

TRAFFIC IMPACT STUDY

For

Schmidt Property
El Paso County, Colorado
PCD File No. P-22-022

September 2022
January 2023
February 2023
Revised:
February 24, 2023

Prepared for:

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Fred Lantz, PE



Traffic Engineer's Statement

The attached traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.



02/24/2023

Fred Lantz, P.E. #23410

Date

Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.



Turkey Canon Quarry Inc
20 Boulder Crescent St 2nd Floor
Colorado Springs, CO 80903-3300

02/24/2023

Date

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I. Introduction

Project Overview

This traffic impact study is provided as a planning document and addresses the capacity, geometric, and control requirements associated with the development entitled Schmidt Property.

This traffic impact study has been revised to address County review comments made to the previous version regarding additional analyses on roadway improvements and safety as well as updates to site access locations. ***This study has been further revised to describe how site access onto Brush Top Road, Marksheffel Road, and Vollmer Road are conceptual and assumed within this study for analysis purposes associated with the property rezone request. It is hereby acknowledged that final site access approval (for location, turn movements, etc.) is to be reviewed and granted by El Paso County and City of Colorado Springs, where applicable, with later site development applications such as Preliminary Plan.***

This assumed residential development consists of an estimated 714 dwelling units. The 31.44-acre development is located along the south side of (future) Marksheffel Road and near the southwest corner of Vollmer Road intersection with Tahiti Drive in El Paso County, Colorado.

Study Area Boundaries

The study area to be examined in this analysis encompasses Vollmer Road near the existing intersection with Tahiti Drive and future Marksheffel Road as well as primary site access.

Consistent with Section B.2.3.B of Appendix B – Transportation Impact Study Guidelines from the County’s Engineering Criteria Manual (ECM)¹, the study area did not include the Vollmer Road intersections with Black Forest Road, Cowpoke Road, nor Dry Needle Place since the development’s trip distribution pattern does not anticipate much, if any, site traffic traveling to/from these intersections.

Figure 1 illustrates location of the site and study intersections.

Site Description

Land for the development is currently vacant and surrounded by a mix of commercial, residential, and open space land uses.

The rezone development is conceptual and is subject to change. However, for purposes of this analysis, the development assumes the new construction of approximately 714 multifamily residential dwelling units. It should be noted that the land use density described is estimated based on an assumed maximum density allowed per zoning (30 dwelling units per acre) in relation to the known acreage allocated for development at this time.

¹ El Paso County Engineering Criteria Manual, El Paso County, October 2020.

Considering the conceptual nature of the development, future access will likely include multiple access drives along future Brush Top Road (extended). These access locations are subject to change and therefore were not considered within this analysis. For purposes of this analysis, conceptual primary points of entry to the overall development area are assumed at the following locations:

- One full-movement access which will serve as the west leg of the intersection of Marksheffel Road and Vollmer Road.
- One full-movement access on Marksheffel Road at northwest corner of development site (approximately 1,480 feet west of Vollmer Road, measured from centerline). This access is intended to serve as the future collector roadway (Brush Top Road) connection between Marksheffel Road and Trails at Forest Meadows Subdivision.
- One right-in / right-out access on the north side of the property onto Marksheffel Road.
- One full-movement access onto Vollmer Road on the southeast side of the property.

Until approved by El Paso County and City of Colorado Springs (where applicable), all access locations, road locations, alignments, turn movements, and general design described in this study are conceptual and subject to change. Final location and design or need for any standards deviation request will be reviewed and determined through later site development applications such as Preliminary Plan.

It is anticipated that development construction would be phased with completion by end of Year 2040. However, specific phasing details are undefined at this time. For purposes of this analysis, initial development phasing is assumed to include the new construction of 480 multifamily residential dwelling units completed by Year 2027. Development buildout is expected to be completed by Year 2040 and include completed construction of the total 714 dwelling units.

General site and access locations are shown on Figure 1.

A conceptual site plan, as prepared by NES Inc., is shown on Figure 2. This plan is provided for illustrative purposes only.



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Figure 1
SITE LOCATION



Existing and Committed Surface Transportation Network

Within the study area, Vollmer Road is the primary roadway that will accommodate traffic to and from the proposed development. The secondary roadways include Tahiti Drive, and Marksheffel Road. A brief description of each roadway, based on the County's 2040 Major Transportation Corridors Plan (MTCP)² and Engineering Criteria Manual (ECM)³, is provided below:

Vollmer Road is a north-south rural roadway having two through lanes (one lane in each direction) with shared turn lanes at the intersection within the study area. Vollmer Road provides a posted speed limit of 45 MPH. Pursuant to the County's MTCP it is understood that Vollmer Road is envisioned to be a minor arterial roadway with four through lanes upon build-out. No additional right-of-way dedication appears needed as of this study date.

Tahiti Drive (at time of this study) is a north-south rural unpaved roadway having two through lanes (one lane in each direction) with shared turn lanes at the intersection within the study area. Tahiti Drive is unclassified in County's MTCP. However, per Standard Drawing 2-10 of the County ECM and the roadway's estimated ROW width, Tahiti Drive is assumed to be classified as a local roadway with a posted speed limit of 45 MPH. It is anticipated that Tahiti Drive will be closed as part of this proposed development and as area development occurs to allow for construction of Marksheffel Road (extension) to the west of Vollmer Road.

Marksheffel Road is a future east-west principal arterial roadway having a build-out cross-section of six through lanes (three lanes in each direction) with exclusive turn lanes at intersections within the study area pursuant to the County's MTCP. Marksheffel Road is anticipated to provide a posted speed limit of 45 MPH based on the County ECM. It is understood that ownership and maintenance of Marksheffel Road will be assumed by the City of Colorado Springs and specific design requirements are therefore to be pursuant to the City's engineering standards and specifications. For analysis purposes, and to remain consistent with assumptions made in previously approved traffic reports within the area, it is assumed that Marksheffel Road will be constructed as a four-lane roadway ending at Vollmer Road by Year 2027. It is uncertain as to when build-out for Marksheffel Road to six through lanes may occur depending on continued area development. Therefore, Year 2040 analysis conditions assume Marksheffel to remain a four-lane roadway and will be extended west of Vollmer Road. This assumption provides for a conservative analysis.

The Marksheffel Road cross-section will consist of four 11-foot wide through lanes, a 12-foot wide center turn lane, and two six-foot wide shoulders. In addition, a 10-foot-wide trail will be constructed along the south side of Marksheffel Road as well as a six-foot wide sidewalk on the north side of Marksheffel Road.

Existing study intersections operate under a stop-controlled condition. A stop-controlled intersection is defined as a roadway intersection where vehicle rights-of-way are controlled by one or more "STOP" signs. It is however understood that the future intersections of Marksheffel Road with Vollmer Road will be signalized upon surrounding area build-out or when signal warrants are met. For analysis purposes signalization is assumed to occur by Year 2040.

² El Paso County 2016 Major Transportation Corridors Plan Update, Felsburg Holt & Ullevig, December 2016.

³ El Paso County Engineering Criteria Manual, El Paso County, December 2016.

II. Existing Traffic Conditions

Morning (AM) and afternoon (PM) peak hour traffic counts were collected at the intersection of Vollmer Road with Tahiti Drive. Counts were collected on March 24, 2022, with AM peak hour counts being collected during the period of 7:00 a.m. to 9:00 a.m. and PM peak hour counts being collected during the period of 4:00 p.m. to 6:00 p.m.

Average daily traffic (ADT) 24-hour traffic volumes shown for Vollmer Road were obtained from the City of Colorado Springs Web Mapping Application Traffic Counts data map.

Collected and referenced counts representing existing traffic volumes and existing intersection geometry are shown on Figure 3. Traffic count data is included for reference in Appendix A.

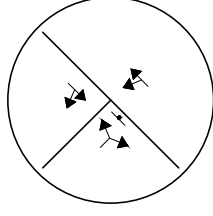
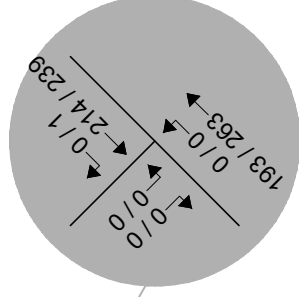


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Vollmer Road

Tahiti Drive

(7,970)



LEGEND

-  Study Intersection Volumes
-  Study Intersection Lane Geometry
-  Development Site

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Figure 3
EXISTING TRAFFIC
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

Peak Hour Intersection Levels of Service – Existing Traffic

The Signalized and Unsignalized Intersection Analysis techniques, as published in the Highway Capacity Manual (HCM), 6th Edition, by the Transportation Research Board and as incorporated into the SYNCHRO computer program, were used to analyze the study intersections for existing and future traffic conditions. These nationally accepted techniques allow for the determination of intersection level of service (LOS) based on the congestion and delay of each traffic movement.

