



WEST SIDE WOODS SUBDIVISION TRAFFIC IMPACT STUDY

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1.0 EXECUTIVE SUMMARY

This traffic impact study (TIS) evaluates site access and potential traffic impacts associated with the proposed West Side Woods Subdivision. The 58.85-acre development is located in south ½ of Section 23 and north ½ of Section 26, Township 10 North, Range 4 West of the Principal Montana Meridian, in Lewis and Clark County, Montana. As proposed, West Side Woods Subdivision will include 92 single-family residential lots, 4 multi-family lots with 80 condo units, and 4 open space lots. The property is currently used as vacant open space. Traffic from the internal access roads of the proposed subdivision will access Park Drive at two locations and Hauser Boulevard at two locations. Traffic will utilize Park Drive, Hauser Boulevard, and Knight Street to access Granite Avenue to the east and proceed north to Euclid Avenue (U.S. Highway 12). A vicinity map is provided in Appendix A.

West Side Woods Subdivision is proposed to be constructed in four phases, beginning in 2023. A 6-year build-out horizon is anticipated for the development, with completion and final plat for Phase 1 by 2023, completion and final plat for Phase 2 in 2025, completion and final plat for Phase 3 in 2027, and completion and final plat for Phase 4 in 2029. The preliminary plat is provided in Appendix B.

In August 2020, October 2021, and September 2022, Abelin Traffic Services (ATS) collected traffic count data on Granite Avenue, Hauser Boulevard, and Highway 12. Data was also obtained from a 2017 intersection count conducted by the Montana Department of Transportation (MDT) at Granite Street and Highway 12 (Euclid Avenue). Trip generation for West Side Woods Subdivision was based on rates reported in the *Institute of Transportation Engineers (ITE) Trip Generation, 11th Edition* and the *Trip Generation Handbook*. Trips were generated for the proposed development according to expected size and type of land use.

Using the data collected for this project, ATS provided a Level of Service (LOS) analysis at area intersections for each phase of the development. This evaluation was conducted in accordance with the procedures outlined in the Transportation Research Board's *Highway Capacity Manual 7th Edition: A Guide for Multimodal Mobility Analysis* and the Highway Capacity Software (HCS) version 8.2. The intersections of Hauser Boulevard/Granite Avenue, Knight Street/Granite Avenue, and Granite Street/Highway 12 as currently developed can handle the additional traffic from the proposed subdivision.

The proposed subdivision is anticipated to add up to 1,407 trips per day between Hauser Boulevard and Granite Avenue at full-build-out of the subdivision. The two primary routes to Granite Avenue will be via Hauser Boulevard with 80% of the vehicle trips and Knight Street with 20% of vehicle trips. Hauser Boulevard is currently an east/west collector road and traffic counts indicate that the road currently carries 700 vehicles per day. At full build-out of the subdivision, Hauser Boulevard between Park Drive and Granite Avenue is anticipated to have 1,826 vehicle trips per day. Knight Street is currently a local road that services approximately 30 single-family residential homes within Overlook Estates Subdivision. Knight

Street currently has approximately 283 vehicle trips per day and at full build-out Knight Street will have 564 vehicle trips per day. It is anticipated that 80% of the traffic from Hauser Boulevard from the development will utilize Granite Avenue to the north to access Highway 12 (Euclid Avenue) and 20% will utilize Hauser Boulevard to the east to access other parts of Helena or utilize other routes to get to Highway 12 (Euclid Avenue). Granite Avenue is currently a minor collector and traffic counts collected by ATS indicate a current traffic volume of 584 vehicle trips per day. Traffic counts on Granite Avenue have decreased significantly from the original traffic county in 2020 to the 2022 traffic count. In 2020 and 2021 the City of Helena was working on water and sewer installation project on the west side of Helena. Based on the traffic collected to date it appears the construction project was pushing additional traffic to Granite Street to access Highway 12. The project was completed in 2021 and it appears from the traffic counts that the traffic has dispersed to preconstruction patterns. At full build-out of the subdivision, Granite Avenue from Hauser Boulevard to Euclid Avenue (U.S. Highway 12) is anticipated to have 1,729 vehicle trips per day. All other roads adjacent to the subdivision will have varying amounts of traffic from several different access points but are anticipated to carry less than 1,500 trips per day.

The analyses presented in this report indicates that internal roads and roads directly adjacent to the subdivision will convey less than 1,500 vehicle trips per day at full build-out of the subdivision and would be classified as local roads. Knight Street with the anticipated traffic will remain a local road. Hauser Boulevard between Park Drive and Granite Avenue and Granite Avenue between Hauser Boulevard and Euclid Avenue (U.S. Highway 12) will experience the highest increase in traffic by the proposed subdivision. Hauser Boulevard between Park Drive and Granite Avenue is currently classified as a local street and at full build-out would be classified as a minor collector. Granite Avenue from Hauser Boulevard to Euclid Avenue (U.S. Highway 12) based on current collected traffic data is currently classified as a local road and at full build-out would be classified as a minor collector road. Roads directly adjacent to the subdivision, Park Drive and Hauser Boulevard, will be improved by being paved to local road standards. Park Drive to Hauser Boulevard is currently gravel and should be paved to a local road width. Hauser Boulevard from Park Drive to Granite Avenue is currently gravel and should be paved to a minor collector width. Granite Avenue from Hauser Boulevard to Knight Street is paved and it is not anticipated additional improvements are needed for this section. The existing intersections can convey the anticipated increase in traffic without improvements.

Pedestrian counts were also conducted at the crosswalk at the intersection of Overlook Boulevard and Granite Street in front of Kessler School in 2021 and 2022. Pedestrian counts remained relatively similar during the two time periods. In order to increase safety at the school for pedestrians, the applicant has volunteered to install pedestrian actuated flashing crosswalk signs north and south of the crossing as well as install a streetlight at the intersection. These measures will provide better visibility of the intersection to drivers and will make this crossing safer for pedestrians. The applicant is also proposing to install bulb outs on Granite Street as well as electronic flashing speed limit signs on the south end at the intersection with Knight Street to improve safety adjacent to the school.

2.0 EXISTING AREA ANALYSIS

The West Side Woods Subdivision will develop an existing 58.85 acres of vacant open space land on Helena's West Side Woods into a residential subdivision. The project is located west of Granite Avenue and south of Euclid Avenue (U.S. Highway 12), see vicinity map in Appendix A. The site is currently in Lewis and Clark County and the applicant is requesting the City of Helena annex the proposed project. This would require annexation of adjacent roads including Park Drive, Hauser Boulevard, and Hauser Boulevard from Park Drive east to Granite Avenue. Granite Avenue from Hauser Boulevard to Euclid Avenue (U.S. Highway 12) is currently within the City of Helena.

Regional and direct access will be provided via the area's existing road network. Hauser Boulevard is located adjacent to the northeast corner of the subdivision for approximately 650-ft. Park Drive is located adjacent to the east side of the subdivision for approximately 1,450-ft. It is anticipated that the majority of traffic will utilize Hauser Boulevard to access Granite Avenue approximately 300-ft to the east. Then proceed north along Granite Avenue for approximately 1,500-ft to the Euclid Avenue (U.S. Highway 12). The preliminary plat is provided in Appendix B and shows how the proposed roads from the subdivision integrate with the existing roads. The study area selected for the project includes all major intersections which will be significantly impacted by the development. The majority of traffic from the project (80%) will use Granite Avenue to reach Euclid Avenue and will continue east into Helena. Traffic impacts east of Granite Avenue will be low and likely well distributed across multiple routes and intersection; therefore, no additional analysis was conducted east of Granite Avenue for this study.

2.1 PARK DRIVE

Park Drive is a local road that extends to the southwest from Hauser Boulevard and provides access to six residential homes along the south side of the street. Park Drive currently has a gravel surface and ends at an intersection with Flowerree Street to the south. The intersection of Park Drive and Hauser Boulevard is uncontrolled.

2.2 HAUSER BOULEVARD

Hauser Boulevard is an east/west local road that provides access to the residential homes on the West Side Woods of Helena. The road currently has a paved surface east of Granite Avenue with several sections currently being resurfaced. West of Granite Avenue the road surface becomes gravel and Hauser Boulevard splits at an intersection with Park Drive. The posted speed limit is 25 MPH. All cross-streets are STOP controlled east of Granite Avenue. Traffic data collected in 2019 by the City of Helena and indicates that the road currently carries 700 VPD between the intersection of Park Drive and Granite Avenue.

2.3 GRANITE AVENUE

Granite Avenue is a minor collector roadway that extends south from Highway 12 past Kessler Elementary School and into the residential areas on Mount Helena. South of Highway 12 the road has a paved width of 36 feet with curb and gutter and on-street parking along the east side of the road. The road narrows south of Knight Street and has a rural 24-foot paved cross-section. All cross-streets are STOP controlled, including Hauser Boulevard. The posted speed limit is 15 MPH near the Kessler Elementary School during school hours and then becomes 25 MPH south of Knight Street. Traffic counts conducted by ATS suggest an ADT Volume of 1,600 VPD south of Highway 12.

2.4 KNIGHT STREET

Knight Street is an east/west local road that provides access to the residential homes west of Granite Avenue. The road currently has an urban cross-section and a paved surface width of 30 feet with on-street parking. Knight Street currently provides access to 30 residential homes located within the Overlook Estates subdivision.

2.5 OTHER USERS

All projects need to consider additional transportation users such as pedestrians, bicycles, and bussing. There are existing facilities sidewalks located on Granite Avenue from Euclid Avenue (U.S. Highway 12) south to Knight Street. Sidewalks are also present throughout the Overlook Estates Subdivision north of the West Side Woods Subdivision location. The remaining adjacent street network does not currently have any existing bike or pedestrian facilities.

All internal streets will be designed to include sidewalks including ADA ramps at intersections. Portions of Park Drive and Hauser Boulevard adjacent to the proposed subdivision will be improved to meet City of Helena standards including sidewalks and ADA ramps. Hauser Boulevard connects on the north to Overlook Estates Subdivision internal road and sidewalk network. All internal sidewalks will connect to Hauser Boulevard and pedestrians will be able to access sidewalks from the subdivision down Hauser Boulevard, down Knight Street or Overlook Boulevard to Granite Avenue and then down to Euclid Avenue (U.S. Highway 12). This will provide a continuous sidewalk network from the subdivision to the Kessler School.

Further, an extensive trail network is planned throughout the subdivision and open space that would connect to proposed street sidewalks as well as existing City of Helena trail system and open space to the south of the project site. This will provide expanded opportunity for walking and biking trails that connect to the wider City of Helena trail network.

Currently, the City of Helena transit system does not provide service to this area of the city. The Capital Shuttle goes as far as Laurel Street on the west side which is approximately 12 blocks from the proposed project site. There are no plans to add a transit stop for the proposed project.

2.6 ADJACENT CURRENT AND FUTURE DEVELOPMENT

The properties surrounding the project site are either currently developed single-family residential which are located to the west, east, and north of the project site, commercial development to the west, and existing open space to the south. The City of Helena currently owns the open space to the south and therefore it is not anticipated that development will occur on these lands. The remaining parcels are already developed with existing land uses and are not anticipated to be developed further. There are no existing roads that abut the property to the west and due to the extremely steep topography and existing development, it would be difficult to connect or extend roadways to the west; therefore, no road extensions are planned. There is an existing road that abuts the subdivision on the north, Overlook Boulevard. There is currently a 12 to 15-ft drop-off from the property to the finished grade of the existing street. Due to topography, it is not proposed to connect a proposed roadway with existing Overlook Boulevard. All other proposed streets connect to existing streets and roads adjacent to the proposed subdivision.

3.0 SITE DEVELOPMENT CHARACTERISTICS

The proposed West Side Woods Subdivision will develop 92 single-family residential lots, 80 condo units on 4 lots, and 4 open space lots. The subdivision is proposed to be annexed into the City of Helena and therefore all infrastructure will be required to meet City of Helena subdivision regulations and design standards where possible.

3.1 SITE ACCESS

The development will have primary access from Hauser Boulevard, Park Drive, and a proposed internal street network.

- A. Primary Access - Primary access will be provided from Granite Avenue via Hauser Boulevard and Park Drive.
- B. Secondary Access - Some traffic may utilize Knight Street to the north and over to Granite Street, but this is anticipated to be a small percentage of traffic.
- C. Internal Access - Proposed subdivision traffic will be distributed throughout the subdivision via proposed internal access roads. All internal access roads will be local streets constructed to meet City of Helena local street standards. There are several dead-end streets located throughout the proposed subdivision. The dead-end streets are necessary due to topographic constraints of the site. The site is bounded by existing development on the west and south. The existing residential development to the west does not provide an opportunity to extend proposed streets to the west to connect to existing road networks. There is a small section of the property that abuts Highway 12 (Euclid Avenue) right-of-way in the northwest corner of the subdivision. In this location there is a very large cut section (approximately 50-ft) down to the roadway from the property. It would not be possible to construct a connection to Highway 12 in this location due to the elevation difference. Overlook Boulevard within

Overlook Estates abuts the property on the north side. There is a large cut at this dead-end street (approximately 20-ft) from the existing ground on the property. It would not be possible to construct a street that meets the grade requirements for the City of Helena to connect to existing Overlook Boulevard. Finally, there are two drainages that cross through the subject property. The site has some steep existing grades. Due to topography of the site, to meet street grade requirements of the city, and reduce cuts and fills for proposed roads to limit construction disturbance several dead-end streets are proposed throughout the subdivision.

3.2 PROJECT PHASING

The proposed West Side Woods Subdivision is proposed to be developed in four phases starting in 2023. The build-out is assumed to be complete by 2029. Below are the details of the project phasing. The plat include in Appendix B shows the proposed phasing.

- A. Phase 1 - Construction and final plat by the end of 2023. Phase 1 will include 28 single-family residential lots, 28 condo units on 2 multi-family lots, and 1 open space lot.
- B. Phase 2 - Construction and final plat by the end of 2025. Phase 2 will include 10 single-family residential lots and 20 condo units on 1 multi-family lot, and 1 open space lot.
- C. Phase 3 - Construction and final plat by the end of 2027. Phase 3 will include 43 single-family residential lots and 1 open space lot.
- D. Phase 4 - Construction and final plat by the end of 2029. Phase 4 will include 11 single-family residential lots, 32 condo units on 1 multi-family lot, and 1 open space lot.

4.0 EXISTING SYSTEM TRAFFIC ANALYSIS

4.1 MANUAL TRAFFIC COUNT

ATS collected traffic data for this project on three separate occasions. The first set of traffic counts used for the analysis were collected in this area in August 2020. This data collection included traffic counts on Granite Avenue and Hauser Boulevard. Due to the COVID-19 outbreak, this data was supplemented heavily with historic traffic information and data from a 2017 intersection count conducted by MDT at Granite Avenue and Highway 12. This information was used for the original 2020 traffic analysis for this project.

To answer questions from the City of Helena with the first application, ATS performed a pedestrian count at the Overlook Boulevard crosswalk on Granite Avenue in May of 2021 to develop pedestrian crossing recommendations for this location. ATS then conducted a second round of data collection along Granite Avenue the week of October 12-14, 2021, to address public comment on the first application. This data indicated that overall traffic volumes in this area were similar to those collected by ATS in 2020 along Granite Avenue and Hauser Boulevard and was similar to the data collected by MDT at the intersection of Granite and Highway 12 in 2017. Peak-hour traffic volumes at the intersection of Granite Avenue and Highway 12 traffic collected in October of 2021 were eight percent lower than the data

collected by MDT in 2017. Daily traffic data collected on Knight Street in October 2021 was nearly identical to the 2020 data collected by ATS (300 VPD) and the traffic data collected along Granite Avenue in October 2021 was lower than the data collected on the same segment in 2020.

In September 2022, Abelin Traffic Services again collected traffic count data on Granite Avenue and performed a 10-hour intersection count at Highway 12. ATS also recorded peak school-hour intersection turning movement counts on Granite Avenue at Knight Street and Overlook Boulevard including pedestrian counts to provide the most up-to-date information for traffic volumes in this area. Overall traffic volume counts in this area have been extremely consistent over the past five years. The multi-day traffic count conducted at the intersection of Highway 12 by MDT in September of 2017 were within 3-5% of the 10-hour traffic volume counts conducted by ATS in September of 2022. This matches all the available historic traffic data for this area. Traffic volumes on Granite Street reduced significantly between the original count in 2020 and the most recent count in 2022. The City of Helena was working on construction of the west side water and sewer project in 2020 and 2021. The project was the installation of water and sewer mains within existing streets on Helena’s west side. It is likely that due to the ongoing construction work east of Granite to install water and sewer mains, traffic in the area were rerouting during construction to avoid the construction area. As construction completed in late 2021, traffic redistributed itself to other roads in the area other than Granite Street to access Highway 12. This would explain the significant decrease in traffic between 2020 and 2022 on Granite Street. The manual traffic count data collected in 2020, 2021, and 2022 are provided in Appendix C. The critical information collected from these three studies is summarized in Table 1 below.

Table 1. Traffic Data Collection and Trends 2020-2022

	2020	2021	2022
Highway 12 & Granite Ave. Peak-Hour Traffic Volume	1,080 VPH	1,113 VPH	1,198 VPH
Granite Avenue ADT	1,617 VPD	728 VPD	584 VPD
Overlook Boulevard Crosswalk AM Peak Pedestrian Counts	No data	24 PPH	21 PPH
Overlook Boulevard Crosswalk PM Peak Pedestrian Counts	No data	72 PPH	55 PPH
Project Anticipated Generated VPD	1,509 VPD	1,443 VPD	1,407 VPD

4.2 HISTORIC TRAFFIC DATA

Historic traffic data was also collected for Highway 12 and Hauser Boulevard from the Montana Department of Transportation and the City of Helena. The data for this location is

presented in Table 2. The historic traffic data indicates that traffic volume in this area have been flat for the last ten years.

Table 2. Historic Traffic Data

Location	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
US 12 E of Williams #25-7C-005	9,790	9,650	9,560	10,360	9,234	9,822	9,826	9,777	8,917	6,308
US 12 W of Joslyn #25-7C-006	11,790	11,560	13,170	11,480	11,701	11,837	12,003	11,943	11,303	11,755
Hauser Blvd W of Linden #25-7B-033	360	210	210	220	782	600	609	492	458	495
Hauser Blvd E of Laurel # 25-7B-032	1,000	810	820	840	730	724	735	739	687	742

4.3 VEHICLE CRASH DATA

Vehicle crash data for this area was obtained by MDT, a total of five crashes have occurred at the intersection of Euclid Avenue and Granite Street in the last five years. Only three other vehicle crashes were reported along the remainder of Granite Street during this time period. Crash rates on these roads and intersections are well within normal levels and do not indicate a need for any crash mitigation.

5.0 TRIP GENERATION

ATS performed a trip generation analysis to determine the anticipated future traffic volumes from the proposed development using the trip generation rates contained in Trip Generation (Institute of Transportation Engineers, Eleventh Edition). These rates are the national standard and are based on the most current information available to planners. A vehicle “trip” is defined as any trip that either begins or ends at the development site. ATS determined that the critical traffic impacts on the intersections and roadways would occur during the weekday morning and evening peak hours. According to the ITE trip generation rates, the development would produce 97 AM peak hour trips (25in/72out), 125 PM peak hour trips (78in/47out), and 1,407 daily trips at full buildout. These generation totals are 100 VPD less than previous studies for this project based on the latest information.

The West Side Woods Subdivision is anticipated to be constructed over 6 years. Development of the lots will be dictated by market demand. This report assumes the development reaches full build-out by the design year of 2029. The land uses expected within the development are discussed in further detail below.

Single-Family Residential #210 - ITE *Trip Generation* defines this land use as single-family detached homes on individual lots. Trip generation is typically based on the number of dwelling units. West Side Woods Subdivision is planned to develop 92 single-family residential lots.

Condominium #230 - ITE *Trip Generation* defines this land use as ownership units that have at least one other owned unit within the same building or structure. Trip generation is typically based on the number of dwelling units. West Side Woods Subdivision is planned to develop 80 condo units over three lots.

Table 3 provides estimated trip generations by phase for the anticipated uses for West Side Woods Subdivision.

