TRANSPORTATION TECHNICAL REPORT
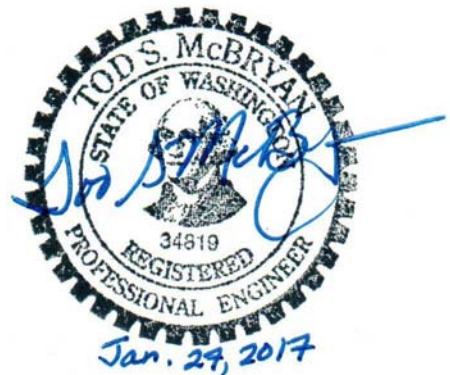
for

Northwood Elementary School Replacement

PREPARED FOR:

Puyallup School District

PREPARED BY:

heffron transportation inc

6544 NE 61st Street, Seattle, WA 98115
ph: (206) 523-3939 ◆ fx: (206) 523-4949

Jan. 24, 2017

January 27, 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.   INTRODUCTION

This report presents the transportation impact analysis for the proposed replacement of Northwood Elementary School at its existing site located at 9805-24th Street E in Edgewood. It includes a description of existing and proposed conditions in the site vicinity, projected trip generation and distribution patterns, operational analysis at the project study area intersections, and an assessment of the project's impacts to safety, transit service, and non-motorized facilities.

The elements and organization of this analysis follow the City of Edgewood's (City's) *Traffic Impact Analysis Guidelines*.[1] The study area for the analysis was defined by City review staff [2] and its transportation review consultant[3] based on preliminary scoping analyses prepared by Heffron Transportation.[4] An analysis scoping meeting was held at the City on Thursday, November 10, 2016. The study area was identified based on the trip generation, distribution patterns, and assignments presented in that analysis. The school's morning arrival peak hour occurs between 8:00 and 9:00 A.M. and the afternoon dismissal peak hour occurs between 2:45 and 3:45 P.M. The project is expected to generate relatively little new traffic during the commuter PM peak hour (typically the highest hour between 4:00 and 6:00 P.M.) and, based on direction from the City, was not included in the analysis. The four off-site study area intersections and the corresponding analysis periods are listed below:

- Meridian Avenue E/8th Street E – morning peak hour
- Meridian Avenue E/16th Street E – morning and afternoon peak hours
- Meridian Avenue E/24th Street E – morning and afternoon peak hours
- 94th Avenue E/24th Street E – morning and afternoon peak hours

1.1.   Project Description

The school serves kindergarten through sixth grade (K-6) and consists of the main school building (30,400 square feet (sf)[5]) and six classrooms in portable buildings with capacity for 436 students.[6] Existing enrollment (as of fall 2016) was reported at 429 students[7] and the school currently has 36 staff.[8] The school site is located west of Meridian Avenue E and north of 24th Street E. The site location and vicinity are shown on Figure 1.

The Northwood Elementary School site has hard and soft surface play areas and a grass play field. There is on-site parking with 59 striped stalls in the main lot for staff and parents/visitors. There are also seven spaces located behind the school building to the north. The school access is located on 24th Street E. The driveway extends 390 feet, then divides and loops around the main parking lot. The loop operates with a one-way circulation pattern for staff/visitors and school buses. School bus load/unload occurs in the front of the school just north of the parking lot.

---

[1]   City of Edgewood, March, 2012.
[2]   Personal communication: Kevin Stender, City of Edgewood, November 17, 2016.
[3]   Email and personal communication: Kevin Jones, Transpo Group, November 15-16, 2016 and December 5, 2016.
[4]   Heffron Transportation, Inc. "Transportation Analysis Scoping", November 4, 2016.
[5]   Pierce County Assessor, https://epip.co.pierce.wa.us/cfapps/atr/epip/buildings.cfm?parcel=0420091011, accessed, Jan. 2017.
[6]   Puyallup School District: Northwood Elementary School Portable Move Traffic Impact Fee Adjustment, Heffron Transportation, Inc., June 16, 2010.
[7]   Email communication: Brian Devereux, Puyallup School District (PSD) Dir. Of Facilities Planning, September 26, 2016.
[8]   Email communication: Larry Vandeberg, PSD Assistant Dir. Of Construction Management, December 16, 2016.

January 27, 2017

Surprise Lake

SITE

8th St E

161

13th St Ct E

16th St E

18th St Ct E

20th St E

24th St E

32nd St E

32nd St E

36th St E

92nd Ave E

94th Ave E

Meridian Ave E

112th Ave E

114th Ave E

114th Ave E

161

N
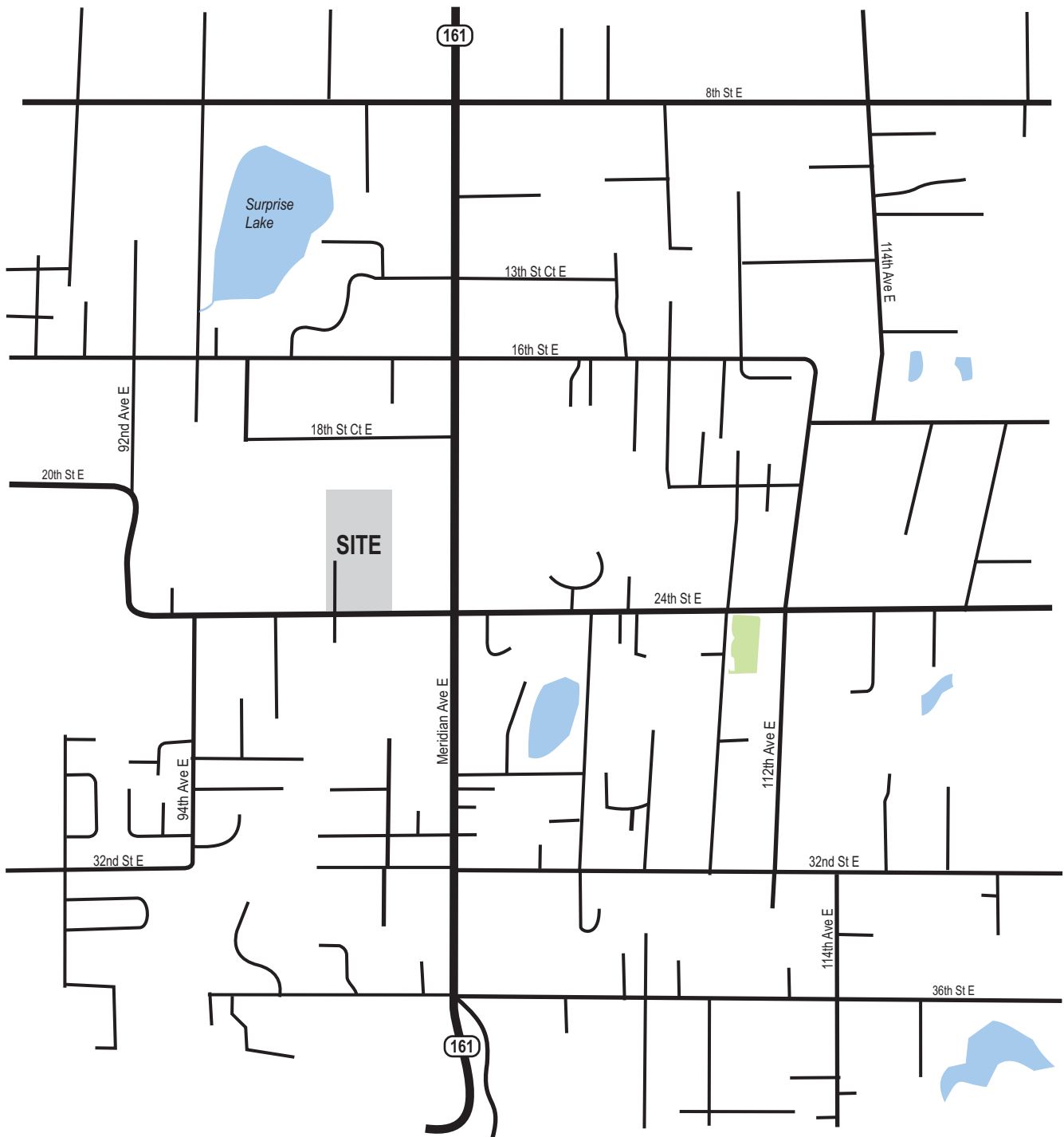
Northwood Elementary School Replacement

Figure 1

Site Vicinity Map

heffron transportation inc

01.02.17

The project would remove the existing structures and parking on the site and construct a new elementary school with approximately 80,600 sf and capacity for up to 730 students. The proposed site plan is shown on Figure 2. As shown, the new school is proposed to have two access driveways on 24th Street E. The school bus load/unload area, staff parking (for 37 vehicles), and day-care van/shuttle load/unload would be accessed from the site's western driveway (along the western edge) at the location of the existing access driveway. The main parking lot (for 60 vehicles) and the passenger vehicle load/unload area would be accessed from a new east access driveway (located approximately 330 feet east of the west driveway). The proposal also includes 13 auxiliary parking spaces on the east side of the main access driveway near the athletic field, bringing the total proposed parking capacity to 110 spaces.

2.   EXISTING CONDITIONS

This section describes the existing roadway network, traffic volumes, traffic operations (in terms of levels of service), traffic safety, transit facilities, non-motorized facilities, and parking.
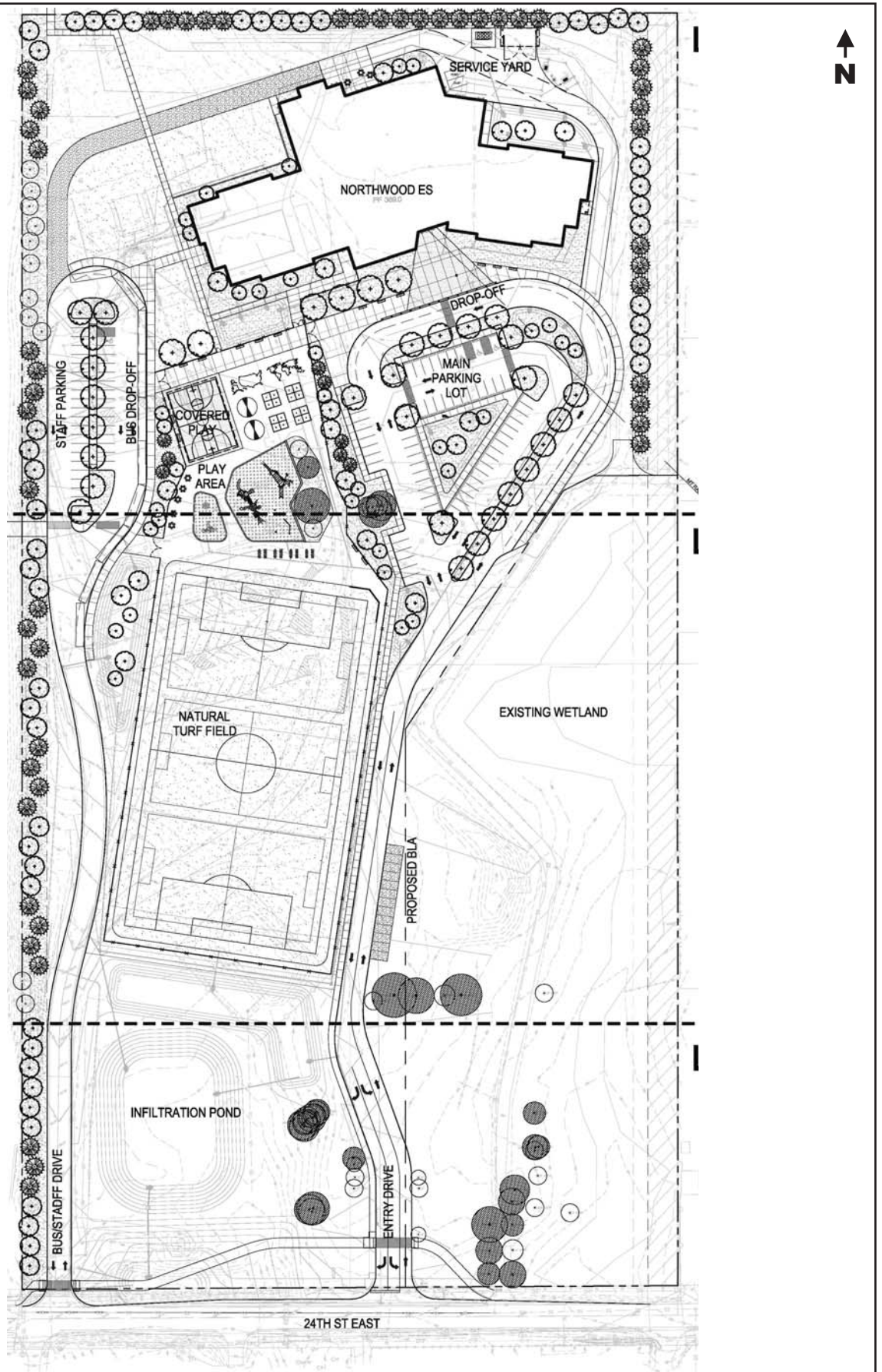
2.1.   Roadway Network

The City designates streets as principal arterials, minor arterials, collectors, and local access streets depending upon the street's function in the roadway network.[9] The key roadways in the vicinity of the project site are described below.

Meridian Avenue E (State Route [SR] 161) is a north-south Principal Arterial that connects between Interstate-5 and SR 18 to the north, and SR 167 and SR 512 to the south. North of 24th Street E, it is generally a five-lane roadway with two travel lanes in each direction and a center two-way left-turn lane. South of 24th Street E, Meridian Avenue E is a three-lane roadway with two travel lanes in each direction and a center two-way left-turn lane. In the vicinity of the site, the roadway has curbs, gutters, and sidewalks on both sides and has a posted speed limit of 35 miles per hour (mph). There are also 4-foot wide shoulders provided for bicycles on both sides of the roadway and on-street parking is not permitted. Its intersections with 8th Street E, 16th Street E, and 24th Street E are signalized with crosswalks on all legs. A mid-block signed and marked crosswalk is located just south of 18th Street Court E.

24th Street E is a two-lane, east-west roadway that provides connection between 125th Avenue Court E to the east and 92nd Avenue E to the west. It is classified as a Minor Arterial to the west of 122nd Avenue E and as a local access street to the east. In the vicinity of the project site, there are generally paved and/or gravel-grass shoulders that vary in width but are typically narrower than three feet. Recent frontage improvements for a residential development directly west of the project site included sidewalk and an eight-foot wide paved shoulder. The roadway has a posted speed limit of 35 mph. A school-zone speed limit (20 mph) is signed near the school and is in effect when beacons are flashing or when children are present. A school crossing of 24th Street E is signed without pavement markings on the west site of the school access. There are no signs prohibiting on-street parking; during field observations of the afternoon school dismissal peak hour, no on-street parking was observed in the vicinity of the site.

---

[9]   City of Edgewood, *Edgewood Comprehensive Plan*, Adopted June 9, 2015.

N

SERVICE YARD

NORTHWOOD ES
FF 389.0

DROP-OFF

STAFF PARKING

BUS DROP-OFF

MAIN
PARKING
LOT

COVERED
PLAY

PLAY
AREA

NATURAL
TURF FIELD

EXISTING WETLAND

PROPOSED BLA

INFILTRATION POND

BUS/STADFF DRIVE

ENTRY DRIVE

24TH ST EAST

**Northwood Elementary
School Replacement**

Figure 2

Proposed Site Plan

heffron
transportation inc

01.02.17

16th Street E is a two-lane, east-west Collector Arterial that provides a connection between Meridian Avenue E and 112th Avenue E to the east. West of Meridian Avenue E, the roadway is known as Taylor Street. Except for a short segment, the roadway west of Meridian Avenue E is outside the city limits and is designated as a Pierce County Collector Arterial. The roadway has mostly grass/gravel shoulders, but there are intermittent sections with no shoulder. There is a 530-foot segment of sidewalk on the south side of the street that extends from Meridian Avenue E to 100th Avenue Court E. East of its intersection with Meridian Avenue E, it has a posted speed limit of 35 mph; west of Meridian Avenue E, it has a posted speed limit of 25 mph. There are no signs prohibiting on-street parking; during field observations of the afternoon school dismissal peak hour, no on-street parking was observed in the vicinity of the site.

8th Street E is an east-west Minor Arterial that provides a connection between Meridian Avenue E and 122nd Avenue E to the east. West of Meridian Avenue E, the roadway is outside the city limits and is designated as a Pierce County Minor Arterial. The roadway has one travel lane in each direction with paved/grass-gravel shoulders. It has a posted speed limit of 35 mph. On-street parking is not permitted on either side of the roadway.

94th Avenue E is a two-lane, north-south Collector Arterial that provides a connection between 24th Street E on the north and 32nd Street E on the south. There are shoulders on both sides are a mix of paved, grass, and gravel. Along some segments of the roadway, the shoulders are over seven feet in width and are used for parking. The roadway has a posted speed limit of 25 mph.
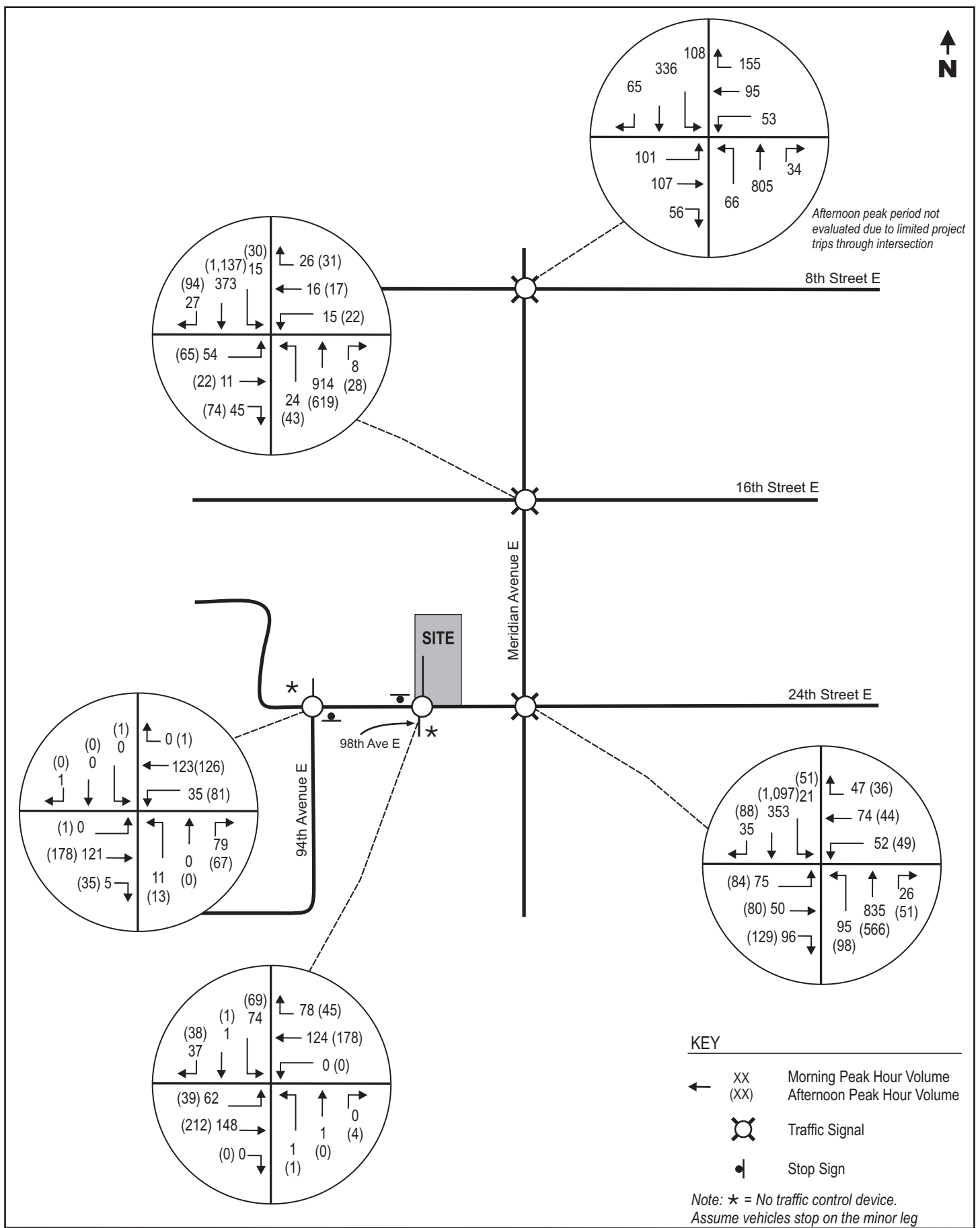
2.2.   Traffic Volumes

Classes at the existing Northwood Elementary School start at 8:55 A.M. and are dismissed at 3:16 P.M. To evaluate the potential traffic conditions in the study area during times when the school generates its highest traffic volumes (the morning arrival and afternoon dismissal peak hours), new peak period turning movement traffic counts were performed at all four study area intersections as well as the existing site access driveway. Morning arrival peak period traffic counts were conducted at all study area intersections and the site access on Tuesday, November 29, 2016. Afternoon dismissal peak period counts were also conducted at the 24th Street E intersections with Meridian Avenue E, 94th Avenue E, and the Northwood Elementary site access driveway on Tuesday, November 29 2016. The afternoon dismissal peak period count at the Meridian Avenue E/16th Street E intersection was performed on Wednesday, December 7, 2016. Morning counts were performed from 7:00 to 9:00 A.M. and afternoon counts were performed from 2:00 to 4:00 P.M. The existing (2016) morning arrival and afternoon dismissal peak hour traffic volumes are shown on Figure 3; the count data sheets are provided in Appendix A.

2.3.   Traffic Operations

2.3.1. Off-Site Study-Area Intersections

Traffic operations analyses were performed for the study-area intersections. Traffic operations are evaluated using levels of service (LOS) with six letter designations, "A" through "F." LOS A is the best and represents the best traffic operation with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. The level of service definitions and thresholds are provided in Appendix B. The City's adopted minimum operational standard for intersections along the Meridian Avenue E corridor is LOS E. For all other arterial and collector intersections, the standard is LOS D (with some limited exceptions that do not apply to the study area intersections).[10]

---

[10]   City of Edgewood Comprehensive Plan – Transportation Element, Adopted June 22, 2015.

heffron transportation inc

108
336
65
155
95
53
101
107
34
805
66
56

Afternoon peak period not evaluated due to limited project trips through intersection

8th Street E

(30)
(1,137) 15
(94) 373
27
26 (31)
16 (17)
15 (22)
(65) 54
(22) 11
(74) 45
8
914 (28)
24 (619)
(43)

16th Street E

Meridian Avenue E

SITE

24th Street E

*

98th Ave E

*

94th Avenue E

(1)
(0) 0
(0) 0
1
0 (1)
123 (126)
35 (81)
(1) 0
(178) 121
(35) 5
79
0 (67)
11 (0)
(13)

(51)
(1,097) 21
(88) 353
35
47 (36)
74 (44)
52 (49)
(84) 75
(80) 50
(129) 96
26
835 (51)
95 (566)
(98)

(69)
(1) 74
(38) 1
37
78 (45)
124 (178)
0 (0)
(39) 62
(212) 148
(0) 0
0
1 (4)
1 (0)
1
(1)

KEY

	XX	Morning Peak Hour Volume
←	(XX)	Afternoon Peak Hour Volume
⌗		Traffic Signal
•|		Stop Sign

Note: ✶ = No traffic control device.
Assume vehicles stop on the minor leg

Northwood Elementary School Replacement

Figure 3
Existing (2016) Traffic Volumes
Morning and Afternoon Peak Hours

heffron transportation inc

01.02.17

Levels of service were determined using procedures in the *Highway Capacity Manual*.[11] Delay calculations rely on complex equations that consider a number of variables. For example, delay at signalized intersections is determined based on traffic volumes by lane group, signal phasing and timing, and the quality of progression along a corridor. Delay at unsignalized intersections is determined for vehicles that must stop or yield for oncoming traffic. That delay is related to the availability of gaps in the main street's traffic flow and the ability of a driver to enter or pass through those gaps.

All level of service calculations were performed using the *Synchro 9.1* traffic operations analysis software. The software models reflect current intersection geometries and levels of service were reported using the *Synchro* module for signalized intersections, which refines *Highway Capacity Manual* methods to account for more detailed driving behavior and signal operations. Timing data for the signalized intersections were obtained from the Washington State Department of Transportation (WSDOT). Input data for this analysis, including geometric characteristics, signal timing, and signal phasing were verified through field observations. Results for unsignalized intersections were reported using the *HCM 2010* module. Table 1 summarizes levels of service for existing (2016) morning arrival and afternoon dismissal peak hours at the off-site study-area intersections. As shown, all study area intersections currently operate at LOS C or better during the morning arrival and afternoon dismissal peak hours. The level of service calculation sheets are included in Appendix C.

Table 1. Level of Service – Existing (2016) Off-Site Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)		Afternoon Peak Hour (2:45 to 3:45 P.M.)	
Signalized Intersection	LOS [1]	Delay [2]	LOS	Delay
Meridian Ave S (SR 161) / 8th St E	C	28.4	n/a [3]	--
Meridian Ave S (SR 161) / 16th St E	A	8.4	B	11.8
Meridian Ave S (SR 161) / 24th St E	C	23.5	C	28.9
Two-Way-Stop-Controlled Intersection	LOS	Delay	LOS	Delay
24th St E / 94th Ave E (overall)	A	2.9	A	3.3
Eastbound Left Turns	A	0.0	A	7.6
Westbound Left Turns	A	7.6	A	8.0
Northbound Movements	A	9.9	B	11.4
Southbound Movements (driveway)	A	9.0	C	16.7

Source: Heffron Transportation, January 2017

1.   *LOS = Level of service.*

2.   *Delay = Average seconds of delay per vehicle.*

3.   *n/a = Not applicable. This intersection is not evaluated for the afternoon dismissal peak hour because the project would generate fewer than 20 trips through this intersection during that hour.*

As shown, the Meridian Avenue E/24th Street E intersection operates at LOS C during the afternoon peak hour. During the analysis scoping discussions, the City's transportation review consultant noted that queues of southbound traffic on Meridian Avenue E can form during the commuter PM peak period south of the 24th Street E intersection where Meridian Avenue E narrows from two lanes to one lane (approximately 550 feet downstream of the intersection). It was noted by the City's consultant that this queuing condition can affect and sometimes prevent westbound-to-southbound left turns from 24th Street E. Field observations conducted at the intersections found that these queues did not occur during the afternoon dismissal peak hour between 2:45 and 3:45 P.M.

---

[11]   Transportation Research Board, 2010.

heffron transportation inc

2.3.2. Site Access Operations & Queuing

Operations at the existing site access driveway were also evaluated. The pedestrian crossing activity, peaking characteristics of school traffic, and heavy vehicle volumes (including school buses), have all been accounted for in these operations analyses. It is noted that there are currently few residences near the school and only one pedestrian was counted at the driveway during the morning and afternoon peak hours (crossing the north leg of the existing school access). Table 2 summarizes levels of service for existing (2016) morning arrival and afternoon dismissal peak hours. As shown, the driveway currently operates at LOS A overall and all movements currently operate at LOS C or better during the morning arrival and afternoon dismissal peak hours.