Level of service is a method of measurement used by transportation professionals to quantify a driver's perception of travel conditions that include travel time, number of stops, and total amount of stopped delay experienced on a roadway network. The HCM categorizes level of service into a range from "A" which indicates little, if any, vehicle delay, to "F" which indicates a level of operation considered unacceptable to most drivers. These levels of service grades with brief descriptions of the operating condition, for unsignalized and signalized intersections, are included for reference in Appendix B and have been used throughout this study.

The level of service analyses results for existing conditions are summarized in Table 1.

Intersection capacity worksheets developed for this study are provided in Appendix C.

Table 1 – Intersection Capacity Analysis Summary – Existing Traffic

INTERSECTION LANE GROUPS	LEVEL OF SERVICE	
	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Tahiti Drive (Stop-Controlled)		
Northeastbound Left and Through	A	A
Southbound Left and Right	A	A

Key: Stop-Controlled Intersection: Level of Service

Existing Traffic Analysis Results

Under existing conditions, operational analysis shows that the unsignalized intersection of Vollmer Road with Tahiti Drive has turning movement operations at LOS A during both the morning and afternoon peak traffic hours.

III. Future Traffic Conditions Without Proposed Development

Background traffic is the traffic projected to be on area roadways without consideration of the proposed development. Background traffic includes traffic generated by development of vacant parcels in the area.

To account for projected traffic from adjacent developments not yet built, Year 2027 and Year 2040 background traffic conditions utilize estimated peak hour and 24-hour daily traffic volumes from the traffic study prepared for Rhetoric Development⁴ and approved area traffic studies, as provided by the County's Electronic Development Application Review Program (EDARP). This referenced traffic study includes traffic generation for the surrounding development area (primarily Sterling Ranch) as analyzed by various traffic engineering consultants.

Total traffic volumes as defined in Figures 7 and 8 of the 2022 Rhetoric Development traffic study were used to define background traffic conditions for purposes of this analysis. As reference, population growth estimates provided by the Pikes Peak Area Council of Governments' (PPACG) 2045 Long Range Transportation Plan⁵, estimates an annual growth rate of approximately two percent for the immediate development area.

Pursuant to the proposed and committed area roadway improvements discussed in Section I, Year 2027 background traffic conditions assume the completion of Marksheffel Road east of Vollmer Road along with a proposed roadway (Business Drive) connection of Marksheffel Road and Vollmer Road envisioned with the referenced Rhetoric Development. For analysis purposes, and to remain consistent with intersection geometry assumptions utilized in previous traffic reports, study intersections were analyzed as stop-controlled conditions. Vollmer Road is assumed to be widened in the southbound direction to provide two through lanes and the Tahiti Drive intersection is anticipated to be closed with existing traffic volumes utilizing alternative routes to the north.

Year 2040 background traffic conditions assume the completion of Marksheffel Road to the west of Vollmer Road, and the intersection of Marksheffel Road with Vollmer Road is assumed to be signalized. Widening of Vollmer Road to provide four through lanes (two lanes in each direction) is also assumed.

Future Year 2040 signal timing parameters for the intersections of Marksheffel Road with Vollmer Road were assumed based on the possible signal head configuration and allowable movements, and pursuant to typical signal timing data described within the County's ECM. Timings were used throughout this study to the best extent possible to remain consistent with typical County signal coordination plans.

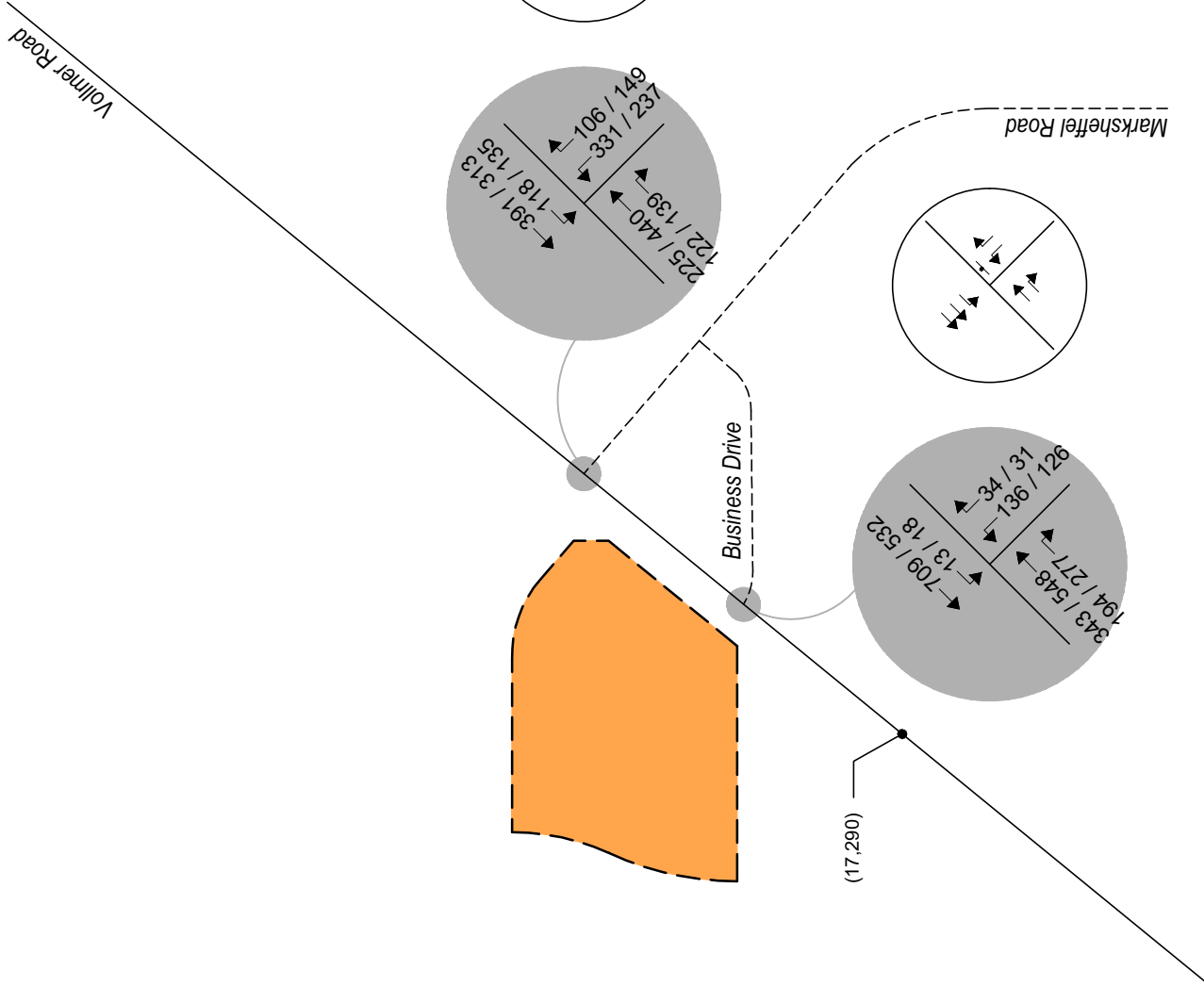
Projected background traffic volumes and intersection geometry for Years 2027 and 2040 are shown on Figure 4 and Figure 5, respectively.

⁴ Rhetoric Site Traffic Impact Study, SM Rocha, LLC, September 2022.

⁵ Moving Forward 2045: Pikes Peak Area Regional Transportation Plan, PPACG, January 2020.