Table 3. West Side Woods Subdivision Expected Trip Generation by Phase

Land Use	ITE Code	Quantity	Rate	Weekday Trip Ends	AM Peak Hour		PM Peak Hour	
					Rate	Trips	Rate	Trips
Phase 1 - 2023								
Single-Family	210	28	9.43	264	0.7	20 (5 in/15 out)	0.94	26 (16 in/10 out)
Condominium	220	28	6.74	189	0.4	11 (3 in/8 out)	0.51	14 (9 in/5 out)
Subtotal				453		31 (8 in/23 out)		40 (25 in/15 out)
Phase 2 - 2025								
Single-Family	210	10	9.43	94	0.7	7 (2 in/5 out)	0.94	9 (6 in/3 out)
Condominium	220	20	6.74	135	0.4	8 (2 in/6 out)	0.51	10 (6 in/4 out)
Subtotal				682		46 (12 in/34 out)		59 (37 in/22 out)

Table 3 Cont'd

Land Use	ITE Code	Quantity	Rate	Weekday Trip Ends	AM Peak Hour		PM Peak Hour	
					Rate	Trips	Rate	Trips
Phase 3 - 2027								
Single-Family	210	43	9.43	405	0.7	30 (8 in/22 out)	0.94	40 (25 in/15 out)
Subtotal				1,087		76 (20 in/26 out)		99 (62 in/37 out)
Phase 4 - 2029								
Single-Family	210	11	9.43	104	0.7	8 (2 in/6 out)	0.94	10 (6 in/4 out)
Condominium	220	32	6.74	216	0.4	13 (3 in/10 out)	0.51	16 (10 in/6 out)
Total at Full Build-out				1,407		97 (25 in/72 out)		125 (78 in/47 out)

Average weekday trips and peak hour generation have been estimated based on the ITE average generation rate. The estimated volumes do not necessarily reflect the level of traffic anticipated to enter and exit the development. The actual peak hour volumes anticipated to enter and exit the development are discussed in the following sections of the report.

Peak school traffic and peak commuter traffic does not generally occur at the same time. The MDT data from 2017 and the ATS data from 2022 for the intersection of Granite Avenue and Highway 12 clearly showed separate peak periods in both the AM and PM traffic hours for commuter and school traffic. During the morning, the peak commuter period was 7:45-8:00 and the peak school period was 8:15-8:30. In the afternoon, the peak school period was 3:15-3:30 and the peak commuter period was 5:00-5:15. In order to accurately assess the traffic conditions for both commuter and school traffic ATS ran a traffic analysis for both time periods. Most of the traffic from the proposed residential homes in the West Side Woods Major Subdivision will be commuter traffic which will occur during the standard morning and evening commuter peak traffic periods. Traffic generation from the development will be significantly less during the peak school traffic periods. For the purposes of this report, it was assumed that the development would produce 50% of its peak-traffic during the PM peak

period of school traffic but 100% during the AM peak period even though it is highly likely that many residents will avoid driving by Kessler School during the morning peak periods due to the known congestion in this area and the availability of other routes.

6.0 TRIP DISTRIBUTION

Traffic for the West Side Woods Subdivision will primarily access existing adjacent streets Park Drive and Hauser Boulevard. It is anticipated at full build-out of the subdivision that the majority of traffic will utilize Hauser Boulevard, 80% of vehicle trips per day or 1,126 vehicle trips, between Park Drive and Granite Avenue to access Granite Avenue and ultimately Euclid Avenue (U.S. Highway 12). The remaining 20% of vehicle trips per day or 281 vehicle trips per day will utilize Hauser Boulevard to Knight Street to access Granite Avenue and ultimately Euclid Avenue (U.S. Highway 12). Trip distribution splits are shown in Figure 1 and traffic volumes by phase for Hauser Boulevard, Granite Avenue, and Knight Street are shown in Table 4.

Figure 1. Trip Distribution

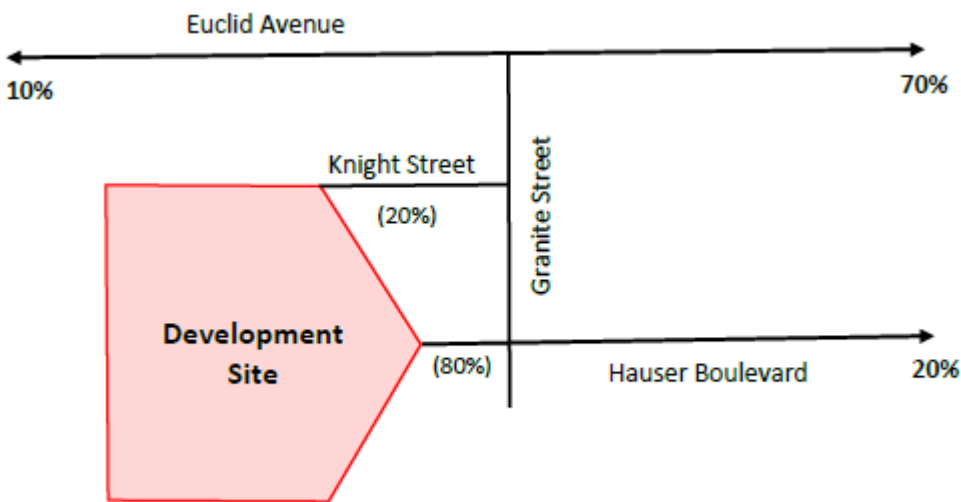


Table 4. Traffic Volume Impacts by Phase

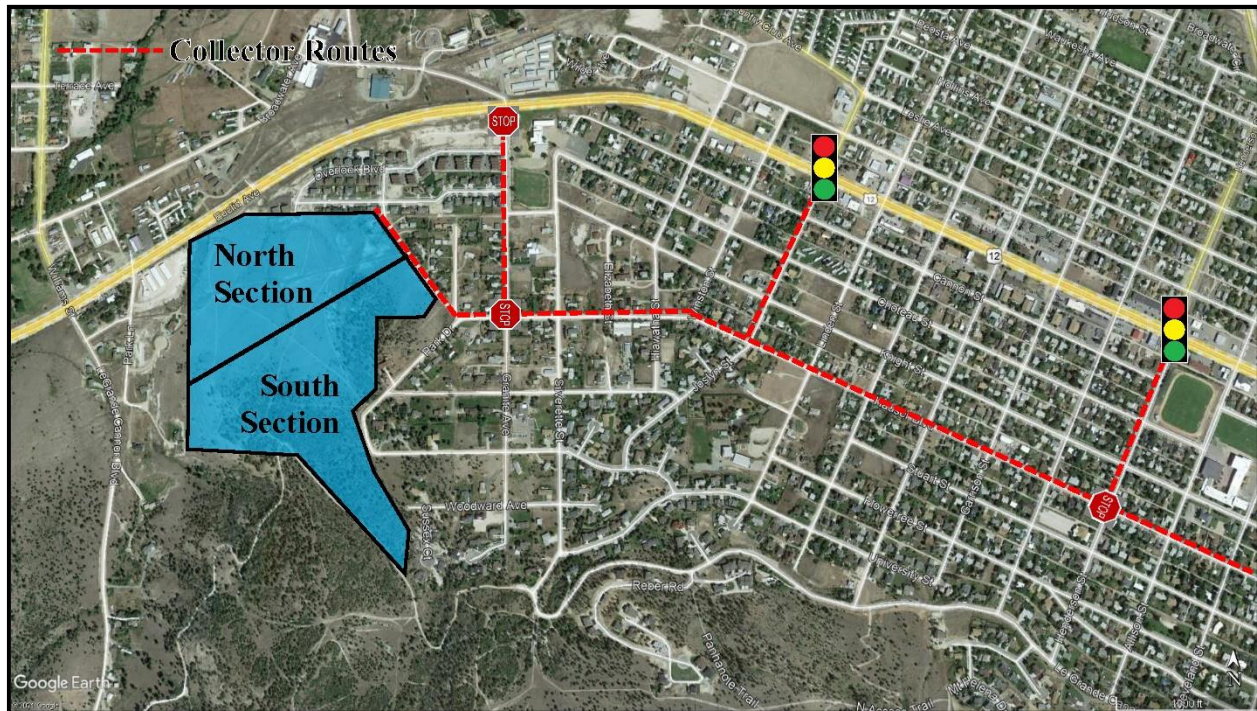
		20%	20%	80%
	ADT Volume	Hauser	Knight	Granite
Trip Generation	Existing	500	283	600
Phase 1	453	591	374	962
Phase 2	682	636	419	1146
Phase 3	1,087	717	500	1470
Phase 4	1,407	781	564	1726

Trip distribution and road assignments for this project were based on the layout of the proposed project and the available travel routes. The analysis predicts that 20% of traffic from the project would use Knight Street at full build-out. Depending on the specific interpretation of the available data, this number could be in the range of 20% up to 35% at the highest. The primary reasons why 20% of traffic was attributed to Knight Street includes the potential travel routes, travel distances, and travel speeds. For all residential properties in the southern portion of the development, which comprises of approximately 50% of the residences, the route along Knight Street will be longer and slower than using Hauser Boulevard and will not be used at any time. Of the remaining 50% of traffic, 20% will have route paths using Hauser Boulevard only matching existing traffic patterns. The remaining 40% of traffic from the development could potentially benefit from using Knight Street as opposed to Hauser Boulevard due to a slightly shorter travel distance.

The total travel distance to reach the intersection of Knight Street and Granite Avenue using Knight Street for residents living in the northern portion of the development is 1,320 feet. Getting to the same intersection using Hauser Boulevard to Granite Avenue is 1,890 feet, an added distance of 570 feet. However, the Knight Street local route is significantly narrower and allows slower travel than the Hauser Boulevard collector route. Overall, the travel times for using these two different routes is nearly identical depending on driver speeds with a maximum difference of approximately 15 seconds. Based on the similar travel time between these routes, ATS determined that drivers in the northern portion of the development would split between the two routes approximately 50% to Hauser and 50% to Knight leaving 20% of the overall traffic from the development using Knight Street. As stated above, depending on how the data is interpreted, this could be as high as 35% of the total traffic with a likely range of 20% to 35%. When viewed by phase the proposed development will likely be more focused on the northern end of the property and have a greater impact on roads to the north such as Knight Street, but later phases will primarily be focused on the southern portion of the development and will not have as high of an impact to the north of the property. The traffic report likely also overestimates that total traffic impacts from the project because no

reductions, for pass-by, internally captured trips, shared trips, or walking was included in the calculations to provide a more conservative overall result to the traffic analysis. Figure 2 shows the split between the north and south on the project site in relation to the collector roads in the area. The figure clearly shows that there are multiple collector routes that access Highway 12 east of the development besides Granite Avenue.

Figure 2. Collector Routes



7.0 OPERATIONAL ANALYSIS

Using the data collected for this project, ATS conducted a Level of Service (LOS) analysis at area intersections. This evaluation was conducted in accordance with the procedures outlined in the Transportation Research Board's *Highway Capacity Manual 7th Edition: A Guide for Multimodal Mobility Analysis* and the Highway Capacity Software (HCS) 2022 version 8.2. Intersections are graded from A to F representing the average delay that a vehicle entering an intersection can expect. Typically, a LOS of C or better is considered acceptable for peak-hour conditions. Modeling data is provided in Appendix D. A summary of LOS analysis for multiple scenarios are provided in Tables 5 through 10.

Table 5. Existing 2022 Level of Service Commuter Peak

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	14.7/22.0	B/C	12.9/30.1	C/D
Granite Avenue & Knight Street	8.8	A	9.1	A
Granite Avenue & Hauser Blvd	8.9/8.9	A/A	8.9/9.2	A/A

Table 6. Existing 2022 Level of Service Summary School Traffic

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	12.7/16.9	B/C	15.3/18.9	C/C
Granite Avenue & Knight Street	9.6	B	9.1	B
Granite Avenue & Hauser Blvd	9.5/9.1	A/A	9.4/9.2	A/A

Table 7. 2029 No Build Level of Service Summary Commuter Peak

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	16.4/25.3	B/D	13.6/34.2	C/D
Granite Avenue & Knight Street	8.9	A	9.4	A
Granite Avenue & Hauser Blvd	9.1/9.0	A/A	9.0/9.4	A/A

Table 8. 2029 No Build Level of Service Summary School Traffic

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	13.7/18.2	B/C	17.3/21.3	C/C
Granite Avenue & Knight Street	10.0	B	9.4	A
Granite Avenue & Hauser Blvd	9.7/9.4	A/A	9.6/8.8	A/A

Table 9. Projected Level of Service Summary Commuter Peak by Phase

Phase	Intersection	AM Peak Period		PM Peak Period	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS
1	Granite Avenue & Highway 12	15.8/23.8	B/C	13.9/34.3	B/C
	Granite Avenue & Knight Street	9.0	A	9.4	A
	Granite Avenue & Hauser Blvd	9.1/9.0	A/A	9.1/9.4	A/A
2	Granite Avenue & Highway 12	16.8/25.6	B/D	14.9/39.5	C/D
	Granite Avenue & Knight Street	9.2	A	9.7	A
	Granite Avenue & Hauser Blvd	9.2/9.1	A/A	9.4/9.6	A/A
3	Granite Avenue & Highway 12	17.9/27.4	B/D	16.0/44.0	C/D
	Granite Avenue & Knight Street	9.32	A	10.2	B
	Granite Avenue & Hauser Blvd	9.4/9.2	A/A	9.6/9.7	B/A
4	Granite Avenue & Highway 12	19.0/28.7	B/D	17.1/49.7	C/E
	Granite Avenue & Knight Street	9.4	A	10.5	B
	Granite Avenue & Hauser Blvd	9.6/9.3	A/A	9.7/9.8	A/A

Table 10. Projected 2029 Level of Service Summary School Traffic

Phase	Intersection	AM Peak Period		PM Peak Period	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS
1	Granite Avenue & Highway 12	13.1/17.6	B/C	16.3/20.3	C/C
	Granite Avenue & Knight Street	9.9	A	9.3	B
	Granite Avenue & Hauser Blvd	9.6/9.2	A/A	9.5/9.2	A/A
2	Granite Avenue & Highway 12	13.7/18.4	B/C	17.4/21.7	C/C
	Granite Avenue & Knight Street	10.1	B	9.4	A
	Granite Avenue & Hauser Blvd	9.7/9.4	A/A	9.6/9.2	A/A

Phase	Intersection	AM Peak Period		PM Peak Period	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS
3	Granite Avenue & Highway 12	14.4/19.1	B/C	18.3/23.1	C/C
	Granite Avenue & Knight Street	10.4	B	9.6	A
	Granite Avenue & Hauser Blvd	9.8/9.6	A/A	9.7/9.2	A/A
4	Granite Avenue & Highway 12	15.1/20.0	B/C	19.4/24.7	C/C
	Granite Avenue & Knight Street	10.7	B	9.7	A
	Granite Avenue & Hauser Blvd	9.9/9.7	A/A	9.8/9.2	A/A

The operational analysis shows that all intersections continue to function at the acceptable levels of service, LOS C or better, through Phase 4 with the exception of the Granite Avenue and Highway 12 intersection, which goes from a LOS C/D to a LOS C/E for the PM peak period. Highway 12 is the through street and there are stop signs located on both the south and north legs of the intersection.

7.1 QUEUING ANALYSIS

ATS performed a vehicle queueing analysis for the intersection of Granite Street and Euclid Avenue based on the traffic modeling and LOS calculations. The vehicle queueing analysis suggest that the 95% vehicle queue is currently approximately 2-3 vehicles and would be expected to rise to 3-4 vehicles by 2029 with the proposed development and background traffic growth in this area. Table 11 shows the queuing analysis for Granite Street and Euclid Avenue.

Table 11. Granite and Euclid Queuing Analysis

Period	AM Peak Period 95% Queue Length		PM Peak Period 95% Queue Length	
	NB Vehicles	SB Vehicles	NB Vehicles	SB Vehicles
2022 Commuter Peak	1.3	0.1	0.4	0.6
2022 School Peak	1.1	0.1	2.1	0.4
2029 Commuter No Build	1.7	0.2	0.5	0.8
2029 School No Build	1.3	0.1	2.7	0.5
2029 Commuter with Project	2.7	0.2	1.1	1.2
2029 School with Project	2.0	0.2	3.3	0.5

7.2 SIGNAL WARRANT ANALYSIS

As requested by the City of Helena, a study was performed at the intersection of Euclid Avenue (Hwy 12) and Granite Avenue to determine if this intersection meets signalization warrants now or in the future. This study was completed in accordance with the procedures outlined in the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD). The study was based on traffic data collected in September 2022 by ATS and information from the traffic impact study produced for the West Side Woods development. The signal warrant analysis is included in Appendix E.

The analysis concludes that based on the traffic data collected for this project, traffic signal warrants are not currently met at the intersection of Euclid Avenue and Granite Street, and it is not likely that a traffic signal will become warranted due to the construction of the West Side Woods development.

It is likely that this intersection will eventually need to be signalized in the future, but not due to the West Side Woods Development. It is most probable the traffic warrants for signalization will be largely due to potential future development on the north side of Euclid Avenue which would require left-turn movements onto Highway 12 from Granite Street. It should also be noted that the development of a traffic signal at this location will encourage drivers to use the Granite Street route because of the easier access to Highway 12. A traffic signal at this location would likely increase the peak-hour congestion in front of Kessler School and traffic volumes, vehicles queuing, and vehicle speeds would likely increase with the installation of a traffic signal. At this time there is insufficient evidence that a traffic signal will become warranted at this location due to the construction of the West Side Woods development.

7.3 CROSSWALK EVALUATION

ATS performed a crosswalk evaluation for the existing pedestrian crossings on Grant Street at Overlook Boulevard and Knight Street adjacent to Kessler School. The studies were performed Monday 5-17-21 to Wednesday 5-19-21 and Thursday 9-22-22 to determine the if the existing crosswalk warrants additional traffic controls now or in the future with the development of the West Side Subdivision. Data was collected during two hour-long periods in the morning and afternoon corresponding to the pick-up and drop-off periods times for Kessler School. The results of the data collection are shown below. Field observations indicated that the crosswalk functions adequately and does not create large back-up of traffic. Compliance with the crosswalk was near 100%.

Table 12. 2021 Vehicle & Pedestrian Activity Overlook Boulevard Crosswalk

	Average Vehicles Per Hour	Average Pedestrians Per Hour
AM Summary	279	24
PM Summary	244	72

*Based on data collected Monday 5-17-21 to Wednesday 5-19-21.

Table 13. 2022 Vehicle & Pedestrian Activity

	Average Vehicles Per Hour	Average Pedestrians Per Hour Overlook Boulevard	Average Pedestrians Per Hour Knight Street
AM Summary	227	21	7
PM Summary	213	55	18

*Based on data collected Thursday 9-22-22.

8.0 RELATIONSHIP TO LONG RANGE TRANSPORTATION PLAN

The analysis shown in this TIS is consistent with the information provided in the *Greater Helena Area Long Range Transportation Plan, 2014 Update* (LRTP) for the intersection of Granite Avenue and Highway 12. The LRTP indicated that the intersection of Granite Avenue and Euclid Avenue (U.S. Highway 12) functioned at LOS D(AM)/E(PM) and projected an LOS of F(AM)/F(PM) by 2035 but did not recommend capacity improvements at the intersection. The LRTP did recommend the installation of a flashing pedestrian crossing at Granite Avenue, which was installed in 2020.

There are no existing dedicated bicycle facilities currently located near or adjacent to the proposed development. Currently, local users share the existing road network in the area with vehicles. The subdivision proposes construction of local streets meeting the City of Helena standards. No dedicated bike facilities are proposed. Open space hiking and mountain biking

trails are proposed throughout the subdivision that can be used to access existing City of Helena open space lands to the south. Some bicycle improvements are identified in the LRTP on Granite Street which include revisions to the existing bulb-outs at Kessler School, so they are more bike friendly and buffered bike lanes on Highway 12. These are outside the scope of this project as no improvements are proposed to Granite Avenue or Highway 12 with this project.

