



**lancaster
mobley**



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Woodlands Master Plan Transportation Impact Study Sisters, Oregon

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Prepared for: Paul Schneider
Paul Hodge
PX2 Investments, LLC

Prepared by: Melissa Webb, PE
Todd Mobley, PE

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Executive Summary

1. The Woodlands Master Plan consists of the construction of a mixed-use housing development which includes a mix of commercial, light industrial, recreational, cottage housing, and multi-family housing land uses. The project site is located between US-20, W Barclay Drive, and N Pine Street in Sisters, Oregon.
2. The initial trip generation calculations show that the proposed development is expected to generate a net increase of 304 trips during the evening peak hour.
3. Based on an analysis of the available crash data, no significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.
4. Upon removal of vegetation (trees) along N Pine Street, adequate sight distances are available at the proposed site access intersections to ensure safe operation along US-20, W Barclay Drive, and N Pine Street. No additional sight distance mitigation is necessary or recommended.
5. Left-turn lane warrants are not projected to be met at any of the study intersections where they would be applicable under the year 2027 buildout conditions scenario. No new left-turn lanes are necessary or recommended.
6. Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections of W Barclay Drive at N Pine Street, W Hood Avenue at US-20, N Pine Street at W Sisters Park Drive, and N Pine Street at US-20 under any of the analysis scenarios.
7. Two study intersections are either currently or projected to operate with v/c ratios that exceed the maximum allowable ODOT performance targets. These intersections are W Barclay Drive at US-20 and N Locust Street at US-20. Suggested mitigation may include the following:
 - US-20 at W Barclay Drive: The intersection is projected to exceed ODOT's maximum v/c ratio of 0.85 under year 2027 background and buildout conditions due to high through volumes of traffic. Per the City's Transportation System Plan (TSP), placing additional emphasis on Barclay Drive as an alternative route, particularly for trucks, will help distribute demand. This emphasis would serve to balance volumes at the existing roundabout, improving operation and extending the capacity of the intersection. As such, no mitigation is recommended for this project.
 - N Locust Street at US-20: The City of Sisters has indicated that this roundabout is included within the City plans and has a funding mechanism within the City's System Development Charge (SDC) methodology. In addition, the applicant has contributed a total proportional share fee of \$23,948 during the zone change phase of this development (CP 20-03, ZC 20-02). This proportional share payment will fund improvements related to the proposed Alternate Route corridor. As a result, no mitigation at this intersection is recommended for this project.

Introduction

The proposed Woodlands Master Plan involves the construction of a mixed-use housing development, including a mix of commercial, light industrial, recreational, cottage housing, and multi-family housing in Sisters, Oregon.

This report examines the impacts of the proposed development on the transportation system in the vicinity of the project site. The purpose of this report is to analyze potential traffic impacts and recommend any required transportation mitigation measures to ensure safe and efficient performance of the transportation facilities that will be impacted by the proposed development. All supporting data and calculations are provided in the appendices to this report.

Location Description

The project site is located southeast of the intersection of W Barclay Drive at US Highway 20 (US-20) in Sisters, Oregon, and consists of the northern portion of tax lot 102. The site currently has multiple buildings on it, which will be removed upon construction of the Woodlands development. The Woodlands Master Plan consists of a mixed-use housing development which includes a mix of commercial, recreational, cottage housing, and multi-family housing land uses.

The project site is shown in Figure 1. A site plan is included in Appendix A.





Figure 1: Project Location (image from Google Earth)

Vicinity Roadways

The proposed development is expected to impact six roadways near the site. Table 1 provides a description of each of the vicinity roadways.

Table 1: Vicinity Roadway Descriptions

Street Name	Functional Classification	Cross-Section	Speed (MPH)	Curbs & Sidewalks	On-Street Parking	Bicycle Facilities
US-20	State Highway/ Arterial	2-3 Lanes	20-35 posted	Yes	Downtown Core	Partial
W Barclay Drive	Arterial	2 Lanes	30 posted	Partial	No	Partial
N Pine Street	Collector	2-3 Lanes	25 posted	Partial	Yes	No
N Locust Street	Arterial	2-3 Lanes	20-40 posted	Partial	Partial	Partial
W Sisters Park Drive	Neighborhood Route	2 Lanes	25 statutory	Partial	Partial	None
W Hood Avenue (between US-20 and OR 242)	Arterial	3 Lanes	30 posted	Partial	No	Both Sides

Table Notes: Functional Classification provided by the City of Sisters Transportation System Plan (TSP) Refinement¹, Figure 7-1

Study Intersections

Based on the location of the subject property, preliminary calculations of trip generation, and coordination with the City of Sisters, the following intersections were identified for analysis:

- US-20 at W Barclay Drive;
- W Barclay Drive at site access (future intersection);
- W Barclay Drive at N Pine Street;
- E Barclay Drive at N Locust Street;
- W Hood Avenue at US-20 (includes a future site access);
- N Pine Street at W Sisters Park Drive (includes a future site access);
- N Pine Street at US-20; and
- N Locust Street at US-20

A summarized description of the study intersections is provided in Table 2.

¹ Kittelson & Associates, *Sisters Transportation System Plan Refinement*, June 2018

Table 2: Study Intersection Descriptions

	Intersection	Geometry	Traffic Control	Phasing/Stopped Approaches
1	US-20 at W Barclay Drive	Four-Legged	Yield-Controlled	Roundabout
2	W Barclay Drive at Site Access (future intersection)	Three-Legged	Stop-Controlled	NB Stop-Controlled
3	W Barclay Drive at N Pine Street	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled
4	E Barclay Drive at N Locust Street	Three-Legged	Stop-Controlled	EB Stop-Controlled
5	W Hood Avenue at US-20	Three-Legged*	Stop-Controlled	NEB Stop-Controlled
6	N Pine Street at W Sisters Park Drive	Three-Legged*	Stop-Controlled	WB Stop-Controlled
7	N Pine Street at US-20	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled
8	N Locust Street at US-20	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled

* Intersection will be converted to a four-legged intersection to allow for site access.

Transit Facilities











The site has two Cascades East Transit bus routes located within approximately ¼ mile of the proposed development:

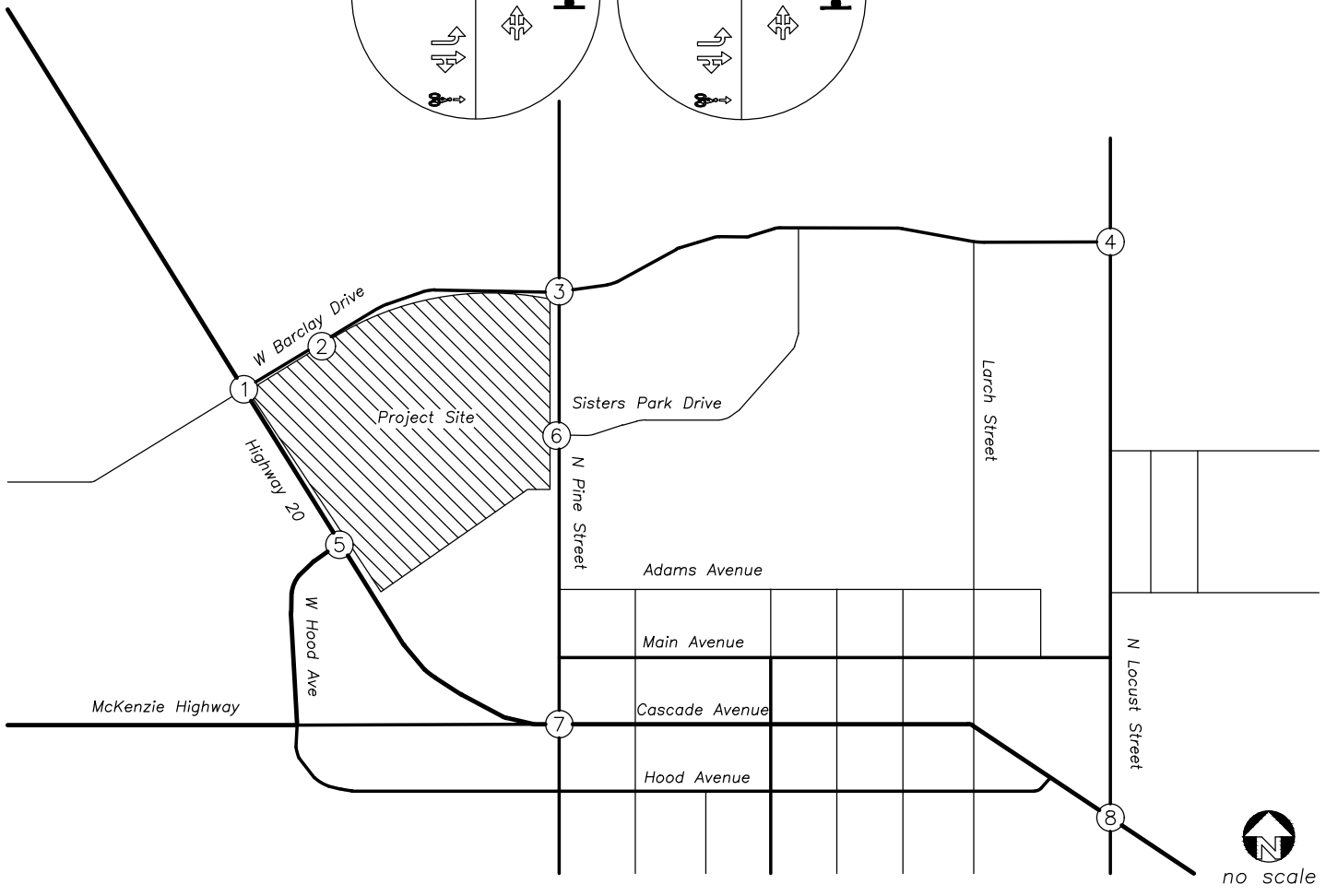
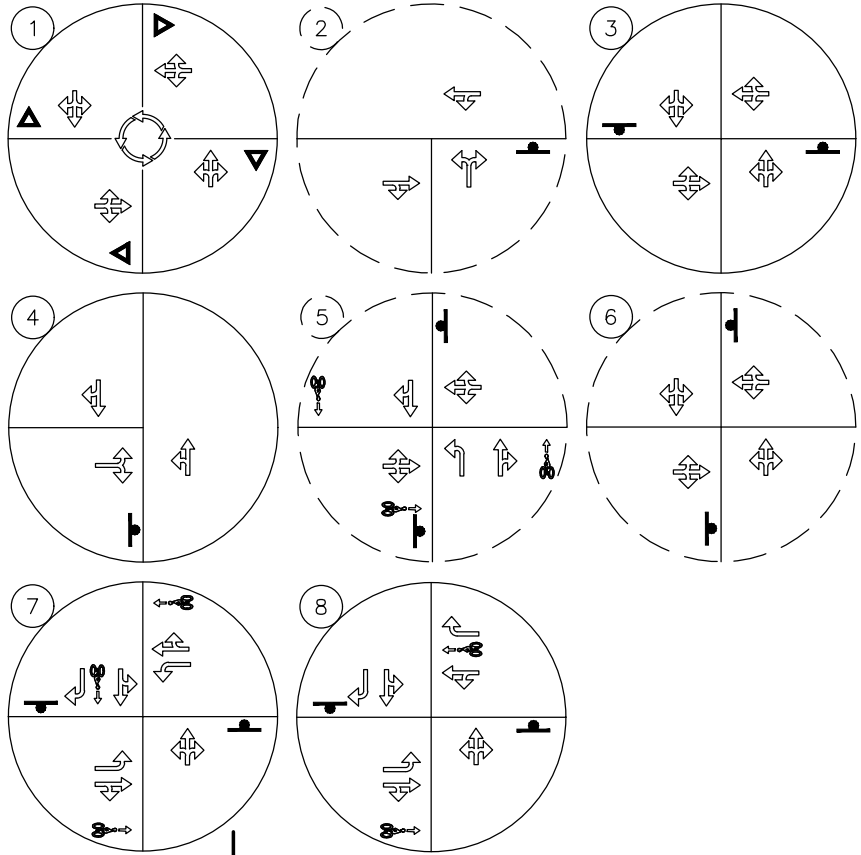
- Route #28 (*Redmond-Sisters*) runs between Sisters (Ray’s Food Place) and the Redmond Transit Hub via Highway 126. Weekday service runs from about 6:15 AM to 8:30 AM with headways of approximately 70 minutes and a single run from 2:40 PM to 3:45 PM. There is no service on Saturday or Sunday.
- Route #29 (*Bend-Sisters*) runs between Sisters (Ray’s Food Place) and the Bend Hawthorne Station via US-20. Weekday service runs from about 6:40 AM to 7:45 AM (single run) and again from 3:45 PM to 6:15 PM with headways of approximately 85 minutes. Saturday service runs from approximately 8:30 AM to 9:40 AM (single run) and again from about 1:00 PM to 3:40 PM with headways of approximately 90 minutes. There is no service on Sunday.

Both bus routes share stops located in the parking lot of Ray’s Food Place and at the intersection of W Main Avenue at N Oak Street.

A vicinity map showing the project site, vicinity streets, and study intersection configurations is shown in Figure 2.

LEGEND

-  STUDY INTERSECTION
-  STUDY INTERSECTION (proposed)
-  STOP SIGN
-  YIELD SIGN
-  ROUNDABOUT
-  BIKE LANE
-  PROJECT SITE
-  ARTERIAL ROADWAY
-  COLLECTOR ROADWAY
-  LOCAL ROADWAY



Site Trips

Trip Generation

The proposed Woodlands Master Plan will include the construction of approximately 44,000 square feet of ground-floor commercial buildings, 25,000 square feet of open space/public amenity building, 101 units of single-family cottage housing, and 269 units of multi-family housing (to include second and third-story apartments above commercial buildings, an apartment complex, congregate/workforce housing, and duplex units).

To estimate the number of trips that will be generated by the proposed development, trip rates from the *Trip Generation Manual*² were used. Data for the following land use codes were used: 210 (*Single-Family Detached Housing*), 220 (*Multi-Family Housing, Low-Rise*), 221 (*Multi-Family Housing, Mid-Rise*), 495 (*Recreational Community Center*), and 820 (*Shopping Center*). Land use codes 210, 220, and 221 were used to estimate the proposed trip generation based on the number of units, or in the case of the congregate housing, the number of expected residents. Land use codes 495 and 820 were used to estimate the proposed trip generation based on the gross square footage of the buildings.

Internal Trips

One of the benefits of collocating the commercial buildings and residential units is the convenience of linking retail and residential trips together. Some of the vehicle trips generated from the proposed development are expected to be shared/internally captured within the site and will not impact the study intersections or adjoining roadways. An evening peak internal capture rate of approximately 19 percent was calculated for the proposed development using the *National Cooperative Highway Research Project's* (NCHRP) Report 684.

Pass-By and Diverted Trips

The proposed development is expected to attract pass-by and diverted trips to the site. Pass-by trips are trips that leave the adjacent roadway to patronize a land use and then continue in their original direction of travel. Like pass-by trips, diverted trips are trips that divert from a nearby roadway not adjacent to the site to patronize a land use before continuing to their original destination. Pass-by trips do not add vehicles to the surrounding transportation system; however, they do add turning movements at site access intersections. Diverted trips may add turning movements at both site access and other nearby intersections.

Pass-by trip generation was determined by referencing data from land-use code 820 of the *Trip Generation Handbook*. Approximately 34 percent of evening peak hour site trips are assumed as pass-by trips.

The initial trip generation calculations show that the proposed development is expected to generate a net increase of 304 trips during the evening peak hour. The trip generation calculations are summarized in Table 3. Detailed trip generation calculations are included in Appendix A.

² Institute of Transportation Engineers, *Trip Generation Manual*, 10th Edition, 2017.

Table 3: Trip Generation Summary

Description	Land Use	ITE Code	Size	Evening Peak Hour		
				In	Out	Total
Open Space/Public Amenity	Recreational Community Center	495	25,000 SF	27	31	58
NSBP Lots						
Apartments on upper 2 floors	Multi-Family Housing (Low-rise)	220	12 units	4	3	7
Ground Floor Commercial	Shopping Center	820	20,000 SF	36	40	76
Mixed-Use Building in DC Zone						
Apartments on 2 floors	Multi-Family Housing (Low-rise)	220	64 units	23	13	36
Ground Floor Commercial	Shopping Center	820	24,000 SF	44	47	91
Apartment Building in MFR Zone	Multi-Family Housing (Low-rise)	220	48 units	17	10	27
Townhomes with ADUs/Triplex	Multi-Family Housing (Mid-rise)	221	65 units	18	11	29
Cottages	Single-Family Housing	210	101 units	63	37	100
Congregate Housing	Multi-Family Housing (Low-rise)	220	60 residents	7	1	8
Total Site Trips				239	193	432
<i>Internal Trip Capture (19%)</i>				<i>45</i>	<i>37</i>	<i>82</i>
External Trips				194	156	350
<i>Pass-By Trips* (34%/34%)</i>				<i>23</i>	<i>23</i>	<i>46</i>
PRIMARY SITE TRIPS				171	133	304

Table Notes: *Pass-by rate only applied to the external trips generated by the shopping center

Trip Distribution

A preliminary directional distribution of the site trips to and from the proposed development was estimated based on the approved trip distribution from the previous transportation impact study conducted for the zone change (CP 20-03/ZM 20-02). The following trip distribution was estimated and used for analysis:

- Approximately 30 percent of site trips will travel to/from the southeast along US-20;
- Approximately 15 percent of site trips will travel to/from the south along S Pine Street;
- Approximately 10 percent of site trips will travel to/from local destinations south of the project site along N Pine Street;
- Approximately 10 percent of site trips will travel to/from the northwest along US-20;

- Approximately 10 percent of site trips will travel to/from the west along McKinney Butte Road;
- Approximately 10 percent of site trips will travel to/from local destinations along N Locust Street;
- Approximately 5 percent of site trips will travel to/from the north along Camp Polk Road;
- Approximately 5 percent of site trips will travel to/from the east along Sisters Park Drive; and
- Approximately 5 percent of site trips will travel to/from the north along N Pine Street.

Trip distribution was estimated based on the most current site plan, which shows three accesses to the development along W Barclay Drive, N Pine Street, and US-20. In general, it is expected that most trips to and from the site will be traveling to and from the south and the east. Vehicles will likely use US-20, N Locust Street, W Barclay Drive, and N Pine Street to access the proposed site, and will likely use W Barclay Drive, N Locust Street, and N Pine Street to reach local destinations within Sisters and to avoid peak-hour delays along US-20 through town. The proposed site access at US-20 was analyzed with a restriction applied to the southbound left-turn movement. For the 2027 background and buildout scenarios, it was assumed that the proposed roundabout at the intersection of N N Locust Street at US-20 is not installed and the intersection continues to operate as a four-legged, stop-controlled intersection.

The following assumptions were used for trip distribution:

- For trips traveling to/from the southeast along US-20: Trips to the site would be split between all three site accesses. Approximately one-third of site trips would use the W Barclay Drive access and travel to and from the site via the Alternate Route. Approximately one-third of site trips would use the N Pine Street access and travel through downtown Sisters via US-20. Finally, approximately one-third of site trips would use the site access directly off US-20.
- For trips traveling to/from local destinations south of the project site along N Pine Street: Half of the trips would use the proposed site access on N Pine Street and half would use the proposed site access on US-20.
- For trips traveling to/from the northwest along US-20: For trips exiting the site, half of the trips would use the proposed site access on W Barclay Drive and the other half would exit the site via the proposed site access on US-20. All trips into the site would use the proposed site access on W Barclay Drive.
- For trips traveling to/from the west along McKinney Butte Road: All trips into the site would use the proposed site access on W Barclay Drive. For vehicle trips exiting the site, it was assumed that half of the trips would use the proposed site access on W Barclay Drive and the other half would exit the site via the proposed site access on US-20.
- For trips traveling to/from local destinations along N Locust Street: Half of the trips would use the proposed site access on N Pine Street, and half would use the proposed site access on W Barclay Drive.
- For trips traveling to/from the north along Camp Polk Road: Half of the trips would use the proposed site access on N Pine Street, and half would use the proposed site access on W Barclay Drive.
- For trips traveling to/from the north along N Pine Street: Half of the trips would use the proposed site access on N Pine Street, and half would use the proposed site access on W Barclay Drive.

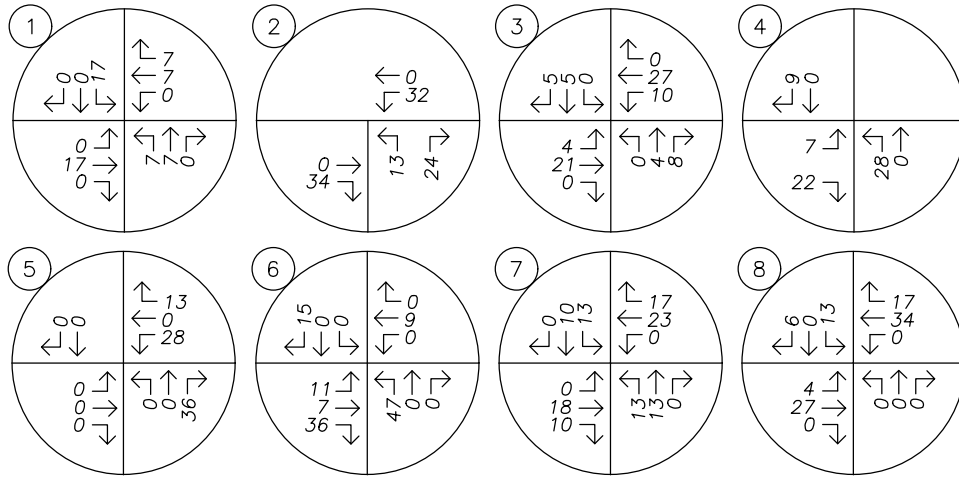
The trip distribution and assignment for the total site trips generated during the evening peak hour is shown in Figure 3.



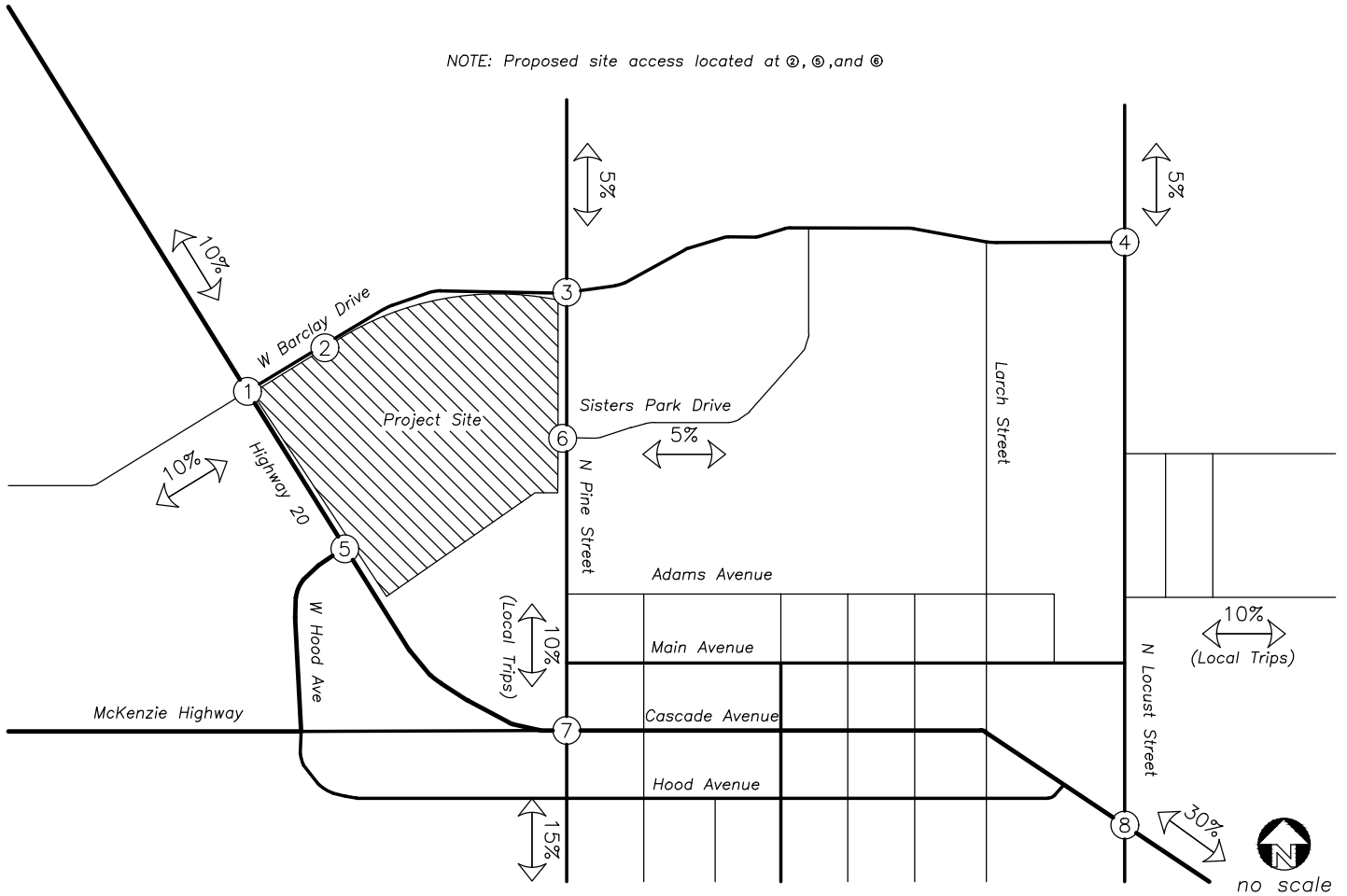
LEGEND

XX% PERCENT OF PROJECT TRIPS

NET TRIP GENERATION			
	IN	OUT	TOTAL
PM	171	133	304



NOTE: Proposed site access located at ①, ③, and ⑤



Multi-Modal Access

Pedestrian System

An inventory of the existing pedestrian system shows:

- US-20 has multi-use path facilities along both sides of the roadway from the roundabout at W Barclay Drive to McKenzie Highway (west side of US-20) and to N Pine Street (east side of US-20). The proposed development will provide connections to these existing pedestrian facilities at the site access location along US-20. In addition, a crosswalk is proposed across US-20 on the northwest leg of the intersection with W Hood Avenue. This crosswalk will allow for access to the existing multi-use path on the west side of US-20.
- W Barclay Drive has a multi-use path along the south side of the street from the roundabout at US-20 to N Pine Street. Along the north side of the street, a portion of multi-use path is available from US-20 to the entrance to the Best Western Ponderosa Lodge. The proposed development will remove the existing path along the south side of W Barclay Drive (east of the roundabout improvements) and replace it with a 10-foot multi-use path, which will provide connections to the existing pedestrian facilities east of the roundabout.
- N Pine Street has sidewalks along both sides of the roadway from US-20 to W Main Avenue. From W Main Avenue to W Barclay Drive, there are no sidewalks or path facilities on either side of the roadway. The City of Sisters TSP Pedestrian Master Plan Projects identifies the need for a proposed multi-use path along N Pine Street from W Barclay Drive to W Main Avenue. The City of Sisters plans to construct a multi-use path from W Main Avenue to a new industrial development located north of N Pine Street, which will enhance and improve the pedestrian network in the area. The proposed Woodlands development plans to contribute funds to this project on a pro-rate basis based on property frontage. However, a gap will remain on N Pine Street between the development and the sidewalk that begins at N Main Avenue until the property to the south redevelops.
- The proposed development features a mix of 8-foot-wide multi-use paths and 4-foot to 6-foot paths within the subdivision. In addition, there are several internal pedestrian connections that will provide connectivity between various streets within the subdivision.

