



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 2021. 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, Abelin Traffic Services (ATS) collected traffic count data on Granite Avenue and Hauser Boulevard and performed peak-hour intersection turning movement counts on Granite Avenue at Knight Street and Hauser Boulevard. 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, 10th 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 (HCM) - Special Report 209* and the Highway Capacity Software (HCS) version 7.8. 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 1,443 trips per day to 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 current traffic counts in 2019 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 1,854 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 571 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 1,600 vehicle trips per day. At full build-out of the subdivision, Granite Avenue from Hauser Boulevard to Euclid Avenue (U.S. Highway 12) is anticipated to have 2,764 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) is currently classified as a minor collector and at full build-out would remain a minor collector. 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.

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.

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

In August 2020, Abelin Traffic Services (ATS) collected traffic count data on Granite Avenue and Hauser Boulevard and performed peak-hour intersection turning movement counts on Granite Avenue at Knight Street and Hauser Boulevard. Data was also obtained from a 2017 intersection count conducted by MDT at Granite Avenue and Highway 12. Data is included in Appendix C.

Due to the COVID-19 outbreak, traffic volumes throughout Montana have dropped below normal levels and the Helena schools were not open during the August 2020 traffic counts. It is not known if traffic volumes in this area will return to normal during the 2020/2021 school year. For this reason, ATS performed most of the traffic analysis for this project based on the September 2017 traffic counts conducted by MDT and factored the 2020 data collected along Granite Avenue to correlate with the 2017 data.

The raw September 2017 MDT traffic data for Granite Avenue was adjusted for seasonal variations based on historic monthly traffic volumes from MDT permanent count station A-80 located on Custer Avenue near Brady Street. Based on the MDT traffic information, the raw data collected by MDT in September 2017 was 107% of the AADT for that time period.

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 1**. The historic traffic data indicates that traffic volumes in this area have increased at a rate of 0.5% annually over the last ten years.

Table 1. Historic Traffic Data

Location	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
US 12 E of Williams #25-7C-005	9,430	8,840	9,790	9,650	9,560	10,360	9,234	9,822	9,826	9,777
US 12 W of Joslyn #25-7C-006	11,510	11,600	11,790	11,560	13,170	11,480	11,701	11,837	12,003	11,943
Hauser Blvd W of Linden #25-7B-033	350	360	360	210	210	220	782	600	609	492
Hauser Blvd E of Laurel # 25-7B-032	1,040	1,010	1,000	810	820	840	730	724	735	739

5.0 TRIP GENERATION

A trip generation analysis was performed to determine the anticipated future traffic volumes from the proposed development using the trip generation rates contained in *Trip Generation* (Institute of Transportation Engineers, Tenth Edition). These rates are the national standard and are based on the most current information available to transportation planners. A vehicle “trip” is defined as any trip that either begins or ends at the development site. It was 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 105 AM peak hour trips, 137 PM peak hour trips, and 1,453 daily trips at full build-out.

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 2027. 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 2 provides estimated trip generations by phase for the anticipated uses for West Side Woods Subdivision. 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.

Table 2. 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	9.44	264	0.74	21	0.99	28
Condominium	220	28	7.32	205	0.46	13	0.56	16
Subtotal				469		34		44
Phase 2 - 2025								
Single-Family	210	10	9.44	94	0.74	7	0.99	10
Condominium	220	20	7.32	146	0.46	9	0.56	11
Subtotal				709		50		65
Phase 3 - 2027								
Single-Family	210	43	9.44	406	0.74	32	0.99	43
Subtotal				1,115		82		108
Phase 4 - 2029								
Single-Family	210	11	9.44	104	0.74	8	0.99	11
Condominium	220	32	7.32	234	0.46	15	0.56	18
Total at Full Build-out				1,453		105		137

Peak school traffic and peak commuter traffic does not generally occur at the same time. The MDT data 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 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 peak periods of school traffic.

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 1,207 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 302 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 show in Figure 1 and traffic volumes by phase for Hauser Boulevard, Granite Avenue, and Knight Street are shown in Table 3.

Figure 1. Trip Distribution

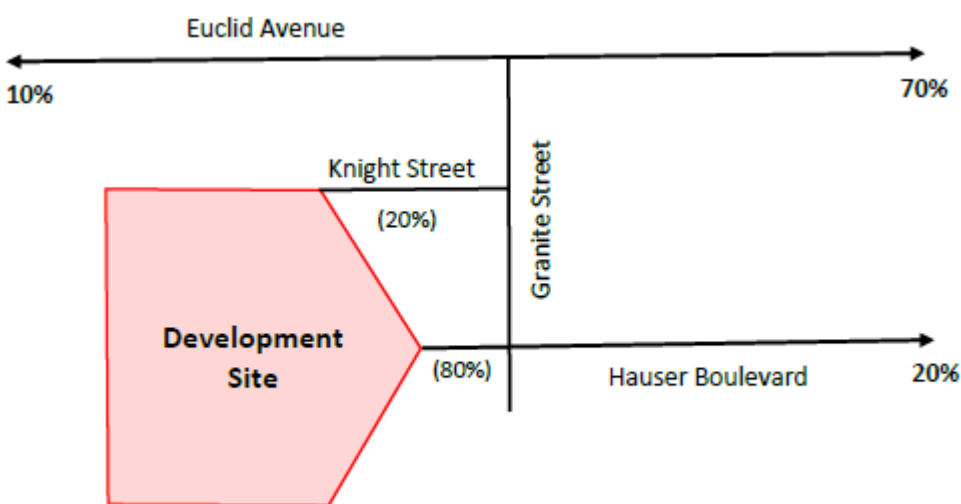


Table 3. Traffic Volume Impacts by Phase

		20%	20%	80%
	ADT Volume	Hauser	Knight	Granite
Trip Generation	Existing	700	283	1,600
Phase 1	469	794	377	1,975
Phase 2	709	842	425	2,167
Phase 3	1,115	923	506	2,492
Phase 4	1,453	991	574	2,762

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 (HCM) - Special Report 209* and the Highway Capacity Software (HCS) version 7.8. 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 the existing LOS analysis for the existing intersections are provided in Tables 4 and 5 and summary of LOS calculations for existing intersections with West Side Woods Subdivision traffic added at each phase are provided in Tables 6 and 7.

Table 4. Existing 2020 Level of Service Commuter Peak

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	12.7/25.3	B/D	15.0/25.4	C/D
Granite Avenue & Knight Street	9.3	A	9.6	A
Granite Avenue & Hauser Blvd	9.4/8.7	A/A	9.7/9.1	A/A

Table 5. Existing 2020 Level of Service Summary School Traffic

Intersection	AM Peak Period		PM Peak Period	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Granite Avenue & Highway 12	12.1/19.2	B/C	13.8/17.9	B/C
Granite Avenue & Knight Street	9.9	A	10.2	B
Granite Avenue & Hauser Blvd	9.9/8.8	A/A	10.4/9.4	B/A

Table 6. 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	13.2/26.8	B/D	16.0/28.6	C/D
	Granite Avenue & Knight Street	9.5	A	9.9	A
	Granite Avenue & Hauser Blvd	9.6/8.8	A/A	9.9/9.3	A/A
2	Granite Avenue & Highway 12	13.5/27.7	B/D	16.3/30.1	C/D
	Granite Avenue & Knight Street	9.6	A	10.0	A
	Granite Avenue & Hauser Blvd	9.7/9.8	A/A	10.0/9.4	A/A
3	Granite Avenue & Highway 12	14.2/29.4	B/D	17.3/34.0	C/D
	Granite Avenue & Knight Street	9.8	A	10.2	B
	Granite Avenue & Hauser Blvd	9.8/9.0	A/A	10.2/9.6	B/A
4	Granite Avenue & Highway 12	14.7/30.8	B/D	18.0/35.5	C/E
	Granite Avenue & Knight Street	9.9	A	10.4	B
	Granite Avenue & Hauser Blvd	9.9/9.1	A/A	10.4/9.7	A/A

Table 7. Projected 2027 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	12.3/19.8	B/C	14.4/18.6	B/C
	Granite Avenue & Knight Street	10.0	A	10.3	B
	Granite Avenue & Hauser Blvd	10.0/8.9	B/A	10.6/9.5	B/A
2	Granite Avenue & Highway 12	12.5/20.5	B/C	14.9/19.5	B/C
	Granite Avenue & Knight Street	10.1	B	10.5	B
	Granite Avenue & Hauser Blvd	10.0/8.8	B/A	10.5/9.5	B/A
3	Granite Avenue & Highway 12	12.3/20.1	B/C	14.6/19.0	B/C
	Granite Avenue & Knight Street	10.0	B	10.4	B
	Granite Avenue & Hauser Blvd	10.0/8.8	B/A	10.6/9.6	B/A
4	Granite Avenue & Highway 12	12.6/20.7	B/C	15.0/19.9	C/C
	Granite Avenue & Knight Street	10.1	B	10.6	B
	Granite Avenue & Hauser Blvd	10.2/8.9	B/A	10.8/9.7	B/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. A signal warrant analysis was conducted by ATS and is included in Appendix E. The signal warrant analysis indicates that a signal for this intersection is not warranted at this time. The signal warrant analysis concludes that due to the high volume of right turning traffic a signal is not warranted at this time. Signal warrants will likely not be met until future development to the north of Highway 12 requires signalization due to left turning movements. The LRTP did recommend the installation of a flashing pedestrian crossing at Granite Avenue, which was installed in 2020. No other improvements are recommended for the Granite Avenue and Highway 12 intersection.

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 on 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.

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.

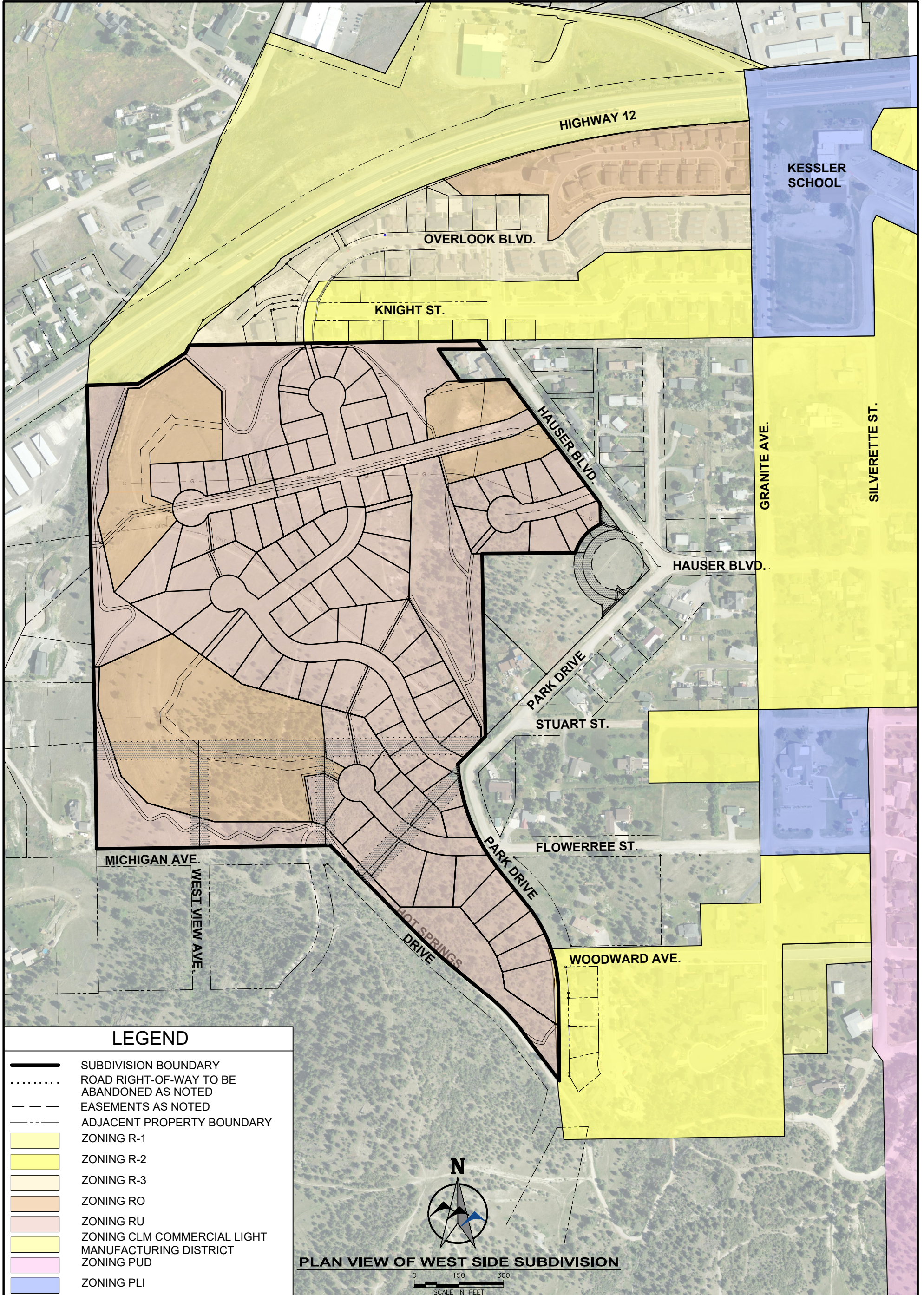
Phase 3 Recommended Improvements

- 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.

APPENDIX A
VICINITY MAP

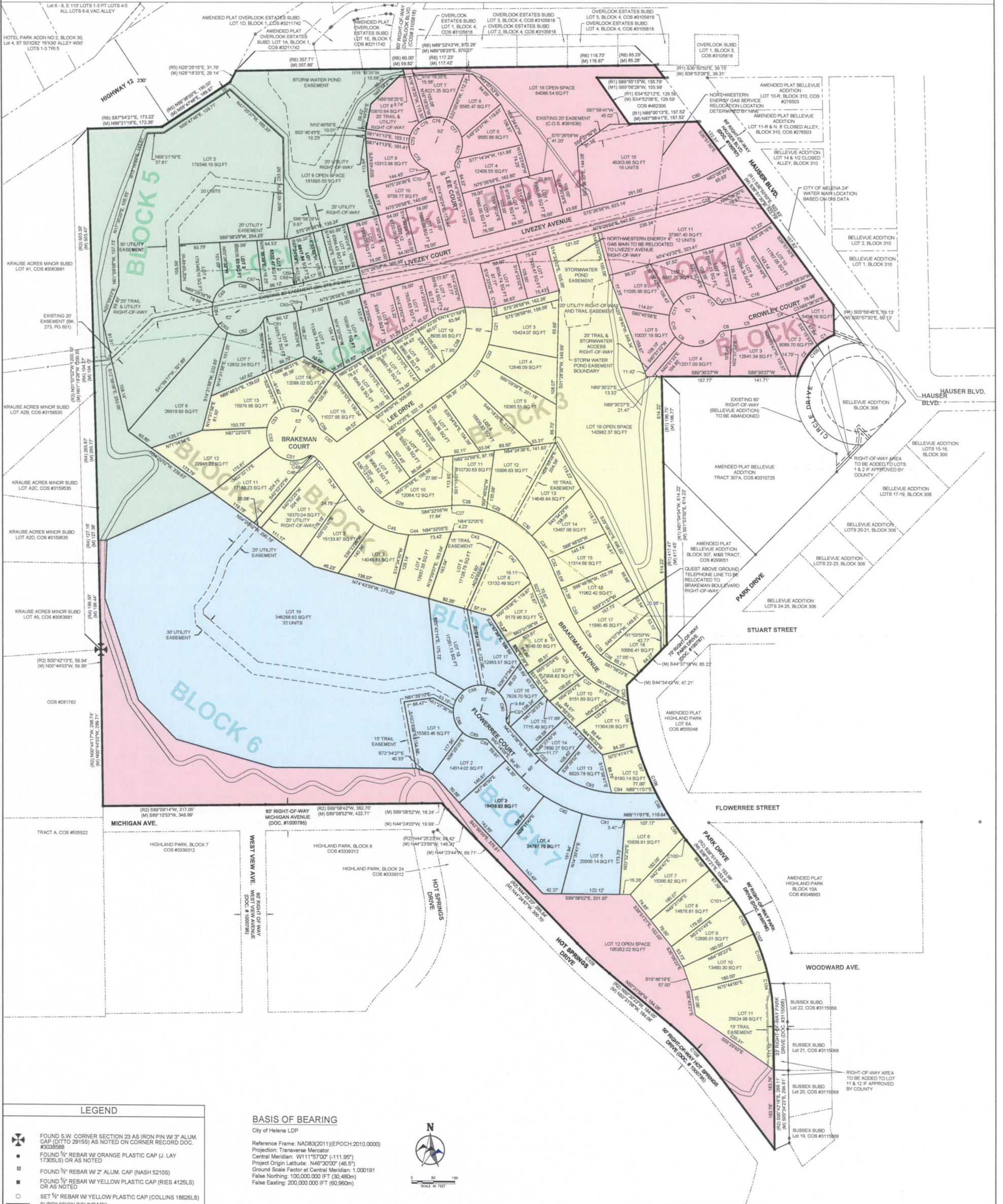


2b	ECO DEVELOPMENT, LLC	 ENGINEERING 1275 MAPLE STREET, SUITE F HELENA, MT 59601 (406) 443-3962	PROJECT: 2022-292		
	WEST SIDE WOODS MAJOR SUBDIVISION		DESIGNED: JMF		
	VICINITY MAP		DRAWN: DLC		
			CHECKED: DDP		
			APPROVED: JMF		
			DATE: SEPTEMBER 15, 2022		

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" ALUM. CAP (DITTO 2915S) AS NOTED ON CORNER RECORD DOC. #303858
- FOUND 5/8" REBAR W/ ORANGE PLASTIC CAP (J. LAY 1732LS) OR AS NOTED
- FOUND 5/8" REBAR W/ 2" ALUM. 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
- NORTHWESTERN 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 #310725)
- (R2) RECORD (CERTIFICATE OF SURVEY #3339312)
- (R3) RECORD (CERTIFICATE OF SURVEY #3063881)
- (R4) RECORD (CERTIFICATE OF SURVEY #3159535)
- (R5) RECORD (STATE OF MT STATE HIGHWAY COMMISSION RIGHT-OF-WAY PLAN F_249(30))
- (R6) RECORD (CERTIFICATE OF SURVEY #3211742)
- (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: N48°30'00" (48.5°)
 Ground Scale Factor at Central Meridian: 1.000191
 False Northing: 100,000,000 IFT (30,480m)
 False Easting: 200,000,000 IFT (60,960m)

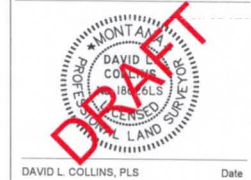


SHEET 2 OF 2

1/4	SEC.	TWP.	RGE.
<input checked="" type="checkbox"/>	23	10N.	4W.
1/4	SEC.	TWP.	RGE.
<input checked="" type="checkbox"/>	26	10N.	4W.

