T·O ENGINEERS

TECHNICAL MEMORANDUM

TO:	Inga Note, P.E., City of Spokane Greg Figg, WSDOT
FROM:	Caleb Lindquist, Staff Engineer Pete Szobonya, P.E., Senior Engineer
DATE:	July 2021
JOB NO.:	210313
RE:	Crystal Ridge Threshold Analysis
CC:	Mamdouh El-Aarag, P.E., MHE Engineering

☐**Urgent** ☒**For Review** ☐**Please Comment** ☐**Please Reply** ☐**For Your Use**

This memorandum summarizes the transportation threshold analysis prepared on behalf of the Crystal Ridge subdivision proposed within the City of Spokane. The purpose of this memorandum is to review the transportation impacts of a proposed residential development on State and City roadways and recommend improvements to assure safe and sufficient mobility, as needed. The memorandum can be used to support environmental reviews (SEPA support), a transportation concurrency determination, and design approval processes.

This study will be submitted to the City of Spokane as the lead land use jurisdiction and the Washington State Department of Transportation (WSDOT) as an impacted agency. Additional agencies can comment per invitation of staff from the City of Spokane. Questions regarding the proposed land use action can be addressed by MHE Engineering. Questions about this study can be addressed by T-O Engineers.

1. PROJECT DESCRIPTION

The Crystal Ridge Second Addition project involves the development of a 56-lot subdivision on a 14.25-acre parcel generally situated west of U.S. Route 195 and south of 16th Avenue in Spokane. The plat is in the southern half of the northwestern quarter of section 25, township 25 north, range 42 east, W.M. lying easterly of the Spokane Portland and Seattle Railroad Company right of way and westerly of the abandoned Union Pacific Railroad right of way. The address of the development is 2500 W 17th Ave, Spokane, Washington 99201. The development is zoned as residential – single family (RSF). The property is owned by Mr. Konstantin Vasilenko at Spokane Townhomes LLC. Sewer, water, and fire district is all provided by the City of Spokane.

The site is to be developed with lot sizes ranging from 4,100 to 11,300 square-feet. The density of units on this development is 3.93 units per acre. Access to the property will be gained through a connection to Nettleton Lane. Additionally, a connection will be made to Cochran Street on the northeast end of the site. The Cochran Street connection will be used as emergency access only. Nettleton Lane extends to 16th Avenue where project trips can distribute to U.S. Route 195 or other City streets to access the region.

The project would be developed in phases with completion and full occupancy anticipated by year 2024. **Figure 1** provides a site location map. **Figure 2** provides the current site plan for the Crystal Ridge development. The site plan is subject to some change throughout design. The conclusions of this study should be adequate so long as the number of units do not increase substantially, nor

the number or location of proposed site access does not differ substantially from what is planned. An increase of more than six (6) dwellings on the site would increase the travel demands of this project by 10-perenton, warranting further study. A decrease in dwellings should not impact the conclusions as the number of trips decrease; therefore, making the conclusions "worse case". This analysis is designed to be conservative in assumptions and predictions.

2. Analysis Scope and Methodology

WSDOT staff required that a transportation threshold determination be provided for this project, as opposed to a trip generation and distribution letter only, or a full traffic impact analysis (TIA). A transportation threshold study is an abridged TIA structured to address the most relevant impacts of a new development, typically at one or two adjacent or off-site intersections. In this situation, the project will most substantially impact the off-site intersections of 16th Avenue / U.S. Route 195 and Sunset Highway / Government Way, as identified per coordination with City and WSDOT staff. Another difference, as compared to a TIA, is the threshold study tends to focus mostly on traffic conditions with minimal review provided for non-motorized facilities. Crash statistics are also not addressed in the threshold study.

The analysis was performed based on a review of forecast AM and PM peak hour traffic volumes. The AM and PM peak hours are the highest hours of travel demand along 16th Avenue / U.S. Route 195 and Sunset Highway / Government Way. The analysis was prepared for year 2024 as the project will be complete by this forecast horizon.

Methodology – Intersection Operations

Congestion and increased vehicle delays are experienced more rapidly at intersections versus road segments (between intersections) due to the number and frequency of conflicts (e.g., turning vehicles and stopping or slowing movements). For this reason, intersection operations/capacity normally provide a basis for a threshold determination, with conditions measured in terms of levels of service (LOS). LOS represents the performance of an intersection from the motorist's perspective. LOS analysis is effective in understanding the performance of an intersection with respect to the individual user and the amount of time they will spend waiting to travel through the intersection, or in accessing a roadway from a stopped approach.

LOS methodologies are derived from the *Highway Capacity Manual* (Transportation Research Board, 2016). The *Highway Capacity Manual* (HCM) is a nationally recognized and locally accepted method of measuring traffic flow and congestion for intersections and driveways. Criteria range from LOS A, indicating free-flow conditions with minimal vehicle delay, to LOS F, indicating congestion with significant vehicle delay. LOS are differentiated via control delay thresholds.

LOS for a signalized intersection is defined in terms of the average control delay experienced by all vehicles at an intersection, typically over a specified time such as a peak hour. LOS at a *four-way* stop-controlled intersection is also defined by the average control delays experienced by all vehicles at the intersection within the specified timeframe. LOS for a *two-way* stop-controlled intersection is a function of the average control vehicle delay experienced by an approach or approach movement over a time interval. Typically, the stopped approach or movement experiencing the worst LOS is reported for the intersection.

Table 1 outlines the LOS criteria for signalized and unsignalized intersections from the *Highway Capacity Manual*. As shown, LOS thresholds, as a function of delay, vary between signalized and unsignalized intersections. This is because driver tolerances for delay have been documented to be much higher at signalized versus unsignalized intersections.

Table 1. Intersection Level of Service Criteria		
Levels of Service	Signalized Control Delay (sec/veh)	Unsignalized Control Delay (sec/veh)
A	≤10	≤10
B	>10 – 20	>10 - 15
C	>20 – 35	>15 - 25
D	>35 – 55	>25 - 35
E	>55 – 80	>35 - 50
F	> 80	>50

City and WSDOT officials have established LOS D as the minimum acceptable level for signalized intersections and LOS E for unsignalized intersections in this area of Spokane, including along U.S. Route 195. LOS was determined using Synchro 11, a software module from Trafficware®. This software tool utilizes the methodologies of HCM and is a standard industry software package. See the technical appendix for the LOS reports generated by Synchro.

3. Forecast Traffic Volumes

Intersection turn movement counts were collected on June 10th, 2021, for the Sunset Boulevard / Government Way intersection and June 11th for the U.S. Route 195 / 16th Avenue intersection. The two counts are recent enough to be considered useful and reflective of real-life conditions for this study. Counts were performed between 7:00 to 9:00 AM and 4:00 to 6:00 PM, with the AM and PM peak hours of the intersection identified from each count and used with the capacity analysis.

Figure 3 provides a summary of the current AM and PM peak hour traffic volumes at the study intersections of Sunset Boulevard and Government Way and U.S. Route 195 at 16Th Avenue. Note that counts were taken after the Governor Jay Inslee opened Washington State to Phase III, a standing of business compliance in response to the COVID-19 pandemic. Traffic demands did decrease substantially at the onset of the pandemic but have predominantly normalized since approximately February/March of 2021. The phase III determination predominantly normalized lingering traffic impacts. As such, no adjustments were applied counts to address pandemic conditions.

Year 2024 forecasts account for baseline traffic growth, the trip assignments associated with the Crystal Ridge development, and the trip assignments associated with an anticipated pipeline project. A summary of these forecasts elements is discussed in the following subsections.

Baseline Traffic Growth

Baseline traffic growth refers to the increase of through traffic not typically associated with specific land use developments. Typically, this growth is anticipated from factors such as through traffic growth due to development outside a project study area, the construction of individual homes and small business on lots, and other similar traffic growth motivators. Baseline growth is forecast with the use of annual growth rates, identified as described below. This growth rate was applied to existing traffic volumes to generate baseline year 2024 forecasts for the AM and PM peak hours.

The City and WSDOT maintain historical traffic counts for arterials and highways, respectively. Available historical counts were reviewed for 10 years extending 2009 to 2019 for stations around the Sunset Boulevard / Government Way and U.S. Route 195 / 16th Avenue intersections. The review indicates traffic has increased at within the two to three percent range annually, on

average, over the last ten years on all but U.S. 395. However, there is substantial development yet anticipated off the Highway within the City. As such, a 3-percent annual growth rate was applied to create a 9.3 percent total increase in traffic by 2024, as the result of this baseline growth rate application. This growth rate is also anticipated to address any potential lingering count adjustments remaining from COVID-19 impacts.

Pipeline Project

A concurrently developing "pipeline" project has been approved by local agencies for construction but has yet to generate trips to be reflected in traffic counts. It is important to address these projects in forecasts specifically, as they are certain to generate trips that impact a study area, in this case the Sunset Boulevard / Government Way and 16th Avenue / U.S. Route 195 intersections.

One pipeline project is considered for this project. Wheatland Estates, a proposed development in Spangle, Washington will have noticeable impact with regard to study intersections. The project applicant proposes the development of 50.54 acres, as occupied by 197 single family residential lots. The site is proposed to be accessed from the south by three roads. Two access roads along Cheney-Spangle Road and one access road are a proposed extension of Terra Firma Road. The site is proposed to be accessed from the east by two connections to U.S. Route 195.

The Wheatland Estates project is proposed to be completed in year 2025 but may be completed earlier due to construction schedule and permitting. This threshold determination considers the Wheatland Estates project to be completed by 2024, to generate conservative analysis results. Per a TIA prepared by Whipple Consulting Engineers in 2019, the project is expected to generate 146 trips in the AM peak hour with 196 trips generated during the PM peak hour. About 35-percent of these trips are expected to travel U.S. Route 195. **Figure 4** shows the project assignments anticipated by the Wheatland Estates pipeline project at study intersections.

Note: The Wheatland Estates TIA indicates that 16th avenue and U.S. Route 195 is already operating below acceptable level of service currently. The TIA recommended improvements to this intersection to reduce congestion and preserve intersection safety.

Trip Generation

Trip generation was forecast based on the methodologies of the Trip Generation Manual (ITE, 10th Edition, 2017). Trip Generation is a nationally recognized and locally accepted resource for forecasting traffic for commercial, institutional, and residential developments. The methods were developed based on the survey of other existing land uses located within the U.S.

Trip generation was developed using ITE Land Use Code 210. Trip totals were calculated based on the number of single-family homes, as this is the method described in the Trip Generation Manual. Trip generation was forecast for the AM and PM peak hours of adjacent street traffic, representing the impacts of the project upon the morning and evening rush hours of commute traffic. **Table 2** provides a summary of trip generation for the 2024 occupancy year of the project.

Table 2. Trip Generation Potentials, Crystal Ridge Development, Year 2024

Land Use	Weekday	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Total Trips (56 single-family detached homes)	610	11	34	45	35	21	56

Source: Trip Generation manual (ITE, 2017)

As shown, 610 weekday trips are forecast with this development. About 45 of these trips are generated during the AM peak hour and 56 during the PM peak hour. These peak hourly trips would comprise 17 percent of total weekday trips.