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LEGEND

- Study Intersection Volumes
- Study Intersection Lane Geometry
- Development Site

Figure 4
BACKGROUND TRAFFIC - YEAR 2027
 Volumes & Intersection Geometry
 AM / PM Peak Hour
 (ADT) : Average Daily Traffic

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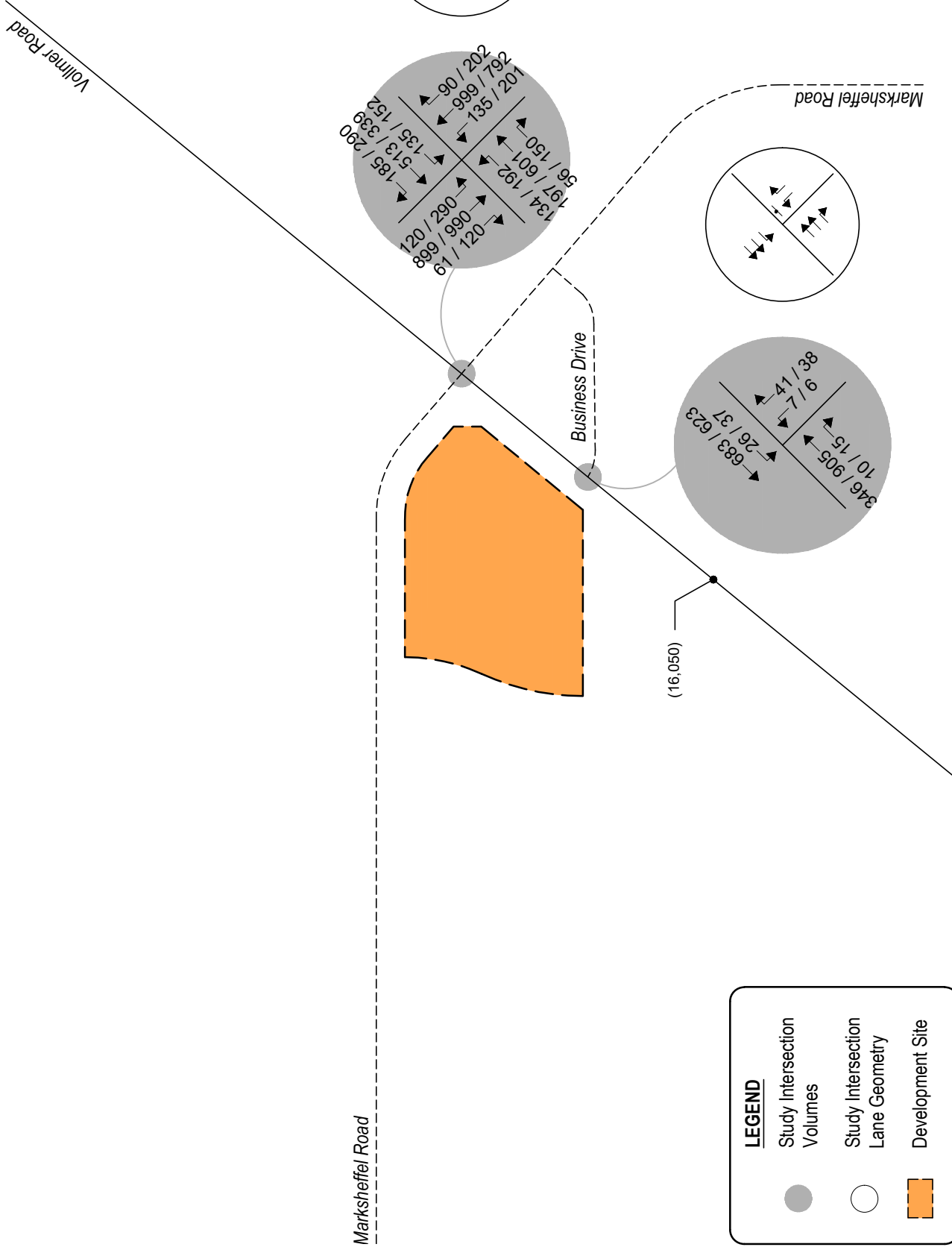


Figure 5
BACKGROUND TRAFFIC - YEAR 2040
 Volumes & Intersection Geometry
 AM / PM Peak Hour
 (ADT) : Average Daily Traffic

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Peak Hour Intersection Levels of Service – Background Traffic

As with existing traffic conditions, the operations of study intersections were analyzed under background conditions, without the proposed development, using the SYNCHRO computer program.

Background traffic level of service analysis results for Year 2027 are listed in Table 2. Year 2040 operational results are summarized in Table 3.

Definitions of levels of service are given in Appendix B. Intersection capacity worksheets are provided in Appendix C.

Table 2 – Intersection Capacity Analysis Summary – Background Traffic – Year 2027

INTERSECTION LANE GROUPS	LEVEL OF SERVICE	
	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Marksheffel Road (Stop-Controlled)		
Westbound Left	F	F
Westbound Right	B	B
Southbound Left	A	A
Vollmer Road / Business Drive (Stop-Controlled)		
Westbound Left	C	D
Westbound Right	B	B
Southbound Left	A	A

Key: Stop-Controlled Intersection: Level of Service

Background Traffic Analysis Results – Year 2027

Year 2027 background traffic analysis indicates that the unsignalized intersection of Vollmer Road with Marksheffel Road has turning movement operations at or better than LOS B during both the AM and PM peak traffic hours. Exceptions would include the westbound left turning movement which operates at LOS F during either peak traffic hour. The LOS F operations are attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection. In order to provide mitigation for the poor operations along the minor road approach, signalization is an option which is anticipated to achieve acceptable levels of service.

The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the AM peak traffic hour and LOS D or better for the PM peak traffic hour.

Table 3 – Intersection Capacity Analysis Summary – Background Traffic – Year 2040

INTERSECTION LANE GROUPS	LEVEL OF SERVICE	
	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Marksheffel Road (Signalized)	C (31.2)	D (36.9)
Vollmer Road / Business Drive (Stop-Controlled)		
Westbound Left	C	E
Westbound Right	A	B
Southbound Left	A	B

Key: Signalized Intersection: Level of Service (Control Delay in sec/veh)
 Stop-Controlled Intersection: Level of Service

Background Traffic Analysis Results – Year 2040

By Year 2040 and without the proposed development, the study intersection of Vollmer Road with Marksheffel Road experiences overall LOS C operations during the AM peak traffic hour and LOS D during the PM peak traffic hour under an assumed traffic signal control.

The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the morning peak traffic hour and LOS B for the afternoon peak traffic hour. Exceptions would include the westbound left turning movement which operates at LOS E during the afternoon peak traffic hour. The LOS E operation is attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection.

It is to be noted that it is not uncommon for unsignalized movements to or from an arterial roadway, in urban areas, to operate with noticeable delays during peak traffic hours. It is, however, likely that turn movements will operate better than the results obtained with this HCM Two-Way Stop-Control (TWSC) level of service analysis would indicate, as the HCM analysis may not accurately account for the effect of vehicle platooning and gaps caused by upstream signals. The upstream signal control on Vollmer Road at Marksheffel Road will tend to create additional gaps in the traffic stream for turning movements at Business Drive which will most likely provide mitigation to the LOS E operation projected during the afternoon peak traffic hour.

IV. Proposed Project Traffic

Trip Generation

Standard traffic generation characteristics compiled by the Institute of Transportation Engineers (ITE) in their report entitled Trip Generation Manual, 11th Edition, were applied to the assumed land use in order to estimate average daily traffic (ADT), AM Peak Hour, and PM Peak Hour vehicle trips. A vehicle trip is defined as a one-way vehicle movement from a point of origin to a point of destination.

The ITE land use code 220 (Multifamily Housing (Low-Rise)) was used for estimating trip generation because of its best fit to the assumed land use description.

As actual land uses, densities, or site plans within the Schmidt Property become defined over time, it is expected that traffic generation characteristics considered within this study will need to be updated by more specific traffic analyses or studies to help assess what, if any, transportation improvements are needed to mitigate potential traffic impacts.

Trip generation rates used in this study are presented in Table 4.

Table 4 – Trip Generation Rates

ITE CODE	LAND USE	UNIT	TRIP GENERATION RATES						
			24 HOUR	AM PEAK HOUR			PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
220	Multifamily Housing (Low-Rise)	DU	6.74	0.10	0.30	0.40	0.32	0.19	0.51

Key: DU = Dwelling Units

Table 5 illustrates projected ADT, AM Peak Hour, and PM Peak Hour traffic volumes likely generated by the assumed development upon build-out.

Table 5 – Trip Generation Summary

ITE CODE	LAND USE	SIZE	DU	TOTAL TRIPS GENERATED						
				24 HOUR	AM PEAK HOUR			PM PEAK HOUR		
					ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
220	Multifamily Housing (Low-Rise)	714	DU	4,812	69	217	286	229	135	364
<i>Total:</i>				4,812	69	217	286	229	135	364

Key: DU = Dwelling Units

Note: All data and calculations above are subject to being rounded to nearest value.