There are no existing sidewalk networks located near the subdivision with the exception of the Overlook Estates subdivision to the south of the development. It is proposed to construct Hauser Boulevard along the east boundary of the subdivision to City of Helena standards including sidewalks. The sidewalks from internal subdivision roads will connect to the new Hauser Boulevard sidewalks and will connect to the existing sidewalks in Overlook Estates providing for a continuous sidewalk network from the subdivision through Overlook Estates to the Kessler School and Highway 12. The LRTP does not include recommended sidewalk projects in the vicinity of the proposed subdivision.

No transit stops are currently located near the proposed subdivision, and it is not anticipated that new transit locations will be developed in the West Side Woods in the near future. The LRTP does not identify any transit improvements on the West Side of Helena.

9.0 RECOMMENDATIONS AND CONCLUSIONS

This report indicates that the traffic generated at full build-out of the West Side Woods Subdivision can be adequately accommodated by the proposed access roads and recommended improvements to the local area transportation network. The analysis presented in this report indicates that all intersections except Granite Avenue and Euclid (U.S. Highway 12) will operate at a LOS B or better in the design year with West Side Woods Subdivision anticipated traffic. Therefore, the following recommendations by phase are presented based on this study:

Phase 1 Recommended Improvements

- Livezey Avenue, Livezey Court, Lee Court and Crowley Court should be designed and constructed to City of Helena local road standards.
- The intersection of Livezey Avenue and Lee Court will be an uncontrolled intersection.
- Livezey Avenue and Crowley Court access to Hauser Boulevard will require stop sign control.
- An emergency access road from the intersection of Livezey Avenue and Lee Drive shall be constructed to a minimum 24-ft gravel surface south to Park Avenue following the future alignment for Lee Drive and Brakeman Avenue. A minimum 30-ft emergency access easement shall be provided on the Phase 1 final plat. The emergency access shall be maintained by the applicant or the HOA until the final alignment is constructed with Phase 3 and dedicated to the City of Helena.

- Hauser Boulevard directly adjacent to the proposed subdivision should be improved to the City of Helena local road standards.
- Hauser Boulevard not adjacent to the subdivision to the intersection with Hauser Boulevard should be paved to a local road width of 30-ft. It is not recommended at this time that curb and gutter and sidewalk be added to this section of road as adjacent existing roads are gravel and contain no sidewalks. This facilitates the existing stormwater drainage pattern for these streets.
- Hauser Boulevard from Park Drive to Granite Avenue should be paved to a minor collector width of 32-ft. It is not recommended at this time that curb and gutter and sidewalk be added to this section of road as existing Granite Avenue at this location and Hauser Boulevard east of Granite Avenue is paved with no curb and gutter or sidewalks. This facilitates the existing stormwater drainage pattern for these streets.
- Pedestrian connectivity will be provided via internal sidewalks on both sides of all internal roads. The sidewalks will connect to sidewalk improvements proposed on Hauser Boulevard. Pedestrians will then be able to utilize the sidewalks on Knight Street and Overlook Boulevard to connect to Granite Avenue at Kessler School. A trail system will also be provided that will connect through the open space lots and the internal roads. The trail system will connect with existing City of Helena open space on the south side the subdivision providing pedestrian and bicycle access to the wider City of Helena trail system.
- The developer has agreed, in cooperation with Kessler School and Helena School District staff, to install a pedestrian actuated flashing crosswalk sign at the current crosswalk at the Overlook Boulevard and Granite Avenue intersection as well as a streetlight to provide for better pedestrian safety at this location. Further, the developer has agreed to the installation of bulb outs on the south end of the Kessler School property at the east leg of the Knight Street and Granite Avenue intersection as well as a flashing electronic speed limit sign south of this intersection in an effort to slow traffic speeds through the school area.

Phase 2 Recommended Improvements

- Livezey Court should be designed and constructed to City of Helena local road standards.
- Pedestrian connectivity will be provided via internal sidewalks on both sides of all internal roads. The sidewalks will connect to sidewalk improvements proposed on Hauser Boulevard. Pedestrians will then be able to utilize the sidewalks on Knight Street and Overlook Boulevard to connect to Granite Avenue at Kessler School. A trail system will also be provided that will connect through the open space lots and the internal roads. The trail system will connect with existing City of Helena open space on the south side the subdivision providing pedestrian and bicycle access to the wider City of Helena trail system.

Phase 3 Recommended Improvements

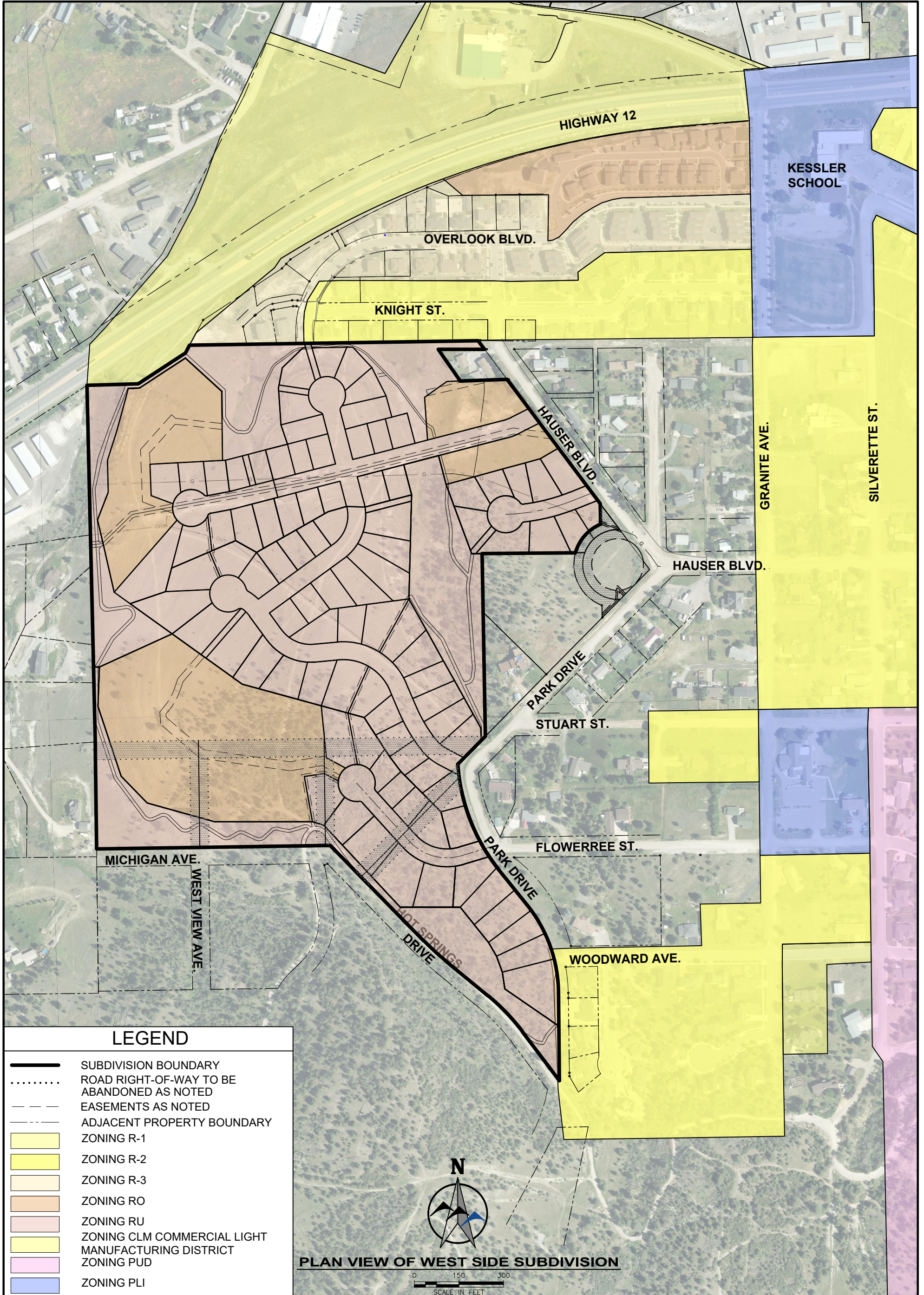
- Brakeman Avenue, Brakeman Court, and Lee Drive should be designed and constructed to City of Helena local road standards.
- The intersection of Brakeman Avenue and Lee Drive will be an uncontrolled intersection.
- Brakeman Avenue access to Park Drive will require stop sign control.
- Park Drive directly adjacent to the proposed subdivision should be improved to the City of Helena local road standards.
- Park Drive not adjacent to the subdivision to Hauser Boulevard should be paved to a local road width of 30-ft. It is not recommended at this time that curb and gutter and sidewalk be added to this section of road as adjacent existing roads are gravel and contain no sidewalks. This facilitates the existing stormwater drainage pattern for these streets.
- Pedestrian connectivity will be provided via internal sidewalks on both sides of all internal roads. The sidewalks will connect to sidewalk improvements proposed on Hauser Boulevard. Pedestrians will then be able to utilize the sidewalks on Knight Street and Overlook Boulevard to connect to Granite Avenue at Kessler School. A trail system will also be provided that will connect through the open space lots and the internal roads. The trail system will connect with existing City of Helena open space on the south side the subdivision providing pedestrian and bicycle access to the wider City of Helena trail system.

Phase 4 Recommended Improvements

- Flowerree Court should be designed and constructed to City of Helena local road standards.
- Flowerree Court access to Park Drive will require stop sign control.
- Pedestrian connectivity will be provided via internal sidewalks on both sides of all internal roads. The sidewalks will connect to sidewalk improvements proposed on Hauser Boulevard. Pedestrians will then be able to utilize the sidewalks on Knight Street and Overlook Boulevard to connect to Granite Avenue at Kessler School. A trail system will also be provided that will connect through the open space lots and the internal roads. The trail system will connect with existing City of Helena open space on the south side the subdivision providing pedestrian and bicycle access to the wider City of Helena trail system.

There are no recommended improvements for the intersection of Granite Avenue and Euclid Avenue (Highway 12) at this time. The signal warrant analysis indicates that a signal is not warranted based on anticipated traffic from the development. Additionally, the LRTP indicates the LOS for the intersection as E/F in 2035 with no recommendations for improvements.

APPENDIX A
VICINITY MAP

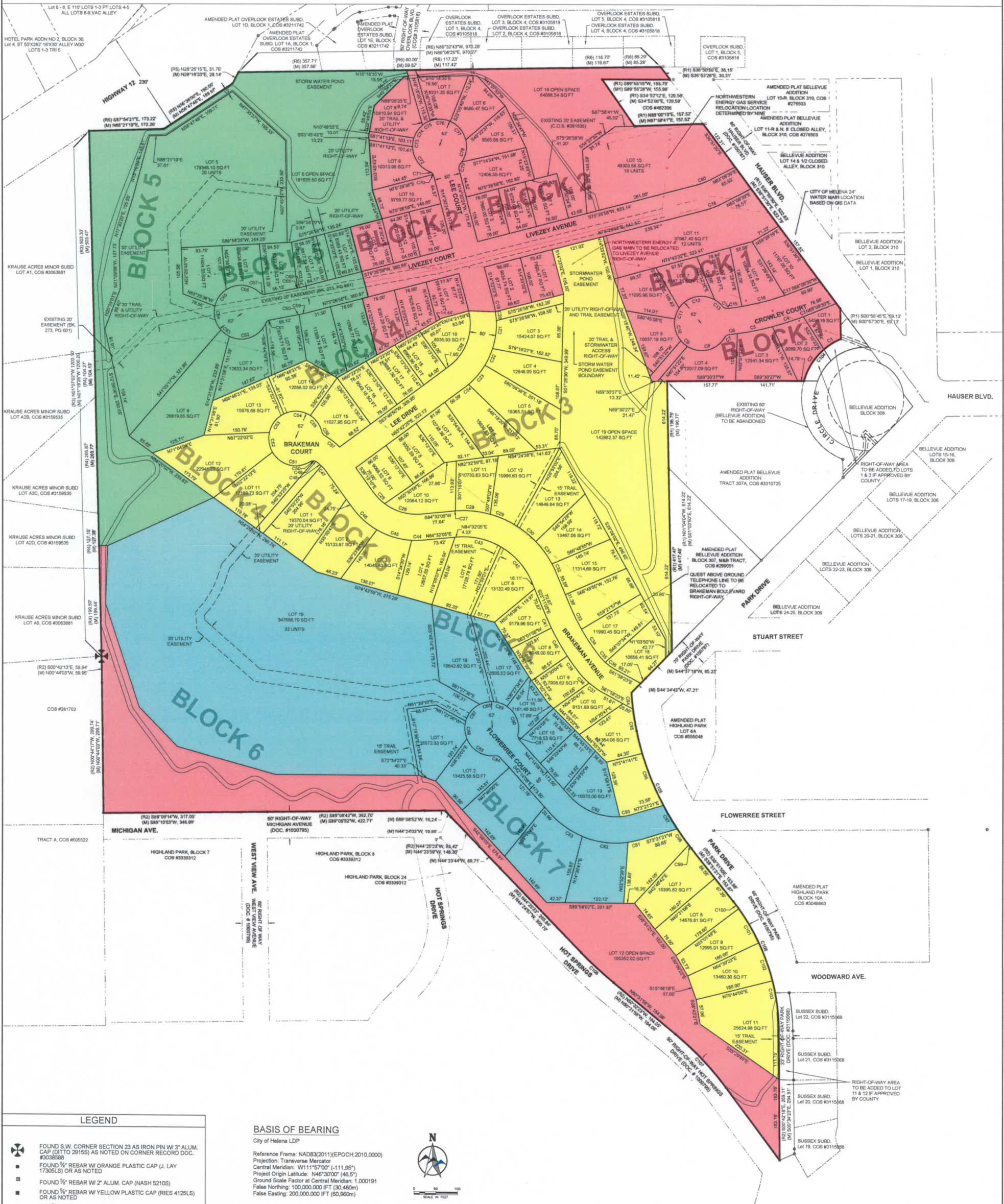


2b	ECO DEVELOPMENT, LLC	 WWC ENGINEERING 1275 MAPLE STREET, SUITE F HELENA, MT 59601 (406) 443-3962	PROJECT: 2022-292		
	WEST SIDE WOODS MAJOR SUBDIVISION		DESIGNED: JMF		
	VICINITY MAP		DRAWN: DLC		
			CHECKED: DDP		
			APPROVED: JMF		
		DATE: SEPTEMBER 15, 2022			

APPENDIX B
PRELIMINARY PLAT

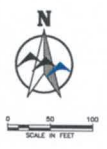
WEST SIDE WOODS SUBDIVISION PRELIMINARY PLAT

LOCATED IN THE SOUTH 1/2 OF SECTION 23, AND THE NORTH 1/2 OF SECTION 26, TOWNSHIP 10 NORTH, RANGE 4 WEST P.M.M., LEWIS AND CLARK COUNTY, MONTANA



LEGEND	
	FOUND S.W. CORNER SECTION 23 AS IRON PIN W 3" ALLUM. CAP (D.T.T.O 29155) AS NOTED ON CORNER RECORD DOC. #3038588
	FOUND 5/8" REBAR W ORANGE PLASTIC CAP (J. LAY 17305L) OR AS NOTED
	FOUND 5/8" REBAR W 2" ALLUM. CAP (NASH 5210S)
	FOUND 5/8" REBAR W YELLOW PLASTIC CAP (RIES 4125LS) OR AS NOTED
	SET 5/8" REBAR W YELLOW PLASTIC CAP (COLLINS 18626LS)
	SUBDIVISION BOUNDARY
	LOT LINES
	EASEMENTS AS NOTED
	ADJACENT PROPERTY BOUNDARY
	NORTH-WESTERN GAS LINE AS NOTED
	QUEST ABOVE GROUND TELEPHONE LINE
	CITY OF HELENA 24 INCH WATER MAIN
	PHASE 1 BOUNDARY
	PHASE 2 BOUNDARY
	PHASE 3 BOUNDARY
	PHASE 4 BOUNDARY
(M)	MEASURED (THIS SURVEY)
(R1)	RECORD (CERTIFICATE OF SURVEY #331072S)
(R2)	RECORD (CERTIFICATE OF SURVEY #3339312)
(R3)	RECORD (CERTIFICATE OF SURVEY #3063881)
(R4)	RECORD (CERTIFICATE OF SURVEY #315963S)
(R5)	RECORD (STATE OF MT STATE HIGHWAY COMMISSION RIGHT-OF-WAY PLAN F_248(30))
(R6)	RECORD (CERTIFICATE OF SURVEY #321174Z)
(R7)	RECORD (CERTIFICATE OF SURVEY #3105818)

BASIS OF BEARING
 City of Helena LDP
 Reference Frame: NAD83(2011)(EPOCH 2010.000)
 Projection: Transverse Mercator
 Central Meridian: W111°57'00" (-111.95°)
 Project Origin Latitude: N46°30'00" (46.5°)
 Ground Scale Factor at Central Meridian: 1.000191
 False Northing: 100,000,000 IFT (30,480m)
 False Easting: 200,000,000 IFT (60,960m)



SHEET 2 OF 2			
1/4	SEC.	TWP.	RGE.
	23	10N.	4W.
1/4	SEC.	TWP.	RGE.
	26	10N.	4W.

SURVEY IS NOT VALID UNLESS SEAL CONTAINS THE SIGNATURE OF THE PROFESSIONAL LAND SURVEYOR.