Trip Distribution and Assignment

Trip distribution and assignment is the process of forecasting likely travel routes for development-related traffic, as to identify the impacts upon area streets. For this study, an assessment of origins and destinations was performed based on a review of average daily traffic (ADT) counts (i.e., travel densities) and an understanding of land use information within relation to the site. Also, known congestion issues were reflected in these assessments; in particular, the difficulties of performing an eastbound left-turn onto U.S. Route 195 combined with a problematic merge of northbound U.S. Route 195 to eastbound I-90 traffic due to a short ramp junction.

In terms of counts, U.S. Route 195 supports about 24,000 ADT at 16th Avenue and Sunset Highway nearly 15,000 ADT at Government Way, with Government Way supporting about 10,000 ADT north of the Sunset Highway. Thus, trips were initially proportioned to these routes based on a comparison of ADT travel densities. However, most trips are expected to travel to/from downtown Spokane and the I-90 corridor for the work commute, with the shortest route provided via U.S. Route 195.

Thus, about 65-percent of trips overall were expected to/from the City via U.S. Route 195, traveling via I-90, and the balance Sunset Highway. About 45-percent of trips approaching the site were expected to travel south on U.S. Route 195 and turn right onto 16th Avenue with the 20-percent balance using Sunset Highway, turning right at Government Way. However, given the congestion/travel issues noted above, distributions were reversed with about 20-percent of trips forecast to turn left on U.S. Route 195 for travel to I-90 and Spokane, with 45-percent using Sunset Highway given this is a less congested and safer departure route.

Project trips are anticipated to use two commercial centers, the various restaurants and services provided within Airway Heights and those restaurants/services aligned at the Cheney-Spokane Road interchange south on U.S. Route 195. About 10-percent of trips were expected to travel to/from Airway Heights via Sunset Road and 10-percent to/from the Cheney-Spokane Road interchange via U.S. Route 195 to access these services, respectively.

Government Way provides a more direct route to north Spokane versus using I-90 and downtown arterial streets, as noted by rather high ADT volumes. Thus, the remaining 15-percent of site trips were forecast to travel this roadway, approaching, and departing site trips, during the weekday.

Trips were assigned to study roadways based on the described distribution patterns. **Figure 5** provides a summary of project trip assignments for the AM and PM peak hours. Per WSDOT request, a total of 7 AM peak hour and 3 PM peak hour project trips are forecast to turn left onto U.S. Route 195 at 16th Avenue (eastbound to northbound), and then use the I-90 on-ramp from U.S. Route 195 (northbound to westbound) during the typical weekday.

Year 2024 Forecasts

Pipeline project trips were combined with baseline traffic growth forecasts to generate non-project forecasts. These year 2024 without project peak hour traffic volumes are shown with **Figure 6.** Understanding the “before and after” forecast of a project is important in conceptualizing the impact that the development will have on the transportation system at given study intersections.

Without-project forecasts and project trip assignments were combined to generate the year 2024 with-project forecasts shown with **Figure 7** for the AM and PM peak hours. In summary, year 2024 traffic forecasts are comprised of: baseline growth, trips generated by the Wheatland Estates pipeline project, and trips generated by the Crystal Ridge development.

The forecasting process described results an approximate 12% increase in TEV over 2021 traffic counts during both peak hours, averaging just under 4-percent annual growth over three years. The purpose of this analysis is to show that conservative traffic forecasts were developed for the capacity/LOS analyses. It is likely that true background traffic growth will be lower than the three percent used in this analysis.

4. Roadway Network

This study provides an analysis of capacity and mobility for the two off-site intersections. Sunset Boulevard and Government Way are principal arterials that connect that access residential and commercial areas and provide connectivity between areas inside and outside of the city.

- **Government Way** has two northbound and two southbound travel lanes at the Sunset Highway Intersection. The posted speed limit is 30 miles per hour. There are northbound and southbound left-turn lanes at this signalized intersection, working on permitted left-turn phasing (shared movements with through-traffic). Government Way is designated Lindeke Street south of the Government Way intersection.
- **Sunset Boulevard** has eastbound and westbound left-turn lanes with protected/exclusive allowances, also with right turn lanes on both approaches. There are two through lanes in the westbound direction and only one in the eastbound direction with bike lanes. Sunset Boulevard has a posted speed limit of 30 miles per hour around the signaled intersection.

16th Avenue is a minor arterial that extends from Lindeke Street to U.S. Route 195.

- **16th Avenue** has one lane of travel in both directions (two-lane road) with a posted speed limit of 25 miles per hour. Left, through, and right-turning movements are shared from single approach lanes at U.S. Route 195. Traffic most cross two highway lanes to cross or turn left onto U.S. Route 195.

U.S. Route 195 is an urban freeway that extends from I-90 to the Washington-Idaho border.

- **U.S. Route 95** is a divided highway at 16th Avenue with two northbound and two southbound lanes. The posted speed limit is 55 miles per hour. At the intersection with 16th Avenue, there are existing left turn lanes on both approaches. There is space for one-queued vehicle in the median opening between travel lanes.

WSDOT is working to implement J-Turns along U.S. Route 195 through Spokane to improve performance and safety for highway traffic. One such improvement is programmed near 16th Avenue with a southbound to northbound J-turn planned south of the existing intersection. This project would close 16th Avenue to eastbound and westbound through and left-turn movements. All eastbound traffic would perform a right-turn, travel south and perform the J-turn, and then travel north to access I-90 and Spokane.

Figure 8 from WSDOT provides more detail about this planned J-turn improvement. Although programmed, the timing for this improvement may fall beyond the build-year of Crystal Ridge. As such, an alternative analysis was performed for this intersection assuming the improvement, but both the no-build and build-conditions have been presented subsequently. The analysis assumes eastbound and westbound through and left-turn movements would be redirected to right-turning

movements. Given the J-Turn, the added eastbound right-turn traffic was added as northbound through traffic along U.S. Route 195. No reciprocal was assumed for the westbound movement as there is no J-turn available to redirect traffic. There is only a moderate redirection of westbound traffic, so the worse-case analysis was assuming this as increased right-turns (as opposed to redirection south to Thorpe Road via local streets).

Note that the same distributions were assumed overall, as described previously. This is because, even though the revisions would promote safer eastbound movements to U.S. Route 195, travel distance would be increased and there still is an issue with the northbound I-90 merge. Thus, most departing traffic was still assumed to use Sunset Highway, as described previously. See **Figure 9** for 2024 peak hour traffic volumes with the J-turn intersection installed.

5. Operations/Capacity

Traffic operations/capacity were quantified for Sunset Highway/Government Way and U.S. Route 195/16th Avenue based on year 2024 with-project forecasts for the AM and PM peak hours. **Table 3** provides a summary of LOS results. Existing LOS are shown for comparison. LOS worksheets have been attached to this memorandum for further review. The with-project condition shows LOS for the U.S. Route 195 intersection without and with development of the J-turn project. Without-project LOS are attached as well, though they have not been represented in the table below.

Again, LOS and delay are the function of the worse approach or approach movement for a one or two-way stop-controlled intersection, which is the control-type of the U.S. Rout 195/16th avenue intersection. LOS is the functional of all control delays for a signalized intersection.

Table 3. Level of Service Summary

Intersection Location	Existing (2021)				Future With-Project (2024)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Sunset Hwy / Government Way (Signalized)	B	16.0	B	16.8	B	17.5	B	18.7
U.S. Route 195 & 16th Avenue (Unsignalized, No J-turn)	D	26.4	F	58.2	E	41.6	F	143.6
U.S. Route 195 & 16th Avenue (Unsignalized, With J-turn)					B	14.9	D	27.5

As shown, the Sunset Boulevard/Government Way intersection currently operates in the LOS B range during both peak hours. Operations are maintained at LOS B between peak hours with-project development, which is acceptable per City standard for signalized intersections.

The U.S. Route 195/16th avenue currently functions at LOS D during the AM peak and LOS F during the PM peak hour, indicating the intersection is failing (during the PM peak hour). City of Spokane and WSDOT require LOS E or better for unsignalized intersections, which corresponds with a delay of less than 50 seconds. Without improvements, the intersection falls to LOS E during the AM peak hour, which is still acceptable, and a worsened LOS F condition during the PM peak hour, show with over a 100-second increase in average control delays. A comparison with the attached LOS worksheets indicates the project would be responsible for a 33-second increase in average vehicle delays during the PM peak hour, but this impact is overstated. Delays increase almost exponentially when high LOS F conditions are reach for a stop-controlled approach.

Comparatively, the project causes less than a 5-second increase in average control delay for the approach during the AM peak hour, a more representative impact measurement for the project.

The J-Turn improvement would elevate AM and PM peak hour conditions back to acceptable LOS range. In fact, the reduction of critical left-turn and through movements from these intersections elevates LOS above the existing conditions results. This analysis affirms the need for J-turns to help with mobility and safety at the U.S. Route 195/16th Avenue intersection.

6. Summary and Recommendations

Crystal Ridge is a 56-home subdivision proposed on 14.25-acres east of 16th avenue and west of U.S. Route 195 in Spokane, forecast for construction and full occupancy by year 2024. The development is anticipated to generate 45 AM peak hour trips, 56 PM peak hour trips, and 610 total weekday trips. About 65-percent of project trips are anticipated to/from Spokane and I-90 via travel on Sunset Highway and U.S. Route 195. The 35-percent balance of trips are expected from other various destinations within relationship to the project.

Two intersections were reviewed for this threshold analysis, Sunset Boulevard/Government Way and U.S. Route 195/16th avenue. The Sunset Boulevard/Government Way intersection currently functions within acceptable City capacity allowances and should continue to operate acceptably through year 2024 following the development Crystal Ridge, the development of one pipeline project, and including conservative baseline growth rates. U.S. Route 195/16th Avenue currently functions at LOS F during the PM peak hour, which is acceptable per City and WSDOT guidelines, with conditions worsening by year 2024 with traffic growth.

However, WSDOT has planned an improvement to address mobility and safety issues along U.S. Route 195. A new J-turn located south of 16th Avenue we accommodate redirected eastbound and westbound left-turns and through movements at 16th Avenue, reducing critical movements, and addressing LOS issues to well above current conditions. The proposed and programmed WSDOT improvement mitigates issues identified for the intersection.

WSDOT indicates they are collecting developer participation to help fund median restrictions and staff has requested an impact evaluation to help with the funding assessments. As indicated, there are 7 AM and 3 PM peak hour project trips assigned to the intersection, for an average of 5 eastbound left-turns for the typical weekday. There are 78 redirected through and left turn (critical) movements during the AM peak hour with 50 during the PM peak hour, an average of 64 trips between peak hours.

A weight impact assessment is taken by dividing project trip assignments by total redirected trips, equating to a 7.81-percent impact assessment. This assessment would be weighed against the developer's contribution of improvements at the intersection, which is anticipated to include the extension of median revisions to block eastbound and westbound left-turn and through traffic.