Table 2. Level of Service – Existing (2016) Site Access Conditions

Two-Way-Stop-Controlled Intersection	Morning Peak Hour (8:00 to 9:00 A.M.)		Afternoon Peak Hour (2:45 to 3:45 P.M.)	
	LOS [1]	Delay [2]	LOS	Delay
24th St E / 98th Ave E / School Dwy (overall)	A	7.8	A	9.0
Eastbound Left Turns	A	7.9	A	7.9
Westbound Left Turns	A	0.0	A	0.0
Northbound Movements	B	14.5	B	10.6
Southbound Movements	C	19.9	C	22.5

Source: Heffron Transportation, January 2017

1. *LOS = Level of service.*

2. *Delay = Average seconds of delay per vehicle.*

Peak school-related queuing typically occurs in the afternoon when family-vehicles arrive on site and drivers wait for dismissal. Therefore, afternoon site access and on-site queuing conditions were observed on Tuesday, January 3, 2017. The observations found that family drivers begin arriving at the site to pick up students prior to 2:55 P.M. Many line up along the side of the one-way loop road on-site rather than parking in available spaces in the lot; however, parking spaces filled up closer to the 3:16 P.M. dismissal time. The number of waiting vehicles was highest just before dismissal and included a total of about 62 cars with about 46 vehicles around the on-way loop and about 16 vehicles that used empty parking stalls within the parking lot.

The inbound queue of vehicles did not extend past the on-site gore point where the two-way driveway splits into one-way segments. Since the queue did not extend to 24th Street E, there was no interference from inbound school traffic with operations on 24th Street E. The outbound queue for vehicles leaving the site lasted for about ten minutes and peaked at about 15 vehicles. The main cause for delay leaving the site was due to left-turning vehicles awaiting adequate gaps in traffic on 24th Street E.

2.4. Parking

As described previously, the existing school has on-site parking with 59 striped spaces in the main lot and 7 spaces behind the school for a total supply of 66 spaces.

School-day parking demand at elementary schools is primarily driven by staffing levels and family-volunteer activity. A field count of on-site parking demand was conducted on Tuesday, January 3, 2017 at 1:45 P.M. and found 36 vehicles in the main lot and 6 vehicles in the back lot for a total demand of 42 vehicles (59% utilized). No on-street parking was observed along 24th Street E in the vicinity of the site. Based on the current school staffing level (36 employees), the school generates about 1.17 parked

vehicles per employee. This rate is consistent with rates for elementary schools observed by Heffron Transportation at numerous locations throughout Western Washington. ITE's *Parking Generation[12]* does not include data for elementary schools based on staffing levels (the data provided are based on enrollment levels and are unclear if they reflect conditions during morning arrival, afternoon dismissal, or special events). *Parking Generation* does include an employee-based rate for middle schools of 1.22-vehicles-per-employee, which is consistent with observations by Heffron Transportation.

2.5. Traffic Safety

As directed by the City's Transportation review consultant,[13] collision data for the study area intersections and roadway segments along 24th Street E were obtained from WSDOT. These data, reflecting the period between January 1, 2013 to October 31, 2016 (approximately 3.8 years), were examined to determine if there are any unusual traffic safety conditions that could impact or be impacted by the proposed project. The collision data are summarized in Table 3. There were relatively few collisions reported at the study area intersections during the 3.8-year time period. The highest number of collisions (9) occurred at the 24th Street E/Meridian Avenue E intersection and reflected an average of 2.3 collisions per year. Seven of the nine collisions were rear-end collisions, which are more common along approached to signalized intersections.

A common measure for determining crash rates at intersections is the number of crashes per million entering vehicles (MEV). The collision rate per MEV is a ratio of the number of collisions and the total number of vehicles that travel through an intersection over the study period. This collision rate, allows a comparison of intersections with varying traffic volumes. For example, intersections that have very high traffic volumes are more likely to have a larger number of collisions; however, the rate of collisions may be low when considering the volume of traffic. The rate for the 24th Street E/Meridian Avenue E intersection was determined using estimated Average Daily Traffic (ADT) volumes. The ADT volumes were estimated based on PM peak hour counts for the intersections assuming that an intersection's ADT is 10 times the PM peak hour volume. This estimating tool (the inverse is also known as a K-factor—0.1 in this case) is commonly applied to estimate daily traffic. Collision rates higher than 1.00 per MEV are considered to be relatively high and intersections with rates higher than that may merit additional examination from a safety perspective. The collision rate for the 24th Street E/Meridian Avenue E intersection is 0.27 and is well below 1.00 collision per MEV over the 3.8-year period. None of the intersection or roadway segment collisions involved fatalities. The data for the study area do not indicate any unusual traffic safety conditions along either the roadway segment or study area intersections along 24th Street E.

Table 3. Collision Summary (January 1, 2013 through October 31, 2016)

Intersection	Rear-End	Side-Swipe	Left Turn	Right Angle	Ped / Cycle	Other [a]	Total for 3.8 Years	Average/ Year
24th St E / 94th Ave E	1	0	0	0	0	0	1	0.3
24th St E / School Access	0	0	0	0	0	0	0	0.0
24th St E / Meridian Ave E	7	0	0	1	0	1	9	2.3
Roadway Segment	Rear-End	Side-Swipe	Left Turn	Right Angle	Ped / Cycle	Other [a]	Total for 3.8 Years	Average/ Year
24th St E – between 94th Ave E and Meridian Ave E	4	1	0	1	0	1	7	1.8

Source: Washington State Department of Transportation, November 2016.

a. *"Other" collisions involved vehicle striking an object and vehicle in ditch.*
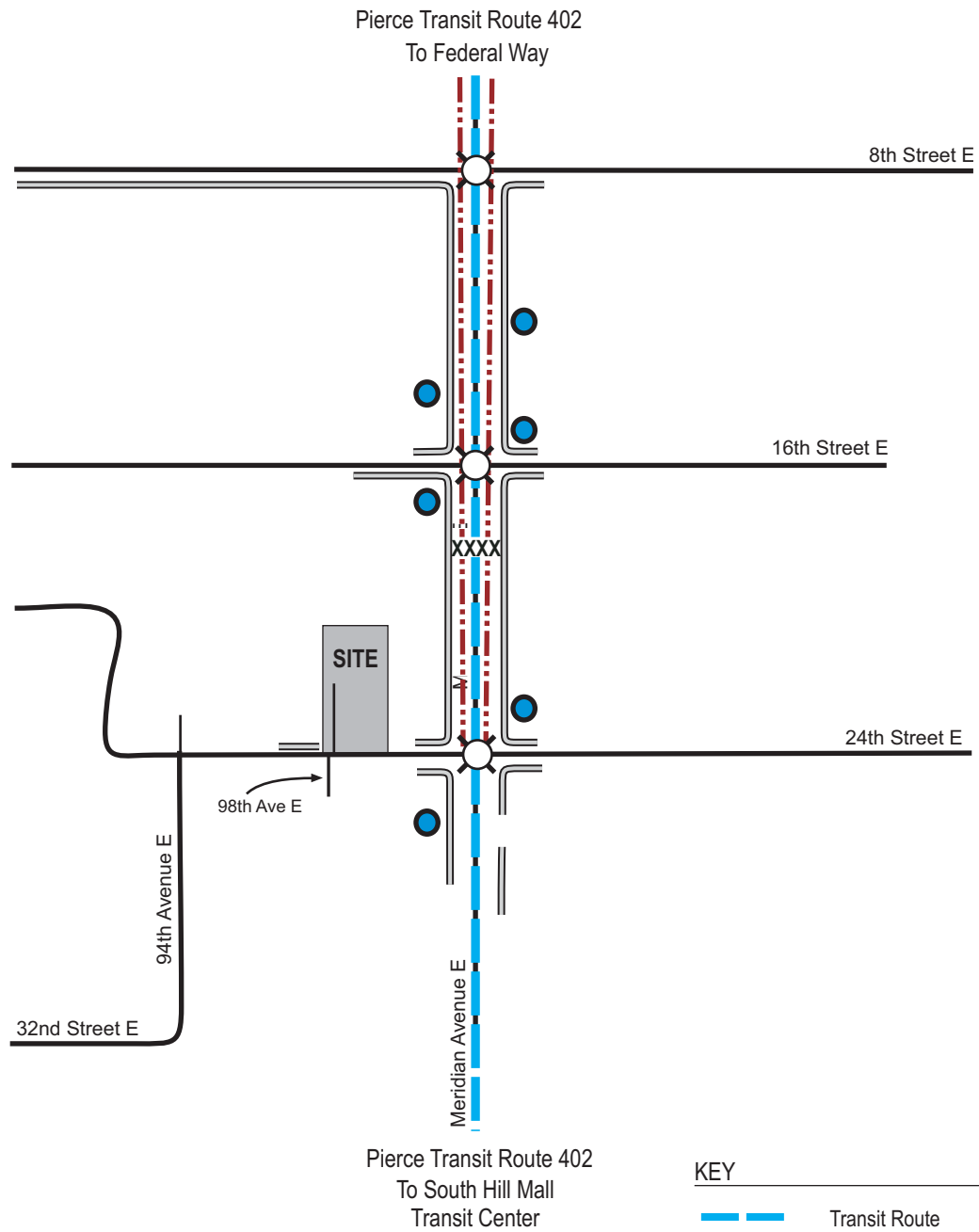
---

[12] ITE, 4th Edition, 2010.
[13] Email communication, K. Jones, PE, PTOE, Transpo Group, Nov. 18, 2016.

2.6.   Transit Facilities and Service

The site is not directly served with transit stops; however, Pierce Transit provides bus service within the larger City of Edgewood and Pierce County areas. The closest transit stops are located about ¼ mile to the east on Meridian Avenue E at the 24th Street E intersection (the southbound stop is on the south side and the northbound stop is on the north side). These stops are served by Pierce Transit Route 402, which operates seven days per week between Meridian, Puyallup, and Federal Way. Weekday service is provided from about 5:00 A.M. to 9:00 P.M. with headways (time between consecutive buses) of 30 minutes to an hour. The transit facilities and service are shown on Figure 4.

2.7.   Non-Motorized Transportation Facilities

As described in the *Roadway Network* section, Meridian Avenue E has sidewalks and 4-foot wide shoulders for bicycles on both sides of the roadway within the study area. There are marked crosswalks with pedestrian signals at all three signalized study-area intersections. There is a signed and marked midblock crosswalk on Meridian Avenue E just south of 18th Street Court E. The non-motorized facilities are also shown on Figure 4.

N

Pierce Transit Route 402
To Federal Way

8th Street E

16th Street E

XXXX

SITE

24th Street E

98th Ave E

94th Avenue E

Meridian Avenue E

32nd Street E

Pierce Transit Route 402
To South Hill Mall
Transit Center

KEY

— — —	Transit Route
⬤	Transit Stop
—··—··—	Bicycle Shoulder
═══	Sidewalk
XXXX	Signed and Marked Crosswalk
⨂	Signalized; Crosswalks with Pedestrian Signals on all Legs

**Northwood Elementary
School Replacement**

Figure 4
**Public Transit System and
Bicycle/Pedestrian Facilities**

heffron
transportation inc

01.02.17

3.   FUTURE BASELINE CONDITIONS

This section of the report presents the future conditions without the proposed project. Year 2019 was selected as the future horizon year for the analyses because this is the year the replacement school is planned to opened. For comparison, and to provide an analysis of potential new traffic and parking impacts, year 2019 without-project conditions assume the existing Northwood Elementary School would operate at its existing capacity of 436 students. The following sections describe planned improvements, traffic volumes, and traffic operations (in terms of levels of service).

3.1.   Planned Transportation Projects in Site Vicinity

The City of Edgewood's adopted *2017-2022 Capital Improvement Plan (CIP)*[14] was reviewed to determine if any proposed projects would affect study-area roadways or intersections. No funded roadway or non-motorized projects within the study area are identified in the CIP that are expected to affect the capacity or operations at the study area intersections by year 2019 when the proposed Northwood Elementary School Replacement project would be complete and occupied.

It is noted that the City of Edgewood is working to implement its *Meridian Avenue Corridor Projects*, which are identified in the *Edgewood 2035 Comprehensive Plan*. Near the project site, planned improvements include new grid streets along the along the alignments of 20th Street E (Project W-3) and 100th Avenue E (Project W-4) as described below.

- **Project W-3: 20th Street E** – Construct a new Collector Arterial segment of 20th Street E from 101st Avenue E to Meridian Avenue E.

- **Project W-4: 20th Street E / 100th Avenue E / 24th Street E** – Construct a new Collector Arterial segment of 100th Avenue E between 24th Street E and 20th Street E.

The alignment of the planned new segment of 100th Avenue E (Project W-4) falls along the eastern edge of the northern portion of the school site. As a result, the District will be requested to dedicate right-of-way to the City for this roadway's future completion. Since completion of these two projects will rely on right-of-way that has not yet been acquired by the City and the timing of design and construction is unknown at this time, these projects were not assumed to be complete in 2019 for this analysis. Therefore, the existing roadway network was assumed for all analyses of 2019 conditions.

3.2.   Forecast 2019 Background Traffic Volumes

Traffic forecasts were developed for future 2019 without-project conditions based on guidance provided by the City's transportation review consultant. Based on this direction, a 2% compound annual growth rate was applied to the existing 2016 traffic volumes. In addition, traffic estimates associated with 17 planned development projects (called 'pipeline projects') was then added to the background traffic estimates to reflect year 2019 conditions. The 17 pipeline projects are listed below:

- The Arbors at Edgewood
- Caldwell Crest
- Edgewood Apartments
- Edgewood Commercial
- Edgewood Estates
- Nicklaus Property
- North Edgewood Apartments
- Northwood Estates
- Pascolo Estates
- Rainier Vista

---

[14]   City of Edgewood, Adopted August 23, 2016.

- Edgewood Heights
- Edgewood Memory Care
- Edgewood View Point
- Jovita Crossing

- View Pointe
- Westridge Plat
- Wolf Point

It is noted that construction of some of these developments has already begun and some are partially occupied. As a result, the existing counts may already include some of the associated pipeline traffic and the future forecasts may overstate the actual total background volumes.

Traffic assignments for these pipeline projects were provided by the City's Transportation review consultant. These pipeline assignments primarily reflected trips estimated for the commuter PM peak hour (the highest hour between 4:00 and 6:00 P.M.) and did not have estimates of traffic generated during the morning arrival or afternoon dismissal peak hours being evaluated for the Northwood Elementary School Replacement project. Therefore, the pipeline traffic estimates were adjusted to reflect the amount of traffic that could be generated by these developments during the morning and afternoon analysis peak hours. The methodology used to adjust the pipeline traffic estimates was coordinated with the City's transportation review consultant.[15] *Report 365 Travel Estimation Techniques for Urban Planning*[16] from the National Cooperative Highway Research Program (NCHRP) identifies time-of-day characteristics for home-based and non-home-based trips for areas of varying populations.[17] The percentages of trips provided for Home-Based trips, which accounts for the types of trips expected from the pipeline development, were combined to derive ratios of the commuter PM peak hour for the morning arrival and afternoon dismissal peak hours. These published data indicate that Home-Based trips during the 8:00 to 9:00 A.M. school arrival hour are 81.5% of the trip generated during the traditional commuter PM peak hour. Therefore, to estimate pipeline traffic during the morning arrival peak hour, a factor of 81.5% was applied to the PM peak hour pipeline trips. In addition, in order to account for the reverse commute patterns in the morning, the assignments were reversed (e.g. southbound trips on Meridian Avenue E during the PM peak hour would be northbound during the morning).

Similarly, the data indicate that trips occurring between 3:00 and 4:00 P.M. (representing the afternoon dismissal peak hour 2:45 to 3:45 P.M.) are 81.8% of the commuter PM peak hour. To estimate pipeline traffic during the afternoon dismissal peak hour, a factor of 81.8% was applied to the PM peak hour pipeline trips. The resulting pipeline traffic estimates were then added to the forecasts to reflect 2019 without-project traffic estimates for each analysis period. The resulting 2019 "without project" volumes during morning arrival and afternoon dismissal peak hours are shown on Figure 5. The combination of the growth rate and the assumed pipeline trips at the intersections results in 2019 volumes that are between 29% and 49% higher than existing. The pipeline development traffic represents between 18% and 29% of the forecast 2019 total entering volumes.

---

[15] Personal communication, K. Jones, PE, PTOE, Transpo Group, Dec. 15, 2016.

[16] Transportation Research Board, National Academy Press, 1998 – Table 41.

[17] Based on guidance from the City's Transportation consultant, although City of Edgewood population is below 10,000;[17] commute patterns for the area are largely reflective of the greater Puget Sound region and the published travel characteristics for areas with population sizes of 1,000,000 or greater were applied.

N

120
170
525
102
95
61
144
98 1,166 40
114
74

Afternoon peak period not evaluated due to limited project trips through intersection

8th Street E

(36)
(1,492) 23
32 (40)
(118) 569
17 (18)
48
16 (23)
(87) 74
(23) 12
8
(81) 52
27 1,298 (31)
(48) (866)

16th Street E

Meridian Avenue E

SITE

94th Avenue E

24th Street E

(1)
(0) 0
0 (1)
(0) 0
176 (163)
1
75 (148)
(1) 0
(226) 147
143
12 0 (109)
(37) 5
(14) (0)

98th Ave E

(70)
(1,297) 35
67 (52)
(157) 564
87 (58)
95
58 (56)
(143) 140
(94) 62
32
125 1,011 (58)
(165) 143
(144) (775)

(70)
(39) 74
78 (46)
(39) 1
215 (229)
38
0 (0)
(39) 63
(309) 264
0
1 1 (4)
(0) 0
1 (0)
(1)

KEY

XX   Morning Peak Hour Volume
(XX)   Afternoon Peak Hour Volume

⋈   Traffic Signal

●| Stop Sign

*Note: ★ = No traffic control device.
Assume vehicles stop on the minor leg*

**Northwood Elementary
School Replacement**

Figure 5
**Forecast 2019 Without-Project Traffic Volumes
Morning and Afternoon Peak Hours**

heffron
transportation inc

01.02.17

3.3. Traffic Operations

3.3.1. Off-Site Study-Area Intersections

Levels of service for study area intersections were calculated for the 2019-without-project background conditions using the methodology described previously. Table 4 shows the results of the level of service analysis; results for the 2016 existing conditions are included for comparison.

As shown, the assumed growth in background traffic (including pipeline development and the assumed 2% compound annual growth) is forecast to result in increased delays at all study area intersections during both study time periods. However, the signalized intersections would continue to operate at LOS D or better, meeting the City's minimum LOS standard. However, it is noted that some movements, such as left turns from 24th Street E to Meridian Avenue E may operate below LOS D or E. All movements at the 24th Street E/94th Avenue E intersection are forecast to operate at LOS D or better during both peak hours in 2019 without the project.

Table 4. Level of Service – Background Off-Site Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)			
	Existing (2016)		2019 w/o Project		Existing (2016)		2019 w/o Project	
Signalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay
Meridian Ave S (SR 161) / 8th St E	C	28.4	C	33.7	n/a [3]		n/a [3]	
Meridian Ave S (SR 161) / 16th St E	A	8.4	B	10.2	B	11.8	B	14.4
Meridian Ave S (SR 161) / 24th St E	C	23.5	C	30.9	C	28.9	D	37.7
Two-Way Stop Controlled Intersection	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
24th St E / 94th Ave E (overall)	A	2.9	A	3.8	A	3.3	A	4.4
Eastbound Left Turns	A	0.0	A	0.0	A	7.6	A	7.7
Westbound Left Turns	A	7.6	A	7.8	A	8.0	A	8.4
Northbound Movements	A	9.9	B	10.7	B	11.4	B	13.6
Southbound Movements (dwy)	A	9.0	A	9.3	C	16.7	D	27.9

Source: Heffron Transportation, January, 2017.

1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*
3. *n/a = Not applicable. This intersection is not evaluated for the afternoon dismissal peak hour.*

3.3.2. Site Access Operations & Queuing

Future operations at the site access driveway were also evaluated and are presented in Table 5. As shown, the forecast growth in background traffic volumes on 24th Street E is expected to degrade access operations to LOS B overall in the morning and LOS C overall in the afternoon. Southbound turns from the site driveway are forecast to degrade to LOS E in the morning and LOS F in the afternoon.

Table 5. Level of Service – Background Site Access Conditions

Two-Way Stop Controlled Intersection	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)			
	Existing (2016)		2019 w/o Project		Existing (2016)		2019 w/o Project	
	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay
24th St E / 98th Ave E / School Dwy (overall)	A	7.8	B	11.6	A	9.0	C	16.6
Eastbound Left Turns	A	7.9	A	8.3	A	7.9	A	8.3
Westbound Left Turns	A	0.0	A	0.0	A	0.0	A	0.0
Northbound Movements	B	14.5	C	19.2	B	10.6	B	12.2
Southbound Movements	C	19.9	E	41.1	C	22.5	F	54.5

Source: Heffron Transportation, January, 2017.

1.   *LOS = Level of service.*
2.   *Delay = Average seconds of delay per vehicle.*

On-site queuing conditions related to family drivers waiting for afternoon dismissal are not anticipated to change noticeably for the future without-project conditions. However, the outbound queue for vehicles leaving the site may be increased due to additional delays for those turning left.

4.   FUTURE WITH PROJECT CONDITIONS

This section describes the conditions that would exist with the proposed new Northwood Elementary School at its enrollment capacity of 730 students. Potential impacts to study-area traffic operations, site access, queuing, transit, safety, non-motorized facilities, and parking were evaluated. In addition, analysis of special event conditions and construction were examined. The following sections describe the methodology used to determine the proposed project's impacts.

4.1.   Traffic Volumes

The proposed project is expected to generate new trips on the surrounding transportation network. With the enrollment capacity increase from 436 students to the proposed capacity of 730 students, the school is expected to generate an increase in morning and afternoon peak hour traffic compared to existing conditions. The following describes the assumptions used to estimate the potential net increases in traffic during the key analysis periods.

4.1.1.   School Trip Generation Rates

Peak hour trip generation for the school was determined using rates developed from counts performed at the existing Northwood Elementary School on Tuesday, November 29, 2016. The trip results and trip rates are summarized in Table 6. The average rates published in the Institute of Transportation Engineers' [ITE] *Trip Generation Manual*[18] for Elementary Schools (Land Use Code 520) are shown for comparison. The morning arrival and afternoon dismissal peak hour rates observed at Northwood Elementary are somewhat higher than the average published ITE rates. It is noted that these rates reflect all trips generated by the school including student pick-up/drop-offs, school bus trips, parent trips, teacher/staff trips, and visitors.

---

18   ITE, 9th Edition, 2012.

Table 6. Estimated Vehicle Trips Generated by the Proposed Project

School/Reporting Period	Enrollment [1] & Time Period	Number of Trips			Trip Rate (trips/student)			ITE Rates For Comparison
		In	Out	Total	In	Out	Total	
Northwood Elementary	**429 Students**							
Morning Arrival Peak Hour	8:00 – 9:00 A.M.	141	112	253	56%	44%	0.59	0.45 trips/student
Afternoon Dismissal Peak Hour	2:45 – 3:45 P.M.	84	108	192	44%	56%	0.45	0.28 trips/student

Source: Number of trips is based on traffic counts performed at school's driveway on Tuesday, November 29, 2016.

1. *Enrollment in Fall 2016 provided by Puyallup School District.*

4.1.2. Trip Generation Estimates for Replacement School

Table 7 summarizes the forecast trip generation for the existing and proposed replacement Northwood Elementary School based upon the calculated rates described above. It reflects the planned increase in capacity from 436 to 730 students. As shown, the project is forecast to result in net increases of 175 morning arrival peak hour trips and 130 afternoon dismissal peak hour trips.

Table 7. Northwood Elementary School Replacement – Trip Generation Summary

Site Condition	Capacity (students)	Morning Peak Hour (8:00 to 9:00 A.M.)			Afternoon Peak Hour (2:45 to 3:45 P.M.)		
		In	Out	Total	In	Out	Total
Proposed Replacement	730	240	190	430	142	183	325
Existing School	436	142	113	255	85	110	195
Net Change	**294**	**98**	**77**	**175**	**57**	**73**	**130**

Source: Heffron Transportation, Inc., November 2016.

4.1.3. Trip Distribution and Assignment

Separate project trip distribution patterns and assignments were developed for the morning and afternoon peak hours to reflect typical patterns of some family drivers linking trips with work trips. The trip distribution patterns were based on a combination of sources including traffic flow patterns derived from new counts taken in November 2016, the overall residential density within the existing enrollment area for Northwood Elementary School, and planned increases in residential homes within the enrollment area.