Upon build-out, Table 5 illustrates that the assumed development has the potential to generate approximately 4,812 daily vehicle trips with 286 of those occurring during the morning peak hour and 364 during the afternoon peak hour.

No actual site plan, phasing, or unit count is defined as of this study date. The following information is provided for example. Using Table 4 Trip Generation Rates, an assumed initial phase of site development at 480 dwelling units could generate approximately 3,235 daily vehicle trips, 192 morning peak hour trips, and 245 afternoon peak hour trips.

Adjustments to Trip Generation Rates

A development of this type is not likely to attract trips from within area land uses nor pass-by or diverted link trips from the adjacent roadway system, therefore no trip reduction was taken in this analysis.

Trip Distribution

The initial and overall directional distribution of site-generated traffic was determined based on the location of development site within the County, proposed and existing area land uses, allowed turning movements, and available roadway network. Directional distribution used for analysis also complies with the referenced Rhetoric Development traffic study and previously approved traffic studies for the adjacent ongoing development areas.

Trip distribution patterns for the initial phase of development are shown on Figure 6A.

Overall, long-term, trip distribution patterns for development build-out are shown on Figure 6B.

Trip Assignment

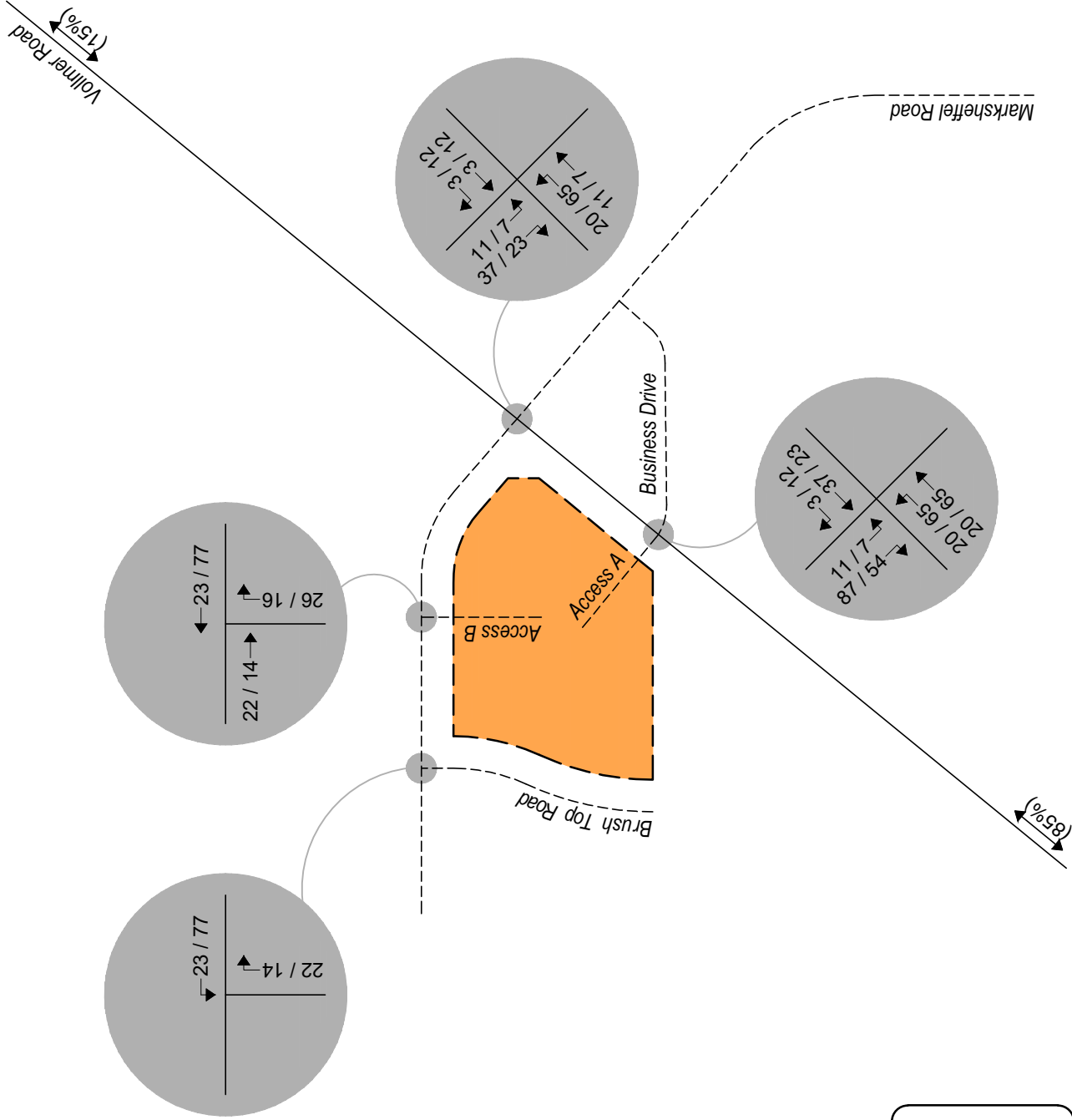
The construction of this development is assumed to be phased with the initial phase being completed by 2027 and entailing an approximate 16-acre portion of residential (480 dwelling units) area located immediately adjacent to future Marksheffel Road.

Traffic assignment is how generated and distributed vehicle trips are expected to be loaded onto the available roadway network.

Applying trip distribution patterns to site-generated traffic provides the initial site-generated trip assignments for Year 2027 shown on Figure 6A, and overall trip assignments Year 2040 are shown on Figure 6B.



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LEGEND

- Study Intersection
- Volumes
- Development Site

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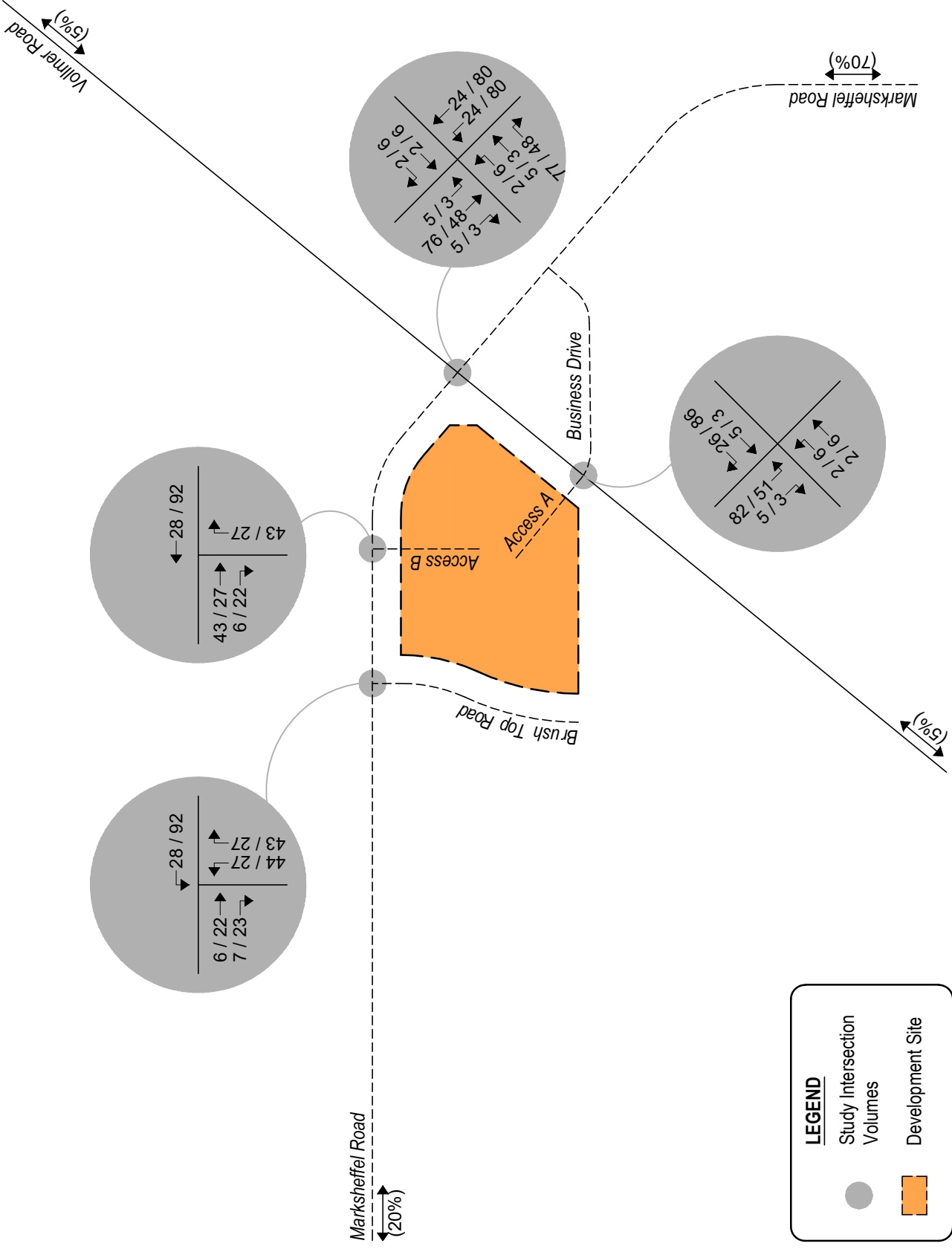