Per Chapter 17.D.030, Title 17 of City of Spokane Municipal Code, this project should technically participate in the transportation impact fee program (TIF) levied of private development to help address transportation capital improvements. However, City staff indicates the TIF would be offset by the development's contribution towards U.S. 2 improvements, given the project is in a fringe area of the South Service district (for the TIF), and not exceed the allocation that would be required of the TIF. The City TIF rate is $1,183.39 per dwelling for single family homes or duplex units, which calculates to $66,269.84.

Thus, the proposed project would provide a 7.81-percent developer contribution towards median improvements along U.S. Route 195, not to exceed the City TIF assessment of $66,269.84. If the direct WSDOT mitigation is less than this assessment, the balance would be provided to the City to support improvements in other areas of the South Hill Service District.

Recommendations

The Crystal Ridge transportation threshold determination confirms the project can be developed without substantially impacting traffic conditions on City or WSDOT roadways. The following are recommendations to address project impacts:

- Provide a 7.81-percent participation of developers costs regarding U.S. Route 195 median improvements in conjunction with the J-Turn project.
- This developer participation would not exceed $66,269.84, which is the City of Spokane TIF calculation for the South District of Spokane.
- Any balance remaining after application of WSDOT mitigation would be provided to the city, if any balance remains.
- Develop frontage improvements as specified by the City of Spokane, and.

This determination should sufficiently support environmental or concurrency determination of the city, and/or the site design process. No additional studies are recommended. Please contact our office with questions.

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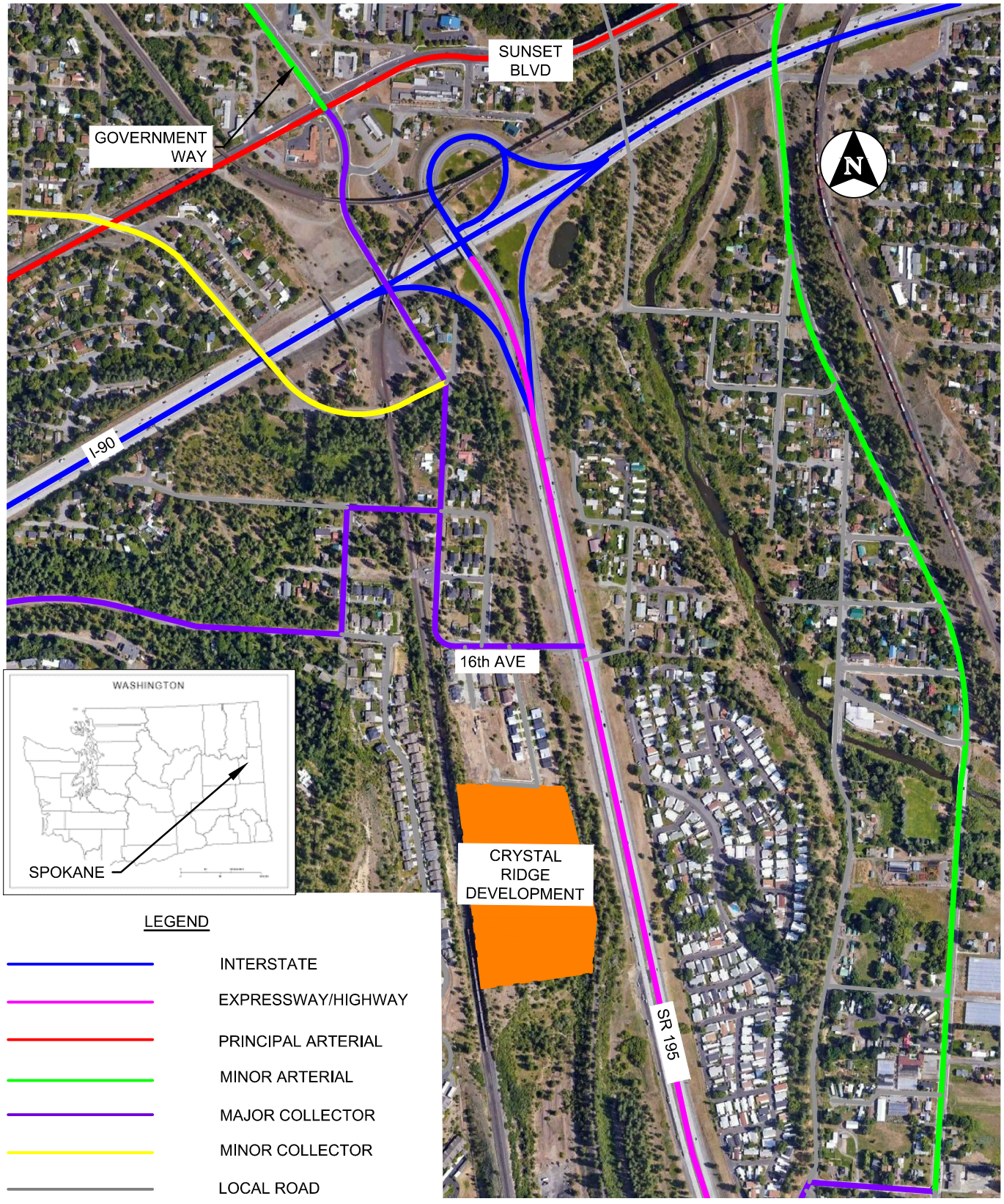
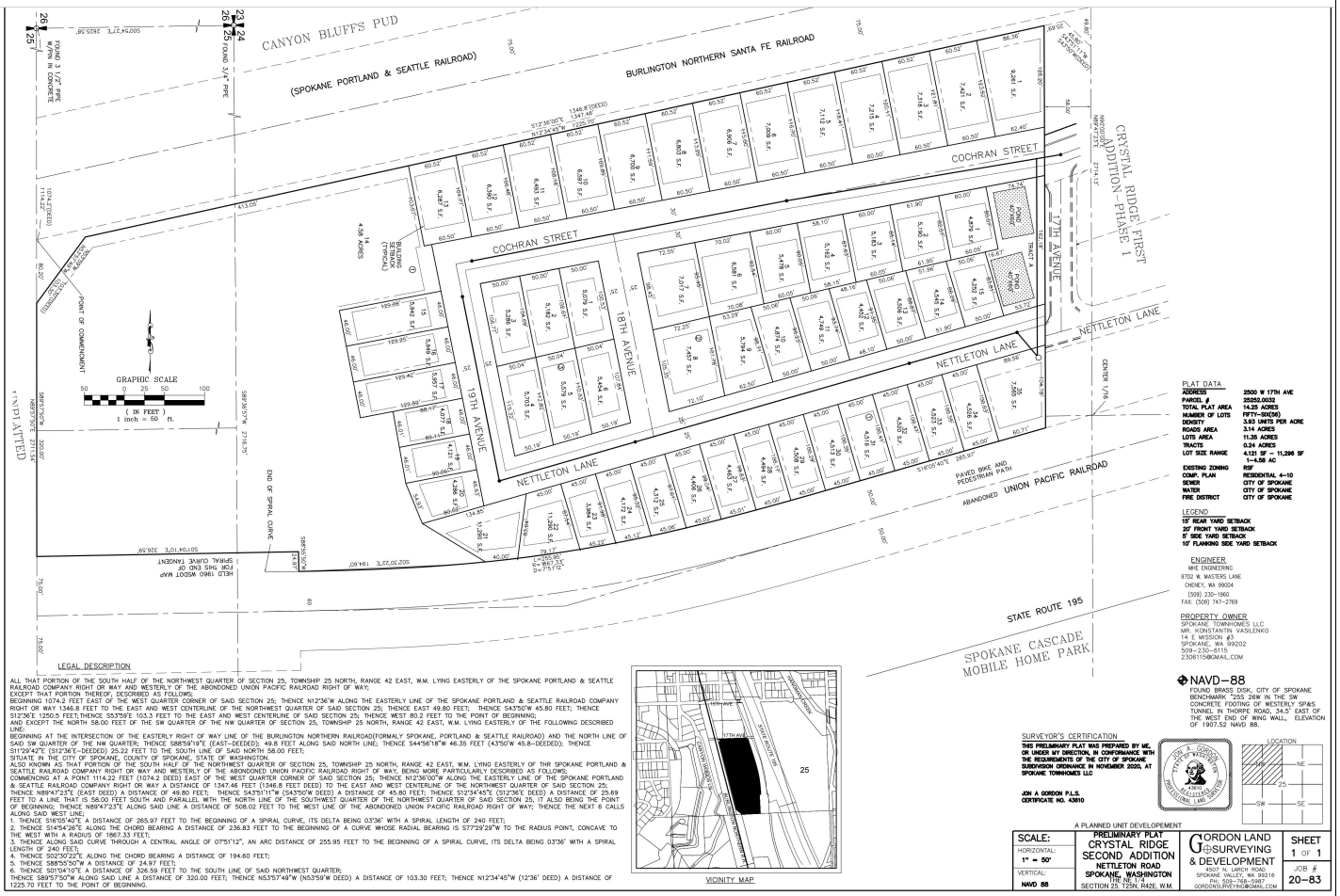


1 SITE LOCATION MAP
NOT TO SCALE

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
1717 S. RUSTLE STREET SUITE 201
SPOKANE, WA 99224
PHONE: (509) 319-2580 WWW.TO-ENGINEERS.COM
E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313



PLAT DATA

ADDRESS	2500 W 17TH AVE
PARCEL #	25252.0032
TOTAL PLAT AREA	14.25 ACRES
NUMBER OF LOTS	FIFTY-SIX(56)
DENSITY	3.93 UNITS PER ACRE
ROADS AREA	3.14 ACRES
LOTS AREA	11.35 ACRES
TRACTS	0.24 ACRES
LOT SIZE RANGE	4,121 SF ~ 11,298 SF 1~4.58 AC
EXISTING ZONING	RSF
COMP. PLAN	RESIDENTIAL 4-10
SEWER	CITY OF SPOKANE
WATER	CITY OF SPOKANE
FIRE DISTRICT	CITY OF SPOKANE

LEGEND

50' REAR YARD SETBACK
20' FRONT YARD SETBACK
5' SIDE YARD SETBACK
10' FLANKING SIDE YARD SETBACK

ENGINEER
MHE ENGINEERING
9702 W. MASTERS LANE
CHENEY, WA 99004
(509) 230-1960
FAX: (509) 747-2769

PROPERTY OWNER
SPOKANE TOWNHOMES LLC
MR. KONSTANTIN VASILENKO
14 E MISSION #3
SPOKANE, WA 99202
509-230-6115
2306115@GMAIL.COM

NAVD-88
FOUND BRASS DISK, CITY OF SPOKANE BENCHMARK "255 26W IN THE SW CONCRETE FOOTING OF WESTERLY SPAN'S TUNNEL IN THORPE ROAD, 34.5' EAST OF THE WEST END OF WING WALL, ELEVATION OF 1907.52 NAVD 88.