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

CERTIFICATE OF SURVEYOR



DAVID L. COLLINS, PLS Date

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

REVISIONS	Date	By



DAVID L. COLLINS, PLS Date

APPENDIX C
TRAFFIC COUNT DATA

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
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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
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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
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11:45 AM	0	1	9	0	9	84	7	0	6	0	0	0	4	83	1	1	205
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10:30 AM	0	0	6	0	9	67	7	0	10	0	0	0	0	73	0	0	172
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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

West Side Major Subdivision
Traffic Model

Seasonal Factor 0.93
Covid Factor 2

AM Peak Hour (15 min x 4)	Granite	PM Peak Hour (15 min x 4)	Granite
2017 MDT Data	<p>12.7/25.3 B/D</p> <p>0 0 15</p> <p>4 398 19</p> <p>19.0 0 126</p> <p>Euclid</p>	<p>15.0/25.4 C/D</p> <p>0 0 22</p> <p>4 618 7</p> <p>7 37</p> <p>Euclid</p>	<p>15.0/25.4 C/D</p> <p>22 484 52</p> <p>4 7 37</p>
2020 ATS Data	<p>9.3 A</p> <p>8 48</p> <p>16 0</p> <p>80</p> <p>Knight</p>	<p>9.6 A</p> <p>16 56</p> <p>72 8</p> <p>Knight</p>	<p>9.6 A</p> <p>16 40</p>
2020 ATS Data	<p>9.4/8.7 A/A</p> <p>24 24 8</p> <p>24 8 0</p> <p>8 24 8</p> <p>Hauser</p>	<p>9.7/9.1 A/A</p> <p>16 64 8</p> <p>40 8 0</p> <p>16 8</p> <p>Hauser</p>	<p>9.7/9.1 A/A</p> <p>16 8 8</p> <p>0 16 8</p>

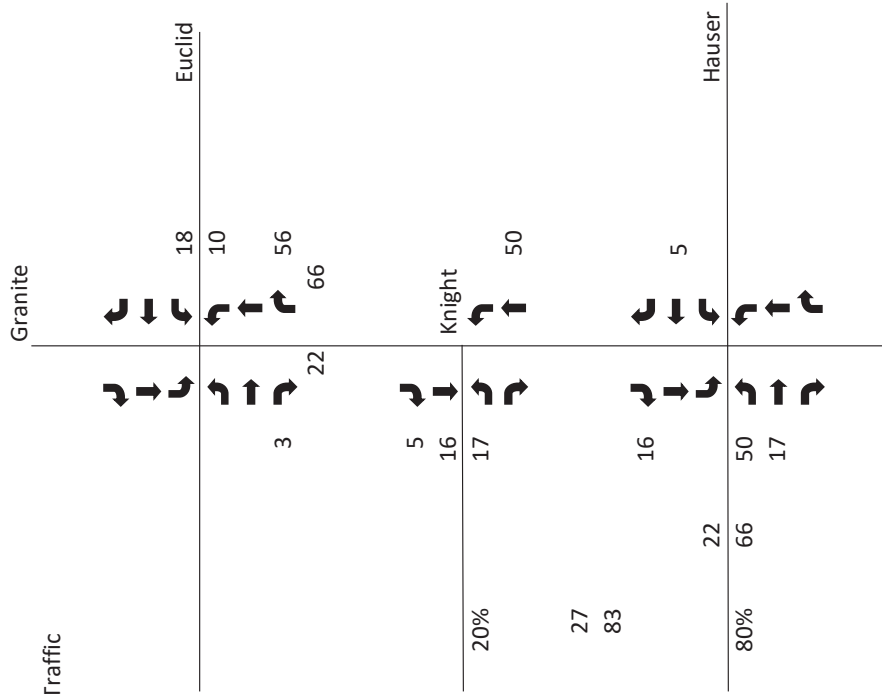
West Side Major Subdivision
Traffic Model

Seasonal Factor 0.93
Covid Factor 3

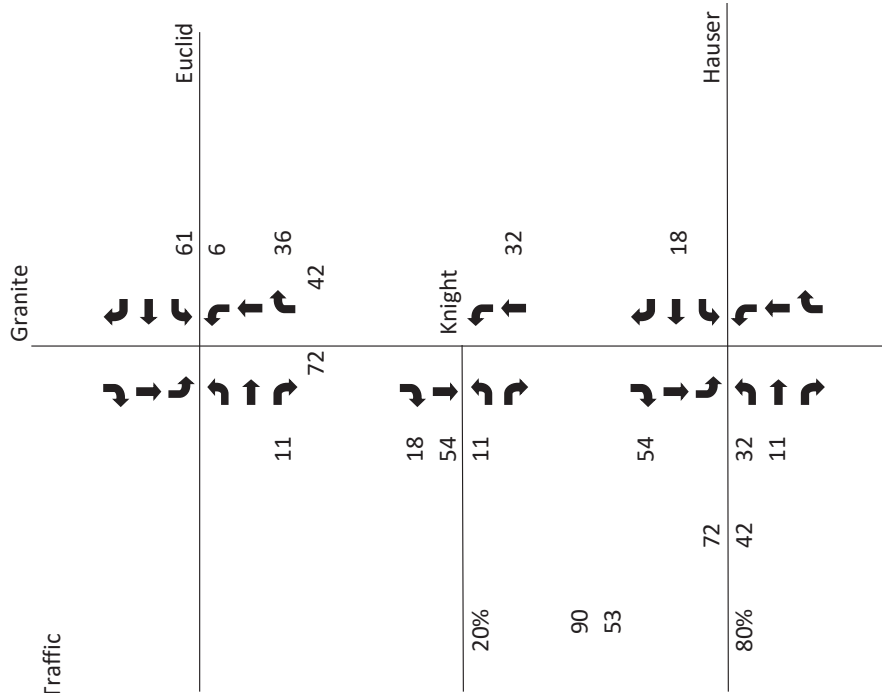
	Granite	PM Peak School Period (15 min x 4)	Granite
AM Peak School Period (15 min x 4)	<p>12.1/19.2 B/C</p> <p>0 7</p> <p>4 4</p> <p>22 22</p> <p>Euclid</p> <p>0 48</p> <p>290 0</p> <p>37 15</p> <p>112 190</p>	<p>13.8/17.9 B/C</p> <p>26</p> <p>342</p> <p>60</p> <p>Euclid</p> <p>48</p> <p>0</p> <p>190</p>	<p>10.2 B</p> <p>24</p> <p>84</p> <p>84</p> <p>12</p> <p>24</p> <p>60</p>
	<p>9.9 A</p> <p>12 24</p> <p>72 72</p> <p>24 24</p> <p>0 0</p> <p>120 120</p>	<p>10.4/9.4 B/A</p> <p>24</p> <p>96</p> <p>12</p> <p>Hauser</p> <p>60</p> <p>12</p> <p>0</p> <p>24</p> <p>12</p>	<p>Hauser</p> <p>12</p> <p>12</p> <p>12</p> <p>0</p> <p>24</p> <p>12</p>

West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour



Site Generated Traffic
PM Peak Hour



West Side Major Subdivision
Traffic Model

Growth Factor 1.035

AM Peak Hour Total Projected Traffic	Granite	14.8/30.9 B/D	Euclid	PM Peak Hour Total Projected Traffic	Granite	18.0/36.1 C/E	Euclid
0	↘ ↙	35	↘ ↙	0	↘ ↙	23	↘ ↙
0	↘ ↙	597	↘ ↙	0	↘ ↙	501	↘ ↙
15	↘ ↙	72	↘ ↙	23	↘ ↙	115	↘ ↙
4	↘ ↙	29	↘ ↙	4	↘ ↙	10	↘ ↙
412	↘ ↙	0	↘ ↙	639	↘ ↙	8	↘ ↙
22	↘ ↙	187	↘ ↙	19	↘ ↙	75	↘ ↙
14	↘ ↙	9.9 A	↘ ↙	35	↘ ↙	10.5 B	↘ ↙
66	↘ ↙		↘ ↙	112	↘ ↙		↘ ↙
33	↘ ↙	8	↘ ↙	85	↘ ↙	17	↘ ↙
0	↘ ↙	133	↘ ↙	8	↘ ↙	73	↘ ↙
41	↘ ↙	9.7/9.1 A/A	↘ ↙	71	↘ ↙	10.4/9.7 B/A	↘ ↙
25	↘ ↙	8	↘ ↙	66	↘ ↙	17	↘ ↙
8	↘ ↙	5	↘ ↙	8	↘ ↙	26	↘ ↙
	↘ ↙	0	↘ ↙	8	↘ ↙	8	↘ ↙
75	↘ ↙	Hauser	↘ ↙	73	↘ ↙	Hauser	↘ ↙
25	↘ ↙	0	↘ ↙	19	↘ ↙	0	↘ ↙
0	↘ ↙	41	↘ ↙	0	↘ ↙	17	↘ ↙
	↘ ↙	8	↘ ↙		↘ ↙	8	↘ ↙

West Side Major Subdivision
Traffic Model

Growth Factor 1.035

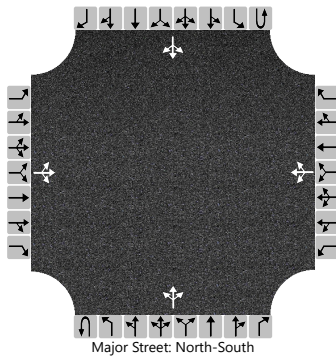
AM Peak Hour Total Projected Traffic	Granite	12.8/21.3 B/C	Euclid	PM Peak Hour Total Projected Traffic	Granite	15.7/20.7 C/C	Euclid
0	Granite	62	8	8	Granite	27	15.7/20.7 C/C
4	Granite	454	4	4	Granite	354	15.7/20.7 C/C
23	Granite	52	23	23	Granite	92	15.7/20.7 C/C
0	Granite	36	0	0	Granite	53	15.7/20.7 C/C
300	Granite	0	300	343	Granite	0	15.7/20.7 C/C
40	Granite	144	40	21	Granite	214	15.7/20.7 C/C
15	Granite	10.2 B	15	34	Granite	10.7 B	10.7 B
83	Granite	12	83	114	Granite	25	10.7 B
33	Granite	149	33	92	Granite	78	10.7 B
0	Granite	10.2 B	0	12	Granite	10.9/9.7 B/A	10.9/9.7 B/A
45	Granite	12	45	52	Granite	25	10.9/9.7 B/A
37	Granite	3	37	99	Granite	21	10.9/9.7 B/A
12	Granite	0	12	12	Granite	12	10.9/9.7 B/A
62	Granite	10.2/9.0 B/A	62	78	Granite	0	10.9/9.7 B/A
21	Granite	Hauser	21	18	Granite	25	10.9/9.7 B/A
0	Granite	Hauser	0	0	Granite	12	10.9/9.7 B/A

APPENDIX D
LOS MODELING

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Hauser Blvd		
Analysis Year	2020			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)		24	8	1		1	1	8		1	40	8		8	24	24
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		

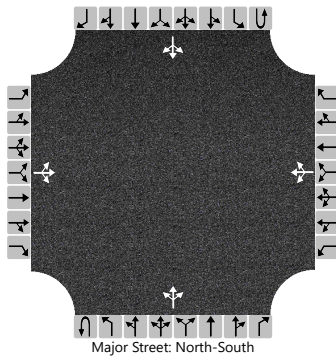
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			33				10			1				8			
Capacity, c (veh/h)			847				974			1553				1553			
v/c Ratio			0.04				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.1				0.0			0.0				0.0			
Control Delay (s/veh)			9.4				8.7			7.3				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.4				8.7				0.2				1.1			
Approach LOS		A				A											

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH1			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)		40	13	1		1	2	8		1	40	8		8	24	29
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		

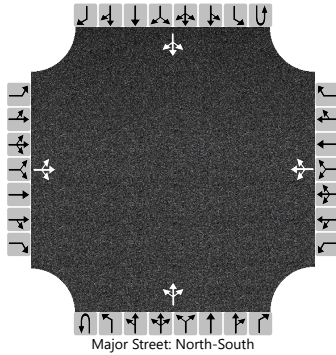
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			54				11			1				8			
Capacity, c (veh/h)			841				949			1546				1553			
v/c Ratio			0.06				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.2				0.0			0.0				0.0			
Control Delay (s/veh)			9.6				8.8			7.3				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.6				8.8				0.2				1.0			
Approach LOS		A				A											

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH2			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)		48	16	1		1	3	8		1	40	8		8	24	32
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		

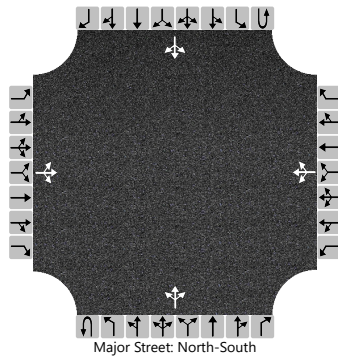
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			65				12			1				8			
Capacity, c (veh/h)			837				929			1542				1553			
v/c Ratio			0.08				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.0			0.0				0.0			
Control Delay (s/veh)			9.7				8.9			7.3				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.7				8.9				0.2				1.0			
Approach LOS		A				A											

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH3			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)		62	21	1		1	4	8		1	41	8		8	25	37
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		

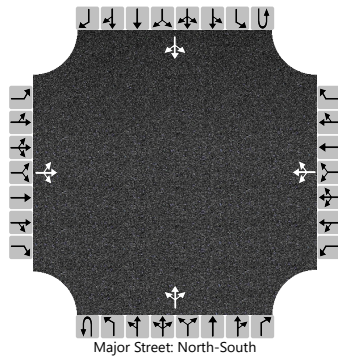
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			84				13			1				8			
Capacity, c (veh/h)			830				909			1535				1551			
v/c Ratio			0.10				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.0			0.0				0.0			
Control Delay (s/veh)			9.8				9.0			7.3				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.8				9.0				0.2				0.9			
Approach LOS		A				A											

HCS7 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	2027			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)		72	24	1		1	5	8		1	41	8		8	25	41	
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		

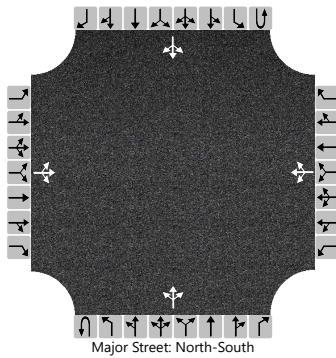
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			97				14			1				8			
Capacity, c (veh/h)			827				894			1529				1551			
v/c Ratio			0.12				0.02			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.0			0.0				0.0			
Control Delay (s/veh)			9.9				9.1			7.4				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.9				9.1				0.2				0.8			
Approach LOS		A				A											

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Hauser Blvd		
Analysis Year	2020			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)		36	12	1		1	1	12		1	60	12		12	36	36
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		

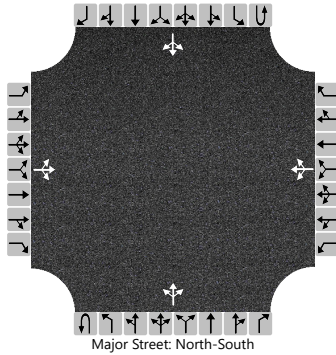
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				14			1				12			
Capacity, c (veh/h)			783				952			1522				1522			
v/c Ratio			0.06				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.2				0.0			0.0				0.0			
Control Delay (s/veh)			9.9				8.8			7.4				7.4			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.9				8.8				0.1				1.1			
Approach LOS		A				A											

