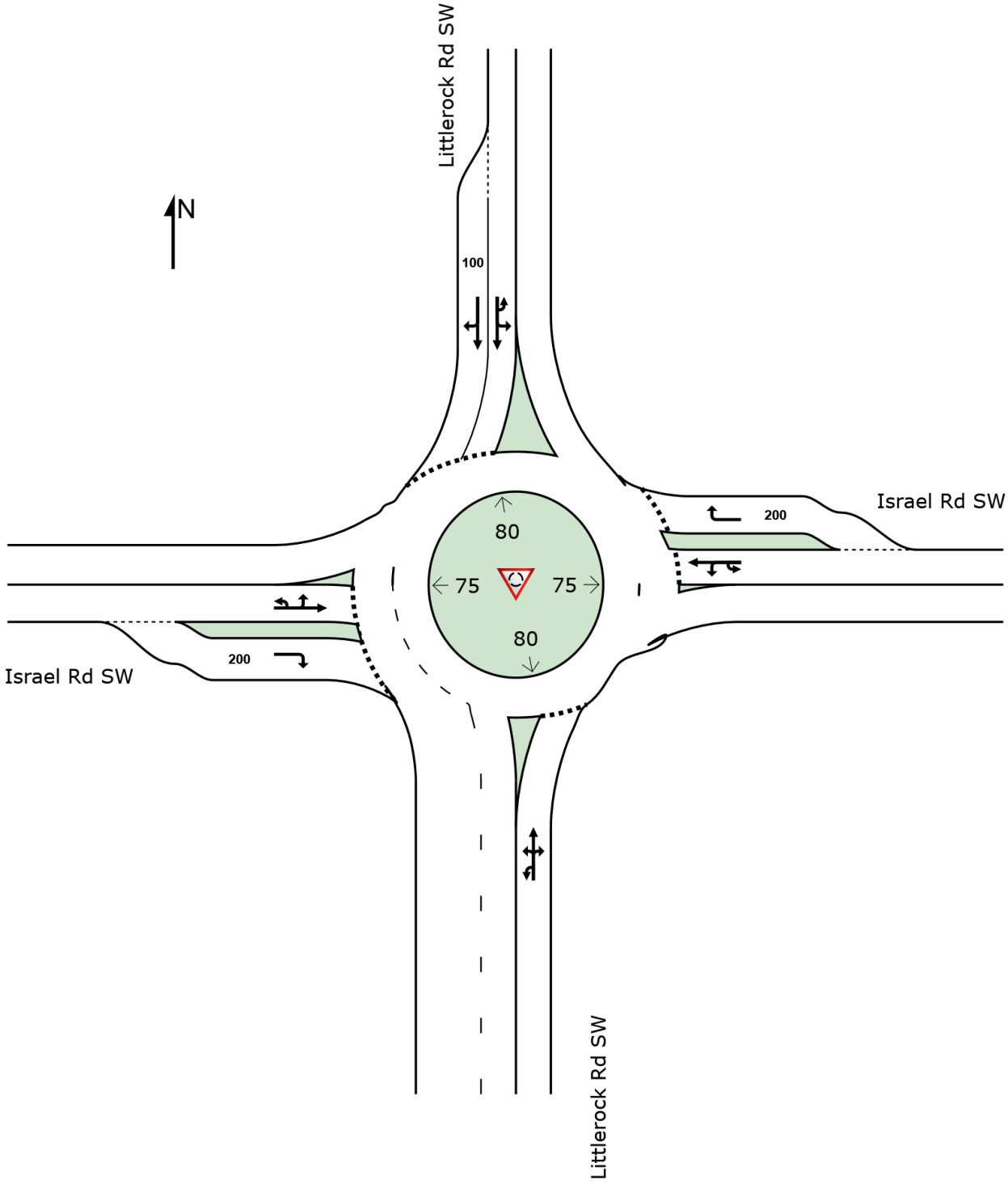
SITE LAYOUT

Site: [Forecast 2031 PM Without Project (Site Folder: 1)]

Israel Rd SW & Littlerock Rd SW
Site Category: NA
Roundabout

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



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Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	52	0	728	853	25
Future Vol, veh/h	0	52	0	728	853	25
Conflicting Peds, #/hr	0	0	0	0	0	0
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	87	87	87	87	87	87
Heavy Vehicles, %	1	1	1	1	2	8
Mvmt Flow	0	60	0	837	980	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	995	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.21	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.309	-	-	-	-
Pot Cap-1 Maneuver	0	298	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	298	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s/v	20.06	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NET	EBLn1	SWT	SWR
Capacity (veh/h)	-	298	-	-
HCM Lane V/C Ratio	-	0.2	-	-
HCM Control Delay (s/veh)	-	20.1	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.7	-	-