LEGAL DESCRIPTION

ALL THAT PORTION OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF SECTION 25, TOWNSHIP 25 NORTH, RANGE 42 EAST, W.M. LYING EASTERLY OF THE SPOKANE PORTLAND & SEATTLE RAILROAD COMPANY RIGHT OR WAY AND WESTERLY OF THE ABONDONED UNION PACIFIC RAILROAD RIGHT OF WAY;
EXCEPT THAT PORTION THEREOF, DESCRIBED AS FOLLOWS;
BEGINNING 1074.2 FEET EAST OF THE WEST QUARTER CORNER OF SAID SECTION 25; THENCE N12°36'W ALONG THE EASTERLY LINE OF THE SPOKANE PORTLAND & SEATTLE RAILROAD COMPANY RIGHT OR WAY 1346.8 FEET TO THE EAST AND WEST CENTERLINE OF THE NORTHWEST QUARTER OF SAID SECTION 25; THENCE EAST 49.80 FEET; THENCE S43°50'W 45.80 FEET; THENCE S12°36'E 1250.5 FEET; THENCE S53°59'E 103.3 FEET TO THE EAST AND WEST CENTERLINE OF SAID SECTION 25; THENCE WEST 80.2 FEET TO THE POINT OF BEGINNING;
AND EXCEPT THE NORTH 58.00 FEET OF THE SW QUARTER OF THE NW QUARTER OF SECTION 25, TOWNSHIP 25 NORTH, RANGE 42 EAST, W.M. LYING EASTERLY OF THE FOLLOWING DESCRIBED LINE;
BEGINNING AT THE INTERSECTION OF THE EASTERLY RIGHT OF WAY LINE OF THE BURLINGTON NORTHERN RAILROAD(FORMALY SPOKANE, PORTLAND & SEATTLE RAILROAD) AND THE NORTH LINE OF SAID SW QUARTER OF THE NW QUARTER; THENCE S88°59'19"E (EAST--DEEDED) 49.8 FEET ALONG SAID NORTH LINE; THENCE S44°56'18"W 46.35 FEET (43'50"W 45.8--DEEDED); THENCE S11°29'42"E (S12°36'E--DEEDED) 25.22 FEET TO THE SOUTH LINE OF SAID NORTH 58.00 FEET;
SITUATE IN THE CITY OF SPOKANE, COUNTY OF SPOKANE, STATE OF WASHINGTON.
ALSO KNOWN AS THAT PORTION OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF SECTION 25, TOWNSHIP 25 NORTH, RANGE 42 EAST, W.M. LYING EASTERLY OF THR SPOKANE PORTLAND & SEATTLE RAILROAD COMPANY RIGHT OR WAY AND WESTERLY OF THE ABONDONED UNION PACIFIC RAILROAD RIGHT OF WAY, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS;
COMMENCING AT A POINT 1114.22 FEET (1074.2 DEED) EAST OF THE WEST QUARTER CORNER OF SAID SECTION 25; THENCE N12°36'00"W ALONG THE EASTERLY LINE OF THE SPOKANE PORTLAND & SEATTLE RAILROAD COMPANY RIGHT OR WAY A DISTANCE OF 1347.46 FEET (1346.8 FEET DEED) TO THE EAST AND WEST CENTERLINE OF THE NORTHWEST QUARTER OF SAID SECTION 25; THENCE N89°47'23"E (EAST DEED) A DISTANCE OF 49.80 FEET; THENCE S43°51'11"W (S43°50'W DEED) A DISTANCE OF 45.80 FEET; THENCE S12°34'45"E (S12°36'E DEED) A DISTANCE OF 25.69 FEET TO A LINE THAT IS 58.00 FEET SOUTH AND PARALLEL WITH THE NORTH LINE OF THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 25, IT ALSO BEING THE POINT OF BEGINNING; THENCE N89°47'23"E ALONG SAID LINE A DISTANCE OF 508.02 FEET TO THE WEST LINE OF THE ABONDONED UNION PACIFIC RAILROAD RIGHT OF WAY; THENCE THE NEXT 6 CALLS ALONG SAID WEST LINE;
1. THENCE S16°05'40"E, A DISTANCE OF 265.97 FEET TO THE BEGINNING OF A SPIRAL CURVE, ITS DELTA BEING 03°36' WITH A SPIRAL LENGTH OF 240 FEET;
2. THENCE S14°54'26"E ALONG THE CHORD BEARING A DISTANCE OF 236.83 FEET TO THE BEGINNING OF A CURVE WHOSE RADIAL BEARING IS S77°29'29"W TO THE RADIUS POINT, CONCAVE TO THE WEST WITH A RADIUS OF 1967.33 FEET;
3. THENCE ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 07°51'12", AN ARC DISTANCE OF 255.95 FEET TO THE BEGINNING OF A SPIRAL CURVE, ITS DELTA BEING 03°36' WITH A SPIRAL LENGTH OF 240 FEET;
4. THENCE S02°30'22"E ALONG THE CHORD BEARING A DISTANCE OF 194.60 FEET;
5. THENCE S88°55'50"W A DISTANCE OF 24.97 FEET;
6. THENCE S01°04'10"E A DISTANCE OF 326.59 FEET TO THE SOUTH LINE OF SAID NORTHWEST QUARTER;
THENCE S89°57'50"W ALONG SAID LINE A DISTANCE OF 320.00 FEET; THENCE N53°57'49"W (N53°56'W DEED) A DISTANCE OF 103.30 FEET; THENCE N12°34'45"W (12°36' DEED) A DISTANCE OF 1225.70 FEET TO THE POINT OF BEGINNING.

VICINITY MAP

SURVEYOR'S CERTIFICATION

THIS PRELIMINARY PLAT WAS PREPARED BY ME, OR UNDER MY DIRECTION, IN CONFORMANCE WITH THE REQUIREMENTS OF THE CITY OF SPOKANE SUBDIVISION ORDINANCE IN NOVEMBER 2020, AT SPOKANE TOWNHOMES LLC

JON A GORDON P.L.S.
CERTIFICATE NO. 43810

LOCATION

A PLANNED UNIT DEVELOPEMENT

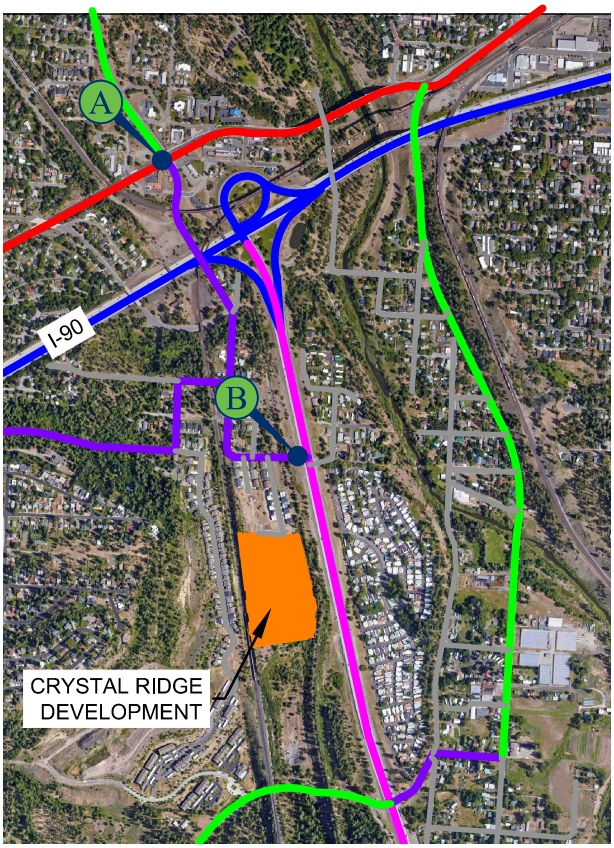
SCALE: HORIZONTAL: 1" = 50' VERTICAL: NAVD 88	PRELIMINARY PLAT CRYSTAL RIDGE SECOND ADDITION NETTLETON ROAD SPOKANE, WASHINGTON THE NE 1/4 SECTION 25, T25N, R42E, W.M.	GORDON LAND SURVEYING & DEVELOPMENT 4907 N. LARCH ROAD SPOKANE VALLEY, WA 99216 PH: 509-768-5887 GORDONSURVEYING@GMAIL.COM	SHEET 1 OF 1 JOB # 20-83

2 SITE PLAN
NOT TO SCALE

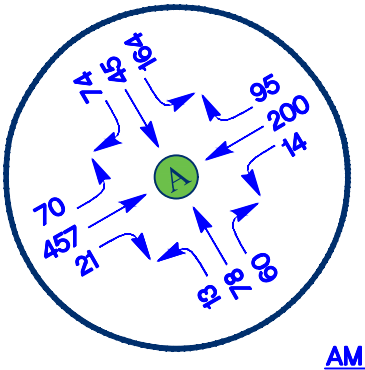
CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
1717 S. RUSTLE STREET SUITE 201
SPOKANE, WA 99224
PHONE: (509) 319-2580 WWW.TO-ENGINEERS.COM

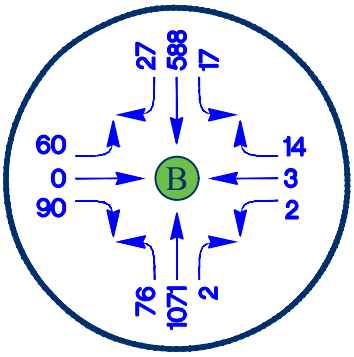
E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313



AM PEAK HOUR - SUNSET/GOVERNMENT



AM PEAK HOUR - 16TH/SR 195



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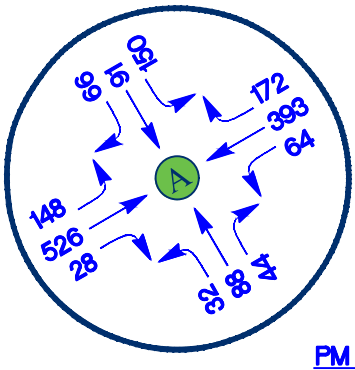
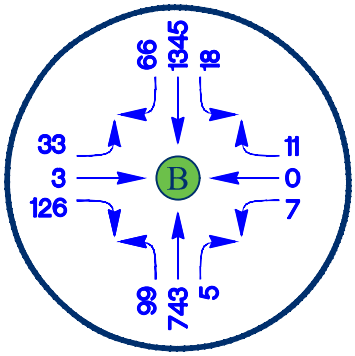


PM PEAK HOUR - 16TH/SR 195



LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

3 EXISTING TRAFFIC
YEAR 2021

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

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E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313