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With PH1			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)		44	15	1		1	1	12		1	61	12		12	36	39
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		

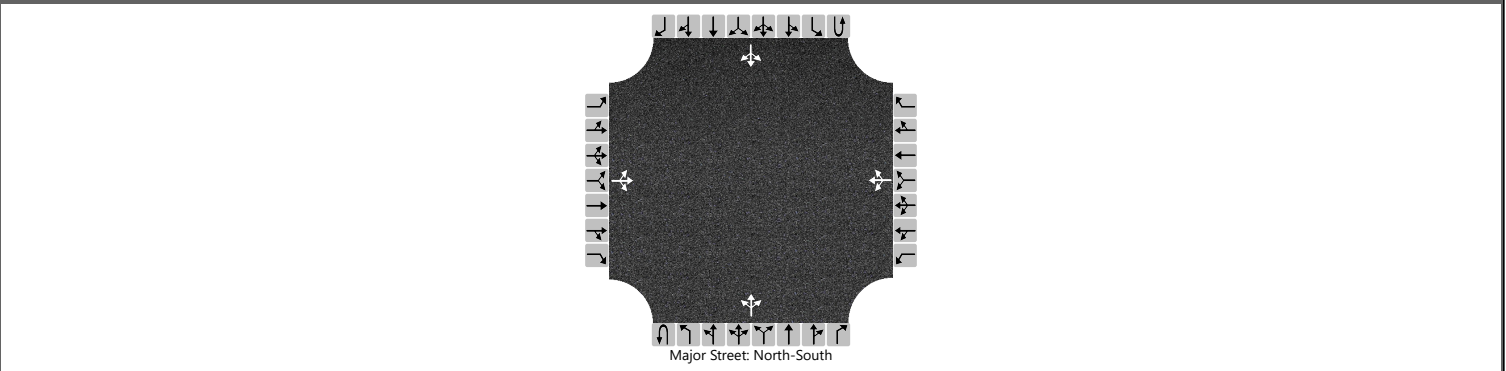
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			60				14			1				12			
Capacity, c (veh/h)			779				950			1518				1520			
v/c Ratio			0.08				0.01			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.2				0.0			0.0				0.0			
Control Delay (s/veh)			10.0				8.8			7.4				7.4			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.0				8.8				0.1				1.1			
Approach LOS		B				A											

HCS7 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	2024	North/South Street	Granite Ave				
Time Analyzed	AM Peak School With PH2	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	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		48	16	1		1	1	12		1	61	12		12	36	40
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		

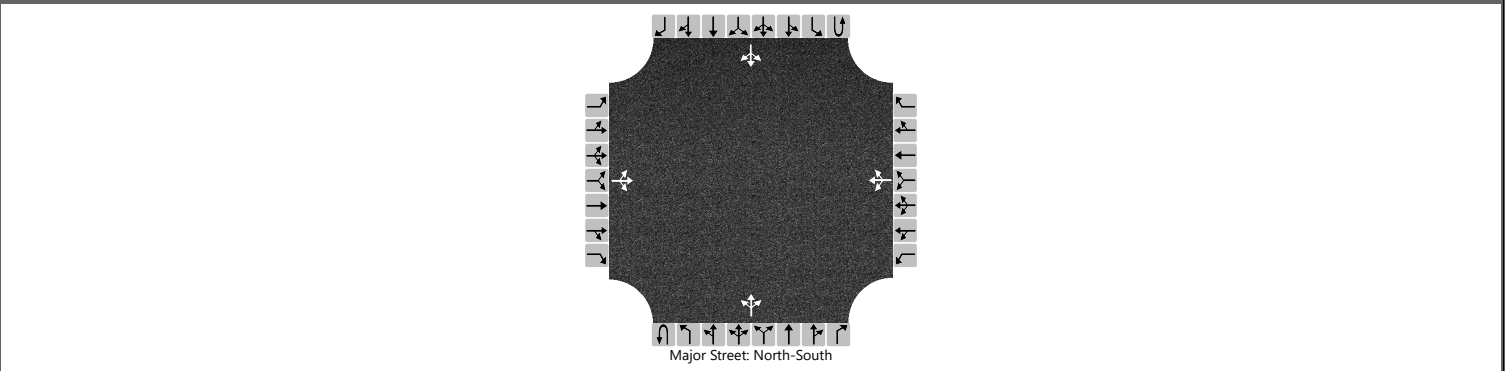
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			65				14				1				12	
Capacity, c (veh/h)			778				950				1517				1520	
v/c Ratio			0.08				0.01				0.00				0.01	
95% Queue Length, Q ₉₅ (veh)			0.3				0.0				0.0				0.0	
Control Delay (s/veh)			10.0				8.8				7.4				7.4	
Level of Service (LOS)			B				A				A				A	
Approach Delay (s/veh)	10.0				8.8				0.1				1.1			
Approach LOS	B				A											

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With PH3			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)		56	19	1		1	2	12		1	62	12		12	37	43
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		

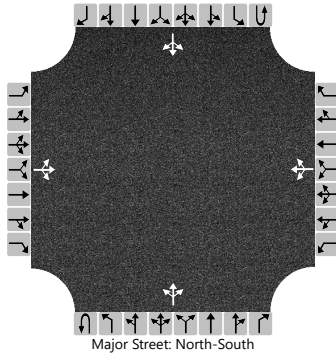
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			76				15			1				12			
Capacity, c (veh/h)			773				927			1512				1519			
v/c Ratio			0.10				0.02			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.0			0.0				0.0			
Control Delay (s/veh)			10.2				8.9			7.4				7.4			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.2				8.9				0.1				1.0			
Approach LOS		B				A											

HCS7 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	2027			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)		61	20	1		1	3	12		1	62	12		12	37	45
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		

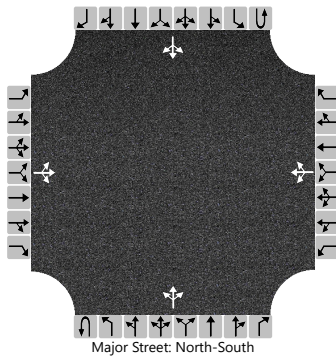
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			82				16			1				12			
Capacity, c (veh/h)			771				909			1509				1519			
v/c Ratio			0.11				0.02			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.1			0.0				0.0			
Control Delay (s/veh)			10.2				9.0			7.4				7.4			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.2				9.0				0.1				1.0			
Approach LOS		B				A											

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Hauser Blvd		
Analysis Year	2020			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)		40	8	1		8	8	16		1	16	8		8	64	16
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		

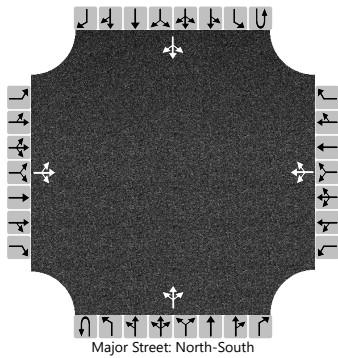
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				32			1				8			
Capacity, c (veh/h)			820				913			1512				1584			
v/c Ratio			0.06				0.04			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.2				0.1			0.0				0.0			
Control Delay (s/veh)			9.7				9.1			7.4				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.7				9.1				0.3				0.7			
Approach LOS		A				A											

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With PH1			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)		50	11	1		8	14	16		1	16	8		8	65	33
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		

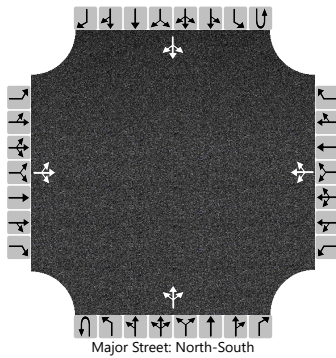
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			62				38			1				8			
Capacity, c (veh/h)			800				874			1489				1584			
v/c Ratio			0.08				0.04			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.1			0.0				0.0			
Control Delay (s/veh)			9.9				9.3			7.4				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		9.9				9.3				0.3				0.6			
Approach LOS		A				A											

HCS7 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	2024	North/South Street	Granite Ave				
Time Analyzed	PM Peak Hour With PH2	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)		55	13	1		8	16	16		1	16	8		8	65	41
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		

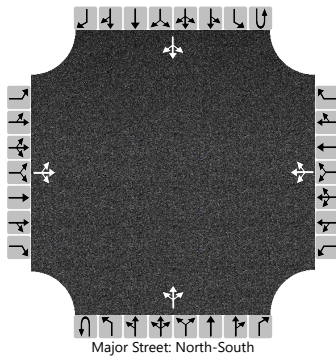
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			69				40			1				8			
Capacity, c (veh/h)			792				861			1479				1584			
v/c Ratio			0.09				0.05			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.1			0.0				0.0			
Control Delay (s/veh)			10.0				9.4			7.4				7.3			
Level of Service (LOS)			A				A			A				A			
Approach Delay (s/veh)		10.0				9.4				0.3				0.5			
Approach LOS		A				A											

HCS7 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	2026	North/South Street	Granite Ave				
Time Analyzed	PM Peak Hour With PH3	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)		65	16	1		8	22	16		1	16	8		8	66	57
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		

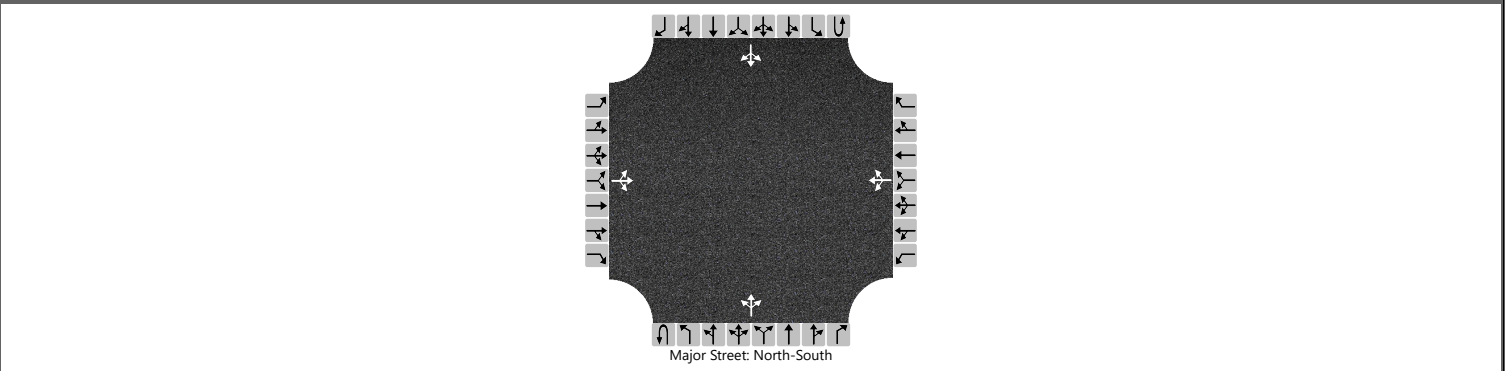
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			82				46			1				8			
Capacity, c (veh/h)			775				830			1458				1584			
v/c Ratio			0.11				0.06			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0			
Control Delay (s/veh)			10.2				9.6			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.2				9.6				0.3				0.5			
Approach LOS		B				A											

HCS7 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	2027			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)		72	18	1		8	26	17		1	17	8		8	66	68	
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		

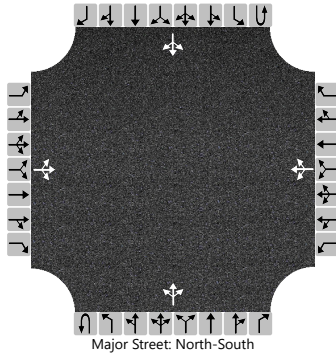
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			91				51			1				8			
Capacity, c (veh/h)			761				815			1444				1583			
v/c Ratio			0.12				0.06			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0			
Control Delay (s/veh)			10.4				9.7			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.4				9.7				0.3				0.4			
Approach LOS		B				A											

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hauser		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Hauser Blvd		
Analysis Year	2020			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)		60	12	1		12	12	24		1	24	12		12	96	24
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		

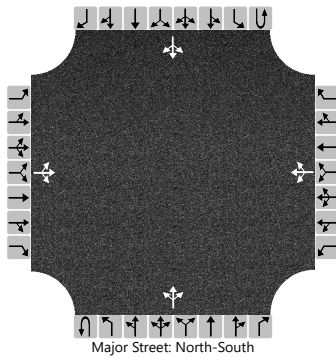
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			73				48			1				12			
Capacity, c (veh/h)			741				866			1462				1568			
v/c Ratio			0.10				0.06			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.3				0.2			0.0				0.0			
Control Delay (s/veh)			10.4				9.4			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.4				9.4				0.2				0.7			
Approach LOS		B				A											

HCS7 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	2022	North/South Street	Granite Ave				
Time Analyzed	PM Peak School With PH1	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)		65	14	1		12	15	24		1	24	12		12	97	33
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		

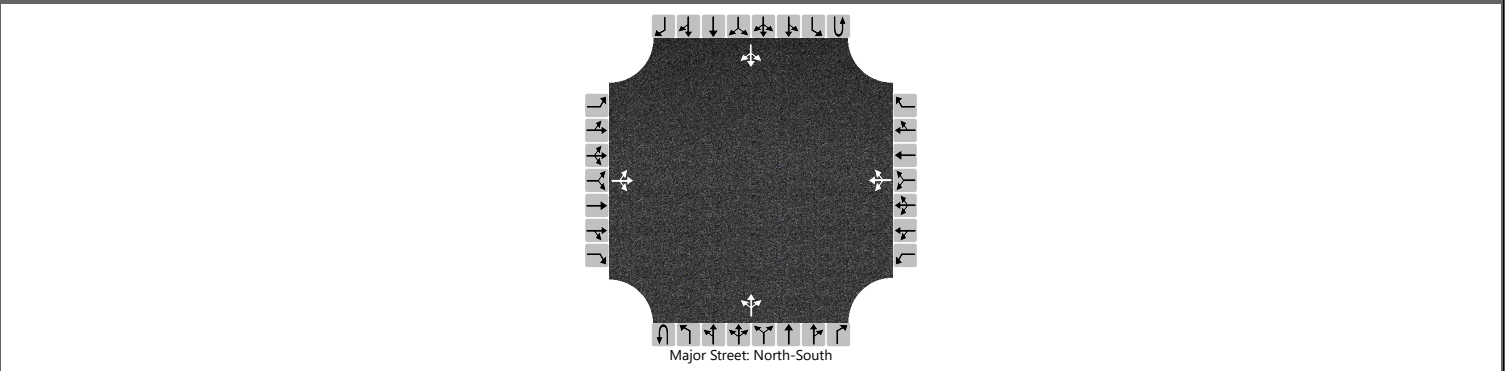
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			80				51			1				12			
Capacity, c (veh/h)			732				848			1449				1568			
v/c Ratio			0.11				0.06			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0			
Control Delay (s/veh)			10.5				9.5			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.5				9.5				0.2				0.7			
Approach LOS		B				A				A				A			

HCS7 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	2024	North/South Street	Granite Ave				
Time Analyzed	PM Peak School With PH2	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	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		68	15	1		12	16	24		1	24	12		12	97	37
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		

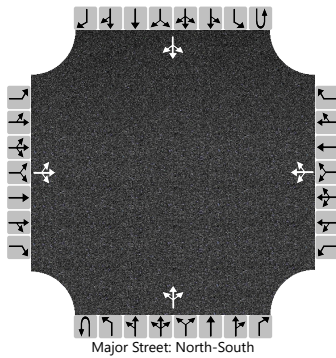
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			84				52			1				12		
Capacity, c (veh/h)			728				842			1444				1568		
v/c Ratio			0.12				0.06			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0		
Control Delay (s/veh)			10.6				9.6			7.5				7.3		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	10.6				9.6				0.2				0.7			
Approach LOS	B				A											

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	PM Peak School With PH3			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)		74	16	1		12	19	25		1	25	12		12	99	45	
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		

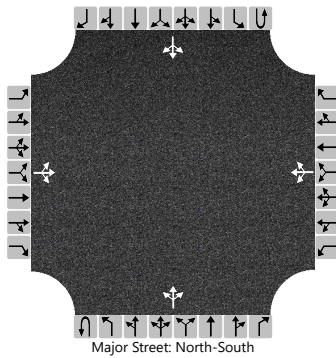
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			91				56			1				12			
Capacity, c (veh/h)			716				828			1432				1567			
v/c Ratio			0.13				0.07			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.4				0.2			0.0				0.0			
Control Delay (s/veh)			10.8				9.7			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.8				9.7				0.2				0.6			
Approach LOS		B				A											

HCS7 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	2027			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)		77	18	1		12	21	25		1	25	12		12	99	51
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		