Pedestrian Crossing – W Hood Avenue at US-20

As part of the Woodlands Master Plan, an enhanced marked crosswalk is proposed across US-20 north of the intersection with W Hood Avenue. The intersection is currently a three-legged, stop-controlled intersection that will be converted to a four-legged stop-controlled intersection upon development to provide access to the site. This site access will be full-movement except for the southbound left-turn movement, which will be restricted. In place of this left-turn movement, a raised median in the “shadow” of the existing northwest-bound left-turn lane is proposed, along with a marked pedestrian crossing. The northwest-bound left-turn lane from US-20 to W Hood Avenue must be retained, as this is effectively the access to westbound Highway 242 (McKenzie Highway).

Currently, there are marked crossings at the Barclay/US-20 roundabout and at the intersection of N Pine Street at US-20. The *ODOT Traffic Manual*³ lists criteria in section 310.2 for determining whether a marked crossing should be placed across a state highway. According to *ODOT Traffic Manual* section 310.2.02, marked crosswalks should only be considered at uncontrolled approaches when an engineering study demonstrates a need, and the location meets the following criteria:

- a. There is good visibility of the crosswalk from all directions, stopping sight distance is a minimum: Based on a posted speed of 35 mph along US-20, the minimum recommended stopping sight distance is 250 feet. Sight distance to the south was measured to exceed 400 feet, and sight distance to the north was measured to exceed 400 feet (to the intersection of US-20 at W Barclay Drive).
- b. There is no reasonable alternative crossing location: The proposed crossing location is located just north of the site access located at the intersection of W Hood Avenue at US-20. The closest crossing to the north is located at the W Barclay Street roundabout, approximately 750 feet (0.14 miles) from the proposed crosswalk. The closest crossing to the south is located at Pine Street, nearly 1,500 feet (0.28 miles) from the proposed crossing
- c. There is established pedestrian usage: With the proposed mixed-use development in place and additional mixed-use development that has already been master planned on the west side of US-20, it is expected that there will be enough pedestrian traffic to warrant an additional marked crosswalk at the intersection of W Hood Avenue at US-20.
- d. Posted speeds should be 40 mph or less: The posted speed along US-20 in the vicinity of the proposed crosswalk is 35 mph.
- e. Traffic volumes along the roadway: Average daily traffic (ADT) volumes summarized in ODOT's "Traffic Volume Tables for State Highways 2019" for ODOT highway 15 at milepost 92.07 were determined to be 10,100 ADT. Since this number is over 10,000 ADT, raised median islands should be included. There are no traffic signals located upstream or downstream of the proposed crosswalk location, which means that traffic flows continuously with fewer gaps to allow crossing the full width of the highway at once.
- f. Pedestrian crossing enhancements should be considered on multi-lane highways: This portion of US-20 single-lane highway, with one through travel lane in each direction.

In addition, the National Cooperative Highway Research Program (NCHRP) Report 562 was evaluated to determine the type of pedestrian crossing treatment to consider at the unsignalized intersection of W Hood Avenue at US-20. There were no pedestrian volumes reported across the major road: there is no existing crosswalk, and the major road is US-20. However, pedestrian volumes were examined for the nearest intersections with marked crosswalks based on the traffic counts taken Thursday, July 16, 2020. W Barclay Drive at US-20 showed one pedestrian crossing the major street during the evening peak hour (and five pedestrians total at the intersection). N Pine Street at US-20 showed two pedestrians crossing the major street during the evening peak hour. Based on low pedestrian volumes at nearby intersections, traffic control devices are not

³ Oregon Department of Transportation, Traffic Manual, January 2021 Edition

recommended. Instead, median refuge islands, curb extensions, and/or traffic calming measures should be considered in addition to the marked crosswalk.

This crosswalk will allow for access to the existing multi-use path on the west side of US-20. This multi-use path runs from McKenzie Highway to McKinney Butte Road (the multi-use path transitions to a sidewalk at McKinney Butte Road and runs north to Rail Way). Having these multi-modal facilities for pedestrians and bicyclists allows for safe access to the various retail and eating establishments located along US-20 from Rail Way to W Hood Avenue.

Bicycle System

Bicyclists have access to on-street bicycle lanes along the corridor of US-20 from N Pine Street to W Barclay Drive. This corridor also features a multi-use path along both sides of the roadway which is available to bicyclists. On-street bicycle lanes are also provided along W Barclay Drive from US-20 to N Pine Street.

The proposed development features several internal roadways which are designated as shared vehicle/bicycle routes. In addition, bicyclists can utilize the planned multi-use paths along W Barclay Drive and N Pine Street, as well as the existing multi-use paths along US-20.

Traffic Volumes

Existing Conditions

Traffic counts were conducted at the study intersections on Thursday, July 16, 2020, from 4:00 PM to 6:00 PM. Data was used from each intersection's respective evening peak hour. Traffic counts at the intersection of N Pine Street at W Sisters Park Drive were derived from balancing volumes from the intersections of W Barclay Drive at N Pine Street and N Pine Street at US-20. For a conservative estimate, additional traffic volumes were assumed to be traveling to/from W Sisters Park Drive. Raw count data is included in Appendix B.

Since US-20 is under the jurisdiction of the Oregon Department of Transportation (ODOT), procedures described in ODOT's *Analysis Procedures Manual*⁴ were used to seasonally adjust existing traffic volumes to reflect the 30th highest hour in a typical year. The Automatic Traffic Recorder (ATR) 09-014 located on US-20 west of Sisters shows that July is consistently the highest month of the year, and that no adjustment would be necessary. The seasonal trends map was also reviewed. It shows this portion of US-20 has a summer trend, and a seasonal adjustment factor (SAF) of 1.0008, which is consistent with the ATR data. The SAF of 1.0008 was applied to through volumes along US-20.

ODOT began COVID-19 traffic monitoring and reporting in mid-March 2020 when statewide closures were mandated by providing a weekly comparison of 2020 traffic volumes versus those of the same period in 2019. ODOT provided summaries of data by corridor, and the data for the Sister's US-20 corridor showed that the July 2020 weekday traffic volumes were approximately 98 percent of those recorded in 2019⁵. As a result, a COVID-19 adjustment factor was not applied to the existing July 2020 counts.

Figure 4 shows the existing traffic volumes at the study intersections during the evening peak hour.

⁴ ODOT, *Analysis Procedures Manual* Version 2, October 2020.

⁵ ODOT, *Observed Statewide Traffic Volume Patterns: Related to COVID-19 Monitoring*, July 31, 2020, page 10.

Background Conditions

To provide analysis of the impact of the proposed land use, an estimate of future traffic volumes is required. A growth rate must be applied to recorded traffic volumes to calculate future volumes.

Growth rates for through traffic on US-20 were derived using ODOT's 2038 Future Volume Table. Corresponding data (as noted in the *Existing Conditions* section) were used for each of the four intersections along US-20.

The following growth rates were applied to US-20 through volumes over a 6-year period to determine year 2027 background volumes:

- US-20 at W Barclay Drive – 1.0068
- W Hood Avenue at US-20 – 1.0197
- N Pine Street at US-20 – 1.0470
- N Locust Street at US-20 – 1.0877

For non-ODOT facilities, a compounded growth rate of two percent per year was applied to the existing traffic volumes over a 6-year period to determine year 2027 background volumes. This two percent per year compounded growth rate is a common and conservative growth rate used for roadways that are not under the jurisdiction of ODOT.

In addition to the expected background traffic growth in the site vicinity, the nearby McKenzie Meadows subdivision will impact future volumes at the study intersections. This development is proposed for the site west of McKinney Ranch Road and east of Sisters High School, on the north side of W McKinney Butte Road, and will include 150 single-family homes and 55 units of low-rise multi-family housing. Since this development will likely be contributing trips to the transportation system by 2027, the site trips it is projected to generate were included in the 2027 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provide in Appendix B.

The Threewind Master Plan development is also expected to impact future volumes at the study intersections. This development is proposed for the site southeast of W McKinney Butte Road and west of W Hood Avenue and will include 50 units of multi-family housing and 28,000 square feet of commercial space. Since this development will likely be contributing trips to the transportation system by 2027, the site trips it is projected to generate were included in the 2027 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provided in Appendix B.

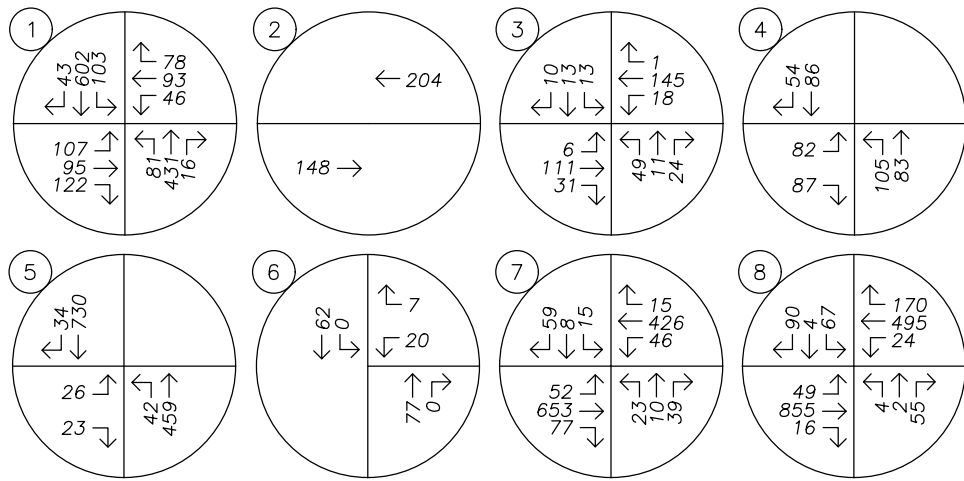
Finally, the Dollar General is also expected to impact future volumes at the study intersections. This development is proposed for the site southeast of McKinney Butte Road, east of N Wheeler Loop, and northwest of the existing Bi-Mart store, and includes construction of a 9,100 square foot building. Since this development will likely be contributing trips to the transportation system by 2027, the stie trips it is projected to generate were included in the 2027 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provided in Appendix B.

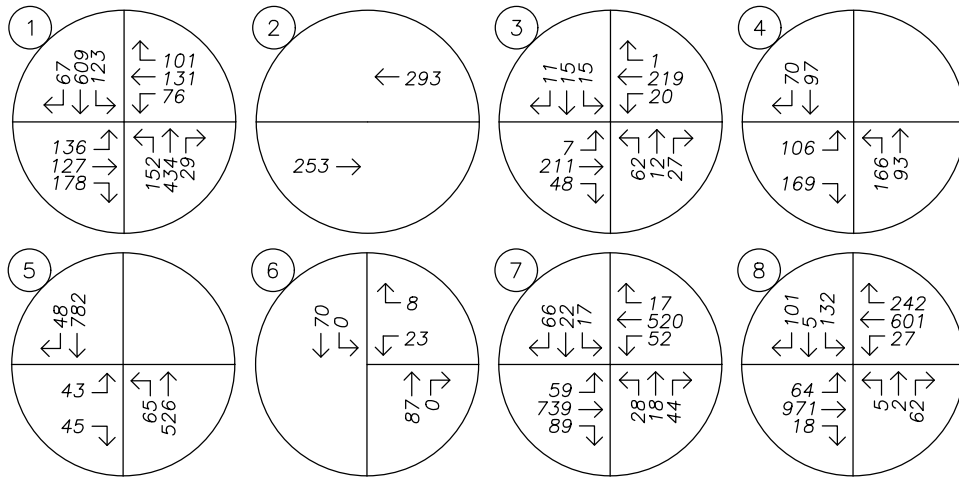
All three future developments are expected to be complete or mostly complete by 2027.

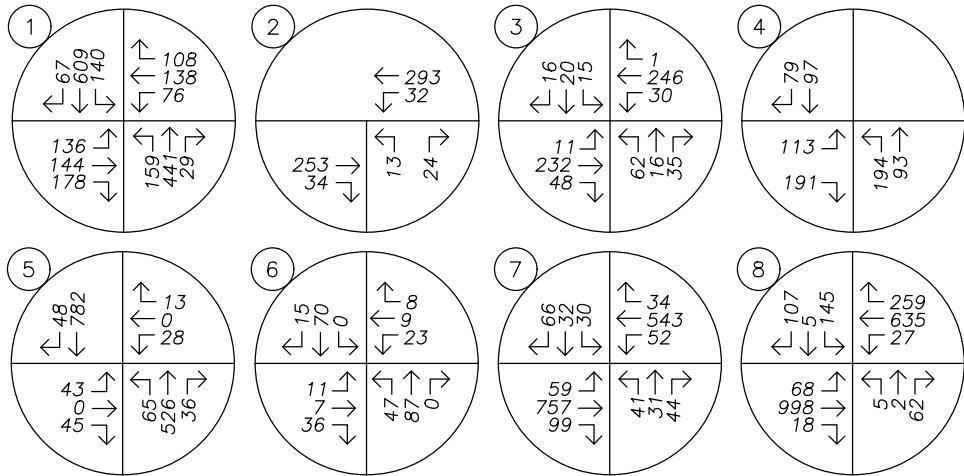
Figure 5 shows the projected year 2027 background traffic volumes at the study intersections during the evening peak hour.

Buildout Conditions

Figure 6 shows year 2027 buildout traffic volumes at the study intersections during the evening peak hour.







Safety Analysis

Crash History Review

Using data obtained from ODOT's Crash Data System, a review of approximately five years of the most recent available crash history (January 2015 through December 2019) was performed at the study intersections. The crash data was evaluated based on the number of crashes, the type of collisions, and the severity of the collisions. Crash severity is based on injuries sustained by people involved in the crash, and includes five categories:

- *PDO* – Property Damage Only;
- *Injury C* – Possible Injury;
- *Injury B* – Suspected Minor Injury;
- *Injury A* – Suspected Serious Injury; and
- *Fatality*

Crash rates provide the ability to compare safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak hour represents approximately 10 percent of the annual average daily traffic (AADT) at the intersection.

The intersections along US-20 are ODOT facilities, which adhere to the crash analysis methodologies within ODOT's *Analysis Procedures Manual* (APM). According to the APM, intersections which experience crash rates in excess of their respective 90th percentile crash rates should be "flagged for further analysis". Staff has requested that all study intersections be examined using the 90th percentile crash rate. *Exhibit 4-1: Intersection Crash Rates per MEV by Land Type and Traffic Control* of the APM indicates the 90th percentile crash rate for a four-legged, unsignalized intersection within an urban setting is 0.408 CMEV, while the 90th percentile crash rate for a three-legged unsignalized intersection within an urban setting is 0.293 CMEV. Crash rates in excess of the 90th percentile may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

Table 4 provides a summary of crash types while Table 5 summarizes crash severities and rates for each of the study intersections. Detailed crash data is provided in the appendix to this report.

Table 4: Crash Type Summary

Intersection	Crash Type								Total Crashes
	Turn	Rear End	Angle	Fixed Object	Side swipe	Ped/Bike	Backing	Other	
1 US-20 at W Barclay Drive	3	2	2	2	0	0	1	0	10
3 W Barclay Drive at N Pine Street	0	0	3	0	0	0	0	0	3
4 E Barclay Drive at N Locust Street	1	0	0	0	0	0	0	0	1
5 W Hood Avenue at US-20	1	0	0	1	0	0	0	0	2
6 N Pine Street at W Sisters Park Drive	0	0	0	1	0	0	0	0	1
7 N Pine Street at US-20	0	1	1	0	0	1	0	0	3
8 N Locust Street at US-20	1	2	0	0	0	0	0	0	3

Table 5: Crash Severity and Rate Summary

Intersection	Severity					Total Crashes	Peak Hour Volume	Crash Rate	90 th % Rate
	PDO	C	B	A	Fatal				
1 US-20 at W Barclay Drive	7	2	1	0	0	10	17,640	0.31	0.408
3 W Barclay Drive at N Pine Street	0	0	3	0	0	3	4,320	0.38	0.408
4 E Barclay Drive at N Locust Street	0	1	0	0	0	1	4,970	0.11	0.293
5 W Hood Avenue at US-20	2	0	0	0	0	2	13,130	0.08	0.293
6 N Pine Street at W Sisters Park Drive	1	0	0	0	0	0	1,660	0.33	0.293
7 N Pine Street at US-20	2	1	0	0	0	3	14,220	0.12	0.408
8 N Locust Street at US-20	0	3	0	0	0	3	18,300	0.09	0.408



Based on a review of the crash data, several crashes involved either a pedestrian or were classified as Suspected Minor Injury" (*Injury B*). An in-depth analysis of these crashes is detailed in the following sections to determine any potential crash patterns indicative of safety issues.

US-20 at W Barclay Drive

The intersection of US-20 at W Barclay Drive had one crash resulting in injuries consistent with *Injury B* classification. Driving conditions at the time of the crash were during late-night hours with wet roads. The crash was a fixed-object collision that occurred when the driver of a northwest-bound vehicle failed to negotiate a curve and went off the road due to driving in excess of the posted speed. The crash occurred in November 2018 after the installation of the roundabout. The driver sustained injuries consistent with *Injury B* classification.

W Barclay Drive at N Pine Street

The intersection of W Barclay Drive at N Pine Street had three crashes resulting in injuries consistent with *Injury B* classification:

- The first crash occurred when the driver of a southbound-traveling vehicle ran a stop sign and collided with an eastbound-traveling vehicle. The crash reported noted that "inattention" was a factor in the collision. The southbound-traveling vehicle overturned after the collision, and the driver sustained injuries consistent with *Injury B* classification, while the driver and passenger of the eastbound-traveling vehicle sustained injuries consistent with *Injury C* classification.
- The second crash occurred when the driver of a northbound-traveling vehicle ran a stop sign and collided with a westbound-traveling vehicle. The northbound-traveling vehicle overturned after the collision, and the driver and passenger both sustained injuries consistent with *Injury B* classification. The driver of the westbound-traveling vehicle did not report any injuries.
- The third crash occurred when the driver of a southbound-traveling vehicle ran a stop sign and collided with a westbound-traveling vehicle. The driver of the southbound-traveling vehicle sustained injuries consistent with *Injury B* classification, while the passenger sustained injuries consistent with *Injury C* classification. Both the driver of the westbound-traveling vehicle and the passenger sustained injuries consistent with *Injury B* classification.

The crash data at the intersection of W Barclay Drive at N Pine Street shows that all three collisions occurred in 2017 and were the result of either a northbound or southbound-traveling vehicle failing to stop at the stop signs located along N Pine Street. Review of the study intersection shows that the northbound approach of N Pine Street has a "Stop Ahead" warning sign as well as a flashing stop sign. The southbound approach of N Pine Street also has a flashing stop sign. Both flashing stop signs were in place by May of 2018 and appear to have been installed following the three crashes in 2017. The preliminary crash data from January 2018 to December 2019 shows that there were no reported crashes at the intersection during this analysis period.

N Pine Street at US-20

The intersection of N Pine Street at US-20 had one crash which involved a pedestrian and was classified as "Possible Injury or Complaint of Pain" (*Injury C*). The crash occurred when the driver of a westbound vehicle failed to yield right-of-way to a southbound pedestrian crossing in a marked crosswalk. The pedestrian sustained injuries consistent with *Injury C* classification.

Currently there are marked crosswalks across all four legs of the intersection. There are no curb extensions as there are left-turn lanes along US-20 as well as bicycle lanes on both sides of the roadway. There is no on-street parking located along US-20 at the intersection. The intersection was improved in 2014 at the same time as the rest of the intersections located in the downtown core area of Sisters.

Crash Rates

All of the intersections had crash rates below the 90th percentile rates except for the intersection of N Pine Street at W Sisters Park Drive. There was one reported crash during the five-year analysis period. Driving conditions at the time of the crash were during daylight hours with snow on the roadway. The crash was a fixed-object collision that occurred when the driver of a northbound vehicle made a right-turn onto W Sisters Park Drive and slid into a sign due to wet, icy, or slippery roadway conditions. The crash severity was listed a *Property Damage Only*. Given the minor severity of the crash and the roadway conditions at the time of the crash, there is no contributing design concerns identified at the study intersection.

Conclusion

No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.

Access Spacing

The City of Sisters Development Code 3.1.300(I)(1) identifies access spacing standards for various roadway classifications. W Barclay Drive and N Pine Street are classified by the City of Sisters as collector roadways, and the minimum driveway-to-driveway spacing along a collector roadway is 100 feet. In addition, the minimum roadway-to-driveway spacing along a collector roadway is also 100 feet. US-20 is classified by ODOT as a statewide highway. The *Oregon Highway Plan*⁶ requires an access management spacing standard of 500 feet for statewide highways in urban areas with a 35 mph posted speed.

The most recent site plan shows three site access locations. One full-movement site access is along W Barclay Drive, approximately 750 feet from the intersection of W Barclay Drive at N Pine Street. The second full-movement site access is located along N Pine Street across from Sisters Park Drive, approximately 700 feet from the intersection of W Barclay Drive at N Pine Street. Finally, the third site access is located along US-20 across from W Hood Avenue, approximately 860 feet from the intersection of US-20 at W Barclay Drive. This site access will full-movement except for the southbound left-turn movement, which will be restricted.

The most recent site plan shows that proposed site access locations are in compliance with the access spacing standards shown in Development Code 3.1.300(I)(1) as well as the *Oregon Highway Plan*.

Sight Distance Evaluation

Intersection sight distance was measured for the proposed site access intersections on US-20, W Barclay Drive, and N Pine Street. Sight distance was measured and evaluated in accordance with standards established in A

⁶ Oregon Department of Transportation, *1999 Oregon Highway Plan: Including amendments November 1999 through May 2015*, 1999, Table 14.

*Policy on Geometric Design of Highways and Streets*⁷. According to AASHTO, the driver's eye is assumed to be 14.5 feet from the near edge of the nearest travel lane of the intersecting street and at a height of 3.5 feet above the minor-street approach pavement. The vehicle driver's eye-height along the major-street approach is assumed to be 3.5 feet above the cross-street pavement.