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: FORECAST 2031 PEAK HOUR LEVEL OF SERVICE WITH PROJECT

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	183	0	139	314	0	1252	174	400	352	1280	526	288
Future Volume (vph)	183	0	139	314	0	1252	174	400	352	1280	526	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	400		0	100		300	400		300
Storage Lanes	1		1	2		2	1		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1668	0	1463	3143	0	2627	1668	3336	1492	3236	3336	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300			339			352			288
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			801			605			1075	
Travel Time (s)		13.9			18.2			13.8			24.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	3%	4%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	183	0	139	314	0	1252	174	400	352	1280	526	288
Shared Lane Traffic (%)												
Lane Group Flow (vph)	183	0	139	314	0	1252	174	400	352	1280	526	288
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			20			20	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Prot	Prot		pt+ov	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1		6	5		2 3	7	4		3	8	
Permitted Phases			6						4			8
Detector Phase	1		6	5		2 3	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0		3.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0		8.0	13.0			24.0	26.0	26.0	13.0	26.0	26.0
Total Split (s)	27.0		13.0	27.0			30.0	28.0	28.0	52.0	50.0	50.0
Total Split (%)	22.5%		10.8%	22.5%			25.0%	23.3%	23.3%	43.3%	41.7%	41.7%
Maximum Green (s)	18.0		8.0	18.0			21.0	19.0	19.0	43.0	41.0	41.0
Yellow Time (s)	4.0		4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	5.0		1.0	5.0			5.0	5.0	5.0	5.0	5.0	5.0
Lost Time Adjust (s)	-5.0		-2.0	-6.0			-6.0	-5.0	-6.0	-6.0	-6.0	-6.0
Total Lost Time (s)	4.0		3.0	3.0			3.0	4.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead		Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5		2.5	2.5			2.5	2.5	2.5	3.0	2.5	2.5
Recall Mode	None		None	None			None	C-Min	C-Min	None	C-Min	C-Min

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	13.0
Total Split (s)	13.0
Total Split (%)	11%
Maximum Green (s)	11.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)							7.0	7.0	7.0		7.0	7.0
Flash Don't Walk (s)							8.0	10.0	10.0		10.0	10.0
Pedestrian Calls (#/hr)							0	0	0		0	0
Act Effct Green (s)	21.0		13.5	21.9		68.3	22.7	22.6	23.6	49.0	49.9	49.9
Actuated g/C Ratio	0.18		0.11	0.18		0.57	0.19	0.19	0.20	0.41	0.42	0.42
v/c Ratio	0.63		0.32	0.55		0.76	0.55	0.64	0.61	0.97	0.38	0.37
Control Delay (s/veh)	55.6		2.0	48.1		18.1	50.0	45.5	8.3	41.2	22.9	2.1
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	55.6		2.0	48.1		18.1	50.0	45.5	8.3	41.2	22.9	2.1
LOS	E		A	D		B	D	D	A	D	C	A
Approach Delay (s/veh)		32.4			24.1			32.2			31.2	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	130		0	113		321	112	143	0	415	136	5
Queue Length 95th (ft)	208		0	159		433	171	190	49	m447	m164	m12
Internal Link Dist (ft)		531			721			525			995	
Turn Bay Length (ft)	400			400			100		300	400		300
Base Capacity (vph)	319		430	628		1642	375	667	589	1321	1387	788
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	0
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	0
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	0
Reduced v/c Ratio	0.57		0.32	0.50		0.76	0.46	0.60	0.60	0.97	0.38	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 48 (40%), Referenced to phase 4:NET and 8:SWT, Start of Yellow			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay (s/veh): 29.2		Intersection LOS: C	
Intersection Capacity Utilization 75.0%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Black Lake Blvd & SR 101

Lane Group	Ø2
Walk Time (s)	
Flash Don't Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay (s/veh)	
Queue Delay	
Total Delay (s/veh)	
LOS	
Approach Delay (s/veh)	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection	
Int Delay, s/veh	8.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	181	84	185	314	188	188
Future Vol, veh/h	181	84	185	314	188	188
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	100
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	1	3	1	1	2
Mvmt Flow	197	91	201	341	204	204

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	288	0	986	242
Stage 1	-	-	-	-	242	-
Stage 2	-	-	-	-	743	-
Critical Hdwy	-	-	4.13	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.227	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	1268	-	276	796
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	472	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	232	796
Mov Cap-2 Maneuver	-	-	-	-	329	-
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	397	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	3.1	21.73
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	329	796	-	-	1268	-
HCM Lane V/C Ratio	0.622	0.257	-	-	0.159	-
HCM Control Delay (s/veh)	32.4	11.1	-	-	8.4	-
HCM Lane LOS	D	B	-	-	A	-
HCM 95th %tile Q(veh)	3.9	1	-	-	0.6	-

Intersection	
Int Delay, s/veh	42.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	181	84	185	314	188	188
Future Vol, veh/h	181	84	185	314	188	188
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	1	3	1	1	2
Mvmt Flow	197	91	201	341	204	204

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	288	0	986	242
Stage 1	-	-	-	-	242	-
Stage 2	-	-	-	-	743	-
Critical Hdwy	-	-	4.13	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.227	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	1268	-	276	796
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	472	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1268	-	232	796
Mov Cap-2 Maneuver	-	-	-	-	232	-
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	397	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	3.1	123.63
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	360	-	-	1268	-
HCM Lane V/C Ratio	1.137	-	-	0.159	-
HCM Control Delay (s/veh)	123.6	-	-	8.4	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	15.8	-	-	0.6	-