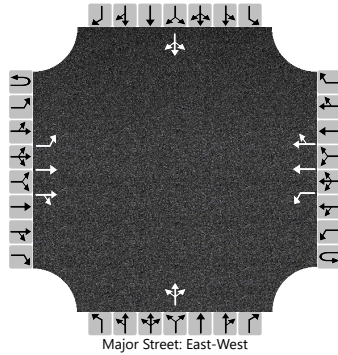
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			96				58			1				12			
Capacity, c (veh/h)			710				818			1425				1567			
v/c Ratio			0.14				0.07			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.5				0.2			0.0				0.0			
Control Delay (s/veh)			10.9				9.7			7.5				7.3			
Level of Service (LOS)			B				A			A				A			
Approach Delay (s/veh)		10.9				9.7				0.2				0.6			
Approach LOS		B				A											

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak With PH1			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	4	623	11	0	72	488	23	6	8	48		23	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

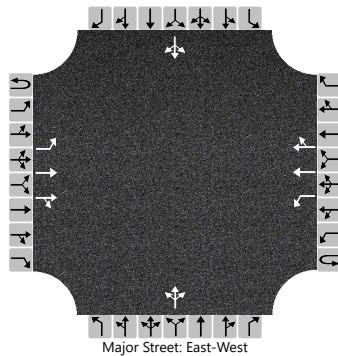
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				72				62				25		
Capacity, c (veh/h)		1043				938				389				178		
v/c Ratio		0.00				0.08				0.16				0.14		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				0.6				0.5		
Control Delay (s/veh)		8.5				9.2				16.0				28.6		
Level of Service (LOS)		A				A				C				D		
Approach Delay (s/veh)	0.1				1.1				16.0				28.6			
Approach LOS									C				D			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Highway 12		
Analysis Year	2020			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	4	398	19	0	52	577	33	19	1	126		15	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

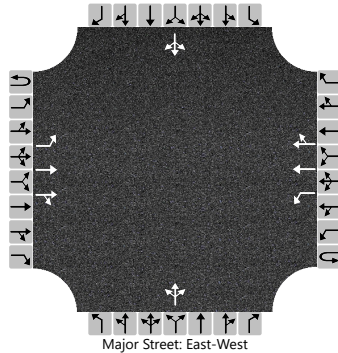
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				52				146				17		
Capacity, c (veh/h)		958				1131				615				194		
v/c Ratio		0.00				0.05				0.24				0.09		
95% Queue Length, Q ₉₅ (veh)		0.0				0.1				0.9				0.3		
Control Delay (s/veh)		8.8				8.3				12.7				25.3		
Level of Service (LOS)		A				A				B				D		
Approach Delay (s/veh)	0.1				0.7				12.7				25.3			
Approach LOS									B				D			

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak With PH1			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	4	402	20	0	58	582	34	22	1	145		15	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

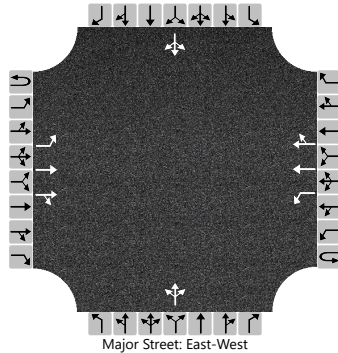
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				58				168				17		
Capacity, c (veh/h)		953				1127				607				182		
v/c Ratio		0.00				0.05				0.28				0.09		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				1.1				0.3		
Control Delay (s/veh)		8.8				8.4				13.2				26.8		
Level of Service (LOS)		A				A				B				D		
Approach Delay (s/veh)	0.1				0.7				13.2				26.8			
Approach LOS									B				D			

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM Peak With PH2			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	4	403	20	0	62	584	34	24	1	155		15	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	

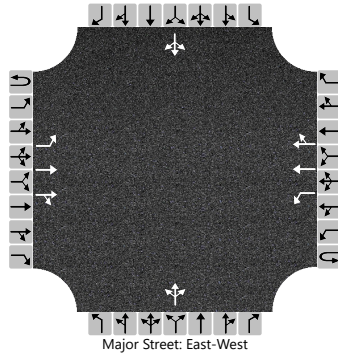
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				62					180				17	
Capacity, c (veh/h)		951				1126					601				176	
v/c Ratio		0.00				0.06					0.30				0.10	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.3				0.3	
Control Delay (s/veh)		8.8				8.4					13.5				27.7	
Level of Service (LOS)		A				A					B				D	
Approach Delay (s/veh)	0.1				0.8				13.5				27.7			
Approach LOS									B				D			

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM Peak With PH3			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	4	408	22	0	68	592	34	27	1	172		15	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

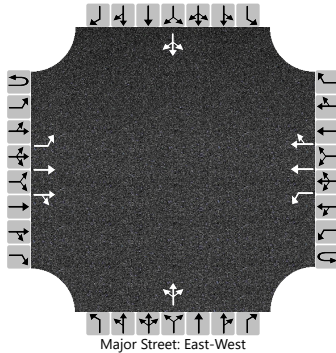
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				68				200				17		
Capacity, c (veh/h)		945				1119				589				164		
v/c Ratio		0.00				0.06				0.34				0.10		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				1.5				0.3		
Control Delay (s/veh)		8.8				8.4				14.2				29.4		
Level of Service (LOS)		A				A				B				D		
Approach Delay (s/veh)	0.1				0.8				14.2				29.4			
Approach LOS									B				D			

HCS7 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	2027			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	
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	4	412	22	0	72	597	35	29	1	185		15	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

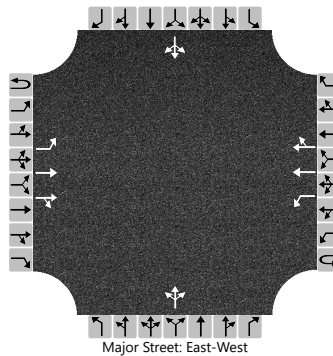
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				72				215				17		
Capacity, c (veh/h)		940				1115				583				156		
v/c Ratio		0.00				0.06				0.37				0.11		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				1.7				0.4		
Control Delay (s/veh)		8.8				8.5				14.7				30.8		
Level of Service (LOS)		A				A				B				D		
Approach Delay (s/veh)	0.1				0.9				14.7				30.8			
Approach LOS									B				D			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Highway 12		
Analysis Year	2020			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	290	37	0	41	439	60	30	1	112		22	4	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

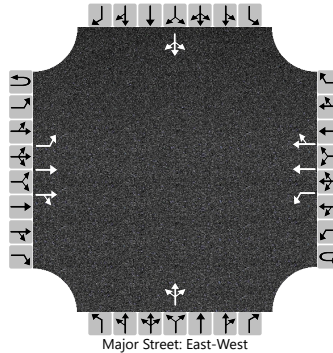
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				41					143					27	
Capacity, c (veh/h)		1054				1222					653					280	
v/c Ratio		0.00				0.03					0.22					0.10	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					0.8					0.3	
Control Delay (s/veh)		8.4				8.0					12.1					19.2	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)	0.0				0.6				12.1				19.2				
Approach LOS									B				C				

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	AM School Peak With PH1			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	293	38	0	44	443	60	32	1	121		23	4	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	

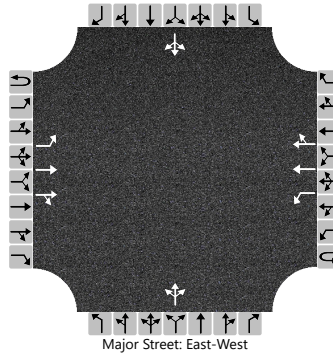
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				44					154				28	
Capacity, c (veh/h)		1051				1218					648				271	
v/c Ratio		0.00				0.04					0.24				0.10	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					0.9				0.3	
Control Delay (s/veh)		8.4				8.1					12.3				19.8	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				0.6				12.3				19.8			
Approach LOS									B				C			

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM School Peak With PH2			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	294	38	0	46	444	60		32	1	126		23	4	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

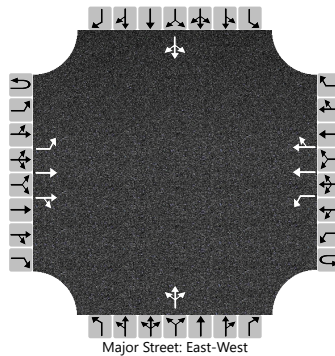
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				46					159					28	
Capacity, c (veh/h)		1050				1217					650					267	
v/c Ratio		0.00				0.04					0.24					0.10	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					1.0					0.3	
Control Delay (s/veh)		8.4				8.1					12.3					20.1	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)		0.0				0.7				12.3				20.1			
Approach LOS										B				C			

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM School Peak With PH3			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	298	39	0	49	450	61	34	1	136		23	4	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

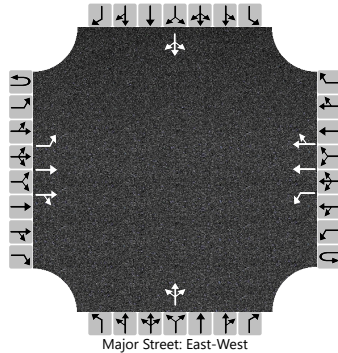
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				49				171				28		
Capacity, c (veh/h)		1043				1212				644				257		
v/c Ratio		0.00				0.04				0.27				0.11		
95% Queue Length, Q ₉₅ (veh)		0.0				0.1				1.1				0.4		
Control Delay (s/veh)		8.5				8.1				12.6				20.7		
Level of Service (LOS)		A				A				B				C		
Approach Delay (s/veh)	0.0				0.7				12.6				20.7			
Approach LOS									B				C			

HCS7 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	2027			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	300	40	0	51	454	62		36	1	143		23	4	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

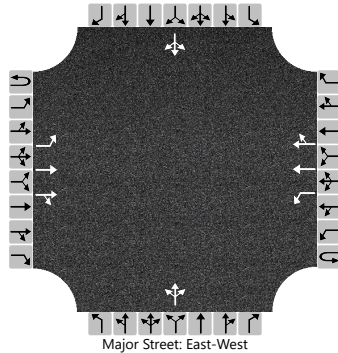
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				51					180					28	
Capacity, c (veh/h)		1039				1209					639					250	
v/c Ratio		0.00				0.04					0.28					0.11	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					1.2					0.4	
Control Delay (s/veh)		8.5				8.1					12.8					21.2	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)	0.0				0.7				12.8				21.2				
Approach LOS									B				C				

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM Peak With PH3			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	4	408	22	0	68	592	34	27	1	172		15	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

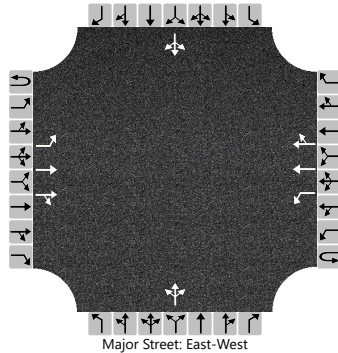
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				68				200					17	
Capacity, c (veh/h)		945				1119				589					164	
v/c Ratio		0.00				0.06				0.34					0.10	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				1.5					0.3	
Control Delay (s/veh)		8.8				8.4				14.2					29.4	
Level of Service (LOS)		A				A				B					D	
Approach Delay (s/veh)	0.1				0.8				14.2				29.4			
Approach LOS									B				D			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Highway 12		
Analysis Year	2020			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						

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	4	618	7	0	52	484	22		4	7	37		22	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

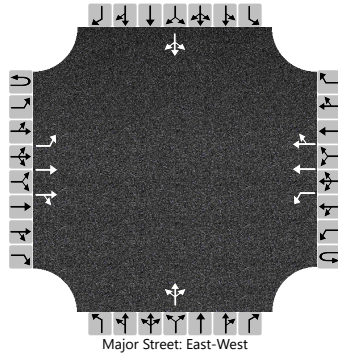
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				52					48					24	
Capacity, c (veh/h)		1048				946					406					201	
v/c Ratio		0.00				0.05					0.12					0.12	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					0.4					0.4	
Control Delay (s/veh)		8.4				9.0					15.0					25.4	
Level of Service (LOS)		A				A					C					D	
Approach Delay (s/veh)		0.1				0.8				15.0				25.4			
Approach LOS										C				D			

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	PM Peak With PH2			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	4	625	13	0	81	490	23	7	8	54		23	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

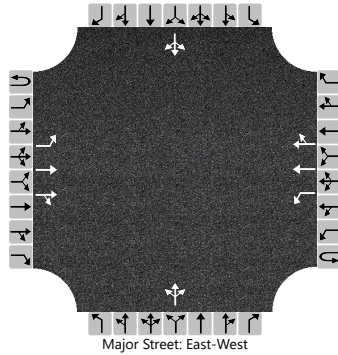
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				81				69				25		
Capacity, c (veh/h)		1042				935				387				168		
v/c Ratio		0.00				0.09				0.18				0.15		
95% Queue Length, Q ₉₅ (veh)		0.0				0.3				0.6				0.5		
Control Delay (s/veh)		8.5				9.2				16.3				30.1		
Level of Service (LOS)		A				A				C				D		
Approach Delay (s/veh)	0.1				1.3				16.3				30.1			
Approach LOS									C				D			

HCS7 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	2026	North/South Street	Granite Ave				
Time Analyzed	PM Peak With PH3	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	4	634	16	0	100	496	23	9	8	65		23	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

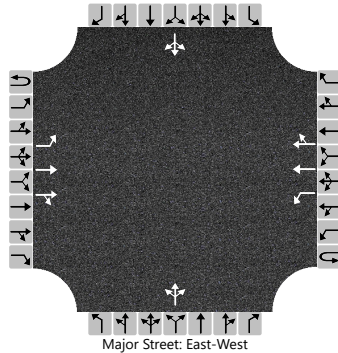
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				100				82				25		
Capacity, c (veh/h)		1036				925				373				149		
v/c Ratio		0.00				0.11				0.22				0.17		
95% Queue Length, Q ₉₅ (veh)		0.0				0.4				0.8				0.6		
Control Delay (s/veh)		8.5				9.4				17.3				34.0		
Level of Service (LOS)		A				A				C				D		
Approach Delay (s/veh)	0.1				1.5				17.3				34.0			
Approach LOS									C				D			

HCS7 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	2027			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
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	4	639	18	0	112	501	23		10	8	73		23	0	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

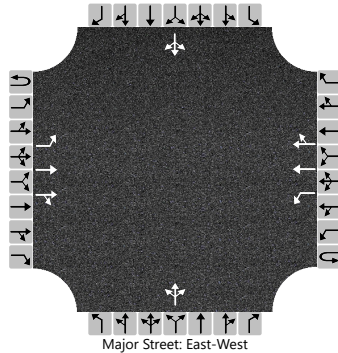
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				112				91				25		
Capacity, c (veh/h)		1032				920				368				143		
v/c Ratio		0.00				0.12				0.25				0.17		
95% Queue Length, Q ₉₅ (veh)		0.0				0.4				1.0				0.6		
Control Delay (s/veh)		8.5				9.5				18.0				35.5		
Level of Service (LOS)		A				A				C				E		
Approach Delay (s/veh)	0.1				1.7				18.0				35.5			
Approach LOS									C				E			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Hwy 12		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Highway 12		
Analysis Year	2020			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						

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	331	15	0	60	342	26	48	1	190		22	4	7	
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	

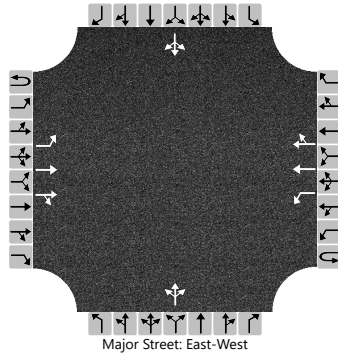
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				60					239				33	
Capacity, c (veh/h)		1180				1202					644				312	
v/c Ratio		0.00				0.05					0.37				0.11	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.7				0.4	
Control Delay (s/veh)		8.1				8.2					13.8				17.9	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				1.1				13.8				17.9			
Approach LOS									B				C			

HCS7 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	2022	North/South Street	Granite Ave				
Time Analyzed	PM School Peak With PH1	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	334	17	0	70	345	26		50	1	197		23	4	8
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

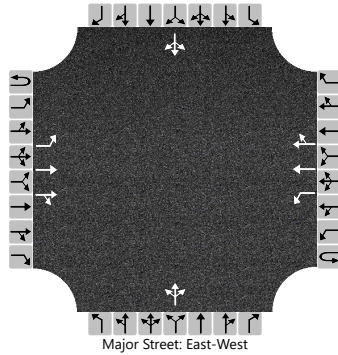
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				70					248					35	
Capacity, c (veh/h)		1177				1197					630					300	
v/c Ratio		0.00				0.06					0.39					0.12	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.9					0.4	
Control Delay (s/veh)		8.1				8.2					14.4					18.6	
Level of Service (LOS)		A				A					B					C	
Approach Delay (s/veh)		0.0				1.3				14.4				18.6			
Approach LOS										B				C			

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	PM School Peak With PH2			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	335	18	0	75	346	26	50	1	200		23	4	8	
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