Based on a posted speed of 35 mph along US-20, the minimum recommended intersection sight distance is 390 feet. Sight distance to the south was measured to exceed 400 feet, and sight distance to the north was measured to exceed 400 feet (to the intersection of US-20 at W Barclay Drive).

Based on a posted speed of 30 mph along W Barclay Drive, the minimum recommended intersection sight distance is 335 feet. Sight distance to the east was measured to exceed 350 feet (to the intersection of N Pine Street at W Barclay Drive). Sight distance to the west was measured to exceed 350 feet (to the intersection of US-20 at W Barclay Drive).

Based on a posted speed of 25 mph along N Pine Street, the minimum recommended intersection sight distance is 280 feet. Sight distance to the north and south was limited by two large trees. Provided that the existing trees are removed, sight distance at the proposed site access can be increased to over 280 feet to the north and south.

Upon removing vegetation along N Pine Street, adequate sight distances are available at the proposed site access intersections to ensure safe operation along US-20, W Barclay Drive, and N Pine Street. No sight distance mitigation is necessary or recommended.

Perpendicular Parking

City staff have recommended that the proposed angled parking located northeast of both buildings along Highway 20 be converted to perpendicular parking to provide more flexibility in the direction of travel before and after entering the parking spaces. The intent of this flexibility is to avoid channeling traffic to the alley at the south end of the site.

This change can be accommodated and still conform to the same 70-foot right-of-way width (40-foot half-width). The current site plan shows 21 feet for the length of an angled parking stall, and the perpendicular stall will be a length of 20 feet. The site plan will be updated accordingly and resubmitted.

Warrant Analysis

Left-turn lane warrants and preliminary traffic signal warrants were examined for the study intersections where such treatments would be applicable.

Left-Turn Lane Warrants

A left-turn refuge lane is primarily a safety consideration for the major street, removing left-turning vehicles from the through traffic stream. The left-turn lane warrants were examined using methodologies provided in the National Cooperative Highway Research Program's (NCHRP) *Report 457*. Left-turn lane warrants were evaluated

⁷ American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 6th Edition, 2011.

based on the number of advancing and opposing vehicles, number of turning vehicles, travel speed, and the number of through lanes.

Left-turn lane warrants were examined for the study intersections where such treatments would be applicable:

- W Barclay Drive at Site Access – Westbound approach
- W Barclay Drive at N Pine Street – Eastbound approach
- W Barclay Drive at N Pine Street – Westbound approach
- N Pine Street at W Sisters Park Drive – Northbound approach

Left-turn lane warrants are not projected to be met under the year 2027 buildout conditions scenario for any of the above-mentioned study intersections. No new left-turn lanes are necessary or recommended.

Left-turn lane warrants were not examined for the intersection of E Barclay Drive at N Locust Street. This intersection is identified in the City's TSP Refinement and a future project includes either the realignment of the intersection to make a continuous movement to/from the west and south legs, or the installation of a single-lane roundabout.

Left-turn lane warrants were also not examined for the intersection of N Locust Street at US-20. This intersection is identified in the City's TSP Refinement, and a future project includes the construction of a roundabout.

Preliminary Traffic Signal Warrants

Preliminary traffic signal warrants were examined for the following unsignalized study intersections to determine whether the installation of a new traffic signal will be warranted at the intersection upon completion of the proposed development:

- W Barclay Drive at N Pine Street;
- W Hood Avenue at US-20;
- N Pine Street at W Sisters Park Drive; and
- N Pine Street at US-20.

Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at any of the unsignalized study intersections under any of the analysis scenarios.

Traffic signal warrants were not examined for the intersection of N Locust Street at US-20 since the intersection is listed in the City's TSP Refinement as a candidate for a future roundabout. In addition, traffic signal warrants were not examined for the intersection of E Barclay Drive at N Locust Street since the intersection is listed in the City's TSP Refinement as a candidate for a future intersection realignment or roundabout.

Operational Analysis

A capacity and delay analysis were conducted for each of the study intersections per the unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)⁸. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little, or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Performance Standards

The study intersections of US-20 at W Barclay Drive, N Pine Street at US-20, W Hood Avenue at US-20, and N Locust Street at US-20 are under the jurisdiction of ODOT. The applicable minimum operation standard for this facility is established under the *Oregon Highway Plan*⁹ and is based on the v/c ratio of the intersection. According to the *Oregon Highway Plan*, US-20 is a freight route on a statewide highway with a posted speed of 20-35 mph, and has a target maximum allowable v/c ratio of 0.85. The above mentioned intersections along US-20 were analyzed according to this standard.

The study intersections of W Barclay Drive at N Pine Street, E Barclay Drive at N Locust Street, N Pine Street at W Sisters Park Drive, and the proposed site access along W Barclay Drive, are two-way stop-controlled intersections under the jurisdiction of the City of Sisters. The City's TSP Refinement states that two-way stop-controlled intersections should have a v/c ratio no greater than 0.90.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 6 for the evening peak hour. Detailed calculations as well as tables showing the relationship between delay and LOS are included in Appendix D.

⁸ Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

⁹ Oregon Department of Transportation, *1999 Oregon Highway Plan: Including amendments November 1999 through May 2015*, 1999

Table 6: Capacity Analysis Summary

Intersection & Condition	PM Peak Hour		
	LOS	Delay (s)	V/C
1. US-20 at W Barclay Drive			
2021 Existing Conditions	C (Overall)	17 (Overall)	0.79
2027 Background Conditions	E (Overall)	37 (Overall)	1.00 (SB)
2027 Buildout Conditions	E (Overall)	45 (Overall)	1.03 (SB)
2. W Barclay Drive at Site Access (future intersection)			
2027 Buildout Conditions	B	15	0.04
3. W Barclay Drive at N Pine Street			
2021 Existing Conditions	B	13	0.11
2027 Background Conditions	C	18	0.20
2027 Buildout Conditions	C	22	0.24
4. E Barclay Drive at N Locust Street			
2021 Existing Conditions	B	14	0.18
2027 Background Conditions	C	21	0.31
2027 Buildout Conditions	D	25	0.37
5. W Hood Avenue at US-20			
2021 Existing Conditions	E	43	0.22
2027 Background Conditions	F	83	0.51
2027 Buildout Conditions	F	93	0.55
6. N Pine Street at W Sisters Park Drive (future site access)			
2021 Existing Conditions	A	10	0.03
2027 Background Conditions	A	10	0.04
2027 Buildout Conditions	B	12	0.02
7. N Pine Street at US-20			
2021 Existing Conditions	F	56	0.24
2027 Background Conditions	F	>100	0.41
2027 Buildout Conditions	F	>200	0.77
8. N Locust Street at US-20			
2021 Existing Conditions	F	>200	1.03 (SBL)
2027 Background Conditions	F	>200	3.52 (SBL)
2027 Buildout Conditions	F	>200	4.45 (SBL)

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection. **BOLDED** results indicate operation above acceptable jurisdictional standards



The operation analysis shows two intersections are either currently or projected to operate with v/c ratios in excess of minimum ODOT performance targets:

- US-20 at W Barclay Drive
- N Locust Street at US-20

Further inspection and potential mitigations at the intersections listed above are discussed within the following *Mitigation Analysis* section.

All other study intersections are currently operating acceptable per City of Sisters standards and ODOT targets and are projected to continue operating acceptably through the 2027 buildout year, regardless of the potential increase in site trip generation upon development of the Woodlands Master Plan. No operational mitigation is necessary or recommended at these intersections.

Mitigation Analysis

As determined within the *Operational Analysis* section, two study intersections are projected to exceed acceptable levels of operation per ODOT performance targets. The following narrative discusses potential mitigative measures which may improve operation of study intersections to acceptable levels. The City of Sisters TSP Refinement, Deschutes County TSP, and ODOT's Statewide Transportation Improvement Plan (STIP) were reviewed to determine any planned projects at these intersections.

US-20 at W Barclay Drive

The intersection of US-20 at W Barclay Drive is projected to exceed ODOT's target maximum v/c ratio of 0.85 under year 2027 background and buildout conditions due to high volumes of through traffic on US-20. US-20 through Sisters is a key freight corridor for the Central Oregon region. An Alternate Route for the movement of trucks through Sisters is planned to route through trucks off of US-20 along W Barclay Drive and N Locust Street during peak periods of congestion.

Currently, vehicles choosing to use W Barclay Drive for eastbound travel to avoid downtown traffic experience long delays when turning left onto US-20 from N Locust Street. Future upgrades to the Alternate Route include a roundabout that is planned at the intersection of US-20 at N Locust Street. When constructed, this improvement will reduce long delays for vehicles turning left onto US-20 from N Locust Street, thus making the Alternate Route a reasonable choice for vehicles traveling both eastbound and westbound to bypass downtown Sisters. Increased use of the Alternate Route may also improve operation at the intersection of US-20 at W Barclay Drive. No mitigation at the intersection is recommended as part of the proposed Woodlands Master Plan development.

N Locust Street at US-20

The intersection of N Locust Street at US-20 is also projected to operate above acceptable ODOT standards; however, this issue is projected to occur regardless of whether the proposed development is approved. The City of Sisters is aware that the intersection fails to meet operational standards, and recently conducted a roundabout feasibility study at the intersection.

According to the City’s TSP Refinement, a long-term mitigation improvement includes the installation of a full-size roundabout at the intersection. For the 2027 background and buildout year analysis, it was assumed that the roundabout was not installed, and the intersection continues to operate as a four-legged, stop-controlled intersection.

Table 7 shows a comparative analysis of intersection performance, both with and without the roundabout installed at the intersection of N Locust Street at US-20.

Table 7: Capacity Analysis Summary - N Locust Street/US-20 Intersection

Intersection & Condition	PM Peak Hour		
	LOS	Delay (s)	V/C
8. N Locust Street at US-20 (no roundabout)			
2027 Background Conditions	F	>200	3.52 (SBL)
2027 Buildout Conditions	F	>200	4.45 (SBL)
8. N Locust Street at US-20 (roundabout installed)			
2027 Background Conditions	C	25	0.96 (EB)
2027 Buildout Conditions	D	30	1.00 (EB)

Based on the operational analysis results, the installation of a roundabout at the intersection of N Locust Street at US-20 improves the operation of the intersection. The intersection is shown as operating above acceptable standards due to the eastbound approach: however, as more vehicles use the Alternate Route to bypass downtown Sisters, there will be a lower traffic volume at the westbound approach and intersection operations will improve.

When constructed, both the roundabout and the Alternate Route will reduce long delays for vehicles turning left onto US-20 from N Locust Street, thus making the Alternate Route a reasonable choice for vehicles traveling both eastbound and westbound to bypass downtown Sisters.

The City of Sisters has indicated that this roundabout is included within the City plans and has a funding mechanism within the City’s System Development Charge (SDC) methodology. In addition, the applicant has contributed a total proportional share fee of \$23,948 during the zone change phase of this development (CP 20-03, ZC 20-02). As a result, no mitigation at this intersection is recommended for this project. The proportional share fee is discussed within the following *Mitigation Contributed* section.

Mitigation Contributed

Based on input from City of Sisters staff and an established proportional share payment methodology agreed upon for a prior project (CP 20-02, ZC 20-01), proportional share fees were evaluated for the Barclay-Locust corridor and impacts to US-20. According to City staff, the diversion of traffic from US-20 onto the corridor will provide the necessary mitigation to avoid a significant impact at these cited highway intersections. City and ODOT staff offered a proposed mitigation to include a proportional share payment towards improvements along US-20 and the parallel Alternate Route to support east-west mobility needs along the US-20 corridor.



The applicant has contributed a total proportional share fee of \$23,948 during the zone change phase of this development (CP 20-03, ZC 20-02).

Highway 20 Access Justification

To demonstrate the benefit of the proposed access to the W Hood Avenue at US-20 intersection, a comparative analysis was conducted both with and without the access in place. Having access to US-20 to serve the site will clearly decrease traffic volumes at the W Barclay Drive/US-20 roundabout, which prior analyses have shown will have capacity limitations in the future. The access to the highway is proposed both to provide a “relief valve” for the roundabout and to provide connectivity for the local street system. The City of Sisters strongly encouraged the internal street connection as proposed.

As described in the following section, the configuration of the W Hood Avenue/US-20/site access intersection is currently proposed with a restriction of southeast-bound left turns into the site. In place of this left-turn movement, a marked pedestrian crossing with a refuge in the center lane on the highway is proposed. This configuration is reflected in the “with access” scenario below.

For scenarios both with and without access to US-20, the overall trip distribution pattern shown in Figure 3 in this TIA is used. The access scenarios affect traffic volumes on the streets adjacent to the project (US-20, W Barclay Drive, and N Pine Street) but no other offsite intersections.

Table 8 shows a comparative analysis of intersection performance, both with and without the access to US-20. Detailed capacity analysis calculations are included in Appendix D. As expected, having the access to the highway improves operation at the roundabout as well as the site access to Barclay Drive. Operation at the intersection of W Hood Avenue at US-20 does operate slightly worse with the access forming the fourth leg to the intersection, but from a system-wide perspective, a minor increase in delay on lower-volume, stop-controlled approaches is a favorable tradeoff for an improvement in operation at the roundabout.

Table 8: Capacity Analysis Summary (2027 Buildout Conditions, US-20 Access Options)

Intersection & Condition	PM Peak Hour		
	LOS	Delay (s)	V/C
1. US Highway 20 at W Barclay Drive			
With Access	E (Overall)	45 (Overall)	1.03 (SB)
Without Access	F (Overall)	48 (Overall)	1.05 (SB)
2. W Barclay Drive at Site Access			
With Access	B	15	0.04
Without Access	C	16	0.08
3. W Barclay Drive at N Pine Street			
With Access	C	22	0.24
Without Access	C	24	0.26
5. W Hood Avenue at US Highway 20			
With Access	F	93	0.55
Without Access	F	83	0.51

Table Notes: **BOLDED** values indicate higher values than the scenario with US Highway 20 access.

Proposed Access Configuration

Figure 7 shows the proposed configuration of the access to W Hood Avenue. As explained previously, all existing turning movements at the intersection are proposed to be retained, and only the southeast-bound left turn into the site is proposed to be restricted. In the place of this left-turn movement, a raised median in the “shadow” of the existing northwest-bound left turn lane is proposed, along with a marked pedestrian crossing.

The two key components of this design are:

1. The retention of the northwest-bound left turn from US-20 onto W Hood Avenue. This movement must be retained, as this is effectively the access to westbound Highway 242) McKenzie Highway), and
2. Installation of a new marked crosswalk across US-20. Currently, there are marked crossings at the Barclay roundabout and at the intersection of US-20 at N Pine Street. With the proposed mixed-use development in place and additional mixed-use development that has already been master planned on the opposite side of US-20, it is expected that there will be enough demand to warrant this additional marked crosswalk.



Conclusions

The following key findings relate to transportation:

- No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.
- Upon removal of vegetation (trees) along N Pine Street, adequate sight distances are available at the proposed site access intersections to ensure safe operation along US-20, W Barclay Drive, and N Pine Street. No additional sight distance mitigation is necessary or recommended.
- Left-turn lane warrants are not projected to be met at any of the study intersections where they would be applicable under the year 2027 buildout conditions scenario. No new left-turn lanes are necessary or recommended.
- Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections of W Barclay Drive at N Pine Street, W Hood Avenue at US-20, N Pine Street at W Sisters Park Drive, and N Pine Street at US-20 under any of the analysis scenarios.
- Two study intersections are either currently or projected to operate with v/c ratios that exceed the maximum allowable ODOT performance targets. These intersections are W Barclay Drive at US-20 and N Locust Street at US-20. Suggested mitigation may include the following:
 - US-20 at W Barclay Drive: The intersection is projected to exceed ODOT's maximum v/c ratio of 0.85 under year 2027 background and buildout conditions due to high through volumes of traffic on the highway. Per the City's Transportation System Plan (TSP), placing additional emphasis on W Barclay Drive as an alternative route, particularly for trucks, may help distribute demand. This emphasis would serve to balance volumes at the existing roundabout, improving operation and extending the capacity of the intersection. As such, no mitigation is recommended for this project.
 - N Locust Street at US-20: The City of Sisters has indicated that this roundabout is included within the City plans and has a funding mechanism within the City's System Development Charge (SDC) methodology. In addition, the applicant has contributed a total proportional share fee of \$23,948 during the zone change phase of this development (CP 20-03, ZC 20-02). This proportional share payment will fund improvements related to the proposed Alternate Route corridor. As a result, no mitigation at this intersection is recommended for this project.
- All other study intersections are currently operating acceptably per City of Sisters and ODOT standards and are projected to continue operating acceptably through the 2027 buildout year, regardless of the potential increase in site trip generation upon development of the site. No operational mitigation is necessary or recommended at these intersections.



Appendix A – Site Information

Site Plan

Trip Generation Calculations



TRIP GENERATION CALCULATIONS
(Cottage Housing)

Land Use: Single-Family Detached Housing
Land Use Code: 210
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 101

AM PEAK HOUR

Trip Rate: 0.74

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	19	56	75

PM PEAK HOUR

Trip Rate: 0.99

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	63	37	100

WEEKDAY

Trip Rate: 9.44

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	477	477	954

SATURDAY

Trip Rate: 9.54

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	482	482	964



TRIP GENERATION CALCULATIONS
(Apartment Building)

Land Use: Multifamily Housing (Low-Rise)
Land Use Code: 220
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 124

AM PEAK HOUR

Trip Rate: 0.46

	Enter	Exit	Total
Directional Distribution	23%	77%	
Trip Ends	13	44	57

PM PEAK HOUR

Trip Rate: 0.56

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	43	26	69

WEEKDAY

Trip Rate: 7.32

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	454	454	908

SATURDAY

Trip Rate: 8.14

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	505	505	1,010



TRIP GENERATION CALCULATIONS (Congregate Housing)

Land Use: Multifamily Housing (Low-Rise)

Land Use Code: 220

Setting/Location: General Urban/Suburban

Variable: Residents

Variable Value: 60

AM PEAK HOUR

Trip Rate: 0.17

	Enter	Exit	Total
Directional Distribution	15%	85%	
Trip Ends	2	8	10

PM PEAK HOUR

Trip Rate: 0.13

	Enter	Exit	Total
Directional Distribution	90%	10%	
Trip Ends	7	1	8

WEEKDAY

Trip Rate: 1.42

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	43	43	86



TRIP GENERATION CALCULATIONS
(DC Zoning)

Land Use: Multifamily Housing (Low-Rise)
Land Use Code: 220
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 64

AM PEAK HOUR

Trip Rate: 0.46

	Enter	Exit	Total
Directional Distribution	23%	77%	
Trip Ends	7	22	29

PM PEAK HOUR

Trip Rate: 0.56

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	23	13	36

WEEKDAY

Trip Rate: 7.32

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	234	234	468

SATURDAY

Trip Rate: 8.14

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	260	260	520



TRIP GENERATION CALCULATIONS (NSBP Zoning)

Land Use: Multifamily Housing (Low-Rise)
Land Use Code: 220
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 12

AM PEAK HOUR

Trip Rate: 0.46

	Enter	Exit	Total
Directional Distribution	23%	77%	
Trip Ends	1	5	6

PM PEAK HOUR

Trip Rate: 0.56

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	4	3	7

WEEKDAY

Trip Rate: 7.32

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	44	44	88

SATURDAY

Trip Rate: 8.14

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	49	49	98



TRIP GENERATION CALCULATIONS

Land Use: Multifamily Housing (Mid-Rise)
Land Use Code: 221
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 65

AM PEAK HOUR

Trip Rate: 0.36

	Enter	Exit	Total
Directional Distribution	26%	74%	
Trip Ends	6	17	23

PM PEAK HOUR

Trip Rate: 0.44

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	18	11	29

WEEKDAY

Trip Rate: 5.44

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	177	177	354

SATURDAY

Trip Rate: 4.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	160	160	320



TRIP GENERATION CALCULATIONS

Land Use: Recreational Community Center
Land Use Code: 495
Variable: 1000 Square Feet Gross Floor Area
Variable Quantity: 25

AM PEAK HOUR

Trip Rate: 1.76

	Enter	Exit	Total
Directional Distribution	66%	34%	
Trip Ends	29	15	44

PM PEAK HOUR

Trip Rate: 2.31

	Enter	Exit	Total
Directional Distribution	47%	53%	
Trip Ends	27	31	58

WEEKDAY

Trip Rate: 28.82

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	360	360	720

SATURDAY

Trip Rate: 9.10

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	114	114	228



TRIP GENERATION CALCULATIONS (DC Zoning)

Land Use: Shopping Center
Land Use Code: 820
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 24

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	14	9	23

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	44	47	91

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	453	453	906

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	553	553	1,106



TRIP GENERATION CALCULATIONS
(NSBP Zoning)

Land Use: Shopping Center
Land Use Code: 820
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 20

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	12	7	19

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	36	40	76

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	378	378	756

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	461	461	922

Appendix B – Traffic Counts

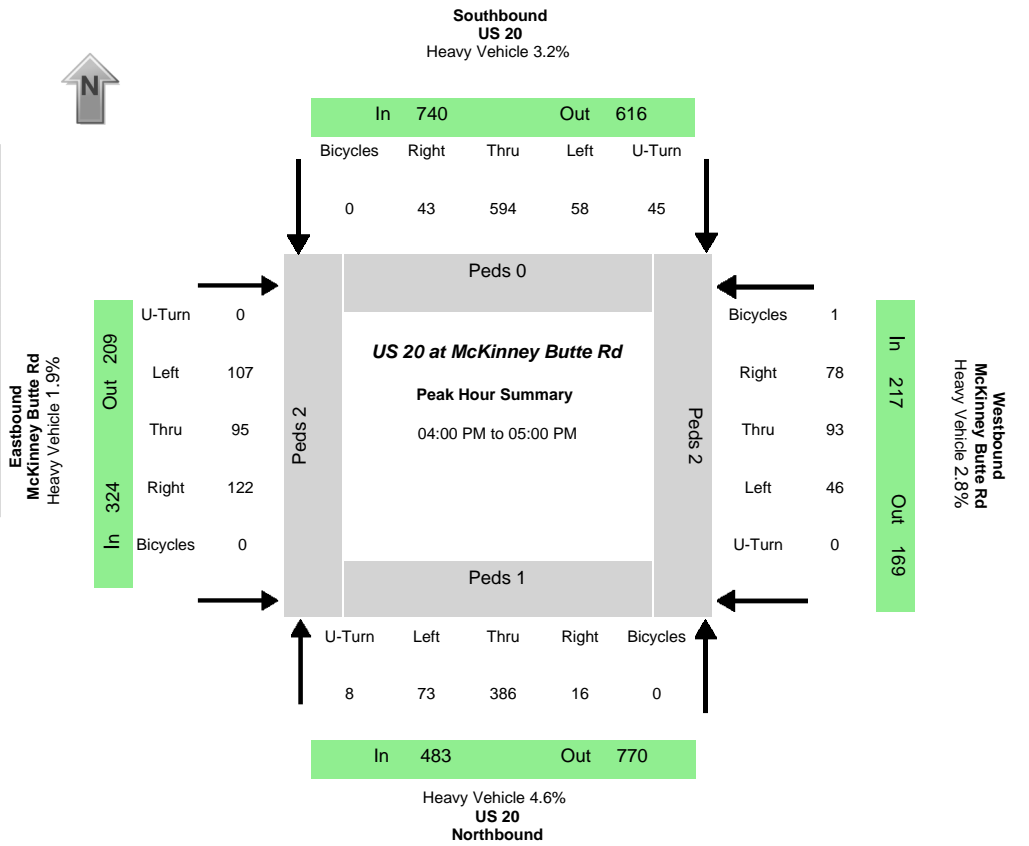
Traffic Counts

In-Process Traffic



Data Provided by K-D-N.com 503-594-4224

N/S street	US 20
E/W street	McKinney Butte Rd
City, State	Sisters OR
Site Notes	
Location	44.29452 - -121.56363
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:05:00 PM
PHF (15-Min Int)	0.90