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	30	331	0	0	251	23	0	0	0	53	0	40
Future Vol, veh/h	30	331	0	0	251	23	0	0	0	53	0	40
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	5	1	1	1	3	1	1	1	1	1	1	1
Mvmt Flow	31	341	0	0	259	24	0	0	0	55	0	41

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	282	0	0	341	0	0	662	686	341	674	674	271
Stage 1	-	-	-	-	-	-	403	403	-	271	271	-
Stage 2	-	-	-	-	-	-	259	282	-	403	403	-
Critical Hdwy	4.15	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.245	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1263	-	-	1223	-	-	377	372	704	370	378	770
Stage 1	-	-	-	-	-	-	626	601	-	737	687	-
Stage 2	-	-	-	-	-	-	748	679	-	626	601	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1263	-	-	1223	-	-	346	360	704	359	366	770
Mov Cap-2 Maneuver	-	-	-	-	-	-	346	360	-	359	366	-
Stage 1	-	-	-	-	-	-	607	583	-	737	687	-
Stage 2	-	-	-	-	-	-	708	679	-	607	583	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.66	0	0	14.72
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	150	-	-	1223	-	-	466
HCM Lane V/C Ratio	-	0.024	-	-	-	-	-	0.206
HCM Control Delay (s/veh)	0	7.9	0	-	0	-	-	14.7
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	0.8

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	7	13	31	11	153	14	189	24	100	183	9
Future Vol, veh/h	9	7	13	31	11	153	14	189	24	100	183	9
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
Heavy Vehicles, %	1	1	9	4	10	3	1	2	5	4	5	1
Mvmt Flow	9	7	14	32	11	159	15	197	25	104	191	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	8.6	9.8	10.1	11.4
HCM LOS	A	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	31%	16%	34%
Vol Thru, %	83%	24%	6%	63%
Vol Right, %	11%	45%	78%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	227	29	195	292
LT Vol	14	9	31	100
Through Vol	189	7	11	183
RT Vol	24	13	153	9
Lane Flow Rate	236	30	203	304
Geometry Grp	1	1	1	1
Degree of Util (X)	0.316	0.045	0.273	0.411
Departure Headway (Hd)	4.807	5.39	4.841	4.87
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	740	668	735	733
Service Time	2.884	3.39	2.917	2.945
HCM Lane V/C Ratio	0.319	0.045	0.276	0.415
HCM Control Delay, s/veh	10.1	8.6	9.8	11.4
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	1.4	0.1	1.1	2

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	20	190	22	24	192
Future Vol, veh/h	13	20	190	22	24	192
Conflicting Peds, #/hr	0	0	0	0	0	0
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	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	1	1	3
Mvmt Flow	15	23	221	26	28	223

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	513	234	0	0	247	0
Stage 1	234	-	-	-	-	-
Stage 2	279	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	523	808	-	-	1325	-
Stage 1	807	-	-	-	-	-
Stage 2	770	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	511	808	-	-	1325	-
Mov Cap-2 Maneuver	511	-	-	-	-	-
Stage 1	807	-	-	-	-	-
Stage 2	752	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	10.82	0	0.86
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	657	200	-
HCM Lane V/C Ratio	-	-	0.058	0.021	-
HCM Control Delay (s/veh)	-	-	10.8	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	112	23	106	210	0	13	0	63	0	1	0
Future Vol, veh/h	0	112	23	106	210	0	13	0	63	0	1	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	14	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	127	26	120	239	0	15	0	72	0	1	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	239	0	0	153	0	0	620	620	140	607	633	239
Stage 1	-	-	-	-	-	-	140	140	-	480	480	-
Stage 2	-	-	-	-	-	-	480	480	-	127	153	-
Critical Hdwy	4.11	-	-	4.11	-	-	7.11	6.51	6.21	7.11	6.51	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.11	5.51	-
Follow-up Hdwy	2.209	-	-	2.209	-	-	3.509	4.009	3.309	3.509	4.009	3.309
Pot Cap-1 Maneuver	1334	-	-	1433	-	-	401	405	910	410	398	803
Stage 1	-	-	-	-	-	-	865	782	-	569	556	-
Stage 2	-	-	-	-	-	-	569	556	-	879	772	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1334	-	-	1433	-	-	362	366	910	341	360	803
Mov Cap-2 Maneuver	-	-	-	-	-	-	362	366	-	341	360	-
Stage 1	-	-	-	-	-	-	865	782	-	514	502	-
Stage 2	-	-	-	-	-	-	512	502	-	810	772	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0	2.6	10.66	15.04
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	723	1334	-	-	604	-	-	360
HCM Lane V/C Ratio	0.12	-	-	-	0.084	-	-	0.003
HCM Control Delay (s/veh)	10.7	0	-	-	7.7	0	-	15
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.3	-	-	0

Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	6	221	3	3	3	235	29	2	0	33	33
Future Vol, veh/h	18	6	221	3	3	3	235	29	2	0	33	33
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	6	1	3	67	1	1	1	1	50	1	1	1
Mvmt Flow	19	6	228	3	3	3	242	30	2	0	34	34