The current enrollment boundary for Northwood Elementary has about two-thirds of its area extending southwest of the school to N Levee Road E on the south and about 70th Avenue E to the west. The remaining third of the area surrounds the school site and extends northeast to 8th Street E on the north and 122nd Avenue E on the east. It is recognized that attendance areas are subject to review by the Boundary Review Committee and ultimately the Puyallup School Board. Current planning indicates most planned growth in Edgewood is in the Northwood attendance area, which may indicate boundary changes for Northwood Elementary School would be minor. However, any changes will not be known until late 2018. The resulting total project trip distribution patterns and assignments for the morning arrival and afternoon dismissal peak hours are shown on Figure 6.
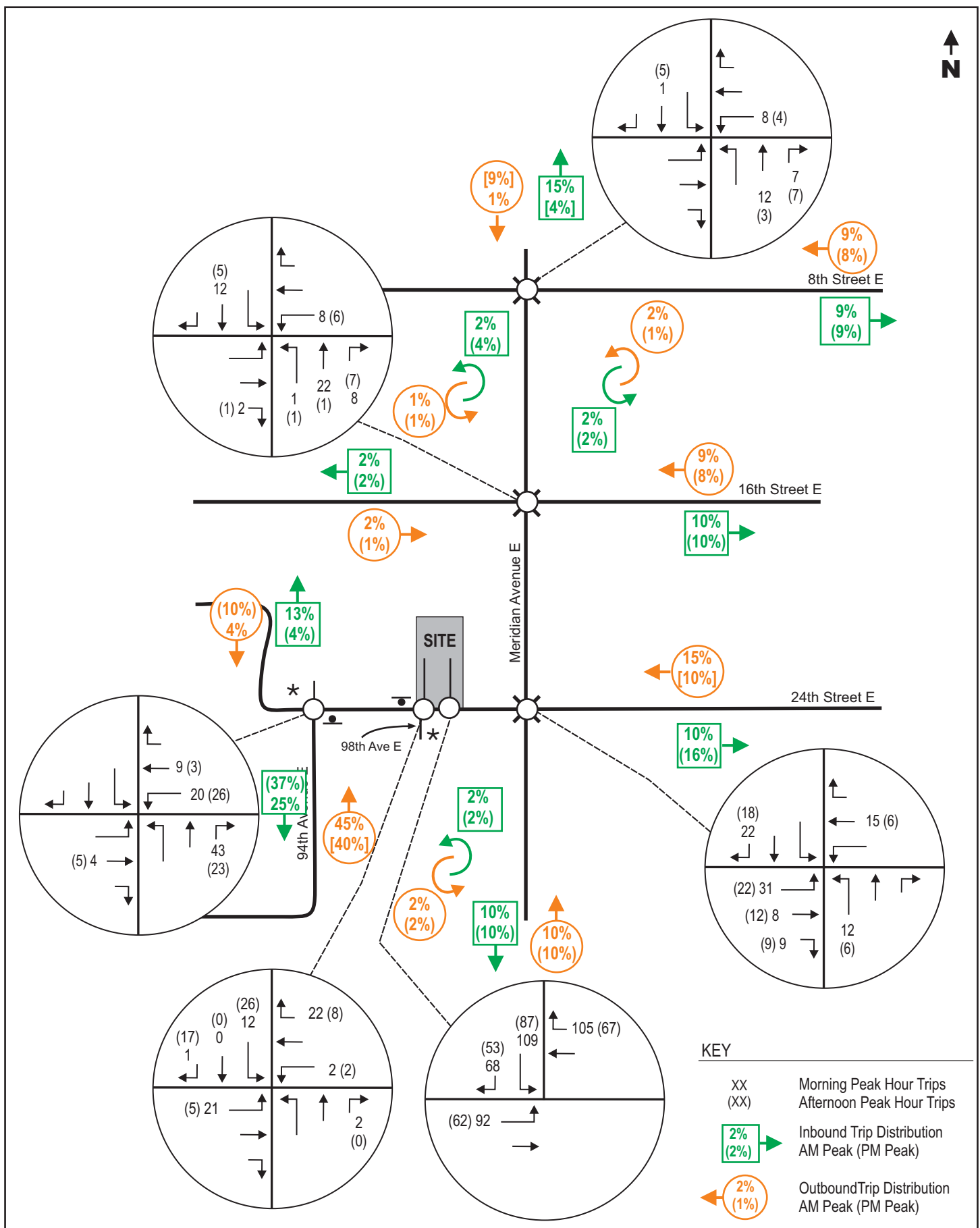
Northwood Elementary School Replacement

Figure 6
**Project Trip Distribution & Assignment
Morning and Afternoon Peak Hours**

heffron
transportation inc

N

8th Street E

16th Street E

24th Street E

Meridian Avenue E

SITE

98th Ave E

94th Ave E

KEY

XX	Morning Peak Hour Trips
(XX)	Afternoon Peak Hour Trips

2% / (2%) → Inbound Trip Distribution AM Peak (PM Peak)

2% / (1%) ← Outbound Trip Distribution AM Peak (PM Peak)

01.02.17

4.1.1. Forecast With-Project Traffic Volumes

To estimate 2019 traffic volumes with the proposed project, the project trips were added to the 2019 without-project volumes described and presented previously. Forecast 2019 with-project volumes for morning and afternoon peak hours are shown on Figure 7.

4.2. Traffic Operations

4.2.1. Off-Site Study-Area Intersections

Intersection levels of service for future with-project conditions at the off-site intersections were determined using the same methodology described previously. Table 8 summarizes forecast 2019-with-project levels of service; the without-project results are shown for comparison. As shown, the school project is expected to add some delay to the off-site study-area intersections; however, all four are expected to continue operating at without-project levels—LOS D or better—with the proposed Northwood Elementary School project during both peak hours.

Table 8. Level of Service – Future (2019) With-Project Off-Site Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)			
	2019 w/o Project		2019 with Project		2019 w/o Project		2019 with Project	
Signalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay
Meridian Ave S (SR 161) / 8th St E	C	33.7	C	34.1	n/a [3]		n/a [3]	
Meridian Ave S (SR 161) / 16th St E	B	10.2	B	10.4	B	14.4	B	14.5
Meridian Ave S (SR 161) / 24th St E	C	30.9	C	33.9	D	37.7	D	41.8
Two-Way-Stop-Controlled Intersection	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
24th St E / 94th Ave E (overall)	A	3.8	A	4.4	A	4.4	A	5.0
Eastbound Left Turns	A	0.0	A	0.0	A	7.7	A	7.7
Westbound Left Turns	A	7.8	A	7.8	A	8.4	A	8.6
Northbound Movements	B	10.7	B	11.2	B	13.6	B	14.5
Southbound Movements	A	9.3	A	9.4	D	27.9	D	34.0

Source: Heffron Transportation, January, 2017.

1.   LOS = Level of service.

2.   Delay = Average seconds of delay per vehicle.

3.   n/a = Not applicable. This intersection is not evaluated for the afternoon dismissal peak hour.

Figure 7
Forecast 2019 With-Project Traffic Volumes
Morning and Afternoon Peak Hours

Northwood Elementary School Replacement

8th Street E

16th Street E

24th Street E

Meridian Avenue E

94th Avenue E

98th Ave E

SITE

Afternoon peak period not evaluated due to limited project trips through intersection

KEY

| | XX | Morning Peak Hour Volume |
| ← | (XX) | Afternoon Peak Hour Volume |

⌗   Traffic Signal

•| Stop Sign

Note: ★ = No traffic control device.
Assume vehicles stop on the minor leg

heffron transportation inc

01.02.17
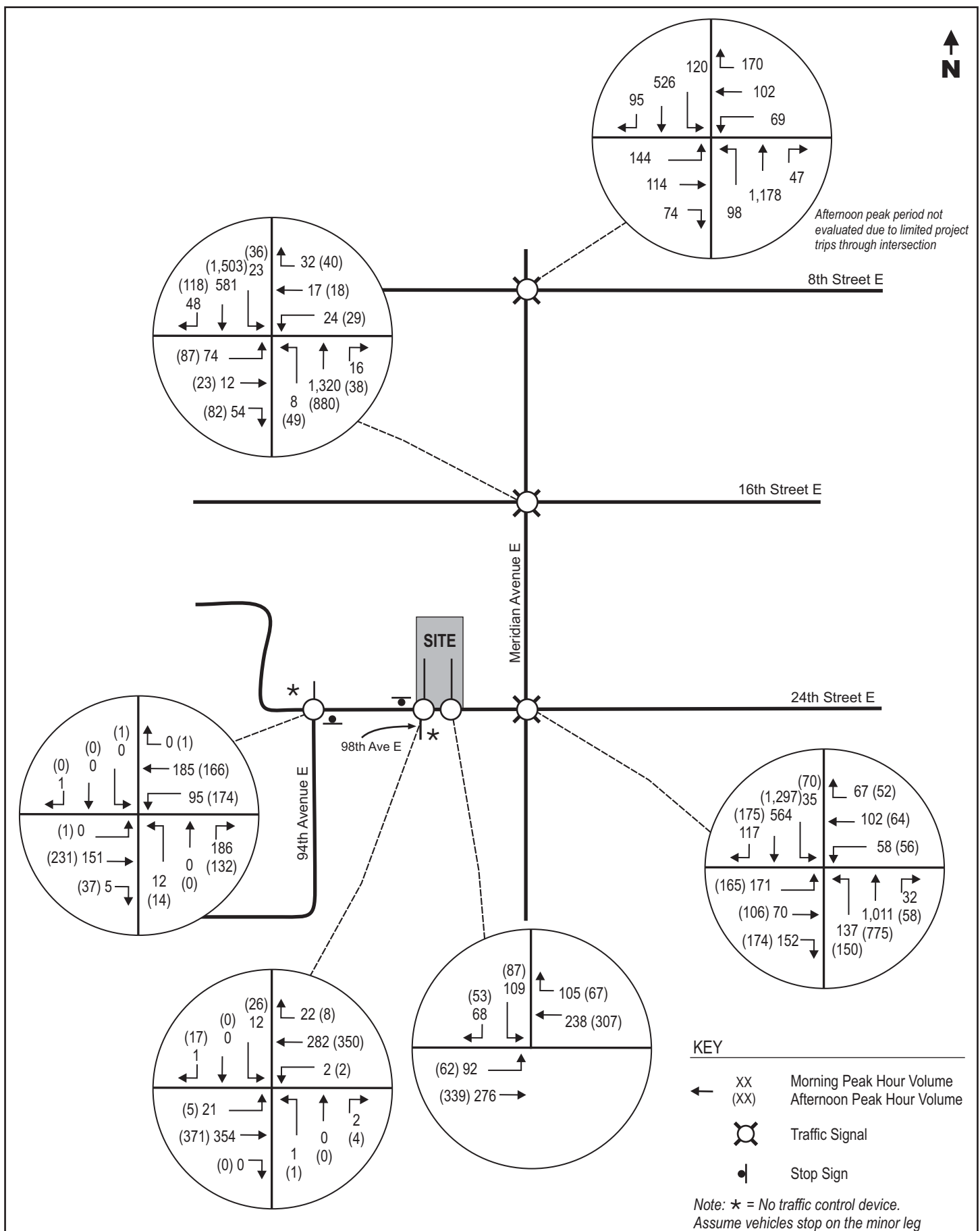
4.2.2. Site Access Operations & Queuing

Channelization Needs

The need for left-turn lanes at the site driveways on 24th Street E was evaluated using two methods. First, the method preferred by Pierce County and outlined in Highway Research Record (HRR) 211 *Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections*[19] was applied. This methodology is used to assess the need for left-turn lanes on streets or highways where left-turning drivers must yield to oncoming traffic. With this methodology, the left-turn lane is warranted if there is a high probability that left-turning vehicles would unduly delay vehicles approaching from the same direction as the left turn. The methodology is based on the relationship of advancing volume, opposing volume, and left-turn percentages at an unsignalized intersection.

To evaluate the warrants, the advancing volume, opposing volume, and left-turn percentages were compared to the applicable charts in the appendix of *HRR 211*. *HRR 211* provides specific curves for design speeds of 40 mph and above, and for left turn percentages up to 40%. Therefore, it reflects a conservative analysis tool for 24th Street E, which has a posted speed limit of 35 mph and school zone speed limit of 20 mph. Table 9 summarizes the turning volumes and analysis results for the two access intersections. As shown, the highest volume of left-turns is expected to occur at the proposed new easternmost access driveway on 24th Street E (where passenger-vehicle access and egress would be consolidated). Smaller numbers of left turns are expected during peak hours at the western access driveway that would be designated for school buses and staff only. The eastern (main access) driveway would meet warrants for left-turn storage of 75-feet during both the morning arrival and afternoon dismissal peak hours in 2019 with the project. The analysis charts are attached in Appendix D.

Table 9. Northwood Elementary Replacement Project – Left-Turn Lane Analysis Summary

Peak Period / Location	Left-turn Volume	Advancing Volume [a]	% Lefts	Opposing Volume [b]	Turn Lane Warranted?
Morning Peak Hour					
Left to School Bus/Staff Driveway (West)	21	375	5.6%	306	No [c]
Left to Main Access Driveway (East)	92	368	25%	343	Yes [d]
Afternoon Peak Hour					
Left to School Bus/Staff Driveway (West)	5	376	1.3%	360	No [e]
Left to Main Access Driveway (East)	62	401	15.5%	374	Yes [f]

Source: *Heffron Transportation, Inc. (Jan. 2017) using HRR 211 – Aspects of Traffic Control Devices, Highway Research Board, 1967.*
a.   *Advancing Volume = Total of left-turning, through-, and right-turning vehicles.*
b.   *Opposing Volume = Total of vehicles in opposing lane.*
c.   *Applied HRR 211 Figure 2 (40 mph roadway and conditions with left turns of 5% of advancing traffic).*
d.   *HRR 211 provides curves for conditions with left turns of 20% and 30% of advancing traffic on 40 mph roadways (Figures 5 & 6). An estimated curve for left turns at 25% of advancing traffic was interpolated and applied for this evaluation.*
e.   *Applied HRR 211 Figure 2 (40 mph roadway and conditions with left turns of 5% of advancing traffic).*
f.   *Applied HRR 211 Figure 4 (40 mph roadway and conditions with left turns of 15% of advancing traffic).*

In addition to the HRR 211 charts, the channelization requirements for the school driveways were also evaluated using guidance in section 1310.03(2)(a) of WSDOT's *Design Manual* (July 2016). The manual states:

---

[19] Highway Research Board, 1967.

heffron
transportation inc

> *At unsignalized intersections, use the following as a guide to determine whether or not to provide one-way left-turn lanes:*
>
> - *A traffic analysis indicates congestion reduction with a left-turn lane. On two-lane highways, use Exhibit 1310-7a, based on total traffic volume (DHV) for both directions and percent left- turn traffic, to determine whether further investigation is needed.*
>
> - *A study indicates crash reduction with a left-turn lane.*
>
> - *Restrictive geometrics require left-turning vehicles to slow greatly below the speed of the through traffic.*
>
> - *There is less than decision sight distance for traffic approaching a vehicle stopped at the intersection to make a left turn.*
>
> *A traffic analysis based on the Highway Capacity Manual (HCM) may also be used to determine whether left-turn lanes are needed to maintain the desired level of service.*

Exhibit 1310-7a – Left-Turn Storage Guidelines: Two-Lane, Unsignalized from the WSDOT *Design Manual* was used together with the forecast 2019 morning arrival and afternoon dismissal peak hour traffic volumes on 24th Street E as described above. The warrant exhibit only provides guidance for roadways with posted speed limits of 40 mph or higher; therefore, the lowest (40 mph) curve was applied. As shown on the attached warrant evaluation sheet, the forecast-with-project traffic volumes and the resulting left-turn percentages at the eastern access driveway would fall above the warrant curves for both peak hour conditions. Therefore, the WSDOT guidelines also indicate left-turn storage is needed to accommodate the left-turning traffic at that access. The WSDOT guidance also indicates that left-turn storage would not be needed at the western school-bus staff access driveway.

The exact design and limits of the widening on 24th Street E for the left-turn storage should be coordinated with City of Edgewood staff based on the various existing constraints including: nearby wetlands; available right-of-way; topographical constraints; and planned future improvements that may be incorporated into the future 100th Avenue E grid street project. However, for planning purposes, the following provides estimates of the potential channelization.

Exhibit 1310-8a – Left-Turn Storage Length: Two-Lane, Unsignalized (40 mph) from the WSDOT *Design Manual* was used to determine a potential storage length for the left-turn lane at the eastern (main) access driveway. As shown on the attached evaluation sheet, the morning arrival peak hour volumes indicate a storage length of 100 feet would be appropriate. The analysis charts are attached in Appendix D.

Based on the two methods (HRR 211 and WSDOT Design Manual), left-turn storage of 75 to 100 feet is recommended. Widening of 24th Street E would also be required to accommodate transitions and taper lengths. Taper lengths may vary based on jurisdiction preferences. However, the WSDOT recommended taper ratio for a 35-mph roadway is 35:1 (taper length to width of left-turn lane on departure side of centerline per *Exhibit 1310-10a – Median Channelization: Widening* from the WSDOT *Design Manual*). Assuming the center left-turn storage lane is 12-feet wide (6 feet on each side of the centerline), the taper length could be as long as 210 feet ($35 \times 6 = 210$). A shadow taper (also assumed to be 210 feet in length) could be required west of the access roadway. In addition, to help facilitate left-turns out of the site, a short center acceleration storage area (about 50 feet) is recommended to accommodate two-stage left-turns from the east driveway. Therefore, the total widening of 24th Street E to accommodate the left-turn lane could extend between 580 and 605 feet (assuming 210 feet for the transition and taper east of the access driveway, 75 to 100 feet for storage, 35 feet to accommodate the width of the access driveway, 50 feet for eastbound acceleration storage, and 210 feet for the taper west of the access driveway). These lengths may need to be adjusted based on noted constraints.

The segment of 24th Street E where the school driveways are planned is straight and flat. No sight-line obstructions (either horizontal curves or vertical curves) would interfere with sight-distance for drivers turning to or from the driveways in either direction.

Access Operations

With-project operations at the site access driveways were evaluated reflecting the recommended channelization from the previous section. There are two residential developments planned on the north side of 24th Street E to the west within walking distance of the site and it is possible that the replacement school could generate some additional pedestrian or bicycle trips. In addition, the larger school is expected to require additional school buses. Therefore, the potential increases in pedestrian crossing activity and school buses have been accounted for in the operations analyses of the site access intersections. The results are presented in Table 10.

As shown, operations at the west access driveway (serving school buses and some staff trips) are projected to operate at LOS A overall and all movements are forecast at LOS D or better. The new east access that would serve the main parking lot and the pick-up/drop-off loop is also forecast to operate at LOS A overall during both periods with the recommended channelization. During both analysis periods, the southbound left-turn movement would operate at LOS D and the southbound right-turn movement would operate at LOS B. It is acknowledged that operations could be worse for left-turns out of the site, if drivers are unwilling to use the center acceleration area for two-stage left-turns to eastbound 24th Street E. It is likely that there would be some congestion leaving the site for about 20 minutes twice each school day—during morning arrival and afternoon dismissal.

Table 10. Level of Service – Future (2019) With-Project Site Access Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)			
	2019 w/o Project		2019 with Project		2019 w/o Project		2019 with Project	
Two-Way-Stop-Controlled Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay
24th St E / West School Dwy (overall)	B	11.6	A	1.5	C	16.6	A	3.1
Eastbound Left Turns	A	8.3	A	8.4	A	8.3	A	9.6
Westbound Left Turns	A	0.0	A	8.2	A	0.0	A	8.1
Northbound Movements	C	19.2	B	13.4	B	12.2	B	12.2
Southbound Movements	E	41.1	D	27.5	F	54.5	C	21.9
24th St E / East School Dwy (overall)	n/a [4]		A	8.2	n/a [4]		A	7.1
Eastbound Left Turns			A	8.4			A	8.3
Southbound Left Turns			D	29.6			D	25.3
Southbound Right-Turns			B	11.7			B	12.0

Source: Heffron Transportation, January, 2017.

1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*
3. *Driveway does not exist for without-project conditions.*

On-Site Queuing Conditions

Peak queuing conditions are expected to increase with the larger school capacity. In the mornings, school drop-off activities usually occur with limited queues or delay. This is because arrivals tend to be

spread out over the 20 to 30 minutes before school start time. During this period, family drivers generally arrive, drop off students, and then immediately leave the site. In the afternoons, many drivers arrive early and wait in the queue lane(s) or parking spaces for the students to be dismissed, and longer vehicle queues can develop.

The morning arrival queue can be modeled directly using Poisson arrival methodologies for a multi-channel service system (i.e., the number of drop-off spaces that can be used simultaneously). Assumptions documented from queuing data collection at Bellevue School District schools were used for this analysis.[20] This includes the assumption that it takes about 15 seconds for students to exit a vehicle while at the drop-off location space and the entire morning arrival time for a school occurs within 20 minutes. This equates to a service rate for each drop-off space of 4 vehicles per minute (80 vehicles in 20 minutes or a rate of 240 vehicles per hour). For the Northwood Elementary School Replacement, the total estimated morning arrival peak hour volume is 240 vehicles (as presented in the *Trip Generation* section); however, 197 are forecast to arrive at the main load/unload area. To account for the compressed 20-minute arrival period, the arrival rate for the model is three times this level or 591 vehicles per hour.

Students could be dropped off anywhere along the load/unload zone shown on the site plan (see Figure 2), which allows 26 spaces to be used at one time. However, to provide an analysis of potential worst-case conditions, a range of 10 to 15 spaces was evaluated to estimate both the average and 95th-percentile queues for the drop-off area closest to the building. Table 11 presents the estimated queues for the assumed drop-off spaces at the proposed school during the morning arrival. As shown, the estimated morning arrival queue is expected be accommodated on-site and is not expected to exceed the available load/unload zone capacity. The queue model calculation results are included in Appendix D.

Table 11. Estimated Morning Arrival Vehicle Queues

Vehicles Served Simultaneously	Average Queue	95th Percentile Queue	Exceeds On-Site Vehicle Capacity?
10 vehicles	2 vehicles	5 vehicles	No
15 vehicles	2 vehicles	5 vehicles	No

Source: *Heffron Transportation, Inc., January 2017, using service rate assumptions based on observations included in the* Enatai Elementary School Traffic Impact Analysis, *(Gibson Traffic Consultants, August 2014).*

Although the queue analysis and estimation model is reasonable for application to morning arrival queues, the afternoon queueing conditions are different. Family drivers arrive prior to school dismissal during a time when no vehicles are being loaded (or serviced). In addition, students arrive at their family vehicles at different rates, so the service times per vehicle are different than during morning arrival. Therefore, on-site vehicle queue estimates during afternoon school dismissal were based on observations at the existing Northwood Elementary and at a Puyallup School District elementary school with enrollment similar to that proposed for Northwood.

Based on observations at the existing school and adjusting proportionally based on enrollment (730 proposed future compared to 429 existing), the maximum afternoon queue demand is estimated at about 105 vehicles. For comparison, afternoon dismissal queues were observed on Wednesday, January 4, 2017 at Edgerton Elementary School,[21] which currently has enrollment of 740 students in K-6 and 33 students in pre-K. Based on those observations, the peak number of vehicles observed just before dismissal was 110 (including 45 in the main pick-up queue, about 60 waiting within the parking lot, and about 5 on

---

[20]   Gibson Traffic Consultants, Enatai Elementary School Traffic Impact Analysis, August 2014.
[21]   Located at 16528-127th Avenue Court E in Puyallup.

surrounding streets). Based on these observations, the estimated afternoon vehicle demand estimate of 105 vehicles is a reasonable approximation for the larger Northwood Elementary Replacement.

The on-site passenger-vehicle load/unload loop would provide space for 26 vehicles to load/unload simultaneously and the proposed new main access driveway is roughly long enough (about 800 feet to the first load/unload space) to accommodate about 40 vehicles before spilling back onto 24th Street E. Combined, the site proposes a total queuing length of about 1,320 linear feet. Planning research and guidance from several sources suggest providing on-site queue stacking of between 1.2 and 2.0 feet per student.[22] In addition, the main visitor lot is expected to have between 35 and 40 parking spaces available in the late afternoon where family drivers can park and wait for students. Finally, during the peak few minutes around dismissal, there are typically some vehicles circulating within the drive aisles of the parking lot. In total, the site could accommodate between 100 and 120 vehicles on-site without spilling onto 24th Street E, which would meet the demand expected and would fall at the upper end of the referenced guidance.

It is acknowledged that some fluctuation in volumes and queuing activities are common as they can be affected by weather, special events, and unfamiliarity with drop-off/pick-up procedures at the beginning of each school year. It is noted that family drivers with younger students are more likely to park their vehicles and walk their children to and from the school.

4.3. Transit Facilities & Service

It is possible that some transit trips could be generated by teachers or staff at the site. However, the nearest transit stops are about ¼ mile away and the number of added transit trips is likely to be very small. School bus transportation would continue to be provided to those students that qualify. The project is not expected to result in adverse impacts to transit.

4.4. Non-Motorized Transportation Facilities

The project would construct a new walkway along its frontage on the north side of 24th Street E. The larger school may attract some additional pedestrian and bicycle trips within the local site vicinity, particularly from the planned new residential development located immediately to the west. Prior to opening of the replacement school, the District should review and identify any changes to walk routes, crosswalk locations, and/or crossing guard locations.

4.5. Parking

4.5.1. School Day Parking

As described previously, school-day parking at elementary schools is primarily driven by staffing levels and family-volunteer activity. The District estimates that Northwood Elementary School could have up to 61 employees with the school at its planned capacity of 730 students. Using the parking rate derived specifically for Northwood Elementary, the larger replacement school is projected to have a midday parking demand of about 71 vehicles, which is likely to occur midday when teachers, administrative staff, kitchen staff, and volunteers are typically on site. The proposed on-site parking supply of 110 spaces is expected to accommodate typical midday peak parking demand.

---

[22] Keith B. Higgins, PE, TE – Hatch Mott MacDonald, *Retooling School Drop-off/Pick-up Zones to Meet Demand,* WesternITE Meeting Paper 9C, 2010.

4.5.2. Evening Event Parking

Similar to the existing school, the Northwood Elementary School Replacement would have common spaces and a gymnasium that are expected to be used for occasional evening and/or weekend events at the school. The types of events typically held at the school include the following.

- **Large School Events** – Typically occur about once per month or once every other month. The largest events occur two or three times per year and usually include: Curriculum Night/Open House, Holiday Boutique, musical concerts or talent shows, and STEM or science fairs and showcases. Some of the larger events have staggered arrivals and not all attendees are on site at once, while others have fixed start and end times and all attendees are on site simultaneously.

- **PTA (or other) Meetings** – There are commonly one or two smaller PTA events per month that usually occur in the library. Typically, attendance ranges from about 30 to 100 people.

- **Community Use** – The site may be scheduled for use by community groups (e.g. Cub Scouts, Boy Scouts, Brownies, etc.) or recreational sports on the playfield or in the gymnasium. Community-use events usually have smaller attendance levels of 10 to 50 people, but may occur more frequently.

For evening events, the on-site parking supply of 110 spaces would be available. Room for another 26 parked vehicles would exist in the family-vehicle load/unload zone and another 20 parked vehicles in the school-bus load/unload zone, bringing the on-site total to 156 spaces for evening or weekend events.

For larger evening events, there are typically between 3.0 and 3.5 persons attending for each parked vehicle. This rate accounts for higher levels of carpooling (families and students in a single vehicle) as well as drop-off activity that does not generate parked vehicles. At these rates, the on-site parking supply could accommodate events with attendance of between 465 and 545 persons. If event parking demand exceeds these levels or if larger attendance levels are expected, it may be necessary to modify the event to reduce total peak demand. For example, curriculum night could be separated into two nights based on grade levels.

4.6. Construction Traffic

The existing school will continue to operate on the site while the new school is being constructed. This will require careful coordination to make sure that construction activities do not affect school loading/unloading and parking operations when school is in session.

The District should require the selected contractor to develop a construction management plan (CMP) that addresses traffic and pedestrian control during school construction. It should define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CMP should identify parking locations for the construction staff; to the extent possible, construction employee parking should be contained on-site.

4.7. Long-Term Conditions

As described previously the City of Edgewood is working to implement its *Meridian Avenue Corridor Projects*, which are identified in the *Edgewood 2035 Comprehensive Plan*. Near the project site, planned improvements include new grid streets along the along the alignments of 20th Street E (Project W-3) and 100th Avenue E (Project W-4).

Since the alignment of the planned new segment of 100th Avenue E (Project W-4) falls along the eastern edge of the northern portion of the school site, the Puyallup School District has been coordinating with the City to determine right-of-way dedication requirements. It is expected that the two projects would be constructed by either the City (if and when all necessary right-of-way is acquired) or by other adjacent land owners as part of re-development of their properties.