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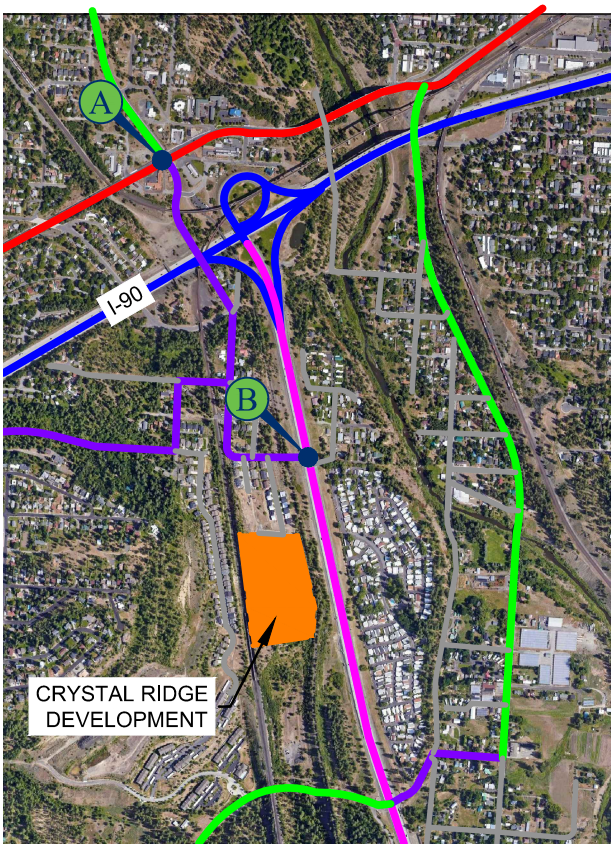

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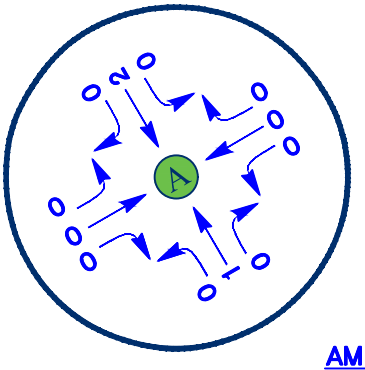

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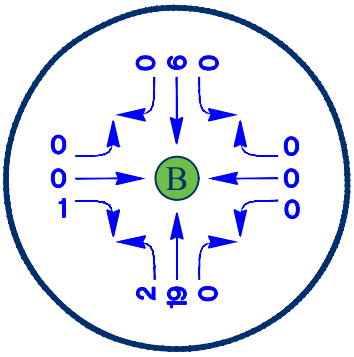

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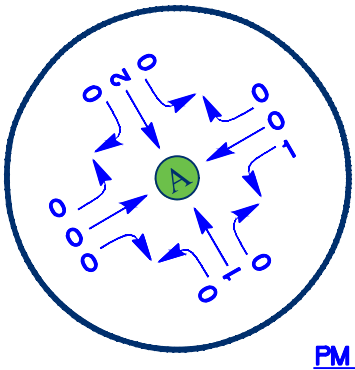

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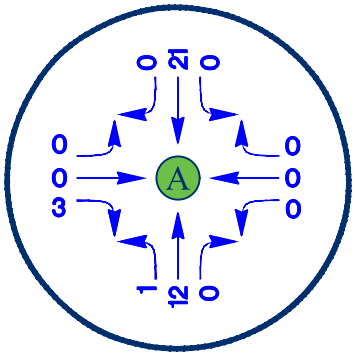

LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

4 PIPELINE - WHEATLAND ESTATES
YEAR 2025

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
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SPOKANE, WA 99224
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E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313

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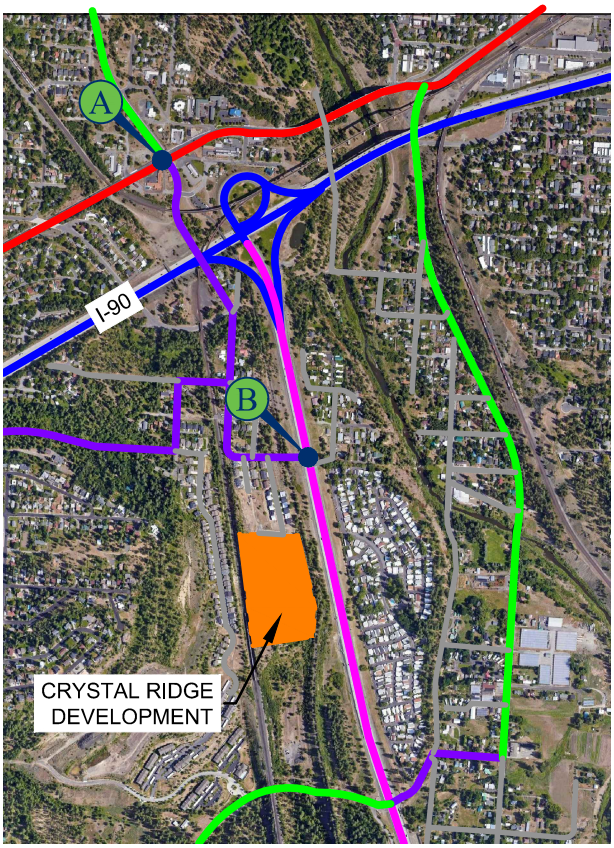

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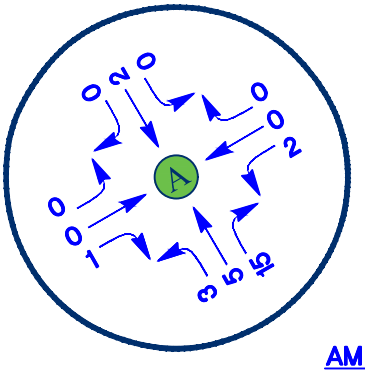

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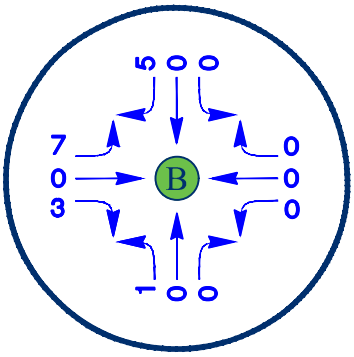

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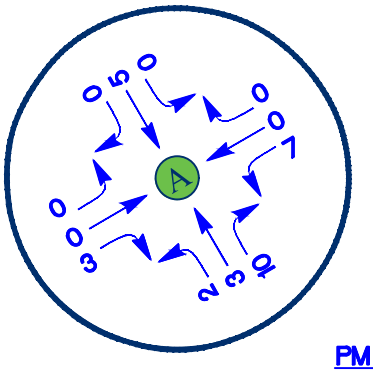

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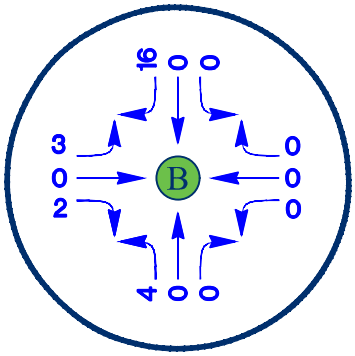

LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

5 TRIP ASSIGNMENTS
YEAR 2024

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
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SPOKANE, WA 99224
PHONE: (509) 319-2580 WWW.TO-ENGINEERS.COM
E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313

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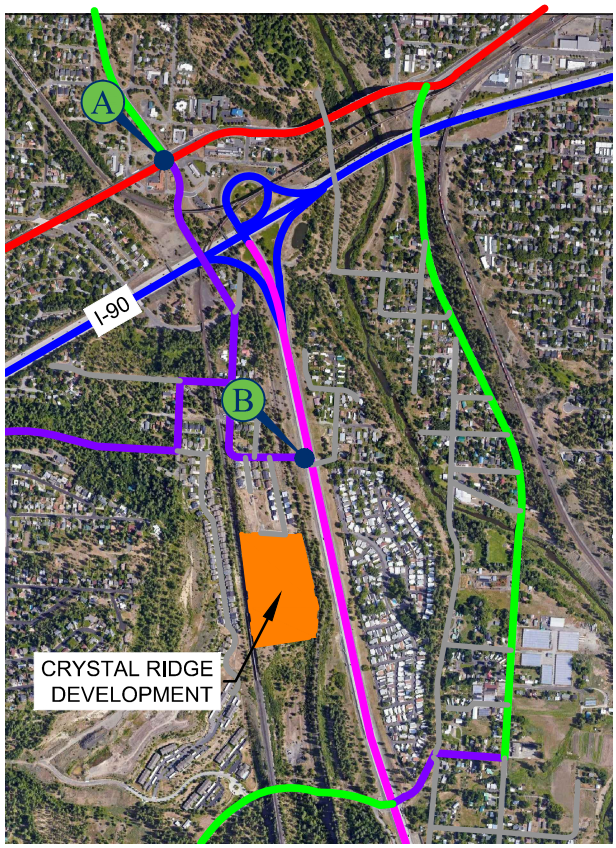

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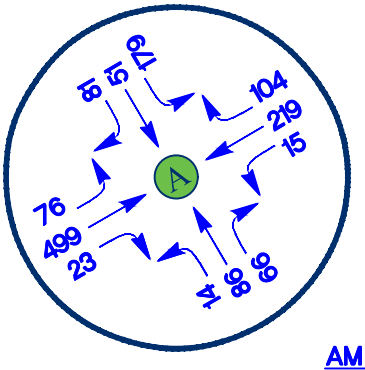

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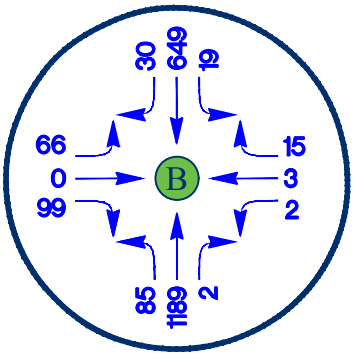

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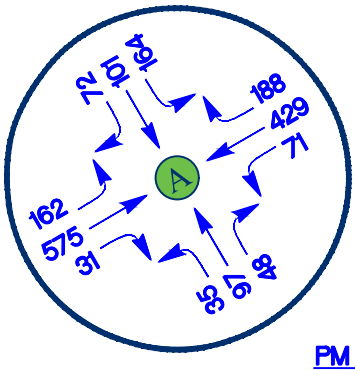
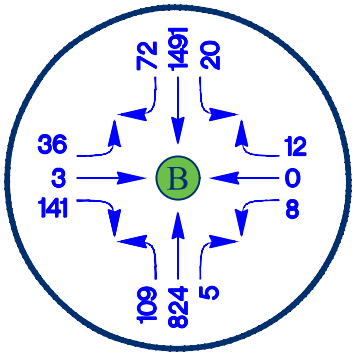


PM PEAK HOUR - 16TH/SR 195



LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

6 FUTURE WITHOUT PROJECT
YEAR 2024

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
1717 S. RUSTLE STREET SUITE 201
SPOKANE, WA 99224
PHONE: (509) 319-2580 WWW.TO-ENGINEERS.COM
E-FILE: 210313-TIS.dwg DATE: 6/17/21 JOB: 210313