Figure 6B
SITE DEVELOPMENT DISTRIBUTION - YEAR 2040
 (%): Overall
SITE-GENERATED
 AM / PM Peak Hour

V. Future Traffic Conditions With Proposed Developments

Total traffic is the traffic projected to be on area roadways with consideration of the proposed development. Total traffic includes background traffic projections for Years 2027 and 2040 with consideration of site-generated traffic. For analysis purposes, it was assumed that development construction would be completed by end of Year 2040.

Pursuant to area roadway improvement discussions provided in Section III, Year 2027 and Year 2040 total traffic conditions assume no additional roadway improvements to accommodate regional transportation demands than that described for each background analysis year. Roadway improvements associated with site development are expected to be limited to site access and frontage as required by the governing agency. An exception is Marksheffel Road where the construction of a partial roadway section (two through lanes with shared center turn lane) is envisioned with the initial phase of site development.

Projected Year 2027 total traffic volumes and intersection geometry are shown in Figure 7. Figure 8 shows projected total traffic volumes and intersection geometry for Year 2040.

Total Traffic Auxiliary Lane Analysis

Auxiliary lanes for site development accesses were based on the County's ECM.

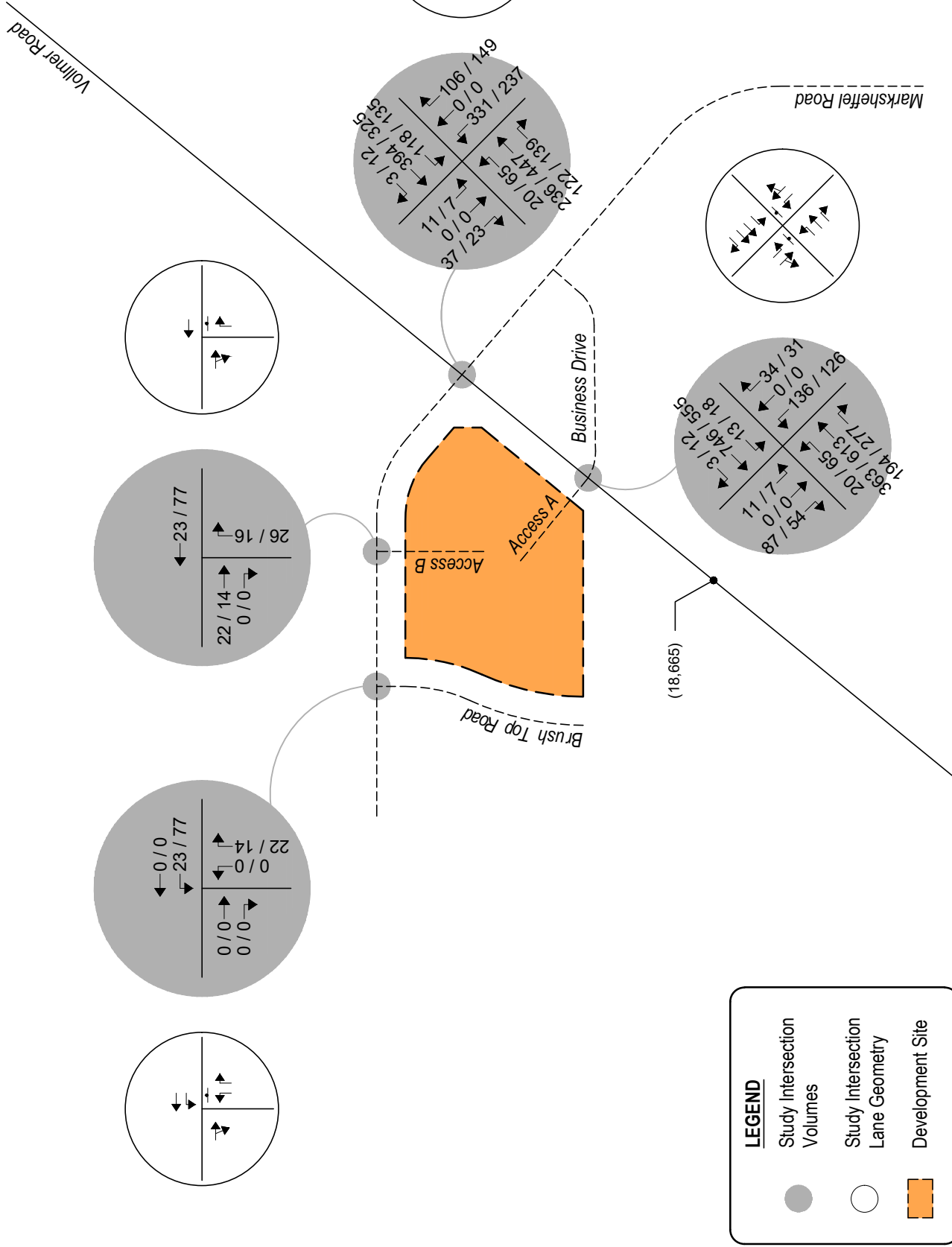
Considering development build-out, an evaluation of auxiliary lane requirements, pursuant to Section 2.3.7 of the County's ECM, reveals that southbound right turn deceleration lanes along Vollmer Road at Marksheffel Road and Access A are required since the southbound right turn ingress volumes exceed the 25 vehicles per hour threshold. Dedicated right turn lanes were also assumed along the future, ultimate section of Marksheffel Road at Vollmer Road, Access B, and (future) Brush Top Road.

Section 2.3.7 of the County's ECM also concludes that exclusive left turn deceleration lanes are required along ultimate Marksheffel Road at Vollmer Road and Brush Top Road, as well as along Vollmer Road at Marksheffel Road, since the projected left turn ingress volumes exceed the County's threshold of 10 vehicles per hour. Dedicated left turn lanes were also assumed along Vollmer Road at Access A.

Due to the conservative analysis performed throughout this study and the conceptual nature of assumed site development, it is expected that auxiliary lane requirements evaluated within this study will need to be updated by more specific traffic analyses or studies as actual area development occurs, to help assess if transportation improvements are needed to meet the County's vehicle volume thresholds. Refer to Table 8 (Turn Lane Queues and Storage Requirements) for auxiliary lane recommendations.