CERTIFICATE OF SURVEYOR

DAVID L. COLLINS, PLS

ECO DEVELOPMENT LLC
WEST SIDE WOODS SUBDIVISION
 JOB# 2020-216

WVC ENGINEERING
 1275 MAPLE STREET, SUITE F
 HELENA, MT 59601
 (406) 443-3962

REVISIONS	DATE	BY	DESCRIPTION

Date: _____

APPENDIX C
TRAFFIC COUNT DATA

Turning Movement Count

All Vehicles

Location US12 & Henderson Helena West

Date 9/28/2022 PM, 9/22/2022 AM

	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thr	Right	Peds	Left	Thr	Right	Peds	Left	Thr	Right	Peds	Left	Thr	Right	Peds	
7:00 - 7:15	2	0	9	0	1	0	0	0	0	65	0	0	2	67	7	0	153
7:15 - 7:30	4	0	9	0	3	0	0	0	0	68	0	0	4	100	5	0	193
7:30 - 7:45	1	0	25	1	2	0	0	0	0	80	1	0	4	116	3	0	233
7:45 - 8:00	5	1	36	0	2	1	0	0	0	113	4	0	6	152	17	0	337
8:00 - 8:15	8	0	42	0	2	0	1	0	0	78	11	0	14	92	13	0	261
8:15 - 8:30	11	0	35	0	1	0	0	1	0	69	15	0	17	97	8	0	254
8:30 - 8:45	3	0	14	0	5	1	0	0	1	78	2	0	2	79	6	0	191
8:45 - 9:00	1	1	10	0	2	0	1	0	0	80	3	0	6	74	5	0	183
9:00 - 9:15	2	0	7	0	6	0	1	0	1	67	1	0	0	87	7	0	179
9:15 - 9:30	0	1	1	0	3	0	0	0	0	60	0	0	4	82	12	1	164
9:30 - 9:45	2	0	11	0	4	0	2	0	0	60	3	0	4	67	9	0	162
9:45 - 10:00	0	0	10	0	4	0	0	0	1	71	1	0	2	61	9	0	159
10:00 - 10:15	0	0	8	0	6	0	0	0	0	67	0	0	3	105	8	0	197
10:15 - 10:30	1	0	6	0	2	2	2	0	1	61	1	0	9	87	4	0	176
10:30 - 10:45	0	0	9	0	6	0	0	1	1	97	1	0	8	74	12	0	209
10:45 - 11:00	2	0	8	0	6	0	0	0	0	91	5	0	5	86	2	0	205
11:00 - 11:15	0	1	14	0	10	0	2	0	0	87	0	0	6	72	2	0	194
11:15 - 11:30	1	0	6	0	5	1	0	0	0	101	3	0	4	63	4	0	188
11:30 - 11:45	2	0	11	0	4	0	1	0	0	98	1	0	7	79	3	0	206
11:45 - 12:00	1	0	8	0	3	0	0	0	0	94	2	0	3	72	2	0	185
12:00 - 12:15	1	0	8	0	6	0	0	0	2	94	1	0	12	89	4	0	217
12:15 - 12:30	1	1	7	0	7	1	0	0	0	97	1	0	9	86	5	0	215
12:30 - 12:45	0	0	5	1	7	0	1	0	1	81	0	0	6	116	4	0	222
12:45 - 1:00	1	1	13	0	5	0	0	1	0	94	0	0	7	95	15	0	232
1:00 - 1:15	2	0	12	0	11	0	2	0	0	57	0	0	12	84	7	0	187
1:15 - 1:30	0	0	9	0	7	0	1	1	0	76	0	0	11	90	10	0	205
1:30 - 1:45	1	2	9	0	6	0	2	0	0	84	1	0	7	80	3	0	195
1:45 - 2:00	3	0	9	0	7	1	0	0	0	83	0	0	9	81	8	0	201
2:00 - 2:15	0	1	4	0	5	0	0	0	0	95	3	0	13	69	8	0	198
2:15 - 2:30	2	1	6	0	4	1	1	0	0	90	4	0	14	72	8	0	203
2:30 - 2:45	0	0	20	0	13	0	2	0	0	130	5	0	9	80	16	0	275
2:45 - 3:00	1	0	12	0	4	1	0	0	0	106	10	0	18	94	6	0	252
3:00 - 3:15	2	0	20	0	8	1	1	0	2	114	11	0	18	107	8	0	292
3:15 - 3:30	18	0	51	0	7	1	0	0	0	93	3	0	12	97	2	0	284
3:30 - 3:45	5	0	11	0	6	0	1	0	0	124	1	0	17	90	1	0	256
3:45 - 4:00	2	0	4	0	5	0	1	0	1	108	1	0	17	82	6	0	227
4:00 - 4:15	1	0	11	0	6	0	0	0	0	150	2	0	13	110	3	0	296
4:15 - 4:30	0	0	14	0	4	0	0	0	1	126	0	0	16	125	7	0	293
4:30 - 4:45	0	0	17	2	8	0	0	0	0	180	4	0	23	116	2	0	352
4:45 - 5:00	1	0	12	1	13	0	0	0	0	126	2	0	14	85	3	0	257
5:00 - 5:15	2	0	9	1	7	0	2	0	1	97	0	0	14	100	5	0	238
5:15 - 5:30	2	0	8	0	7	0	1	2	2	105	1	0	22	98	4	0	252
5:30 - 5:45	1	0	7	0	4	1	2	0	0	94	0	0	27	82	2	0	220
5:45 - 6:00	0	0	10	0	6	0	1	0	1	88	2	0	20	79	3	0	210
6:00 - 6:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 - 6:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 - 6:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 - 7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	92	10	567	6	240	12	28	6	16	4077	106	0	450	3919	278	1	9808

Turning Movement Count

All Vehicles

Location Granite/Kessler School

Date 9/21/2022

	Northbound				Southbound				Overlook Eastbound				Knight Eastbound				Knight Westbound		Peds	
	Ovrk	Thr	Knight	Peds	Ovrk	Thr	RKngt	Knight	Left	Right	Peds	Left	Right	Peds	Total	Left	Right	Overlook	Knight	
7:00 - 7:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 - 7:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 - 7:45	0	5	0	0	0	3	0	0	13	0	1	0	5	0	3	0	30	0	0	
7:45 - 8:00	0	15	0	0	1	7	1	0	17	0	1	0	2	0	2	0	46	0	3	
8:00 - 8:15	0	25	1	0	9	16	1	0	5	0	0	0	7	0	0	0	64	0	13	
8:15 - 8:30	0	21	0	0	5	28	1	4	1	0	0	0	5	0	2	0	67	0	12	
8:30 - 8:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:45 - 9:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9:00 - 9:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9:15 - 9:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9:30 - 9:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9:45 - 10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:00 - 10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:15 - 10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:30 - 10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:15 - 11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:30 - 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:45 - 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:15 - 12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:30 - 12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12:45 - 1:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:00 - 1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:15 - 1:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:30 - 1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:45 - 2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:00 - 2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:15 - 2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:30 - 2:45	0	6	0	0	5	3	3	0	0	0	0	0	4	1	1	0	23	0	2	
2:45 - 3:00	0	11	0	0	4	7	4	1	2	0	0	0	3	0	1	0	33	1	4	
3:00 - 3:15	2	3	2	0	8	12	1	0	3	0	1	0	3	0	0	0	35	0	2	
3:15 - 3:30	2	11	1	0	8	10	3	5	14	1	1	0	9	0	4	0	69	12	1	
3:30 - 3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:45 - 4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 - 4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 - 4:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 - 4:45	0	5	0	0	5	9	3	1	3	0	0	0	6	0	0	0	32	0	0	
4:45 - 5:00	2	5	0	0	6	4	5	2	6	0	0	0	2	0	0	0	32	0	0	
5:00 - 5:15	1	7	0	0	9	5	4	0	2	0	0	0	4	0	0	0	32	0	2	
5:15 - 5:30	0	8	0	0	6	14	11	0	2	0	0	0	2	0	0	0	43	0	1	
5:30 - 5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45 - 6:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 - 6:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 - 6:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 - 6:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 - 7:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	7	122	4	0	66	118	37	13	68	1	4	0	52	1	13	0	506			

	9/19/2022	to	9/25/2022							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Week	Weekend	Week Day 85%
Hour	9/19/2022	9/20/2022	9/21/2022	9/22/2022	9/23/2022	9/24/2022	9/25/2022	Day Avg	Avg	Avg Speed
0 - 1	*	*	0	0	*	*	*	0	0	0
1 - 2	*	*	2	0	*	*	*	1	0	37
2 - 3	*	*	0	0	*	*	*	0	0	0
3 - 4	*	*	1	2	*	*	*	1.5	0	22.5
4 - 5	*	*	1	1	*	*	*	1	0	29
5 - 6	*	*	5	8	*	*	*	6.5	0	32.5
6 - 7	*	*	17	10	*	*	*	13.5	0	34.5
7 - 8	*	*	34	39	*	*	*	36.5	0	31.5
8 - 9	*	*	42	48	*	*	*	45	0	30.25
9 - 10	*	*	24	18	*	*	*	21	0	31
10 - 11	*	13	42	27	*	*	*	27.33	0	32.33
11 - 12	*	39	28	32	*	*	*	33	0	33.6
12 - 13	*	32	36	24	*	*	*	30.67	0	34.13
13 - 14	*	33	40	*	*	*	*	36.5	0	32.75
14 - 15	*	32	26	*	*	*	*	29	0	30.85
15 - 16	*	71	57	*	*	*	*	64	0	32
16 - 17	*	67	51	*	*	*	*	59	0	33.35
17 - 18	*	60	57	*	*	*	*	58.5	0	34
18 - 19	*	40	42	*	*	*	*	41	0	35.35
19 - 20	*	28	27	*	*	*	*	27.5	0	32.5
20 - 21	*	25	30	*	*	*	*	27.5	0	31.85
21 - 22	*	8	11	*	*	*	*	9.5	0	31.5
22 - 23	*	4	7	*	*	*	*	5.5	0	33.5
23 - 24	*	1	2	*	*	*	*	1.5	0	40.5
Totals	0	453	582	209	0	0	0			
% of Total	0%	36.41%	46.78%	16.8%	0%	0%	0%			

	10/11/2021	to	10/17/2021							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Week	Weekend	Week Day 85%
Hour	10/11/2021	10/12/2021	10/13/2021	10/14/2021	10/15/2021	10/16/2021	10/17/2021	Day Avg	Avg	Avg Speed
0 - 1	*	*	0	0	*	*	*	0	0	0
1 - 2	*	*	1	0	*	*	*	0.5	0	37
2 - 3	*	*	2	0	*	*	*	1	0	35
3 - 4	*	*	1	2	*	*	*	1.5	0	23
4 - 5	*	*	1	0	*	*	*	0.5	0	29
5 - 6	*	*	2	4	*	*	*	3	0	29
6 - 7	*	*	8	13	*	*	*	10.5	0	37
7 - 8	*	*	32	35	*	*	*	33.5	0	33.5
8 - 9	*	*	63	62	*	*	*	62.5	0	32.35
9 - 10	*	*	33	27	*	*	*	30	0	33.8
10 - 11	*	*	28	36	*	*	*	32	0	34.5
11 - 12	*	*	45	24	*	*	*	34.5	0	34
12 - 13	*	*	50	35	*	*	*	42.5	0	34.75
13 - 14	*	*	37	31	*	*	*	34	0	33.9
14 - 15	*	44	39	37	*	*	*	40	0	32.83
15 - 16	*	68	65	68	*	*	*	67	0	33.5
16 - 17	*	33	64	7	*	*	*	34.67	0	35.33
17 - 18	*	64	58	*	*	*	*	61	0	33.85
18 - 19	*	38	58	*	*	*	*	48	0	35.2
19 - 20	*	29	38	*	*	*	*	33.5	0	33.5
20 - 21	*	22	33	*	*	*	*	27.5	0	34.15
21 - 22	*	14	15	*	*	*	*	14.5	0	34.5
22 - 23	*	4	3	*	*	*	*	3.5	0	36.5
23 - 24	*	2	2	*	*	*	*	2	0	34.5
Totals	0	318	678	381	0	0	0			
% of Total	0%	23.09%	49.24%	27.67%	0%	0%	0%			

	10/11/2021	to	10/17/2021							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Week	Weekend	Week Day 85%
Hour	10/11/2021	10/12/2021	10/13/2021	10/14/2021	10/15/2021	10/16/2021	10/17/2021	Day Avg	Avg	Avg Speed
0 - 1	*	*	0	0	*	*	*	0	0	0
1 - 2	*	*	0	0	*	*	*	0	0	0
2 - 3	*	*	0	0	*	*	*	0	0	0
3 - 4	*	*	1	1	*	*	*	1	0	14.5
4 - 5	*	*	1	0	*	*	*	0.5	0	17
5 - 6	*	*	3	2	*	*	*	2.5	0	22.5
6 - 7	*	*	9	11	*	*	*	10	0	23.5
7 - 8	*	*	21	24	*	*	*	22.5	0	22.9
8 - 9	*	*	25	24	*	*	*	24.5	0	24.25
9 - 10	*	*	5	20	*	*	*	12.5	0	24
10 - 11	*	*	9	19	*	*	*	14	0	26.75
11 - 12	*	*	13	18	*	*	*	15.5	0	24.5
12 - 13	*	*	10	11	*	*	*	10.5	0	20.25
13 - 14	*	*	18	21	*	*	*	19.5	0	24.25
14 - 15	*	20	8	19	*	*	*	15.67	0	27.77
15 - 16	*	35	33	22	*	*	*	30	0	24.5
16 - 17	*	32	27	6	*	*	*	21.67	0	26.27
17 - 18	*	29	26	*	*	*	*	27.5	0	24.5
18 - 19	*	19	23	*	*	*	*	21	0	22
19 - 20	*	6	18	*	*	*	*	12	0	22
20 - 21	*	6	3	*	*	*	*	4.5	0	22.75
21 - 22	*	6	5	*	*	*	*	5.5	0	24.25
22 - 23	*	2	4	*	*	*	*	3	0	18
23 - 24	*	5	1	*	*	*	*	3	0	18.5
Totals	0	160	263	198	0	0	0			
% of Total	0%	25.76%	42.35%	31.88%	0%	0%	0%			

Summary of Turning Movement Counts

Study Name Euclid & Granite

Observer CJW

Date 10/13/2021 & 10/14/21

10/13/2021

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
4:30 PM	3	0	13	5	0	2	0	141	5	11	82	1	263
4:45 PM	0	0	13	10	0	0	1	135	3	22	110	3	297
5:00 PM	0	0	10	12	1	0	0	106	0	19	89	2	239
5:15 PM	0	0	1	3	0	0	1	64	4	15	76	2	166
Total	3	0	37	30	1	2	2	446	12	67	357	8	965

Pedestrians

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Counte	Clockw	Total	Counte	Clockw	Total	Counte	Clockw	Total	Counte	Clockw	Total	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	1	1	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	1	0	0	0	0	0	0	1

10/14/2021

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
7:30 AM	4	0	21	5	0	0	0	83	4	8	152	3	280
7:45 AM	9	0	20	3	1	0	0	95	5	12	153	10	308
8:00 AM	8	2	42	3	0	1	0	81	13	9	108	13	280
8:15 AM	12	0	36	3	0	0	1	73	16	14	81	9	245
Total	33	2	119	14	1	1	1	332	38	43	494	35	1113

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3:00 PM	5	0	23	4	0	0	0	91	8	19	76	7	233
3:15 PM	19	0	48	6	0	0	0	75	7	13	81	4	253
3:30 PM	3	0	11	8	0	1	2	107	3	17	87	5	244
Total	27	0	82	18	0	1	2	273	18	49	244	16	730

Summary of Turning Movement Counts

Study Name Hauser & Granite

Observer CJW

Date 10/13/2021 & 10/14/21

10/13/2021

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
4:30 PM	0	1	0	1	1	0	0	0	0	0	0	0	3
4:45 PM	0	6	2	0	3	2	1	0	0	0	0	1	15
5:00 PM	0	3	0	1	4	3	0	1	0	0	1	2	15
5:15 PM	0	2	0	0	9	1	0	0	0	3	5	1	21
Total	0	12	2	2	17	6	1	1	0	3	6	4	54

10/14/2021

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
7:30 AM	0	2	2	1	1	0	1	0	0	0	0	0	7
7:45 AM	0	6	2	2	1	0	0	1	0	1	1	1	15
8:00 AM	0	6	0	1	1	0	1	3	0	0	0	10	22
8:15 AM	0	7	1	2	6	1	1	4	0	1	0	6	29
Total	0	12	2	2	17	6	1	1	0	3	6	4	54

Cars

Start Time	Northbound			Southbound			Eastbound			Westbound			Total All
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3:00 AM	4	0	0	0	5	1	1	2	0	0	1	7	21
3:15 AM	0	4	1	5	2	0	1	2	0	0	1	4	20
3:30 AM	0	2	0	3	5	1	1	1	0	2	0	2	17
Total	4	6	1	8	12	2	3	5	0	2	2	13	58

Study Name Euclid & Granite

Start Date 09/26/2017

Start Time 7:00 AM

Site Code

Project Traffic Safety

Type Road

Classification Totals

Start Time	Southbound Approach Southbound				Westbound Approach Westbound				Northbound Approach Northbound				Eastbound Approach Eastbound				
	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
7:00 AM	0	0	1	0	5	88	1	0	10	0	0	0	0	55	0	0	160
7:15 AM	1	0	1	0	3	126	1	0	21	0	3	0	1	77	2	0	236
7:30 AM	0	0	0	0	13	97	8	0	22	1	5	0	4	108	0	0	258
7:45 AM	0	1	5	0	22	149	9	0	26	0	5	0	4	96	1	0	318
8:00 AM	0	0	4	0	18	97	12	0	33	0	6	0	0	90	0	1	261
8:15 AM	0	1	4	0	10	105	13	0	39	0	5	0	0	84	0	0	261
8:30 AM	1	0	6	0	11	85	6	0	23	0	3	0	0	73	0	0	208
8:45 AM	0	1	4	0	13	89	3	0	13	0	0	0	0	88	0	0	211
9:00 AM	0	1	2	0	5	69	7	0	8	0	1	0	1	66	0	0	160
9:15 AM	0	0	6	0	4	71	2	0	5	0	0	0	0	77	0	0	165
9:30 AM	0	0	7	0	7	81	5	0	5	0	2	0	0	71	1	0	179
9:45 AM	1	0	4	0	6	72	10	0	5	0	1	0	1	67	0	0	167
10:00 AM	0	0	6	0	10	65	3	0	6	0	0	0	0	74	0	0	164
10:15 AM	0	0	6	0	6	76	9	0	4	0	0	0	0	61	1	0	163
10:30 AM	0	0	4	0	7	69	5	0	9	0	0	0	0	76	0	0	170
10:45 AM	0	0	11	0	10	77	4	1	11	0	2	0	1	82	0	0	199
11:00 AM	1	0	5	0	5	60	6	0	8	0	0	0	1	79	1	1	167
11:15 AM	0	0	4	0	3	69	3	0	8	0	1	0	1	74	0	0	163
11:30 AM	0	0	10	0	8	71	13	0	4	0	1	0	2	78	1	0	188
11:45 AM	0	1	4	0	5	57	8	0	8	0	1	0	1	97	2	0	184
12:00 PM	0	0	3	0	9	68	3	0	8	0	1	0	3	69	0	0	164
12:15 PM	0	0	9	0	6	79	10	0	6	0	0	0	0	100	1	0	211
12:30 PM	0	0	4	0	5	69	6	1	6	0	1	0	0	82	1	1	176
12:45 PM	0	0	11	0	6	74	10	0	6	0	2	0	2	83	0	0	194
1:00 PM	2	0	7	0	6	84	8	0	5	0	1	0	2	70	0	0	185
1:15 PM	0	0	3	0	5	93	8	1	7	0	4	0	1	70	0	0	192
1:30 PM	0	1	4	0	6	94	8	0	15	0	1	0	1	77	0	0	207
1:45 PM	0	1	14	0	2	71	6	0	8	0	2	0	1	82	2	0	189
2:00 PM	0	0	6	0	8	77	11	0	3	1	1	0	4	81	0	0	192
2:15 PM	0	1	12	0	11	87	10	2	3	1	2	0	0	81	1	0	211
2:30 PM	1	0	14	0	3	82	9	0	15	0	3	0	3	91	0	0	221
2:45 PM	0	1	12	0	6	89	8	0	7	0	0	0	4	86	0	0	213
3:00 PM	0	1	9	0	11	94	22	0	4	0	2	0	9	91	2	0	245
3:15 PM	2	1	6	0	7	92	16	0	51	0	13	0	4	89	0	0	281
3:30 PM	1	0	9	0	5	83	11	1	14	0	1	0	3	142	1	0	271
3:45 PM	3	0	7	0	6	104	15	0	11	0	1	0	1	108	0	0	256
4:00 PM	0	0	7	0	1	70	13	0	3	0	1	0	3	139	0	0	237
4:15 PM	0	0	4	0	4	97	11	0	5	2	1	0	3	98	0	0	225
4:30 PM	0	1	0	0	5	98	7	0	6	0	1	0	3	155	0	0	276
4:45 PM	0	0	10	0	8	83	17	0	15	1	2	0	3	130	1	0	270
5:00 PM	1	0	11	0	3	111	11	0	11	0	3	0	0	109	1	0	261
5:15 PM	0	0	8	0	9	94	13	0	6	0	1	0	2	87	2	0	222
5:30 PM	0	0	11	0	8	94	16	0	5	1	0	0	1	108	0	0	244
5:45 PM	0	0	4	0	22	88	21	0	7	3	5	0	0	67	1	0	218
6:00 PM	1	0	12	0	8	77	9	0	9	0	0	0	1	58	0	0	175
6:15 PM	0	0	1	0	3	78	16	0	6	0	0	0	0	70	0	0	174
6:30 PM	0	0	3	0	1	65	17	0	7	0	2	0	3	39	0	0	137
6:45 PM	1	0	5	0	1	50	10	0	9	0	1	0	2	50	0	0	129
7:00 AM	0	1	2	0	4	78	2	0	18	0	0	0	1	71	0	0	177
7:15 AM	0	0	2	0	4	126	2	0	13	0	3	0	0	95	0	0	245
7:30 AM	3	0	2	0	13	111	8	0	22	0	2	0	2	99	0	0	262
7:45 AM	0	0	1	0	13	153	8	0	37	0	5	0	4	120	1	0	342
8:00 AM	0	0	3	0	17	121	9	0	32	1	5	0	14	79	0	0	281
8:15 AM	0	1	2	0	5	96	14	0	28	0	7	0	10	68	0	0	231
8:30 AM	1	1	2	0	7	87	4	1	17	1	1	0	2	79	1	0	204
8:45 AM	0	0	5	0	10	69	8	0	11	0	0	0	0	87	1	0	191
9:00 AM	0	1	4	0	12	91	2	0	4	1	5	0	0	81	0	0	201
9:15 AM	0	0	3	0	11	74	6	1	9	0	1	0	0	69	0	0	174
9:30 AM	0	0	3	0	4	67	4	0	6	0	2	0	0	59	0	0	145
9:45 AM	0	0	9	0	6	72	5	0	8	1	1	0	0	73	0	0	175
10:00 AM	0	0	4	0	7	61	8	0	7	0	2	0	1	66	0	0	156
10:15 AM	0	0	8	0	6	79	2	8	6	0	1	0	2	67	0	0	179
10:30 AM	0	0	2	0	6	70	2	0	4	0	0	0	0	76	0	0	160
10:45 AM	0	0	4	0	5	65	8	0	4	0	0	0	3	90	0	0	179
11:00 AM	1	0	7	0	8	56	3	0	5	0	0	0	0	88	1	1	170
11:15 AM	1	1	10	0	9	82	1	0	10	0	2	0	0	69	1	0	186
11:30 AM	1	0	8	0	7	57	6	0	12	0	0	0	2	87	1	0	181
11:45 AM	0	1	9	0	9	84	7	0	6	0	0	0	4	83	1	1	205
12:00 PM	0	0	8	0	8	86	11	1	4	0	0	0	1	75	0	1	195
12:15 PM	0	0	3	0	10	100	7	0	6	0	1	0	2	78	0	0	207
12:30 PM	0	0	8	0	5	85	10	1	11	0	1	0	0	91	1	0	213