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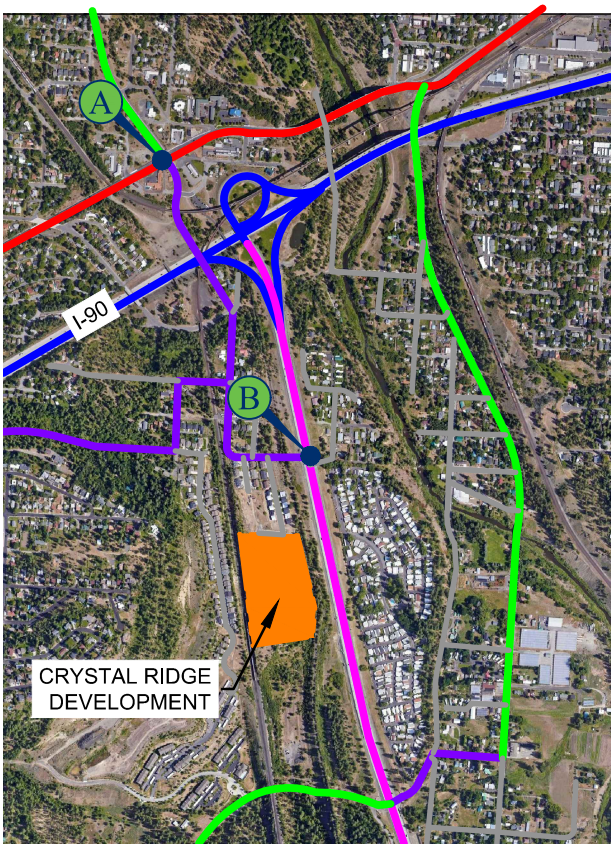

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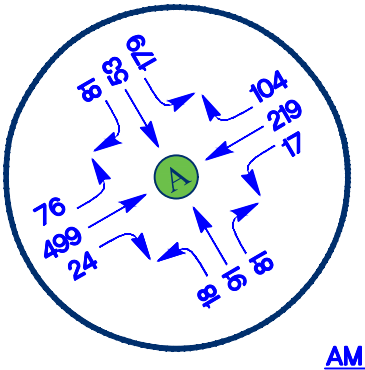

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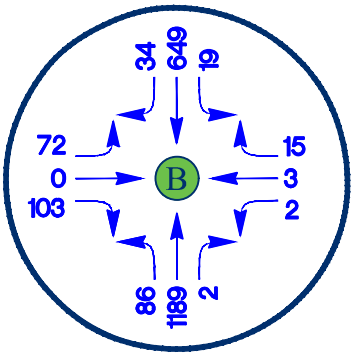

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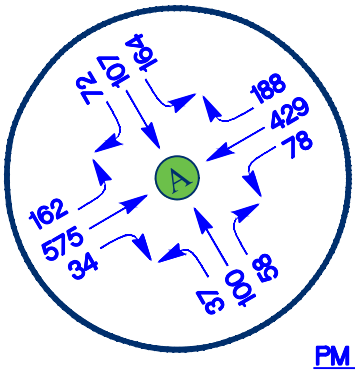
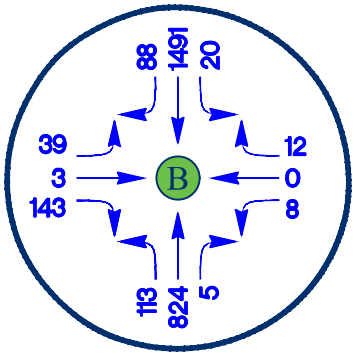


PM PEAK HOUR - 16TH/SR 195



LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

7 FUTURE WITH PROJECT
YEAR 2024

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
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8

J-TURN IMPROVEMENT TO SR 195

YEAR 2024

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
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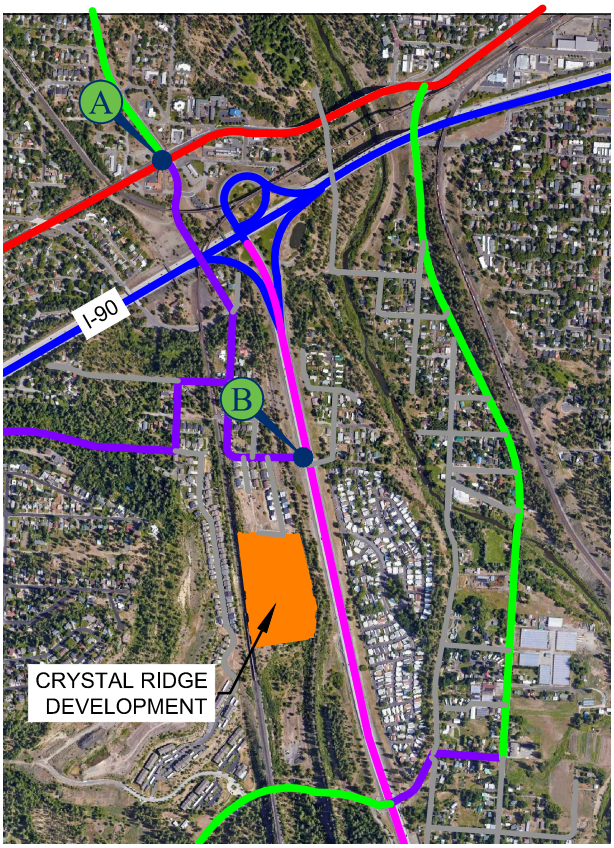

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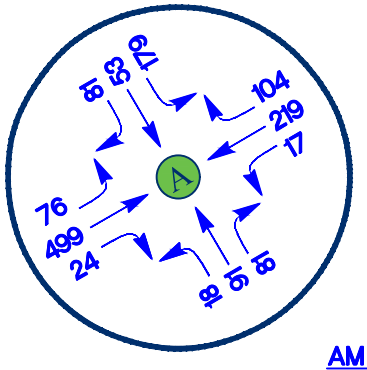

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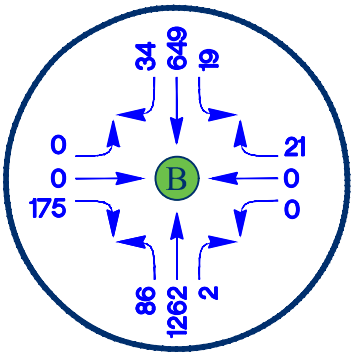

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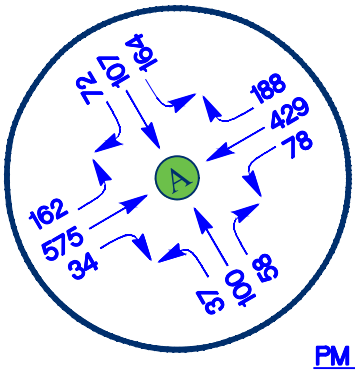

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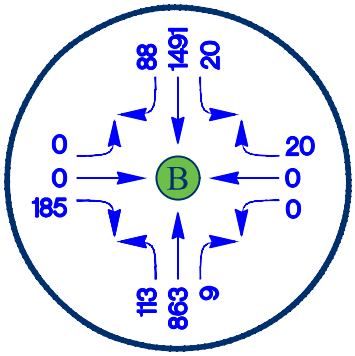

LEGEND

- INTERSTATE
- EXPRESSWAY/HIGHWAY
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD

9 FUTURE WITH PROJ. - J TURN INCL.
YEAR 2024

CRYSTAL RIDGE ADDITION
TRAFFIC THRESHOLD ANALYSIS

T-O ENGINEERS
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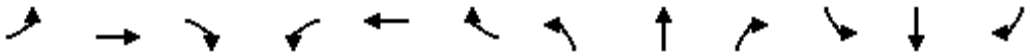


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	457	21	14	200	95	13	78	60	164	45	74
Future Volume (veh/h)	70	457	21	14	200	95	13	78	60	164	45	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	74	486	22	15	213	101	14	83	64	174	48	79
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	208	643	543	207	1186	527	399	485	341	400	433	385
Arrive On Green	0.12	0.35	0.35	0.12	0.34	0.34	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1753	1841	1553	1753	3497	1553	1240	1960	1378	1219	1749	1554
Grp Volume(v), veh/h	74	486	22	15	213	101	14	73	74	174	48	79
Grp Sat Flow(s),veh/h/ln	1753	1841	1553	1753	1749	1553	1240	1749	1589	1219	1749	1554
Q Serve(g_s), s	2.0	11.8	0.5	0.4	2.2	2.3	0.5	1.7	1.9	6.6	1.1	2.0
Cycle Q Clear(g_c), s	2.0	11.8	0.5	0.4	2.2	2.3	2.5	1.7	1.9	8.5	1.1	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	208	643	543	207	1186	527	399	433	394	400	433	385
V/C Ratio(X)	0.36	0.76	0.04	0.07	0.18	0.19	0.04	0.17	0.19	0.44	0.11	0.21
Avail Cap(c_a), veh/h	537	1062	896	554	2074	921	764	947	860	758	947	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.5	14.5	10.9	19.8	11.8	11.8	16.1	14.9	15.0	18.4	14.7	15.1
Incr Delay (d2), s/veh	0.8	2.6	0.0	0.1	0.1	0.2	0.1	0.3	0.3	1.1	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	4.3	0.1	0.2	0.7	0.7	0.1	0.6	0.6	1.8	0.4	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.3	17.1	10.9	19.9	11.9	12.1	16.1	15.2	15.3	19.4	14.9	15.5
LnGrp LOS	C	B	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		582			329			161			301	
Approach Delay, s/veh		17.4			12.3			15.3			17.7	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	17.1	10.5	23.0		17.1	10.0	23.5					
Change Period (Y+Rc), s	4.6	4.5	* 5.8		4.6	4.0	5.8					
Max Green Setting (Gmax), s	27.4	15.5	* 30		27.4	16.0	29.2					
Max Q Clear Time (g_c+I1), s	4.5	4.0	4.3		10.5	2.4	13.8					
Green Ext Time (p_c), s	1.2	0.1	2.4		1.8	0.0	3.6					

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

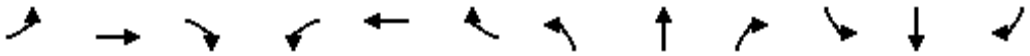
Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	0	90	2	3	14	76	1071	2	17	588	27
Future Vol, veh/h	60	0	90	2	3	14	76	1071	2	17	588	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	66	0	99	2	3	15	84	1177	2	19	646	30