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- Study Intersection Volumes
- Study Intersection Lane Geometry
- Development Site

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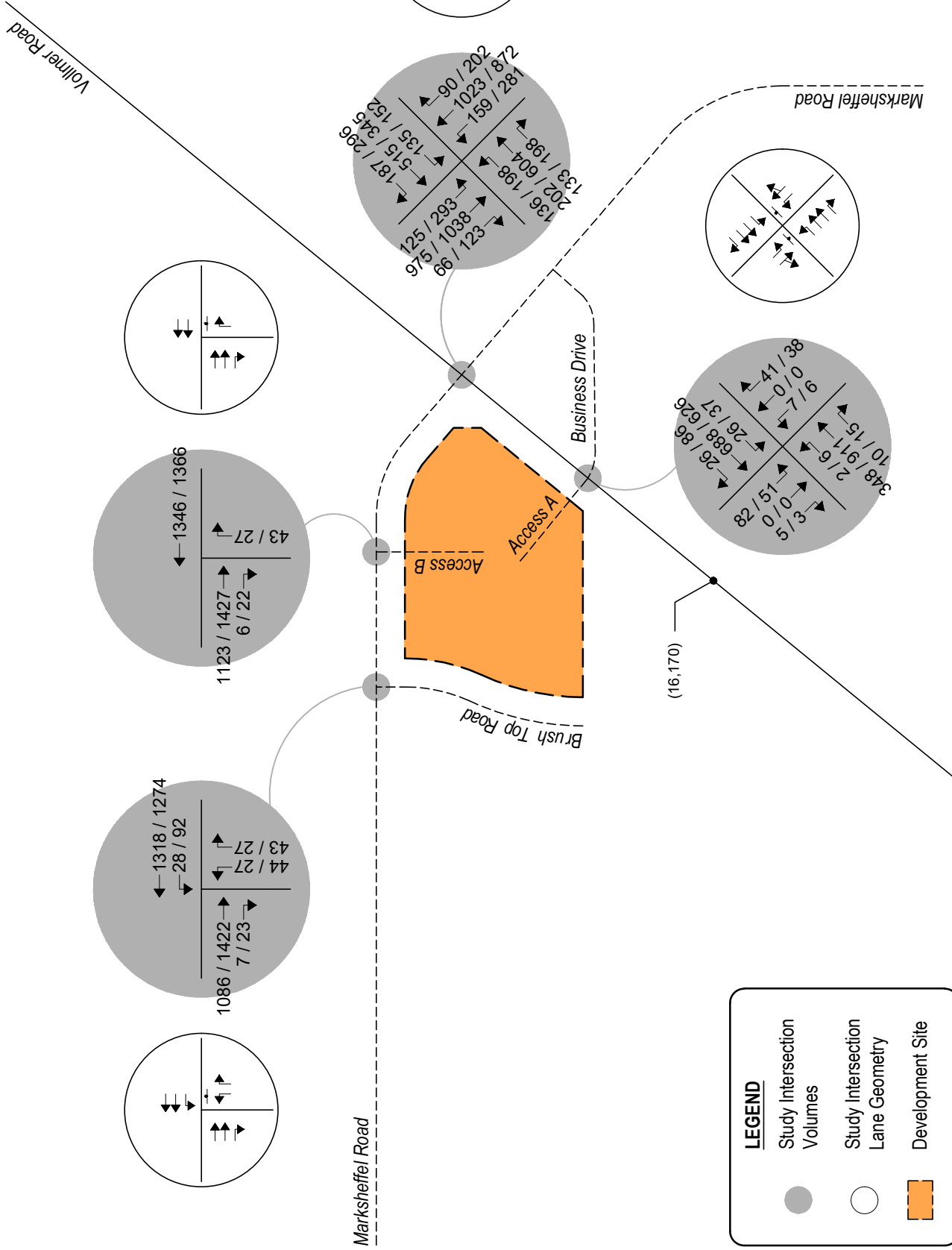
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Figure 7
TOTAL TRAFFIC - YEAR 2027
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

February 2023
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LEGEND

- Study Intersection Volumes
- Study Intersection Lane Geometry
- Development Site

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Figure 8
TOTAL TRAFFIC - YEAR 2040
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

VI. Project Impacts

The analyses and procedures described in this study were performed in accordance with the latest HCM and are based upon the worst-case conditions that occur during a typical weekday upon build-out of site development and analyzed land uses. Therefore, study intersections are likely to operate with traffic conditions better than those described within this study, which represent the peak hours of weekday operations only.

Peak Hour Intersection Levels of Service – Total Traffic

As with background traffic, the operations of the study intersections were analyzed under projected total traffic conditions using the SYNCHRO computer program. Total traffic level of service analysis results for Years 2027 and 2040 are summarized in Table 6 and Table 7, respectively.

Definitions of levels of service are given in Appendix B. Intersection capacity worksheets are provided in Appendix C.

Table 6 – Intersection Capacity Analysis Summary – Total Traffic – Year 2027

INTERSECTION LANE GROUPS	LEVEL OF SERVICE	
	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Marksheffel Road (Stop-Controlled)		
Eastbound Left	D	F
Eastbound Through	A	A
Eastbound Right	A	A
Westbound Left	F	F
Westbound Through	A	A
Westbound Right	B	B
Northbound Left	A	A
Southbound Left	A	A
Vollmer Road / Access A / Business Drive (Stop-Controlled)		
Eastbound Left	E	F
Eastbound Through and Right	B	B
Westbound Left	F	F
Westbound Through and Right	B	B
Northbound Left	A	A
Southbound Left	A	B
Marksheffel Road / Access B (Stop-Controlled)		
Northbound Right	A	A
Marksheffel Road / Brush Top Road (Stop-Controlled)		
Westbound Left	A	A
Northbound Left	A	A
Northbound Right	A	A

Key: Stop-Controlled Intersection: Level of Service

Table 7 – Intersection Capacity Analysis Summary – Total Traffic – Year 2040

INTERSECTION LANE GROUPS	LEVEL OF SERVICE	
	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Marksheffel Road (Signalized)	C (28.8)	D (37.8)
Vollmer Road / Access A / Business Drive (Stop-Controlled)		
Eastbound Left	E	F
Eastbound Through and Right	B	B
Westbound Left	C	E
Westbound Through and Right	A	B
Northbound Left	A	A
Southbound Left	A	B
Marksheffel Road / Access B (Stop-Controlled)		
Northbound Right	B	C
Marksheffel Road / Brush Top Road (Stop-Controlled)		
Westbound Left	B	C
Northbound Left	F	F
Northbound Right	B	C

Key: Signalized Intersection: Level of Service (Control Delay in sec/veh)
 Stop-Controlled Intersection: Level of Service

Total Traffic Analysis Results Upon Development Build-Out

Table 7 illustrates how, by Year 2040 and upon assumed development build-out, the signalized intersection of Vollmer Road with Marksheffel Road shows an overall LOS C operation during the morning peak traffic hour and LOS D operation during the afternoon peak traffic hour. Compared to the background traffic analysis, the traffic generated by the proposed development is not expected to significantly change the operations of the study intersection.

The stop-controlled intersection of Vollmer Road with Access A projects turning movement operations at LOS C or better during the AM peak traffic hour and LOS B or better during the PM peak traffic hour. Exceptions include the eastbound and westbound left turning movements which operate at LOS E and F during their respective peak traffic hours. The LOS E and F operations are attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection.

The stop-controlled intersection of Marksheffel Road with Access B expects turning movement operations at LOS B during the AM peak traffic hour and LOS C during the PM peak traffic hour.

The stop-controlled intersection of Marksheffel Road with Brush Top Road is projected to have morning and afternoon peak traffic hour turning movement operations at or better than LOS C. Exceptions would include the northbound left turning movement which operates at LOS F during either peak traffic hour. The LOS F operations are attributed to the through traffic volume along Marksheffel Road and the stop-controlled nature of the intersection. This poor operation occurs for the minor leg approach and is not expected to negatively impact the operations of Marksheffel Road. While signalization is a potential mitigating solution, it is recommended that as actual land uses and densities become defined within the overall area, intersection operational analyses will need to be updated to help assess if transportation improvements are needed to mitigate potential traffic impacts.

Queue Length Analysis

Queue lengths for the study intersections were analyzed using Year 2040 total traffic conditions. The analysis yields estimate of 95th percentile queue lengths, which have only a five percent probability of being exceeded during the analysis time period. An average vehicle length of 25 feet was assumed. Queue lengths were modeled and are included with the Synchro worksheets in Appendix C.

Table 8 summarizes the 95th percentile queue results in comparison to the projected storage requirements for turn movements within study area for Year 2040.

As Table 8 shows, all turn lane lengths into the site have sufficient storage to accommodate future traffic volumes. However, at the Vollmer Road intersection with Marksheffel Road, left turning movements are projected to have 95th percentile queuing that exceed existing turn lane lengths.

Due to the conservative analysis performed throughout this study and the conceptual nature of assumed site development, it is expected that vehicle queue lengths evaluated within this study will need to be updated by more specific traffic analyses or studies as actual area development occurs, to help assess if transportation improvements are needed.