12:45 PM	0	0	10	0	3	73	9	1	6	0	2	0	1	83	0	0	188
1:00 PM	0	1	5	0	5	77	8	0	6	1	2	0	1	94	0	0	200
1:15 PM	0	0	9	0	5	95	10	0	7	0	1	0	0	82	0	0	209
1:30 PM	1	0	5	0	6	82	7	0	10	0	1	0	0	91	1	1	205
1:45 PM	0	0	8	0	6	68	6	0	13	0	2	0	1	77	0	0	181
2:00 PM	0	0	6	0	9	67	6	1	4	0	1	0	1	91	1	0	187
2:15 PM	1	0	5	0	5	93	13	1	5	0	0	0	1	93	1	1	219
2:30 PM	1	0	8	0	5	90	9	0	6	1	1	0	2	96	0	0	219
2:45 PM	0	2	7	0	11	65	12	1	8	0	0	0	8	82	1	0	197
3:00 PM	0	0	13	0	4	61	16	0	3	0	0	0	5	114	2	0	218
3:15 PM	1	1	2	0	3	81	18	0	38	0	15	0	4	93	0	0	256
3:30 PM	1	0	6	0	9	120	5	1	17	1	2	0	2	134	0	0	298
3:45 PM	1	0	5	0	4	89	4	1	8	0	0	0	3	86	1	0	202
4:00 PM	1	0	15	0	4	97	12	1	3	0	1	0	6	111	1	0	252
4:15 PM	0	3	4	0	8	94	16	0	6	0	1	0	3	112	2	0	249
4:30 PM	0	0	6	0	6	130	14	0	10	2	1	0	2	166	1	0	338
4:45 PM	1	0	10	0	4	96	13	0	7	0	5	0	2	115	1	0	254
5:00 PM	2	1	15	0	1	110	16	1	16	1	2	0	1	93	0	0	259
5:15 PM	1	0	7	0	8	109	20	0	16	0	4	0	3	93	0	0	261
5:30 PM	0	0	11	0	11	100	24	0	13	0	1	0	1	79	0	0	240
5:45 PM	0	0	6	0	13	79	20	0	10	0	0	0	2	75	1	0	206
6:00 PM	0	0	7	0	5	78	13	0	6	0	2	0	5	63	0	0	179
6:15 PM	2	1	5	0	1	69	6	1	2	0	1	0	1	97	0	0	186
6:30 PM	0	0	10	0	0	63	12	0	7	0	2	0	1	61	0	0	156
6:45 PM	0	0	3	0	1	48	6	0	11	0	4	0	0	49	0	0	122
7:00 AM	0	0	0	0	5	69	1	0	13	0	1	0	0	60	0	0	149
7:15 AM	0	0	1	0	2	125	5	0	16	0	4	0	0	80	1	0	234
7:30 AM	0	1	1	0	8	115	7	0	25	0	3	0	4	88	0	1	253
7:45 AM	0	0	4	0	14	155	6	0	34	0	5	0	5	107	0	0	330
8:00 AM	0	0	2	0	23	116	8	0	28	1	6	0	18	84	1	0	287
8:15 AM	0	1	6	0	11	118	16	0	30	0	8	0	10	78	0	0	278
8:30 AM	0	0	3	0	12	73	2	0	17	1	3	0	0	87	0	0	198
8:45 AM	0	0	6	0	8	78	4	0	5	0	1	0	2	70	0	0	174
9:00 AM	0	1	2	0	9	62	3	0	5	0	2	0	0	54	0	0	138
9:15 AM	0	0	1	0	2	82	0	0	7	0	0	0	0	67	0	0	159
9:30 AM	1	0	1	0	6	73	2	1	4	1	1	0	0	66	0	0	156
9:45 AM	0	0	5	0	12	93	3	0	3	0	1	0	1	85	0	0	203
10:00 AM	0	0	8	0	7	85	4	0	7	0	1	0	2	82	0	0	196
10:15 AM	0	0	5	0	7	81	7	0	4	0	0	0	1	61	0	0	166
10:30 AM	0	0	6	0	9	67	7	0	10	0	0	0	0	73	0	0	172
10:45 AM	0	0	7	0	9	76	2	0	7	1	0	0	1	81	1	0	185
11:00 AM	0	0	5	0	9	75	5	0	6	1	0	0	2	71	1	0	175
11:15 AM	1	0	7	0	4	71	9	0	7	0	1	0	2	99	1	1	203
11:30 AM	0	0	7	0	2	73	9	1	6	0	0	0	0	76	0	0	174
11:45 AM	0	0	12	0	2	81	9	0	5	0	1	0	0	84	1	1	196
12:00 PM	0	1	7	0	11	82	5	0	3	0	0	0	2	69	0	0	180
12:15 PM	0	0	11	0	9	77	10	2	7	0	2	0	1	90	1	0	210
12:30 PM	0	0	9	0	7	96	10	0	13	0	1	0	2	101	0	0	239
12:45 PM	0	0	8	0	7	74	11	0	13	0	3	0	2	105	0	0	223
1:00 PM	0	0	4	0	6	92	7	0	9	0	0	0	0	70	0	1	189
1:15 PM	1	0	5	0	10	77	6	1	5	0	1	0	1	57	0	0	164
1:30 PM	0	0	8	0	11	71	13	0	3	0	0	0	0	84	1	2	193
1:45 PM	0	1	4	0	14	79	6	0	9	1	1	0	1	104	0	0	220
2:00 PM	0	0	9	0	8	106	6	0	10	0	1	0	1	101	1	0	243
2:15 PM	2	0	15	0	11	92	12	0	5	0	0	0	1	92	2	0	232
2:30 PM	0	0	10	0	2	62	7	0	10	1	1	0	2	117	0	0	212
2:45 PM	0	0	6	0	6	92	18	1	11	1	0	0	5	113	0	0	253
3:00 PM	1	0	4	0	7	82	19	0	7	0	2	0	5	100	2	1	230
3:15 PM	0	1	5	0	8	88	15	0	45	2	16	0	4	111	0	0	295
3:30 PM	1	0	4	0	7	111	15	0	15	0	2	0	2	111	1	0	269
3:45 PM	2	0	10	0	2	91	8	0	15	0	2	0	3	102	0	0	235
4:00 PM	1	0	9	0	3	96	15	0	6	0	3	0	5	139	0	0	277
4:15 PM	1	0	3	0	4	98	13	0	7	1	2	0	1	104	3	0	237
4:30 PM	0	0	10	0	3	120	14	0	8	0	2	0	9	175	0	0	341
4:45 PM	0	0	15	0	3	103	13	1	8	0	0	0	4	153	1	0	301
5:00 PM	1	0	21	0	7	114	10	0	13	1	2	0	2	116	0	0	287
5:15 PM	1	0	18	0	13	104	15	1	8	0	1	0	2	129	0	0	292
5:30 PM	0	0	2	0	5	88	19	0	6	0	2	0	1	101	0	0	224
5:45 PM	0	1	2	0	6	91	23	2	10	1	1	0	1	84	0	0	222
6:00 PM	0	0	2	0	12	89	13	0	11	0	0	0	0	70	2	0	199
6:15 PM	1	0	3	0	3	72	9	0	7	0	5	0	0	78	0	0	178
6:30 PM	0	0	6	0	3	67	13	0	9	0	1	0	1	56	0	0	156
6:45 PM	0	0	9	0	2	58	10	0	10	1	0	0	3	67	0	0	160

LOCATION: Granite& Knight

Date 8/25/2020

All Vehicles

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30		2			0		2			3							7
7:45	1	10			0		2			6							19
8:00	1	6			0		2			6	1						16
8:15		7			0		1			5	2						15
4:30	4	4			2		0			2	1						13
4:45	5	8			1		1			4	1						20
5:00	2	5			0		9			7	2						25
5:15	3	9			1		1			3	0						17
	16	51	0	67	4	0	18	22	0	36	7	43	0	0	0	0	
	24%	76%	0%		18%	0%	82%		0%	84%	16%		#####	#####	#####		

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30																	0
7:45																	0
8:00																	0
8:15																	0
4:30																	0
4:45																	0
5:00																	0
5:15																	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	#####	#####	#####		#####	#####	#####		#####	#####	#####		#####	#####	#####		

TOTAL

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30	0	2	0	0	0	0	2	0	0	3	0	0	0	0	0	0	7
7:45	1	10	0	0	0	0	2	0	0	6	0	0	0	0	0	0	19
8:00	1	6	0	0	0	0	2	0	0	6	1	0	0	0	0	0	16
8:15	0	7	0	0	0	0	1	0	0	5	2	0	0	0	0	0	15
4:30	4	4	0	0	2	0	0	0	0	2	1	0	0	0	0	0	13
4:45	5	8	0	0	1	0	1	0	0	4	1	0	0	0	0	0	20
5:00	2	5	0	0	0	0	9	0	0	7	2	0	0	0	0	0	25
5:15	3	9	0	0	1	0	1	0	0	3	0	0	0	0	0	0	17
	16	51	0	67	4	0	18	22	0	36	7	43	0	0	0	0	
	24%	76%	0%		18%	0%	82%		0%	84%	16%		#####	#####	#####		

LOCATION: Granite & Hauser
 Date 8/25/2020
 All Vehicles

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30	1	3	0		0	0	0		0	0	1		1	0	0		6
7:45	1	2	0		0	1	4		1	4	2		0	0	0		15
8:00	0	5	0		0	1	3		3	3	0		1	0	0		16
8:15	1	3	0		0	2	1		1	2	1		0	0	0		11
4:30	0	1	0		0	0	0		0	3	2		1	0	0		7
4:45	1	2	0		0	0	0		2	5	2		1	1	1		15
5:00	0	1	0		0	1	1		4	1	1		2	1	0		12
5:15	0	2	1		0	0	5		2	8	0		0	0	1		19
	4	19	1	24	0	5	14	19	13	26	9	48	6	2	2	10	
	17%	79%	4%		0%	26%	74%		27%	54%	19%		60%	20%	20%		

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30																	0
7:45																	0
8:00																	0
8:15																	0
4:30																	0
4:45																	0
5:00																	0
5:15																	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	#####	#####	#####		#####	#####	#####		#####	#####	#####		#####	#####	#####		

TOTAL

	Northbound				Eastbound				Southbound				Westbound				TOTAL
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
7:30	1	3	0	0	0	0	0	0	0	0	1	0	1	0	0	0	6
7:45	1	2	0	0	0	1	4	0	1	4	2	0	0	0	0	0	15
8:00	0	5	0	0	0	1	3	0	3	3	0	0	1	0	0	0	16
8:15	1	3	0	0	0	2	1	0	1	2	1	0	0	0	0	0	11
4:30	0	1	0	0	0	0	0	0	0	3	2	0	1	0	0	0	7
4:45	1	2	0	0	0	0	0	0	2	5	2	0	1	1	1	0	15
5:00	0	1	0	0	0	1	1	0	4	1	1	0	2	1	0	0	12
5:15	0	2	1	0	0	0	5	0	2	8	0	0	0	0	1	0	19
	4	19	1	24	0	5	14	19	13	26	9	48	6	2	2	10	
	17%	79%	4%		0%	26%	74%		27%	54%	19%		60%	20%	20%		

Basic Volume Report: GRANITE

Station ID : GRANITE

Info Line 1 : ATS
Info Line 2 : UNICORN 1

GPS Lat/Lon :
DB File : GRANITE.DB

Last Connected Device Type : Unic-L

Version Number : 1.41

Serial Number :

Number of Lanes : 1

Posted Speed Limit : 0.0 mph

Lane #1 Configuration

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
1.	N/S		Normal	Axle	Yes	

Lane #1 Basic Volume Data From: 11:00 - 08/19/2020 To: 10:59 - 08/24/2020

Date	DW	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total
081920	W												117	116	106	110	132	130	155	121	86	81	43	31	15	1243
082020	T	9	1	2	0	2	18	46	96	118	88	69	105	115	113	111	111	123	163	98	69	53	41	23	8	1582
082120	F	5	0	2	0	4	12	47	84	87	89	86	96	120	119	106	98	129	142	101	105	80	42	36	14	1604
082220	S	13	9	6	6	3	11	24	50	74	95	87	101	108	101	73	88	81	86	101	61	64	44	41	14	1341
082320	S	14	5	0	2	1	3	4	22	44	78	87	93	148	89	110	101	80	90	73	65	73	50	21	12	1265
082420	M	3	5	0	4	5	13	42	96	101	74	79														422
Month Total :		44	20	10	12	15	57	163	348	424	424	408	512	607	528	510	530	543	636	494	386	351	220	152	63	7457
Percent :		1%	0%	0%	0%	0%	1%	2%	5%	6%	6%	5%	7%	8%	7%	7%	7%	7%	9%	7%	5%	5%	3%	2%	1%	
ADT :		9	4	2	2	3	11	33	70	85	85	82	102	121	106	102	106	109	127	99	77	70	44	30	13	1492

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total	Percent
DW Totals :	1265	422	0	1243	1582	1604	1341	Weekday (Mon-Fri) :	4851 65%
# Days :	1.0	0.5	0.0	0.5	1.0	1.0	1.0	ADT :	1617
ADT :	1265	921	0	2295	1582	1604	1341	Weekend (Sat-Sun) :	2606 35%
Percent :	17%	6%	0%	17%	21%	22%	18%	ADT :	1303

Basic Volume Report: HAUSER

Station ID : HAUSER

Info Line 1 : ATS

Info Line 2 : Unicorn # 2

GPS Lat/Lon :

DB File : HAUSER.DB

Last Connected Device Type : Unic-L

Version Number : 1.41

Serial Number : 91434

Number of Lanes : 1

Posted Speed Limit : 0.0 mph

Lane #1 Configuration

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
1.	E/W		Normal	Axle	Yes	

Lane #1 Basic Volume Data From: 11:00 - 08/19/2020 To: 10:59 - 08/24/2020

Date	DW	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total
081920	W												7	9	14	4	17	11	9	4	5	5	3	1	0	89
082020	T	1	1	0	0	0	0	2	7	8	6	8	10	10	9	3	7	6	13	8	3	5	2	2	1	112
082120	F	0	4	0	0	0	0	3	6	7	9	8	11	14	5	8	10	10	20	7	13	6	5	2	1	149
082220	S	1	3	0	0	0	0	2	3	4	4	8	6	12	9	11	9	9	8	5	11	5	8	0	1	119
082320	S	4	2	0	1	0	0	2	2	3	3	6	7	8	8	16	7	7	17	6	12	11	2	0	0	124
082420	M	2	3	0	1	0	0	7	7	9	11	12														52
Month Total :		8	13	0	2	0	0	16	25	31	33	42	41	53	45	42	50	43	67	30	44	32	20	5	3	645
Percent :		1%	2%	0%	0%	0%	0%	2%	4%	5%	5%	7%	6%	8%	7%	7%	8%	7%	10%	5%	7%	5%	3%	1%	0%	
ADT :		2	3	0	0	0	0	3	5	6	7	8	8	11	9	8	10	9	13	6	9	6	4	1	1	129

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total	Percent
DW Totals :	124	52	0	89	112	149	119	Weekday (Mon-Fri) :	402 62%
# Days :	1.0	0.5	0.0	0.5	1.0	1.0	1.0	ADT :	134
ADT :	124	113	0	164	112	149	119	Weekend (Sat-Sun) :	243 38%
Percent :	19%	8%	0%	14%	17%	23%	18%	ADT :	122

APPENDIX D
LOS MODELING

West Side Major Subdivision
Traffic Model Fall 2022

AM Peak Hour
(15 min x 4)

		Granite		
		14.7/22.0 B/C		
0	↶	↶	63	
0	↷	↷	565	
7	↶	↶	22	Euclid
<hr/>				
0	↷	↷	41	
420	↶	↶	0	
15	↷	↷	130	
 		8.8 A		
4	↶			
28	↷			
<hr/>		Knight		
8	↶	↶	4	
8	↷	↷	60	
 		8.9/8.9 A/A		
4	↶	↶	4	
8	↷	↷	4	
8	↶	↶	4	Hauser
<hr/>				
4	↷	↷	0	
0	↶	↶	24	
0	↷	↷	8	

PM Peak Hour
(15 min x 4)

		Granite		
		12.9/30.1 B/D		
4	↶	↶	7	
0	↷	↷	432	
30	↶	↶	86	Euclid
<hr/>				
0	↷	↷	4	
670	↶	↶	0	
15	↷	↷	63	
 		9.1 A		
4	↶			
56	↷			
<hr/>		Knight		
8	↶	↶	24	
4	↷	↷	32	
 		8.9/9.2 A/A		
4	↶	↶	4	
36	↷	↷	20	
0	↶	↶	12	Hauser
<hr/>				
0	↷	↷	0	
0	↶	↶	8	
0	↷	↷	0	

West Side Major Subdivision
Traffic Model Fall 2022

AM Peak School Period
(15 min x 4)

		Granite		
			12.7/16.9 B/C	
0	↶	↶	30	
0	↷	↷	361	
4	↶	↶	63	Euclid
<hr/>				
0	↷	↷	41	
257	↶	↶	0	
56	↷	↷	130	
		9.6 A		
4	↶			
112	↷			
<hr/>				
20	↷	↶	4	
8	↶	↷	84	
		9.5/9.1 A/A		
4	↶	↶	4	
24	↷	↷	0	
8	↶	↶	24	Hauser
<hr/>				
4	↷	↷	0	
16	↶	↶	28	
0	↷	↷	4	

PM Peak School Period
(15 min x 4)

		Granite		
			15.3/18.9 C/C	
4	↶	↶	7	
4	↷	↷	361	
26	↶	↶	45	Euclid
<hr/>				
0	↷	↷	67	
346	↶	↶	0	
11	↷	↷	190	
		9.1 A		
12	↶			
40	↷			
<hr/>				
36	↷	↶	8	
16	↶	↷	44	
		8.9/9.2 A/A		
0	↶	↶	16	
8	↷	↷	4	
20	↶	↶	0	Hauser
<hr/>				
4	↷	↷	0	
8	↶	↶	16	
0	↷	↷	4	

West Side Major Subdivision
Traffic Model

Euclid Growth Factor 1.091
Hauser 1.36

AM Peak Hour
Projected No Build Traffic
2029

		Granite				
		16.4/25.3 B/D				
0	↶	↶	69			
0	↷	↷	617			
8	↶	↶	24	Euclid		
<hr/>						
0	↷	↷	45			
459	↶	↶	0			
16	↷	↷	142			
		8.9 A				
5	↶					
38	↷	Knight				
11	↶	↶	5			
11	↷	↷	82			
		9.1/9.0 A/A				
5	↶	↶	5			
11	↷	↷	5			
11	↶	↶	5	Hauser		
<hr/>						
5	↷	↷	0			
0	↶	↶	33			
0	↷	↷	11			