The City of Edgewood recommended the District design team explore options to provide access, egress, or both from the planned new 100th Avenue E. Options for this access configuration were examined; however, the school's site layout was designed to ensure access will function at opening in 2019 and to provide the maximize amount of on-site queue capacity to avoid overspill to City roadways. The on-site circulation and travel paths have been arranged to maximize on-site efficiency and reduce or eliminate conflicts among and between modes (school buses, passenger vehicles, and staff). Therefore, the District and its design team believe the site plan presented provides the best opportunity to meet District project objective based on programming and site constraints. Once the City's new grid streets (particularly 100th Avenue E) are complete, site access to the new replacement Northwood Elementary School could be modified to allow for service/delivery vehicle access onto the new 100th Avenue E at the north end of the school site. A future pedestrian connection to 100th Avenue E is also planned; the exact design and location will be coordinated with City staff.

5. FINDINGS AND RECOMMENDATIONS

5.1. Findings of Needed Improvement

Based on the analysis presented, no improvements would be required at off-site intersections to accommodate the proposed Northwood Elementary School Replacement project. However, improvements to 24th Street E along the site frontage, consisting of left-turn storage of 75 to 100 feet, are recommended at the east access driveway. Widening of 24th Street E would be required to accommodate transitions and tapers in both directions. The exact design and limits of the widening on 24th Street E for the left-turn storage should be coordinated with City of Edgewood staff based on the various existing constraints including: nearby wetlands; available right-of-way; topographical constraints; and planned future improvements that may be incorporated into the future 100th Avenue E grid street project.

5.2. Proposed Mitigation Recommendations

The following measures are recommended to reduce and minimize transportation-related impacts from the school replacement project.

A. Prior to opening of the replacement school, the District should review and identify any changes to walk routes, crosswalk locations, and/or crossing guard locations.

B. The school should develop a transportation and parking management plan to minimize the traffic and parking impacts associated with large events. The plan should identify locations for event parking (e.g. bus or passenger call load/unload zones) and ensure that all parking areas are open and available during large events. If large events are anticipated to generate demand that would exceed the on-site event parking supply, the school should examine ways to reduce the demand and event attendance (e.g. through splitting events based on grade levels).

C. The District should require the selected contractor to develop a construction management plan (CMP) that addresses traffic and pedestrian control during school construction. It should define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CMP should identify parking locations for the construction staff; to the extent possible, construction employee parking should be contained on-site.

5.3. Transportation Impact Fee Estimate

The City of Edgewood collects traffic impact fees for new development. Based on rates published for Elementary Schools (Land Use 520) in *Exhibit A from City of Edgewood Ordinance 15-0438,*[23] the impact fee rate for this project would be $274 per student of added capacity. Based on this rate and the proposal to increase school capacity by 294 students (from 436 to 730), the estimated impact fee would be $80,556. The City also collects a 5% administrative fee at the time of impact fee payment, which would add $4,028 to the total. However, the project would likely be eligible for credit against this fee per the Edgewood Municipal Code Section 4.30.100.A, which states:

---

[23] Adopted 4/28/2015; effective 5/4/2015.

heffron
transportation inc

An applicant shall be entitled to a credit against the applicable traffic impact fee collected under the fee schedule adopted by the ordinance codified in this chapter for the value of any dedication of land for, improvement to, or new construction of, any system improvements provided by the applicant, to facilities that are:

1. *Included within the six-year transportation improvement program and identified as system improvements that are to be funded in part by traffic impact fees; and*

2. *At suitable sites and constructed at an acceptable quality as determined by the city; and*

3. *Completed, dedicated, or otherwise transferred to the city prior to the determination and award of a credit as set forth in this section.*

The dedication of right-of-way for the new 100th Avenue E arterial segment may meet these requirements at the time of building permit and impact fee collection. Therefore, the costs of the right-of-way may be credited against the traffic impact fee amount.

It should be noted that traffic impact fees are due and payable before the building permit is issued by the City based on the fee rates in effect at that time. According to City code, claims for credit are processed by the City using whichever of the following options is selected by the applicant:

1. Claims for credits that are submitted prior to, or with, an application for a building permit for which an impact fee will be due will be processed by the City before payment of the impact fee is due in order to allow any credit authorized by the City to reduce the amount of the impact fee; or

2. Claims for credits that are submitted no later than 30 days after the issuance of a building permit for which an impact fee is due shall be processed by the City after the impact fee is paid in full, and any credit authorized by the City will be refunded to the applicant within 90 days of receipt of the claim for credit.

Claims for credits that are submitted more than six months after the issuance of a building permit for which an impact fee is due are deemed to be waived and shall be denied.

APPENDIX A
Turn Movement Count Data Sheets

MERIDIAN AVE E (SR 161)
MILTON WAY

idax

Date: Tue, Nov 29, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 7:00 AM to 8:00 AM

Peak Hour

N

MERIDIAN AVE E (SR 161)

471 1,282
66 369 36 0

8TH ST E

0 133
216
117 TEV: 2,065 97 274
PHF: 0.96
215 45 44 101
53 0

MILTON WAY

0 53 1,032 20

466 1,105

MERIDIAN AVE E (SR 161)

	HV %:	PHF
EB	4.7%	0.93
WB	4.4%	0.91
NB	4.2%	0.93
SB	3.4%	0.90
TOTAL	4.1%	0.96

0
0
0 0
0 2
0
2
0

Two-and-a-Half-Hour Count Summaries

Interval Start	MILTON WAY Eastbound				8TH ST E Westbound				MERIDIAN AVE E (SR 161) Northbound				MERIDIAN AVE E (SR 161) Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	32	4	17	0	17	22	36	0	14	258	4	0	10	81	17	512	0
7:15 AM	0	25	13	9	0	7	15	43	0	14	257	1	0	7	78	21	490	0
7:30 AM	0	32	9	16	0	9	28	23	0	7	285	5	0	7	105	14	540	0
7:45 AM	0	28	19	11	0	11	32	31	0	18	232	10	0	12	105	14	523	2,065
Peak Hour	0	117	45	53	0	44	97	133	0	53	1,032	20	0	36	369	66	2,065	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	2	10	6	19	0	0	0	0	0	0	0	0	1	1
7:15 AM	2	3	10	4	19	0	0	0	0	0	2	0	0	0	2
7:30 AM	6	2	12	4	24	0	0	0	0	0	0	0	0	1	1
7:45 AM	1	5	14	2	22	0	0	0	0	0	0	0	0	0	0
Peak Hour	10	12	46	16	84	0	0	0	0	0	2	0	0	2	4

Two-and-a-Half-Hour Count Summaries

Interval Start	MILTON WAY				8TH ST E				MERIDIAN AVE E (SR 161)				MERIDIAN AVE E (SR 161)				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	32	4	17	0	17	22	36	0	14	258	4	0	10	81	17	512	0
7:15 AM	0	25	13	9	0	7	15	43	0	14	257	1	0	7	78	21	490	0
7:30 AM	0	32	9	16	0	9	28	23	0	7	285	5	0	7	105	14	540	0
7:45 AM	0	28	19	11	0	11	32	31	0	18	232	10	0	12	105	14	523	2,065
8:00 AM	0	22	23	11	0	8	23	31	0	14	223	6	1	13	92	19	486	2,039
8:15 AM	0	25	25	17	0	10	25	49	0	20	214	9	0	48	54	11	507	2,056
8:30 AM	0	31	17	15	0	16	20	44	0	12	195	7	0	21	96	20	494	2,010
8:45 AM	0	23	42	13	0	19	27	31	0	20	173	12	0	26	94	15	495	1,982
9:00 AM	0	30	24	12	0	40	44	31	0	23	146	10	0	22	103	15	500	1,996
9:15 AM	0	41	11	20	0	16	23	21	0	15	163	3	0	14	91	5	423	1,912
Count Total	0	289	187	141	0	153	259	340	0	157	2,146	67	1	180	899	151	4,970	0
Peak Hour	0	117	45	53	0	44	97	133	0	53	1,032	20	0	36	369	66	2,065	0

Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	2	10	6	19	0	0	0	0	0	0	0	0	1	1
7:15 AM	2	3	10	4	19	0	0	0	0	0	2	0	0	0	2
7:30 AM	6	2	12	4	24	0	0	0	0	0	0	0	0	1	1
7:45 AM	1	5	14	2	22	0	0	0	0	0	0	0	0	0	0
8:00 AM	1	0	8	2	11	0	0	0	0	0	0	0	0	0	0
8:15 AM	2	0	13	3	18	0	0	0	0	0	1	0	1	1	3
8:30 AM	10	3	4	6	23	0	0	0	0	0	0	1	0	1	2
8:45 AM	9	6	10	4	29	0	0	0	1	1	2	0	0	2	4
9:00 AM	2	16	10	8	36	0	0	0	0	0	2	0	0	2	4
9:15 AM	1	6	6	5	18	0	0	0	0	0	0	0	0	1	1
Count Total	35	43	97	44	219	0	0	0	1	1	7	1	1	9	18
Peak Hour	10	12	46	16	84	0	0	0	0	0	2	0	0	2	4

MERIDIAN AVE E (SR 161)
57TH AVE NE (16TH ST E)

idax

N

Peak Hour

Date: Tue, Nov 29, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 7:00 AM to 8:00 AM

MERIDIAN AVE E (SR 161)

451 1,162

20 421 10 0

57TH AVE NE (16TH ST E)

0   34

65 38   23   63

TEV: 1,708
PHF: 0.94

70 7   6   29

25   0

TAYLOR ST

0 22 1,090 12

MERIDIAN AVE E (SR 161)

452 1,124

	HV % :	PHF
EB	1.4%	0.80
WB	3.2%	0.79
NB	4.4%	0.98
SB	3.5%	0.88
TOTAL	4.0%	0.94

Two-and-a-Half-Hour Count Summaries

Interval Start	TAYLOR ST				57TH AVE NE (16TH ST E)				MERIDIAN AVE E (SR 161)				MERIDIAN AVE E (SR 161)				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	8	1	4	0	0	7	9	0	5	264	3	0	4	101	5	411	0
7:15 AM	0	9	2	5	0	2	5	13	0	3	276	4	0	1	84	4	408	0
7:30 AM	0	12	1	9	0	2	6	10	0	11	276	1	0	1	123	4	456	0
7:45 AM	0	9	3	7	0	2	5	2	0	3	274	4	0	4	113	7	433	1,708
Peak Hour	0	38	7	25	0	6	23	34	0	22	1,090	12	0	10	421	20	1,708	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	10	5	16	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	11	3	14	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	2	12	3	17	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	17	5	22	0	0	0	0	0	0	0	0	0	0
Peak Hour	1	2	50	16	69	0	0	0	0	0	0	0	0	0	0

Two-and-a-Half-Hour Count Summaries

Interval Start	TAYLOR ST				57TH AVE NE (16TH ST E)				MERIDIAN AVE E (SR 161)				MERIDIAN AVE E (SR 161)				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	8	1	4	0	0	7	9	0	5	264	3	0	4	101	5	411	0
7:15 AM	0	9	2	5	0	2	5	13	0	3	276	4	0	1	84	4	408	0
7:30 AM	0	12	1	9	0	2	6	10	0	11	276	1	0	1	123	4	456	0
7:45 AM	0	9	3	7	0	2	5	2	0	3	274	4	0	4	113	7	433	1,708
8:00 AM	0	14	4	7	0	2	6	8	0	6	243	2	0	3	99	4	398	1,695
8:15 AM	0	12	2	11	0	3	5	9	0	6	244	2	0	1	72	1	368	1,655
8:30 AM	0	11	2	7	0	6	1	4	0	5	227	2	0	1	102	11	379	1,578
8:45 AM	0	17	3	20	0	4	4	5	0	7	200	2	0	10	100	11	383	1,528
9:00 AM	0	21	3	13	0	2	4	8	0	6	176	5	0	5	106	23	372	1,502
9:15 AM	0	8	5	15	0	1	4	10	0	7	176	1	0	7	110	9	353	1,487
Count Total	0	121	26	98	0	24	47	78	0	59	2,356	26	0	37	1,010	79	3,961	0
Peak Hour	0	38	7	25	0	6	23	34	0	22	1,090	12	0	10	421	20	1,708	0

Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	10	5	16	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	11	3	14	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	2	12	3	17	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	17	5	22	0	0	0	0	0	0	0	0	0	0
8:00 AM	1	0	8	4	13	0	0	0	0	0	2	0	0	0	2
8:15 AM	1	1	14	1	17	0	0	0	0	0	0	0	0	0	0
8:30 AM	3	0	10	4	17	0	0	0	0	0	2	0	2	1	5
8:45 AM	3	1	8	7	19	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	3	11	12	26	0	0	0	0	0	0	1	0	0	1
9:15 AM	2	2	6	2	12	0	0	0	0	0	1	0	3	0	4
Count Total	11	9	107	46	173	0	0	0	0	0	5	1	5	1	12
Peak Hour	1	2	50	16	69	0	0	0	0	0	0	0	0	0	0

Mark Skaggs: (425) 250-0777

mark.skaggs@idaxdata.com

MERIDIAN AVE E
TAYLOR ST

idax
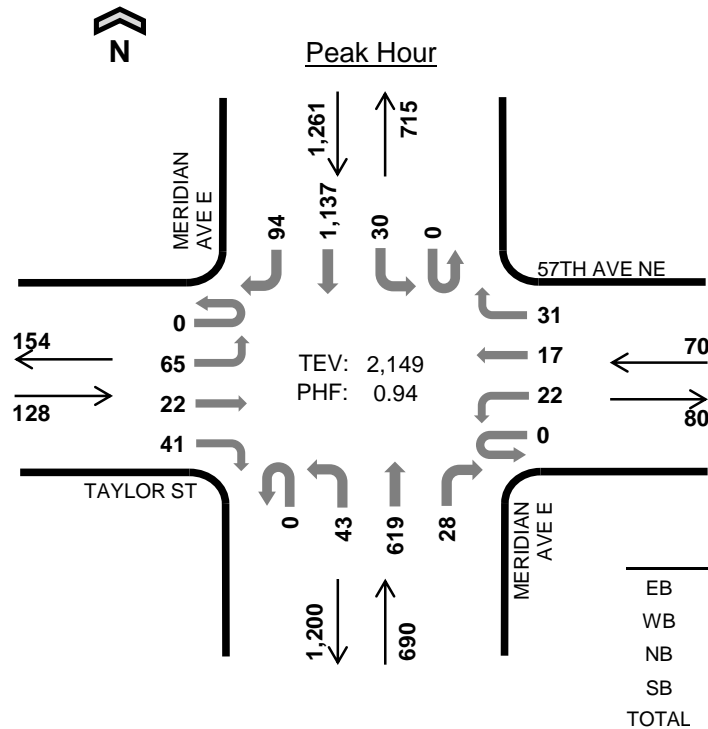
Date: Wed, Dec 07, 2016
Count Period: 2:00 PM to 4:00 PM
Peak Hour: 2:45 PM to 3:45 PM

Peak Hour

N

MERIDIAN AVE E

1,261
715
1,137
30
0
94

0
154
65
22
41

TEV: 2,149
PHF: 0.94

57TH AVE NE

31
17
22
0
70
80

0
43
619
28

MERIDIAN AVE E

1,200
690

TAYLOR ST

	HV %:	PHF
EB	3.9%	0.78
WB	5.7%	0.88
NB	4.1%	0.91
SB	3.6%	0.94
TOTAL	3.8%	0.94

Two-Hour Count Summaries

Interval Start	TAYLOR ST Eastbound				57TH AVE NE Westbound				MERIDIAN AVE E Northbound				MERIDIAN AVE E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:00 PM	0	7	1	2	0	4	1	6	1	6	139	6	0	4	159	13	349	0
2:15 PM	0	12	4	4	0	2	0	10	0	5	145	3	0	7	194	15	401	0
2:30 PM	0	9	3	10	0	2	2	8	0	4	145	2	0	13	248	16	462	0
2:45 PM	**0**	**19**	**7**	**15**	**0**	**4**	**5**	**7**	**0**	**11**	**148**	**10**	**0**	**7**	**256**	**22**	**511**	1,723
3:00 PM	**0**	**18**	**4**	**6**	**0**	**3**	**4**	**12**	**0**	**12**	**158**	**3**	**0**	**7**	**288**	**17**	**532**	1,906
3:15 PM	**0**	**14**	**3**	**8**	**0**	**5**	**5**	**5**	**0**	**8**	**139**	**11**	**0**	**9**	**291**	**34**	**532**	2,037
3:30 PM	**0**	**14**	**8**	**12**	**0**	**10**	**3**	**7**	**0**	**12**	**174**	**4**	**0**	**7**	**302**	**21**	**574**	**2,149**
3:45 PM	0	14	11	11	0	1	2	5	0	5	140	4	0	15	282	19	509	2,147
Count Total	0	107	41	68	0	31	22	60	1	63	1,188	43	0	69	2,020	157	3,870	0
Peak Hour	**0**	**65**	**22**	**41**	**0**	**22**	**17**	**31**	**0**	**43**	**619**	**28**	**0**	**30**	**1,137**	**94**	**2,149**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:00 PM	1	1	3	7	12	0	0	0	0	0	0	1	0	0	1
2:15 PM	2	1	5	11	19	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	2	5	10	17	0	0	0	0	0	0	0	0	0	0
2:45 PM	**2**	**1**	**6**	**10**	**19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**
3:00 PM	**2**	**2**	**10**	**17**	**31**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**
3:15 PM	**0**	**1**	**4**	**10**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**
3:30 PM	**1**	**0**	**8**	**8**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**
3:45 PM	0	1	4	12	17	0	0	0	0	0	0	0	0	0	0
Count Total	8	9	45	85	147	0	0	0	0	0	1	3	1	0	5
Peak Hour	**5**	**4**	**28**	**45**	**82**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**	**4**

MERIDIAN AVE E (SR 161)
24TH ST E

idax

Date: Tue, Nov 29, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 7:00 AM to 8:00 AM

Peak Hour

N

MERIDIAN AVE E (SR 161)

442 ↓ 1,125 ↑
24 392 ↓ 26 0 ↑

24TH ST E

0
189 ← 56 ← 109 ← 234
210 → 69 66 → 129
85 0

24TH ST E

0 56 1,010 ↑ 34
543 ↓ 1,100 ↑

MERIDIAN AVE E (SR 161)

TEV: 1,986
PHF: 0.97

	HV %:	PHF
EB	2.4%	0.85
WB	1.7%	0.73
NB	4.3%	0.94
SB	3.4%	0.83
TOTAL	3.6%	0.97

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				MERIDIAN AVE E (SR 161) Northbound				MERIDIAN AVE E (SR 161) Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	19	20	23	0	21	31	16	0	12	248	10	0	7	78	3	488	0
7:15 AM	0	12	23	23	0	21	39	20	0	7	247	7	0	9	91	5	504	0
7:30 AM	0	16	15	20	0	12	29	12	0	12	259	6	0	4	123	6	514	0
7:45 AM	0	9	11	19	0	12	10	11	0	25	256	11	0	6	100	10	480	1,986
Peak Hour	0	56	69	85	0	66	109	59	0	56	1,010	34	0	26	392	24	1,986	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	3	1	13	6	23	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	1	12	3	17	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	10	3	13	0	0	0	0	0	1	0	0	1	2
7:45 AM	1	2	12	3	18	0	0	0	0	0	0	0	0	0	0
Peak Hour	5	4	47	15	71	0	0	0	0	0	1	0	1	1	3

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				MERIDIAN AVE E (SR 161) Northbound				MERIDIAN AVE E (SR 161) Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	19	20	23	0	21	31	16	0	12	248	10	0	7	78	3	488	0
7:15 AM	0	12	23	23	0	21	39	20	0	7	247	7	0	9	91	5	504	0
7:30 AM	0	16	15	20	0	12	29	12	0	12	259	6	0	4	123	6	514	0
7:45 AM	0	9	11	19	0	12	10	11	0	25	256	11	0	6	100	10	480	1,986
8:00 AM	0	15	9	10	0	19	15	15	0	22	223	9	0	6	93	7	443	1,941
8:15 AM	0	15	10	18	0	9	25	8	0	24	215	7	0	4	64	7	406	1,843
8:30 AM	0	12	9	29	0	12	24	12	0	30	221	4	0	4	100	15	472	1,801
8:45 AM	0	33	22	39	0	12	10	12	0	19	176	6	0	7	96	6	438	1,759
9:00 AM	0	15	8	21	0	8	8	12	0	21	146	9	0	8	103	12	371	1,687
9:15 AM	0	12	9	24	0	10	8	10	0	18	155	5	0	9	104	6	370	1,651
Count Total	0	158	136	226	0	136	199	128	0	190	2,146	74	0	64	952	77	4,486	0
Peak Hour	0	56	69	85	0	66	109	59	0	56	1,010	34	0	26	392	24	1,986	0

Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	3	1	13	6	23	0	0	0	0	0	0	0	0	0	0
7:15 AM	1	1	12	3	17	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	10	3	13	0	0	0	0	0	1	0	0	1	2
7:45 AM	1	2	12	3	18	0	0	0	0	0	0	0	0	0	0
8:00 AM	2	4	14	3	23	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	1	13	2	17	0	0	0	0	0	0	0	0	0	0
8:30 AM	1	2	6	6	15	0	0	0	0	0	0	0	0	1	1
8:45 AM	10	4	4	7	25	0	0	0	0	0	0	0	1	0	1
9:00 AM	6	3	8	6	23	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	1	7	4	12	0	0	0	0	0	0	0	0	0	0
Count Total	25	19	99	43	186	0	0	0	0	0	1	0	2	2	5
Peak Hour	5	4	47	15	71	0	0	0	0	0	1	0	1	1	3

MERIDIAN AVE E (SR 161)
24TH ST E

idax

Date: Tue, Nov 29, 2016
Count Period: 2:00 PM to 4:00 PM
Peak Hour: 2:45 PM to 3:45 PM

N

Peak Hour

MERIDIAN AVE E (SR 161)

1,236
686
1,097
51
0
88

0
230
84
293
80
129

24TH ST E

TEV: 2,373
PHF: 0.95

24TH ST E

36
44
129
49
182
0

0
98
566
51
1,275
715

MERIDIAN AVE E (SR 161)

5
1
1
0
1
0
1

	HV %:	PHF
EB	5.1%	0.72
WB	3.1%	0.85
NB	3.2%	0.88
SB	3.6%	0.94
TOTAL	3.6%	0.95

Two-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				MERIDIAN AVE E (SR 161) Northbound				MERIDIAN AVE E (SR 161) Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:00 PM	0	17	11	18	0	23	9	17	0	24	105	7	0	14	174	20	439	0
2:15 PM	0	18	6	20	0	14	7	11	0	19	129	15	0	14	199	15	467	0
2:30 PM	0	18	18	18	0	12	21	8	0	26	125	13	0	13	212	24	508	0
2:45 PM	0	19	13	25	0	15	9	14	0	32	155	15	0	15	297	16	625	2,039
3:00 PM	0	15	17	31	0	9	13	8	0	24	130	14	0	13	250	24	548	2,148
3:15 PM	0	33	30	39	0	11	10	8	0	18	146	9	0	7	277	21	609	2,290
3:30 PM	0	17	20	34	0	14	12	6	0	24	135	13	0	16	273	27	591	2,373
3:45 PM	0	24	34	40	0	10	14	12	0	17	112	19	0	6	253	16	557	2,305
Count Total	0	161	149	225	0	108	95	84	0	184	1,037	105	0	98	1,935	163	4,344	0
Peak Hour	0	84	80	129	0	49	44	36	0	98	566	51	0	51	1,097	88	2,373	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:00 PM	2	7	4	4	17	0	0	0	0	0	0	0	1	0	1
2:15 PM	1	3	4	10	18	0	0	0	0	0	0	1	2	0	3
2:30 PM	4	5	9	11	29	0	0	0	0	0	0	0	1	0	1
2:45 PM	5	4	7	16	32	0	0	0	0	0	0	0	1	0	1
3:00 PM	3	0	9	6	18	1	1	1	5	8	0	0	0	0	0
3:15 PM	6	0	4	8	18	0	0	0	0	0	0	0	0	0	0
3:30 PM	1	0	3	14	18	0	0	0	0	0	0	1	0	0	1
3:45 PM	4	3	4	4	15	0	0	0	0	0	0	2	0	0	2
Count Total	26	22	44	73	165	1	1	1	5	8	0	4	5	0	9
Peak Hour	15	4	23	44	86	1	1	1	5	8	0	1	1	0	2

Mark Skaggs: (425) 250-0777

mark.skaggs@idaxdata.com

94TH AVE E
24TH ST E

idax

N

Peak Hour

Date: Tue, Nov 29, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 7:00 AM to 8:00 AM

DWY

1   1

0   0   1   0

0

0   24TH ST E

154   0   1

0   TEV: 393   129   167

103   97   PHF: 0.89   37   195

6   0

24TH ST E

0   25   0   97

94TH AVE E

43   122

	HV %:	PHF
EB	1.0%	0.92
WB	1.2%	0.91
NB	4.1%	0.78
SB	0.0%	0.25
TOTAL	2.0%	0.89

0
1
0   0
0
0
0

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				94TH AVE E Northbound				DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	28	0	0	11	32	0	0	6	0	33	0	0	0	0	110	0
7:15 AM	0	0	25	2	0	11	29	0	0	10	0	26	0	1	0	0	104	0
7:30 AM	0	0	24	0	0	5	40	1	0	5	0	23	0	0	0	0	98	0
7:45 AM	0	0	20	4	0	10	28	0	0	4	0	15	0	0	0	0	81	393
Peak Hour	0	0	97	6	0	37	129	1	0	25	0	97	0	1	0	0	393	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	5	0	6	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Peak Hour	1	2	5	0	8	0	0	0	0	0	0	0	1	0	1

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				94TH AVE E Northbound				DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	28	0	0	11	32	0	0	6	0	33	0	0	0	0	110	0
7:15 AM	0	0	25	2	0	11	29	0	0	10	0	26	0	1	0	0	104	0
7:30 AM	0	0	24	0	0	5	40	1	0	5	0	23	0	0	0	0	98	0
7:45 AM	0	0	20	4	0	10	28	0	0	4	0	15	0	0	0	0	81	393
8:00 AM	0	0	25	0	0	11	20	0	0	6	0	17	0	0	0	0	79	362
8:15 AM	0	0	24	4	0	12	29	0	0	3	0	20	0	0	0	1	93	351
8:30 AM	0	0	36	0	0	3	36	0	0	0	0	22	0	0	0	0	97	350
8:45 AM	0	0	36	1	0	9	38	0	0	2	0	20	0	0	0	0	106	375
9:00 AM	0	0	14	3	0	14	20	0	0	8	0	15	0	0	0	0	74	370
9:15 AM	0	0	24	3	0	6	19	0	0	1	0	19	0	0	0	0	72	349
Count Total	0	0	256	17	0	92	291	1	0	45	0	210	0	1	0	1	914	0
Peak Hour	0	0	97	6	0	37	129	1	0	25	0	97	0	1	0	0	393	0

Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	5	0	6	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
8:00 AM	2	2	1	0	5	0	0	0	0	0	0	0	0	0	0
8:15 AM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0
8:30 AM	1	2	3	0	6	0	0	0	0	0	0	0	0	0	0
8:45 AM	3	1	1	0	5	0	0	0	0	0	0	0	0	0	0
9:00 AM	3	1	1	0	5	0	0	0	0	0	0	0	0	0	0
9:15 AM	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0
Count Total	12	10	12	0	34	0	0	0	0	0	0	0	1	0	1
Peak Hour	1	2	5	0	8	0	0	0	0	0	0	0	1	0	1

94TH AVE E
24TH ST E

idax

Date: Tue, Nov 29, 2016
Count Period: 2:00 PM to 4:00 PM
Peak Hour: 3:00 PM to 4:00 PM

N

Peak Hour

DWY

24TH ST E

1
2
0 0 1 0

0
151
1
246 202
43

TEV: 534
PHF: 0.93

137
74
264
212

0
0
0

1

0

0

0

0

0

0

0

24TH ST E

0 14 0 61

117 75

94TH AVE E

	HV %:	PHF
EB	1.6%	0.82
WB	2.4%	0.77
NB	2.7%	0.89
SB	0.0%	0.25
TOTAL	2.1%	0.93

Two-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				94TH AVE E Northbound				DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:00 PM	0	0	22	0	0	20	16	0	0	3	0	15	0	0	0	0	76	0
2:15 PM	0	0	23	3	1	14	25	0	0	3	0	14	0	0	0	0	83	0
2:30 PM	0	0	33	3	0	25	27	0	0	6	0	16	0	1	0	0	111	0
2:45 PM	0	0	38	3	0	20	24	0	0	1	0	25	0	0	0	0	111	381
3:00 PM	**0**	**1**	**54**	**8**	**0**	**10**	**22**	**1**	**0**	**4**	**0**	**14**	**0**	**0**	**0**	**0**	**114**	**419**
3:15 PM	**0**	**0**	**44**	**12**	**0**	**25**	**44**	**0**	**0**	**4**	**0**	**11**	**0**	**1**	**0**	**0**	**141**	**477**
3:30 PM	**0**	**0**	**42**	**10**	**0**	**26**	**36**	**0**	**0**	**4**	**0**	**17**	**0**	**0**	**0**	**0**	**135**	**501**
3:45 PM	**0**	**0**	**62**	**13**	**0**	**13**	**35**	**0**	**0**	**2**	**0**	**19**	**0**	**0**	**0**	**0**	**144**	**534**
Count Total	0	1	318	52	1	153	229	1	0	27	0	131	0	2	0	0	915	0
Peak Hour	**0**	**1**	**202**	**43**	**0**	**74**	**137**	**1**	**0**	**14**	**0**	**61**	**0**	**1**	**0**	**0**	**534**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:00 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
2:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
2:30 PM	1	5	2	0	*8*	0	0	0	0	*0*	0	0	2	0	*2*
2:45 PM	2	3	5	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	**0**	**1**	**0**	**0**	*1*	**0**	**0**	**0**	**0**	*0*	**0**	**0**	**1**	**0**	*1*
3:15 PM	**2**	**2**	**0**	**0**	*4*	**0**	**0**	**0**	**0**	*0*	**0**	**0**	**0**	**0**	*0*
3:30 PM	**1**	**1**	**1**	**0**	*3*	**0**	**0**	**0**	**0**	*0*	**0**	**0**	**0**	**0**	*0*
3:45 PM	**1**	**1**	**1**	**0**	*3*	**0**	**0**	**0**	**0**	*0*	**0**	**0**	**0**	**0**	*0*
Count Total	7	14	9	0	*30*	0	0	0	0	*0*	0	0	3	0	*3*
Peak Hour	**4**	**5**	**2**	**0**	*11*	**0**	**0**	**0**	**0**	*0*	**0**	**0**	**1**	**0**	*1*

Mark Skaggs: (425) 250-0777   mark.skaggs@idaxdata.com

NORTHWOOD ELEM ACCESS
24TH ST E

idax
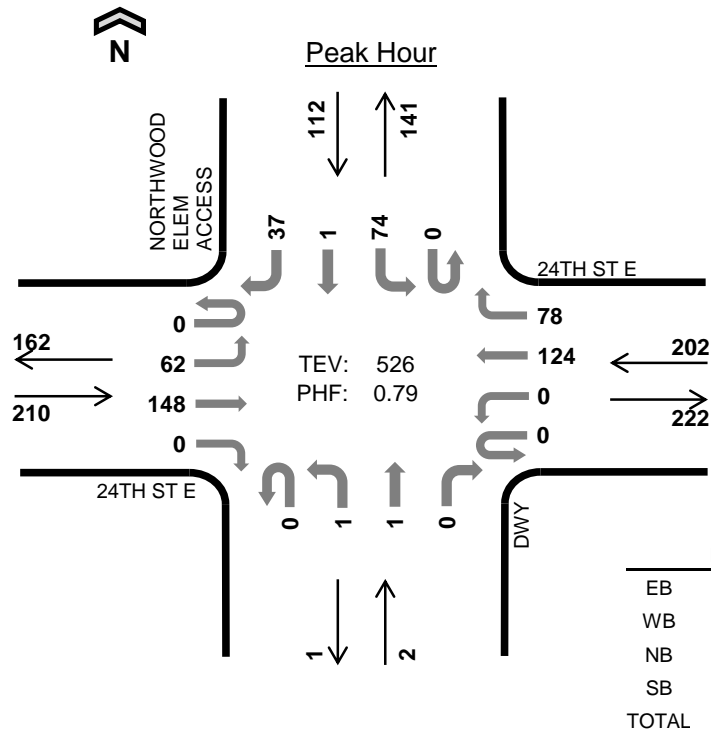
Date: Tue, Nov 29, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 8:00 AM to 9:00 AM

Peak Hour

N

NORTHWOOD ELEM ACCESS

112   141
37   1   74   0
162   0   78
62   TEV: 526   124   202
PHF: 0.79
210   148   0   222
0   0
24TH ST E   DWY
0   1   1   0
1   2

	HV %:	PHF
EB	3.8%	0.82
WB	5.9%	0.84
NB	0.0%	0.25
SB	7.1%	0.42
TOTAL	5.3%	0.79

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				DWY Northbound				NORTHWOOD ELEM ACCESS Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM	0	5	39	0	0	0	34	11	0	0	0	0	0	0	0	0	89	0
8:15 AM	0	16	31	0	0	0	35	17	0	0	0	0	0	12	0	9	120	0
8:30 AM	0	28	36	0	0	0	29	31	0	1	1	0	0	17	0	8	151	0
8:45 AM	0	13	42	0	0	0	26	19	0	0	0	0	0	45	1	20	166	526
Peak Hour	0	62	148	0	0	0	124	78	0	1	1	0	0	74	1	37	526	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:00 AM	2	2	0	0	4	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	3	0	2	5	0	0	1	0	1	0	0	0	0	0
8:30 AM	4	4	0	4	12	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	3	0	2	7	0	0	0	0	0	0	0	1	0	1
Peak Hour	8	12	0	8	28	0	0	1	0	1	0	0	1	0	1

Two-and-a-Half-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				DWY Northbound				NORTHWOOD ELEM ACCESS Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	67	0	0	0	47	1	0	0	0	1	0	0	0	0	116	0
7:15 AM	0	0	56	0	0	0	45	4	0	0	0	0	0	0	0	0	105	0
7:30 AM	0	0	54	0	0	0	43	5	0	1	0	0	0	0	0	0	103	0
7:45 AM	0	1	38	0	0	0	37	1	0	1	0	0	0	1	0	0	79	403
8:00 AM	**0**	**5**	**39**	**0**	**0**	**0**	**34**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**89**	**376**
8:15 AM	**0**	**16**	**31**	**0**	**0**	**0**	**35**	**17**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**9**	**120**	**391**
8:30 AM	**0**	**28**	**36**	**0**	**0**	**0**	**29**	**31**	**0**	**1**	**1**	**0**	**0**	**17**	**0**	**8**	**151**	**439**
8:45 AM	**0**	**13**	**42**	**0**	**0**	**0**	**26**	**19**	**0**	**0**	**0**	**0**	**0**	**45**	**1**	**20**	**166**	**526**
9:00 AM	0	2	31	0	0	0	35	4	0	0	0	0	0	6	0	2	80	517
9:15 AM	0	3	41	0	0	0	26	1	0	0	0	0	0	2	0	0	73	470
Count Total	0	68	435	0	0	0	357	94	0	3	1	1	0	83	1	39	1,082	0
Peak Hour	**0**	**62**	**148**	**0**	**0**	**0**	**124**	**78**	**0**	**1**	**1**	**0**	**0**	**74**	**1**	**37**	**526**	**0**

Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
8:00 AM	**2**	**2**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	**0**	**3**	**0**	**2**	**5**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
8:30 AM	**4**	**4**	**0**	**4**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	**2**	**3**	**0**	**2**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**
9:00 AM	2	1	0	1	4	0	0	0	0	0	1	0	0	0	1
9:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Count Total	15	16	0	9	40	0	0	1	0	1	1	0	2	0	3
Peak Hour	**8**	**12**	**0**	**8**	**28**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**1**

NORTHWOOD ELEM ACCESS
24TH ST E

idax

Date: Tue, Nov 29, 2016
Count Period: 2:00 PM to 4:00 PM
Peak Hour: 3:00 PM to 4:00 PM

Peak Hour

N

NORTHWOOD ELEM ACCESS

110   56
38   1   71   0

24TH ST E

0   33
221 ← 23   182 ← 215
TEV: 600
PHF: 0.79
270 → 246   0
321 →
1   0

24TH ST E   DWY

0   1   0   4

2   5
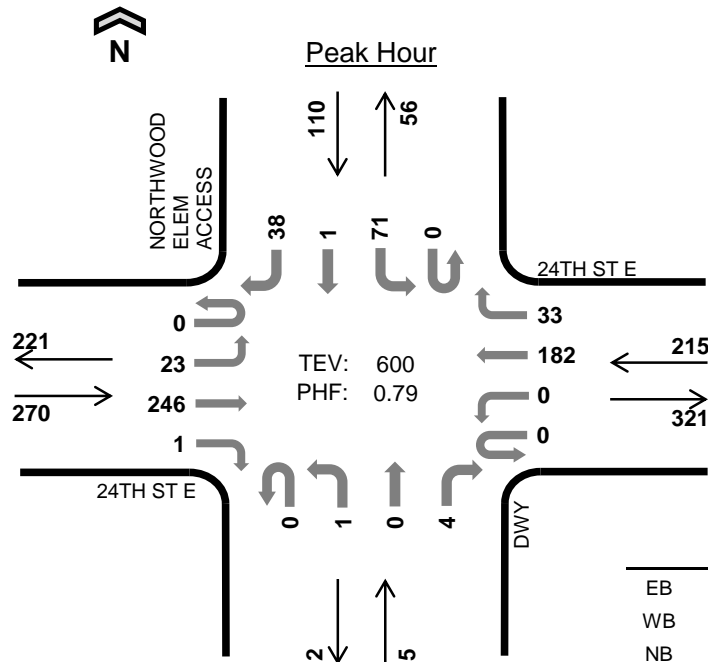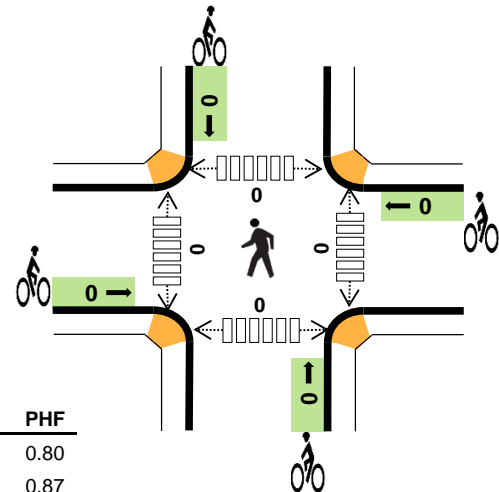
	HV % :	PHF
EB	3.3%	0.80
WB	2.8%	0.87
NB	0.0%	0.63
SB	7.3%	0.34
TOTAL	3.8%	0.79

Two-Hour Count Summaries

Interval Start	24TH ST E Eastbound				24TH ST E Westbound				DWY Northbound				NORTHWOOD ELEM ACCESS Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:00 PM	0	0	40	1	0	0	42	4	0	0	0	1	0	2	0	0	90	0
2:15 PM	0	4	35	0	0	0	39	0	0	0	0	0	0	2	0	1	81	0
2:30 PM	0	1	50	0	0	0	53	9	0	0	0	0	0	2	0	2	117	0
2:45 PM	0	16	49	0	0	0	44	12	0	0	0	1	0	2	0	0	124	412
3:00 PM	**0**	**16**	**51**	**0**	**0**	**0**	**33**	**29**	**0**	**0**	**0**	**1**	**0**	**7**	**0**	**3**	**140**	**462**
3:15 PM	**0**	**5**	**55**	**0**	**0**	**0**	**45**	**4**	**0**	**1**	**0**	**1**	**0**	**52**	**0**	**28**	**191**	**572**
3:30 PM	**0**	**2**	**57**	**0**	**0**	**0**	**56**	**0**	**0**	**0**	**0**	**1**	**0**	**8**	**1**	**7**	**132**	**587**
3:45 PM	**0**	**0**	**83**	**1**	**0**	**0**	**48**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**137**	**600**
Count Total	0	44	420	2	0	0	360	58	0	1	0	6	0	79	1	41	1,012	0
Peak Hour	**0**	**23**	**246**	**1**	**0**	**0**	**182**	**33**	**0**	**1**	**0**	**4**	**0**	**71**	**1**	**38**	**600**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:00 PM	0	3	0	1	*4*	0	0	0	0	*0*	0	1	1	1	*3*
2:15 PM	0	0	0	1	*1*	0	0	0	0	*0*	0	0	0	1	*1*
2:30 PM	2	6	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
2:45 PM	6	3	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	**4**	**5**	**0**	**2**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
3:15 PM	**2**	**0**	**0**	**6**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
3:30 PM	**1**	**1**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
3:45 PM	**2**	**0**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	17	18	0	10	*45*	0	0	0	0	*0*	0	1	1	2	*4*
Peak Hour	**9**	**6**	**0**	**8**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

APPENDIX B
Level of Service Definitions

Levels of service (LOS) are qualitative descriptions of traffic operating conditions. These levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. Levels of service for this analysis were developed using procedures presented in the *Highway Capacity Manual* (Transportation Research Board, 2010).

Level of service for signalized intersections is defined in terms of delay. Delay can be a cause of driver discomfort, frustration, inefficient fuel consumption, and lost travel time. Specifically, level of service criteria are stated in terms of the average delay per vehicle in seconds. Delay is a complex measure and is dependent on a number of variables including: the quality of progression, cycle length, green ratio, and a volume-to-capacity ratio for the lane group or approach in question. Table A-1 shows the level of service criteria for signalized intersections from the *Highway Capacity Manual.*

Table A-1. Level of Service Criteria

Level of Service	Average Delay Per Vehicle	General Description
A	Less than 10.0 Seconds	Free flow
B	10.1 to 20.0 seconds	Stable flow (slight delays)
C	20.1 to 35.0 seconds	Stable flow (acceptable delays)
D	35.1 to 55.0 seconds	Approaching unstable flow (tolerable delay—occasionally wait through more than one signal cycle before proceeding.
E	55.1 to 80.0 seconds	Unstable flow (approaching intolerable delay)
F	Greater than 80.0 seconds	Forced flow (jammed)

Source: Transportation Research Board, Highway Capacity Manual, 2010.

For unsignalized two-way-stop-controlled, all-way-stop-controlled, and roundabout intersections, level of service is based on the average delay per vehicle. The level of service for a two-way, stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. Delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. The delay at an all-way, stop-sign (AWSC) controlled intersection is based on saturation headways, departure headways, and service times. Delay at roundabouts is based on entry flow rates and flow rate capacity. Table A-2 shows the level of service criteria for unsignalized intersections from the *Highway Capacity Manual*.

Table A-2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Delay (seconds per vehicle)
A	Less than 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

Source: Transportation Research Board, Highway Capacity Manual, 2010.

heffron
transportation inc

APPENDIX C
Level of Service Calculation Sheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↱		↱	↑	↗	↰	↑↱		↰	↑↑	↗
Traffic Volume (vph)	101	107	56	53	95	155	66	805	34	108	336	65
Future Volume (vph)	101	107	56	53	95	155	66	805	34	108	336	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	270		0	200		65	300		0	185		220
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		1.00		0.99	1.00	1.00		1.00		0.98
Frt		0.948				0.850		0.994				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1671	1658	0	1752	1845	1568	1736	3446	0	1752	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1670	1658	0	1744	1845	1547	1733	3446	0	1748	3505	1533
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19				158		4				98
Link Speed (mph)		20			20			35			20	
Link Distance (ft)		439			627			2678			556	
Travel Time (s)		15.0			21.4			52.2			19.0	
Confl. Peds. (#/hr)	1		4	4		1	1		3	3		1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	8%	8%	8%	3%	3%	3%	4%	4%	4%	3%	3%	3%
Adj. Flow (vph)	103	109	57	54	97	158	67	821	35	110	343	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	166	0	54	97	158	67	856	0	110	343	66
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases						4						2
Detector Phase	8	8		4	4	4	1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0	10.0	6.0	10.0		6.0	10.0	10.0
Minimum Split (s)	30.0	30.0		36.0	36.0	36.0	20.0	50.0		22.6	50.0	50.0
Total Split (s)	25.0	25.0		31.0	31.0	31.0	15.0	46.4		17.6	49.0	49.0
Total Split (%)	20.8%	20.8%		25.8%	25.8%	25.8%	12.5%	38.7%		14.7%	40.8%	40.8%
Maximum Green (s)	20.4	20.4		26.4	26.4	26.4	10.4	41.5		13.0	44.1	44.1
Yellow Time (s)	3.6	3.6		3.6	3.6	3.6	3.6	3.9		3.6	3.9	3.9
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6		4.6	4.6	4.6	4.6	4.9		4.6	4.9	4.9
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		2.7	2.7	2.7	2.5	3.5		3.0	3.0	3.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0		0.2	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.0	10.0	10.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0		0.0	15.0	15.0
Recall Mode	None	None		None	None	None	None	Max		None	Max	Max
Walk Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)	18.0	18.0		25.0	25.0	25.0		15.0			17.0	17.0
Pedestrian Calls (#/hr)	0	0		0	0	0		0			0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	13.9	13.9		11.5	11.5	11.5	8.4	41.9		10.7	46.6	46.6
Actuated g/C Ratio	0.14	0.14		0.12	0.12	0.12	0.09	0.43		0.11	0.48	0.48
v/c Ratio	0.43	0.65		0.26	0.44	0.49	0.45	0.57		0.57	0.20	0.08
Control Delay	44.1	47.7		44.0	48.1	12.4	53.7	23.9		54.3	17.0	1.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	44.1	47.7		44.0	48.1	12.4	53.7	23.9		54.3	17.0	1.9
LOS	D	D		D	D	B	D	C		D	B	A
Approach Delay		46.4			29.1			26.0			23.0	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	58	85		31	57	0	39	199		64	63	0
Queue Length 95th (ft)	115	163		72	115	59	91	325		132	116	13
Internal Link Dist (ft)		359			547			2598			476	
Turn Bay Length (ft)	270			200		65	300			185		220
Base Capacity (vph)	354	366		481	506	539	187	1492		236	1686	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	0.29	0.45		0.11	0.19	0.29	0.36	0.57		0.47	0.20	0.08

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 96.8
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 28.4   Intersection LOS: C
Intersection Capacity Utilization 63.8%   ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Meridian Ave E (SR 161) & 8th St E

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟		↱	↟↟		↱	↟↟	
Traffic Volume (vph)	54	11	45	15	16	26	24	914	8	15	373	27
Future Volume (vph)	54	11	45	15	16	26	24	914	8	15	373	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99			1.00		1.00		
Frt		0.878			0.908			0.999			0.990	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1542	0	1736	1644	0	1736	3467	0	1736	3436	0
Flt Permitted	0.728			0.719			0.950			0.950		
Satd. Flow (perm)	1290	1542	0	1312	1644	0	1736	3467	0	1731	3436	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		47			27			1			9	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	2		1	1		2			4	4		
Confl. Bikes (#/hr)									1			
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 (%)	7%	7%	7%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	56	11	47	16	17	27	25	952	8	16	389	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	58	0	16	44	0	25	960	0	16	417	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	38.0	38.0		38.0	38.0		15.0	67.0		15.0	67.0	
Total Split (%)	31.7%	31.7%		31.7%	31.7%		12.5%	55.8%		12.5%	55.8%	
Maximum Green (s)	33.4	33.4		33.4	33.4		10.4	62.1		10.4	62.1	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	10.0	10.0		10.9	10.9		6.7	71.2		6.6	69.0	
Actuated g/C Ratio	0.11	0.11		0.12	0.12		0.07	0.79		0.07	0.77	
v/c Ratio	0.39	0.27		0.10	0.20		0.19	0.35		0.12	0.16	
Control Delay	45.9	18.2		38.0	22.3		44.2	4.7		42.9	4.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	45.9	18.2		38.0	22.3		44.2	4.7		42.9	4.6	
LOS	D	B		D	C		D	A		D	A	
Approach Delay		31.8			26.5			5.7			6.0	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	27	5		7	8		12	65		8	23	
Queue Length 95th (ft)	71	42		28	41		41	183		30	71	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	482	606		491	632		202	2753		202	2643	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.10		0.03	0.07		0.12	0.35		0.08	0.16	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 89.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.39
Intersection Signal Delay: 8.4   Intersection LOS: A
Intersection Capacity Utilization 43.5%   ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Traffic Volume (vph)	75	50	96	52	74	47	95	835	26	21	353	35
Future Volume (vph)	75	50	96	52	74	47	95	835	26	21	353	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99							
Frt		0.902			0.942			0.995			0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1603	0	1703	1680	0	1736	3454	0	1736	3423	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1701	1603	0	1701	1680	0	1736	3454	0	1736	3423	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		72			23			3			9	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1274			2535			555			2630	
Travel Time (s)		24.8			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1		1	1		1						
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	81	54	103	56	80	51	102	898	28	23	380	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	81	157	0	56	131	0	102	926	0	23	418	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	21.0	39.0		17.0	35.0		24.0	62.0		12.0	50.0	
Total Split (%)	16.2%	30.0%		13.1%	26.9%		18.5%	47.7%		9.2%	38.5%	
Maximum Green (s)	16.4	34.4		12.4	30.4		19.4	57.1		7.4	45.1	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	10.2	13.2		8.8	12.0		11.3	59.8		6.8	51.0	
Actuated g/C Ratio	0.10	0.14		0.09	0.12		0.12	0.61		0.07	0.52	
v/c Ratio	0.46	0.56		0.37	0.58		0.51	0.44		0.19	0.23	
Control Delay	53.3	31.6		52.8	46.1		52.8	13.8		52.5	16.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	53.3	31.6		52.8	46.1		52.8	13.8		52.5	16.6	
LOS	D	C		D	D		D	B		D	B	
Approach Delay		38.9			48.1			17.7			18.5	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)	48	49		33	64		60	141		14	79	
Queue Length 95th (ft)	107	123		82	137		127	306		44	145	
Internal Link Dist (ft)		1194			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	293	624		221	551		353	2116		134	1791	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.28	0.25		0.25	0.24		0.29	0.44		0.17	0.23	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 97.7
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 23.5   Intersection LOS: C
Intersection Capacity Utilization 58.5%   ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Ø1	Ø2		Ø3	Ø4
12 s	62 s		17 s	39 s

Ø5	Ø6		Ø7	Ø8
24 s	50 s		21 s	35 s

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	121	5	35	123	0	11	0	79	0	0	1
Future Vol, veh/h	0	121	5	35	123	0	11	0	79	0	0	1
Conflicting Peds, #/hr	1	0	0	0	0	1	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	85	85	85	84	84	84	98	98	98	25	25	25
Heavy Vehicles, %	6	6	6	4	4	4	6	6	6	0	0	0
Mvmt Flow	0	142	6	42	146	0	11	0	81	0	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	147	0	0	148	0	0	377	376	145	417	379	147
Stage 1	-	-	-	-	-	-	145	145	-	231	231	-
Stage 2	-	-	-	-	-	-	232	231	-	186	148	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.16	6.56	6.26	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Follow-up Hdwy	2.254	-	-	2.236	-	-	3.554	4.054	3.354	3.5	4	3.3
Pot Cap-1 Maneuver	1411	-	-	1421	-	-	573	549	892	550	556	905
Stage 1	-	-	-	-	-	-	848	769	-	776	717	-
Stage 2	-	-	-	-	-	-	762	706	-	820	779	-
Platoon blocked, %		-	-		-	-		-	-		-	-
Mov Cap-1 Maneuver	1411	-	-	1421	-	-	557	531	892	488	538	904
Mov Cap-2 Maneuver	-	-	-	-	-	-	557	531	-	488	538	-
Stage 1	-	-	-	-	-	-	848	769	-	775	694	-
Stage 2	-	-	-	-	-	-	734	683	-	746	779	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0		1.7		9.9		9	
HCM LOS					A		A	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	831	1411	-	-	1421	-	-	904
HCM Lane V/C Ratio	0.111	-	-	-	0.029	-	-	0.004
HCM Control Delay (s)	9.9	0	-	-	7.6	0	-	9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	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	62	148	0	0	124	78	1	1	0	74	1	37
Future Vol, veh/h	62	148	0	0	124	78	1	1	0	74	1	37
Conflicting Peds, #/hr	1	0	0	0	0	1	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	82	82	82	84	84	84	25	25	25	42	42	42
Heavy Vehicles, %	7	3	0	0	7	5	0	0	0	11	0	0
Mvmt Flow	76	180	0	0	148	93	4	4	0	176	2	88