Table 8 – Turn Lane Queues and Storage Requirements – Total Traffic – Year 2040

Intersection	Turn Movement	Existing Turn Lane Length (feet)	AM Peak Hour	PM Peak Hour	Recommended Turn Lane Length (feet)	
			95th Percentile Queue Length (feet)	95th Percentile Queue Length (feet)		
Signalized Intersections						
Vollmer Road / Marksheffel Road	EB	L	155'	72'	264'	265'
		T	-	378'	419'	-
		R	155'	0'	33'	155'
	WB	L	155'	130'	320'	320'
		T	-	396'	344'	-
		R	155'	13'	46'	155'
	NB	L	155'	121'	201'	205'
		T	-	95'	326'	-
		R	155'	49'	73'	155'
	SB	L	155'	114'	173'	175'
		T	-	239'	165'	-
		R	155'	58'	96'	155'
Stop-Controlled Intersections						
Vollmer Road / Access A	EB	L	115'	60'	58'	115'
		T,R	-	0'	0'	-
	WB	L	-	3'	5'	-
		T,R	-	5'	8'	-
	NB	L	155'	0'	0'	155'
		T	-	0'	0'	-
		R	155'	0'	0'	155'
	SB	L	155'	3'	5'	155'
		T	-	0'	0'	-
R		155'	0'	0'	155'	
Marksheffel Road / Access B	EB	T	-	0'	0'	-
		R	155'	0'	0'	155'
	WB	T	-	0'	0'	-
	NB	R	-	10'	8'	-
Marksheffel Road / Brush Top Road	EB	T	-	0'	0'	-
		R	155'	0'	0'	155'
	WB	L	155'	5'	23'	155'
		T	-	0'	0'	-
	NB	L	115'	98'	100'	115'
		R	-	8'	8'	-

Note: Turn Lane Length does not include taper length.

Pedestrian Circulation & Safety Analysis

In accordance with Section B.2.4.B of the County's ECM, an assessment to pedestrian connectivity and safety was considered. However, it is emphasized that the site plan analyzed throughout this study is conceptual and details of pedestrian circulation and connectivity have not been determined. As actual site plans within the overall development become defined over time, it is assumed that an evaluation of pedestrian circulation and connectivity may need to be evaluated. The submittal of a school routing plan in accordance with County standards is anticipated with the preliminary plan submittal.

With the assumption that future site plans are designed per the County's ECM, and pursuant to the Federal Highway Administration's (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations⁶, pedestrian safety is not expected to be of concern. Moreover, traffic calming and pedestrian crossing treatments are not applicable, and traffic calming is not recommended for the proposed conditions. The submittal of applicable safety and accident analysis in accordance with County standards is anticipated with the preliminary plan submittal or later development submittals.

⁶ Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, Federal Highway Administration, July 2018.

Recommended Improvements

Table 9 illustrates the recommended roadway and intersection control improvements associated with the proposed Schmidt Property development and adjacent area.

Table 9 – Recommended Improvements Summary

IMPROVEMENT	TYPE	TIMING	RESPONSIBILITY
Signalization of Marksheffel Road / Vollmer Road	Traffic Signal	When Warranted	Developments and other trip generators within the overall area
Widen Vollmer Road to four-lane cross-section	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct extension of Marksheffel Road to Vollmer Road	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct west leg of Vollmer Road and Marksheffel Road intersection	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct south leg of Marksheffel Road and Brush Top Road intersection	Roadway Segment	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct southbound right turn lane along Vollmer Road at Marksheffel Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct southbound right turn lane along Vollmer Road at Access A	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct eastbound right turn lane along Marksheffel Road at Vollmer Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct eastbound right turn lane along Marksheffel Road at Brush Top Road	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct westbound left turn lane along Marksheffel Road at Vollmer Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct westbound left turn lane along Marksheffel Road at Brush Top Road	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct northbound left turn lane along Vollmer Road at Marksheffel Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned

Recommended improvements, as shown in Table 9 above, may be reimbursable under the County's MTCP and include roadway widening improvements and auxiliary lane improvements along Vollmer Road and Marksheffel Road.

Marksheffel Road improvements within City limits require City of Colorado Springs approval and responsibility arrangement.

VII. Conclusion

This traffic impact study is provided as a planning document and addressed the capacity, geometric, and control requirements associated with the development entitled Schmidt Property. This assumed residential development consists of an estimated 714 dwelling units. The 31.44-acre development is located along the south side of (future) Marksheffel Road and near the southwest corner of the Vollmer Road intersection with Tahiti Drive in El Paso County, Colorado.

The study area examined in this analysis encompassed Vollmer Road near the existing intersection with Tahiti Drive and future Marksheffel Road as well as primary site access.

Analysis was conducted for critical AM Peak Hour and PM Peak Hour traffic operations for existing traffic conditions, Year 2027 and Year 2040 background traffic conditions, and Year 2027 and Year 2040 total traffic conditions.

Analysis of existing traffic conditions indicates that the unsignalized intersection of Vollmer Road with Tahiti Drive has turning movement operations at LOS A during both peak traffic hours.

Without the proposed development, Year 2027 background operational analysis shows that the unsignalized intersection of Vollmer Road with Marksheffel Road has turning movement operations at or better than LOS B during both peak traffic hours. Exceptions would include the westbound left turning movement which operates at LOS F during either peak traffic hour. In order to provide mitigation for the poor operations along the minor road approach, signalization is an option which is anticipated to provide acceptable levels of service. The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the AM peak traffic hour and LOS D or better for the PM peak traffic hour.

By Year 2040 and without the proposed development, the study intersection of Vollmer Road with Marksheffel Road experiences overall LOS C operations during the AM peak traffic hour and LOS D during the PM peak traffic hour. The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the morning peak traffic hour and LOS B for the afternoon peak traffic hour. Exceptions would include the westbound left turning movement which operates at LOS E during the afternoon peak traffic hour.

Analysis of future traffic conditions indicates that the addition of site-generated traffic is expected to create minimal impact to traffic operations for the existing and surrounding roadway system upon roadway and intersection control improvements assumed within this analysis. With all conservative assumptions defined in this analysis, study intersections are projected to operate at future levels of service comparable to Year 2040 background traffic conditions. Proposed site accesses have long-term operations at LOS C or better during peak traffic periods and upon build-out. Exceptions include the eastbound and westbound left turning movements at the Vollmer Road and Access A intersection, as well as the northbound left turning movements at the intersection of Marksheffel Road and Brush Top Road, which operate at LOS E and F during their respective peak traffic hours.

This site is subject to the El Paso County Road Impact Fee Program (Resolution 19-471), as amended. An option for payment will be selected at the final land use approval stage.

APPENDIX A

Traffic Count Data



ALL TRAFFIC DATA SERVICES

(303) 216-2439

www.alltrafficdata.net

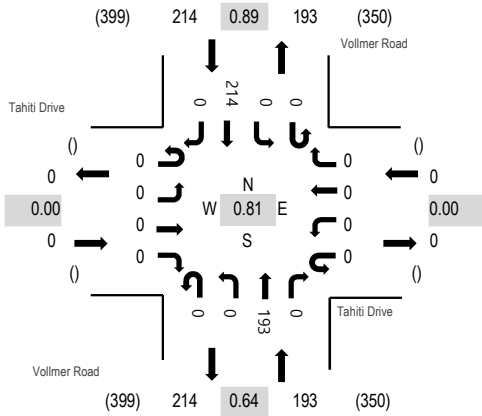
Location: 3 Vollmer Road & Tahiti Drive AM

Date: Thursday, March 24, 2022

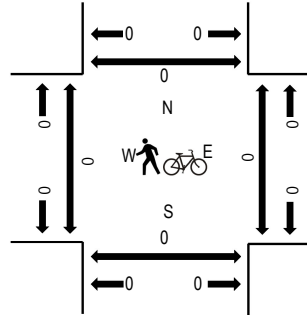
Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles on Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Tahiti Drive Eastbound				Tahiti Drive Westbound				Vollmer Road Northbound			Vollmer Road Southbound				Total	Rolling Hour	Pedestrian Crossings					
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North	
7:00 AM	0	0	0	0	0	0	0	0	0	0	42	0	0	0	0	30	0	72	374	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	33	0	0	0	0	47	0	80	400	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	55	0	96	400	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	75	0	0	0	0	51	0	126	407	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	37	0	0	0	0	61	0	98	375	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	34	0	0	0	0	46	0	80		0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	47	0	0	0	0	56	0	103		0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	53	0	94		0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	350	0	0	0	0	399	0	749		0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	193	0	0	0	0	214	0	407		0	0	0	0