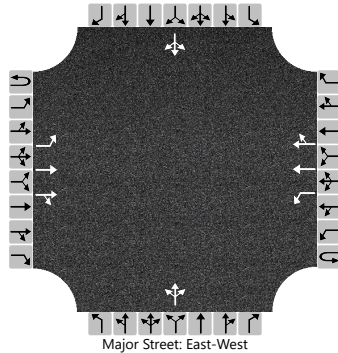
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				75				251				35		
Capacity, c (veh/h)		1176				1195				625				293		
v/c Ratio		0.00				0.06				0.40				0.12		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				1.9				0.4		
Control Delay (s/veh)		8.1				8.2				14.6				19.0		
Level of Service (LOS)		A				A				B				C		
Approach Delay (s/veh)	0.0				1.4				14.6				19.0			
Approach LOS									B				C			

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	PM School Peak With PH3			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	340	19	0	84	351	27		50	1	208		23	4	8
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

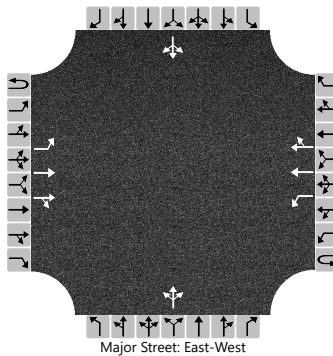
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				84					259					35	
Capacity, c (veh/h)		1170				1189					616					276	
v/c Ratio		0.00				0.07					0.42					0.13	
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					2.1					0.4	
Control Delay (s/veh)		8.1				8.3					15.0					19.9	
Level of Service (LOS)		A				A					C					C	
Approach Delay (s/veh)		0.0				1.5				15.0				19.9			
Approach LOS										C				C			

HCS7 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	2027			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	343	21	0	91	354	27	53	1	214		23	4	8	
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

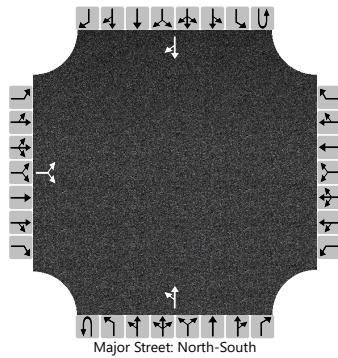
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				91				268				35		
Capacity, c (veh/h)		1167				1184				601				265		
v/c Ratio		0.00				0.08				0.45				0.13		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2				2.3				0.4		
Control Delay (s/veh)		8.1				8.3				15.7				20.6		
Level of Service (LOS)		A				A				C				C		
Approach Delay (s/veh)	0.0				1.6				15.7				20.6			
Approach LOS									C				C			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA	Intersection	Granite & Knight				
Agency/Co.	ATS	Jurisdiction	City of Helena				
Date Performed	8/25/2020	East/West Street	Knight Street				
Analysis Year	2020	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)		16		1						8	80				48	8
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						

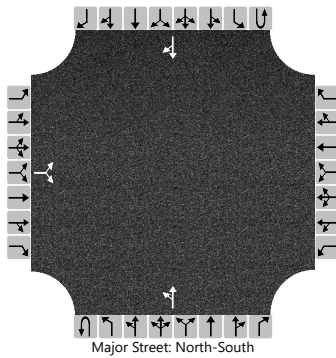
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17							8						
Capacity, c (veh/h)			846							1542						
v/c Ratio			0.02							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.3							7.3						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.3								0.7						
Approach LOS		A														

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH1			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)		21		1						8	96					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						

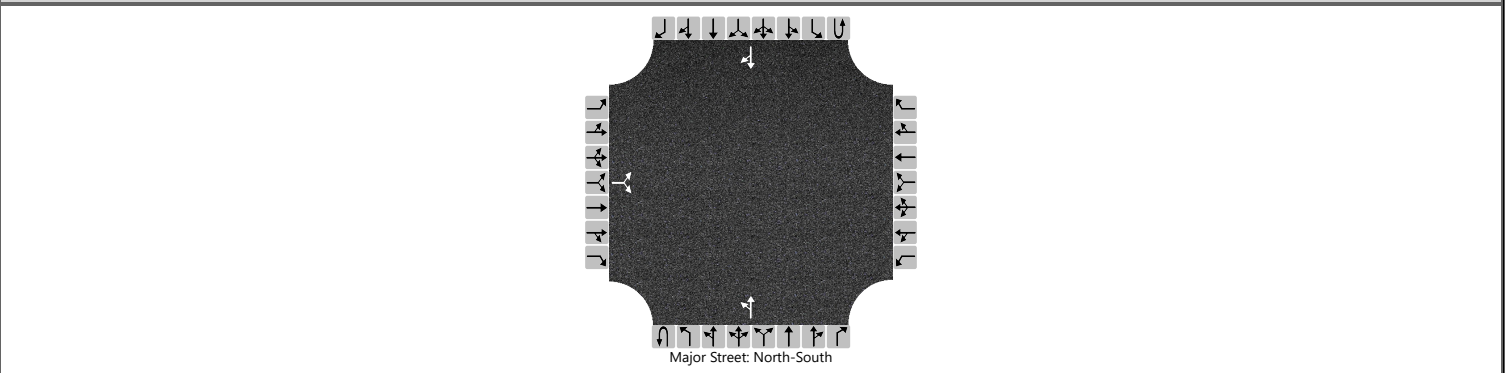
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			22							8						
Capacity, c (veh/h)			820							1533						
v/c Ratio			0.03							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.5							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.5								0.6						
Approach LOS		A														

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH2			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)		24		1						8	104					56	11
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						

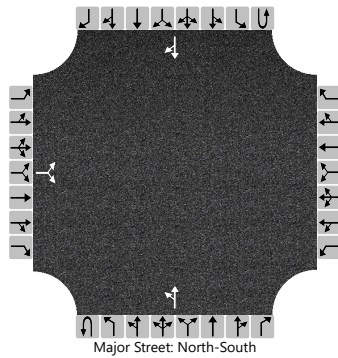
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			25							8						
Capacity, c (veh/h)			808							1528						
v/c Ratio			0.03							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.6							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.6								0.6						
Approach LOS		A														

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	AM Peak Hour With PH3			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)		29		1						8	119					62
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						

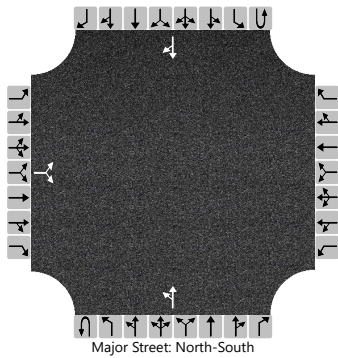
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30							8						
Capacity, c (veh/h)			784							1519						
v/c Ratio			0.04							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.8							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.8								0.5						
Approach LOS		A														

HCS7 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	2027			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)		33		1						8	131				65	13
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						

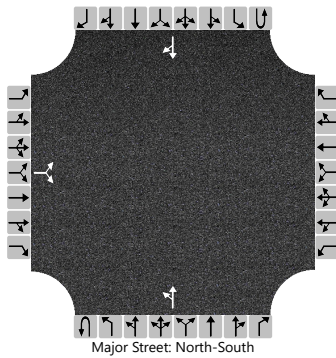
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			34							8						
Capacity, c (veh/h)			768							1514						
v/c Ratio			0.04							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.9							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.9								0.5						
Approach LOS		A														

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA			Intersection	Granite & Knight		
Agency/Co.	ATS			Jurisdiction	City of Helena		
Date Performed	8/25/2020			East/West Street	Knight Street		
Analysis Year	2020			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)		24		1						12	120				72	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						

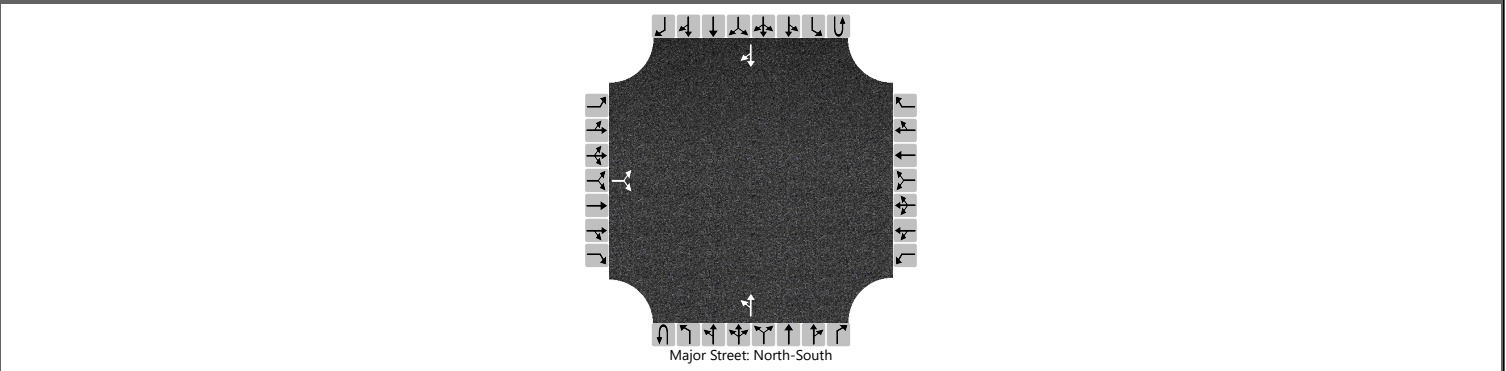
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			25							12						
Capacity, c (veh/h)			764							1506						
v/c Ratio			0.03							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.9							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.9								0.7						
Approach LOS		A														

HCS7 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	2022	North/South Street	Granite Ave				
Time Analyzed	AM Peak School With PH1	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		1						12	129				75	13
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						

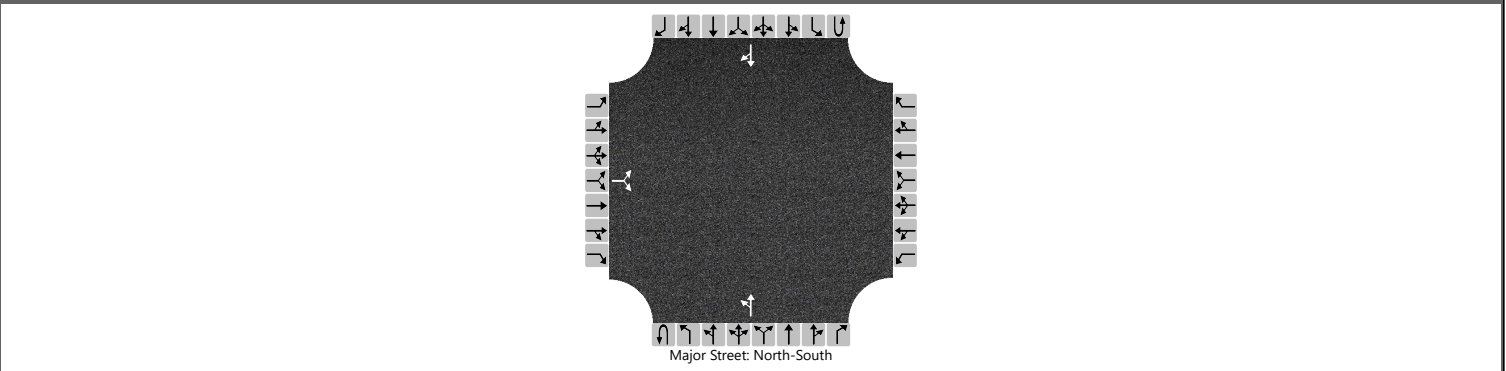
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			28							12						
Capacity, c (veh/h)			751							1501						
v/c Ratio			0.04							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			10.0							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		10.0								0.7						
Approach LOS		A														

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With PH2			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)		28		1						12	133				77	13
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						

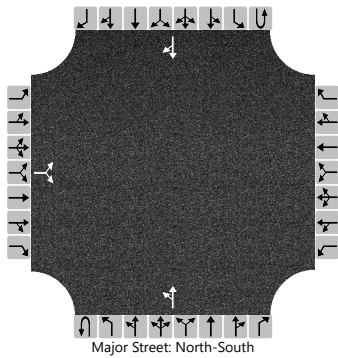
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			29							12						
Capacity, c (veh/h)			745							1499						
v/c Ratio			0.04							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			10.0							7.4						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.0								0.7						
Approach LOS		B														

HCS7 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	2024			North/South Street	Granite Ave		
Time Analyzed	AM Peak School With PH3			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)		31		1						12	142				80	14
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						

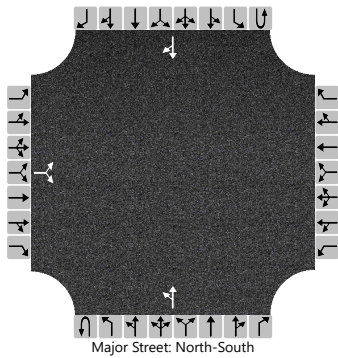
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			32							12						
Capacity, c (veh/h)			733							1494						
v/c Ratio			0.04							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			10.1							7.4						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.1								0.6						
Approach LOS		B														

HCS7 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	2027			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)		33		1						12	148				82	15
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						

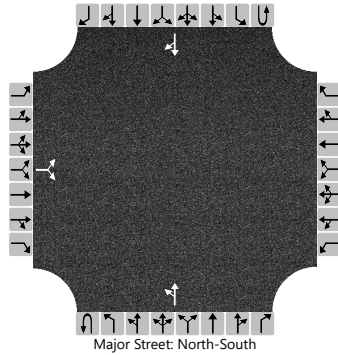
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			34							12						
Capacity, c (veh/h)			724							1490						
v/c Ratio			0.05							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			10.2							7.4						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.2								0.6						
Approach LOS		B														

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA	Intersection	Granite & Knight				
Agency/Co.	ATS	Jurisdiction	City of Helena				
Date Performed	8/25/2020	East/West Street	Knight Street				
Analysis Year	2020	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)		72		8						16	40				56	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						

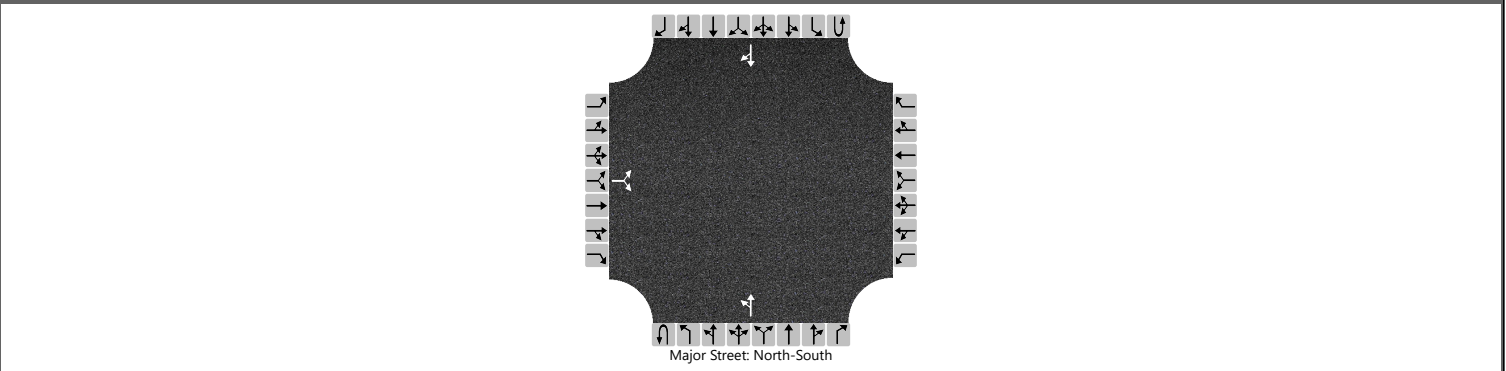
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			80							16						
Capacity, c (veh/h)			859							1522						
v/c Ratio			0.09							0.01						
95% Queue Length, Q ₉₅ (veh)			0.3							0.0						
Control Delay (s/veh)			9.6							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.6								2.2						
Approach LOS		A								A						

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With PH1			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)		76		8						16	50					73	22
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						

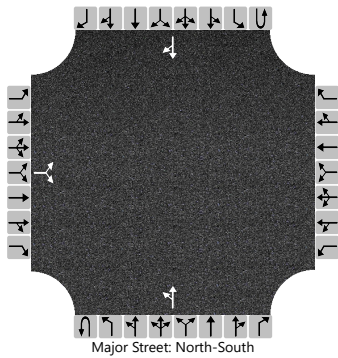
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			84							16						
Capacity, c (veh/h)			826							1493						
v/c Ratio			0.10							0.01						
95% Queue Length, Q ₉₅ (veh)			0.3							0.0						
Control Delay (s/veh)			9.9							7.4						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		9.9								1.9						
Approach LOS		A														

HCS7 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	2022			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With PH1			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)		78		8						16	55				82	25
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						