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	567	568	51	553	584	31	68	0	0	32	0	0
Stage 1	51	51	-	515	515	-	-	-	-	-	-	-
Stage 2	516	516	-	37	68	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.51	6.23	7.77	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.51	-	6.77	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4.009	3.327	4.103	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	428	434	1014	359	425	1046	1540	-	-	1587	-	-
Stage 1	952	854	-	440	536	-	-	-	-	-	-	-
Stage 2	535	536	-	836	840	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	356	365	1014	230	357	1046	1540	-	-	1587	-	-
Mov Cap-2 Maneuver	356	365	-	230	357	-	-	-	-	-	-	-
Stage 1	952	854	-	370	450	-	-	-	-	-	-	-
Stage 2	445	450	-	643	840	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	10.92	14.97	6.87	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1512	-	-	860	370	1587	-	-
HCM Lane V/C Ratio	0.157	-	-	0.294	0.025	-	-	-
HCM Control Delay (s/veh)	7.8	0	-	10.9	15	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.6	-	-	1.2	0.1	0	-	-

MOVEMENT SUMMARY

Site: [Forecast 2031 PM With Project (Site Folder: 1)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Israel Rd SW & Littlerock Rd SW
Site Category: NA
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: Littlerock Rd SW															
3u	U	All MCs	1	1.0	1	1.0	0.857	22.3	LOS D	14.3	363.8	1.00	1.08	1.58	18.2
3	L2	All MCs	254	4.0	254	4.0	0.857	20.6	LOS D	14.3	363.8	1.00	1.08	1.58	18.2
8	T1	All MCs	444	1.0	444	1.0	0.857	17.9	LOS D	14.3	363.8	1.00	1.08	1.58	18.2
18	R2	All MCs	95	1.0	95	1.0	0.857	16.1	LOS D	14.3	363.8	1.00	1.08	1.58	18.2
Approach			794	2.0	794	2.0	0.857	18.5	LOS B	14.3	363.8	1.00	1.08	1.58	18.2
East: Israel Rd SW															
1u	U	All MCs	1	1.0	1	1.0	0.614	20.4	LOS C	5.4	135.3	0.94	0.92	1.20	30.5
1	L2	All MCs	144	1.0	144	1.0	0.614	18.2	LOS B	5.4	135.3	0.94	0.92	1.20	30.5
6	T1	All MCs	209	1.0	209	1.0	0.614	12.8	LOS B	5.4	135.3	0.94	0.92	1.20	31.1
16	R2	All MCs	159	4.0	159	4.0	0.377	11.2	LOS B	2.2	56.3	0.82	0.84	0.88	32.2
Approach			513	1.9	513	1.9	0.614	13.8	LOS B	5.4	135.3	0.90	0.90	1.10	31.3
North: Littlerock Rd SW															
7u	U	All MCs	30	4.0	30	4.0	0.559	18.7	LOS B	5.2	131.1	0.88	0.83	1.06	30.8
7	L2	All MCs	200	3.0	200	3.0	0.559	16.3	LOS B	5.2	131.1	0.88	0.83	1.06	30.8
4	T1	All MCs	608	1.0	608	1.0	0.559	10.2	LOS B	5.5	140.0	0.88	0.78	1.02	32.7
14	R2	All MCs	153	2.0	153	2.0	0.559	9.5	LOS A	5.5	140.0	0.88	0.76	1.00	33.0
Approach			991	1.6	991	1.6	0.559	11.6	LOS B	5.5	140.0	0.88	0.79	1.03	32.3
West: Israel Rd SW															
5u	U	All MCs	2	1.0	2	1.0	0.355	14.2	LOS B	1.6	41.8	0.67	0.77	0.70	32.7
5	L2	All MCs	110	1.0	110	1.0	0.355	11.9	LOS B	1.6	41.8	0.67	0.77	0.70	32.7
2	T1	All MCs	143	5.0	143	5.0	0.355	7.3	LOS A	1.6	41.8	0.67	0.77	0.70	33.1
12	R2	All MCs	201	9.0	201	9.0	0.344	8.4	LOS A	1.5	38.9	0.67	0.82	0.71	33.2
Approach			456	5.8	456	5.8	0.355	8.9	LOS A	1.6	41.8	0.67	0.79	0.70	33.1
All Vehicles			2754	2.5	2754	2.5	0.857	13.6	LOS B	14.3	363.8	0.89	0.90	1.15	26.3

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.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2024 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: HEATH & ASSOCIATES | Licence: PLUS / 1PC | Processed: Wednesday, November 20, 2024 9:41:13 AM
Project: C:\Users\LucasMaulin\Heath and Associates\Office Access - Documents\Project Files\Vista Views at Black Lake Tumwater - 5138\5-Analysis\SIDRA Analysis.sip9