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	241	0	0	180	0	0	571	573	180	529	527	195
Stage 1	-	-	-	-	-	-	332	332	-	195	195	-
Stage 2	-	-	-	-	-	-	239	241	-	334	332	-
Critical Hdwy	4.17	-	-	4.1	-	-	7.1	6.5	6.2	7.21	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Follow-up Hdwy	2.263	-	-	2.2	-	-	3.5	4	3.3	3.599	4	3.3
Pot Cap-1 Maneuver	1297	-	-	1408	-	-	435	432	868	446	459	851
Stage 1	-	-	-	-	-	-	686	648	-	786	743	-
Stage 2	-	-	-	-	-	-	769	710	-	661	648	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1297	-	-	1408	-	-	369	404	868	420	429	850
Mov Cap-2 Maneuver	-	-	-	-	-	-	369	404	-	420	429	-
Stage 1	-	-	-	-	-	-	641	606	-	734	742	-
Stage 2	-	-	-	-	-	-	687	709	-	614	606	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	0	14.5	19.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	386	1297	-	-	1408	-	-	504
HCM Lane V/C Ratio	0.021	0.058	-	-	-	-	-	0.529
HCM Control Delay (s)	14.5	7.9	0	-	0	-	-	19.9
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	3.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↱		↱	↱		↱	↟↱		↱	↟↱	
Traffic Volume (vph)	65	22	74	22	17	31	43	619	28	30	1137	94
Future Volume (vph)	65	22	74	22	17	31	43	619	28	30	1137	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00	1.00		1.00	1.00	
Frt		0.884			0.903			0.993			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1615	0	1703	1605	0	1736	3443	0	1736	3426	0
Flt Permitted	0.724			0.647			0.950			0.950		
Satd. Flow (perm)	1321	1615	0	1160	1605	0	1734	3443	0	1734	3426	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		79			33			6			11	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	1				1		2		1	1		2
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	69	23	79	23	18	33	46	659	30	32	1210	100
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	102	0	23	51	0	46	689	0	32	1310	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	36.0	36.0		36.0	36.0		14.2	72.0		12.0	69.8	
Total Split (%)	30.0%	30.0%		30.0%	30.0%		11.8%	60.0%		10.0%	58.2%	
Maximum Green (s)	31.4	31.4		31.4	31.4		9.6	67.1		7.4	64.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.6	11.6		11.6	11.6		7.6	70.6		6.9	69.9	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.08	0.72		0.07	0.71	
v/c Ratio	0.45	0.39		0.17	0.24		0.35	0.28		0.27	0.54	
Control Delay	50.2	18.6		42.5	22.7		50.7	6.1		50.1	9.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.2	18.6		42.5	22.7		50.7	6.1		50.1	9.0	
LOS	D	B		D	C		D	A		D	A	
Approach Delay		31.3			28.9			8.9			10.0	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	42	13		13	10		28	80		19	200	
Queue Length 95th (ft)	86	62		38	45		66	125		51	315	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	421	569		370	534		169	2465		130	2429	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.18		0.06	0.10		0.27	0.28		0.25	0.54	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 98.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 11.8
Intersection Capacity Utilization 53.9%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service A

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

Ø1	Ø2		Ø4
14.2 s	69.8 s		36 s

Ø5	Ø6		Ø8
12 s	72 s		36 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↑ħ		↱	↑ħ		↱	↑↑ħ		↱	↑↑ħ	
Traffic Volume (vph)	84	80	129	49	44	36	98	566	51	51	1097	88
Future Volume (vph)	84	80	129	49	44	36	98	566	51	51	1097	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00				1.00	
Frt		0.907			0.932			0.988			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	1641	0	1752	1709	0	1752	3463	0	1736	3427	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1717	1641	0	1752	1709	0	1752	3463	0	1736	3427	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		58			29			10			8	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1274			2535			555			2630	
Travel Time (s)		24.8			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1					1	1					1
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 (%)	5%	5%	5%	3%	3%	3%	3%	3%	3%	4%	4%	4%
Adj. Flow (vph)	88	83	134	51	46	38	102	590	53	53	1143	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	88	217	0	51	84	0	102	643	0	53	1235	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	17.0	34.5		14.2	31.7		18.0	66.9		14.4	63.3	
Total Split (%)	13.1%	26.5%		10.9%	24.4%		13.8%	51.5%		11.1%	48.7%	
Maximum Green (s)	12.4	29.9		9.6	27.1		13.4	62.0		9.8	58.4	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	10.3	16.5		8.2	14.6		11.0	65.0		8.3	59.6	
Actuated g/C Ratio	0.09	0.15		0.07	0.13		0.10	0.58		0.07	0.53	
v/c Ratio	0.56	0.75		0.40	0.34		0.59	0.32		0.41	0.67	
Control Delay	65.2	49.7		62.5	35.2		65.2	15.1		62.7	23.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	65.2	49.7		62.5	35.2		65.2	15.1		62.7	23.6	
LOS	E	D		E	D		E	B		E	C	
Approach Delay		54.2			45.5			21.9			25.2	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	63	115		37	37		73	133		38	352	
Queue Length 95th (ft)	126	202		84	87		141	208		85	520	
Internal Link Dist (ft)		1194			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	193	488		153	443		213	2020		154	1834	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.46	0.44		0.33	0.19		0.48	0.32		0.34	0.67	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 111.6
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 28.9   Intersection LOS: C
Intersection Capacity Utilization 71.3%   ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Intersection

Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		♣			♣			♣			♣	
Traffic Vol, veh/h	1	178	35	81	126	1	13	0	67	1	0	0
Future Vol, veh/h	1	178	35	81	126	1	13	0	67	1	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	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	84	84	84	75	75	75	77	77	77	25	25	25
Heavy Vehicles, %	2	2	2	3	3	3	8	8	8	0	0	0
Mvmt Flow	1	212	42	108	168	1	17	0	87	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	170	0	0	254	0	0	620	621	233	665	642	170
Stage 1	-	-	-	-	-	-	235	235	-	386	386	-
Stage 2	-	-	-	-	-	-	385	386	-	279	256	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.18	6.58	6.28	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.572	4.072	3.372	3.5	4	3.3
Pot Cap-1 Maneuver	1407	-	-	1305	-	-	392	396	791	376	395	879
Stage 1	-	-	-	-	-	-	755	699	-	641	614	-
Stage 2	-	-	-	-	-	-	626	600	-	732	699	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1407	-	-	1305	-	-	364	359	791	311	358	878
Mov Cap-2 Maneuver	-	-	-	-	-	-	364	359	-	311	358	-
Stage 1	-	-	-	-	-	-	754	698	-	640	558	-
Stage 2	-	-	-	-	-	-	569	545	-	651	698	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.1	11.4	16.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	664	1407	-	-	1305	-	-	311
HCM Lane V/C Ratio	0.156	0.001	-	-	0.083	-	-	0.013
HCM Control Delay (s)	11.4	7.6	0	-	8	0	-	16.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.6	0	-	-	0.3	-	-	0

Intersection												
Int Delay, s/veh	9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⟐			⟐			⟐			⟐	
Traffic Vol, veh/h	39	212	0	0	178	45	1	0	4	69	1	38
Future Vol, veh/h	39	212	0	0	178	45	1	0	4	69	1	38
Conflicting Peds, #/hr	1	0	0	0	0	1	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	94	94	94	90	90	90	63	63	63	34	34	34
Heavy Vehicles, %	8	5	0	0	2	11	0	0	0	7	0	8
Mvmt Flow	41	226	0	0	198	50	2	0	6	203	3	112

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	249	0	0	226	0	0	589	558	226	536	533	224
Stage 1	-	-	-	-	-	-	309	309	-	224	224	-
Stage 2	-	-	-	-	-	-	280	249	-	312	309	-
Critical Hdwy	4.18	-	-	4.1	-	-	7.1	6.5	6.2	7.17	6.5	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.17	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.17	5.5	-
Follow-up Hdwy	2.272	-	-	2.2	-	-	3.5	4	3.3	3.563	4	3.372
Pot Cap-1 Maneuver	1282	-	-	1354	-	-	423	441	818	448	456	801
Stage 1	-	-	-	-	-	-	705	663	-	767	722	-
Stage 2	-	-	-	-	-	-	731	704	-	688	663	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1282	-	-	1354	-	-	352	424	818	432	439	800
Mov Cap-2 Maneuver	-	-	-	-	-	-	352	424	-	432	439	-
Stage 1	-	-	-	-	-	-	679	638	-	738	721	-
Stage 2	-	-	-	-	-	-	626	703	-	657	638	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	1.2		0		10.6		22.5	
HCM LOS					B		C	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	647	1282	-	-	1354	-	-	516
HCM Lane V/C Ratio	0.012	0.032	-	-	-	-	-	0.616
HCM Control Delay (s)	10.6	7.9	0	-	0	-	-	22.5
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	4.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↱		↱	↑	↱	↱	↑↱		↱	↑↑	↱
Traffic Volume (vph)	144	114	74	61	102	170	98	1166	40	120	525	95
Future Volume (vph)	144	114	74	61	102	170	98	1166	40	120	525	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	270		0	200		65	300		0	185		220
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		1.00		0.99	1.00	1.00		1.00		0.98
Frt		0.941				0.850		0.995				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1671	1644	0	1752	1845	1568	1736	3451	0	1752	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1670	1644	0	1744	1845	1547	1733	3451	0	1750	3505	1533
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24				173		3				98
Link Speed (mph)		20			20			35			20	
Link Distance (ft)		439			627			2678			556	
Travel Time (s)		15.0			21.4			52.2			19.0	
Confl. Peds. (#/hr)	1		4	4		1	1		3	3		1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	8%	8%	8%	3%	3%	3%	4%	4%	4%	3%	3%	3%
Adj. Flow (vph)	147	116	76	62	104	173	100	1190	41	122	536	97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	192	0	62	104	173	100	1231	0	122	536	97
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases						4						2
Detector Phase	8	8		4	4	4	1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0	10.0	6.0	10.0		6.0	10.0	10.0
Minimum Split (s)	30.0	30.0		36.0	36.0	36.0	20.0	50.0		22.6	50.0	50.0
Total Split (s)	25.0	25.0		31.0	31.0	31.0	15.0	46.4		17.6	49.0	49.0
Total Split (%)	20.8%	20.8%		25.8%	25.8%	25.8%	12.5%	38.7%		14.7%	40.8%	40.8%
Maximum Green (s)	20.4	20.4		26.4	26.4	26.4	10.4	41.5		13.0	44.1	44.1
Yellow Time (s)	3.6	3.6		3.6	3.6	3.6	3.6	3.9		3.6	3.9	3.9
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6		4.6	4.6	4.6	4.6	4.9		4.6	4.9	4.9
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		2.7	2.7	2.7	2.5	3.5		3.0	3.0	3.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0		0.2	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.0	10.0	10.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0		0.0	15.0	15.0
Recall Mode	None	None		None	None	None	None	Max		None	Max	Max
Walk Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)	18.0	18.0		25.0	25.0	25.0		15.0			17.0	17.0
Pedestrian Calls (#/hr)	0	0		0	0	0		0			0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	15.3	15.3		12.2	12.2	12.2	9.4	42.5		11.3	44.4	44.4
Actuated g/C Ratio	0.15	0.15		0.12	0.12	0.12	0.09	0.42		0.11	0.44	0.44
v/c Ratio	0.58	0.71		0.29	0.46	0.51	0.62	0.84		0.62	0.34	0.13
Control Delay	49.4	50.5		45.1	49.1	12.1	62.4	33.6		58.1	20.3	4.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	49.4	50.5		45.1	49.1	12.1	62.4	33.6		58.1	20.3	4.7
LOS	D	D		D	D	B	E	C		E	C	A
Approach Delay		50.0			29.5			35.8			24.4	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	87	102		37	63	0	61	358		74	113	0
Queue Length 95th (ft)	161	188		80	122	60	#139	#593		147	186	32
Internal Link Dist (ft)		359			547			2598			476	
Turn Bay Length (ft)	270			200		65	300			185		220
Base Capacity (vph)	342	356		465	490	537	181	1467		229	1554	734
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	0.43	0.54		0.13	0.21	0.32	0.55	0.84		0.53	0.34	0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 100
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 33.7   Intersection LOS: C
Intersection Capacity Utilization 75.9%   ICU Level of Service D
Analysis Period (min) 15
\#   95th percentile volume exceeds capacity, queue may be longer.
    Queue shown is maximum after two cycles.

Splits and Phases: 1: Meridian Ave E (SR 161) & 8th St E

Ø1	Ø2		Ø4	Ø8
15 s	49 s		31 s	25 s

Ø5	Ø6
17.6 s	46.4 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	⬆		↱	⬆		↱	↑↑		↱	↑↑	
Traffic Volume (vph)	74	12	52	16	17	32	27	1298	8	23	569	48
Future Volume (vph)	74	12	52	16	17	32	27	1298	8	23	569	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99			1.00		1.00		
Frt		0.879			0.903			0.999			0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1544	0	1736	1634	0	1736	3467	0	1736	3429	0
Flt Permitted	0.724			0.713			0.950			0.950		
Satd. Flow (perm)	1282	1544	0	1301	1634	0	1736	3467	0	1733	3429	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		54			33			1			12	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	2		1	1		2			4	4		
Confl. Bikes (#/hr)									1			
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 (%)	7%	7%	7%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	77	13	54	17	18	33	28	1352	8	24	593	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	67	0	17	51	0	28	1360	0	24	643	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	36.0	36.0		36.0	36.0		11.4	72.7		11.3	72.6	
Total Split (%)	30.0%	30.0%		30.0%	30.0%		9.5%	60.6%		9.4%	60.5%	
Maximum Green (s)	31.4	31.4		31.4	31.4		6.8	67.8		6.7	67.7	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.2	11.2		12.0	12.0		6.4	75.7		6.4	73.5	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.07	0.78		0.07	0.76	
v/c Ratio	0.52	0.30		0.11	0.22		0.25	0.50		0.21	0.25	
Control Delay	54.1	18.6		40.4	22.1		50.9	7.1		50.0	5.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	54.1	18.6		40.4	22.1		50.9	7.1		50.0	5.7	
LOS	D	B		D	C		D	A		D	A	
Approach Delay		37.6			26.7			8.0			7.3	
Approach LOS		D			C			A			A	
Queue Length 50th (ft)	47	8		10	10		17	119		15	72	
Queue Length 95th (ft)	94	47		30	45		47	315		43	116	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	415	537		421	552		121	2701		120	2596	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.12		0.04	0.09		0.23	0.50		0.20	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 97.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 10.2   Intersection LOS: B
Intersection Capacity Utilization 55.2%   ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

Ø1	Ø2		Ø4
11.4 s	72.6 s		36 s

Ø5	Ø6		Ø8
11.3 s	72.7 s		36 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟		↰	↟↟↱		↰	↟↟↱	
Traffic Volume (vph)	140	62	143	58	87	67	125	1011	32	35	564	95
Future Volume (vph)	140	62	143	58	87	67	125	1011	32	35	564	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99							
Frt		0.895			0.935			0.995			0.978	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1589	0	1703	1666	0	1736	3454	0	1736	3395	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1701	1589	0	1701	1666	0	1736	3454	0	1736	3395	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		89			27			3			16	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1274			2535			555			2630	
Travel Time (s)		24.8			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1		1	1		1						
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	151	67	154	62	94	72	134	1087	34	38	606	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	151	221	0	62	166	0	134	1121	0	38	708	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	25.0	41.6		15.4	32.0		23.2	61.2		11.8	49.8	
Total Split (%)	19.2%	32.0%		11.8%	24.6%		17.8%	47.1%		9.1%	38.3%	
Maximum Green (s)	20.4	37.0		10.8	27.4		18.6	56.3		7.2	44.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	14.8	23.1		8.9	14.7		13.5	58.5		6.9	46.9	
Actuated g/C Ratio	0.14	0.21		0.08	0.14		0.12	0.54		0.06	0.43	
v/c Ratio	0.65	0.54		0.45	0.67		0.62	0.60		0.35	0.48	
Control Delay	60.1	28.8		61.6	52.1		60.1	21.6		62.4	25.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	60.1	28.8		61.6	52.1		60.1	21.6		62.4	25.1	
LOS	E	C		E	D		E	C		E	C	
Approach Delay		41.5			54.7			25.7			27.0	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	105	87		43	97		93	302		27	180	
Queue Length 95th (ft)	186	167		96	177		168	461		68	300	
Internal Link Dist (ft)		1194			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	324	606		171	445		301	1859		116	1471	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.47	0.36		0.36	0.37		0.45	0.60		0.33	0.48	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 108.8
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 30.9   Intersection LOS: C
Intersection Capacity Utilization 67.0%   ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Ø1	Ø2		Ø3	Ø4
11.8 s	61.2 s		15.4 s	41.6 s

Ø5	Ø6		Ø7	Ø8
23.2 s	49.8 s		25 s	32 s

Intersection

Int Delay, s/veh	3.8	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬥			⬥			⬥			⬥	
Traffic Vol, veh/h	0	147	5	75	176	0	12	0	143	0	0	1
Future Vol, veh/h	0	147	5	75	176	0	12	0	143	0	0	1
Conflicting Peds, #/hr	1	0	0	0	0	1	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	85	85	85	84	84	84	98	98	98	25	25	25
Heavy Vehicles, %	6	6	6	4	4	4	6	6	6	0	0	0
Mvmt Flow	0	173	6	89	210	0	12	0	146	0	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	211	0	0	179	0	0	566	565	176	638	568	211
Stage 1	-	-	-	-	-	-	176	176	-	389	389	-
Stage 2	-	-	-	-	-	-	390	389	-	249	179	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.16	6.56	6.26	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Follow-up Hdwy	2.254	-	-	2.236	-	-	3.554	4.054	3.354	3.5	4	3.3
Pot Cap-1 Maneuver	1336	-	-	1385	-	-	429	429	857	392	435	834
Stage 1	-	-	-	-	-	-	817	746	-	639	612	-
Stage 2	-	-	-	-	-	-	626	601	-	759	755	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1336	-	-	1385	-	-	403	397	857	307	403	833
Mov Cap-2 Maneuver	-	-	-	-	-	-	403	397	-	307	403	-
Stage 1	-	-	-	-	-	-	817	746	-	638	567	-
Stage 2	-	-	-	-	-	-	578	557	-	630	755	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.3	10.7	9.3
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	788	1336	-	-	1385	-	-	833
HCM Lane V/C Ratio	0.201	-	-	-	0.064	-	-	0.005
HCM Control Delay (s)	10.7	0	-	-	7.8	0	-	9.3
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.7	0	-	-	0.2	-	-	0

Intersection

Int Delay, s/veh 11.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⊕			⊕			⊕			⊕	
Traffic Vol, veh/h	63	264	0	0	215	78	1	1	0	74	1	38
Future Vol, veh/h	63	264	0	0	215	78	1	1	0	74	1	38
Conflicting Peds, #/hr	1	0	0	0	0	1	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	82	82	82	84	84	84	25	25	25	42	42	42
Heavy Vehicles, %	7	2	0	0	4	5	0	0	0	11	0	0
Mvmt Flow	77	322	0	0	256	93	4	4	0	176	2	90

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	350	0	0	322	0	0	825	826	322	781	779	303
Stage 1	-	-	-	-	-	-	476	476	-	303	303	-
Stage 2	-	-	-	-	-	-	349	350	-	478	476	-
Critical Hdwy	4.17	-	-	4.1	-	-	7.1	6.5	6.2	7.21	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.21	5.5	-
Follow-up Hdwy	2.263	-	-	2.2	-	-	3.5	4	3.3	3.599	4	3.3
Pot Cap-1 Maneuver	1182	-	-	1249	-	-	294	310	724	302	330	741
Stage 1	-	-	-	-	-	-	574	560	-	687	667	-
Stage 2	-	-	-	-	-	-	671	636	-	552	560	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1182	-	-	1249	-	-	241	285	724	280	304	740
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	285	-	280	304	-
Stage 1	-	-	-	-	-	-	529	516	-	632	666	-
Stage 2	-	-	-	-	-	-	587	635	-	504	516	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.6	0	19.2	41.1
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	261	1182	-	-	1249	-	-	354
HCM Lane V/C Ratio	0.031	0.065	-	-	-	-	-	0.76
HCM Control Delay (s)	19.2	8.3	0	-	0	-	-	41.1
HCM Lane LOS	C	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	6.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟		↱	↟↟↟		↱	↟↟↟	
Traffic Volume (vph)	87	23	81	23	18	40	48	866	31	36	1492	118
Future Volume (vph)	87	23	81	23	18	40	48	866	31	36	1492	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00	1.00		1.00	1.00	
Frt		0.883			0.896			0.995			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1613	0	1703	1591	0	1736	3451	0	1736	3427	0
Flt Permitted	0.717			0.614			0.950			0.950		
Satd. Flow (perm)	1308	1613	0	1101	1591	0	1735	3451	0	1734	3427	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		86			43			5			11	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	1				1		2		1	1		2
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	93	24	86	24	19	43	51	921	33	38	1587	126
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	110	0	24	62	0	51	954	0	38	1713	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	35.8	35.8		35.8	35.8		11.4	72.4		11.8	72.8	
Total Split (%)	29.8%	29.8%		29.8%	29.8%		9.5%	60.3%		9.8%	60.7%	
Maximum Green (s)	31.2	31.2		31.2	31.2		6.8	67.5		7.2	67.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	12.8	12.8		12.8	12.8		6.6	73.1		6.8	71.0	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.06	0.71		0.07	0.69	
v/c Ratio	0.57	0.40		0.18	0.26		0.46	0.39		0.33	0.72	
Control Delay	55.9	17.5		42.3	20.5		60.2	7.4		54.1	13.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	55.9	17.5		42.3	20.5		60.2	7.4		54.1	13.0	
LOS	E	B		D	C		E	A		D	B	
Approach Delay		35.1			26.6			10.1			13.9	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	58	14		14	11		32	131		24	336	
Queue Length 95th (ft)	110	63		39	48		74	200		59	503	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	399	551		335	515		115	2464		122	2378	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.20		0.07	0.12		0.44	0.39		0.31	0.72	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 102.4
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 14.4   Intersection LOS: B
Intersection Capacity Utilization 64.4%   ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

↘ Ø1	↓ Ø2		← Ø4	
11.4 s	72.8 s		35.8 s	

↘ Ø5	↑ Ø6		→ Ø8	
11.8 s	72.4 s		35.8 s	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟		↱	↟↟		↱	↟↟	
Traffic Volume (vph)	143	94	165	56	58	52	144	775	58	70	1297	157
Future Volume (vph)	143	94	165	56	58	52	144	775	58	70	1297	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00				1.00	
Frt		0.904			0.929			0.990			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	1636	0	1752	1703	0	1752	3470	0	1736	3407	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1717	1636	0	1752	1703	0	1752	3470	0	1736	3407	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		65			31			8			13	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1274			2535			555			2630	
Travel Time (s)		24.8			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1					1	1					1
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 (%)	5%	5%	5%	3%	3%	3%	3%	3%	3%	4%	4%	4%
Adj. Flow (vph)	149	98	172	58	60	54	150	807	60	73	1351	164
Shared Lane Traffic (%)												
Lane Group Flow (vph)	149	270	0	58	114	0	150	867	0	73	1515	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	17.4	37.2		11.8	31.6		17.2	64.2		16.8	63.8	
Total Split (%)	13.4%	28.6%		9.1%	24.3%		13.2%	49.4%		12.9%	49.1%	
Maximum Green (s)	12.8	32.6		7.2	27.0		12.6	59.3		12.2	58.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	12.6	22.8		7.0	14.9		12.4	64.2		9.8	59.1	
Actuated g/C Ratio	0.11	0.19		0.06	0.13		0.11	0.54		0.08	0.50	
v/c Ratio	0.81	0.73		0.56	0.47		0.81	0.46		0.51	0.88	
Control Delay	84.4	46.5		76.9	40.3		84.1	19.2		65.4	34.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	84.4	46.5		76.9	40.3		84.1	19.2		65.4	34.5	
LOS	F	D		E	D		F	B		E	C	
Approach Delay		60.0			52.6			28.8			35.9	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	112	153		44	59		113	211		54	522	
Queue Length 95th (ft)	#248	249		#108	116		#249	324		110	#798	
Internal Link Dist (ft)		1194			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	187	501		107	415		188	1893		180	1716	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.80	0.54		0.54	0.27		0.80	0.46		0.41	0.88	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 117.8
Natural Cycle: 125
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 37.7   Intersection LOS: D
Intersection Capacity Utilization 84.5%   ICU Level of Service E
Analysis Period (min) 15
\#   95th percentile volume exceeds capacity, queue may be longer.
     Queue shown is maximum after two cycles.