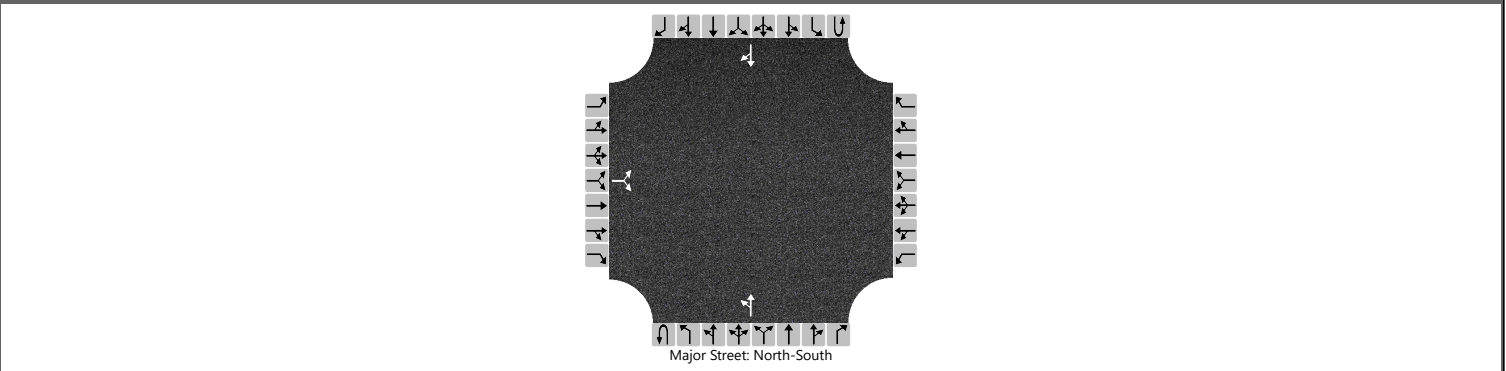
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			86							16						
Capacity, c (veh/h)			809							1478						
v/c Ratio			0.11							0.01						
95% Queue Length, Q ₉₅ (veh)			0.4							0.0						
Control Delay (s/veh)			10.0							7.5						
Level of Service (LOS)			A							A						
Approach Delay (s/veh)		10.0								1.7						
Approach LOS		A														

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	PM Peak Hour With PH3			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)		82		8						16	65				98	30
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						

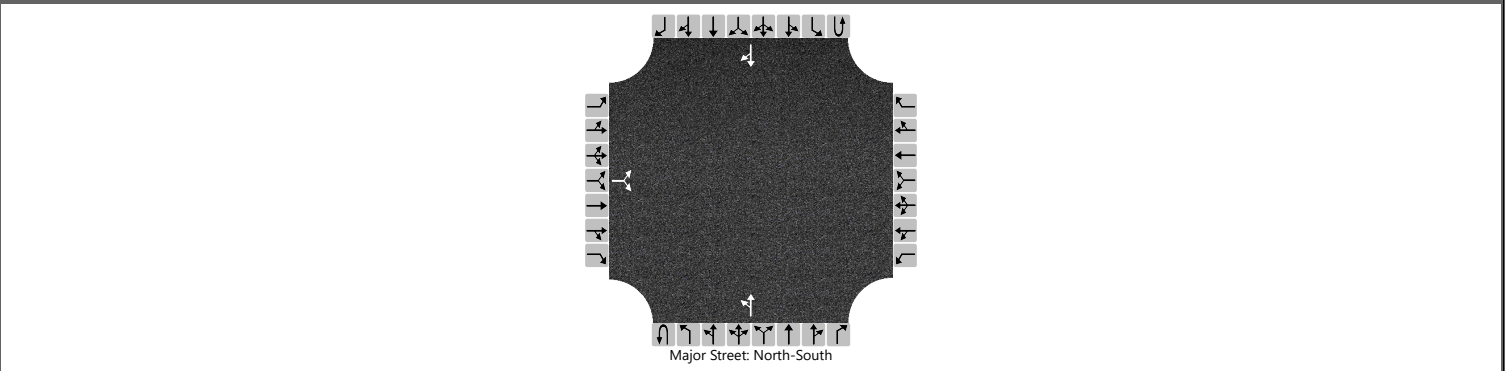
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			90							16						
Capacity, c (veh/h)			780							1452						
v/c Ratio			0.12							0.01						
95% Queue Length, Q ₉₅ (veh)			0.4							0.0						
Control Delay (s/veh)			10.2							7.5						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.2								1.6						
Approach LOS		B														

HCS7 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	2027			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)		85		8						17	72					110	34
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						

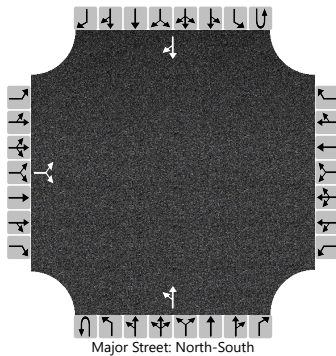
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93							17							
Capacity, c (veh/h)			756							1432							
v/c Ratio			0.12							0.01							
95% Queue Length, Q ₉₅ (veh)			0.4							0.0							
Control Delay (s/veh)			10.4							7.5							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		10.4								1.5							
Approach LOS		B															

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	RLA	Intersection	Granite & Knight				
Agency/Co.	ATS	Jurisdiction	City of Helena				
Date Performed	8/25/2020	East/West Street	Knight Street				
Analysis Year	2020	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	1	0		0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		84		12						24	60				84	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						

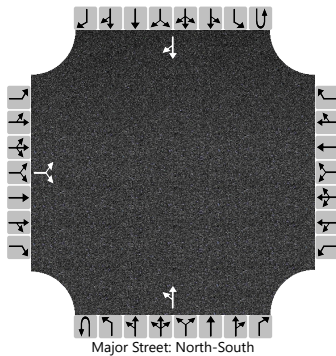
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			96							24						
Capacity, c (veh/h)			788							1476						
v/c Ratio			0.12							0.02						
95% Queue Length, Q ₉₅ (veh)			0.4							0.0						
Control Delay (s/veh)			10.2							7.5						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.2								2.2						
Approach LOS		B														

HCS7 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	2027			North/South Street	Granite Ave		
Time Analyzed	PM Peak School With PH1			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)		86		12						24	65				93	27
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						

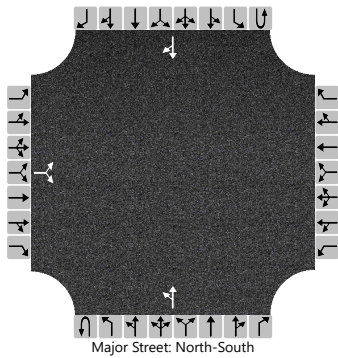
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			98							24						
Capacity, c (veh/h)			773							1462						
v/c Ratio			0.13							0.02						
95% Queue Length, Q ₉₅ (veh)			0.4							0.1						
Control Delay (s/veh)			10.3							7.5						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.3								2.1						
Approach LOS		B														

HCS7 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	2027	North/South Street	Granite Ave				
Time Analyzed	PM Peak School With PH2	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	1	0		0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		87		12						24	68				98	28
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						

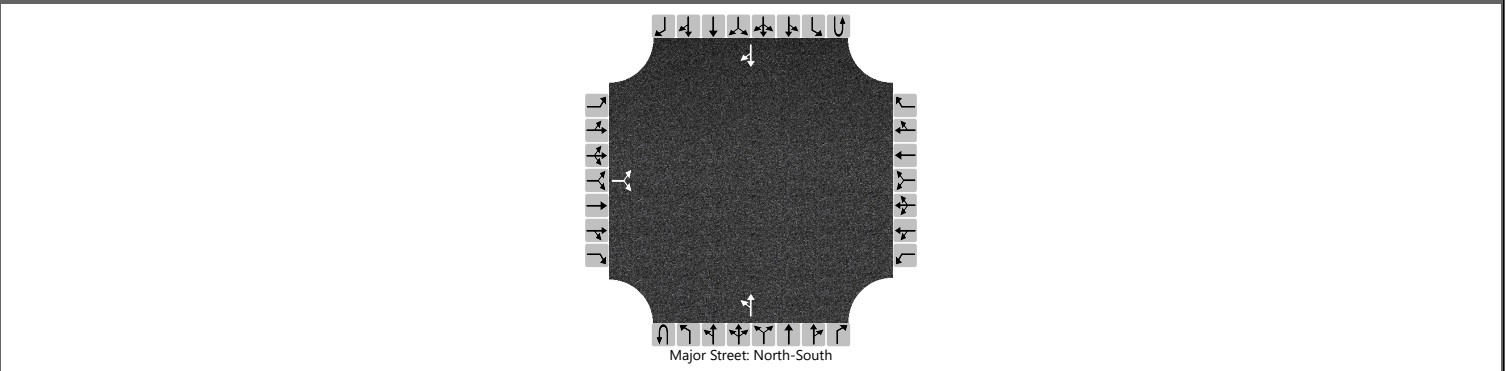
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			99							24						
Capacity, c (veh/h)			764							1454						
v/c Ratio			0.13							0.02						
95% Queue Length, Q ₉₅ (veh)			0.4							0.1						
Control Delay (s/veh)			10.4							7.5						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		10.4								2.1						
Approach LOS		B														

HCS7 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	2026			North/South Street	Granite Ave		
Time Analyzed	PM Peak School With PH3			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)		90		12						25	74					107	31
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)			102							25							
Capacity, c (veh/h)			745							1440							
v/c Ratio			0.14							0.02							
95% Queue Length, Q ₉₅ (veh)			0.5							0.1							
Control Delay (s/veh)			10.6							7.5							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		10.6								2.0							
Approach LOS		B															

HCS7 Two-Way Stop-Control Report

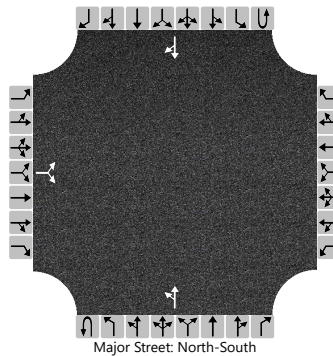
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/6/2021
Analysis Year	2027
Time Analyzed	PM Peak School With Dev
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	
Movement																	
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)		92		12						25	77					113	33
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)			104							25							
Capacity, c (veh/h)			735							1430							
v/c Ratio			0.14							0.02							
95% Queue Length, Q ₉₅ (veh)			0.5							0.1							
Control Delay (s/veh)			10.7							7.6							
Level of Service (LOS)			B							A							
Approach Delay (s/veh)		10.7								2.0							
Approach LOS		B								A							

West Side Major Subdivision
Traffic Model

Seasonal Factor 0.93
Covid Factor 2

		Granite						Granite					
AM Peak Hour (15 min x 4)		12.7/25.3 B/D				PM Peak Hour (15 min x 4)		15.0/25.4 C/D					
Existing 2021	2017 MDT Data	0	↶	↷	33	Euclid	Existing	0	↶	↷	22	Euclid	
		0	↵	↶	577		2021	0	↵	↶	484		
		15	↶	↷	52		22	↶	↷	52			
		4	↷	↶	19			4	↷	↶	4		
		398	↷	↶	0			618	↷	↶	7		
		19	↷	↶	126			7	↷	↶	37		
	2020 ATS Data	8	↶	↷	9.3 A			16	↶	↷	9.6 A		
		48	↵	↶	Knight			56	↵	↶	Knight		
		16	↷	↶	↶ 8			72	↷	↶	↶ 16		
		0	↷	↶	↶ 80			8	↷	↶	↶ 40		
	2020 ATS Data	24	↶	↷	9.4/8.7 A/A	Hauser		16	↶	↷	9.7/9.1 A/A	Hauser	
		24	↵	↶	↶ 8				64	↵	↶		↶ 8
		8	↶	↷	↶ 0				8	↶	↷		↶ 8
		24	↷	↶	↶ 0			40	↷	↶	↶ 0		
		8	↷	↶	↶ 40			8	↷	↶	↶ 16		
		0	↷	↶	↶ 8			0	↷	↶	↶ 8		

West Side Major Subdivision
Traffic Model

Seasonal Factor 0.93
Covid Factor 3

AM Peak School Period
(15 min x 4)

Existing
2021

Granite

12.1/19.2 B/C

0	↶	↷	60
4	↵	↶	439
22	↶	↷	41
0	↷	↶	30
290	↷	↶	0
37	↶	↷	112

Euclid

9.9 A

12	↶	↷	12
72	↵	↶	120
24	↷	↶	12
0	↶	↷	120

Hauser

9.9/8.8 A/A

36	↶	↷	12
36	↵	↶	0
12	↶	↷	0
36	↷	↶	0
12	↷	↶	60
0	↶	↷	12

PM Peak School Period
(15 min x 4)

Existing
2021

Granite

13.8/17.9 B/C

7	↶	↷	26
4	↵	↶	342
22	↶	↷	60
0	↷	↶	48
331	↷	↶	0
15	↶	↷	190

Euclid

10.2 B

24	↶	↷	24
84	↵	↶	60
84	↷	↶	24
12	↶	↷	60

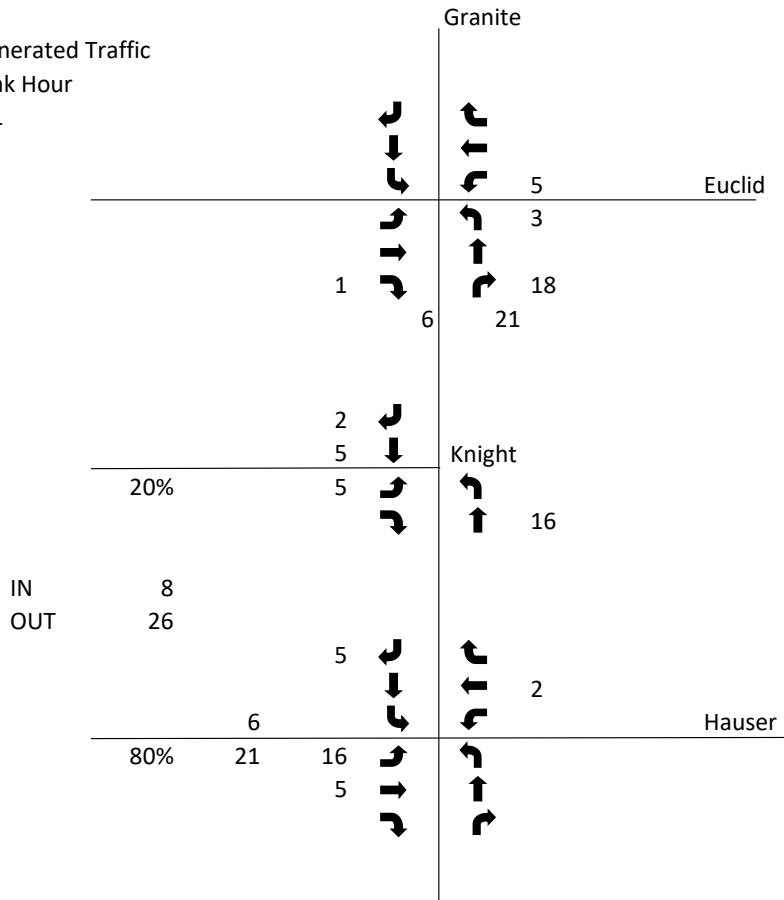
Hauser

10.4/9.4 B/A

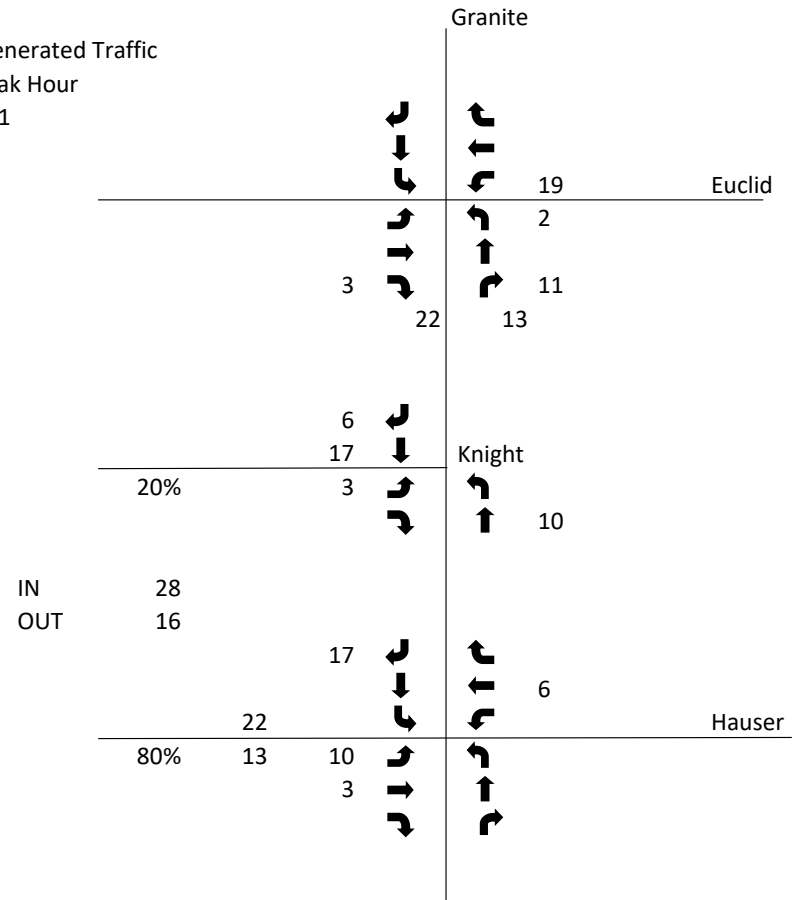
24	↶	↷	24
96	↵	↶	12
12	↶	↷	12
60	↷	↶	0
12	↷	↶	24
0	↶	↷	12