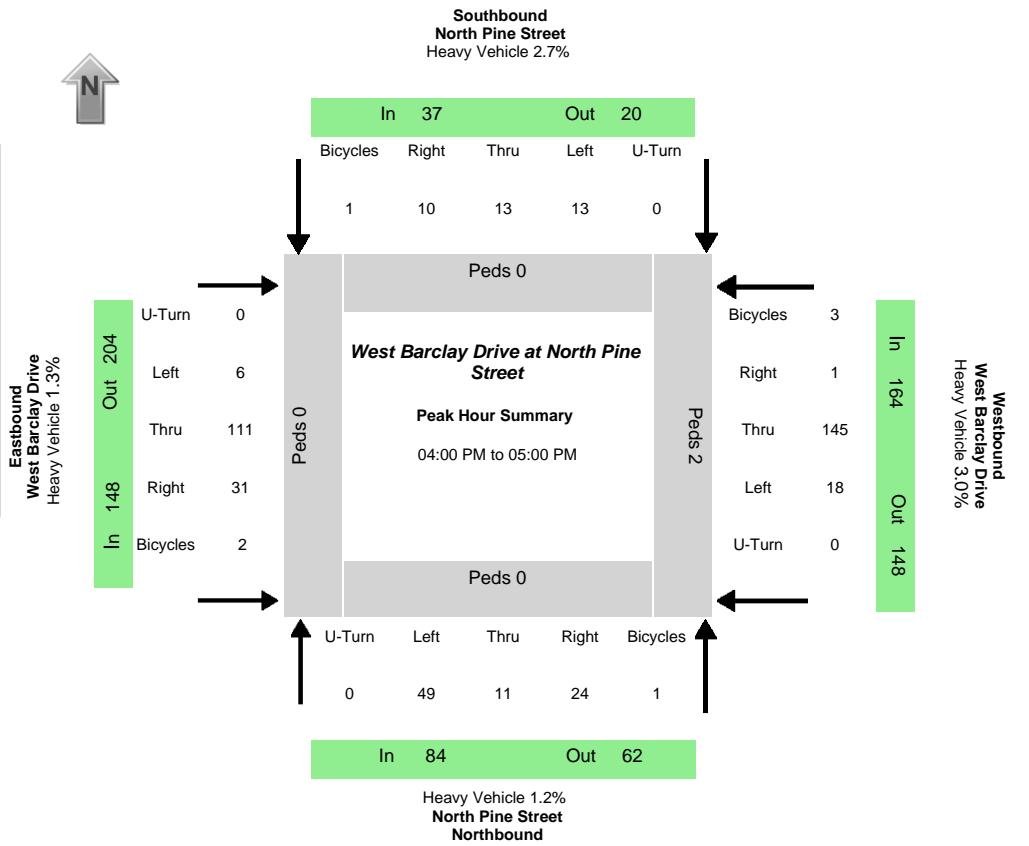
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
73	386	16	8	58	594	43	45	107	95	122	0	46	93	78	0	483	740	324	217	770	616	209	169
Percent Heavy Vehicles																							
2.7%	5.2%	0.0%	0.0%	0.0%	3.4%	2.3%	6.7%	2.8%	1.1%	1.6%	0.0%	4.3%	1.1%	3.8%	0.0%	4.6%	3.2%	1.9%	2.8%	3.1%	4.7%	1.9%	0.6%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	2	5

Time	Northbound US 20				Southbound US 20				Eastbound McKinney Butte Rd				Westbound McKinney Butte Rd				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	7	30	2	0	6	56	2	1	10	10	8	0	4	8	8	0		
04:05:00 PM	10	36	0	0	6	48	1	8	12	7	13	0	4	11	11	0		
04:10:00 PM	4	33	2	2	7	52	6	1	11	13	15	0	3	9	7	0	484	
04:15:00 PM	6	29	1	1	5	61	8	5	9	6	11	0	5	5	6	0	490	
04:20:00 PM	1	31	0	2	4	51	2	2	8	14	13	0	6	7	3	0	467	
04:25:00 PM	4	28	3	0	4	37	1	2	12	8	6	0	2	14	8	0	431	
04:30:00 PM	8	34	0	1	2	58	3	4	2	4	6	0	2	7	4	0	408	
04:35:00 PM	6	23	2	0	4	38	1	5	4	11	12	0	8	8	3	0	389	
04:40:00 PM	7	35	1	1	6	47	4	4	10	7	9	0	4	6	5	0	406	
04:45:00 PM	7	29	2	0	6	63	5	4	6	7	9	0	3	6	10	0	428	
04:50:00 PM	11	38	0	0	3	38	6	6	11	5	9	0	3	2	8	0	443	
04:55:00 PM	2	40	3	1	5	45	4	3	12	3	11	0	2	10	5	0	443	1764
05:00:00 PM	2	33	0	1	5	28	1	4	11	5	11	0	5	1	7	0	400	1726
05:05:00 PM	3	20	0	1	3	25	3	7	7	7	12	0	3	9	6	0	366	1665
05:10:00 PM	5	29	0	0	2	30	2	4	6	7	14	0	8	4	4	1	336	1616
05:15:00 PM	10	32	2	0	4	52	4	3	6	5	10	0	3	7	7	0	367	1603
05:20:00 PM	5	24	3	1	3	44	3	1	6	1	13	0	2	8	8	0	383	1581
05:25:00 PM	4	31	2	0	1	37	3	4	7	1	11	0	3	7	4	0	382	1567
05:30:00 PM	3	22	0	0	3	39	1	2	8	4	7	0	4	1	5	0	336	1531
05:35:00 PM	2	29	3	0	5	41	5	5	3	7	8	0	1	8	3	0	334	1526
05:40:00 PM	10	25	1	0	2	31	4	3	7	2	8	0	4	6	4	0	326	1487
05:45:00 PM	6	30	0	0	2	33	3	3	16	2	8	0	2	4	4	0	340	1443
05:50:00 PM	13	27	2	0	3	30	1	1	14	4	8	0	2	8	7	0	340	1423
05:55:00 PM	8	31	2	1	1	33	3	4	4	4	8	0	3	7	8	0	350	1394

Data Provided by K-D-N.com 503-594-4224

N/S street	North Pine Street
E/W street	West Barclay Drive
City, State	Sisters OR
Site Notes	
Location	44.297051 - -121.553918
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:05:00 PM
PHF (15-Min Int)	0.84



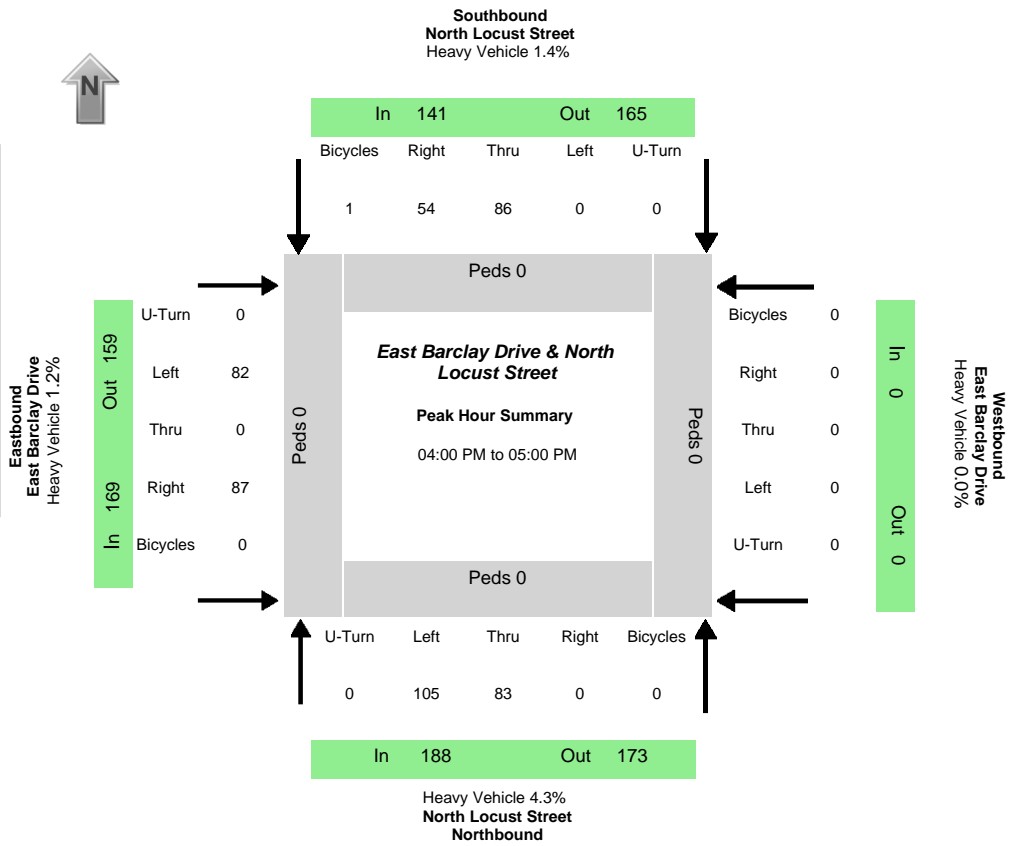
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
49	11	24	0	13	13	10	0	6	111	31	0	18	145	1	0	84	36	148	164	62	18	204	148
Percent Heavy Vehicles																							
2.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	1.2%	2.8%	1.4%	3.0%	0.0%	0.0%	2.9%	2.0%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk				Sum	
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	1	0	0	0	0	1	0	1	1	0	0	2	1	0	0	7	0	0	0	2	2

Time	Northbound North Pine Street				Southbound North Pine Street				Eastbound West Barclay Drive				Westbound West Barclay Drive				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	4	0	0	0	0	1	0	0	0	9	4	0	3	15	0	0		
04:05:00 PM	8	0	4	0	0	1	1	0	1	10	1	0	1	12	0	0		
04:10:00 PM	8	6	3	0	3	2	0	0	1	10	2	0	1	11	0	0	122	
04:15:00 PM	5	1	3	0	3	1	0	0	1	15	0	0	1	12	0	0	128	
04:20:00 PM	0	0	2	0	2	1	2	0	0	13	5	0	0	13	0	0	127	
04:25:00 PM	4	0	3	0	0	0	1	0	1	7	4	0	4	16	0	0	120	
04:30:00 PM	6	0	1	0	1	1	1	0	0	6	2	0	1	5	0	0	102	
04:35:00 PM	2	1	2	0	2	0	4	0	0	10	1	0	1	14	0	0	101	
04:40:00 PM	2	0	1	0	0	2	0	0	1	8	4	0	1	12	1	0	93	
04:45:00 PM	3	1	2	0	1	1	1	0	0	12	3	0	0	14	0	0	107	
04:50:00 PM	2	1	3	0	0	2	0	0	0	6	2	0	1	10	0	0	97	
04:55:00 PM	5	1	0	0	1	1	0	0	1	5	3	0	4	11	0	0	97	432
05:00:00 PM	2	0	0	0	0	1	0	0	0	8	3	0	1	11	0	0	85	422
05:05:00 PM	7	1	2	0	0	0	1	0	1	8	0	0	2	9	0	0	89	414
05:10:00 PM	4	1	1	0	0	1	1	0	0	5	0	0	1	9	0	0	80	390
05:15:00 PM	2	0	1	0	0	0	2	0	0	10	0	0	0	10	0	0	79	373
05:20:00 PM	4	2	3	0	0	0	0	0	1	6	2	0	0	11	0	0	77	364
05:25:00 PM	1	0	0	0	0	1	0	0	0	4	2	0	0	14	0	0	76	346
05:30:00 PM	2	1	2	0	0	1	1	0	0	3	2	0	0	8	1	0	72	343
05:35:00 PM	4	3	1	0	0	0	1	0	0	11	1	0	1	6	0	0	71	334
05:40:00 PM	3	1	2	0	0	0	1	0	1	3	1	0	0	8	0	0	69	322
05:45:00 PM	2	0	0	0	1	0	0	0	0	5	1	0	1	10	1	0	69	305
05:50:00 PM	3	0	1	0	0	0	1	0	0	7	1	0	1	12	0	0	67	304
05:55:00 PM	2	0	0	0	0	0	1	0	1	4	0	0	0	11	1	0	67	292

Data Provided by K-D-N.com 503-594-4224

N/S street	North Locust Street
E/W street	East Barclay Drive
City, State	Sisters OR
Site Notes	
Location	44.29342 - -121.57694
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:05:00 PM
PHF (15-Min Int)	0.89



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
105	83	0	0	0	86	54	0	82	0	87	0	0	0	0	0	188	140	169	0	173	165	159	0
Percent Heavy Vehicles																							
5.7%	2.4%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	1.2%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.3%	1.4%	1.2%	0.0%	0.6%	1.8%	5.0%	0.0%

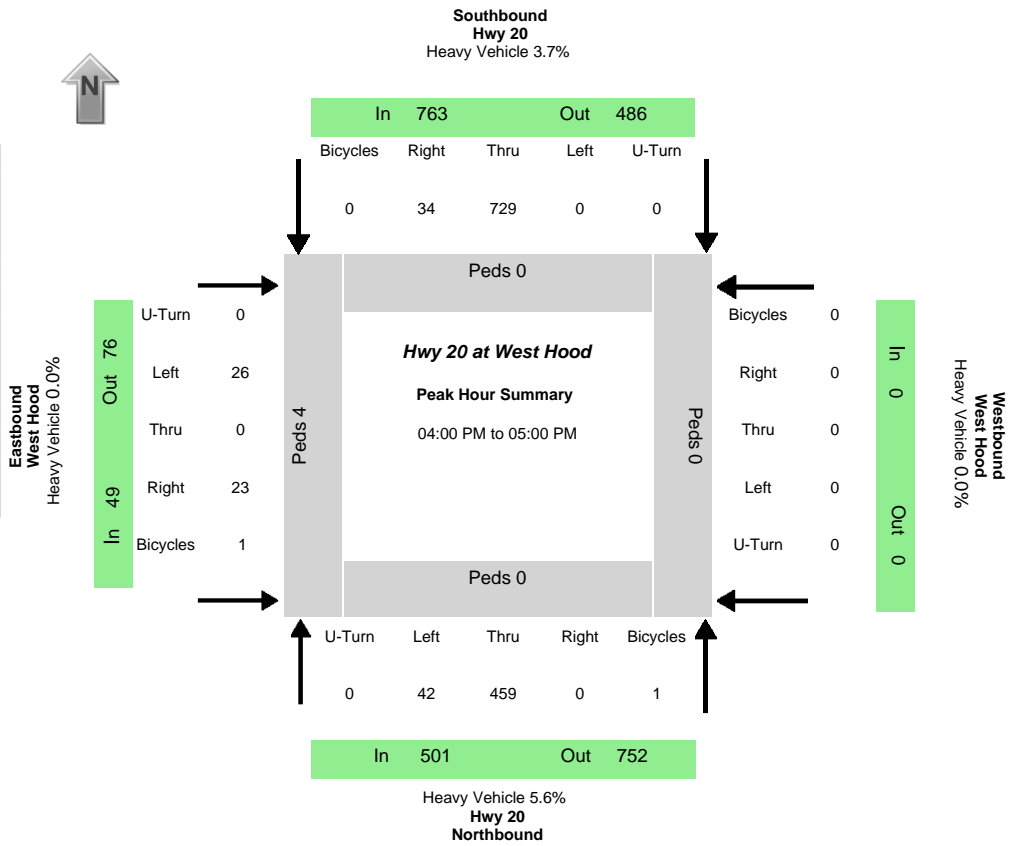
PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Time	Northbound North Locust Street				Southbound North Locust Street				Eastbound East Barclay Drive				Westbound East Barclay Drive				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	12	2	0	0	0	10	8	0	4	0	8	0	0	0	0	0		
04:05:00 PM	9	9	0	0	0	9	3	0	9	0	7	0	0	0	0	0		
04:10:00 PM	7	6	0	0	0	8	4	0	15	0	5	0	0	0	0	0	135	
04:15:00 PM	11	8	0	0	0	8	4	0	6	0	11	0	0	0	0	0	139	
04:20:00 PM	8	5	0	0	0	7	7	0	5	0	13	0	0	0	0	0	138	
04:25:00 PM	11	4	0	0	0	2	0	0	4	0	9	0	0	0	0	0	123	
04:30:00 PM	6	5	0	0	0	5	4	0	7	0	5	0	0	0	0	0	107	
04:35:00 PM	11	6	0	0	0	6	0	0	8	0	8	0	0	0	0	0	101	
04:40:00 PM	8	8	0	0	0	9	6	0	6	0	8	0	0	0	0	0	116	
04:45:00 PM	12	10	0	0	0	8	6	0	6	0	4	0	0	0	0	0	130	
04:50:00 PM	5	13	0	0	0	9	10	0	6	0	2	0	0	0	0	0	136	
04:55:00 PM	5	7	0	0	0	5	2	0	6	0	7	0	0	0	0	0	123	497
05:00:00 PM	5	9	0	0	0	6	1	0	2	0	9	0	0	0	0	0	109	485
05:05:00 PM	4	9	0	0	0	7	2	0	6	0	7	0	0	0	0	0	99	474
05:10:00 PM	8	7	0	0	0	5	1	0	2	0	2	0	0	0	0	0	92	454
05:15:00 PM	11	8	0	0	0	7	1	0	6	0	7	1	0	0	0	0	101	447
05:20:00 PM	4	7	0	0	0	7	2	0	5	0	4	0	0	0	0	0	95	431
05:25:00 PM	5	8	0	0	0	5	1	0	5	0	4	0	0	0	0	0	98	429
05:30:00 PM	5	6	0	0	0	4	1	0	1	0	3	0	0	0	0	0	77	417
05:35:00 PM	2	7	0	0	0	4	5	0	6	0	5	0	0	0	0	0	77	407
05:40:00 PM	4	5	0	0	0	2	4	0	1	0	3	0	0	0	0	0	68	381
05:45:00 PM	9	6	0	0	0	7	4	0	4	0	4	0	0	0	0	0	82	369
05:50:00 PM	9	7	0	0	0	2	1	0	6	0	2	0	0	0	0	0	80	351
05:55:00 PM	6	9	0	0	0	7	4	0	2	0	2	0	0	0	0	0	91	349



KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	Hwy 20
E/W street	West Hood
City, State	Sisters OR
Site Notes	
Location	44.293657 - -121.557960
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:00:00 PM
PHF (15-Min Int)	0.95



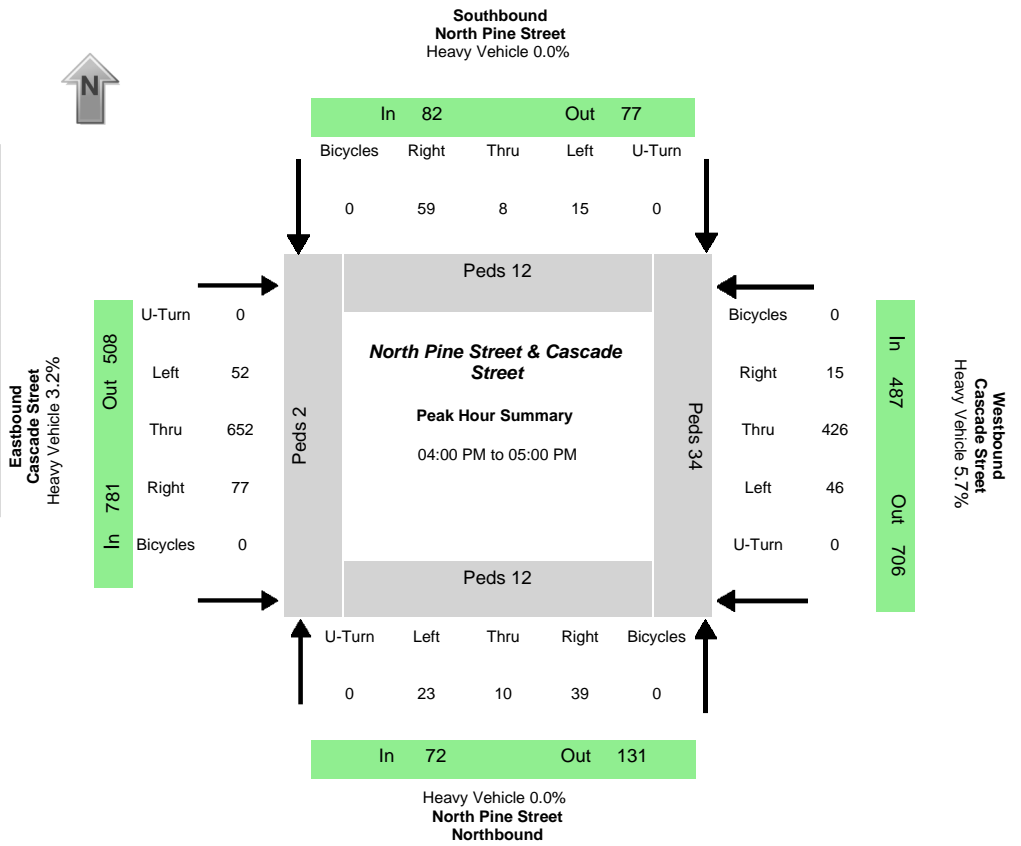
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
42	459	0	0	0	729	34	0	26	0	23	0	0	0	0	0	501	763	49	0	752	485	76	0
Percent Heavy Vehicles																							
11.9%	5.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	3.7%	0.0%	0.0%	3.7%	4.7%	6.6%	0.0%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	4	0	4

All Vehicle Volumes																		
Time	Northbound Hwy 20				Southbound Hwy 20				Eastbound West Hood				Westbound West Hood				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	2	36	0	0	0	64	5	0	3	0	0	0	0	0	0	0		
04:05:00 PM	6	44	0	0	0	58	2	0	2	0	6	0	0	0	0	0		
04:10:00 PM	3	37	0	0	0	68	3	0	3	0	3	0	0	0	0	0	345	
04:15:00 PM	1	28	0	0	0	69	5	0	0	0	2	0	0	0	0	0	340	
04:20:00 PM	5	36	0	0	0	61	10	0	1	0	3	0	0	0	0	0	338	
04:25:00 PM	3	40	0	0	0	49	2	0	4	0	1	0	0	0	0	0	320	
04:30:00 PM	4	41	0	0	0	69	1	0	1	0	0	0	0	0	0	0	331	
04:35:00 PM	7	32	0	0	0	58	0	0	1	0	2	0	0	0	0	0	315	
04:40:00 PM	4	42	0	0	0	55	1	0	3	0	2	0	0	0	0	0	323	
04:45:00 PM	4	46	0	0	0	76	1	0	1	0	0	0	0	0	0	0	335	
04:50:00 PM	2	43	0	0	0	46	2	0	6	0	3	0	0	0	0	0	337	
04:55:00 PM	1	34	0	0	0	56	2	0	1	0	1	0	0	0	0	0	325	1313
05:00:00 PM	4	44	0	0	0	40	3	0	0	0	0	0	0	0	0	0	288	1294
05:05:00 PM	2	21	0	0	0	42	2	0	1	0	1	0	0	0	0	0	255	1245
05:10:00 PM	2	43	0	0	0	52	1	0	3	0	1	0	0	0	0	0	262	1230
05:15:00 PM	3	40	0	0	0	67	2	0	2	0	5	0	0	0	0	0	290	1244
05:20:00 PM	3	31	0	0	0	58	1	0	2	0	0	0	0	0	0	0	316	1223
05:25:00 PM	4	33	0	0	0	52	0	0	2	0	1	0	0	0	0	0	306	1216
05:30:00 PM	5	24	0	0	0	48	1	0	3	0	2	0	0	0	0	0	270	1183
05:35:00 PM	1	33	0	0	0	42	0	0	4	0	3	0	0	0	0	0	258	1166
05:40:00 PM	2	37	0	0	0	42	1	0	2	0	0	0	0	0	0	0	250	1143
05:45:00 PM	2	40	0	0	0	44	1	0	1	0	1	0	0	0	0	0	256	1104
05:50:00 PM	4	32	0	0	0	41	0	0	2	0	4	0	0	0	0	0	256	1085
05:55:00 PM	1	37	0	0	0	50	0	0	0	0	4	0	0	0	0	0	264	1082

Data Provided by K-D-N.com 503-594-4224

N/S street	North Pine Street
E/W street	Cascade Street
City, State	Sisters OR
Site Notes	
Location	44.291337 - -121.553786
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:25:00 PM
PHF (15-Min Int)	0.97