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Ø1	Ø2		Ø3	Ø4
16.8 s	64.2 s		11.8 s	37.2 s

Ø5	Ø6		Ø7	Ø8
17.2 s	63.8 s		17.4 s	31.6 s

Intersection												
Int Delay, s/veh	4.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬦			⬦			⬦			⬦	
Traffic Vol, veh/h	1	226	37	148	163	1	14	0	109	1	0	0
Future Vol, veh/h	1	226	37	148	163	1	14	0	109	1	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	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	84	84	84	75	75	75	77	77	77	25	25	25
Heavy Vehicles, %	2	2	2	3	3	3	8	8	8	0	0	0
Mvmt Flow	1	269	44	197	217	1	18	0	142	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	220	0	0	313	0	0	906	907	291	978	929	219
Stage 1	-	-	-	-	-	-	293	293	-	614	614	-
Stage 2	-	-	-	-	-	-	613	614	-	364	315	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.18	6.58	6.28	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.572	4.072	3.372	3.5	4	3.3
Pot Cap-1 Maneuver	1349	-	-	1242	-	-	251	269	734	232	270	826
Stage 1	-	-	-	-	-	-	702	660	-	483	486	-
Stage 2	-	-	-	-	-	-	470	473	-	659	659	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1349	-	-	1242	-	-	216	220	734	161	221	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	220	-	161	221	-
Stage 1	-	-	-	-	-	-	701	659	-	482	398	-
Stage 2	-	-	-	-	-	-	385	387	-	531	658	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4	13.6	27.9
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	577	1349	-	-	1242	-	-	161
HCM Lane V/C Ratio	0.277	0.001	-	-	0.159	-	-	0.025
HCM Control Delay (s)	13.6	7.7	0	-	8.4	0	-	27.9
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	1.1	0	-	-	0.6	-	-	0.1

Intersection

Int Delay, s/veh 16.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✛			✛			✛			✛	
Traffic Vol, veh/h	39	309	0	0	299	46	1	0	4	70	1	39
Future Vol, veh/h	39	309	0	0	299	46	1	0	4	70	1	39
Conflicting Peds, #/hr	1	0	0	0	0	1	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	94	94	94	90	90	90	63	63	63	34	34	34
Heavy Vehicles, %	8	4	0	0	1	11	0	0	0	7	0	8
Mvmt Flow	41	329	0	0	332	51	2	0	6	206	3	115

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	384	0	0	329	0	0	829	796	329	774	771	359
Stage 1	-	-	-	-	-	-	412	412	-	359	359	-
Stage 2	-	-	-	-	-	-	417	384	-	415	412	-
Critical Hdwy	4.18	-	-	4.1	-	-	7.1	6.5	6.2	7.17	6.5	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.17	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.17	5.5	-
Follow-up Hdwy	2.272	-	-	2.2	-	-	3.5	4	3.3	3.563	4	3.372
Pot Cap-1 Maneuver	1142	-	-	1242	-	-	292	322	717	310	333	672
Stage 1	-	-	-	-	-	-	621	598	-	649	631	-
Stage 2	-	-	-	-	-	-	617	615	-	605	598	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1142	-	-	1242	-	-	232	308	717	297	318	671
Mov Cap-2 Maneuver	-	-	-	-	-	-	232	308	-	297	318	-
Stage 1	-	-	-	-	-	-	594	572	-	620	630	-
Stage 2	-	-	-	-	-	-	509	614	-	573	572	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0	12.2	54.5
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	506	1142	-	-	1242	-	-	370
HCM Lane V/C Ratio	0.016	0.036	-	-	-	-	-	0.874
HCM Control Delay (s)	12.2	8.3	0	-	0	-	-	54.5
HCM Lane LOS	B	A	A	-	A	-	-	F
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	8.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↱		↱	↑	↱	↱	↑↱		↱	↑↑	↱
Traffic Volume (vph)	144	114	74	69	102	170	98	1178	47	120	526	95
Future Volume (vph)	144	114	74	69	102	170	98	1178	47	120	526	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	270		0	200		65	300		0	185		220
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor	1.00	0.99		1.00		0.99	1.00	1.00		1.00		0.98
Frt		0.941				0.850		0.994				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1671	1644	0	1752	1845	1568	1736	3447	0	1752	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1670	1644	0	1744	1845	1547	1733	3447	0	1750	3505	1533
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24				173		4				98
Link Speed (mph)		20			20			35			20	
Link Distance (ft)		439			627			2678			556	
Travel Time (s)		15.0			21.4			52.2			19.0	
Confl. Peds. (#/hr)	1		4	4		1	1		3	3		1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	8%	8%	8%	3%	3%	3%	4%	4%	4%	3%	3%	3%
Adj. Flow (vph)	147	116	76	70	104	173	100	1202	48	122	537	97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	192	0	70	104	173	100	1250	0	122	537	97
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases						4						2
Detector Phase	8	8		4	4	4	1	6		5	2	2
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0	10.0	6.0	10.0		6.0	10.0	10.0
Minimum Split (s)	30.0	30.0		36.0	36.0	36.0	20.0	50.0		22.6	50.0	50.0
Total Split (s)	25.0	25.0		31.0	31.0	31.0	15.0	46.4		17.6	49.0	49.0
Total Split (%)	20.8%	20.8%		25.8%	25.8%	25.8%	12.5%	38.7%		14.7%	40.8%	40.8%
Maximum Green (s)	20.4	20.4		26.4	26.4	26.4	10.4	41.5		13.0	44.1	44.1
Yellow Time (s)	3.6	3.6		3.6	3.6	3.6	3.6	3.9		3.6	3.9	3.9
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6		4.6	4.6	4.6	4.6	4.9		4.6	4.9	4.9
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		2.7	2.7	2.7	2.5	3.5		3.0	3.0	3.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	3.0		0.2	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.0	10.0	10.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	15.0		0.0	15.0	15.0
Recall Mode	None	None		None	None	None	None	Max		None	Max	Max
Walk Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Flash Dont Walk (s)	18.0	18.0		25.0	25.0	25.0		15.0			17.0	17.0
Pedestrian Calls (#/hr)	0	0		0	0	0		0			0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	15.3	15.3		12.2	12.2	12.2	9.4	42.5		11.3	44.4	44.4
Actuated g/C Ratio	0.15	0.15		0.12	0.12	0.12	0.09	0.42		0.11	0.44	0.44
v/c Ratio	0.58	0.71		0.33	0.46	0.51	0.62	0.85		0.62	0.35	0.13
Control Delay	49.4	50.5		45.9	49.1	12.1	62.4	34.4		58.1	20.3	4.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	49.4	50.5		45.9	49.1	12.1	62.4	34.4		58.1	20.3	4.7
LOS	D	D		D	D	B	E	C		E	C	A
Approach Delay		50.0			30.0			36.5			24.4	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	87	102		42	63	0	61	367		74	114	0
Queue Length 95th (ft)	161	188		88	122	60	#139	#608		147	187	32
Internal Link Dist (ft)		359			547			2598			476	
Turn Bay Length (ft)	270			200		65	300			185		220
Base Capacity (vph)	342	356		465	490	537	181	1466		229	1554	734
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	0.43	0.54		0.15	0.21	0.32	0.55	0.85		0.53	0.35	0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 100
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 34.1   Intersection LOS: C
Intersection Capacity Utilization 76.5%   ICU Level of Service D
Analysis Period (min) 15
\#   95th percentile volume exceeds capacity, queue may be longer.
      Queue shown is maximum after two cycles.

Splits and Phases: 1: Meridian Ave E (SR 161) & 8th St E

Ø1	Ø2		Ø4	Ø8
15 s	49 s		31 s	25 s

Ø5	Ø6
17.6 s	46.4 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↑↱		↱	↑↱		↱	↑↑↱		↱	↑↑↱	
Traffic Volume (vph)	74	12	54	24	17	32	28	1320	16	23	581	48
Future Volume (vph)	74	12	54	24	17	32	28	1320	16	23	581	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99			1.00		1.00		
Frt		0.878			0.903			0.998			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1542	0	1736	1634	0	1736	3463	0	1736	3433	0
Flt Permitted	0.724			0.712			0.950			0.950		
Satd. Flow (perm)	1283	1542	0	1299	1634	0	1736	3463	0	1733	3433	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		56			33			2			12	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	2		1	1		2			4	4		
Confl. Bikes (#/hr)									1			
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 (%)	7%	7%	7%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	77	13	56	25	18	33	29	1375	17	24	605	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	69	0	25	51	0	29	1392	0	24	655	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	36.0	36.0		36.0	36.0		11.4	72.7		11.3	72.6	
Total Split (%)	30.0%	30.0%		30.0%	30.0%		9.5%	60.6%		9.4%	60.5%	
Maximum Green (s)	31.4	31.4		31.4	31.4		6.8	67.8		6.7	67.7	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.3	11.3		12.1	12.1		6.4	75.6		6.4	73.4	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.07	0.78		0.07	0.76	
v/c Ratio	0.52	0.30		0.15	0.22		0.25	0.52		0.21	0.25	
Control Delay	53.5	18.2		41.4	22.1		51.2	7.3		50.0	5.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	53.5	18.2		41.4	22.1		51.2	7.3		50.0	5.8	
LOS	D	B		D	C		D	A		D	A	
Approach Delay		36.8			28.4			8.2			7.3	
Approach LOS		D			C			A			A	
Queue Length 50th (ft)	47	8		15	10		18	125		15	75	
Queue Length 95th (ft)	94	47		40	45		49	330		43	120	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	416	538		421	552		122	2693		120	2594	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.13		0.06	0.09		0.24	0.52		0.20	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 97.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 10.4   Intersection LOS: B
Intersection Capacity Utilization 56.1%   ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

↘ Ø1	↓ Ø2	↖ Ø4
11.4 s	72.6 s	36 s

↘ Ø5	↑ Ø6	➔ Ø8
11.3 s	72.7 s	36 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	⤷	⇈		⤷	⇈		⤷	⇈⇈		⤷	⇈⇈	
Traffic Volume (vph)	171	70	152	58	102	67	137	1011	32	35	564	117
Future Volume (vph)	171	70	152	58	102	67	137	1011	32	35	564	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	0.99		1.00	0.99							
Frt		0.897			0.941			0.995			0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1593	0	1703	1678	0	1736	3454	0	1736	3381	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1701	1593	0	1701	1678	0	1736	3454	0	1736	3381	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		84			23			3			21	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		923			2535			555			2630	
Travel Time (s)		18.0			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1		1	1		1						
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	184	75	163	62	110	72	147	1087	34	38	606	126
Shared Lane Traffic (%)												
Lane Group Flow (vph)	184	238	0	62	182	0	147	1121	0	38	732	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	25.0	41.6		15.4	32.0		23.2	61.2		11.8	49.8	
Total Split (%)	19.2%	32.0%		11.8%	24.6%		17.8%	47.1%		9.1%	38.3%	
Maximum Green (s)	20.4	37.0		10.8	27.4		18.6	56.3		7.2	44.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	16.6	26.5		8.9	16.2		14.3	58.8		6.9	46.4	
Actuated g/C Ratio	0.15	0.24		0.08	0.14		0.13	0.52		0.06	0.41	
v/c Ratio	0.73	0.54		0.46	0.70		0.67	0.62		0.36	0.52	
Control Delay	65.1	30.1		64.1	55.2		63.6	23.5		64.7	27.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	65.1	30.1		64.1	55.2		63.6	23.5		64.7	27.6	
LOS	E	C		E	E		E	C		E	C	
Approach Delay		45.3			57.5			28.2			29.4	
Approach LOS		D			E			C			C	
Queue Length 50th (ft)	133	104		45	116		107	328		28	205	
Queue Length 95th (ft)	227	189		97	196		186	474		69	317	
Internal Link Dist (ft)		843			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	312	587		165	431		290	1807		112	1405	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.59	0.41		0.38	0.42		0.51	0.62		0.34	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 112.5
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 33.9   Intersection LOS: C
Intersection Capacity Utilization 68.9%   ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Ø1	Ø2		Ø3	Ø4
11.8 s	61.2 s		15.4 s	41.6 s

Ø5	Ø6		Ø7	Ø8
23.2 s	49.8 s		25 s	32 s

Intersection

Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⟷			⟷			⟷			⟷	
Traffic Vol, veh/h	0	151	5	95	185	0	12	0	186	0	0	1
Future Vol, veh/h	0	151	5	95	185	0	12	0	186	0	0	1
Conflicting Peds, #/hr	1	0	0	0	0	1	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	85	85	85	84	84	84	98	98	98	25	25	25
Heavy Vehicles, %	6	6	6	4	4	4	6	6	6	0	0	0
Mvmt Flow	0	178	6	113	220	0	12	0	190	0	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	221	0	0	184	0	0	629	628	181	722	631	221
Stage 1	-	-	-	-	-	-	181	181	-	447	447	-
Stage 2	-	-	-	-	-	-	448	447	-	275	184	-
Critical Hdwy	4.16	-	-	4.14	-	-	7.16	6.56	6.26	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.1	5.5	-
Follow-up Hdwy	2.254	-	-	2.236	-	-	3.554	4.054	3.354	3.5	4	3.3
Pot Cap-1 Maneuver	1325	-	-	1379	-	-	389	394	851	345	401	824
Stage 1	-	-	-	-	-	-	812	742	-	595	577	-
Stage 2	-	-	-	-	-	-	582	567	-	736	751	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	1325	-	-	1379	-	-	360	357	851	249	363	823
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	357	-	249	363	-
Stage 1	-	-	-	-	-	-	812	742	-	595	523	-
Stage 2	-	-	-	-	-	-	525	514	-	572	751	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.7	11.2	9.4
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	786	1325	-	-	1379	-	-	823
HCM Lane V/C Ratio	0.257	-	-	-	0.082	-	-	0.005
HCM Control Delay (s)	11.2	0	-	-	7.8	0	-	9.4
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	1	0	-	-	0.3	-	-	0

Northwood Elementary Replacement 8:00 am 11/29/2019 Forecast 2019 With Project Morning Peak
Heffron Transportation, Inc. -JAB

Synchro 9 Report

Intersection

Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬧			⬧			⬧			⬧	
Traffic Vol, veh/h	21	354	0	2	283	22	1	0	2	12	0	1
Future Vol, veh/h	21	354	0	2	283	22	1	0	2	12	0	1
Conflicting Peds, #/hr	15	0	0	0	0	15	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	82	82	82	84	84	84	25	25	25	42	42	42
Heavy Vehicles, %	24	1	0	0	3	23	0	0	0	100	100	100
Mvmt Flow	26	432	0	2	337	26	4	0	8	29	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	378	0	0	432	0	0	839	866	432	857	853	365
Stage 1	-	-	-	-	-	-	483	483	-	370	370	-
Stage 2	-	-	-	-	-	-	356	383	-	487	483	-
Critical Hdwy	4.34	-	-	4.1	-	-	7.1	6.5	6.2	8.1	7.5	7.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	7.1	6.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	7.1	6.5	-
Follow-up Hdwy	2.416	-	-	2.2	-	-	3.5	4	3.3	4.4	4.9	4.2
Pot Cap-1 Maneuver	1070	-	-	1138	-	-	288	293	628	192	210	507
Stage 1	-	-	-	-	-	-	569	556	-	490	479	-
Stage 2	-	-	-	-	-	-	666	616	-	416	419	-
Platoon blocked, %		-	-		-	-		-	-			
Mov Cap-1 Maneuver	1070	-	-	1138	-	-	279	279	628	182	200	500
Mov Cap-2 Maneuver	-	-	-	-	-	-	279	279	-	182	200	-
Stage 1	-	-	-	-	-	-	551	538	-	468	471	-
Stage 2	-	-	-	-	-	-	662	606	-	398	406	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	13.4	27.5
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	443	1070	-	-	1138	-	-	191
HCM Lane V/C Ratio	0.027	0.024	-	-	0.002	-	-	0.162
HCM Control Delay (s)	13.4	8.4	0	-	8.2	0	-	27.5
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.6

Northwood Elementary Replacement 8:00 am 11/29/2019 Forecast 2019 With Project Morning Peak
Heffron Transportation, Inc. -JAB

Synchro 9 Report

Intersection

Int Delay, s/veh	8.2

Movement	EBL	EBT		WBT	WBR	SBL	SBR
Lane Configurations	↱	↑		↱		↰	↱
Traffic Vol, veh/h	92	276		238	105	109	68
Future Vol, veh/h	92	276		238	105	109	68
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	0
Veh in Median Storage, #	-	0		0	-	0	-
Grade, %	-	0		0	-	0	-
Peak Hour Factor	82	82		84	84	42	42
Heavy Vehicles, %	0	1		3	0	0	0
Mvmt Flow	112	337		283	125	260	162

Major/Minor	Major1			Major2		Minor2	
Conflicting Flow All	408	0		-	0	907	346
Stage 1	-	-		-	-	346	-
Stage 2	-	-		-	-	561	-
Critical Hdwy	4.1	-		-	-	6.4	6.2
Critical Hdwy Stg 1	-	-		-	-	5.4	-
Critical Hdwy Stg 2	-	-		-	-	5.4	-
Follow-up Hdwy	2.2	-		-	-	3.5	3.3
Pot Cap-1 Maneuver	1162	-		-	-	309	702
Stage 1	-	-		-	-	721	-
Stage 2	-	-		-	-	575	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1162	-		-	-	279	702
Mov Cap-2 Maneuver	-	-		-	-	397	-
Stage 1	-	-		-	-	721	-
Stage 2	-	-		-	-	520	-

Approach	EB			WB		SB	
HCM Control Delay, s	2.1			0		22.7	
HCM LOS						C	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1162	-	-	-	397	702
HCM Lane V/C Ratio	0.097	-	-	-	0.654	0.231
HCM Control Delay (s)	8.4	-	-	-	29.6	11.7
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.3	-	-	-	4.5	0.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↑		↱	↑		↱	↑↑		↱	↑↑	
Traffic Volume (vph)	87	23	82	29	18	40	49	880	38	36	1503	118
Future Volume (vph)	87	23	82	29	18	40	49	880	38	36	1503	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		0	180		0	280		0	180		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00	1.00		1.00	1.00	
Frt		0.882			0.896			0.994			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1611	0	1703	1591	0	1736	3447	0	1736	3427	0
Flt Permitted	0.717			0.612			0.950			0.950		
Satd. Flow (perm)	1308	1611	0	1097	1591	0	1735	3447	0	1734	3427	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		87			43			6			11	
Link Speed (mph)		35			30			35			35	
Link Distance (ft)		602			674			2630			2678	
Travel Time (s)		11.7			15.3			51.2			52.2	
Confl. Peds. (#/hr)	1				1		2		1	1		2
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	93	24	87	31	19	43	52	936	40	38	1599	126
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	111	0	31	62	0	52	976	0	38	1725	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Detector Phase	8	8		4	4		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0		10.0	10.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	32.6	32.6		35.6	35.6		10.6	28.9		10.6	27.9	
Total Split (s)	35.8	35.8		35.8	35.8		11.4	72.4		11.8	72.8	
Total Split (%)	29.8%	29.8%		29.8%	29.8%		9.5%	60.3%		9.8%	60.7%	
Maximum Green (s)	31.2	31.2		31.2	31.2		6.8	67.5		7.2	67.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		2.7	2.7		2.5	3.5		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	10.0		0.0	10.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Flash Dont Walk (s)	22.0	22.0		22.0	22.0			18.0			16.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	13.1	13.1		13.1	13.1		6.6	73.1		6.8	71.0	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.06	0.71		0.07	0.69	
v/c Ratio	0.56	0.40		0.22	0.26		0.46	0.40		0.33	0.73	
Control Delay	55.0	17.2		43.3	20.3		60.9	7.6		54.4	13.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	55.0	17.2		43.3	20.3		60.9	7.6		54.4	13.3	
LOS	D	B		D	C		E	A		D	B	
Approach Delay		34.4			28.0			10.3			14.2	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	58	14		18	11		33	137		24	344	
Queue Length 95th (ft)	110	63		47	48		76	210		60	520	
Internal Link Dist (ft)		522			594			2550			2598	
Turn Bay Length (ft)	175			180			280			180		
Base Capacity (vph)	397	550		333	513		115	2455		121	2371	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.20		0.09	0.12		0.45	0.40		0.31	0.73	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 102.7
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 14.7   Intersection LOS: B
Intersection Capacity Utilization 64.7%   ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Meridian Ave E (SR 161) & 16th Street E

Ø1	Ø2		Ø4
11.4 s	72.8 s		35.8 s

Ø5	Ø6		Ø8
11.8 s	72.4 s		35.8 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Traffic Volume (vph)	165	106	174	56	64	52	150	775	58	70	1297	175
Future Volume (vph)	165	106	174	56	64	52	150	775	58	70	1297	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	185		0	280		0	280		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00				0.99		1.00				1.00	
Frt		0.907			0.933			0.990			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	1641	0	1752	1711	0	1752	3470	0	1736	3400	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1717	1641	0	1752	1711	0	1752	3470	0	1736	3400	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			28			8			15	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		931			2535			555			2630	
Travel Time (s)		18.1			49.4			10.8			51.2	
Confl. Peds. (#/hr)	1					1	1					1
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 (%)	5%	5%	5%	3%	3%	3%	3%	3%	3%	4%	4%	4%
Adj. Flow (vph)	172	110	181	58	67	54	156	807	60	73	1351	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	172	291	0	58	121	0	156	867	0	73	1533	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	10.0		6.0	10.0	
Minimum Split (s)	10.6	30.6		10.6	31.6		10.6	26.9		10.6	29.9	
Total Split (s)	17.4	37.2		11.8	31.6		17.2	64.2		16.8	63.8	
Total Split (%)	13.4%	28.6%		9.1%	24.3%		13.2%	49.4%		12.9%	49.1%	
Maximum Green (s)	12.8	32.6		7.2	27.0		12.6	59.3		12.2	58.9	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.6	3.9		3.6	3.9	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.9		4.6	4.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	0.2		0.2	0.2		0.2	3.0		0.2	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	15.0		0.0	15.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		19.0			20.0			15.0			18.0	
Pedestrian Calls (#/hr)		0			0			0			0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	12.8	24.8		7.0	16.6		12.6	64.3		9.9	59.1	
Actuated g/C Ratio	0.11	0.21		0.06	0.14		0.11	0.54		0.08	0.49	
v/c Ratio	0.93	0.75		0.57	0.47		0.85	0.47		0.51	0.91	
Control Delay	106.1	48.5		78.9	41.2		89.9	20.2		66.9	38.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	106.1	48.5		78.9	41.2		89.9	20.2		66.9	38.0	
LOS	F	D		E	D		F	C		E	D	
Approach Delay		69.9			53.4			30.9			39.3	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	134	174		44	66		120	221		55	555	
Queue Length 95th (ft)	#302	276		#111	125		#268	334		111	#837	
Internal Link Dist (ft)		851			2455			475			2550	
Turn Bay Length (ft)	185			185			280			280		
Base Capacity (vph)	184	492		105	408		184	1863		177	1683	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.93	0.59		0.55	0.30		0.85	0.47		0.41	0.91	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 119.9
Natural Cycle: 125
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 41.8   Intersection LOS: D
Intersection Capacity Utilization 86.6%   ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
    Queue shown is maximum after two cycles.

Splits and Phases: 3: Meridian Ave E (SR 161) & 24th St E

Ø1	Ø2		Ø3	Ø4
16.8 s	64.2 s		11.8 s	37.2 s

Ø5	Ø6		Ø7	Ø8
17.2 s	63.8 s		17.4 s	31.6 s

Intersection

Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⬥			⬥			⬥			⬥	
Traffic Vol, veh/h	1	231	37	174	166	1	14	0	132	1	0	0
Future Vol, veh/h	1	231	37	174	166	1	14	0	132	1	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	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	84	84	84	75	75	75	77	77	77	25	25	25
Heavy Vehicles, %	2	2	2	3	3	3	8	8	8	0	0	0
Mvmt Flow	1	275	44	232	221	1	18	0	171	4	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	224	0	0	319	0	0	985	987	297	1072	1008	223
Stage 1	-	-	-	-	-	-	299	299	-	687	687	-
Stage 2	-	-	-	-	-	-	686	688	-	385	321	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.18	6.58	6.28	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.572	4.072	3.372	3.5	4	3.3
Pot Cap-1 Maneuver	1345	-	-	1235	-	-	221	242	728	200	242	822
Stage 1	-	-	-	-	-	-	697	656	-	440	450	-
Stage 2	-	-	-	-	-	-	428	438	-	642	655	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1345	-	-	1235	-	-	184	190	728	128	190	821
Mov Cap-2 Maneuver	-	-	-	-	-	-	184	190	-	128	190	-
Stage 1	-	-	-	-	-	-	696	655	-	439	353	-
Stage 2	-	-	-	-	-	-	336	344	-	490	654	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.4	14.5	34
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	567	1345	-	-	1235	-	-	128
HCM Lane V/C Ratio	0.334	0.001	-	-	0.188	-	-	0.031
HCM Control Delay (s)	14.5	7.7	0	-	8.6	0	-	34
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	1.5	0	-	-	0.7	-	-	0.1

Northwood Elementary Replacement 2:45 pm 11/29/2019 Forecast 2019 With Project Afternoon Peak
Heffron Transportation, Inc. -JAB

Synchro 9 Report

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	5	371	0	2	350	8	1	0	4	26	0	17
Future Vol, veh/h	5	371	0	2	350	8	1	0	4	26	0	17
Conflicting Peds, #/hr	1	0	0	0	0	1	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	94	94	94	90	90	90	63	63	63	34	34	34
Heavy Vehicles, %	100	3	0	0	1	100	0	0	0	31	0	29
Mvmt Flow	5	395	0	2	389	9	2	0	6	76	0	50

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	399	0	0	395	0	0	828	808	395	807	804	394
Stage 1	-	-	-	-	-	-	405	405	-	399	399	-
Stage 2	-	-	-	-	-	-	423	403	-	408	405	-
Critical Hdwy	5.1	-	-	4.1	-	-	7.1	6.5	6.2	7.41	6.5	6.49
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.41	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.41	5.5	-
Follow-up Hdwy	3.1	-	-	2.2	-	-	3.5	4	3.3	3.779	4	3.561
Pot Cap-1 Maneuver	780	-	-	1175	-	-	293	317	659	268	319	600
Stage 1	-	-	-	-	-	-	626	602	-	573	606	-
Stage 2	-	-	-	-	-	-	613	603	-	566	602	-
Platoon blocked, %		-	-		-	-		-			-	
Mov Cap-1 Maneuver	780	-	-	1175	-	-	266	314	659	263	316	599
Mov Cap-2 Maneuver	-	-	-	-	-	-	266	314	-	263	316	-
Stage 1	-	-	-	-	-	-	621	597	-	568	604	-
Stage 2	-	-	-	-	-	-	561	601	-	556	597	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	12.2	21.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	509	780	-	-	1175	-	-	338
HCM Lane V/C Ratio	0.016	0.007	-	-	0.002	-	-	0.374
HCM Control Delay (s)	12.2	9.6	0	-	8.1	0	-	21.9
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	1.7

Northwood Elementary Replacement 2:45 pm 11/29/2019 Forecast 2019 With Project Afternoon Peak
Heffron Transportation, Inc. -JAB

Synchro 9 Report

Intersection

Int Delay, s/veh	7.1

Movement	EBL	EBT		WBT	WBR	SBL	SBR
Lane Configurations	↰	↑		↱		↰	↱
Traffic Vol, veh/h	62	339		307	67	87	53
Future Vol, veh/h	62	339		307	67	87	53
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	0
Veh in Median Storage, #	-	0		0	-	0	-
Grade, %	-	0		0	-	0	-
Peak Hour Factor	94	94		90	90	34	34
Heavy Vehicles, %	0	3		1	0	0	0
Mvmt Flow	66	361		341	74	256	156

Major/Minor	Major1			Major2		Minor2	
Conflicting Flow All	416	0		-	0	871	378
Stage 1	-	-		-	-	378	-
Stage 2	-	-		-	-	493	-
Critical Hdwy	4.1	-		-	-	6.4	6.2
Critical Hdwy Stg 1	-	-		-	-	5.4	-
Critical Hdwy Stg 2	-	-		-	-	5.4	-
Follow-up Hdwy	2.2	-		-	-	3.5	3.3
Pot Cap-1 Maneuver	1154	-		-	-	324	673
Stage 1	-	-		-	-	697	-
Stage 2	-	-		-	-	618	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1154	-		-	-	305	673
Mov Cap-2 Maneuver	-	-		-	-	427	-
Stage 1	-	-		-	-	697	-
Stage 2	-	-		-	-	583	-

Approach	EB			WB		SB	
HCM Control Delay, s	1.3			0		20.3	
HCM LOS						C	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1154	-	-	-	427	673
HCM Lane V/C Ratio	0.057	-	-	-	0.599	0.232
HCM Control Delay (s)	8.3	-	-	-	25.3	12
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.2	-	-	-	3.8	0.9

Northwood Elementary Replacement 2:45 pm 11/29/2019 Forecast 2019 With Project Afternoon Peak
Heffron Transportation, Inc. -JAB

Synchro 9 Report

APPENDIX D
Channelization Analysis Details
&
Queue Model Results

AFTERNOON DISMISSAL

62 ↗   ↖ 67

339 →   ← 307

$V_a = 401$ $L = \dfrac{62}{401}$

$V_o = 374$ $= 15.5\%$

AFTERNOON MAIN ACCESS → YES 15'

Grade, Unsignalized Intersections
L = % Left Turns in V_A
S = Storage Length Required
V = 40 mph
L = 15 %

No Left-turn Lane Required

V_o OPPOSING VOLUME (VPH)

V_A ADVANCING VOLUME (VPH)
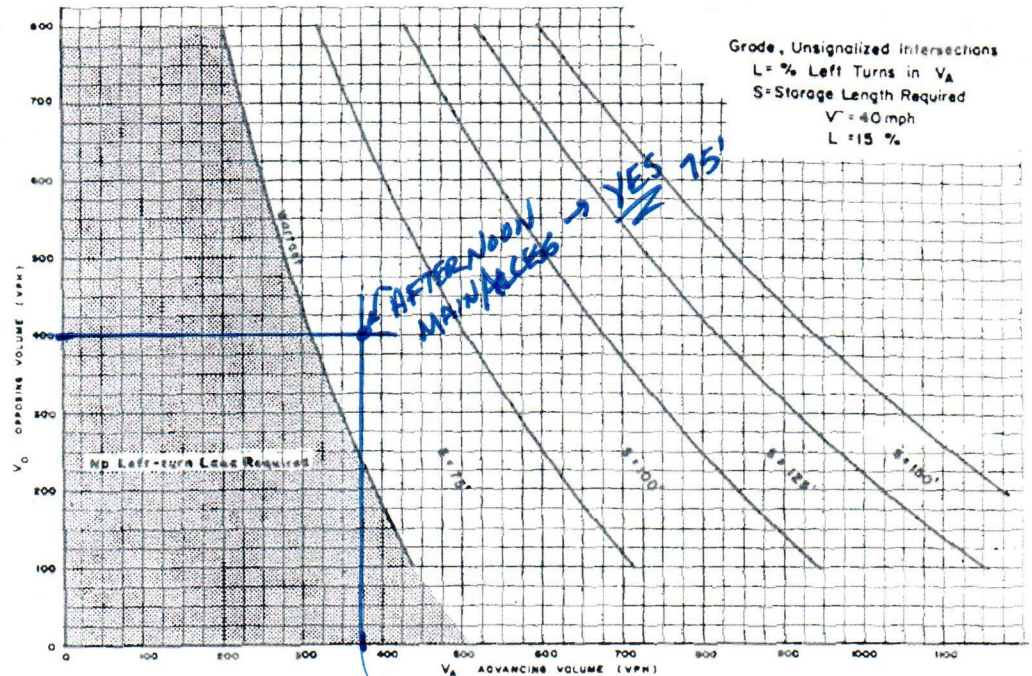
Figure 4. Warrant for left-turn storage lanes on two-lane highways.