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	52	0	729	854	25
Future Vol, veh/h	0	52	0	729	854	25
Conflicting Peds, #/hr	0	0	0	0	0	0
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	87	87	87	87	87	87
Heavy Vehicles, %	1	1	1	1	2	8
Mvmt Flow	0	60	0	838	982	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	996	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.21	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.309	-	-	-	-
Pot Cap-1 Maneuver	0	298	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	298	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s/v	20.09	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NET	EBLn1	SWT	SWR
Capacity (veh/h)	-	298	-	-
HCM Lane V/C Ratio	-	0.201	-	-
HCM Control Delay (s/veh)	-	20.1	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.7	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	108	23	43	173	21	12
Future Vol, veh/h	108	23	43	173	21	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
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	117	25	47	188	23	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	142	0	411	130
Stage 1	-	-	-	-	130	-
Stage 2	-	-	-	-	282	-
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	-	-	1440	-	597	920
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	766	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1440	-	575	920
Mov Cap-2 Maneuver	-	-	-	-	575	-
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	738	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.51	10.71
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	666	-	-	358	-
HCM Lane V/C Ratio	0.054	-	-	0.032	-
HCM Control Delay (s/veh)	10.7	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

APPENDIX: LEFT-TURN LANE WARRANTS

Exhibit 1310-9 Left-Turn Storage Guidelines: Two-Lane, Unsignalized

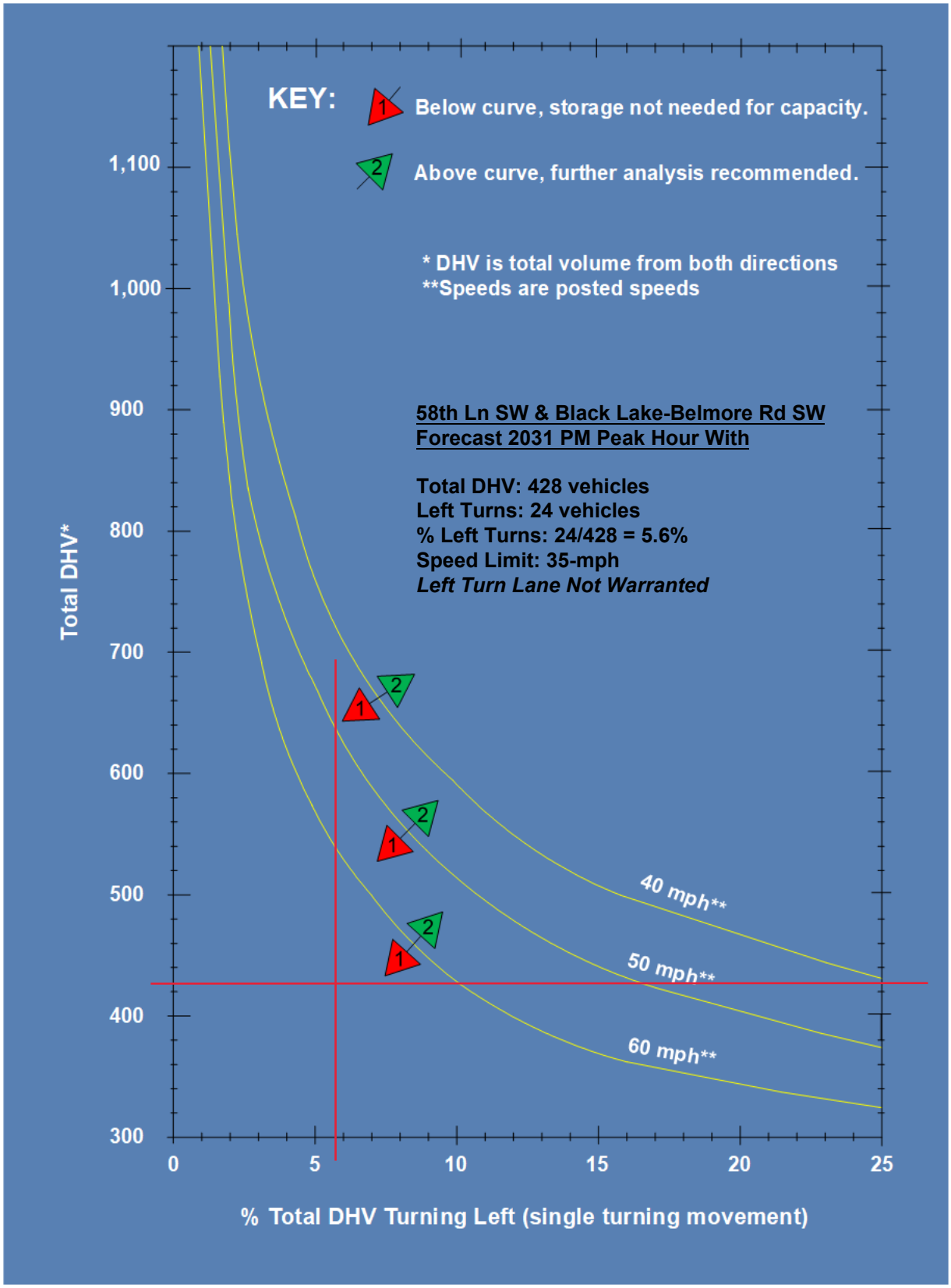
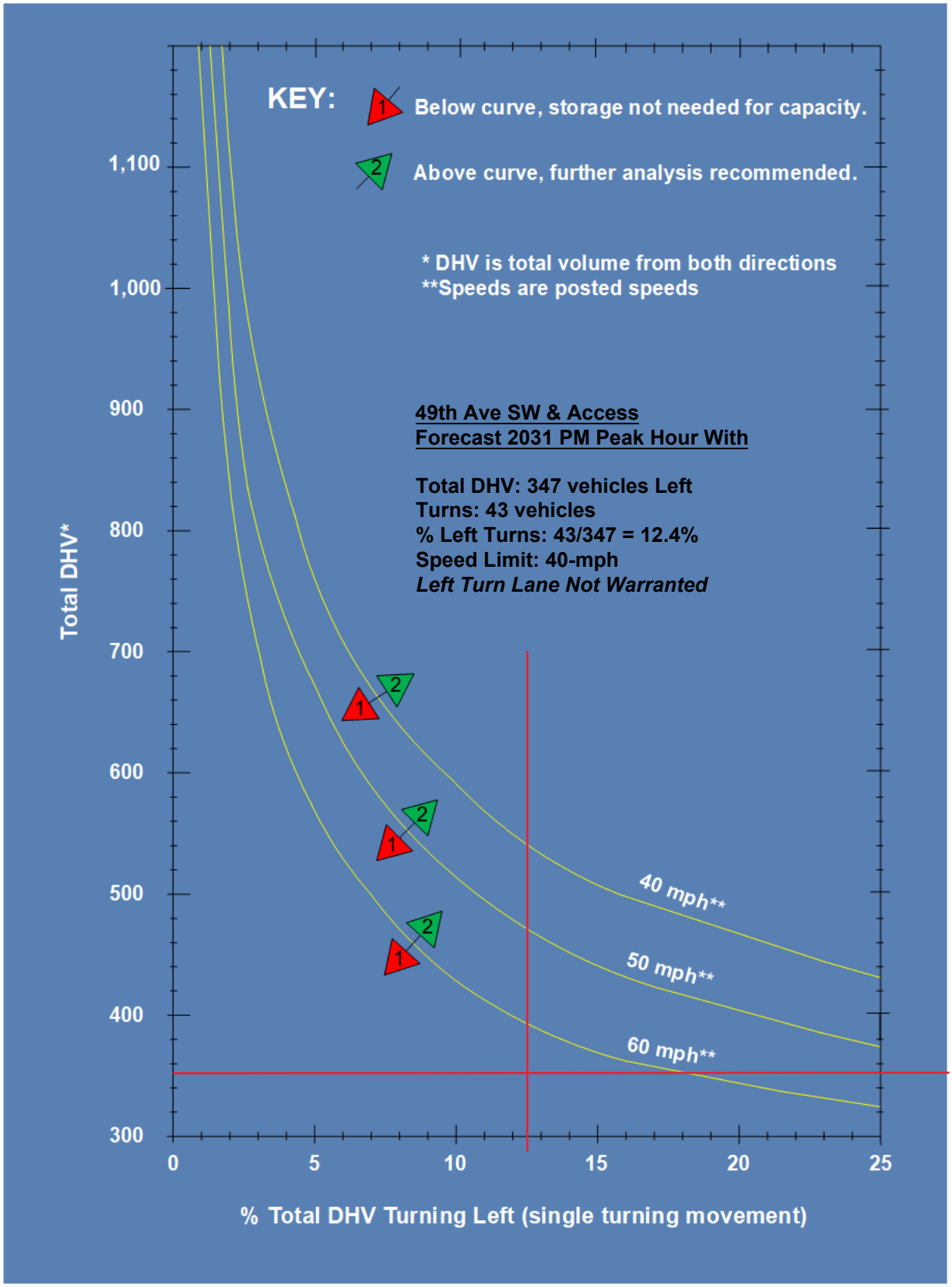