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1442	2029	323	1706	2029	589	646	0	-	1177	0	0
Stage 1	684	684	-	1345	1345	-	-	-	-	-	-	-
Stage 2	758	1345	-	361	684	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	93	57	673	59	57	452	935	-	0	589	-	0
Stage 1	405	447	-	160	218	-	-	-	0	-	-	0
Stage 2	365	218	-	630	447	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	80	50	673	46	50	452	935	-	-	589	-	-
Mov Cap-2 Maneuver	186	134	-	115	136	-	-	-	-	-	-	-
Stage 1	369	433	-	146	198	-	-	-	-	-	-	-
Stage 2	316	198	-	520	433	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.4	19.4	0.6	0.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	935	-	329	270	589	-
HCM Lane V/C Ratio	0.089	-	0.501	0.077	0.032	-
HCM Control Delay (s)	9.2	-	26.4	19.4	11.3	-
HCM Lane LOS	A	-	D	C	B	-
HCM 95th %tile Q(veh)	0.3	-	2.7	0.2	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	148	526	28	64	393	172	32	88	44	150	91	66
Future Volume (veh/h)	148	526	28	64	393	172	32	88	44	150	91	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	156	554	29	67	414	181	34	93	46	158	96	69
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	224	706	598	204	1268	565	378	567	263	395	493	324
Arrive On Green	0.12	0.37	0.37	0.11	0.35	0.35	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1795	1885	1595	1795	3582	1595	1219	2369	1100	1253	2058	1354
Grp Volume(v), veh/h	156	554	29	67	414	181	34	69	70	158	82	83
Grp Sat Flow(s),veh/h/ln	1795	1885	1595	1795	1791	1595	1219	1791	1677	1253	1791	1621
Q Serve(g_s), s	4.4	13.8	0.6	1.8	4.5	4.4	1.2	1.6	1.8	6.1	1.9	2.2
Cycle Q Clear(g_c), s	4.4	13.8	0.6	1.8	4.5	4.4	3.4	1.6	1.8	7.8	1.9	2.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.66	1.00		0.84
Lane Grp Cap(c), veh/h	224	706	598	204	1268	565	378	429	402	395	429	388
V/C Ratio(X)	0.70	0.78	0.05	0.33	0.33	0.32	0.09	0.16	0.17	0.40	0.19	0.21
Avail Cap(c_a), veh/h	526	1041	881	543	2033	905	718	928	870	744	928	840
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.2	14.6	10.5	21.6	12.5	12.4	17.5	15.9	16.0	19.1	16.0	16.1
Incr Delay (d2), s/veh	2.9	3.2	0.0	0.7	0.2	0.5	0.1	0.2	0.3	0.9	0.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	5.2	0.2	0.7	1.6	1.4	0.3	0.6	0.6	1.7	0.8	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.1	17.8	10.6	22.3	12.7	12.9	17.6	16.1	16.2	20.0	16.3	16.5
LnGrp LOS	C	B	B	C	B	B	B	B	B	B	B	B
Approach Vol, veh/h		739			662			173			323	
Approach Delay, s/veh		19.1			13.7			16.5			18.2	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	17.3	11.1	24.5		17.3	10.0	25.6					
Change Period (Y+Rc), s	4.6	4.5	* 5.8		4.6	4.0	5.8					
Max Green Setting (Gmax), s	27.4	15.5	* 30		27.4	16.0	29.2					
Max Q Clear Time (g_c+I1), s	5.4	6.4	6.5		9.8	3.8	15.8					
Green Ext Time (p_c), s	1.2	0.2	4.9		2.0	0.1	4.0					

Intersection Summary	
HCM 6th Ctrl Delay	16.8
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	3	126	7	0	11	99	743	5	18	1345	66
Future Vol, veh/h	33	3	126	7	0	11	99	743	5	18	1345	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	34	3	130	7	0	11	102	766	5	19	1387	68

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2012	2395	694	1703	2395	383	1387	0	-	766	0	0
Stage 1	1425	1425	-	970	970	-	-	-	-	-	-	-
Stage 2	587	970	-	733	1425	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	35	34	388	60	34	618	495	-	0	850	-	0
Stage 1	144	201	-	274	332	-	-	-	0	-	-	0
Stage 2	465	332	-	381	201	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	28	26	388	32	26	618	495	-	-	850	-	-
Mov Cap-2 Maneuver	87	111	-	92	73	-	-	-	-	-	-	-
Stage 1	114	197	-	218	264	-	-	-	-	-	-	-
Stage 2	362	264	-	244	197	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	58.2	25.7	1.7	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	495	-	222	192	850	-
HCM Lane V/C Ratio	0.206	-	0.752	0.097	0.022	-
HCM Control Delay (s)	14.2	-	58.2	25.7	9.3	-
HCM Lane LOS	B	-	F	D	A	-
HCM 95th %tile Q(veh)	0.8	-	5.2	0.3	0.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	499	23	15	219	104	14	86	66	179	51	81
Future Volume (veh/h)	76	499	23	15	219	104	14	86	66	179	51	81
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827	1827	1827	1900	1827	1827	1900
Adj Flow Rate, veh/h	81	531	24	16	233	111	15	91	70	190	54	86
Adj No. of Lanes	1	1	1	1	2	1	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	190	669	566	190	1239	552	397	510	359	397	455	406
Arrive On Green	0.11	0.37	0.37	0.11	0.36	0.36	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1740	1827	1547	1740	3471	1546	1216	1945	1371	1195	1736	1547
Grp Volume(v), veh/h	81	531	24	16	233	111	15	80	81	190	54	86
Grp Sat Flow(s),veh/h/ln	1740	1827	1547	1740	1736	1546	1216	1736	1581	1195	1736	1547
Q Serve(g_s), s	2.4	14.3	0.5	0.5	2.5	2.7	0.5	2.0	2.2	8.1	1.3	2.4
Cycle Q Clear(g_c), s	2.4	14.3	0.5	0.5	2.5	2.7	2.9	2.0	2.2	10.2	1.3	2.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	190	669	566	190	1239	552	397	455	414	397	455	406
V/C Ratio(X)	0.43	0.79	0.04	0.08	0.19	0.20	0.04	0.18	0.19	0.48	0.12	0.21
Avail Cap(c_a), veh/h	491	972	823	507	1898	845	686	867	789	680	867	772
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	15.5	11.2	22.0	12.2	12.2	17.0	15.7	15.7	19.7	15.4	15.8
Incr Delay (d2), s/veh	1.1	3.7	0.0	0.1	0.1	0.3	0.1	0.3	0.3	1.3	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	7.8	0.2	0.2	1.2	1.2	0.2	1.0	1.0	2.8	0.6	1.0
LnGrp Delay(d),s/veh	24.0	19.2	11.2	22.1	12.3	12.5	17.0	15.9	16.1	21.0	15.6	16.2
LnGrp LOS	C	B	B	C	B	B	B	B	B	C	B	B
Approach Vol, veh/h		636			360			176			330	
Approach Delay, s/veh		19.5			12.8			16.1			18.9	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		19.0	10.5	25.4		19.0	10.0	25.9
Change Period (Y+Rc), s		4.6	4.5	* 5.8		4.6	4.0	5.8
Max Green Setting (Gmax), s		27.4	15.5	* 30		27.4	16.0	29.2
Max Q Clear Time (g_c+I1), s		4.9	4.4	4.7		12.2	2.5	16.3
Green Ext Time (p_c), s		1.3	0.1	2.7		1.9	0.0	3.7

Intersection Summary	
HCM 2010 Ctrl Delay	17.4
HCM 2010 LOS	B

Notes

Intersection	
Int Delay, s/veh	3.5

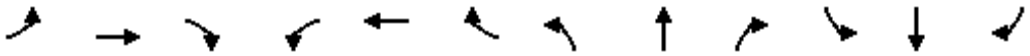
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	66	0	99	2	3	15	85	1189	2	19	649	30
Future Vol, veh/h	66	0	99	2	3	15	85	1189	2	19	649	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	73	0	109	2	3	16	93	1307	2	21	713	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1596	2248	357	1892	2248	654	713	0	-	1307	0	0
Stage 1	755	755	-	1493	1493	-	-	-	-	-	-	-
Stage 2	841	1493	-	399	755	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 71	41	639	43	41	409	883	-	0	525	-	0
Stage 1	367	415	-	129	185	-	-	-	0	-	-	0
Stage 2	326	185	-	598	415	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	~ 59	35	639	32	35	409	883	-	-	525	-	-
Mov Cap-2 Maneuver	~ 57	109	-	90	112	-	-	-	-	-	-	-
Stage 1	328	398	-	115	166	-	-	-	-	-	-	-
Stage 2	274	166	-	476	398	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	36.8	22.1	0.6	0.3
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	883	-	287	233	525	-
HCM Lane V/C Ratio	0.106	-	0.632	0.094	0.04	-
HCM Control Delay (s)	9.6	-	36.8	22.1	12.1	-
HCM Lane LOS	A	-	E	C	B	-
HCM 95th %tile Q(veh)	0.4	-	4	0.3	0.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	162	575	31	71	429	188	35	97	48	164	101	72
Future Volume (veh/h)	162	575	31	71	429	188	35	97	48	164	101	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	171	605	33	75	452	198	37	102	51	173	106	76
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	234	738	624	189	1282	571	374	590	277	391	515	339
Arrive On Green	0.13	0.39	0.39	0.11	0.36	0.36	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1795	1885	1595	1795	3582	1595	1201	2358	1109	1237	2057	1356
Grp Volume(v), veh/h	171	605	33	75	452	198	37	76	77	173	91	91
Grp Sat Flow(s),veh/h/ln	1795	1885	1595	1795	1791	1595	1201	1791	1676	1237	1791	1622
Q Serve(g_s), s	5.2	16.4	0.7	2.2	5.3	5.2	1.4	1.9	2.1	7.3	2.3	2.5
Cycle Q Clear(g_c), s	5.2	16.4	0.7	2.2	5.3	5.2	4.0	1.9	2.1	9.3	2.3	2.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.66	1.00		0.84
Lane Grp Cap(c), veh/h	234	738	624	189	1282	571	374	448	419	391	448	406
V/C Ratio(X)	0.73	0.82	0.05	0.40	0.35	0.35	0.10	0.17	0.18	0.44	0.20	0.22
Avail Cap(c_a), veh/h	489	967	818	505	1887	840	651	862	807	677	862	780
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.8	15.5	10.8	23.8	13.4	13.4	18.5	16.7	16.8	20.4	16.9	17.0
Incr Delay (d2), s/veh	3.3	5.0	0.0	1.0	0.2	0.5	0.2	0.3	0.3	1.1	0.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	6.6	0.2	0.9	1.9	1.7	0.4	0.7	0.8	2.0	0.9	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.1	20.6	10.8	24.8	13.7	13.9	18.7	17.0	17.1	21.6	17.2	17.3
LnGrp LOS	C	C	B	C	B	B	B	B	B	C	B	B
Approach Vol, veh/h		809			725			190			355	
Approach Delay, s/veh		21.5			14.9			17.3			19.4	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	18.8	11.9	26.2		18.8	10.0	28.1					
Change Period (Y+Rc), s	4.6	4.5	* 5.8		4.6	4.0	5.8					
Max Green Setting (Gmax), s	27.4	15.5	* 30		27.4	16.0	29.2					
Max Q Clear Time (g_c+I1), s	6.0	7.2	7.3		11.3	4.2	18.4					
Green Ext Time (p_c), s	1.3	0.2	5.4		2.1	0.1	3.9					

Intersection Summary	
HCM 6th Ctrl Delay	18.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	9.6

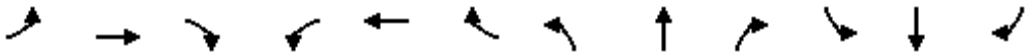
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	36	3	141	8	0	12	109	824	5	20	1491	72
Future Vol, veh/h	36	3	141	8	0	12	109	824	5	20	1491	72
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	37	3	145	8	0	12	112	849	5	21	1537	74