West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour
Phase 1

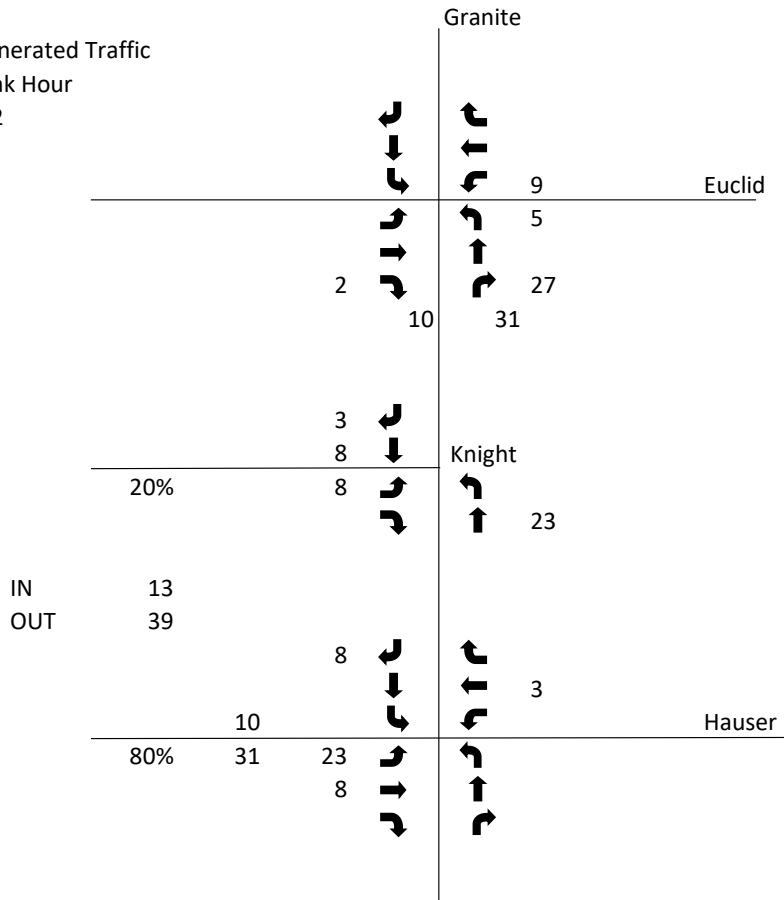


Site Generated Traffic
PM Peak Hour
Phase 1

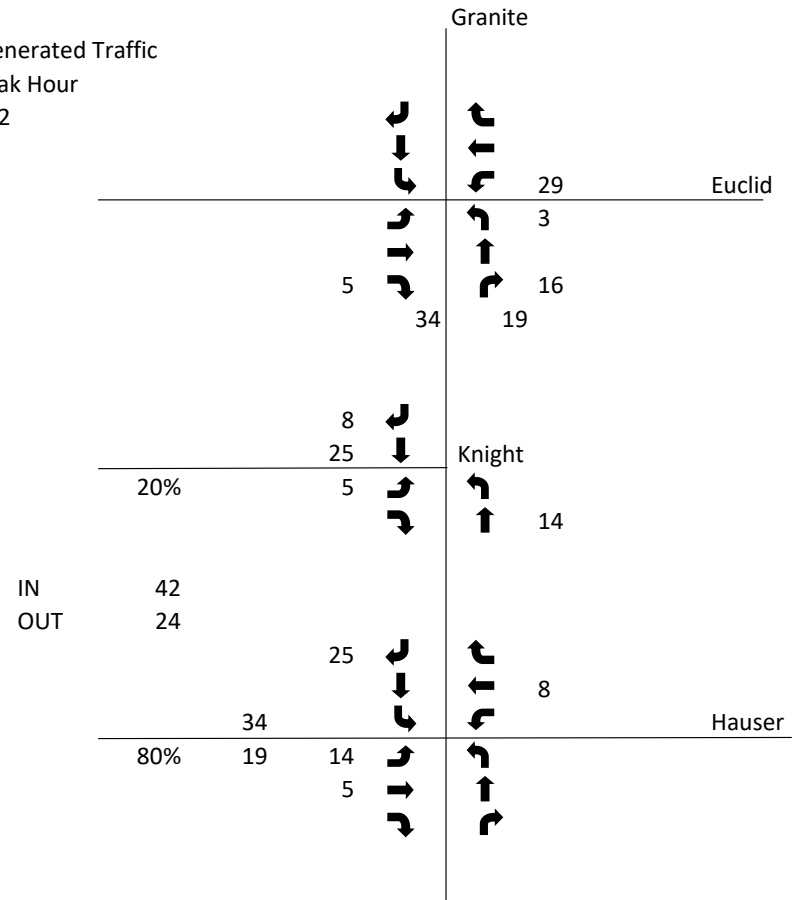


West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour
Phase 2

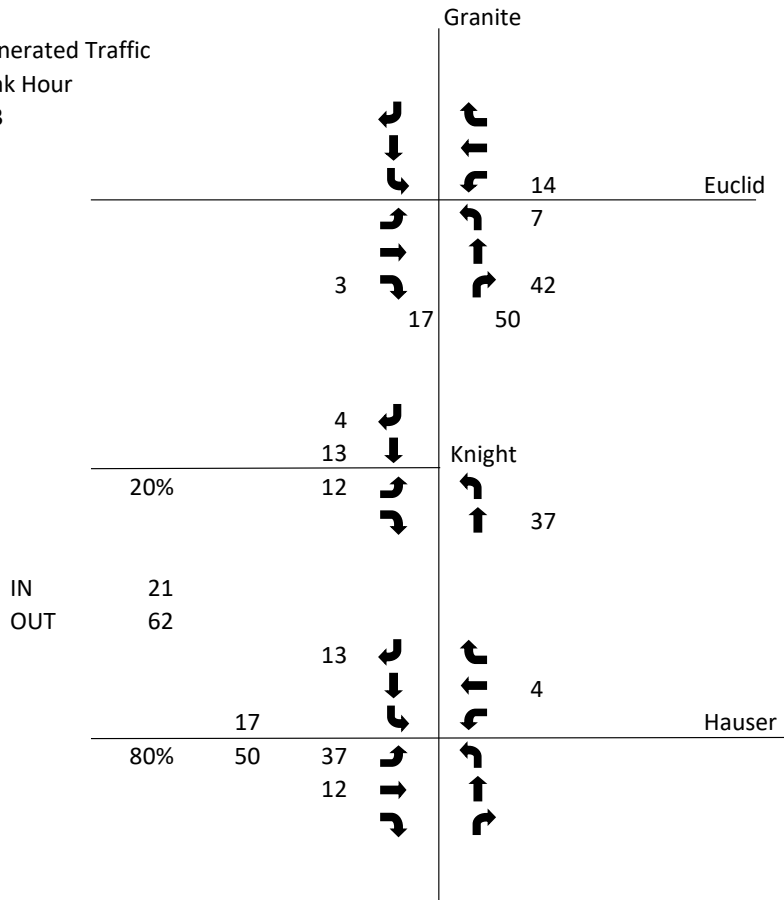


Site Generated Traffic
PM Peak Hour
Phase 2

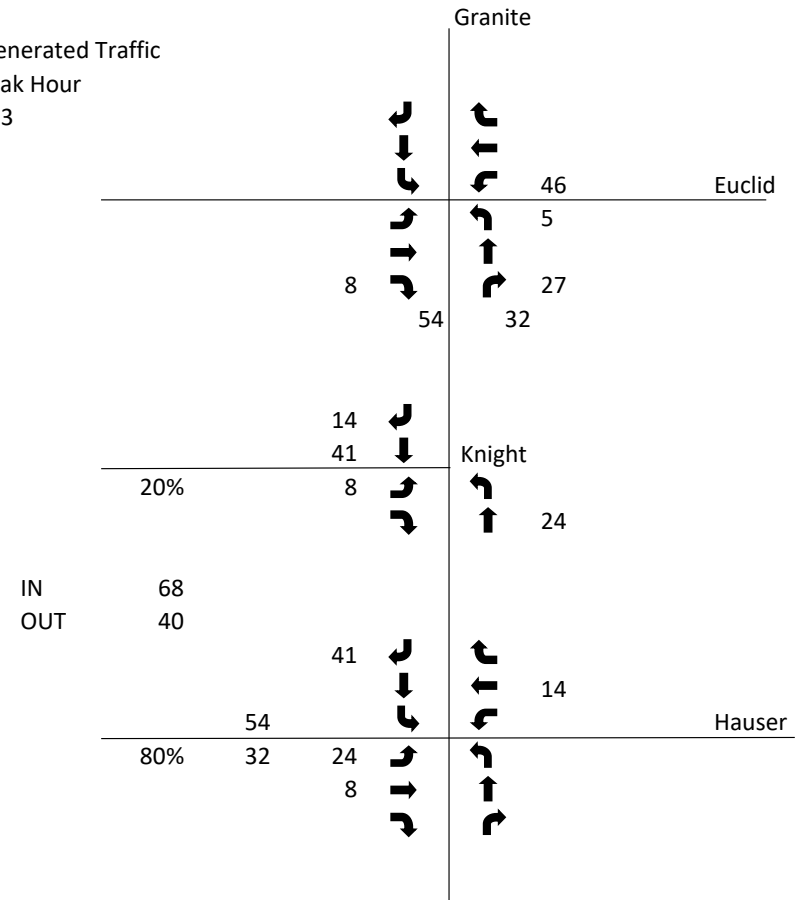


West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour
Phase 3

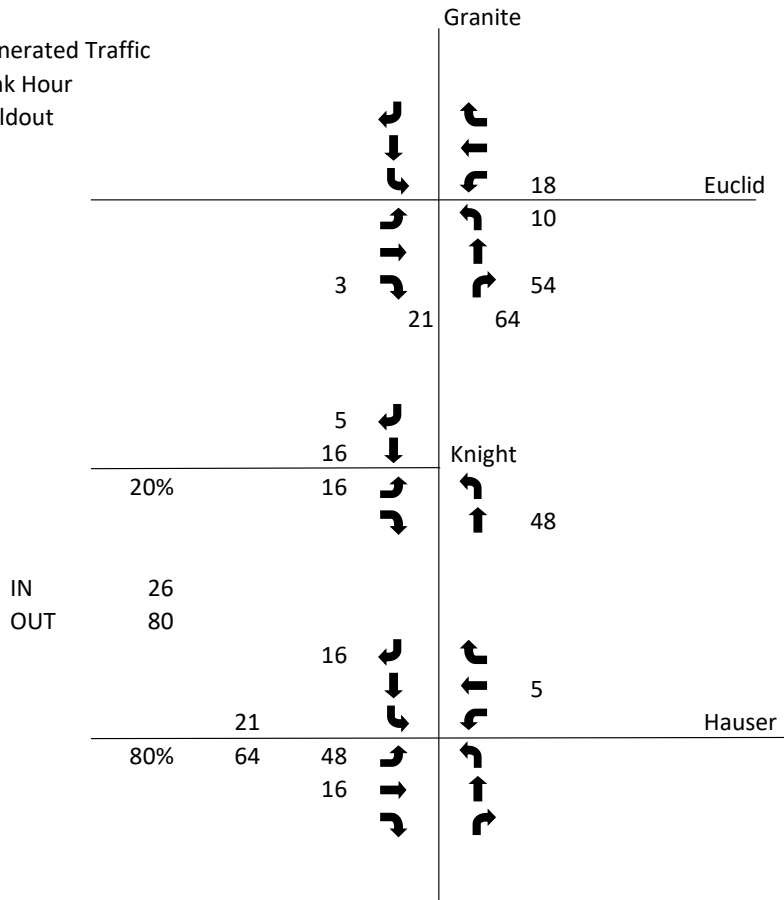


Site Generated Traffic
PM Peak Hour
Phase 3

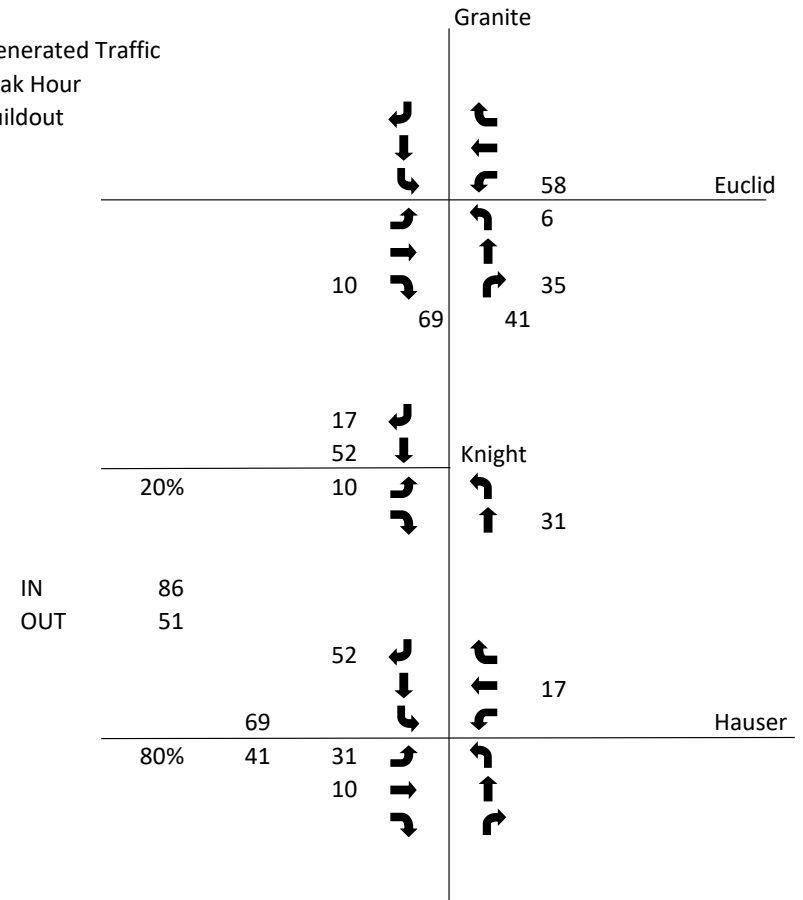


West Side Major Subdivision
Traffic Model

Site Generated Traffic
AM Peak Hour
Full Buildout



Site Generated Traffic
PM Peak Hour
Full Buildout



West Side Major Subdivision
Traffic Model

Growth Factor 1.009

AM Peak Hour

Total Projected Traffic PHASE 1
2022

		Granite		
		13.2/26.8 B/D		
0	↶	↶	34	
0	↷	↷	582	
15	↶	↶	58	Euclid
4	↷	↷	22	
402	↶	↶	0	
20	↷	↷	145	
		9.5 A		
10	↶	↶	8	
53	↷	↷	96	
21	↶	↶	8	
0	↷	↷	96	
		LOS: 9.6/8.8 A/A		
29	↶	↶	8	
24	↷	↷	2	
8	↶	↶	0	Hauser
40	↷	↷	0	
13	↶	↶	40	
0	↷	↷	8	

PM Peak Hour

Total Projected Traffic PHASE 1
2022

		Granite		
		16.0/28.6 C/D		
0	↶	↶	23	
0	↷	↷	488	
23	↶	↶	72	Euclid
4	↷	↷	6	
623	↶	↶	8	
11	↷	↷	48	
		9.9 A		
22	↶	↶	16	
73	↷	↷	50	
76	↶	↶	16	
8	↷	↷	50	
		9.9/9.3 A/A		
33	↶	↶	16	
65	↷	↷	14	
8	↶	↶	8	Hauser
50	↷	↷	0	
11	↶	↶	16	
0	↷	↷	8	

West Side Major Subdivision
Traffic Model

Growth Factor 1.012

AM Peak Hour

Total Projected Traffic PHASE 2
2024

		Granite		
		13.5/27.7 B/D		
0	↶	↶	34	
0	↷	↷	584	
15	↶	↶	62	Euclid
4	↷	↷	24	
403	↶	↶	0	
20	↷	↷	155	
		9.6 A		
11	↶	↶	8	
56	↷	↷	104	
24	↶	↶	8	
0	↷	↷	104	
		9.7/8.9 A/A		
32	↶	↶	8	
24	↷	↷	3	
8	↶	↶	0	Hauser
48	↷	↷	0	
16	↶	↶	40	
0	↷	↷	8	