Exhibit 1310-9 Left-Turn Storage Guidelines: Two-Lane, Unsignalized

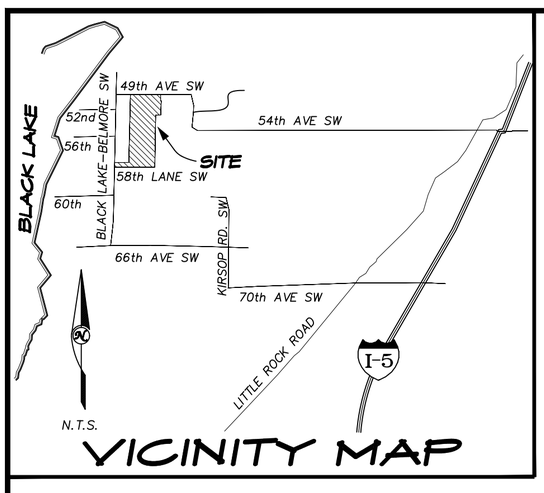


VISTA VIEWS AT BLACK LAKE
TRAFFIC IMPACT ANALYSIS

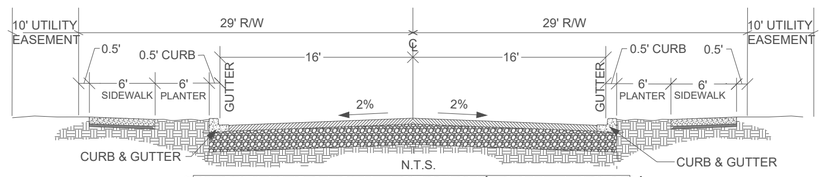
APPENDIX: CONCEPTUAL SITE PLAN

PRELIMINARY PLAT OF VISTA VIEWS AT BLACK LAKE

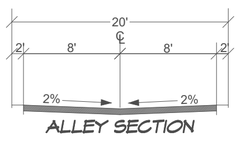
A PORTION OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER AND SOUTHEAST QUARTER OF THE SOUTHWEST QUARTER AND THE NORTHWST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 32, TOWNSHIP 18 NORTH, RANGE 2 WEST, W.M.



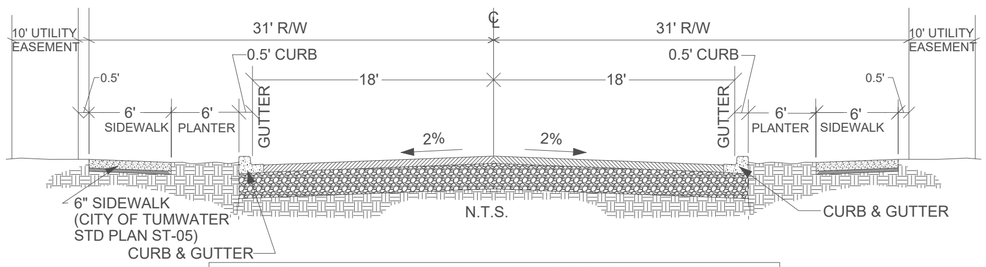
VICINITY MAP



58' PUBLIC ROADWAY SECTION(LOCAL ACCESS)



ALLEY SECTION



62' PUBLIC ROADWAY SECTION (NEIGHBORHOOD COLLECTOR)

DESCRIPTIONS:

PARCEL A
PARCEL "A" OF BOUNDARY LINE ADJUSTMENT NO. BAL-111522TC, AS RECORDED SEPTEMBER 3, 2004, UNDER AUDITOR'S FILE NO.'S 3671242 AND 3671243; IN THURSTON COUNTY, WASHINGTON.

PARCEL B
PARCEL "C" OF BOUNDARY LINE ADJUSTMENT NO. BLAD NO. 020441TC, AS RECORDED JULY 30, 2002, UNDER AUDITOR'S FILE NO.'S 3451145 AND 3451146.

TITLE NOTES

1. A PORTION OF THE LAND DESCRIBED HEREIN HAS BEEN ASSIGNED PROPERTY TAX ACCOUNT NO. 12832310700 BY THURSTON COUNTY.
2. A PORTION OF THE LAND DESCRIBED HEREIN HAS BEEN ASSIGNED PROPERTY TAX ACCOUNT NO. 12832318OO BY THURSTON COUNTY.
3. INTENTIONALLY OMITTED.
4. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS AS SET FORTH ON SHORT SUBDIVISION NO. SS-0250 RECORDED UNDER AUDITOR'S FILE NO. 964806.
5. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO PROVISIONS OF THURSTON COUNTY BOARD OF COMMISSIONERS RESOLUTION NO. 5871 FOR VACATED ROADWAY UNDER AUDITOR'S FILE NO. 1040136
6. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO PROVISIONS OF INSTRUMENT RECORDED UNDER AUDITOR'S FILE NO. 1130043, RELATED TO MOBILE HOMES.
7. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS AS SET FORTH ON SHORT SUBDIVISION NO. SS-1617 RECORDED UNDER AUDITOR'S FILE NO. 1135045.
8. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO EASEMENT AGREEMENT RECORDED UNDER AUDITOR'S FILE NO. 8801130095.
9. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS AS SET FORTH ON SHORT SUBDIVISION NO. BLA-020441TC RECORDED UNDER AUDITOR'S FILE NO. 3451145 AND 3451146.
10. A PORTION OF THE LAND DESCRIBED HEREIN IS SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, ENCROACHMENTS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS AS SET FORTH ON SHORT SUBDIVISION NO. BLA-111522TC RECORDED UNDER AUDITOR'S FILE NO. 3671242 AND 3671243.