PM Peak Hour
Projected No Build Traffic
2029

		Granite				
		13.6/34.2 B/D				
4	↶	↶	8			
0	↷	↷	471			
32	↶	↶	93	Euclid		
<hr/>						
0	↷	↷	4			
731	↶	↶	0			
16	↷	↷	69			
		9.4 A				
5	↶					
76	↷	Knight				
11	↶	↶	33			
5	↷	↷	44			
		9.0/9.4 A/A				
5	↶	↶	5			
49	↷	↷	27			
0	↶	↶	16	Hauser		
<hr/>						
0	↷	↷	0			
0	↶	↶	11			
0	↷	↷	0			

West Side Major Subdivision
Traffic Model

100% Hour Factor

Euclid Growth Factor 1.091
Hauser 1.36

50% Hour Factor

AM Peak Hour
Projected No Build
Peak School Period
2029

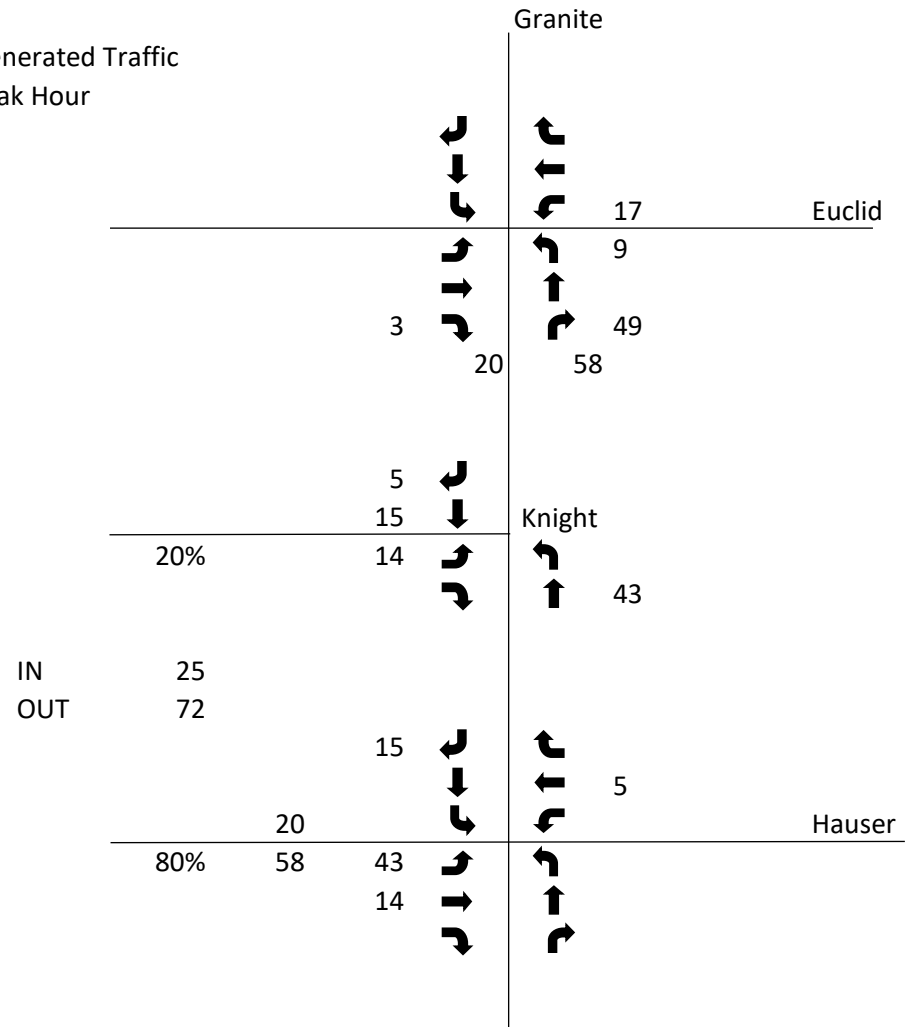
PM Peak Hour
Projected No Build
Peak School Period
2029

		Granite		
		13.7/18.2 B/C		
0	↶	↶	32	
0	↷	↷	394	
4	↶	↶	69	Euclid
<hr/>				
0	↷	↷	45	
280	↶	↶	0	
61	↷	↷	142	
		10.0 B		
5	↶			
152	↷	Knight		
27	↶	↶	5	
11	↷	↷	114	
		9.7/9.4 A/A		
5	↶	↶	5	
33	↷	↷	0	
11	↶	↶	33	Hauser
<hr/>				
5	↷	↷	0	
22	↶	↶	38	
0	↷	↷	5	

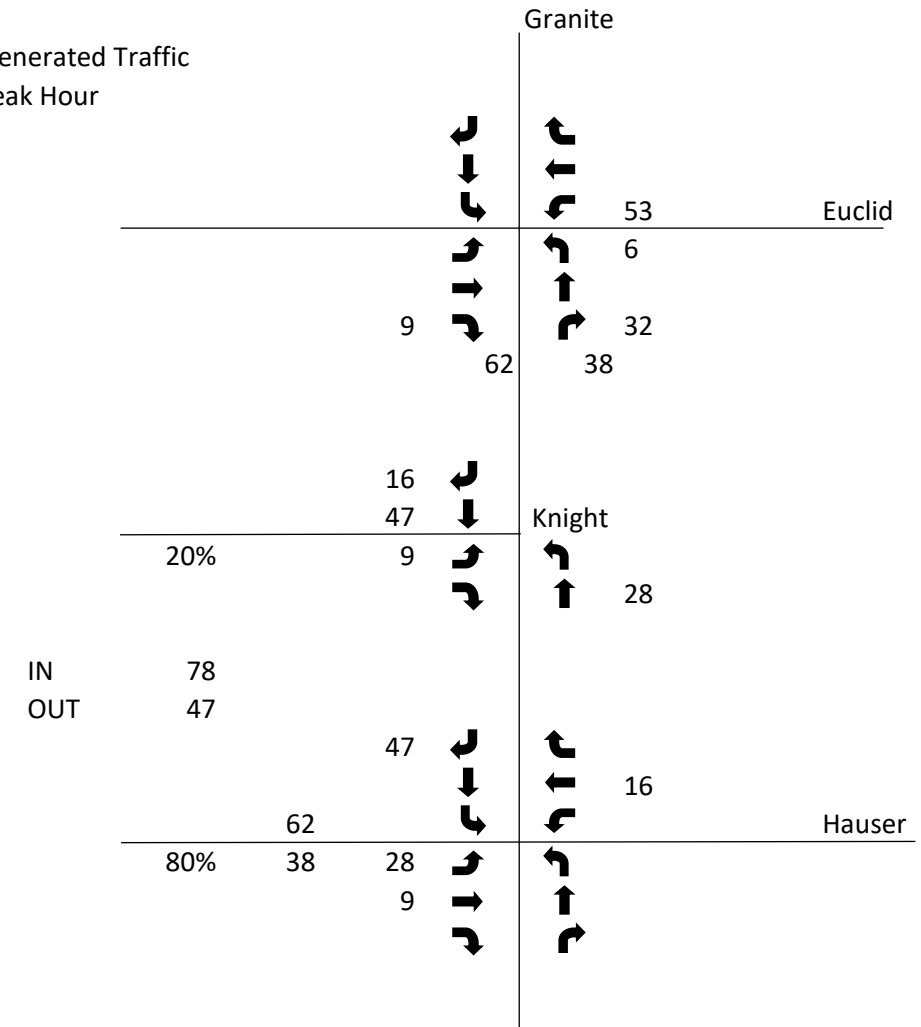
		Granite		
		17.3/21.3 C/C		
4	↶	↶	8	
4	↷	↷	394	
28	↶	↶	49	Euclid
<hr/>				
0	↷	↷	73	
377	↶	↶	0	
12	↷	↷	207	
		9.4 A		
16	↶			
54	↷	Knight		
49	↶	↶	11	
22	↷	↷	60	
		9.6/8.8 A/A		
0	↶	↶	22	
11	↷	↷	5	
27	↶	↶	0	Hauser
<hr/>				
5	↷	↷	0	
11	↶	↶	22	
0	↷	↷	5	

West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour



Site Generated Traffic
PM Peak Hour



West Side Major Subdivision
Traffic Model

Euclid Growth Factor 1.091
Hauser 1.36

AM Peak Hour
Total Projected Traffic

		Granite		
		19.0/28.7 B/D		
0	↶	↶	69	
0	↷	↷	617	
8	↶	↶	41	Euclid
<hr/>				
0	↷	↷	53	
459	↶	↶	0	
19	↷	↷	191	
		9.4 A		
10	↶			
53	↷			
<hr/>				
25	↶	↶	5	
11	↷	↷	125	
		9.6/9.3 A/A		
20	↶	↶	5	
11	↷	↷	10	
11	↶	↶	5	Hauser
<hr/>				
49	↷	↷	0	
14	↶	↶	33	
0	↷	↷	11	

PM Peak Hour
Total Projected Traffic

		Granite		
		17.1/49.7/E		
4	↶	↶	8	
0	↷	↷	471	
32	↶	↶	146	Euclid
<hr/>				
0	↷	↷	10	
731	↶	↶	0	
26	↷	↷	101	
		10.5 B		
21	↶			
123	↷			
<hr/>				
20	↶	↶	33	
5	↷	↷	72	
		9.7/9.8 A/A		10.8 B
52	↶	↶	5	
49	↷	↷	43	
0	↶	↶	16	Hauser
<hr/>				
28	↷	↷	0	
9	↶	↶	11	
0	↷	↷	0	

West Side Major Subdivision
Traffic Model

100% Hour Factor

Euclid Growth Factor
Hauser 1.091

1.36

50% Hour Factor

AM Peak Hour
Total Projected Traffic
Peak School Period

		Granite		
		15.1/20.0 B/C		
0	↶	↶	32	
0	↷	↷	394	
4	↶	↶	86	Euclid
<hr/>				
0	↷	↷	53	
280	↶	↶	0	
64	↷	↷	191	
		10.7 B		
10	↶			
167	↷	Knight		
42	↶	↶	5	
11	↷	↷	157	
		9.9/9.7 A/A		
20	↶	↶	5	
33	↷	↷	5	
11	↶	↶	33	Hauser
<hr/>				
49	↷	↷	0	
36	↶	↶	38	
0	↷	↷	5	

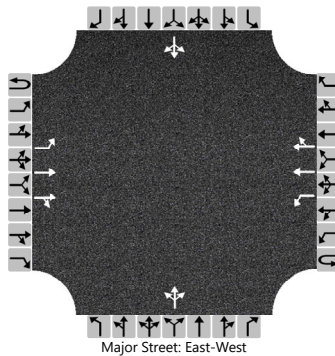
PM Peak Hour
Total Projected Traffic
Peak School Period

		Granite		
		19.3/24.7 C/C		
4	↶	↶	8	
4	↷	↷	394	
28	↶	↶	75	Euclid
<hr/>				
0	↷	↷	76	
377	↶	↶	0	
17	↷	↷	223	
		9.7 A		
24	↶			
78	↷	Knight		
54	↶	↶	11	
22	↷	↷	74	
		9.8/9.1 A/A		
23	↶	↶	22	
11	↷	↷	13	
27	↶	↶	0	Hauser
<hr/>				
20	↷	↷	0	
16	↶	↶	22	
0	↷	↷	5	

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Highway 12		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	Existing AM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	420	15	0	22	565	63		41	0	130		7	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

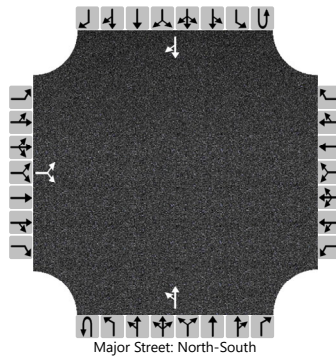
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				22					171					9	
Capacity, c (veh/h)		943				1114					540					221	
v/c Ratio		0.00				0.02					0.32					0.04	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					1.3					0.1	
Control Delay (s/veh)		8.8				8.3					14.7					22.0	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)		0.0				0.3				14.7				22.0			
Approach LOS		A				A				B				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Knight Street		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		8		8						4	60				28	4
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

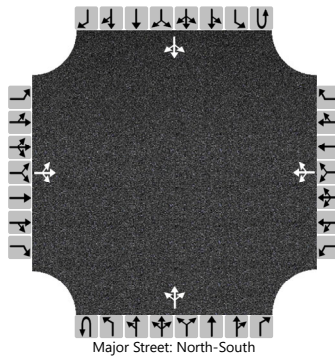
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			16							4						
Capacity, c (veh/h)			963							1574						
v/c Ratio			0.02							0.00						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			8.8							7.3	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	8.8								0.5							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Hauser Blvd		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	1	1		4	4	4		1	24	8		8	8	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

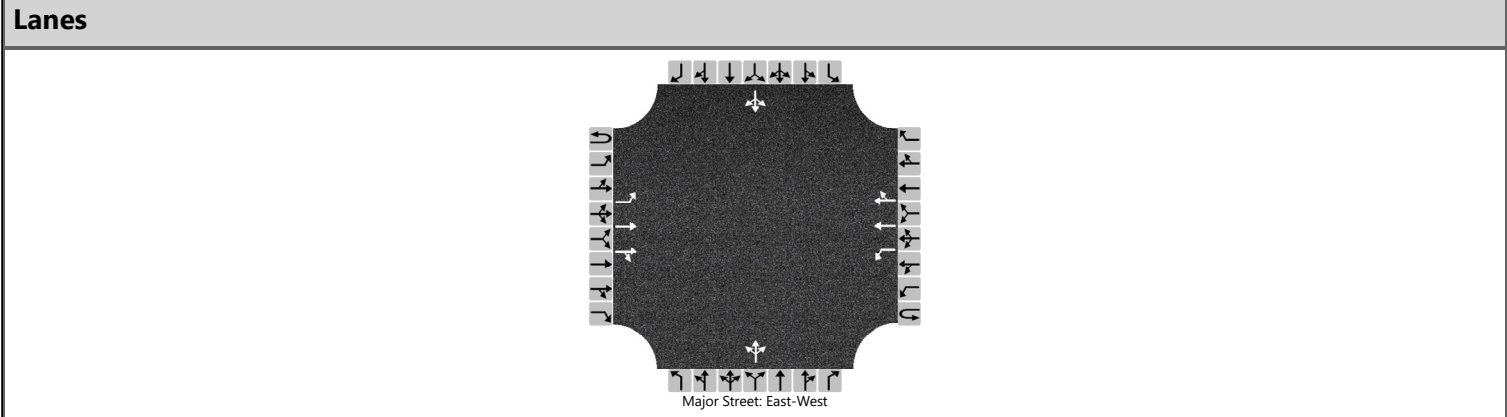
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			6				12							8		
Capacity, c (veh/h)			923				925							1574		
v/c Ratio			0.01				0.01							0.01		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0							0.0		
Control Delay (s/veh)			8.9				8.9			7.3	0.0	0.0		7.3	0.0	0.0
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	8.9				8.9				0.2				2.9			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Highway 12		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	Existing PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	670	15	0	86	432	7		4	1	63		30	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

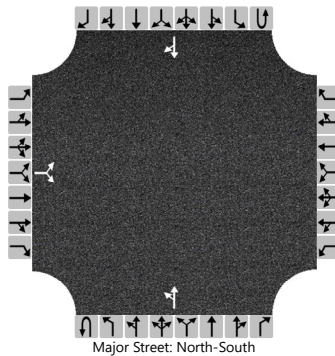
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				86					68				32		
Capacity, c (veh/h)		1110				898					525				175		
v/c Ratio		0.00				0.10					0.13				0.18		
95% Queue Length, Q ₉₅ (veh)		0.0				0.3					0.4				0.6		
Control Delay (s/veh)		8.2				9.4					12.9				30.1		
Level of Service (LOS)		A				A					B				D		
Approach Delay (s/veh)		0.0				1.5				12.9				30.1			
Approach LOS		A				A				B				D			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Knight Street		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		8		4						24	32				56	4
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

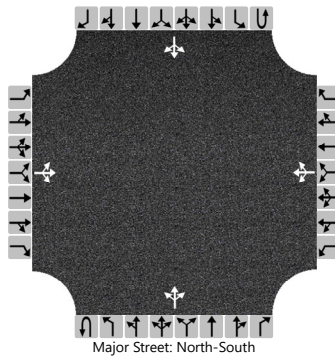
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12							24						
Capacity, c (veh/h)			888							1537						
v/c Ratio			0.01							0.02						
95% Queue Length, Q ₉₅ (veh)			0.0							0.0						
Control Delay (s/veh)			9.1							7.4	0.1					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.1								3.2							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Hauser Blvd		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	1	1		12	20	4		1	8	1		1	36	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

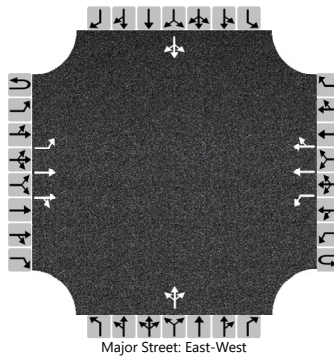
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			3				36							1		
Capacity, c (veh/h)			917				891							1563		
v/c Ratio			0.00				0.04							0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.1							0.0		
Control Delay (s/veh)			8.9				9.2							7.3	0.0	0.0
Level of Service (LOS)			A				A							A	A	A
Approach Delay (s/veh)	8.9				9.2				0.7				0.2			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Highway 12		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	Existing AM School Peak			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	257	56	0	63	361	30		41	1	130		5	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

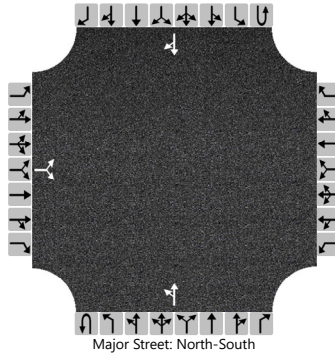
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				63					172					7	
Capacity, c (veh/h)		1157				1237					637					308	
v/c Ratio		0.00				0.05					0.27					0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.1					0.1	
Control Delay (s/veh)		8.1				8.1					12.7					16.9	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)		0.0				1.1				12.7				16.9			
Approach LOS		A				A				B				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Knight Street		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak School Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		20		8						4	84				112	4
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

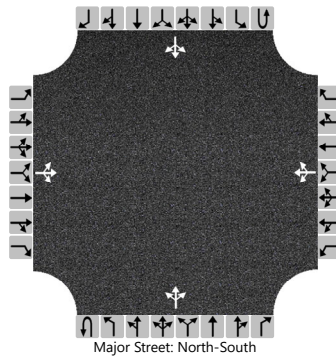
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			28							4						
Capacity, c (veh/h)			817							1466						
v/c Ratio			0.03							0.00						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.6							7.5	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.6								0.4							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/13/2022			East/West Street	Hauser Blvd		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak School Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	16	0		24	0	4		1	28	4		8	24	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