Eastbound Cascade Street
Heavy Vehicle 3.2%

Westbound Cascade Street
Heavy Vehicle 5.7%

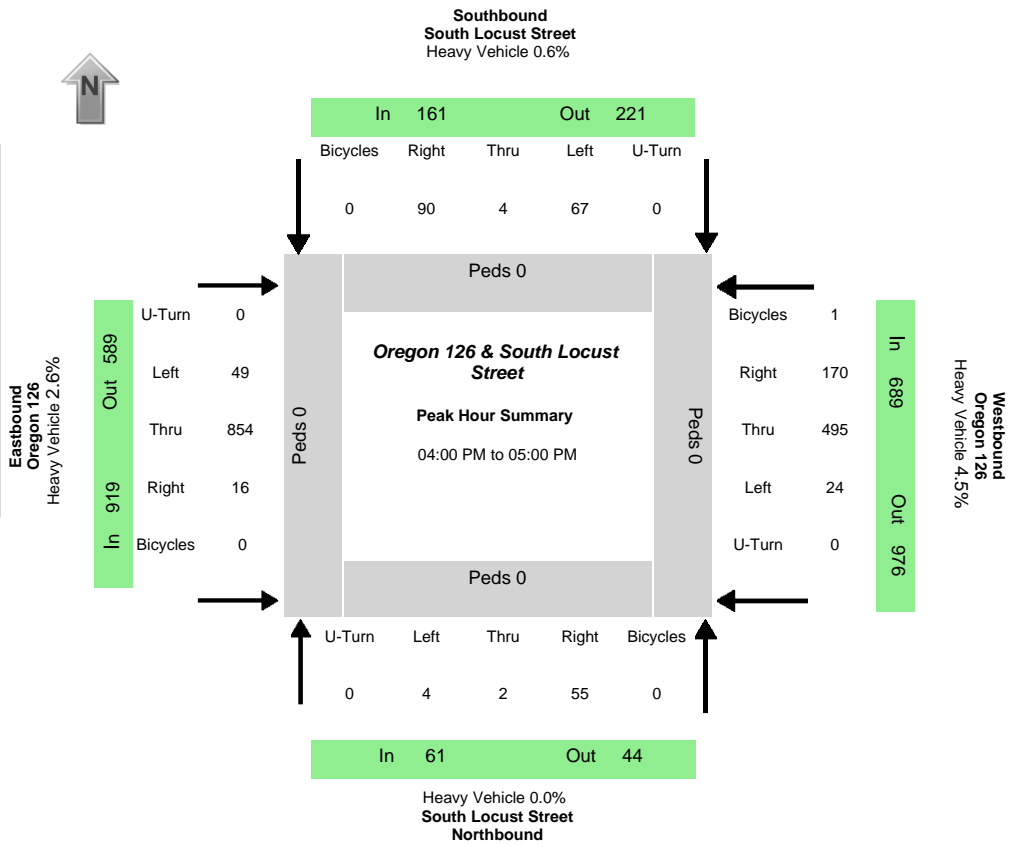
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
23	10	39	0	15	8	59	0	52	652	77	0	46	426	15	0	72	82	781	487	131	77	508	706
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	1.3%	0.0%	0.0%	6.3%	6.7%	0.0%	0.0%	0.0%	3.2%	5.7%	0.8%	1.3%	5.3%	3.4%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	2	34	60

Time	Northbound North Pine Street				Southbound North Pine Street				Eastbound Cascade Street				Westbound Cascade Street				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	4	0	2	0	1	1	4	0	4	56	5	0	5	32	0	0		
04:05:00 PM	2	0	1	0	3	0	3	0	6	53	8	0	6	46	2	0		
04:10:00 PM	2	1	4	0	2	1	3	0	5	54	8	0	3	33	2	0	362	
04:15:00 PM	4	2	1	0	1	0	5	0	4	56	8	0	3	22	1	0	355	
04:20:00 PM	0	1	5	0	2	1	3	0	2	51	7	0	3	36	2	0	338	
04:25:00 PM	1	0	7	0	0	1	4	0	5	58	6	0	4	38	0	0	344	
04:30:00 PM	4	2	4	0	1	0	5	0	4	50	4	0	5	38	1	0	355	
04:35:00 PM	1	1	3	0	0	2	4	0	7	64	8	0	4	32	0	0	368	
04:40:00 PM	1	1	2	0	1	0	6	0	2	48	5	0	3	41	2	0	356	
04:45:00 PM	1	1	4	0	1	1	12	0	1	57	8	0	3	38	1	0	366	
04:50:00 PM	2	0	4	0	1	0	6	0	5	58	5	0	4	39	2	0	366	
04:55:00 PM	1	1	2	0	2	1	4	0	7	47	5	0	3	31	2	0	360	1422
05:00:00 PM	1	1	1	0	0	3	11	0	5	45	4	0	7	34	1	0	345	1421
05:05:00 PM	1	0	3	0	2	3	6	0	1	43	3	0	3	16	1	0	301	1373
05:10:00 PM	1	1	2	0	2	1	3	0	3	47	2	0	4	41	1	0	303	1363
05:15:00 PM	4	1	2	0	0	2	2	0	5	56	6	0	6	37	1	0	312	1378
05:20:00 PM	2	1	4	0	0	1	1	0	0	67	7	0	1	24	0	0	338	1373
05:25:00 PM	1	1	2	0	0	1	6	0	2	53	3	0	6	30	0	0	335	1354
05:30:00 PM	0	2	3	0	1	0	0	0	3	46	0	0	3	30	0	0	301	1324
05:35:00 PM	2	0	0	0	3	1	1	0	3	51	4	0	2	27	2	0	289	1294
05:40:00 PM	0	3	2	0	1	2	1	0	2	41	1	0	3	40	1	0	281	1279
05:45:00 PM	3	0	3	0	2	0	2	0	4	36	3	0	2	39	2	0	289	1247
05:50:00 PM	3	1	0	0	1	1	5	0	2	49	0	0	3	28	0	0	286	1214
05:55:00 PM	4	0	1	0	0	0	2	0	2	45	0	0	3	31	1	0	278	1197

Data Provided by K-D-N.com 503-594-4224

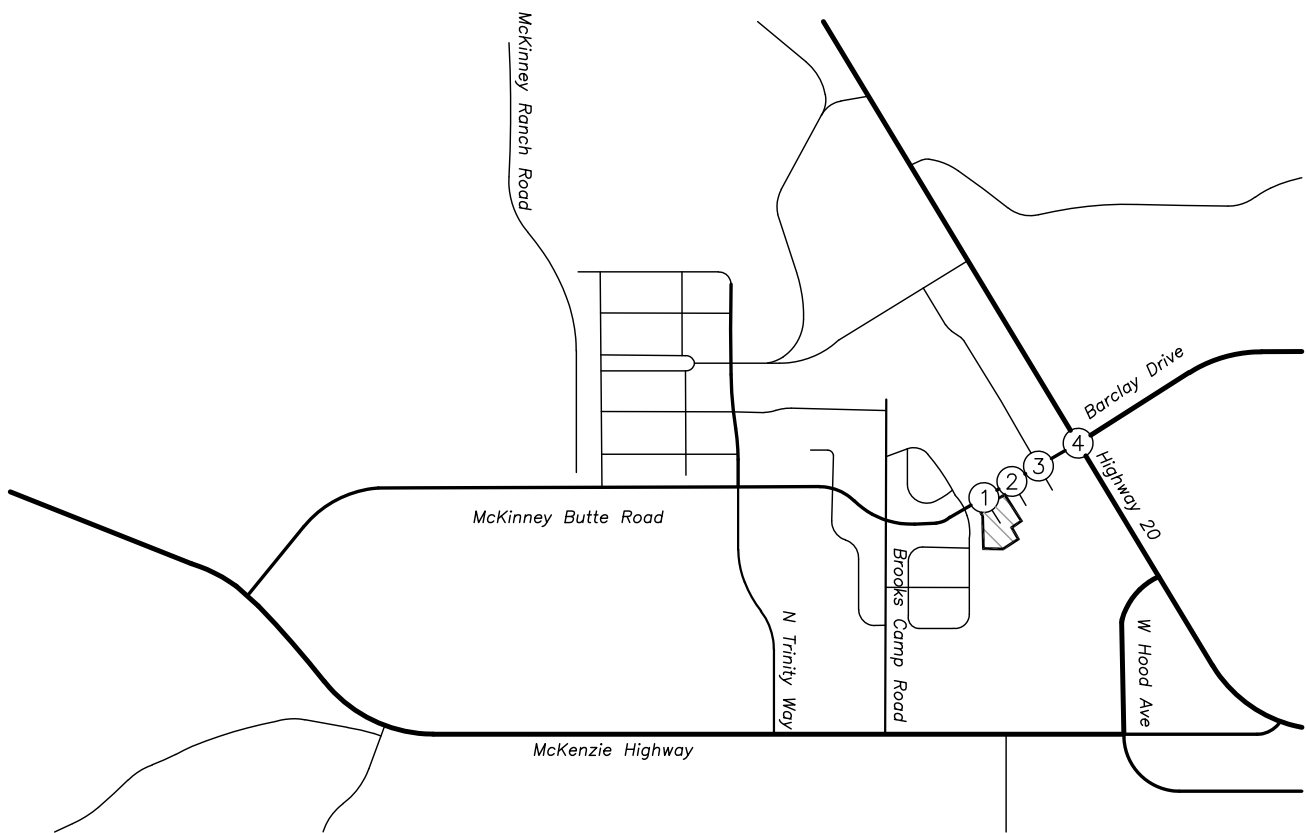
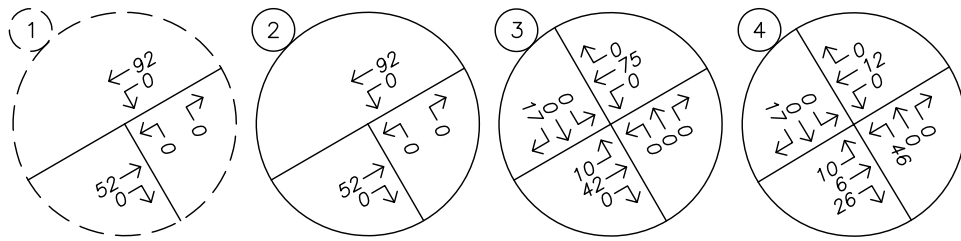
N/S street	South Locust Street
E/W street	Oregon 126
City, State	Sisters OR
Site Notes	
Location	44.290171 - -121.543814
Start Date	Thursday, July 16, 2020
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:00:00 PM
PHF (15-Min Int)	0.97



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
4	2	55	0	67	4	90	0	49	854	16	0	24	495	170	0	61	161	919	689	44	221	589	976
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	5.1%	3.5%	0.0%	0.0%	0.6%	2.6%	4.5%	0.0%	2.7%	4.2%	2.6%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk				Sum	
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0

Time	Northbound South Locust Street				Southbound South Locust Street				Eastbound Oregon 126				Westbound Oregon 126				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	1	0	3	0	7	1	8	0	5	79	0	0	1	48	14	0		
04:05:00 PM	0	0	9	0	7	0	13	0	4	70	1	0	3	45	18	0		
04:10:00 PM	1	0	5	0	5	0	6	0	10	63	2	0	0	34	10	0	473	
04:15:00 PM	0	0	6	0	0	0	7	0	2	77	1	0	2	38	22	0	461	
04:20:00 PM	0	1	2	0	1	0	9	0	0	71	1	0	3	35	9	0	423	
04:25:00 PM	0	0	6	0	7	1	7	0	5	76	4	0	3	40	15	0	451	
04:30:00 PM	1	0	6	0	6	0	5	0	3	63	3	0	0	41	8	0	432	
04:35:00 PM	0	0	4	0	6	0	3	0	3	82	1	0	4	47	15	0	465	
04:40:00 PM	0	0	4	0	8	1	8	0	3	67	0	0	1	40	10	0	443	
04:45:00 PM	1	1	5	0	6	0	11	0	7	64	1	0	1	47	21	0	472	
04:50:00 PM	0	0	3	0	5	0	9	0	4	69	2	0	5	37	16	0	457	
04:55:00 PM	0	0	2	0	9	1	4	0	3	73	0	0	1	43	12	0	463	1830
05:00:00 PM	1	0	1	0	5	1	6	0	10	64	1	0	2	24	11	0	424	1789
05:05:00 PM	1	1	4	0	3	1	3	0	6	60	3	0	3	36	8	0	403	1748
05:10:00 PM	0	1	2	0	6	0	4	0	9	49	0	0	3	38	8	0	375	1732
05:15:00 PM	0	0	4	0	6	0	4	0	4	59	1	0	2	31	23	0	383	1711
05:20:00 PM	1	0	3	0	7	0	4	0	5	71	0	0	1	46	7	0	399	1724
05:25:00 PM	0	0	0	0	4	0	5	0	8	63	1	0	4	24	6	0	394	1675
05:30:00 PM	1	0	0	0	4	0	2	0	5	48	0	0	3	36	5	0	364	1643
05:35:00 PM	0	0	3	0	2	0	4	0	3	57	1	0	4	38	11	0	342	1601
05:40:00 PM	0	2	6	0	5	0	4	0	3	46	0	0	3	37	9	0	342	1574
05:45:00 PM	2	0	1	0	5	0	4	0	2	34	0	0	4	33	8	0	331	1502
05:50:00 PM	3	0	1	0	2	0	2	0	3	51	4	0	4	36	17	0	331	1475
05:55:00 PM	0	1	2	0	6	0	4	0	5	49	1	0	2	38	10	0	334	1445



TRAFFIC VOLUMES
 In-Process Trips - McKenzie Meadows
 PM Peak Hour

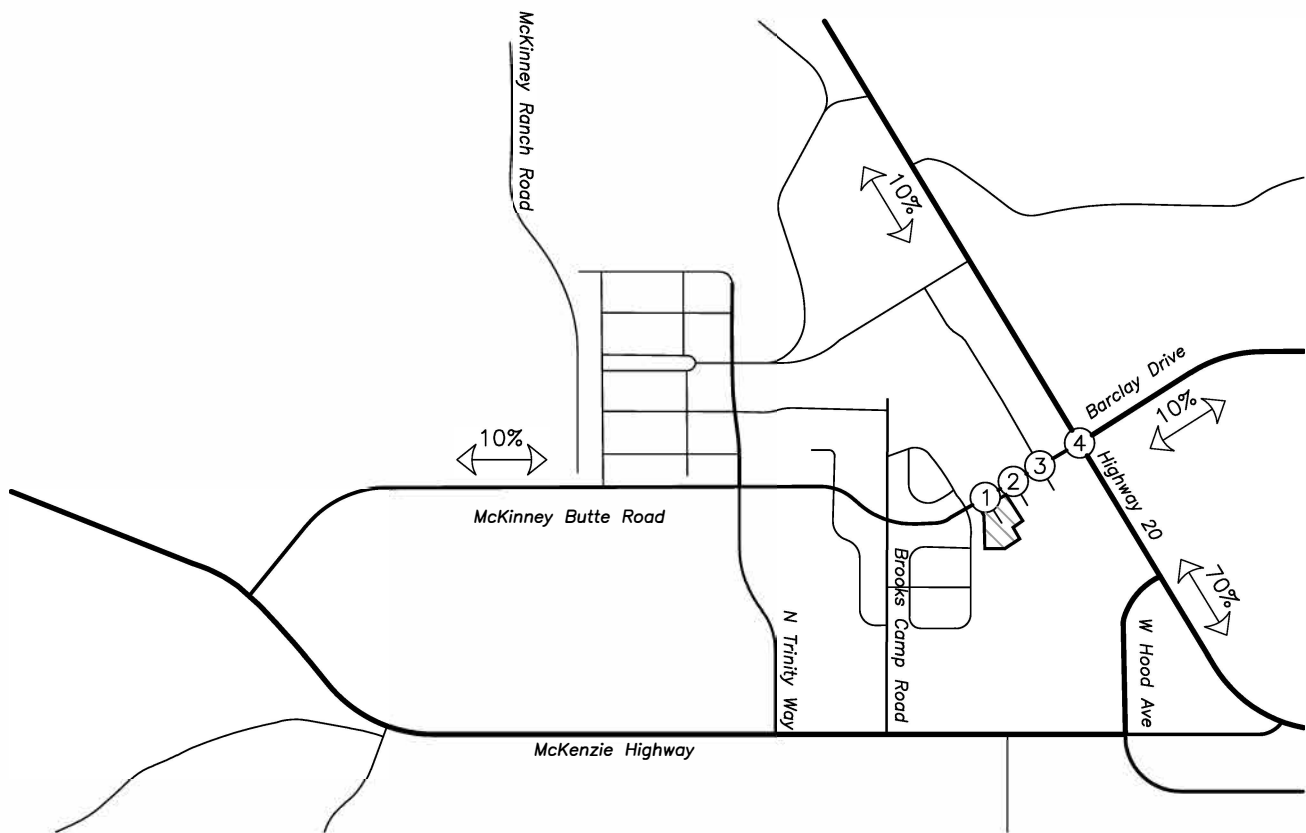
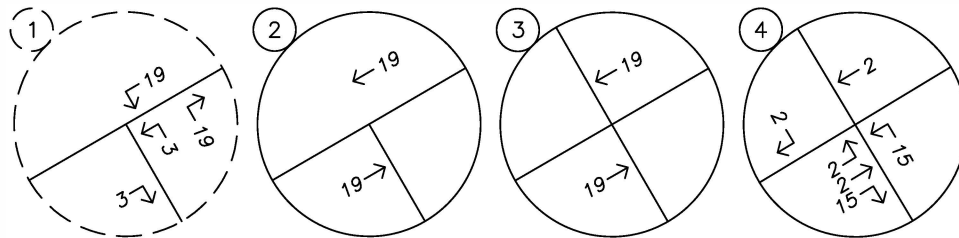


FIGURE
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 PAGE
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LEGEND

XX% PERCENT OF PRIMARY TRIPS

TRIP GENERATION			
	IN	OUT	TOTAL
AM	8	3	11
PM	22	22	44



TRAFFIC VOLUMES
 In-Process Trips – Dollar General
 PM Peak Hour



FIGURE
 5

PAGE
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Appendix C - Safety

Crash History Data

Left-Turn Lane Warrant Analysis

Preliminary Signal Warrant Analysis

Pedestrian Crossing Treatments (NCHRP 562)

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SISTERS, DESCHUTES COUNTY

MCKINNEY BUTTE RD at SANTIAM HY, City of Sisters, Deschutes County, 01/01/2015 to 12/31/2019

6 - 8 of 8 Crash records shown.

SER#	S	D	M	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE																		
INVEST	E	A	U	I	C	O	DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE														
RD DPT	E	L	G	N	H	R	TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED								
UNLOC?	D	C	S	V	L	K	LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE		
01807	N	N	N	N	N	N	09/25/2017	02	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE	9	STRGHT												
COUNTY							MO		SANTIAM HY	CN		YIELD	Y	DRY	ANGL	N/A	NW-SE										000		00		
N							4P			03	0		N	DAY	PDO	PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		
N							44 17 44.79	-121 33 35.37	001600100S00																						
																02	NONE	9	STRGHT												
																N/A	NE-SW										000		00		
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		
00222	N	N	N	N	N	N	02/08/2018	02	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01	NONE	0	TURN-R												
COUNTY							TH		SANTIAM HY	CN		YIELD	Y	DRY	TURN	UNKN	NW-SW										000		00		
N							12P			03	0		N	DAY	INJ	PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		028	000		02		
N							44 17 44.79	-121 33 35.37	001600100S00																						
																02	NONE	0	STRGHT												
																PRVTE	NE-SW										000		00		
																PSNGR	CAR		01	DRVR	INJC	37	F	OR-Y		000	000		00		
02361	N	N	N	N	N	N	12/31/2019	07	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLR	S-1TURN	01	NONE	9	TURN-R												
COUNTY							TU		SANTIAM HY	CN		CHANNEL	Y	DRY	TURN	N/A	NW-SW										052		00		
N							2P			03	4		N	DAY	PDO	SEMI	TOW		01	DRVR	NONE	00	Unk	UNK		000	000		00		
N							44 17 44.82	-121 33 35.37	0016AJ100S00																						
																02	NONE	9	TURN-R												
																N/A	NW-SW										000		00		
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

CITY OF SISTERS, DESCHUTES COUNTY

BARCLAY DR at SANTIAM HY, City of Sisters, Deschutes County, 01/01/2015 to 12/31/2019

1 - 2 of 2 Crash records shown.

SER#	S	D	M	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE																						
INVEST	E	A	U	I	C	O	DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE	A S																	
RD DPT	E	L	G	N	H	R	TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED												
UNLOC?	D	C	S	V	L	K	LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE						
02337	N	N	N	N	N	N	12/26/2016	02	BARCLAY WAY	INTER	CROSS	N	Y	CLR	FIX OBJ	01	NONE	9	STRGHT															058,092	26
COUNTY									MO	SANTIAM HY	NW		STOP SIGN	N	ICE	FIX	N/A	SE-NW															007	00	
N									4P		05	0		N	DAY	PDO	PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00						
N									44 17 44.72 -121 33 34.75	001600100S00																									
00078	Y	Y	N	N	N	N	01/11/2018	02	W BARCLAY DR	INTER	CROSS	N	Y	CLD	FIX OBJ	01	NONE	0	STRGHT															044,040	30
COUNTY									TH	SANTIAM HY	NW		YIELD	Y	WET	FIX	PRVTE	SE-NW															029	044,040	00
N									11P		06	0		N	DLIT	INJ	PSNGR CAR		01	DRVR	INJB	30	M	OR-Y		050,079,081	000		30						
N									44 17 44.45 -121 33 33.58	001600200S00																									

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SISTERS, DESCHUTES COUNTY

MCKINNEY BUTTE RD at SANTIAM HY, City of Sisters, Deschutes County, 01/01/2015 to 12/31/2019

6 - 8 of 8 Crash records shown.

SER#	S	D	M	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE																		
INVEST	E	A	U	I	C	O	DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE														
RD DPT	E	L	G	N	H	R	TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED								
UNLOC?	D	C	S	V	L	K	LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE		
01807	N	N	N	N	N	N	09/25/2017	02	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE	9	STRGHT												02
COUNTY							MO		SANTIAM HY	CN		YIELD	Y	DRY	ANGL	N/A	NW-SE											000	00		
N							4P			03	0		N	DAY	PDO	PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		
N							44 17 44.79	-121 33 35.37	001600100S00																						
																02	NONE	9	STRGHT												
																N/A	NE-SW											000	00		
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		
00222	N	N	N	N	N	N	02/08/2018	02	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLD	ANGL-OTH	01	NONE	0	TURN-R											02	
COUNTY							TH		SANTIAM HY	CN		YIELD	Y	DRY	TURN	UNKN	NW-SW											000	00		
N							12P			03	0		N	DAY	INJ	PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		028	000		02		
N							44 17 44.79	-121 33 35.37	001600100S00																						
																02	NONE	0	STRGHT												
																PRVTE	NE-SW											000	00		
																PSNGR	CAR		01	DRVR	INJC	37	F	OR-Y		000	000		00		
02361	N	N	N	N	N	N	12/31/2019	07	MCKINNEY BUTTE RD	INTER	CROSS	N	N	CLR	S-1TURN	01	NONE	9	TURN-R											02	
COUNTY							TU		SANTIAM HY	CN		CHANNEL	Y	DRY	TURN	N/A	NW-SW											052	00		
N							2P			03	4		N	DAY	PDO	SEMI	TOW		01	DRVR	NONE	00	Unk	UNK		000	000		00		
N							44 17 44.82	-121 33 35.37	0016AJ100S00																						
																02	NONE	9	TURN-R												
																N/A	NW-SW											000	00		
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00		

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Left-Turn Lane Warrant Analysis



Project: 21005 - Sisters Woodlands Master Plan
 Intersection: W Barclay Drive at N Pine Street
 Date: 7/27/2021
 Scenario: 2027 Buildout - PM Peak Hour (WB)

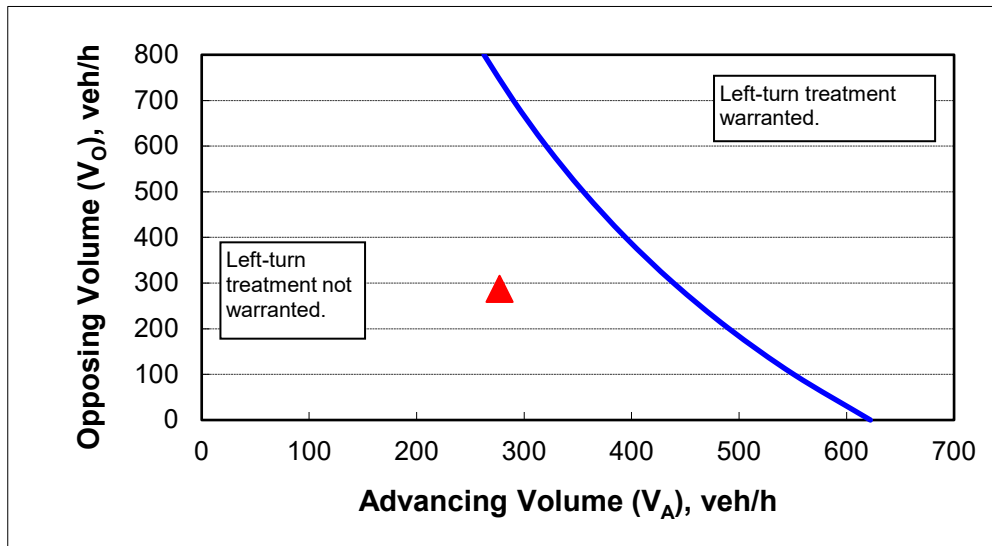
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	277
Opposing volume (V_O), veh/h:	287

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	445
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis



Project: 21005 - Sisters Woodlands Master Plan
 Intersection: W Barclay Drive at Site Access
 Date: 7/27/2021
 Scenario: 2027 Buildout - PM Peak Hour (WB)