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2228	2652	769	1885	2652	425	1537	0	-	849	0	0
Stage 1	1579	1579	-	1073	1073	-	-	-	-	-	-	-
Stage 2	649	1073	-	812	1579	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	~ 24	23	346	44	23	580	433	-	0	791	-	0
Stage 1	115	169	-	237	297	-	-	-	0	-	-	0
Stage 2	427	297	-	341	169	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	~ 18	17	346	20	17	580	433	-	-	791	-	-
Mov Cap-2 Maneuver	65	90	-	56	43	-	-	-	-	-	-	-
Stage 1	85	164	-	176	220	-	-	-	-	-	-	-
Stage 2	310	220	-	189	164	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	126.5	40.4	1.9	0.1
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	433	-	181	122	791	-
HCM Lane V/C Ratio	0.26	-	1.025	0.169	0.026	-
HCM Control Delay (s)	16.2	-	126.5	40.4	9.7	-
HCM Lane LOS	C	-	F	E	A	-
HCM 95th %tile Q(veh)	1	-	8.6	0.6	0.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	499	24	17	219	104	18	91	81	179	53	81
Future Volume (veh/h)	76	499	24	17	219	104	18	91	81	179	53	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	81	531	26	18	233	111	19	97	86	190	56	86
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	190	669	565	190	1240	551	406	494	398	394	470	417
Arrive On Green	0.11	0.36	0.36	0.11	0.35	0.35	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1753	1841	1553	1753	3497	1553	1223	1839	1480	1180	1749	1554
Grp Volume(v), veh/h	81	531	26	18	233	111	19	92	91	190	56	86
Grp Sat Flow(s),veh/h/ln	1753	1841	1553	1753	1749	1553	1223	1749	1570	1180	1749	1554
Q Serve(g_s), s	2.4	14.3	0.6	0.5	2.6	2.8	0.7	2.2	2.5	8.3	1.3	2.4
Cycle Q Clear(g_c), s	2.4	14.3	0.6	0.5	2.6	2.8	3.1	2.2	2.5	10.8	1.3	2.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.94	1.00		1.00
Lane Grp Cap(c), veh/h	190	669	565	190	1240	551	406	470	422	394	470	417
V/C Ratio(X)	0.43	0.79	0.05	0.09	0.19	0.20	0.05	0.20	0.22	0.48	0.12	0.21
Avail Cap(c_a), veh/h	490	970	818	506	1893	841	682	864	776	660	864	768
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.1	15.8	11.4	22.3	12.4	12.4	16.9	15.7	15.7	19.9	15.3	15.7
Incr Delay (d2), s/veh	1.1	3.7	0.0	0.2	0.1	0.3	0.1	0.3	0.4	1.3	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.5	0.2	0.2	0.9	0.9	0.2	0.8	0.9	2.2	0.5	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	19.5	11.5	22.4	12.5	12.7	16.9	15.9	16.1	21.2	15.5	16.0
LnGrp LOS	C	B	B	C	B	B	B	B	B	C	B	B
Approach Vol, veh/h		638			362			202			332	
Approach Delay, s/veh		19.8			13.0			16.1			18.9	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	19.5	10.5	25.4		19.5	10.0	26.0					
Change Period (Y+Rc), s	4.6	4.5	* 5.8		4.6	4.0	5.8					
Max Green Setting (Gmax), s	27.4	15.5	* 30		27.4	16.0	29.2					
Max Q Clear Time (g_c+I1), s	5.1	4.4	4.8		12.8	2.5	16.3					
Green Ext Time (p_c), s	1.5	0.1	2.7		1.9	0.0	3.7					

Intersection Summary	
HCM 6th Ctrl Delay	17.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	72	0	103	2	3	15	86	1189	2	19	649	34
Future Vol, veh/h	72	0	103	2	3	15	86	1189	2	19	649	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	79	0	113	2	3	16	95	1307	2	21	713	37

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1600	2252	357	1896	2252	654	713	0	-	1307	0	0
Stage 1	755	755	-	1497	1497	-	-	-	-	-	-	-
Stage 2	845	1497	-	399	755	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 71	41	639	42	41	409	883	-	0	525	-	0
Stage 1	367	415	-	128	184	-	-	-	0	-	-	0
Stage 2	324	184	-	598	415	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	~ 59	35	639	31	35	409	883	-	-	525	-	-
Mov Cap-2 Maneuver	~ 56	108	-	89	111	-	-	-	-	-	-	-
Stage 1	327	398	-	114	164	-	-	-	-	-	-	-
Stage 2	272	164	-	472	398	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	41.6	22.1	0.6	0.3
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	883	-	281	232	525	-
HCM Lane V/C Ratio	0.107	-	0.684	0.095	0.04	-
HCM Control Delay (s)	9.6	-	41.6	22.1	12.1	-
HCM Lane LOS	A	-	E	C	B	-
HCM 95th %tile Q(veh)	0.4	-	4.6	0.3	0.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	162	575	34	78	429	188	37	100	58	164	107	72
Future Volume (veh/h)	162	575	34	78	429	188	37	100	58	164	107	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	171	605	36	82	452	198	39	105	61	173	113	76
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	233	736	623	187	1276	568	375	569	309	388	537	334
Arrive On Green	0.13	0.39	0.39	0.10	0.36	0.36	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1795	1885	1595	1795	3582	1595	1194	2236	1212	1223	2109	1313
Grp Volume(v), veh/h	171	605	36	82	452	198	39	83	83	173	95	94
Grp Sat Flow(s),veh/h/ln	1795	1885	1595	1795	1791	1595	1194	1791	1657	1223	1791	1630
Q Serve(g_s), s	5.3	16.6	0.8	2.5	5.3	5.2	1.5	2.1	2.3	7.4	2.4	2.6
Cycle Q Clear(g_c), s	5.3	16.6	0.8	2.5	5.3	5.2	4.2	2.1	2.3	9.7	2.4	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.73	1.00		0.81
Lane Grp Cap(c), veh/h	233	736	623	187	1276	568	375	456	422	388	456	415
V/C Ratio(X)	0.73	0.82	0.06	0.44	0.35	0.35	0.10	0.18	0.20	0.45	0.21	0.23
Avail Cap(c_a), veh/h	484	958	811	500	1870	833	640	854	790	660	854	777
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.0	15.7	10.9	24.1	13.6	13.6	18.6	16.7	16.8	20.6	16.9	16.9
Incr Delay (d2), s/veh	3.3	5.2	0.1	1.2	0.2	0.5	0.2	0.3	0.3	1.1	0.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	6.8	0.2	1.0	2.0	1.7	0.4	0.8	0.8	2.1	0.9	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	20.9	11.0	25.3	13.9	14.1	18.8	17.0	17.1	21.8	17.2	17.3
LnGrp LOS	C	C	B	C	B	B	B	B	B	C	B	B
Approach Vol, veh/h		812			732			205			362	
Approach Delay, s/veh		21.8			15.2			17.4			19.4	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	2	3	4	6	7	8
Phs Duration (G+Y+Rc), s	19.2	12.0	26.3	19.2	10.0	28.2
Change Period (Y+Rc), s	4.6	4.5	* 5.8	4.6	4.0	5.8
Max Green Setting (Gmax), s	27.4	15.5	* 30	27.4	16.0	29.2
Max Q Clear Time (g_c+I1), s	6.2	7.3	7.3	11.7	4.5	18.6
Green Ext Time (p_c), s	1.4	0.2	5.3	2.2	0.1	3.9

Intersection Summary	
HCM 6th Ctrl Delay	18.7
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	11.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	3	143	8	0	12	113	824	5	20	1491	88
Future Vol, veh/h	39	3	143	8	0	12	113	824	5	20	1491	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	-	-	-	-	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	40	3	147	8	0	12	116	849	5	21	1537	91

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2236	2660	769	1893	2660	425	1537	0	-	849	0	0
Stage 1	1579	1579	-	1081	1081	-	-	-	-	-	-	-
Stage 2	657	1081	-	812	1579	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.52	6.92	7.52	6.52	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.52	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4.01	3.31	3.51	4.01	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	~ 24	23	346	43	23	580	433	-	0	791	-	0
Stage 1	115	169	-	234	294	-	-	-	0	-	-	0
Stage 2	423	294	-	341	169	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	~ 18	16	346	19	16	580	433	-	-	791	-	-
Mov Cap-2 Maneuver	65	88	-	53	40	-	-	-	-	-	-	-
Stage 1	84	164	-	171	215	-	-	-	-	-	-	-
Stage 2	303	215	-	187	164	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1438.6	42.2	2	0.1
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	433	-	177	117	791	-
HCM Lane V/C Ratio	0.269	-	1.078	0.176	0.026	-
HCM Control Delay (s)	16.3	-	143.6	42.2	9.7	-
HCM Lane LOS	C	-	F	E	A	-
HCM 95th %tile Q(veh)	1.1	-	9.4	0.6	0.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	175	0	0	21	86	1262	2	19	649	34
Future Vol, veh/h	0	0	175	0	0	21	86	1262	2	19	649	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	0	-	-	0	200	-	250	240	-	250
Veh in Median Storage,#	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	192	0	0	23	95	1387	2	21	713	37

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	357	-	-	694	713	0	-	1387	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	639	0	0	385	883	-	0	490	-	0
Stage 1	0	0	-	0	0	-	-	-	0	-	-	0
Stage 2	0	0	-	0	0	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	-	-	639	-	-	385	883	-	-	490	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13	14.9	0.6	0.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	883	-	639	385	490	-
HCM Lane V/C Ratio	0.107	-	0.301	0.06	0.043	-
HCM Control Delay (s)	9.6	-	13	14.9	12.7	-
HCM Lane LOS	A	-	B	B	B	-
HCM 95th %tile Q(veh)	0.4	-	1.3	0.2	0.1	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	185	0	0	20	113	863	5	20	1491	88
Future Vol, veh/h	0	0	185	0	0	20	113	863	5	20	1491	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	Free
Storage Length	-	-	0	-	-	0	200	-	-	240	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	191	0	0	21	116	890	5	21	1537	91

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	769	-	-	445	1537	0	-	890	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.92	-	-	6.92	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.31	-	-	3.31	2.21	-	-	2.21	-	-
Pot Cap-1 Maneuver	0	0	346	0	0	563	433	-	0	764	-	0
Stage 1	0	0	-	0	0	-	-	-	0	-	-	0
Stage 2	0	0	-	0	0	-	-	-	0	-	-	0
Platoon blocked, %								-			-	
Mov Cap-1 Maneuver	-	-	346	-	-	563	433	-	-	764	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.5	11.6	1.9	0.1
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	433	-	346	563	764	-
HCM Lane V/C Ratio	0.269	-	0.551	0.037	0.027	-
HCM Control Delay (s)	16.3	-	27.5	11.6	9.8	-
HCM Lane LOS	C	-	D	B	A	-
HCM 95th %tile Q(veh)	1.1	-	3.2	0.1	0.1	-