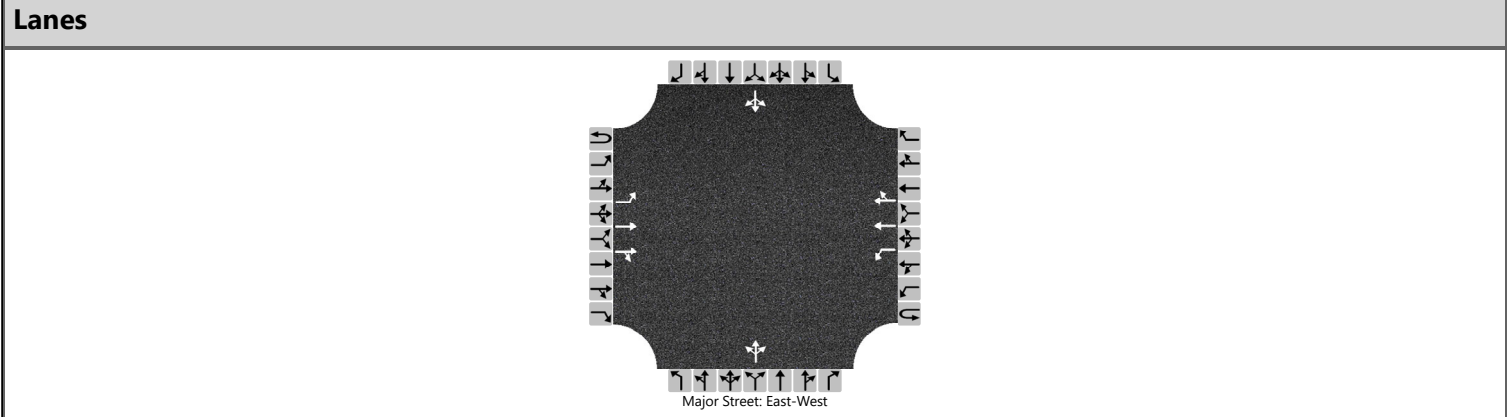
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			20				28			1				8		
Capacity, c (veh/h)			825				900			1579				1574		
v/c Ratio			0.02				0.03			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			9.5				9.1			7.3	0.0	0.0		7.3	0.0	0.0
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.5				9.1				0.2				1.7			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Highway 12		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	Existing PM School Peak			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	346	11	0	45	361	7		67	1	190		26	4	4
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

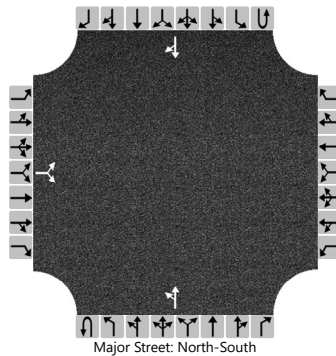
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				45					258					34	
Capacity, c (veh/h)		1180				1191					604					294	
v/c Ratio		0.00				0.04					0.43					0.12	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					2.1					0.4	
Control Delay (s/veh)		8.1				8.1					15.3					18.9	
Level of Service (LOS)		A				A					C					C	
Approach Delay (s/veh)		0.0				0.9				15.3				18.9			
Approach LOS		A				A				C				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/12/2022			East/West Street	Knight Street		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak School Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		36		16						8	44				40	12
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

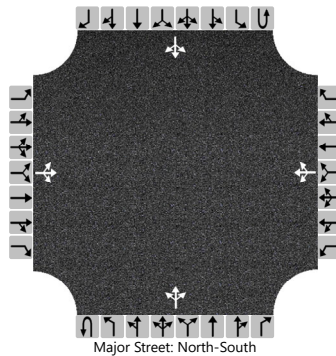
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			52							8						
Capacity, c (veh/h)			922							1548						
v/c Ratio			0.06							0.01						
95% Queue Length, Q ₉₅ (veh)			0.2							0.0						
Control Delay (s/veh)			9.1							7.3	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.1								1.2							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	10/13/2022			East/West Street	Hauser Blvd		
Analysis Year	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak School Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	16	1		24	1	4		1	28	4		8	24	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

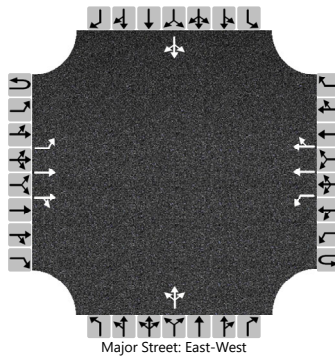
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			21				29			1				8		
Capacity, c (veh/h)			833				895			1579				1574		
v/c Ratio			0.03				0.03			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			9.4				9.2			7.3	0.0	0.0		7.3	0.0	0.0
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.4				9.2				0.2				1.7			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	459	16	0	24	617	69		45	0	142		8	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				24					187					10	
Capacity, c (veh/h)		897				1076					500					187	
v/c Ratio		0.00				0.02					0.37					0.05	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					1.7					0.2	
Control Delay (s/veh)		9.0				8.4					16.4					25.3	
Level of Service (LOS)		A				A					C					D	
Approach Delay (s/veh)		0.0				0.3				16.4				25.3			
Approach LOS		A				A				C				D			

HCS Two-Way Stop-Control Report

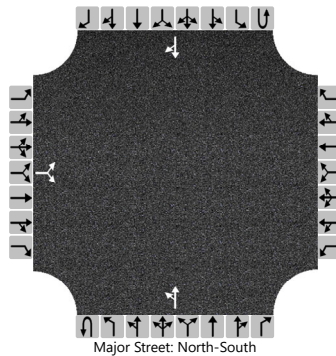
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/6/2021
Analysis Year	2029
Time Analyzed	AM Peak Hour NO BUILD
Intersection Orientation	North-South
Project Description	West Side Major

Site Information

Intersection	Granite & Knight
Jurisdiction	City of Helena
East/West Street	Knight Street
North/South Street	Granite Ave
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		11		11						5	82				38	5
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2									4.1				
Critical Headway (sec)		6.43		6.23									4.13				
Base Follow-Up Headway (sec)		3.5		3.3									2.2				
Follow-Up Headway (sec)		3.53		3.33									2.23				

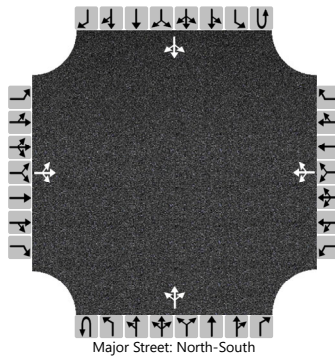
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			22										5				
Capacity, c (veh/h)			934										1559				
v/c Ratio			0.02										0.00				
95% Queue Length, Q ₉₅ (veh)			0.1										0.0				
Control Delay (s/veh)			8.9										7.3	0.0			
Level of Service (LOS)			A										A	A			
Approach Delay (s/veh)	8.9												0.4				
Approach LOS	A												A				

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	0	0		5	5	5		0	33	11		11	11	5
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

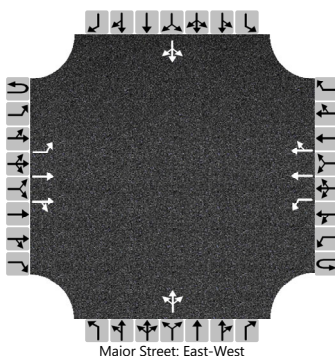
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			5				15							11		
Capacity, c (veh/h)			891				906							1595		1558
v/c Ratio			0.01				0.02							0.00		0.01
95% Queue Length, Q ₉₅ (veh)			0.0				0.1							0.0		0.0
Control Delay (s/veh)			9.1				9.0			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.1				9.0				0.0				3.0			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	731	16	0	93	471	8		4	1	69		32	0	4
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1					7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16					7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2					3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23					3.53	4.03	3.33		3.53	4.03	3.33

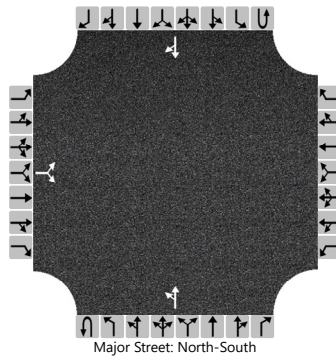
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				93					74					36	
Capacity, c (veh/h)		1073				851					494					159	
v/c Ratio		0.00				0.11					0.15					0.23	
95% Queue Length, Q ₉₅ (veh)		0.0				0.4					0.5					0.8	
Control Delay (s/veh)		8.4				9.8					13.6					34.2	
Level of Service (LOS)		A				A					B					D	
Approach Delay (s/veh)		0.0				1.6				13.6				34.2			
Approach LOS		A				A				B				D			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		11		5						33	44				76	5
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

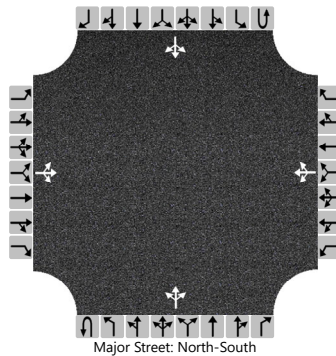
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			16							33						
Capacity, c (veh/h)			833							1510						
v/c Ratio			0.02							0.02						
95% Queue Length, Q ₉₅ (veh)			0.1							0.1						
Control Delay (s/veh)			9.4							7.4	0.2					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.4								3.3							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	1	1		16	27	5		1	11	1		1	49	5
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

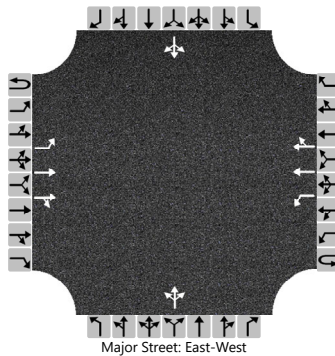
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			3			48				1				1		
Capacity, c (veh/h)			893			871				1545				1600		
v/c Ratio			0.00			0.06				0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0			0.2				0.0				0.0		
Control Delay (s/veh)			9.0			9.4				7.3	0.0	0.0		7.3	0.0	0.0
Level of Service (LOS)			A			A				A	A	A		A	A	A
Approach Delay (s/veh)	9.0				9.4				0.6				0.1			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM School Peak NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	280	61	0	69	394	32		45	1	142		4	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

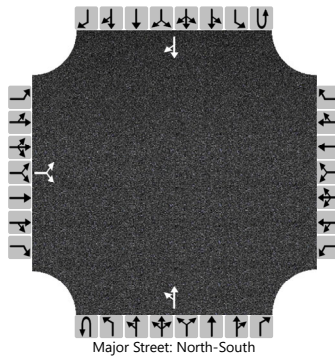
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				69					188					6	
Capacity, c (veh/h)		1123				1208					602					280	
v/c Ratio		0.00				0.06					0.31					0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.3					0.1	
Control Delay (s/veh)		8.2				8.2					13.7					18.2	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)		0.0				1.1				13.7				18.2			
Approach LOS		A				A				B				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak School NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		27		11						5	114				152	5
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

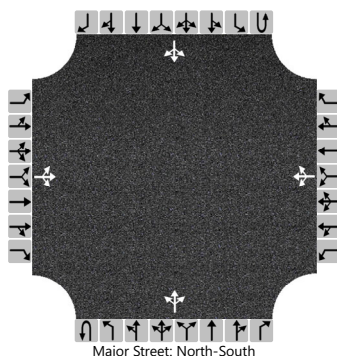
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			38							5						
Capacity, c (veh/h)			751							1417						
v/c Ratio			0.05							0.00						
95% Queue Length, Q ₉₅ (veh)			0.2							0.0						
Control Delay (s/veh)			10.0							7.6	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	10.0								0.3							
Approach LOS	B								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak School NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	22	1		33	1	5		1	38	5		11	33	5
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

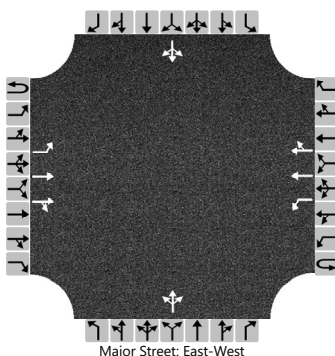
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			28				39			1				11		
Capacity, c (veh/h)			800				852			1566				1559		
v/c Ratio			0.03				0.05			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.1				0.1			0.0				0.0		
Control Delay (s/veh)			9.7				9.4			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.7				9.4				0.2				1.7			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM School Peak NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	377	12	0	49	394	8		73	1	207		28	4	4
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

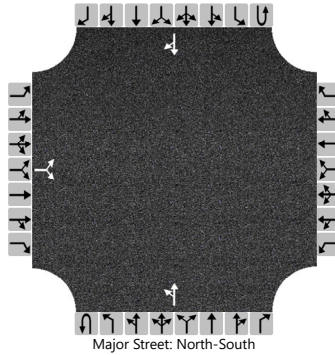
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				49					281					36	
Capacity, c (veh/h)		1146				1159					569					257	
v/c Ratio		0.00				0.04					0.49					0.14	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					2.7					0.5	
Control Delay (s/veh)		8.1				8.2					17.3					21.3	
Level of Service (LOS)		A				A					C					C	
Approach Delay (s/veh)		0.0				0.9				17.3				21.3			
Approach LOS		A				A				C				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak School NO BUILD			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		49		22						11	60				54	16
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

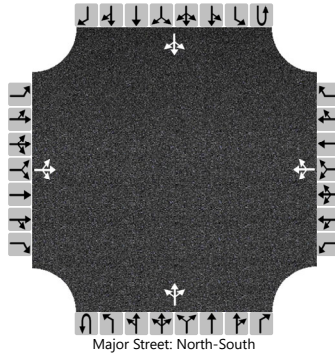
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			71							11						
Capacity, c (veh/h)			884							1524						
v/c Ratio			0.08							0.01						
95% Queue Length, Q ₉₅ (veh)			0.3							0.0						
Control Delay (s/veh)			9.4							7.4	0.1					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.4								1.2							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak School NOB			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	11	1		1	5	22		1	22	5		27	11	1
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

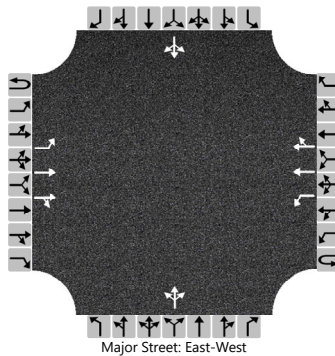
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17				28			1				27		
Capacity, c (veh/h)			808				981			1600				1580		
v/c Ratio			0.02				0.03			0.00				0.02		
95% Queue Length, Q ₉₅ (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			9.6				8.8			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.6				8.8				0.3				5.1			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak With Dev			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	459	19	0	41	617	69		53	0	191		8	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

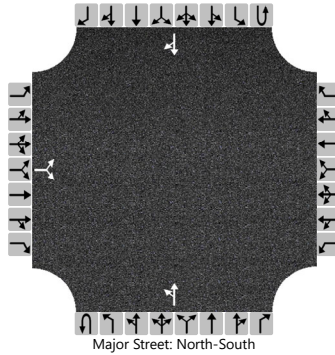
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				41					244					10	
Capacity, c (veh/h)		897				1074					498					162	
v/c Ratio		0.00				0.04					0.49					0.06	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					2.7					0.2	
Control Delay (s/veh)		9.0				8.5					19.0					28.7	
Level of Service (LOS)		A				A					C					D	
Approach Delay (s/veh)		0.0				0.5				19.0				28.7			
Approach LOS		A				A				C				D			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		25		11						5	125				53	10
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

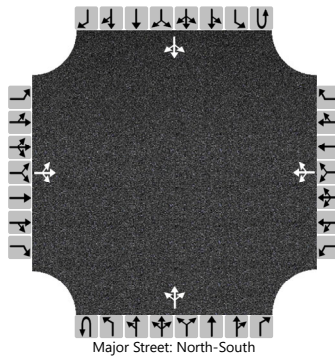
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			36							5						
Capacity, c (veh/h)			846							1533						
v/c Ratio			0.04							0.00						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.4							7.4	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.4								0.3							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		49	14	1		5	10	5		1	33	11		11	11	20
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

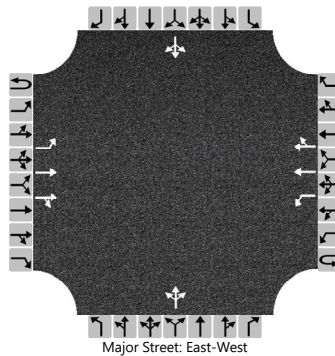
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			64				20							11		
Capacity, c (veh/h)			853				858							1575		1558
v/c Ratio			0.08				0.02							0.00		0.01
95% Queue Length, Q ₉₅ (veh)			0.2				0.1							0.0		0.0
Control Delay (s/veh)			9.6				9.3			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.6				9.3				0.2				2.0			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak With Dev			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	731	26	0	146	471	8		10	1	101		32	0	4
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

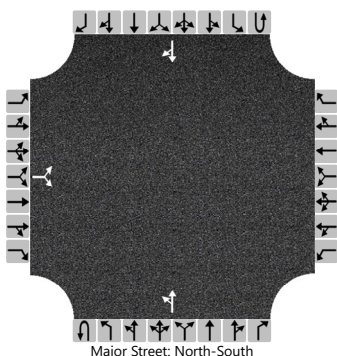
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				146					112					36	
Capacity, c (veh/h)		1073				843					409					116	
v/c Ratio		0.00				0.17					0.27					0.31	
95% Queue Length, Q ₉₅ (veh)		0.0				0.6					1.1					1.2	
Control Delay (s/veh)		8.4				10.2					17.1					49.7	
Level of Service (LOS)		A				B					C					E	
Approach Delay (s/veh)		0.0				2.4				17.1				49.7			
Approach LOS		A				A				C				E			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		50		5						33	72				123	21
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

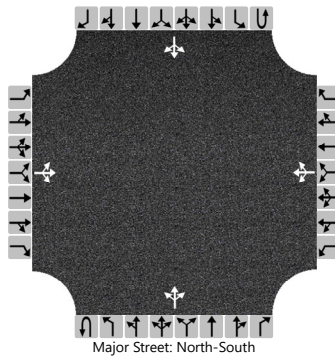
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			55							33						
Capacity, c (veh/h)			714							1432						
v/c Ratio			0.08							0.02						
95% Queue Length, Q ₉₅ (veh)			0.2							0.1						
Control Delay (s/veh)			10.5							7.6	0.2					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	10.5								2.5							
Approach LOS	B								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		28	9	1		16	43	5		1	11	1		1	49	52
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

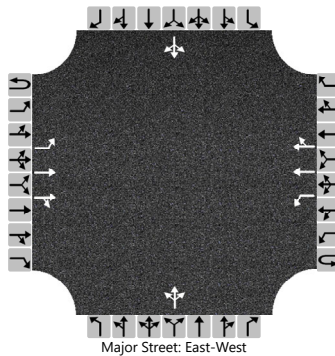
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			38				64			1				1		
Capacity, c (veh/h)			808				812			1485				1600		
v/c Ratio			0.05				0.08			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.1				0.3			0.0				0.0		
Control Delay (s/veh)			9.7				9.8			7.4	0.0	0.0		7.3	0.0	0.0
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.7				9.8				0.6				0.1			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM School Peak With Dev			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	280	64	0	86	394	32		53	1	191		4	1	1
Percent Heavy Vehicles (%)	3	3			3	3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

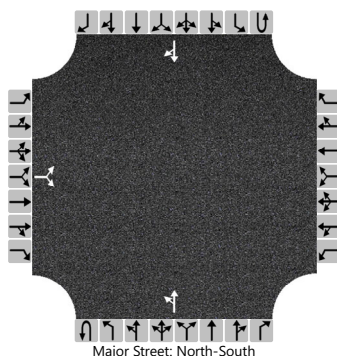
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				86					245					6	
Capacity, c (veh/h)		1123				1205					599					247	
v/c Ratio		0.00				0.07					0.41					0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					2.0					0.1	
Control Delay (s/veh)		8.2				8.2					15.1					20.0	
Level of Service (LOS)		A				A					C					C	
Approach Delay (s/veh)		0.0				1.4				15.1				20.0			
Approach LOS		A				A				C				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		42		11						5	157				167	10
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.43		6.23						4.13						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

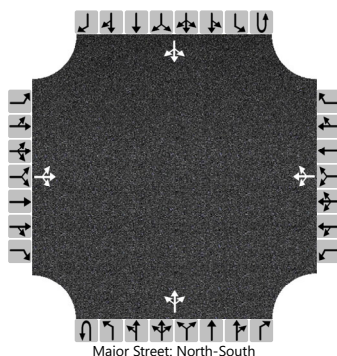
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			53							5						
Capacity, c (veh/h)			688							1393						
v/c Ratio			0.08							0.00						
95% Queue Length, Q ₉₅ (veh)			0.2							0.0						
Control Delay (s/veh)			10.7							7.6	0.0					
Level of Service (LOS)			B							A	A					
Approach Delay (s/veh)	10.7								0.3							
Approach LOS	B								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		49	36	1		33	5	5		1	38	5		11	33	20
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