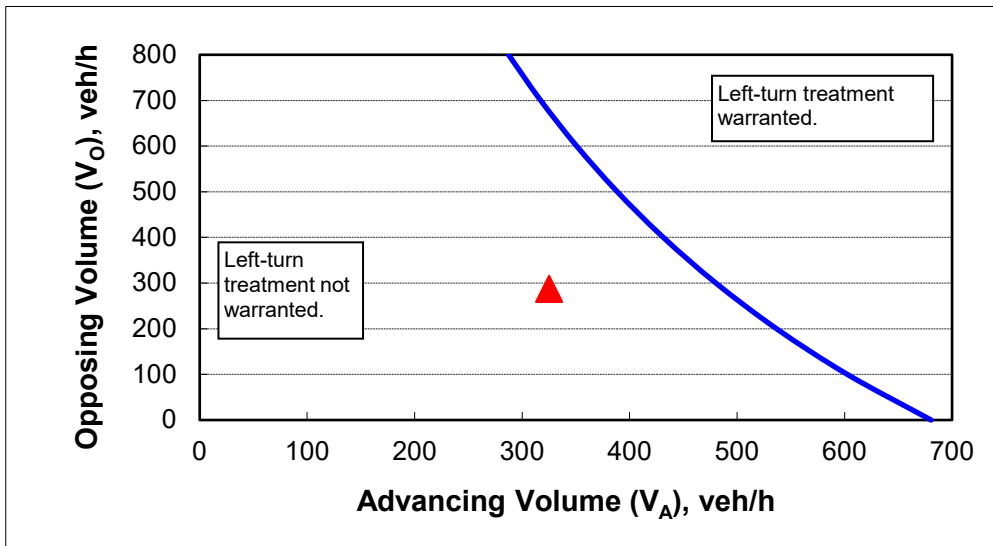
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	10%
Advancing volume (V_A), veh/h:	325
Opposing volume (V_O), veh/h:	287

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	487
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis



Project: 21005 - Sisters Woodlands Master Plan
 Intersection: W Barclay Drive at N Pine Street
 Date: 7/27/2021
 Scenario: 2027 Buildout - PM Peak Hour (EB)

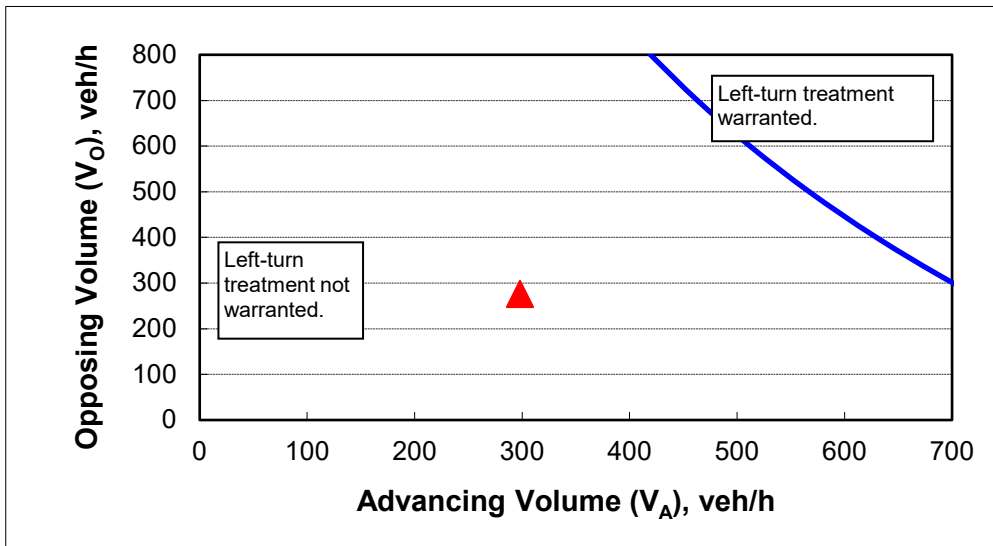
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	298
Opposing volume (V_O), veh/h:	276

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	720
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis



Project: 21005 - Sisters Woodlands Master Plan
 Intersection: N Pine Street at W Sisters Park Drive
 Date: 7/27/2021
 Scenario: 2027 Buildout - PM Peak Hour (NB)

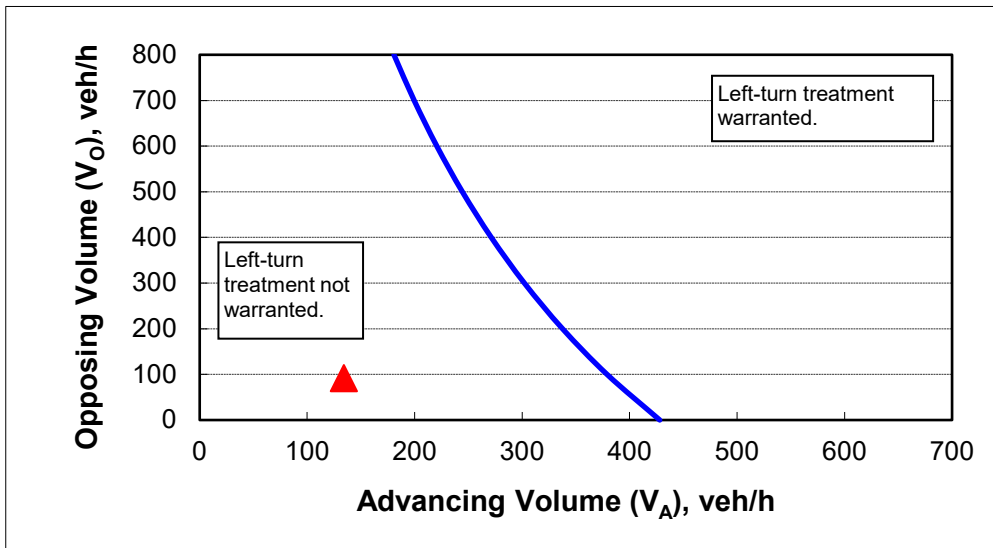
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	25
Percent of left-turns in advancing volume (V_A), %:	35%
Advancing volume (V_A), veh/h:	134
Opposing volume (V_O), veh/h:	92

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	383
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Traffic Signal Warrant Analysis



Project: 21005 Woodlands Master Plan
 Date: 7/20/2021
 Scenario: 2027 Buildout Volumes

Major Street:	US Highway 20	Minor Street:	N Pine Street
Number of Lanes:	1	Number of Lanes:	2
PM Peak Hour Volumes:	1,544	PM Peak Hour Volumes:	105

Warrant Used:

_____ 100 percent of standard warrants used
 X 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
WARRANT 1, CONDITION A					
		100%	70%	100%	70%
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	15,440	6,200	
Minor Street*	1,050	2,500	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	15,440	9,300	
Minor Street*	1,050	1,250	No
<i>Combination Warrant</i>			
Major Street	15,440	7,440	
Minor Street*	1,050	2,000	No

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis



Project: 21005 Woodlands Master Plan
 Date: 7/20/2021
 Scenario: 2027 Buildout Volumes

Major Street:	W Barclay Drive	Minor Street:	N Pine Street
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	575	PM Peak Hour Volumes:	114

Warrant Used:

	100 percent of standard warrants used
<u>X</u>	70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	5,750	6,200	
Minor Street*	1,140	1,850	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	5,750	9,300	
Minor Street*	1,140	950	No
<i>Combination Warrant</i>			
Major Street	5,750	7,440	
Minor Street*	1,140	1,480	No

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis



Project: 21005 Woodlands Master Plan
 Date: 7/20/2021
 Scenario: 2027 Buildout Volumes

Major Street:	US Highway 20	Minor Street:	W Hood Avenue
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	1,457	PM Peak Hour Volumes:	76

Warrant Used:

<u> </u>	100 percent of standard warrants used
<u> X </u>	70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
WARRANT 1, CONDITION A					
		100%	70%	100%	70%
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	14,570	6,200	
Minor Street*	760	1,850	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	14,570	9,300	
Minor Street*	760	950	No
<i>Combination Warrant</i>			
Major Street	14,570	7,440	
Minor Street*	760	1,480	No

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis



Project: 21005 Woodlands Master Plan
 Date: 7/20/2021
 Scenario: 2027 Buildout Volumes

Major Street:	N Pine Street	Minor Street:	W Sisters Park Drive
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	226	PM Peak Hour Volumes:	44

Warrant Used:

	100 percent of standard warrants used
<u>X</u>	70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
WARRANT 1, CONDITION A					
		100%	70%	100%	70%
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	2,260	6,200	
Minor Street*	440	1,850	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	2,260	9,300	
Minor Street*	440	950	No
<i>Combination Warrant</i>			
Major Street	2,260	7,440	
Minor Street*	440	1,480	No

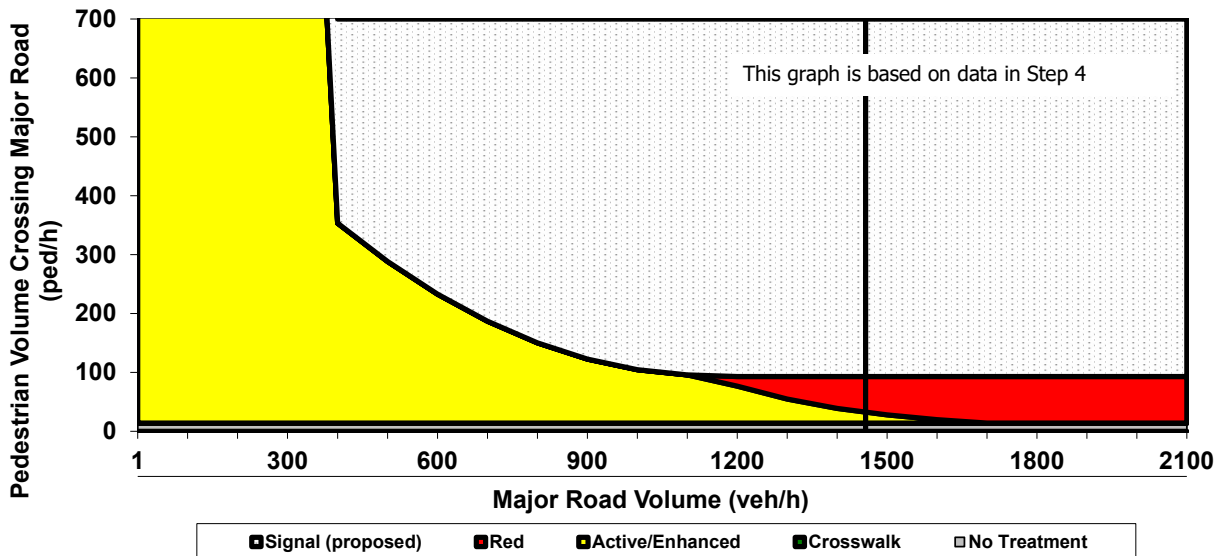
* Minor street right-turning traffic volumes reduced by 25%

GUIDELINES FOR PEDESTRIAN CROSSING TREATMENTS

This spreadsheet combines Worksheet 1 and Worksheet 2 (Appendix A, pages 69-70) of TCRP Report 112/NCHRP Report 562 (*Improving Pedestrian Safety at Unsignalized Intersections*) into an electronic format. This spreadsheet should be used in conjunction with, and not independent of, Appendix A documentation.

Key	This spreadsheet is still under development, please inform TTI if errors are identified.
Blue fields contain descriptive information.	
Green fields are required and must be completed.	
Tan fields are adjustments that are filled out only under certain conditions (follow instructions to the left of the cell).	
Gray fields are automatically calculated and should not be edited.	

Analyst and Site Information			
Analyst	Melissa Webb	Major Street	US-20
Analysis Date	July 22, 2021	Minor Street or Location	W Hood Avenue
Data Collection Date	July 16, 2020	Peak Hour	4:00-5:00 PM
Step 1: Select worksheet:			
Posted or statutory speed limit (or 85th percentile speed) on the major street (mph)		1a	35
Is the population of the surrounding area <10,000? (enter YES or NO)		1b	YES
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a traffic control device?			
Peak-hour pedestrian volume (ped/h), V_p		2a	0
Result: Consider raised median islands, curb extensions, traffic calming, etc. as feasible.			
Step 3: Does the crossing meet the pedestrian warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), V_{maj-s}		3a	1457
[Calculated automatically] Preliminary (before min. threshold) peak hour pedestrian volume to meet warrant		3b	93
[Calculated automatically] Minimum required peak hour pedestrian volume to meet traffic signal warrant		3c	93
Is 15th percentile crossing speed of pedestrians less than 3.5 ft/s (1.1 m/s)? (enter YES or NO)		3d	no
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce 3c by up to 50%.	% rate of reduction for 3c (up to 50%)	3e	
	Reduced value or 3c	3f	93
Result:			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		4a	25
Pedestrian walking speed (ft/s), S_p (suggested speed = 3.5 ft/s)		4b	3.5
Pedestrian start-up time and end clearance time (s), t_s (suggested start-up time = 3 sec)		4c	3
[Calculated automatically] Critical gap required for crossing pedestrian (s), t_c		4d	10
Major road volume, total both approaches OR approach being crossed if raised median island is present, during peak hour (veh/h), V_{maj-d}		4e	1457
Major road flow rate (veh/s), v		4f	0.58
Average pedestrian delay (s/person), d_p		4g	607
Total pedestrian delay (h), D_p The value in 4h is the calculated estimated delay for all pedestrians crossing the major roadway without a crossing treatment (assumes 0% compliance). If the actual total pedestrian delay has been measured at the site, that value can be entered in 4i to replace the calculated value in 4h.		4h	0.0
		4i	
Step 5: Select treatment based up on total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region: enter HIGH for High Compliance or LOW for Low Compliance		5a	low
Treatment Category:		Consider raised median islands, curb extensions, traffic calming, etc. as feasible.	



This worksheet provides general recommendations on pedestrian crossing treatments to consider at unsignalized intersections; in all cases, engineering judgment should be used in selecting a specific treatment for installation. This worksheet does not apply to school crossings. In addition to the results provided by this worksheet, users should consider whether a pedestrian treatment could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex geometrics, or nearby traffic signals.

Appendix D - Analysis

Synchro Reports



Vistro File: Z:\...\Woodlands Master Plan July 2021.vistro

Scenario 1 Existing Volumes

Report File: Z:\...\Existing Conditions.pdf

7/21/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	NEB Right		16.5	C
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.108	12.8	B
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	EB Left	0.179	14.1	B
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	0.239	56.3	F
5	Locust Street at US 20	Two-way stop	HCM 6th Edition	SB Left	1.027	232.9	F
16	US 20 at W Hood Avenue	Two-way stop	HCM 6th Edition	NEB Left	0.223	43.2	E
61	N Pine Street at W Sisters Park Drive (Site Access)	Two-way stop	HCM 6th Edition	WB Left	0.030	9.7	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:	Roundabout	Delay (sec / veh):	16.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	107	95	122	46	93	78	81	431	16	103	602	43
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.90	1.90	1.90	2.80	2.80	2.80	4.20	4.20	4.20	3.20	3.20	3.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	107	95	122	46	93	78	81	431	16	103	602	43
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	26	34	13	26	21	22	118	4	28	165	12
Total Analysis Volume [veh/h]	118	104	134	51	102	86	89	474	18	113	662	47
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	852			707			343			250		
Exiting Flow Rate [veh/h]	246			241			872			703		
Demand Flow Rate [veh/h]	107	95	122	46	93	78	81	431	16	103	602	43
Adjusted Demand Flow Rate [veh/h]	118	104	134	51	102	86	89	474	18	113	662	47

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.97			0.96			0.97		
Entry Flow Rate [veh/h]	363			246			606			849		
Capacity of Entry and Bypass Lanes [veh/h]	579			672			973			1070		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	568			653			934			1037		
X, volume / capacity	0.63			0.37			0.62			0.79		

Movement, Approach, & Intersection Results

Lane LOS	C			B			B			C		
95th-Percentile Queue Length [veh]	4.33			1.68			4.49			8.69		
95th-Percentile Queue Length [ft]	108.34			41.96			112.21			217.28		
Approach Delay [s/veh]	19.53			10.50			13.11			19.27		
Approach LOS	C			B			B			C		
Intersection Delay [s/veh]	16.47											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	12.8
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.108

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	⊕			⊕			⊕			⊕		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	49	11	24	13	13	10	6	111	31	18	145	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.20	1.20	1.20	2.80	2.80	2.80	1.40	1.40	1.40	3.00	3.00	3.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	49	11	24	13	13	10	6	111	31	18	145	1
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	3	7	4	4	3	2	33	9	5	43	0
Total Analysis Volume [veh/h]	58	13	29	15	15	12	7	132	37	21	173	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	0.02	0.03	0.03	0.03	0.01	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	12.84	12.81	10.16	12.37	12.31	9.61	7.57	0.00	0.00	7.61	0.00	0.00
Movement LOS	B	B	B	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.58	0.58	0.58	0.23	0.23	0.23	0.02	0.02	0.02	0.05	0.05	0.05
95th-Percentile Queue Length [ft/ln]	14.59	14.59	14.59	5.72	5.72	5.72	0.38	0.38	0.38	1.14	1.14	1.14
d_A, Approach Delay [s/veh]	12.06			11.56			0.30			0.82		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	3.71											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	14.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.179

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	105	83	86	54	82	87
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.30	4.30	1.40	1.40	1.20	1.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	105	83	86	54	82	87
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	23	24	15	23	24
Total Analysis Volume [veh/h]	118	93	97	61	92	98
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.00	0.00	0.18	0.11
d_M, Delay for Movement [s/veh]	7.79	0.00	0.00	0.00	14.15	11.03
Movement LOS	A	A	A	A	B	B
95th-Percentile Queue Length [veh/ln]	0.27	0.27	0.00	0.00	1.17	1.17
95th-Percentile Queue Length [ft/ln]	6.85	6.85	0.00	0.00	29.33	29.33
d_A, Approach Delay [s/veh]	4.36		0.00		12.54	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.91					
Intersection LOS	B					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 56.3
 Level Of Service: F
 Volume to Capacity (v/c): 0.239

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach	+			+			+			+		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	23	10	39	15	8	59	52	653	77	46	426	15
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	3.20	5.70	5.70	5.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	23	10	39	15	8	59	52	653	77	46	426	15
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	3	10	4	2	15	13	168	20	12	110	4
Total Analysis Volume [veh/h]	24	10	40	15	8	61	54	673	79	47	439	16
Pedestrian Volume [ped/h]	36			36			24			24		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.24	0.09	0.11	0.15	0.08	0.11	0.05	0.01	0.00	0.06	0.00	0.00
d_M, Delay for Movement [s/veh]	56.26	52.80	29.84	50.29	48.67	12.56	8.69	0.00	0.00	9.86	0.00	0.00
Movement LOS	F	F	D	F	E	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.98	1.98	1.98	0.80	0.80	0.38	0.17	0.00	0.00	0.19	0.00	0.00
95th-Percentile Queue Length [ft/ln]	49.55	49.55	49.55	19.97	19.97	9.55	4.15	0.00	0.00	4.75	0.00	0.00
d_A, Approach Delay [s/veh]	41.51			22.74			0.58			0.92		
Approach LOS	E			C			A			A		
d_I, Intersection Delay [s/veh]	4.03											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	232.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.027

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	1	0	0	0	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	4	2	55	67	4	90	24	495	170	49	855	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	4.50	4.50	4.50	2.60	2.60	2.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	2	55	67	4	90	24	495	170	49	855	16
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	14	17	1	23	6	128	44	13	220	4
Total Analysis Volume [veh/h]	4	2	57	69	4	93	25	510	175	51	881	16
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.02	0.17	1.03	0.04	0.17	0.03	0.01	0.00	0.06	0.01	0.00
d_M, Delay for Movement [s/veh]	74.82	54.87	20.66	232.91	214.73	12.67	9.99	0.00	0.00	9.21	0.00	0.00
Movement LOS	F	F	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.02	1.02	1.02	5.52	5.52	0.59	0.10	0.10	0.00	0.18	0.00	0.00
95th-Percentile Queue Length [ft/ln]	25.43	25.43	25.43	138.05	138.05	14.71	2.60	2.60	0.00	4.47	0.00	0.00
d_A, Approach Delay [s/veh]	25.18			109.08			0.35			0.50		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	10.82											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 16: US 20 at W Hood Avenue**

Control Type:	Two-way stop	Delay (sec / veh):	43.2
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.223

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	↵↵			↵			↵↵			↵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	0	0	0	1	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	26	0	23	0	0	0	42	459	0	0	730	34
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	2.00	2.00	0.00	5.60	5.60	2.00	2.00	3.70	3.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	26	0	23	0	0	0	42	459	0	0	730	34
Peak Hour Factor	0.9500	1.0000	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	0	6	0	0	0	11	121	0	0	192	9
Total Analysis Volume [veh/h]	27	0	24	0	0	0	44	483	0	0	768	36
Pedestrian Volume [ped/h]	4			4			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.22	0.00	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	43.16	0.00	14.79	0.00	0.00	11.18	9.77	0.00	0.00	0.00	0.00	0.00
Movement LOS	E		B			B	A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.81	0.00	0.19	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	20.19	0.00	4.87	0.00	0.00	0.00	4.36	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	29.81			11.18			0.82			0.00		
Approach LOS	D			B			A			A		
d_I, Intersection Delay [s/veh]	1.41											
Intersection LOS	E											

Intersection Level Of Service Report

Intersection 61: N Pine Street at W Sisters Park Drive (Site Access)

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.030

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach	←			→						←		
Lane Configuration	←			→						←		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	0	77	0	0	62	0	0	0	0	20	0	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	77	0	0	62	0	0	0	0	20	0	7
Peak Hour Factor	1.0000	0.8400	0.8400	0.8400	0.8400	1.0000	1.0000	1.0000	1.0000	0.8400	1.0000	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	23	0	0	18	0	0	0	0	6	0	2
Total Analysis Volume [veh/h]	0	92	0	0	74	0	0	0	0	24	0	8
Pedestrian Volume [ped/h]	0			0			0			0		

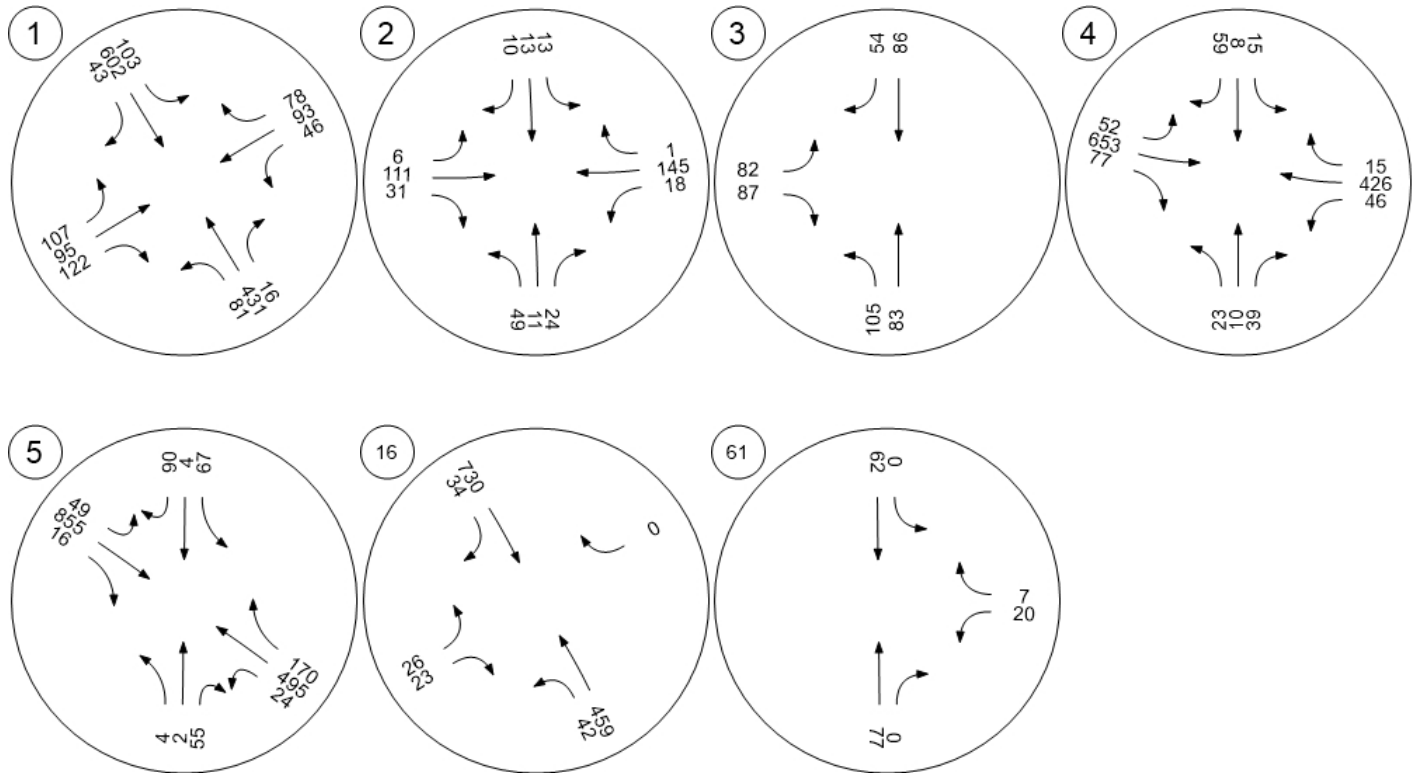
Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane				No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance				No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	7.40	0.00	0.00	0.00	0.00	0.00	9.68	0.00	8.90
Movement LOS		A	A	A	A					A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.12
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.99	0.00	2.99
d_A, Approach Delay [s/veh]	0.00			0.00			0.00			9.49		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	1.53											
Intersection LOS	A											