MORNING ARRIVAL

92 ↗   ↖ 105

276 →   ← 238

$V_a = 368$ $L = \dfrac{92}{368}$

$V_o = 343$ $= 25\%$

MORNING MAIN ACCESS → YES 15'

Grade, Unsignalized Intersections
L = % Left Turns in V_A
S = Storage Length Required
V = 40 mph
L = 20 %

No Left-turn Lane Required

V_o OPPOSING VOLUME (VPH)

V_A ADVANCING VOLUME (VPH)
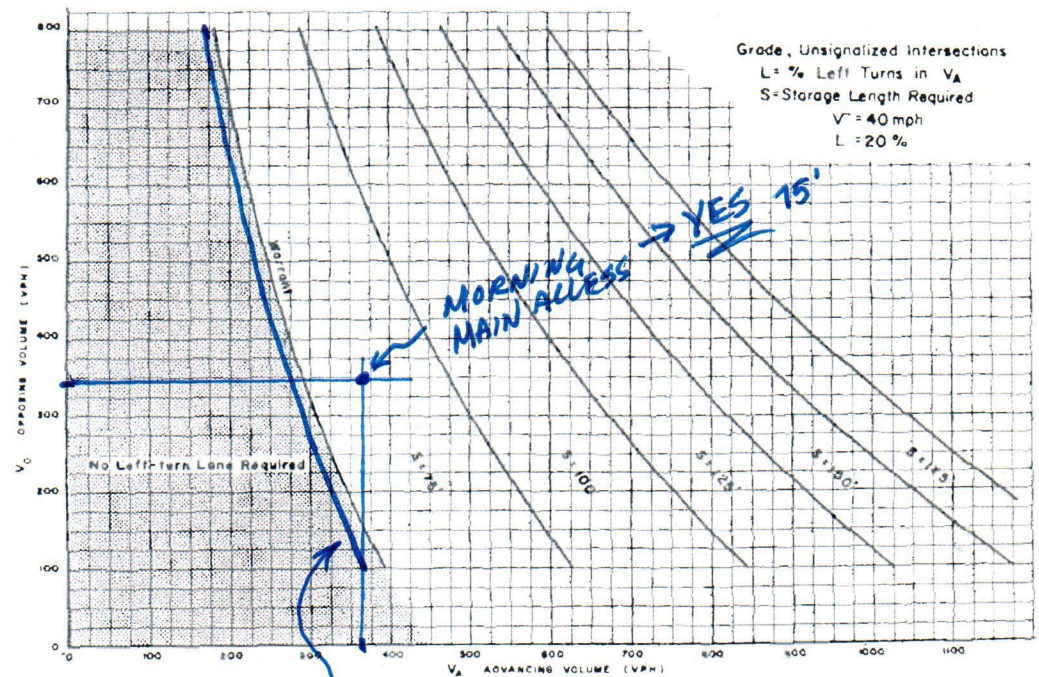
Figure 5. Warrant for left-turn storage lanes on two-lane highways.

ESTIMATED $L = 25\%$ CURVE.

PSD - Northwood Elem. Replacement
Bus/Staff Access (West)

MORNING ARRIVAL

21 ↗   ↖ 22
354 →   ← 202
        ↱ 2

$V_a = 375$ $L = \frac{21}{375}$
$V_0 = 304$ $= 5.6\%$

AFTERNOON DISMISSAL

5 ↗   ↖ 8
371 →   ← 350
        ↱ 2

$V_a = 376$ $L = \frac{5}{376}$
$V_0 = 360$ $= 1.3\%$
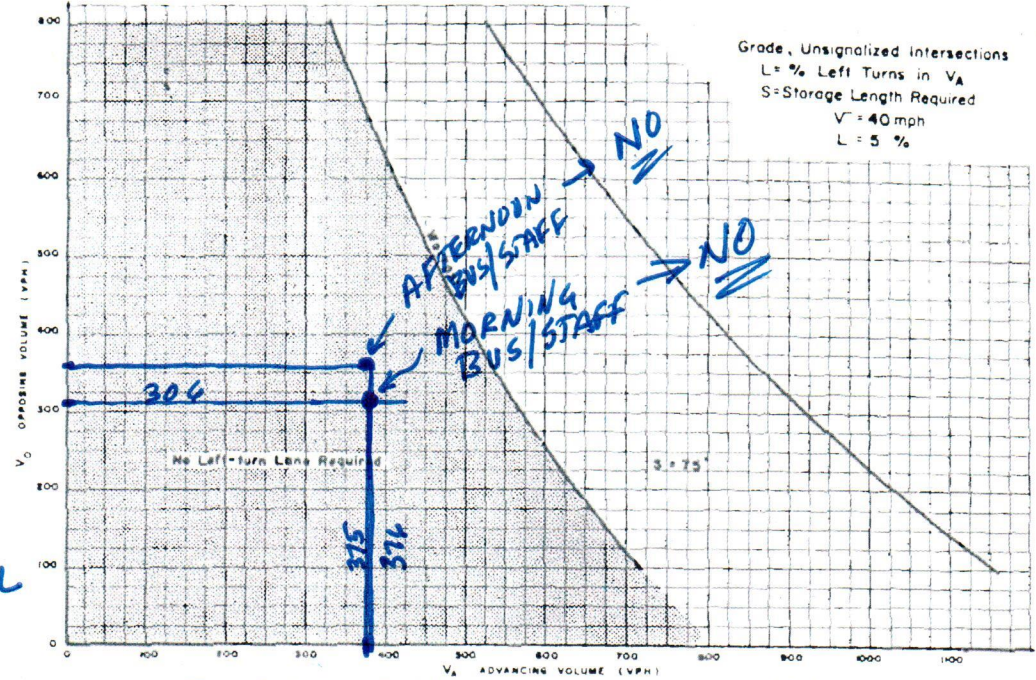
Figure 2. Warrant for left-turn storage lanes on two-lane highways.

Grade, Unsignalized Intersections
L = % Left Turns in V_A
S = Storage Length Required
$V = 40$ mph
L = 5 %

No Left-turn Lane Required

AFTERNOON BUS/STAFF → NO
MORNING BUS/STAFF → NO

304   375 374
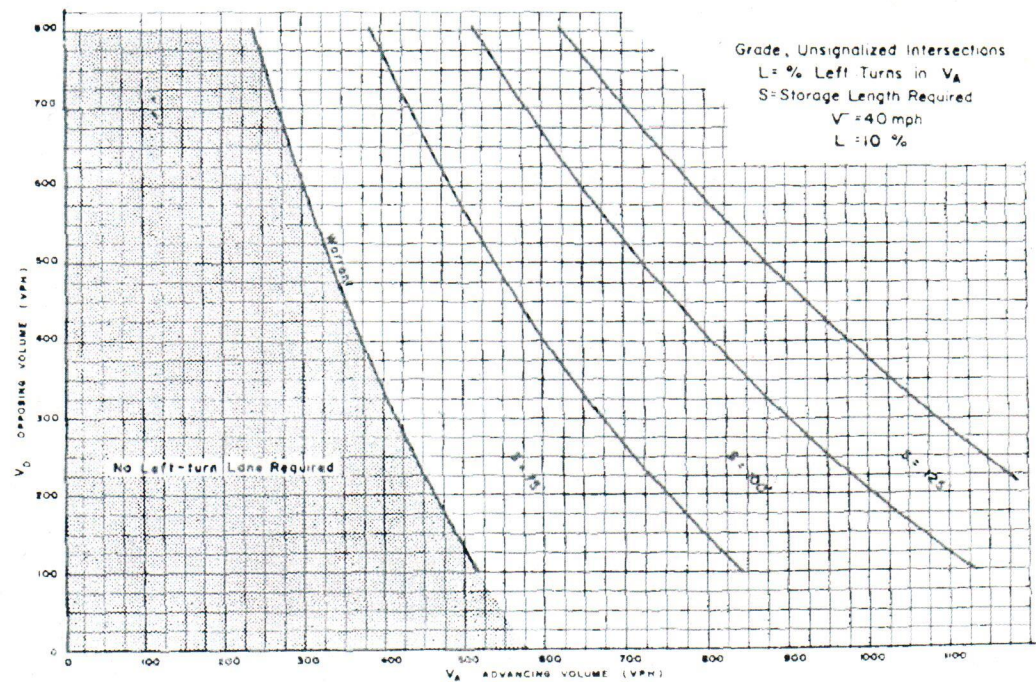
Figure 3. Warrant for left-turn storage lanes on two-lane highways.

Grade, Unsignalized Intersections
L = % Left Turns in V_A
S = Storage Length Required
$V = 40$ mph
L = 10 %

No Left-turn Lane Required

Exhibit 1310-7a Left-Turn Storage Guidelines: Two-Lane, Unsignalized

BUS/STAFF
(WEST)

MORNING

21 ↗   ↖ 22
35A ✳ ← 282
    ↗ 2

DHV = 681
%OLT = 3%

AFTERNOON

5 ↗   ↖ 8
371 → ← 350
    ↗ 2

DHV = 736
%LT = <1%

~~~~~~

MAIN ACC
(EAST)

MORNING

92 ↗   ↖ 105
276 → ← 238
DHV = 711
%LT = 13%

AFTERNOON

62 ↗   ↖ 67
339 → ← 307

~~~~~~

DHV = 775
%LTs = 12%

KEY:

[1] Below curve, storage not needed for capacity.

[2] Above curve, further analysis recommended.

* DHV is total volume from both directions
**Speeds are posted speeds

Total DHV*

% Total DHV Turning Left (single turning movement)

40 mph**
50 mph**
60 mph**

AFTERNOON? NO
BUS/STAFF

MORNING
BUS/STAFF? NO

AFTERNOON? YES
MAIN ACC.

MORNING? YES
MAIN ACC
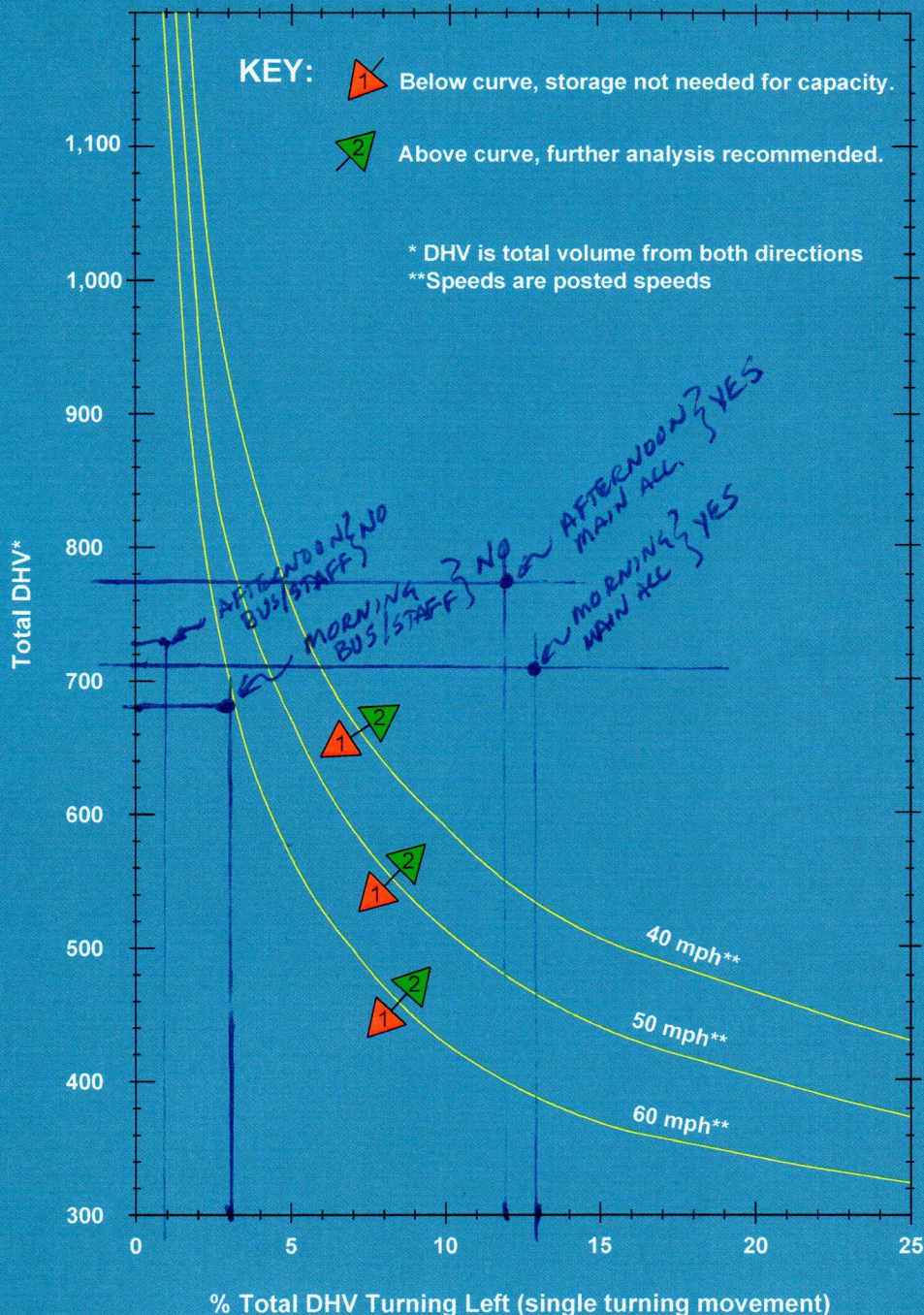
PSD · NORTHWOOD ELEM REPLACEMENT
MAIN ACCESS (EAST) DWY

Exhibit 1310-8a Left-Turn Storage Length: Two-Lane, Unsignalized (40mph)

MORNING — DHV = 711 ; LT₁ = 92
AFTERNOON — DHV = 775 ; LT₅ = 62

40 mph Posted Speed

M/M/s Queueing Model for Puyallup School Disitrct's Northwood Elementary Load/Unload Zone
Morning Peak Hour (Arrival)

Data

$\lambda =$	591	(average arrival rate)
$\mu =$	240.0	(average service rate)
$s =$	10	(# servers)

Results

$L =$	2.462583458		
$L_q =$	8.34578E-05		
		Minutes	
$W =$	0.004	0.3	
$W_q =$	0.000	0.0	
$\rho =$	0.24625		

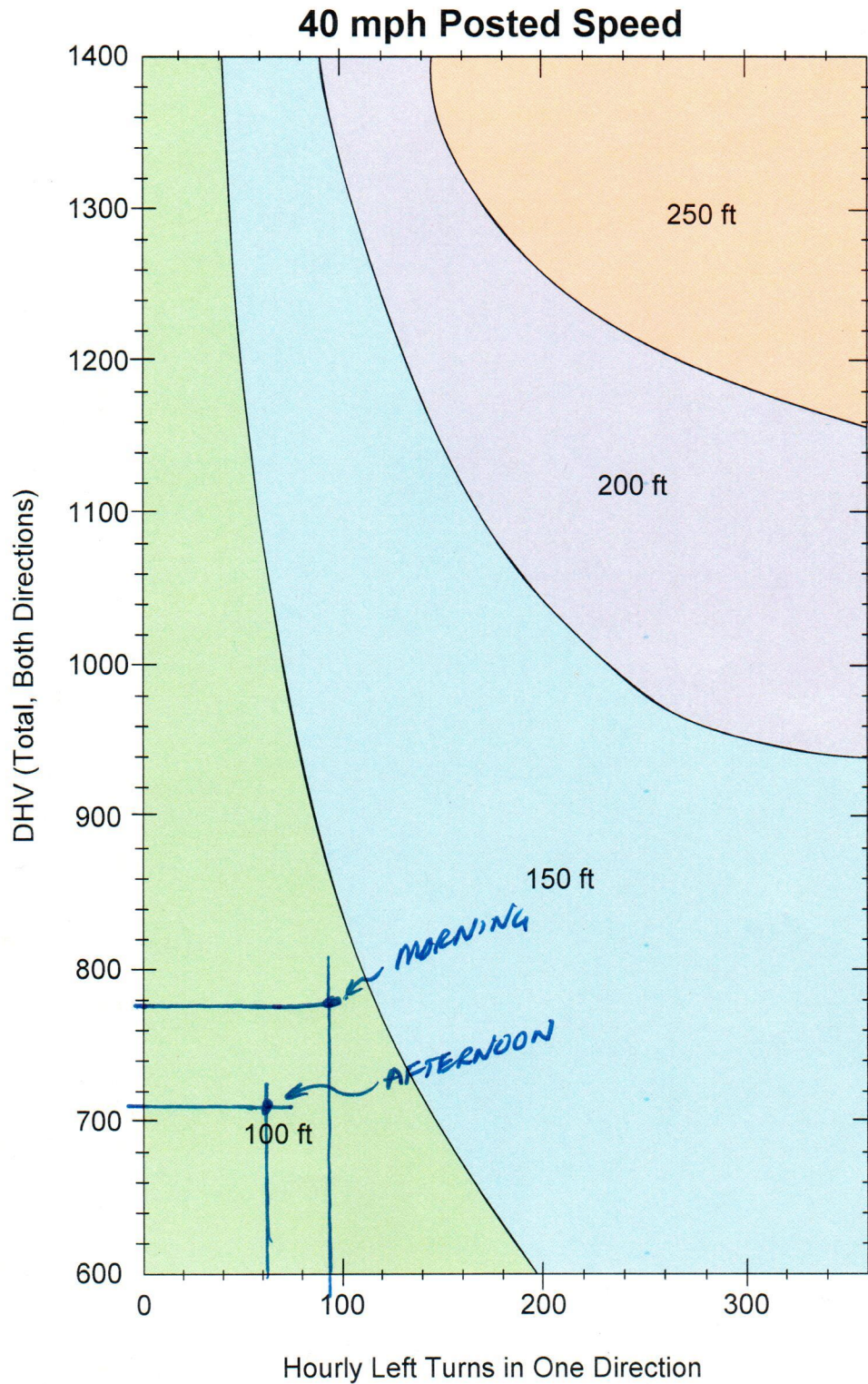|		Prob < x vehicles	
$P_0 =$	0.085220869	8.5%	0
$P_1 =$	0.209856391	29.5%	1
$P_2 =$	0.258385681	55.3%	2
$P_3 =$	0.21209158	76.6%	3
$P_4 =$	0.130568879	89.6%	4
$P_5 =$	0.064305173	96.0%	5
$P_6 =$	0.026391915	98.7%	6
$P_7 =$	0.009284299	99.6%	7
$P_8 =$	0.002857823	99.9%	8
$P_9 =$	0.000781932	100.0%	9
$P_{10} =$	0.000192551	100.0%	10
$P_{11} =$	4.74156E-05	100.0%	11
$P_{12} =$	1.16761E-05	100.0%	12
$P_{13} =$	2.87524E-06	100.0%	13
$P_{14} =$	7.08028E-07	100.0%	14
$P_{15} =$	1.74352E-07	100.0%	15
$P_{16} =$	4.29341E-08	100.0%	16
$P_{17} =$	1.05725E-08	100.0%	17
$P_{18} =$	2.60349E-09	100.0%	18
$P_{19} =$	6.41108E-10	100.0%	19
$P_{20} =$	1.57873E-10	100.0%	20
$P_{21} =$	3.88762E-11	100.0%	21
$P_{22} =$	9.57327E-12	100.0%	22
$P_{23} =$	2.35742E-12	100.0%	23
$P_{24} =$	5.80514E-13	100.0%	24
$P_{25} =$	1.42952E-13	100.0%	25
$P_{25} =$	3.52018E-14	100.0%	26
$P_{26} =$	8.66845E-15	100.0%	27
$P_{27} =$	2.13461E-15	100.0%	28
$P_{28} =$	5.25647E-16	100.0%	29
$P_{29} =$	1.2944E-16	100.0%	30
$P_{30} =$	3.18747E-17	100.0%	31
$P_{31} =$	7.84915E-18	100.0%	32
$P_{32} =$	1.93285E-18	100.0%	33
$P_{33} =$	4.75965E-19	100.0%	34
$P_{34} =$	1.17206E-19	100.0%	35
$P_{35} =$	2.88621E-20	100.0%	36
$P_{36} =$	7.10729E-21	100.0%	37
$P_{37} =$	1.75017E-21	100.0%	38
$P_{38} =$	4.30979E-22	100.0%	39
$P_{39} =$	1.06129E-22	100.0%	40
$P_{40} =$	2.61342E-23	100.0%	41
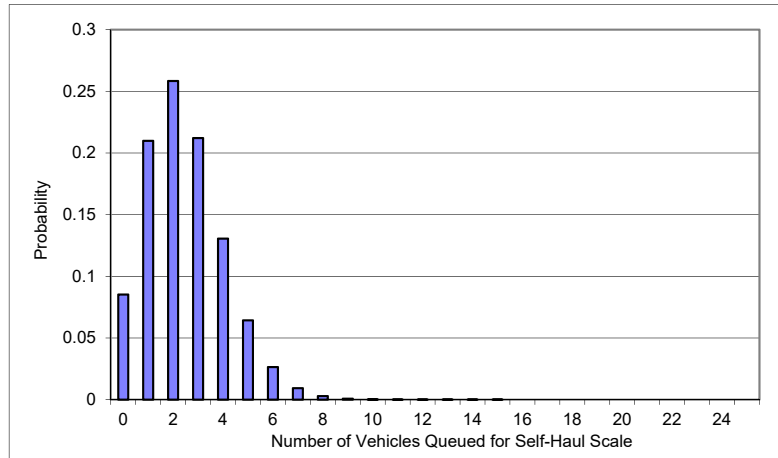
where:

L = average number of vehicles queued at the load/unload zone at any one time

L_q = average number of vehicles in queue

W = average wait time at the load/unload zone (hours)

W_q = ave. wait time in queue (hours)

ρ = Load/Unload Zone utilization

P_0 = probability of 0 vehicles at the Load/Unload Zone

P_1 = probability of 1 vehicle at the Load/Unload Zone, etc.

2 = Average number of vehicles at the load/unload zone at any one time

5 = Peak (95th-percentile) number of vehicles in load/unload zone at any one time

96.0%　　<= Closest probability to 95%

M/M/s Queueing Model for Puyallup School Disitrct's Northwood Elementary Load/Unload Zone
Morning Peak Hour (Arrival)

Data		
$\lambda =$	591	(average arrival rate)
$\mu =$	240.0	(average service rate)
s =	15	(# servers)

Results		
L =	2.462500011	
L_q =	1.13694E-08	
		Minutes
W =	0.004	0.3
W_q =	0.000	0.0
$\rho =$	0.164166667	

where:

L = average number of vehicles queued at the load/unload zone at any one time

L_q = average number of vehicles in queue

W = average wait time at the load/unload zone (hours)

W_q = ave. wait time in queue (hours)

ρ = Load/Unload Zone utilization

P_0 = probability of 0 vehicles at the Load/Unload Zone

P_1 = probability of 1 vehicle at the Load/Unload Zone, etc.

2 = Average number of vehicles at the load/unload zone at any one time

5 = Peak (95th-percentile) number of vehicles in load/unload zone at any one time

96.0%   <= Closest probability to 95%

		Prob < x vehicles	
P_0 =	0.08522163	8.5%	0
P_1 =	0.209858265	29.5%	1
P_2 =	0.258387988	55.3%	2
P_3 =	0.212093474	76.6%	3
P_4 =	0.130570045	89.6%	4
P_5 =	0.064305747	96.0%	5
P_6 =	0.02639215	98.7%	6
P_7 =	0.009284381	99.6%	7
P_8 =	0.002857849	99.9%	8
P_9 =	0.000781939	100.0%	9
P_{10} =	0.000192553	100.0%	10
P_{11} =	4.31055E-05	100.0%	11
P_{12} =	8.84561E-06	100.0%	12
P_{13} =	1.67556E-06	100.0%	13
P_{14} =	2.94719E-07	100.0%	14
P_{15} =	4.83831E-08	100.0%	15
P_{16} =	7.94289E-09	100.0%	16
P_{17} =	1.30396E-09	100.0%	17
P_{18} =	2.14067E-10	100.0%	18
P_{19} =	3.51426E-11	100.0%	19
P_{20} =	5.76924E-12	100.0%	20
P_{21} =	9.47117E-13	100.0%	21
P_{22} =	1.55485E-13	100.0%	22
P_{23} =	2.55255E-14	100.0%	23
P_{24} =	4.19043E-15	100.0%	24
P_{25} =	6.87929E-16	100.0%	25
P_{25} =	1.12935E-16	100.0%	26
P_{26} =	1.85402E-17	100.0%	27
P_{27} =	3.04368E-18	100.0%	28
P_{28} =	4.9967E-19	100.0%	29
P_{29} =	8.20292E-20	100.0%	30
P_{30} =	1.34665E-20	100.0%	31
P_{31} =	2.21074E-21	100.0%	32
P_{32} =	3.6293E-22	100.0%	33
P_{33} =	5.95811E-23	100.0%	34
P_{34} =	9.78123E-24	100.0%	35
P_{35} =	1.60575E-24	100.0%	36
P_{36} =	2.63611E-25	100.0%	37
P_{37} =	4.32761E-26	100.0%	38
P_{38} =	7.1045E-27	100.0%	39
P_{39} =	1.16632E-27	100.0%	40
P_{40} =	1.91471E-28	100.0%	41