PM Peak Hour

Total Projected Traffic PHASE 2
2024

		Granite		
		16.3/30.1 C/D		
0	↶	↶	23	
0	↷	↷	490	
23	↶	↶	81	Euclid
4	↷	↷	7	
625	↶	↶	8	
13	↷	↷	54	
		10.0 A		
25	↶	↶	16	
82	↷	↷	55	
78	↶	↶	16	
8	↷	↷	55	
		10.0/9.4 A/A		
41	↶	↶	16	
65	↷	↷	16	
8	↶	↶	8	Hauser
55	↷	↷	0	
13	↶	↶	16	
0	↷	↷	8	

West Side Major Subdivision
Traffic Model

Growth Factor 1.026

AM Peak Hour

Total Projected Traffic PHASE 3
2026

		Granite		
		14.2/29.4 B/D		
0	↶	↶	34	
0	↵	↶	592	
15	↶	↶	68	Euclid
<hr/>				
4	↷	↷	27	
408	↷	↷	0	
22	↷	↷	172	
<hr/>				
		9.8 A		
12	↶			
62	↵			
<hr/>				
29	↷	↶	8	
0	↷	↶	119	
<hr/>				
		9.8/9.0 A/A		
37	↶	↶	8	
25	↵	↶	4	
8	↶	↶	0	Hauser
<hr/>				
62	↷	↷	0	
21	↷	↷	41	
0	↷	↷	8	

PM Peak Hour

Total Projected Traffic PHASE 3
2026

		Granite		
		17.3/34.0 C/D		
0	↶	↶	23	
0	↵	↶	496	
23	↶	↶	100	Euclid
<hr/>				
4	↷	↷	9	
634	↷	↷	8	
16	↷	↷	65	
<hr/>				
		10.2 B		
30	↶			
98	↵			
<hr/>				
82	↷	↶	16	
8	↷	↶	65	
<hr/>				
		10.2/9.6 B/A		
57	↶	↶	16	
66	↵	↶	22	
8	↶	↶	8	Hauser
<hr/>				
65	↷	↷	0	
16	↷	↷	16	
0	↷	↷	8	

West Side Major Subdivision
Traffic Model

Growth Factor 1.035

AM Peak Hour

Total Projected Traffic

Full Buildout

2027

		Granite			
		14.7/30.8 B/D			
0	↶	↶	35		
0	↵	↵	597		
15	↷	↷	72	Euclid	
<hr/>					
4	↶	↶	29		
412	↵	↵	0		
22	↷	↷	185		
		9.9 A			
13	↶	↶	8		
65	↵	↵	131		
33	↷	↷	8		
0	↶	↶	131		
		9.9/9.1 A/A			
40	↶	↶	8		
25	↵	↵	5		
8	↷	↷	0	Hauser	
<hr/>					
73	↶	↶	0		
24	↵	↵	41		
0	↷	↷	8		

PM Peak Hour

Total Projected Traffic

Full Buildout

2027

		Granite			
		18.0/35.5 C/E			
0	↶	↶	23		
0	↵	↵	501		
23	↷	↷	112	Euclid	
<hr/>					
4	↶	↶	10		
639	↵	↵	8		
18	↷	↷	73		
		10.4 B			
34	↶	↶	17		
110	↵	↵	72		
85	↷	↷	17		
8	↶	↶	72		
		10.4/9.7 B/A			
68	↶	↶	17		
66	↵	↵	25		
8	↷	↷	8	Hauser	
<hr/>					
72	↶	↶	0		
18	↵	↵	17		
0	↷	↷	8		

West Side Major Subdivision
Traffic Model

Growth Factor 1.0088

AM Peak Hour

Total Projected Traffic PHASE 1
2022

		Granite				
		12.3/19.8 B/C				
0	↻	↻	60			
4	↵	↵	443			
23	↶	↶	44	Euclid		
		10.0 A				
0	↷	↷	32			
293	↸	↸	0			
38	↹	↹	121			
		10.0/8.8 B/A				
13	↻	↻	12			
75	↵	↵	129			
27	↶	↶	0			
0	↷	↷	0			
		10.5/9.5 B/A		Hauser		
39	↻	↻	12			
36	↵	↵	1			
12	↶	↶	0			
44	↷	↷	0			
15	↸	↸	61			
0	↹	↹	12			

PM Peak Hour

Total Projected Traffic PHASE 1
2022

		Granite				
		14.4/18.6 B/C				
8	↻	↻	26			
4	↵	↵	345			
23	↶	↶	70	Euclid		
		10.3 B				
0	↷	↷	50			
334	↸	↸	0			
17	↹	↹	197			
		10.5/9.5 B/A				
27	↻	↻	24			
93	↵	↵	65			
86	↶	↶	0			
12	↷	↷	0			
		10.5/9.5 B/A		Hauser		
33	↻	↻	24			
97	↵	↵	15			
12	↶	↶	12			
65	↷	↷	0			
14	↸	↸	24			
0	↹	↹	12			

West Side Major Subdivision
Traffic Model

Growth Factor 1.0123

AM Peak Hour

Total Projected Traffic PHASE 2
2024

		Granite				
		12.3/20.1 B/C				
0	↻	↻	60			
4	↻	↻	444			
23	↻	↻	46	Euclid		
		10.0 B				
0	↻	↻	32			
294	↻	↻	0			
38	↻	↻	126			
		10.0/8.8 B/A				
13	↻	↻	12			
77	↻	↻	133			
28	↻	↻	0			
0	↻	↻	0			
		10.0/8.8 B/A				
40	↻	↻	12			
36	↻	↻	1			
12	↻	↻	0	Hauser		
48	↻	↻	0			
16	↻	↻	61			
0	↻	↻	12			

PM Peak Hour

Total Projected Traffic PHASE 2
2024

		Granite				
		14.6/19.0 B/C				
8	↻	↻	26			
4	↻	↻	346			
23	↻	↻	75	Euclid		
		10.4 B				
0	↻	↻	50			
335	↻	↻	0			
18	↻	↻	200			
		10.6/9.6 B/A				
28	↻	↻	24			
98	↻	↻	68			
87	↻	↻	0			
12	↻	↻	0			
		10.6/9.6 B/A				
37	↻	↻	24			
97	↻	↻	16			
12	↻	↻	12	Hauser		
68	↻	↻	0			
15	↻	↻	24			
0	↻	↻	12			

West Side Major Subdivision
Traffic Model

Growth Factor 1.0263

AM Peak Hour

Total Projected Traffic PHASE 3
2026

		Granite				
		12.6/20.7 B/C				
0	↻	↻	61			
4	↻	↻	450			
23	↻	↻	49	Euclid		
		10.1 B				
0	↻	↻	34			
298	↻	↻	0			
39	↻	↻	136			
		10.2/8.9 B/A				
43	↻	↻	12			
37	↻	↻	2			
12	↻	↻	0	Hauser		
		10.6 B				
56	↻	↻	0			
19	↻	↻	62			
0	↻	↻	12			

PM Peak Hour

Total Projected Traffic PHASE 3
2026

		Granite				
		15.0/19.9 C/C				
8	↻	↻	27			
4	↻	↻	351			
23	↻	↻	84	Euclid		
		10.6 B				
0	↻	↻	52			
340	↻	↻	0			
19	↻	↻	208			
		10.8/9.7 B/A				
31	↻	↻	25			
107	↻	↻	74			
90	↻	↻	12			
12	↻	↻	12	Hauser		
		10.8/9.7 B/A				
45	↻	↻	25			
99	↻	↻	19			
12	↻	↻	12	Hauser		
		10.8/9.7 B/A				
74	↻	↻	0			
16	↻	↻	25			
0	↻	↻	12			

West Side Major Subdivision
Traffic Model

Growth Factor 1.035

AM Peak Hour

Total Projected Traffic

Full Buildout

2027

		Granite			
		12.8/21.2 B/C			
0			62		
4			454		
23			51	Euclid	
<hr/>					
0			36		
300			0		
40			143		
<hr/>					
		10.2 B			
15					
82					
33			12		
0			148		
<hr/>					
		10.2/9.0 B/A			
45			12		
37			3		
12			0	Hauser	
<hr/>					
61			0		
20			62		
0			12		

PM Peak Hour

Total Projected Traffic

Full Buildout

2027

		Granite			
		15.7/20.7 C/C			
8			27		
4			354		
23			91	Euclid	
<hr/>					
0			53		
343			0		
21			214		
<hr/>					
		10.7 B			
33					
113					
92			25		
12			77		
<hr/>					
		10.9/9.7 B/A			
51			25		
99			21		
12			12	Hauser	
<hr/>					
77			0		
18			25		
0			12		

APPENDIX E
SIGNAL WARRANT ANALYSIS



April 9, 2021

Jeremy Fadness, P.E.
WWC Engineering
1275 Maple Street, Suite F
Helena, MT 59601

RE: Euclid Avenue/Granite Avenue Signal Warrant Analysis

Dear Jeremy,

As requested by the City of Helena, ATS has performed a signalization warrant analysis 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 2017 by MDT 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

The traffic data collected by MDT was for three days in September 2017. Based on historic data from MDT (see **Section 4.2** of the Traffic Impact Study), traffic volumes on Euclid Avenue have not changed significantly over the last three years and the 2017 data is still valid for the signal warrant analysis. Traffic volumes within Lewis & Clark County in 2021 continue to be affected by the impacts of Covid-19, especially around public schools, and are not generally recommended for use.

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 2017 data is only 34 VPH. 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

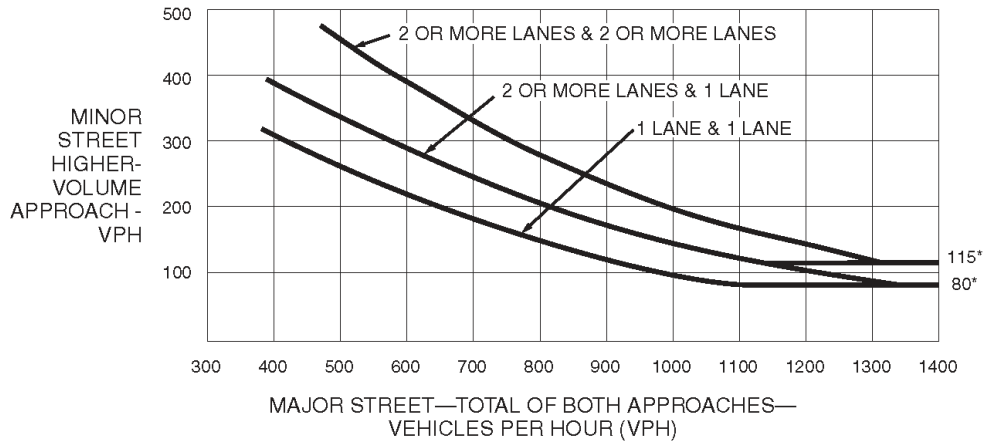
MUTCD SECTION 4C.03

“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 2017 minor leg approach volume at this intersection is approximately 50 VPH in the fourth highest hour. Again, it is unlikely that the fourth highest traffic hour from the West Side subdivision will produce sufficient traffic to meet this warrant, especially if the right-turn traffic reduction is taken into consideration. Therefore, this warrant is not met.

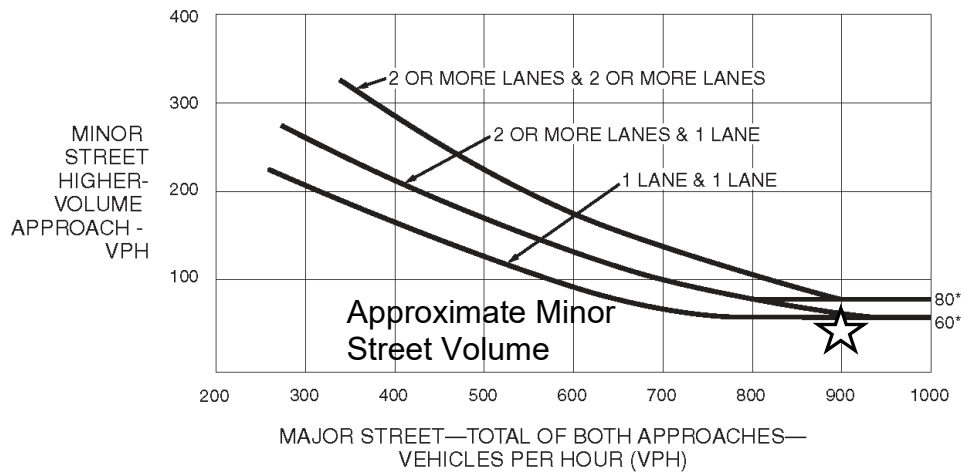
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*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

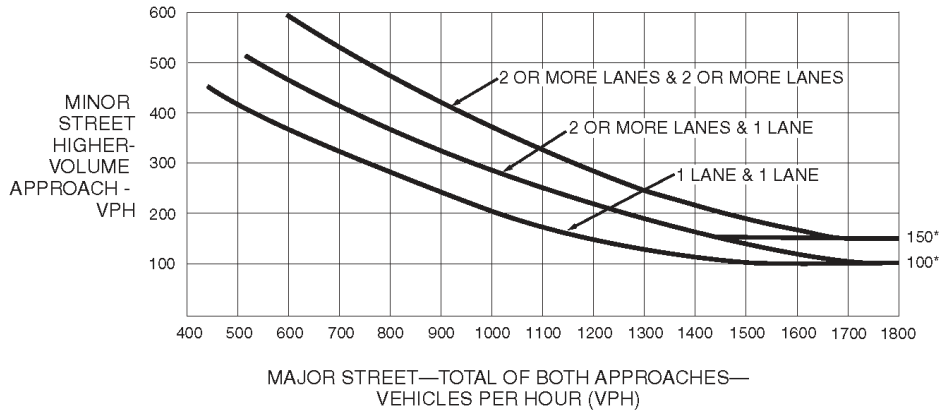
“The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

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 900 VPH and northbound peak-hour traffic is approximately 100 VPH. If the West Side subdivision increases the peak-hour northbound traffic volume by 50-60 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 any right-turn reduction 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.

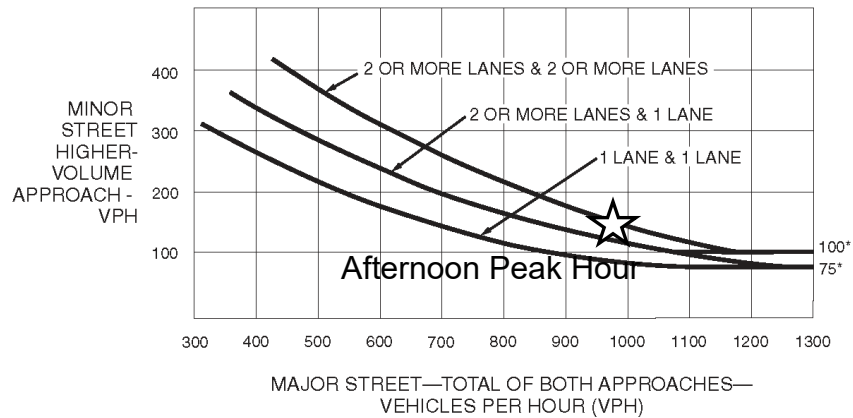
Figure 4C-3. Warrant 3, Peak Hour



*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. 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 eight 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 likely 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. 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.

If you have any questions regarding this analysis and recommendation, please feel free to call me at 406-459-1443.

Sincerely,

A handwritten signature in black ink, appearing to read "Bob Abelin". The signature is written in a cursive style with a large initial "B" and "A".

Bob Abelin, P.E. PTOE
Abelin Traffic Services, Inc.

Study Name Euclid & Granite

Start Date 09/26/2017

	Major	Minor SB	Minor NB	Highest
Start Time	VPD	VPH	VPH	Rank

9/26/2017

7:00 AM	870	9	93	3
8:00 AM	798	21	122	5
9:00 AM	623	21	27	
10:00 AM	637	27	32	
11:00 AM	646	25	31	
12:00 PM	688	27	30	8
1:00 PM	698	32	43	7
2:00 PM	754	47	36	6
3:00 PM	917	39	97	2
4:00 PM	949	22	37	1
5:00 PM	868	35	42	4
6:00 PM	558	23	34	

9/27/2017

7:00 AM	915	11	100	2
8:00 AM	789	15	103	5
9:00 AM	637	20	38	
10:00 AM	632	18	24	
11:00 AM	668	39	35	
12:00 PM	743	29	31	7
1:00 PM	723	29	43	8
2:00 PM	766	30	26	6
3:00 PM	860	30	84	3
4:00 PM	1017	40	36	1
5:00 PM	860	43	63	4
6:00 PM	580	28	35	

9/28/2017

7:00 AM	858	7	101	5
8:00 AM	819	18	100	6
9:00 AM	621	11	24	
10:00 AM	663	26	30	
11:00 AM	689	32	27	
12:00 PM	774	36	42	7
1:00 PM	714	23	29	8
2:00 PM	858	42	40	4
3:00 PM	895	28	106	3
4:00 PM	1080	39	37	1
5:00 PM	934	46	45	2
6:00 PM	628	21	44	

AVERAGE OF 3 DAYS

	Major Street	Minor SB	Minor NB
	VPH	VPH	VPH
Peak Hour	1015	34	37
4hr Peak	862	40	48
8hr Peak	708	26	34