Traffic Volume - Base Volume



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Report File: Z:\...\Background Conditions.pdf

Scenario 2 Background Volumes
7/21/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		37.4	E
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.199	17.8	C
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	EB Left	0.310	20.8	C
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	0.413	107.4	F
5	Locust Street at US 20	Two-way stop	HCM 6th Edition	SB Left	3.522	1,383.1	F
16	US 20 at W Hood Avenue	Two-way stop	HCM 6th Edition	NEB Left	0.512	82.8	F
61	N Pine Street at W Sisters Park Drive (Site Access)	Two-way stop	HCM 6th Edition	WB Left	0.035	9.9	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:
 Analysis Method:
 Analysis Period:

Roundabout
 HCM 6th Edition
 15 minutes

Delay (sec / veh):
 Level Of Service:

37.4
 E

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	136	127	178	76	131	101	152	434	29	123	609	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.90	1.90	1.90	2.80	2.80	2.80	4.20	4.20	4.20	3.20	3.20	3.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	136	127	178	76	131	101	152	434	29	123	609	67
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	37	35	49	21	36	28	42	119	8	34	167	18
Total Analysis Volume [veh/h]	149	140	196	84	144	111	167	477	32	135	669	74
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	916			823			434			408		
Exiting Flow Rate [veh/h]	398			315			976			763		
Demand Flow Rate [veh/h]	136	127	178	76	131	101	152	434	29	123	609	67
Adjusted Demand Flow Rate [veh/h]	149	140	196	84	144	111	167	477	32	135	669	74

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.97			0.96			0.97		
Entry Flow Rate [veh/h]	495			349			705			907		
Capacity of Entry and Bypass Lanes [veh/h]	543			597			887			910		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	532			580			851			882		
X, volume / capacity	0.91			0.58			0.79			1.00		

Movement, Approach, & Intersection Results

Lane LOS	E			C			C			F		
95th-Percentile Queue Length [veh]	10.87			3.75			8.39			17.92		
95th-Percentile Queue Length [ft]	271.64			93.84			209.67			447.99		
Approach Delay [s/veh]	47.77			17.49			22.40			50.92		
Approach LOS	E			C			C			F		
Intersection Delay [s/veh]	37.40											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	17.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.199

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	62	12	27	15	15	11	7	211	48	20	219	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.20	1.20	1.20	2.80	2.80	2.80	1.40	1.40	1.40	3.00	3.00	3.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	12	27	15	15	11	7	211	48	20	219	1
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	4	8	4	4	3	2	63	14	6	65	0
Total Analysis Volume [veh/h]	74	14	32	18	18	13	8	251	57	24	261	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.20	0.03	0.04	0.05	0.05	0.02	0.01	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	17.81	17.12	12.86	16.09	15.45	10.71	7.77	0.00	0.00	7.94	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.11	1.11	1.11	0.38	0.38	0.38	0.02	0.02	0.02	0.06	0.06	0.06
95th-Percentile Queue Length [ft/ln]	27.81	27.81	27.81	9.55	9.55	9.55	0.46	0.46	0.46	1.47	1.47	1.47
d_A, Approach Delay [s/veh]	16.41			14.43			0.20			0.67		
Approach LOS	C			B			A			A		
d_I, Intersection Delay [s/veh]	3.80											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	20.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.310

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	166	93	97	70	106	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.30	4.30	1.40	1.40	1.20	1.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	166	93	97	70	106	169
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	47	26	27	20	30	47
Total Analysis Volume [veh/h]	187	104	109	79	119	190
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.14	0.00	0.00	0.00	0.31	0.21
d_M, Delay for Movement [s/veh]	8.04	0.00	0.00	0.00	20.78	15.41
Movement LOS	A	A	A	A	C	C
95th-Percentile Queue Length [veh/ln]	0.47	0.47	0.00	0.00	3.01	3.01
95th-Percentile Queue Length [ft/ln]	11.79	11.79	0.00	0.00	75.18	75.18
d_A, Approach Delay [s/veh]	5.16		0.00		17.48	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	8.76					
Intersection LOS	C					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 107.4
 Level Of Service: F
 Volume to Capacity (v/c): 0.413

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	28	18	44	17	22	66	59	739	89	52	520	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	3.20	5.70	5.70	5.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	28	18	44	17	22	66	59	739	89	52	520	17
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	5	11	4	6	17	15	190	23	13	134	5
Total Analysis Volume [veh/h]	29	19	45	18	23	68	61	762	92	54	536	19
Pedestrian Volume [ped/h]	36			36			24			24		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.41	0.20	0.11	0.24	0.25	0.12	0.06	0.01	0.00	0.07	0.01	0.00
d_M, Delay for Movement [s/veh]	107.41	93.27	64.98	88.02	79.80	11.95	9.07	0.00	0.00	10.40	0.00	0.00
Movement LOS	F	F	F	F	F	B	A	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	4.07	4.07	4.07	2.07	2.07	0.39	0.21	0.00	0.00	0.24	0.00	0.00
95th-Percentile Queue Length [ft/ln]	101.65	101.65	101.65	51.71	51.71	9.78	5.16	0.00	0.00	6.06	0.00	0.00
d_A, Approach Delay [s/veh]	83.99			38.83			0.60			0.92		
Approach LOS	F			E			A			A		
d_I, Intersection Delay [s/veh]	7.62											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	1,383.1
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	3.522

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach	Northbound			Southbound			Northwestbound			Southeastbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	0	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	4.50	4.50	4.50	2.60	2.60	2.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	16	34	1	26	7	155	62	16	250	5
Total Analysis Volume [veh/h]	5	2	64	136	5	104	28	620	249	66	1001	19
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.17	0.04	0.22	3.52	0.08	0.21	0.04	0.01	0.00	0.09	0.01	0.00
d_M, Delay for Movement [s/veh]	141.58	96.94	32.67	1383.08	1344.29	14.38	10.60	0.00	0.00	10.09	0.00	0.00
Movement LOS	F	F	D	F	F	B	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	1.94	1.94	1.94	16.03	16.03	0.80	0.13	0.13	0.00	0.28	0.00	0.00
95th-Percentile Queue Length [ft/ln]	48.39	48.39	48.39	400.64	400.64	20.02	3.26	3.26	0.00	6.98	0.00	0.00
d_A, Approach Delay [s/veh]	42.15			801.29			0.33			0.61		
Approach LOS	E			F			A			A		
d_I, Intersection Delay [s/veh]	87.11											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 16: US 20 at W Hood Avenue

Control Type:	Two-way stop	Delay (sec / veh):	82.8
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.512

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	↵↵			↵			↵↵			↵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	0	0	0	1	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	43	0	45	0	0	0	65	526	0	0	782	48
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	2.00	2.00	0.00	5.60	5.60	2.00	2.00	3.70	3.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	43	0	45	0	0	0	65	526	0	0	782	48
Peak Hour Factor	0.9500	1.0000	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	0	12	0	0	0	17	138	0	0	206	13
Total Analysis Volume [veh/h]	45	0	47	0	0	0	68	554	0	0	823	51
Pedestrian Volume [ped/h]	4			4			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.51	0.00	0.13	0.00	0.00	0.00	0.09	0.01	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	82.78	0.00	16.47	0.00	0.00	11.78	10.27	0.00	0.00	0.00	0.00	0.00
Movement LOS	F		C			B	B	A			A	A
95th-Percentile Queue Length [veh/ln]	2.22	0.00	0.44	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	55.62	0.00	11.11	0.00	0.00	0.00	7.44	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	48.90				11.78		1.12		0.00			
Approach LOS	E				B		A		A			
d_I, Intersection Delay [s/veh]	3.27											
Intersection LOS	F											

Intersection Level Of Service Report

Intersection 61: N Pine Street at W Sisters Park Drive (Site Access)

Control Type:	Two-way stop	Delay (sec / veh):	9.9
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.035

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach	←			→						←		
Lane Configuration	←			→						←		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	0	87	0	0	70	0	0	0	0	23	0	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	87	0	0	70	0	0	0	0	23	0	8
Peak Hour Factor	1.0000	0.8400	0.8400	0.8400	0.8400	1.0000	1.0000	1.0000	1.0000	0.8400	1.0000	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	26	0	0	21	0	0	0	0	7	0	2
Total Analysis Volume [veh/h]	0	104	0	0	83	0	0	0	0	27	0	10
Pedestrian Volume [ped/h]	0			0			0			0		

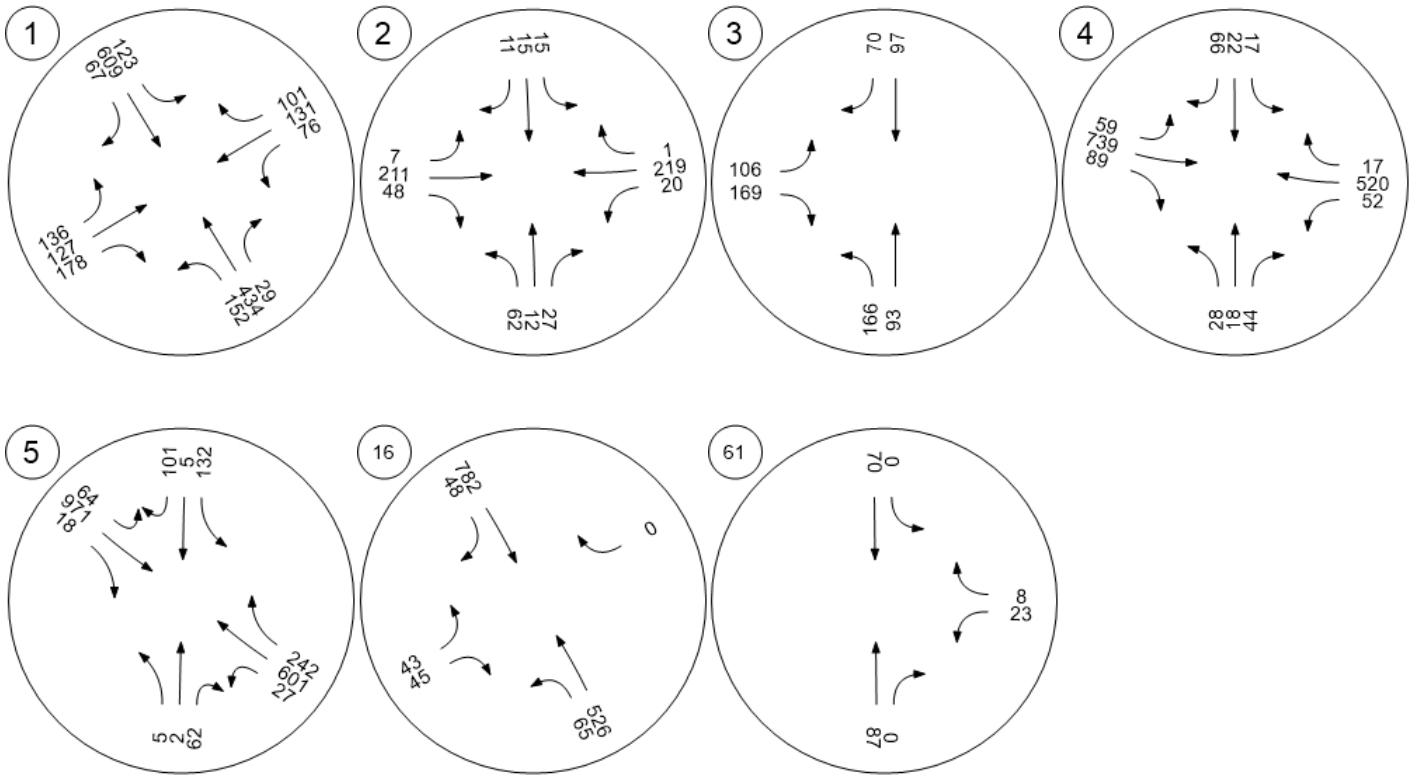
Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane				No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance				No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	7.42	0.00	0.00	0.00	0.00	0.00	9.86	0.00	9.00
Movement LOS		A	A	A	A					A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.14
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.56	0.00	3.56
d_A, Approach Delay [s/veh]	0.00			0.00			0.00			9.63		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	1.59											
Intersection LOS	A											

Traffic Volume - Future Background Volume



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Report File: Z:\...\Buildout Conditions.pdf

Scenario 3 Buildout Volumes Hwy 20 Access
7/27/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		45.3	E
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.241	21.8	C
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	EB Left	0.373	25.3	D
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	0.772	285.0	F
5	Locust Street at US 20	Two-way stop	HCM 6th Edition	SB Left	4.448	1,828.4	F
16	US 20 at W Hood Avenue	Two-way stop	HCM 6th Edition	NEB Left	0.548	92.5	F
60	W Barclay Drive at Site Access	Two-way stop	HCM 6th Edition	NWB Left	0.036	14.7	B
61	N Pine Street at W Sisters Park Drive (Site Access)	Two-way stop	HCM 6th Edition	WB Thru	0.015	11.5	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:	Roundabout	Delay (sec / veh):	45.3
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes		

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	136	127	178	76	131	101	152	434	29	123	609	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.90	1.90	1.90	2.80	2.80	2.80	4.20	4.20	4.20	3.20	3.20	3.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	7	7	7	7	0	17	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	136	144	178	76	138	108	159	441	29	140	609	67
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	37	40	49	21	38	30	44	121	8	38	167	18
Total Analysis Volume [veh/h]	149	158	196	84	152	119	175	485	32	154	669	74
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	936			840			472			425		
Exiting Flow Rate [veh/h]	415			353			976			780		
Demand Flow Rate [veh/h]	136	144	178	76	138	108	159	441	29	140	609	67
Adjusted Demand Flow Rate [veh/h]	149	158	196	84	152	119	175	485	32	154	669	74

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.97			0.96			0.97		
Entry Flow Rate [veh/h]	513			365			722			926		
Capacity of Entry and Bypass Lanes [veh/h]	532			587			853			895		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	522			571			819			867		
X, volume / capacity	0.96			0.62			0.85			1.03		

Movement, Approach, & Intersection Results

Lane LOS	F			C			D			F		
95th-Percentile Queue Length [veh]	12.63			4.27			10.04			20.32		
95th-Percentile Queue Length [ft]	315.73			106.79			251.04			508.01		
Approach Delay [s/veh]	59.08			19.28			27.55			61.64		
Approach LOS	F			C			D			F		
Intersection Delay [s/veh]	45.33											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	21.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.241

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	62	12	27	15	15	11	7	211	48	20	219	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.20	1.20	1.20	2.80	2.80	2.80	1.40	1.40	1.40	3.00	3.00	3.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	4	8	0	5	5	4	21	0	10	27	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	16	35	15	20	16	11	232	48	30	246	1
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	5	10	4	6	5	3	69	14	9	73	0
Total Analysis Volume [veh/h]	74	19	42	18	24	19	13	276	57	36	293	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.24	0.05	0.06	0.06	0.07	0.03	0.01	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	21.77	20.36	14.92	18.95	17.52	11.59	7.86	0.00	0.00	8.04	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.56	1.56	1.56	0.56	0.56	0.56	0.03	0.03	0.03	0.09	0.09	0.09
95th-Percentile Queue Length [ft/ln]	38.91	38.91	38.91	13.92	13.92	13.92	0.77	0.77	0.77	2.28	2.28	2.28
d_A, Approach Delay [s/veh]	19.44			16.10			0.30			0.88		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	4.59											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	25.3
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.373

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	166	93	97	70	106	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.30	4.30	1.40	1.40	1.20	1.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	28	0	0	9	7	22
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	194	93	97	79	113	191
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	54	26	27	22	32	54
Total Analysis Volume [veh/h]	218	104	109	89	127	215
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.16	0.00	0.00	0.00	0.37	0.24
d_M, Delay for Movement [s/veh]	8.15	0.00	0.00	0.00	25.27	18.72
Movement LOS	A	A	A	A	D	C
95th-Percentile Queue Length [veh/ln]	0.57	0.57	0.00	0.00	4.13	4.13
95th-Percentile Queue Length [ft/ln]	14.25	14.25	0.00	0.00	103.15	103.15
d_A, Approach Delay [s/veh]	5.52		0.00		21.15	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	10.45					
Intersection LOS	D					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	285.0
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.772

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach	+			+			+			+		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	28	18	44	17	22	66	59	739	89	52	520	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	3.20	5.70	5.70	5.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	13	13	0	13	10	0	0	18	10	0	23	17
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	41	31	44	30	32	66	59	757	99	52	543	34
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	8	11	8	8	17	15	195	26	13	140	9
Total Analysis Volume [veh/h]	42	32	45	31	33	68	61	780	102	54	560	37
Pedestrian Volume [ped/h]	36			36			24			24		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.77	0.37	0.11	0.54	0.40	0.12	0.07	0.01	0.00	0.08	0.01	0.00
d_M, Delay for Movement [s/veh]	284.97	260.04	227.98	201.60	182.65	12.32	9.23	0.00	0.00	10.55	0.00	0.00
Movement LOS	F	F	F	F	F	B	A	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	8.35	8.35	8.35	4.62	4.62	0.41	0.21	0.00	0.00	0.25	0.00	0.00
95th-Percentile Queue Length [ft/ln]	208.72	208.72	208.72	115.56	115.56	10.30	5.37	0.00	0.00	6.22	0.00	0.00
d_A, Approach Delay [s/veh]	256.72			99.35			0.60			0.87		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	24.28											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	1,828.4
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	4.448

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach	Northbound			Southbound			Northwestbound			Southeastbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	0	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	4.50	4.50	4.50	2.60	2.60	2.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	13	0	6	0	34	17	4	27	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	2	62	145	5	107	27	635	259	68	998	18
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	16	37	1	28	7	164	67	18	257	5
Total Analysis Volume [veh/h]	5	2	64	149	5	110	28	655	267	70	1029	19
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.20	0.05	0.23	4.45	0.08	0.24	0.04	0.01	0.00	0.09	0.01	0.00
d_M, Delay for Movement [s/veh]	170.97	113.74	38.11	1828.41	1782.09	15.11	10.75	0.00	0.00	10.39	0.00	0.00
Movement LOS	F	F	E	F	F	C	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	2.23	2.23	2.23	18.18	18.18	0.91	0.13	0.13	0.00	0.31	0.00	0.00
95th-Percentile Queue Length [ft/ln]	55.76	55.76	55.76	454.50	454.50	22.75	3.35	3.35	0.00	7.83	0.00	0.00
d_A, Approach Delay [s/veh]	49.59			1071.99			0.32			0.65		
Approach LOS	E			F			A			A		
d_I, Intersection Delay [s/veh]	119.67											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 16: US 20 at W Hood Avenue

Control Type:	Two-way stop	Delay (sec / veh):	92.5
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.548

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	0	0	0	1	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	43	0	45	0	0	0	65	526	0	0	782	48
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	2.00	2.00	0.00	5.60	5.60	2.00	2.00	3.70	3.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	28	0	13	0	0	36	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	43	0	45	28	0	13	65	526	36	0	782	48
Peak Hour Factor	0.9500	1.0000	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	0	12	7	0	3	17	138	9	0	206	13
Total Analysis Volume [veh/h]	45	0	47	28	0	14	68	554	36	0	823	51
Pedestrian Volume [ped/h]	4			4			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.55	0.00	0.13	0.40	0.00	0.03	0.09	0.01	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	92.52	43.20	16.47	80.18	66.38	36.23	10.27	0.00	0.00	0.00	0.00	0.00
Movement LOS	F	E	C	F	F	E	B	A	A		A	A
95th-Percentile Queue Length [veh/ln]	2.40	0.44	0.44	1.76	1.76	1.76	0.30	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	59.92	11.11	11.11	44.10	44.10	44.10	7.44	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	53.67			65.53			1.06			0.00		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	5.03											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 60: W Barclay Drive at Site Access

Control Type:	Two-way stop	Delay (sec / veh):	14.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.036

Intersection Setup

Name	Northeastbound		Southwestbound		Northwestbound	
Approach						
Lane Configuration	↷		↶		↵	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	20.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northeastbound		Southwestbound		Northwestbound	
Base Volume Input [veh/h]	253	0	0	293	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	34	32	0	13	24
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	253	34	32	293	13	24
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	70	9	9	81	4	7
Total Analysis Volume [veh/h]	281	38	36	326	14	27
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.03	0.00	0.04	0.04
d_M, Delay for Movement [s/veh]	0.00	0.00	7.99	0.00	14.67	10.36
Movement LOS	A	A	A	A	B	B
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.09	0.09	0.23	0.23
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.24	2.24	5.82	5.82
d_A, Approach Delay [s/veh]	0.00		0.79		11.83	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]				1.07		
Intersection LOS				B		

Intersection Level Of Service Report

Intersection 61: N Pine Street at W Sisters Park Drive (Site Access)

Control Type:	Two-way stop	Delay (sec / veh):	11.5
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	0	87	0	0	70	0	0	0	0	23	0	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	47	0	0	0	0	15	11	7	36	0	9	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	47	87	0	0	70	15	11	7	36	23	9	8
Peak Hour Factor	1.0000	0.8400	0.8400	0.8400	0.8400	1.0000	1.0000	1.0000	1.0000	0.8400	1.0000	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	26	0	0	21	4	3	2	9	7	2	2
Total Analysis Volume [veh/h]	47	104	0	0	83	15	11	7	36	27	9	10
Pedestrian Volume [ped/h]	0			0			0			0		

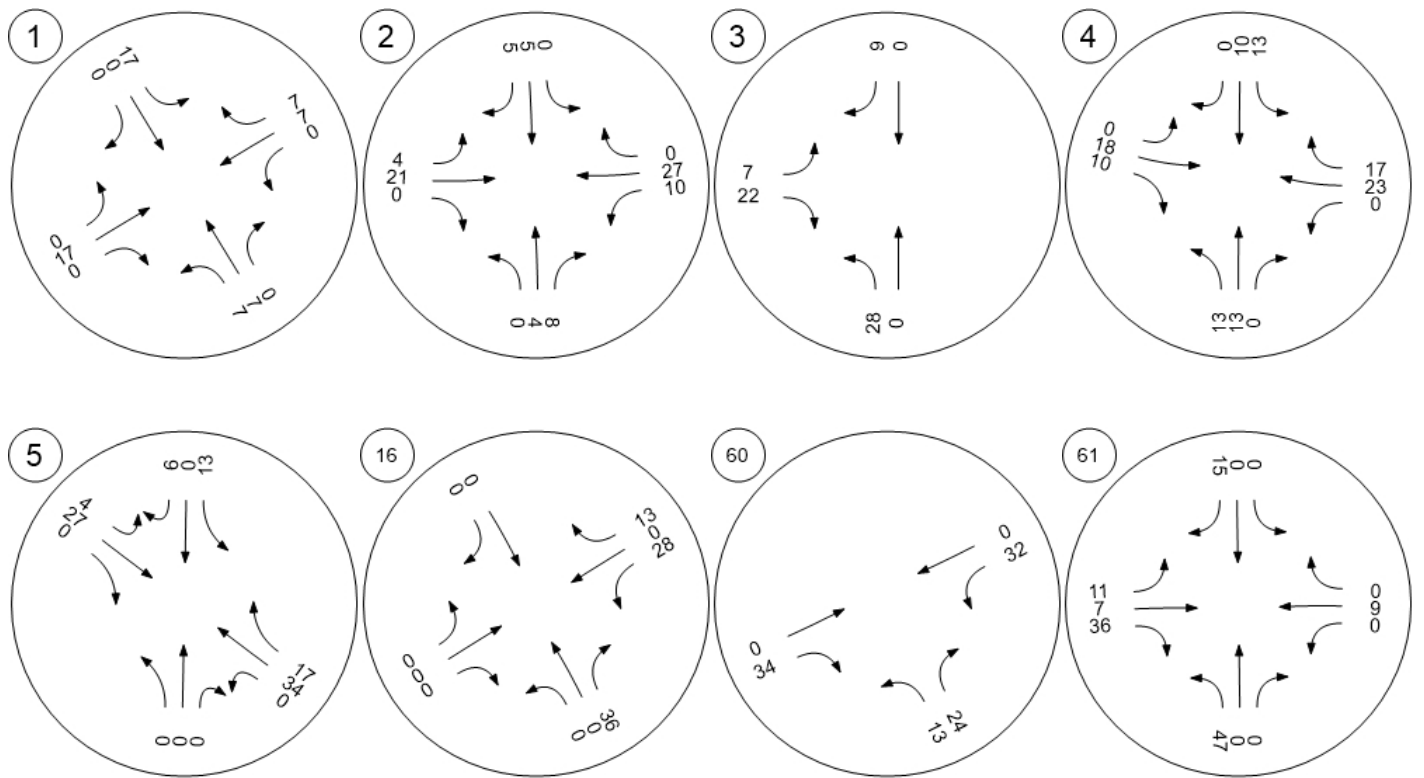
Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