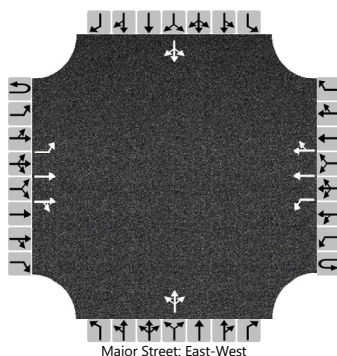
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			86				43			1				11		
Capacity, c (veh/h)			815				816			1546				1559		
v/c Ratio			0.11				0.05			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0		
Control Delay (s/veh)			9.9				9.7			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.9				9.7				0.2				1.3			
Approach LOS	A				A				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Highway 12		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM School Peak With Dev			Peak Hour Factor	1.00		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Priority																
Number of Lanes	0	1	2	0	0	1	2	0	0	1	0		0	1	0	
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	1	377	17	0	75	394	8	76	1	223		28	1	2	
Percent Heavy Vehicles (%)	3	3			3	3			3	3	3		3	3	3	
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.16				7.56	6.56	6.96		7.56	6.56	6.96
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

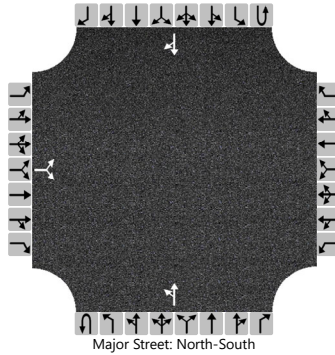
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				75					300				31	
Capacity, c (veh/h)		1146				1154					546				213	
v/c Ratio		0.00				0.06					0.55				0.15	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					3.3				0.5	
Control Delay (s/veh)		8.1				8.3					19.4				24.7	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.0				1.3				19.4				24.7			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Knight Street		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak School With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		54		22						11	74				78	24
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2									4.1				
Critical Headway (sec)		6.43		6.23									4.13				
Base Follow-Up Headway (sec)		3.5		3.3									2.2				
Follow-Up Headway (sec)		3.53		3.33									2.23				

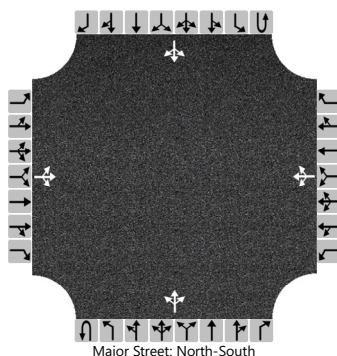
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			76										11				
Capacity, c (veh/h)			838										1484				
v/c Ratio			0.09										0.01				
95% Queue Length, Q ₉₅ (veh)			0.3										0.0				
Control Delay (s/veh)			9.7										7.4	0.1			
Level of Service (LOS)			A										A	A			
Approach Delay (s/veh)	9.7												1.0				
Approach LOS	A												A				

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	4/6/2021			East/West Street	Hauser Blvd		
Analysis Year	2029			North/South Street	Granite Ave		
Time Analyzed	PM Peak School With Dev			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	West Side Major						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		20	16	1		1	13	22		1	22	5		27	11	23
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			37				36			1				27		
Capacity, c (veh/h)			794				916			1571				1580		
v/c Ratio			0.05				0.04			0.00				0.02		
95% Queue Length, Q ₉₅ (veh)			0.1				0.1			0.0				0.1		
Control Delay (s/veh)			9.8				9.1			7.3	0.0	0.0		7.3	0.1	0.1
Level of Service (LOS)			A				A			A	A	A		A	A	A
Approach Delay (s/veh)	9.8				9.1				0.3				3.3			
Approach LOS	A				A				A				A			

APPENDIX E
SIGNAL WARRANT ANALYSIS

SIGNALIZATION WARRANT ANALYSIS

As requested by the City of Helena, a study was performed at the intersection of Euclid Avenue (Hwy 12) and Granite Avenue to determine if this intersection meets signalization warrants now or in the future. This study was completed in accordance with the procedures outlined in the 2009 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). The study was based on traffic data collected in September 2022 by ATS and information from the traffic impact study produced for the West Side development.

The MUTCD outlines nine traffic signal warrants. One or more of these warrants should be met before a traffic signal is installed at an intersection. In order to evaluate these signal warrants, it is necessary to assemble 24-hour traffic volume data, pedestrian volumes, and historic crash trends for an intersection. The individual traffic signal warrants include:

- Warrant 1 – Eight-Hour Vehicular Volume,
- Warrant 2 – Four-Hour Vehicular Volume,
- Warrant 3 – Peak Hour Vehicular Volume,
- Warrant 4 – Pedestrian Volume,
- Warrant 5 – School Crossing,
- Warrant 6 – Coordinated Signal System,
- Warrant 7 – Crash Experience,
- Warrant 8 – Roadway Network
- Warrant 9 – Intersection Near a Grade Crossing.

Additional Considerations

It should also be noted that the MUTCD allows lower minimum threshold volumes for signalization at locations where the speed limit is greater than 40 MPH or the community has a population of less than 10,000. The current posted speed limit on this section of Euclid Avenue is 55 MPH. Therefore, this criterion is met.

The MUTCD allows the elimination of some of the right-turn traffic on the minor approach from the warrant evaluation. Section 4C.01 of the MUTCD stated that:

“Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.”

In this instance, the intersection with Euclid Avenue does not have a separate right-turn lane, but there is sufficient room in the northbound lane (22 feet) for right-turning vehicles to move past a left-turning vehicle and reach Euclid Avenue. Also, the vast majority (80-90%) of northbound vehicles approaching the intersection turn right onto Euclid Avenue and the approach functions at

LOS C. Therefore, it would not be appropriate to include all right-turning vehicles when evaluating the traffic volume warrants for this location.

Additional challenges when evaluating the traffic volume warrants for this location are due to the specific traffic patterns created by Kessler Elementary School. School traffic is typically concentrated in specific time periods which generally fall outside of the normal peak traffic periods created by commuter traffic on adjacent streets. Typically, the peak commuter traffic period will occur between 7:00 and 8:00 AM while the peak school traffic periods will occur after 8:00 AM. Similarly, the peak afternoon school traffic period of 3:00 to 4:00 PM occurs well before the typical peak commuter traffic period between 5:00 and 6:00 PM.

It can also be a challenge to perform precise four-hour and eight-hour warrants based on projected traffic volumes. Typical traffic impact analysis projects focus on peak-hour traffic volumes only and there is little specific guidance to find the fourth or eighth highest generation hour for a residential project.

SIGNALIZATION WARRANTS

Warrant 1 – Eight-Hour Vehicular Volume

MUTCD SECTION 4C.02

“The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then the criteria for Warrant 1 is satisfied and Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then the criteria for Warrant 1 is satisfied and the combination of Conditions A and B is not needed.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

- A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or*
- B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.*

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.”

For a roadway with one lane on the minor street and two lanes on the major approach Table 4C-1 gives the minimum vehicular volumes of 420 Vehicles Per Hour (VPH) on the major street and 105 VPH on the minor approach for Condition A. For Condition B the minimum vehicular volume is 630 VPH on the major street and 70 VPH on the minor approach under reduction C (major street

exceeds 40 mph).

An analysis of the hourly data for Euclid Avenue indicates that the eighth highest hour has over 700 VPH, which is above the minimum volumes for both Conditions A and B. The projected eight-hour approaching traffic volume on the northbound approach for Granite Street from the 2022 data is only 47 VPH and is not sufficient to meet this warrant. The future projected traffic volumes from Granite Street in the 8th highest hour with the planned West Side development and the estimated traffic volume growth on from Euclid Avenue indicates a potential peak hour traffic flow from Granite Street of 71 VPH which may be sufficient to meet condition B of the eight-hour vehicle volume warrant if no right-turn reduction is used. However, as described above, the vast majority (80-90%) of traffic at the intersection turns right onto Euclid Avenue. If the right turn volume is reduced by only 18 vehicles (25%) as allowed by the MUTCD, this warrant would not be met. With no hard evidence that background traffic volumes along Euclid Avenue are increasing, it is not likely that the West Side development would increase the traffic volume at this intersection in the 8th highest hour by a sufficient level to meet this warrant, especially if a right-turn traffic reduction is taken into consideration. Therefore, this warrant is not met.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic minimum hourly volume

^b Used for combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Warrant 2 – Four-Hour Vehicular Volume

MUTCD SECTION 4C.03

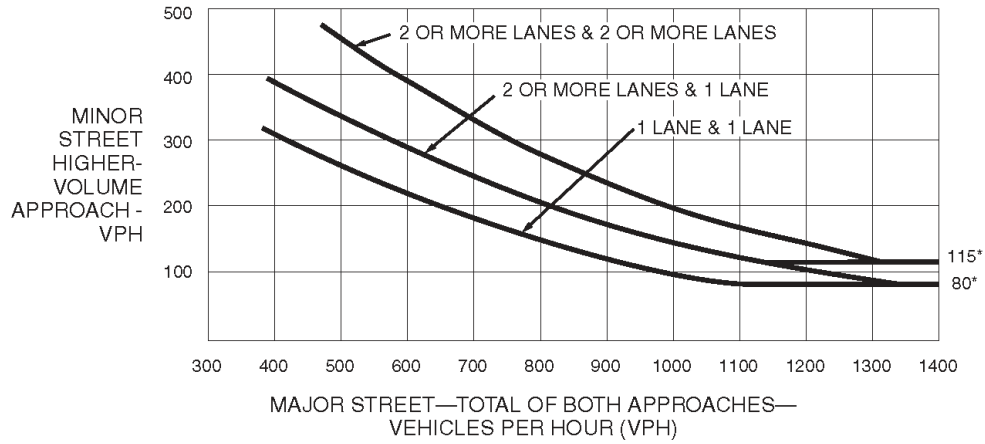
“The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the

corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.”

The data collected by MDT indicates that the fourth highest hour on this section of Euclid Avenue has over 850 VPH, which is near the limit of the chart for figure 4C-2. Therefore, the minor street approach needs only to meet the minimum volume (80 VPH). The existing 2022 minor leg approach volume at this intersection is approximately 40 VPH in the fourth highest hour which is not sufficient to meet this warrant. The future projected traffic volumes from Granite Street in the 4th highest hour with the planned West Side development and the estimated traffic volume growth on from Euclid Avenue indicates a potential peak hour traffic flow from Granite Street of 69 VPH which may be sufficient to meet condition B of the fourth-hour vehicle volume warrant if no right-turn reduction is used. However, as described above, 80-90% of traffic at the intersection turns right onto Euclid Avenue. If the right turn volume is reduced by only 9 vehicles (13%), this warrant would not be met. With no hard evidence that background traffic volumes along Euclid Avenue are increasing, it is not likely that the West Side development would increase the traffic volume at this intersection in the 4th highest hour by a sufficient level to meet this warrant, especially if a right-turn traffic reduction is taken into consideration. Therefore, this warrant is not met.

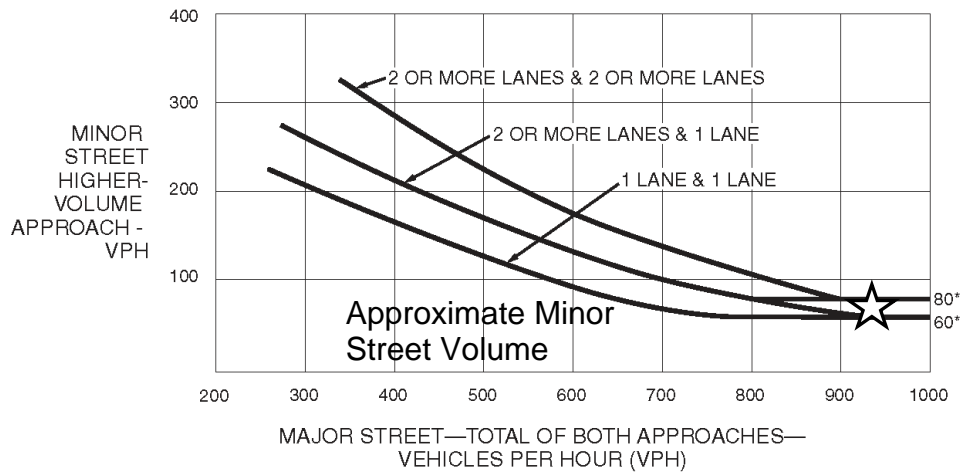
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 3 – Peak Hour Vehicular Volume

MUTCD SECTION 4C.04

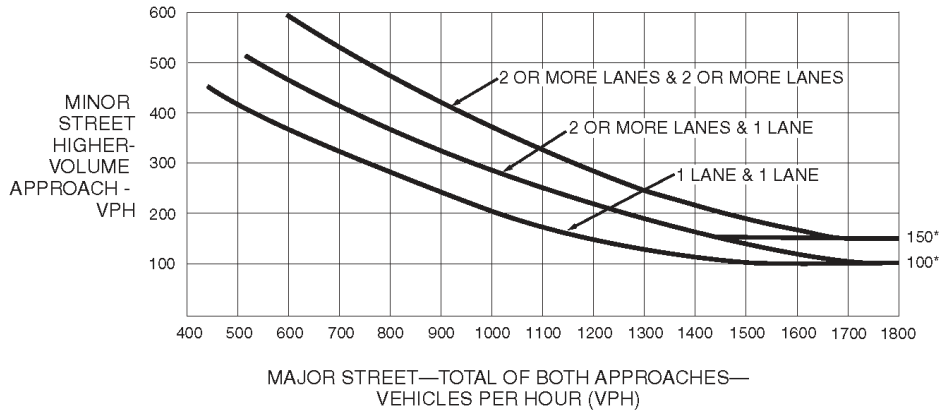
“The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

- A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
 - 1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and*
 - 2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and*
 - 3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.**
- B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.”*

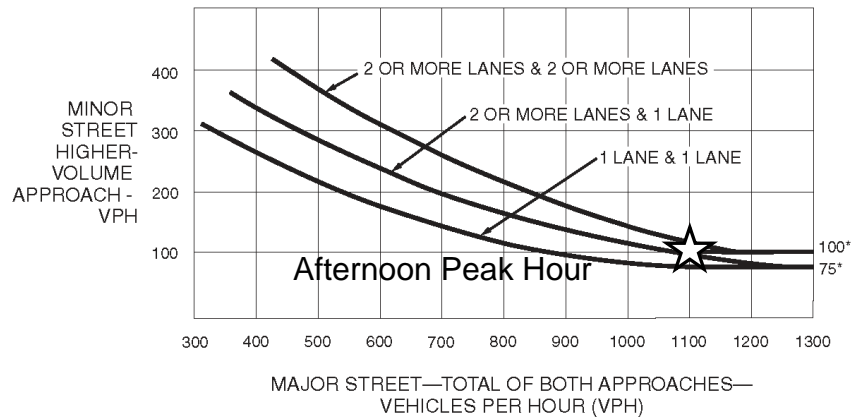
The analysis of the current and projected traffic data indicates that Euclid Avenue has an afternoon peak-hour traffic volume of approximately 1,100 VPH and northbound peak-hour traffic is approximately 59 VPH. If the West Side subdivision increases the peak-hour northbound traffic volume by 30-40 VPH as projected, then the intersection may just meet this warrant. However, it should be noted that this warrant is generally used only in special cases as noted in the MUTCD and if a right-turn reduction of only 10% is applied to the intersection, then the warrant would not be met. At this time there is insufficient information to conclusively determine this warrant would be met with the development of the West Side subdivision. Considering the option for residents of the West Side subdivision to use alternate route to leave the site (Hauser Boulevard) if congestion is occurring near Kessler School, it would be unlikely that the development would trigger the peak-hour warrant for this location. It is also unlikely that MDT would accept this future volume warrant as a valid reason for providing signalization at the intersection without supporting field traffic counts. Therefore, this warrant is not met.

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 4 – Pedestrian Volume

MUTCD SECTION 4C.05

“The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard: The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that both of the following criteria are met:

- A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or*
- B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.”*

At this time there is little pedestrian activity crossing this section of Euclid Avenue during most of the day except for some morning and afternoon pedestrian traffic from Kessler School. The analysis of the traffic data performed by MDT in 2018 did find sufficient need for a pedestrian crossing at this location to warrant the installation of the flashing warning beacons in 2020. The traffic data collected by ATS in September of 2022 indicates that only 12 pedestrians crossed Euclid Avenue during the entire 12-hour study period. At this time there is insufficient information to conclude that the warning beacons installed by MDT are not adequate to meet pedestrian needs in this area. Therefore, this warrant is not met.

Warrant 5 – School Crossing

MUTCD SECTION 4C.06

“The School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word “schoolchildren” includes elementary through high school students.

Standard: The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 students during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing. The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.”

Similar to the pedestrian Warrant #4, there is insufficient information to conclude that the warning beacons installed by MDT in 2020 are not adequate to meet pedestrian needs in this area. Therefore, this warrant is not met.

Warrant 6 – Coordinated Signal System

MUTCD SECTION 4C.07

“Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

- A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.*
- B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.”*

There are existing traffic signals along Euclid Avenue 0.6 miles to the west at Williams Street and 0.5 miles to the east at Joslyn Street. These existing signals provide acceptable platooning, and there is not likely a need for the signal at Granite Street to provide additional platooning along this section of Euclid Avenue. Therefore, this warrant is not met.

Warrant 7 – Crash Experience

MUTCD SECTION 4C.08

“The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

- A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and*
- B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and*
- C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.”*

According to MDT vehicle crash data for this location, a total five crashes have occurred at the intersection of Euclid Avenue and Granite Street in the last five years which is well below the crash rate needed to meet this warrant (five crashes in 12 months). Therefore, the intersection crash warrant is not met.

Warrant 8 – Roadway Network

MUTCD SECTION 4C.09

“Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.”

Standard: The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

- A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or*
- B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a nonnormal business day (Saturday or Sunday). A major route as used in this signal warrant shall have one or more of the following characteristics:*
 - A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or*
 - B. It includes rural or suburban highways outside, entering, or traversing a City; or*
 - C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.”*

Euclid Avenue is a major urban route and Granite Street is a designated collector route. The intersection of Euclid Avenue and Granite Street currently has over 1,000 vehicles entering per hour but is not projected to meet Warrants 1, 2, or 3 for condition A and is not projected to meet the necessary volumes for condition B. Based on this data, this warrant is not met.

Warrant 9 – Intersection Near a Grade Crossing

MUTCD Section 4C.10

“The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.”

Euclid Avenue has no at-grade railroad crossings in this area. Therefore, this warrant is not met.

WARRANT CONCLUSIONS

Based on the traffic data collected for this project, traffic signal warrants are not currently met at the intersection of Euclid Avenue and Granite Street and it is not likely that a traffic signal will become warranted due to the construction of the West Side development.

The traffic impact analysis prepared for the West Side development suggests that the project will not have a major impact on the operations of the Euclid Avenue and Granite Street intersection. The high level of right-turning traffic at the Granite Street intersection limits the overall need for a traffic signal at this location. Additionally, traffic volumes at this location are highly variable due to the influences of the Kessler Elementary School, but school traffic does not generally occur congruently with the primary commuter traffic periods of residential developments. Traffic from the West Side development can also choose to re-route onto other roads on Hauser Boulevard to the east if traffic congestion becomes an issue along Granite Street.

Greater Helena Area Long Range Transportation Plan, 2014 Update indicated that the intersection of Granite Street and Highway 12 functioned at LOS D(AM)/E(PM) and projected an LOS of F(AM)/F(PM) by 2035, but did not recommend capacity improvements at the intersection. The LRTP did recommend the installation of the flashing pedestrian crossing at Granite Street which was installed in 2020.

It is likely that this intersection will eventually need to be signalized in the future. However, it is most probable the traffic warrants for signalization will be largely due to potential future development on the north side of Euclid Avenue which would require left-turns movement onto Highway 12 from Granite Street. It should also be noted that the development of a traffic signal at this location will encourage drivers to use the Granite Street route because of the easier access to Highway 12. A traffic signal at this location would likely increase the peak-hour congestion in front of Kessler School and traffic volumes, vehicles queuing, and vehicle speeds would likely increase with the installation of a traffic signal. At this time there is insufficient evidence that a traffic signal will become warranted at this location due to the construction of the West Side development.