SITE DATA/PROJECT INFORMATION

APPLICANT	Rob Rice Homes 1868 State Avenue NE OLYMPIA, WA 98033
REPRESENTATIVE	JEFF PANTIER HATTON GODAT PANTIER, INC. 3910 MARTIN WAY E, SUITE B OLYMPIA, WA 98506 360-943-1599 JEFFP@HATTONPANTIER.COM
ASSESSOR PARCEL NO.'S	12832310800, 12832310700
ZONING	SFL, Single-Family Low Density Residential
TOTAL AREA	54.36 Acres
-WETLAND AREA	8.86 Acres
-WETLAND BUFFER AREA	3.95 Acres
-PUBLIC ROADWAY LENGTH	7,673 L.F.
-PUBLIC ROADWAY AREA	9.44 Acres
-ALLEY LENGTH	1,457 L.F.
-ALLEY AREA	1.03 Acres
NET AREA	31.08
NO. OF LOTS	186
DENSITY	5.98 UNITS PER ACRE
OPEN SPACE	19.61 ACRES (36%) (17.4% ACTIVE)
SMALLEST LOT AREA	4,000 SQ. FT
AVERAGE LOT AREA	5,448
SEWER	CITY OF TUMWATER
WATER	CITY OF TUMWATER
ELECTRICITY	PUGET SOUND ENERGY
NATURAL GAS	PUGET SOUND ENERGY
COMMUNICATIONS	COMCAST
REFUSE	LEMAY
SCHOOL DISTICT	TUMWATER

TRACT USAGE/AREAS

TRACT	USEAGE	AREA (ACRES)
A	OPEN SPACE/WETLAND/BUFFER/TREE	13.39
B	STORM/ACTIVE REC	3.45
C	OPEN SPACE/PARK	1.08
D1	OPEN SPACE/LANDSCAPE	0.29
D2	OPEN SPACE LANDSCAPE	0.14
E	OPEN SPACE/LANDSCAPE	0.11
F	OPEN SPACE/LANDSCAPE	0.16
G	OPEN SPACE/LANDSCAPE	0.16
H	LANDSCAPE TRACT	0.04
I	LANDSCAPE TRACT	0.04
J	LANDSCAPE TRACT	0.03
K	ALLEY	0.29
L	ALLEY	0.47
M	LANDSCAPE TRACT	0.04
N	LANDSCAPE TRACT	0.04
O	LANDSCAPE TRACT	0.64
P	ALLEY	0.43
Q	PRIVATE RD/CUL-DE-SAC EASEMENT	0.12

PLAT NOTES

1. TRACTS A THROUGH P TO BE OWNED AND MAINTAINED BY THE HOMEOWNERS ASSOCIATION.
2. ALL KNOWN WATER SUPPLIES WITHIN 200 FEET OF THE PROJECT BOUNDARY ARE IDENTIFIED HEREON (LOCATIONS ARE BASED ON FIELD SURVEY AND THURSTON COUNTY RECORDS)
3. ALL EXISTING WELLS AND SEPTIC SYSTEMS TO BE ABANDONED PER THURSTON COUNTY HEALTH AND D.O.E. STANDARDS.
4. TOPOGRPAHIC INFORMATION (CONTOURS) DEPICTED HEREON ARE BASED ON THURSOTN COUNTY PHOTOGRAMMERTRY (NGVD 29).
5. ALL EXISTING BUILDINGS TO BE DEMOLISHED.

BUILDING SETBACKS

FRONT 20'
SIDE 5'
SIDE FLANKING STREET 10'
REAR 20'

LEGEND

- FOUND AS NOTED
- EXISTING WELL
- WELL
- MONITORING WELL
- BMP-366
- WETLAND PER IMAGE PROVIDED BY WETLAND BIOLOGIST (ENVIROVECTOR)
- WETLAND BUFFER PER WETLAND BIOLOGIST (ENVIROVECTOR)
- PHASE LINE
- WIRE FENCE
- WIRE FENCE
- ASPHALT
- GRAVEL
- 1 — 60' WIDE EASEMENT DESCRIBED UNDER AUDITOR'S FILE NO. 8801130095 (SEE TITLE NOTES NO. 8)
- 2 — 5' DRAINAGE EASEMENT AS PER SS 0250 RECORDED UNDER AUDITOR'S FILE NO. 964806 (SEE TITLE NOTES NO. 4)
- 3 — VACATED RIGHT-OF-WAY PURSUANT OF BOARD OF COMMISSIONERS RESOLUTION NO. 5871 RECORDED UNDER AUDITOR'S FILE NO. 1040136 (SEE TITLE NOTES NO. 5)
- 4 — UN-OPENED RIGHT-OF-WAY RECORDED UNDER AUDITOR'S FILE NO. 352883
- P1 — PLANNED 10' WIDE UTILITY EASEMENT
- P2 — PLANNED RIGHT OF WAY DEDICATION (1.10 ACRES)
- P3 — PLANNED WETLAND MITIGATION AREA (CROSS HATCHED AREA) 5,682 S.F.

VERTICAL DATUM
NGVD 29
THURSTON COUNTY
PHOTOGRAMMERTRY

BASIS OF BEARINGS:
THURSTON COUNTY HIGH PRECISION SURVEY CONTROL NETWORK. BASED ON CONTROL POINTS #7547 AND #6028 BEARING EQUALS NORTH 01°23'12" EAST

SCALE: 1"=100 FEET
0 50 100 200

JEFF S. PANTIER
STATE OF WASHINGTON
28073
REGISTERED
PROFESSIONAL LAND SURVEYOR

HATTON GODAT PANTIER
ENGINEERS AND SURVEYORS
3910 MARTIN WAY E, SUITE B
OLYMPIA, WA 98506
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hattonpantier.com

EEP 21-102