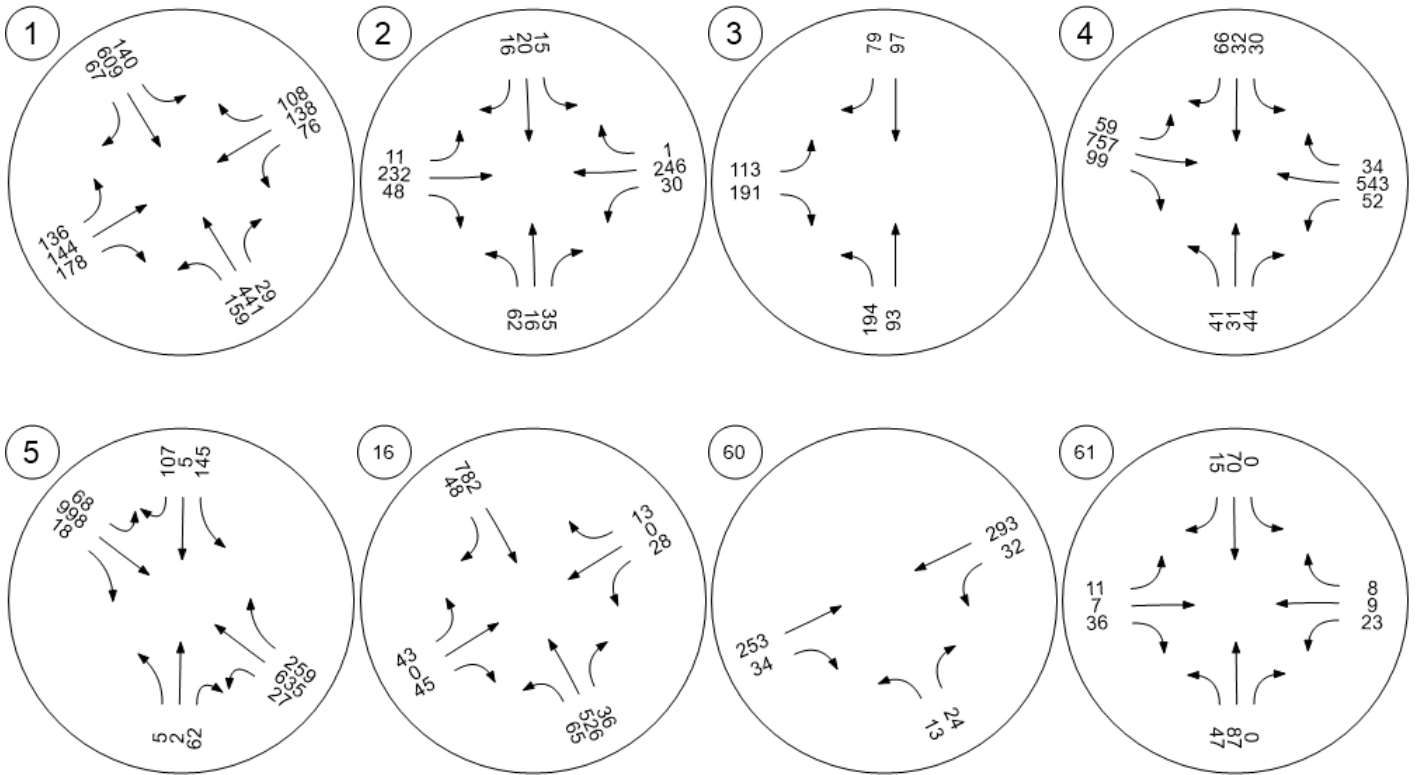
Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.04	0.05	0.02	0.01
d_M, Delay for Movement [s/veh]	7.49	0.00	0.00	7.42	0.00	0.00	11.09	11.31	9.04	11.45	11.47	9.21
Movement LOS	A	A	A	A	A	A	B	B	A	B	B	A
95th-Percentile Queue Length [veh/ln]	0.10	0.10	0.10	0.00	0.00	0.00	0.21	0.21	0.21	0.23	0.23	0.23
95th-Percentile Queue Length [ft/ln]	2.43	2.43	2.43	0.00	0.00	0.00	5.33	5.33	5.33	5.70	5.70	5.70
d_A, Approach Delay [s/veh]	2.33			0.00			9.75			10.97		
Approach LOS	A			A			A			B		
d_I, Intersection Delay [s/veh]	3.96											
Intersection LOS	B											

Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume



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Report File: Z:\...\Buildout Conditions with no US20 Access
2.0.pdf

Scenario 4 Buildout Volumes No Hwy 20 Access
7/21/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		47.9	E
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.253	22.8	C
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	EB Left	0.397	27.3	D
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	SB Left	1.149	617.1	F
5	Locust Street at US 20	Roundabout	HCM 6th Edition	EB Thru		29.9	D
16	US 20 at W Hood Avenue	Two-way stop	HCM 6th Edition	NEB Left	0.528	86.9	F
60	W Barclay Drive at Site Access	Two-way stop	HCM 6th Edition	NWB Left	0.128	16.2	C
61	N Pine Street at W Sisters Park Drive (Site Access)	Two-way stop	HCM 6th Edition	WB Left	0.050	12.2	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:	Roundabout	Delay (sec / veh):	47.9
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes		

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	136	127	178	76	131	101	152	434	29	123	609	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.90	1.90	1.90	2.80	2.80	2.80	4.20	4.20	4.20	3.20	3.20	3.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	17	13	13	0	0	0	17	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	136	144	178	93	144	114	152	434	29	140	609	67
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	37	40	49	26	40	31	42	119	8	38	167	18
Total Analysis Volume [veh/h]	149	158	196	102	158	125	167	477	32	154	669	74
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	954			823			472			441		
Exiting Flow Rate [veh/h]	413			353			995			777		
Demand Flow Rate [veh/h]	136	144	178	93	144	114	152	434	29	140	609	67
Adjusted Demand Flow Rate [veh/h]	149	158	196	102	158	125	167	477	32	154	669	74

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.97			0.96			0.97		
Entry Flow Rate [veh/h]	513			396			705			926		
Capacity of Entry and Bypass Lanes [veh/h]	522			597			853			880		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	512			580			819			853		
X, volume / capacity	0.98			0.66			0.83			1.05		

Movement, Approach, & Intersection Results

Lane LOS	F			C			D			F		
95th-Percentile Queue Length [veh]	13.20			4.93			9.34			21.33		
95th-Percentile Queue Length [ft]	330.03			123.21			233.50			533.21		
Approach Delay [s/veh]	64.04			20.93			25.66			67.18		
Approach LOS	F			C			D			F		
Intersection Delay [s/veh]	47.90											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	22.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.253

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	62	12	27	15	15	11	7	211	48	20	219	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.20	1.20	1.20	2.80	2.80	2.80	1.40	1.40	1.40	3.00	3.00	3.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	4	8	0	5	5	4	21	10	13	39	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	16	35	15	20	16	11	232	58	33	258	1
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	5	10	4	6	5	3	69	17	10	77	0
Total Analysis Volume [veh/h]	74	19	42	18	24	19	13	276	69	39	307	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.25	0.06	0.06	0.06	0.08	0.03	0.01	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	22.85	21.29	15.48	19.69	18.21	11.84	7.90	0.00	0.00	8.08	0.00	0.00
Movement LOS	C	C	C	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.64	1.64	1.64	0.58	0.58	0.58	0.03	0.03	0.03	0.10	0.10	0.10
95th-Percentile Queue Length [ft/ln]	41.12	41.12	41.12	14.61	14.61	14.61	0.78	0.78	0.78	2.50	2.50	2.50
d_A, Approach Delay [s/veh]	20.34			16.66			0.29			0.91		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	4.64											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	27.3
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.397

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	166	93	97	70	106	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.30	4.30	1.40	1.40	1.20	1.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	43	0	0	9	7	22
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	209	93	97	79	113	191
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	59	26	27	22	32	54
Total Analysis Volume [veh/h]	235	104	109	89	127	215
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.17	0.00	0.00	0.00	0.40	0.24
d_M, Delay for Movement [s/veh]	8.20	0.00	0.00	0.00	27.28	20.06
Movement LOS	A	A	A	A	D	C
95th-Percentile Queue Length [veh/ln]	0.62	0.62	0.00	0.00	4.45	4.45
95th-Percentile Queue Length [ft/ln]	15.59	15.59	0.00	0.00	111.33	111.33
d_A, Approach Delay [s/veh]	5.68		0.00		22.74	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	11.04					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 4: Pine Street at US 20

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 617.1
 Level Of Service: F
 Volume to Capacity (v/c): 1.149

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	28	18	44	17	22	66	59	739	89	52	520	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	3.20	5.70	5.70	5.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	26	0	13	20	0	0	17	0	0	0	26
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	28	44	44	30	42	66	59	756	89	52	520	43
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	11	11	8	11	17	15	195	23	13	134	12
Total Analysis Volume [veh/h]	29	45	45	31	43	68	61	779	92	54	536	47
Pedestrian Volume [ped/h]	36			36			24			24		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.09	0.61	0.14	1.15	0.60	0.15	0.07	0.01	0.00	0.08	0.01	0.00
d_M, Delay for Movement [s/veh]	614.64	528.16	490.31	617.10	534.07	14.09	9.18	0.00	0.00	10.49	0.00	0.00
Movement LOS	F	F	F	F	F	B	A	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	10.88	10.88	10.88	7.61	7.61	0.51	0.21	0.00	0.00	0.25	0.00	0.00
95th-Percentile Queue Length [ft/ln]	272.10	272.10	272.10	190.35	190.35	12.75	5.30	0.00	0.00	6.16	0.00	0.00
d_A, Approach Delay [s/veh]	534.92			303.19			0.60			0.89		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	58.93											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:
Analysis Method:
Analysis Period:

Roundabout
HCM 6th Edition
15 minutes

Delay (sec / veh):
Level Of Service:

29.9
D

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			Yes			No		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	5	2	62	132	5	101	64	971	18	27	601	242
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	2.60	2.60	2.60	4.50	4.50	4.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	13	0	0	4	26	0	0	26	26
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	2	62	145	5	101	68	997	18	27	627	268
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	16	37	1	26	18	257	5	7	162	69
Total Analysis Volume [veh/h]	5	2	64	149	5	104	70	1028	19	28	646	276
Pedestrian Volume [ped/h]	0			0			3			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	1276			709			184			79		
Exiting Flow Rate [veh/h]	54			362			785			1269		
Demand Flow Rate [veh/h]	5	2	62	145	5	101	68	997	18	27	627	268
Adjusted Demand Flow Rate [veh/h]	5	2	64	149	5	104	70	1028	19	28	646	276

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			0.97			0.96		
Entry Flow Rate [veh/h]	71			260			1147			993		
Capacity of Entry and Bypass Lanes [veh/h]	376			670			1144			1274		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	376			666			1115			1219		
X, volume / capacity	0.19			0.39			1.00			0.78		

Movement, Approach, & Intersection Results

Lane LOS	B			B			F			C		
95th-Percentile Queue Length [veh]	0.69			1.83			20.64			8.47		
95th-Percentile Queue Length [ft]	17.19			45.85			516.05			211.83		
Approach Delay [s/veh]	12.76			10.73			46.98			16.39		
Approach LOS	B			B			F			C		
Intersection Delay [s/veh]	29.93											
Intersection LOS	D											

Intersection Level Of Service Report
Intersection 16: US 20 at W Hood Avenue

Control Type:	Two-way stop	Delay (sec / veh):	86.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.528

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↵↵			↵			↵↵			↵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	0	0	0	1	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	43	0	45	0	0	0	65	526	0	0	782	48
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	2.00	2.00	0.00	5.60	5.60	2.00	2.00	3.70	3.70
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	17	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	43	0	45	0	0	0	65	526	0	0	799	48
Peak Hour Factor	0.9500	1.0000	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	0	12	0	0	0	17	138	0	0	210	13
Total Analysis Volume [veh/h]	45	0	47	0	0	0	68	554	0	0	841	51
Pedestrian Volume [ped/h]	4			4			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane		No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.53	0.00	0.13	0.00	0.00	0.00	0.09	0.01	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	86.94	0.00	16.79	56.14	0.00	11.78	10.36	0.00	0.00	0.00	0.00	0.00
Movement LOS	F		C	F		B	B	A	A		A	A
95th-Percentile Queue Length [veh/ln]	2.30	0.00	0.46	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	57.51	0.00	11.41	0.00	0.00	0.00	7.56	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	51.10			33.96			1.13			0.00		
Approach LOS	F			D			A			A		
d_I, Intersection Delay [s/veh]	3.37											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 60: W Barclay Drive at Site Access

Control Type:	Two-way stop	Delay (sec / veh):	16.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.128

Intersection Setup

Name	Northeastbound		Southwestbound		Northwestbound	
Approach						
Lane Configuration	↬		↵		↶	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	20.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northeastbound		Southwestbound		Northwestbound	
Base Volume Input [veh/h]	253	0	0	293	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	34	43	0	43	34
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	253	34	43	293	43	34
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	70	9	12	81	12	9
Total Analysis Volume [veh/h]	281	38	48	326	48	38
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.04	0.00	0.13	0.05
d_M, Delay for Movement [s/veh]	0.00	0.00	8.02	0.00	16.23	11.50
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.12	0.12	0.65	0.65
95th-Percentile Queue Length [ft/ln]	0.00	0.00	3.02	3.02	16.18	16.18
d_A, Approach Delay [s/veh]	0.00		1.03		14.14	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	2.06					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 61: N Pine Street at W Sisters Park Drive (Site Access)

Control Type:	Two-way stop	Delay (sec / veh):	12.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.050

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	0	87	0	0	70	0	0	0	0	23	0	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	69	0	0	0	10	18	11	7	36	0	9	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	69	87	0	0	80	18	11	7	36	23	9	8
Peak Hour Factor	1.0000	0.8400	0.8400	0.8400	0.8400	1.0000	1.0000	1.0000	1.0000	0.8400	1.0000	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	17	26	0	0	24	5	3	2	9	7	2	2
Total Analysis Volume [veh/h]	69	104	0	0	95	18	11	7	36	27	9	10
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.04	0.05	0.02	0.01
d_M, Delay for Movement [s/veh]	7.56	0.00	0.00	7.42	0.00	0.00	11.74	11.92	9.14	12.17	12.14	9.29
Movement LOS	A	A	A	A	A	A	B	B	A	B	B	A
95th-Percentile Queue Length [veh/ln]	0.15	0.15	0.15	0.00	0.00	0.00	0.23	0.23	0.23	0.25	0.25	0.25
95th-Percentile Queue Length [ft/ln]	3.67	3.67	3.67	0.00	0.00	0.00	5.64	5.64	5.64	6.25	6.25	6.25
d_A, Approach Delay [s/veh]	3.01			0.00			10.03			11.54		
Approach LOS	A			A			B			B		
d_I, Intersection Delay [s/veh]	4.13											
Intersection LOS	B											

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Scenario 6 Background Volumes with RAB

Report File: Z:\...\Background Conditions with RAB.pdf

7/22/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
5	Locust Street at US 20	Roundabout	HCM 6th Edition	SEB Thru		24.7	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:
Analysis Method:
Analysis Period:

Roundabout
HCM 6th Edition
15 minutes

Delay (sec / veh):
Level Of Service:

24.7
C

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	T			T			T			T		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	4.50	4.50	4.50	2.60	2.60	2.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	16	34	1	26	7	155	62	16	250	5
Total Analysis Volume [veh/h]	5	2	64	136	5	104	28	620	249	66	1001	19
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	1232			682			75			171		
Exiting Flow Rate [veh/h]	54			330			1228			758		
Demand Flow Rate [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Adjusted Demand Flow Rate [veh/h]	5	2	64	136	5	104	28	620	249	66	1001	19

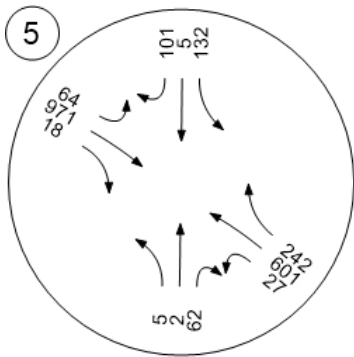
Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			0.96			0.97		
Entry Flow Rate [veh/h]	71			247			938			1115		
Capacity of Entry and Bypass Lanes [veh/h]	393			689			1279			1159		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	393			685			1224			1130		
X, volume / capacity	0.18			0.36			0.73			0.96		

Movement, Approach, & Intersection Results

Lane LOS	B			A			B			E		
95th-Percentile Queue Length [veh]	0.65			1.63			7.03			17.66		
95th-Percentile Queue Length [ft]	16.28			40.65			175.70			441.56		
Approach Delay [s/veh]	12.07			9.96			14.20			37.53		
Approach LOS	B			A			B			E		
Intersection Delay [s/veh]	24.70											
Intersection LOS	C											

Traffic Volume - Future Background Volume



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Scenario 5 Buildout Volumes with RAB

Report File: Z:\...\Buildout Conditions with RAB.pdf

7/22/2021

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
5	Locust Street at US 20	Roundabout	HCM 6th Edition	SEB Thru		30.0	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 5: Locust Street at US 20

Control Type:
 Analysis Method:
 Analysis Period:

Roundabout
 HCM 6th Edition
 15 minutes

Delay (sec / veh):
 Level Of Service:

30.0
 D

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach	Northbound			Southbound			Northwestbound			Southeastbound		
Lane Configuration	T			T			T			T		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	5	2	62	132	5	101	27	601	242	64	971	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.60	0.60	0.60	4.50	4.50	4.50	2.60	2.60	2.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	13	0	6	0	34	17	4	27	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	2	62	145	5	107	27	635	259	68	998	18
Peak Hour Factor	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	16	37	1	28	7	164	67	18	257	5
Total Analysis Volume [veh/h]	5	2	64	149	5	110	28	655	267	70	1029	19
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	1277			719			79			184		
Exiting Flow Rate [veh/h]	54			353			1270			800		
Demand Flow Rate [veh/h]	5	2	62	145	5	107	27	635	259	68	998	18
Adjusted Demand Flow Rate [veh/h]	5	2	64	149	5	110	28	655	267	70	1029	19

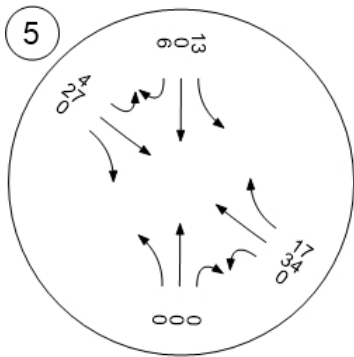
Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			0.96			0.97		
Entry Flow Rate [veh/h]	71			266			993			1148		
Capacity of Entry and Bypass Lanes [veh/h]	375			663			1274			1144		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	375			660			1219			1115		
X, volume / capacity	0.19			0.40			0.78			1.00		

Movement, Approach, & Intersection Results

Lane LOS	B			B			C			F		
95th-Percentile Queue Length [veh]	0.69			1.93			8.47			20.71		
95th-Percentile Queue Length [ft]	17.21			48.24			211.83			517.86		
Approach Delay [s/veh]	12.78			11.07			16.39			47.20		
Approach LOS	B			B			C			F		
Intersection Delay [s/veh]	30.03											
Intersection LOS	D											

Traffic Volume - Net New Site Trips



Appendix E – Miscellaneous

Comment Log



Page	Section	Comment	Action	Addressed
Original TIS Comments				
11	Trip Generation	Internal trip capture applied incorrectly	Recalculate and update table/text	x
12	Trip Distribution	How do pedestrians/bikes/transit access the development? Are there connections to the existing in-place multimodal system?	Added "Multi-Modal" section on page 14 to address pedestrian and bicycle systems, including multi-use paths on Barclay and 20, planned path on Pine. Also include information on transit options near the property (page 7)	x
12	Trip Distribution	ODOT has not committed to completing the RAB at Locust/20 by 2027	Trip distribution was recalculated assuming that in the 2027 background and buildout years, the current intersection configuration would still be there (4-legged stop-controlled for NB and SB)	x
15	Traffic Volumes	Para.3, insert "Sister's" before US 20 Corridor	Text fix	x
15	Traffic Volumes	Were traffic volume trends reviewed against ATR 09-014 for seasonal adjustments?	Seasonal adjustments were applied to existing counts using ODOT methodology. ATR 09-014 shows that July is consistently the highest month of the year, so no adjustment necessary. Seasonal Trend Table gives SAF of 1.0008, which was used as it was the higher of the 2 options.	x
15	Traffic Volumes	Where did 2% compounded growth rate come from?	General growth rate for local, non-ODOT facilities	x
16	Traffic Volumes	How much of the developments will be built out by 2027?	Dollar General - Done. McKenzie Meadows, Threewind expected to be complete or mostly complete by 2027	x
20	Crash History	Delete sentence about 1.00 CMEV and instead use 90th percentile CMEV	Updated text, used 90th percentile for all intersections	x
22	Crash History	Was US 20/Barclay crash before or after roundabout was built?	Crash was in 2018, so after roundabout. Crash history tables were updated to reflect most recent 2015-2019 crash data	x
22	Crash History	Pedestrian collision at US 20/Pine St. Consider developer providing pedestrian crossing enhancements at this intersection similar to intersections east of the location.	There are marked crosswalks on all four intersection legs. The other intersections have curb extensions that shorten the crossing but that would require eliminating the left-turn lanes. It is also far off site from the development.	x
22	Crash History	TIS states all intersections have a crash rate below 90th percentile, however Barclay/Pine does exceed 90th percentile	Update table to include 90th percentile crash rate standards. Barclay/Pine intersection below 90th percentile when updated crash data used	x
23	Access spacing	State that third access is full access and specify which movements would be restricted.	Text update to describe movements at each access, only movement restricted is SBL	x
27	Mitigation Analysis	Consider a mitigation analysis to address the potential improvements to bike/ped facilities and crossings	Information on multi-modal access and improvements included in "Site Trips" section.	x
28	Mitigation Analysis	US/Pine mitigation: proposed development does not add traffic to the northbound approach, Fig 3 shows 25 NBT. Development would push v/c ratio from an acceptable level to over 1.0. Appropriate mitigation should be presented to bring the intersection back to acceptable performance standards, mitigation should align with TSP recommendations. Take out the self-selection of alternate routes.	Intersection capacity analysis updated to account for drivers providing gaps for left-turns from Pine to US-20 during congested, slow-moving traffic along US-20 in downtown Sisters. As a result, v/c ratios were found to be just below standards for buildout year.	x
28	Mitigation Analysis	US20/Locust RAB not committed to be build by 2027. Mitigation ideas should be presented here or a percentage share value of expected cost to mitigate.	"Mitigation Contributed" section, page 31.	x

Addendum Comments

US 20/Hood Ave access, provide a safety evaluation in addition to capacity evaluation	Crash analysis at intersection was included in TIS but not addendum.	x
US 20/Hood Ave access in TIA shows RIRO, addendum shows left out also. Update TIA to reflect revised trip assignment. Clarify desired vehicle movements at the intersection and engineering reasoning to support allowing these movements, as well as how it benefits the system.	Update TIA to show new trip assignment with left turns allowed out of US20/Hood	x
US20/Barclay RAB not committed. Address impact to US20/Pine and US20/Locust with and without RAB, impacts to US20/Hood with and without turning movements	Table 7 examines Locust/US-20 with and without roundabout. Table 8 ("Highway 20 Access Justification") addresses capacity analysis conditions with and without access at W Hood Avenue	x
Enhanced marked crossing at US20/Hood needs engineering study based on section 310.0 of the traffic manual.	See "Pedestrian Crossing-W Hood Avenue at US-20" in the "Site Trips" section. Addressed ODOT Traffic Manual 310.02 and NCHRP Report 562	x
TIA site plan should show crossing on the north side vs. south side.	Figure 7 updated	x
State the intention of the intersection to provide a geometric layout to support and enhanced crossing and how vehicle movement may or may not be restricted by the proposed crossing	"Proposed Access Configuration" section added on page 33	x
How does proposed crossing tie into the existing ped/bike system and what is identified in table 5-1 and table 6-2 of the Sisters TSP?	Information on multi-modal access and improvements included in "Site Trips" section.	x