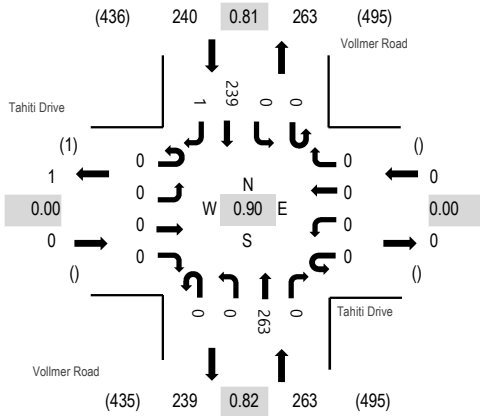
Location: 3 Vollmer Road & Tahiti Drive PM

Date: Thursday, March 24, 2022

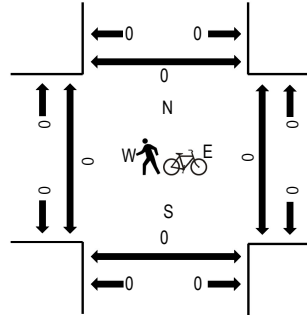
Peak Hour: 04:00 PM - 05:00 PM

Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles on Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Tahiti Drive Eastbound				Tahiti Drive Westbound				Vollmer Road Northbound			Vollmer Road Southbound				Total	Rolling Hour	Pedestrian Crossings					
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North	
4:00 PM	0	0	0	0	0	0	0	0	0	0	66	0	0	0	0	73	1	140	503	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	68	0	0	0	0	52	0	120	467	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	63	0	112	463	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	51	0	131	453	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	55	0	0	0	0	49	0	104	428	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	62	0	0	0	0	54	0	116		0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	54	0	0	0	0	48	0	102		0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	45	0	106		0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	495	0	0	0	0	435	1	931		0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	263	0	0	0	0	239	1	503		0	0	0	0

APPENDIX B

Level of Service Definitions

The following information can be found in the Highway Capacity Manual, Transportation Research Board, 2016: Chapter 19 – Signalized Intersections and Chapter 20 – Two-Way Stop Controlled Intersections.

Automobile Level of Service (LOS) for Signalized Intersections

Levels of service are defined to represent reasonable ranges in control delay.

LOS A

Describes operations with a control delay of 10 s/veh or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

LOS B

Describes operations with control delay between 10 and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

LOS C

Describes operations with control delay between 20 and 35 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D

Describes operations with control delay between 35 and 55 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E

Describes operations with control delay between 55 and 80 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F

Describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Level of Service (LOS) for Unsignalized TWSC Intersections

Level of Service (v/c ≤ 1.0)	Average Control Delay (s/veh)
A	0 - 10
B	> 10 - 15
C	> 15 - 25
D	> 25 - 35
E	> 35 - 50
F	> 50

APPENDIX C

Capacity Worksheets

HCM 6th TWSC
1: Vollmer Road & Tahiti Drive

Existing Traffic Volumes
AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	0	0	193	214	0
Future Vol, veh/h	0	0	0	193	214	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	210	233	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	443	233	233	0	-	0
Stage 1	233	-	-	-	-	-
Stage 2	210	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	572	806	1335	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	825	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	572	806	1335	-	-	-
Mov Cap-2 Maneuver	572	-	-	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	825	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	1335	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM 6th TWSC
1: Vollmer Road & Tahiti Drive

Existing Traffic Volumes
PM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations	T			T		
Traffic Vol, veh/h	0	0	0	263	239	1
Future Vol, veh/h	0	0	0	263	239	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	286	260	1

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	547	261	261	0	-	0
Stage 1	261	-	-	-	-	-
Stage 2	286	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	498	778	1303	-	-	-
Stage 1	783	-	-	-	-	-
Stage 2	763	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	498	778	1303	-	-	-
Mov Cap-2 Maneuver	498	-	-	-	-	-
Stage 1	783	-	-	-	-	-
Stage 2	763	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	1303	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection						
Int Delay, s/veh	27.5					
Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↘	↗	↑	↗	↘	↑↑
Traffic Vol, veh/h	331	106	225	122	118	391
Future Vol, veh/h	331	106	225	122	118	391
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	235	-	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	360	115	245	133	128	425

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	714	245	0	0	378	0
Stage 1	245	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	382	793	-	-	1179	-
Stage 1	795	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 340	793	-	-	1179	-
Mov Cap-2 Maneuver	~ 340	-	-	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	532	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	78.9	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NET	NER	NWL	N1	NWL	N2	SWL	SWT
Capacity (veh/h)	-	-	340	793	1179	-	-	-
HCM Lane V/C Ratio	-	-	1.058	0.145	0.109	-	-	-
HCM Control Delay (s)	-	-	100.9	10.3	8.4	-	-	-
HCM Lane LOS	-	-	F	B	A	-	-	-
HCM 95th %tile Q(veh)	-	-	12.9	0.5	0.4	-	-	-

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

HCM 6th TWSC
2: Vollmer Road & Business Drive

Background Traffic Volumes
AM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	2.6					
Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↙	↗	↑	↗	↙	↗↗
Traffic Vol, veh/h	136	34	343	194	13	709
Future Vol, veh/h	136	34	343	194	13	709
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	148	37	373	211	14	771

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	787	373	0	0	584
Stage 1	373	-	-	-	-
Stage 2	414	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219
Pot Cap-1 Maneuver	344	672	-	-	989
Stage 1	696	-	-	-	-
Stage 2	636	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	339	672	-	-	989
Mov Cap-2 Maneuver	339	-	-	-	-
Stage 1	696	-	-	-	-
Stage 2	627	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	21	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	WBLn1	WBLn2	SWL	SWT
Capacity (veh/h)	-	-	339	672	989	-
HCM Lane V/C Ratio	-	-	0.436	0.055	0.014	-
HCM Control Delay (s)	-	-	23.6	10.7	8.7	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	2.1	0.2	0	-

Intersection						
Int Delay, s/veh	25					
Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↘	↗	↑	↗	↘	↑↑
Traffic Vol, veh/h	237	149	440	139	135	313
Future Vol, veh/h	237	149	440	139	135	313
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	235	-	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	258	162	478	151	147	340

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	942	478	0	0	629	0
Stage 1	478	-	-	-	-	-
Stage 2	464	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	276	586	-	-	951	-
Stage 1	623	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	~ 233	586	-	-	951	-
Mov Cap-2 Maneuver	~ 233	-	-	-	-	-
Stage 1	623	-	-	-	-	-
Stage 2	507	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	88.2	0	2.9
HCM LOS	F		

Minor Lane/Major Mvmt	NET	NER	NWL	N1	NWL	N2	SWL	SWT
Capacity (veh/h)	-	-	233	586	951	-	-	-
HCM Lane V/C Ratio	-	-	1.106	0.276	0.154	-	-	-
HCM Control Delay (s)	-	-	135.1	13.5	9.5	-	-	-
HCM Lane LOS	-	-	F	B	A	-	-	-
HCM 95th %tile Q(veh)	-	-	11.5	1.1	0.5	-	-	-

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

HCM 6th TWSC
2: Vollmer Road & Business Drive

Background Traffic Volumes
PM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	2.8					
Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↙	↗	↑	↗	↙	↗↗
Traffic Vol, veh/h	126	31	548	277	18	532
Future Vol, veh/h	126	31	548	277	18	532
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	137	34	596	301	20	578

























Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	925	596	0	0	897
Stage 1	596	-	-	-	-
Stage 2	329	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219
Pot Cap-1 Maneuver	283	503	-	-	755
Stage 1	549	-	-	-	-
Stage 2	702	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	276	503	-	-	755
Mov Cap-2 Maneuver	276	-	-	-	-
Stage 1	549	-	-	-	-
Stage 2	684	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	26.7	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NET	NER	WBLn1	WBLn2	SWL	SWT
Capacity (veh/h)	-	-	276	503	755	-
HCM Lane V/C Ratio	-	-	0.496	0.067	0.026	-
HCM Control Delay (s)	-	-	30.2	12.7	9.9	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	2.6	0.2	0.1	-

Timings
1: Vollmer Road & Marksheffel Road

Background Traffic Volumes
AM Peak Hour - Year 2040

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	120	899	61	135	999	90	134	197	56	135	513	185
Future Volume (vph)	120	899	61	135	999	90	134	197	56	135	513	185
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.126			0.103			0.241			0.618		
Satd. Flow (perm)	235	3539	1583	192	3539	1583	449	3539	1583	1151	3539	1583
Satd. Flow (RTOR)			142			142			142			201
Lane Group Flow (vph)	130	977	66	147	1086	98	146	214	61	147	558	201
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	15.0	40.0	40.0	15.0	40.0	40.0	15.0	30.0	30.0	15.0	30.0	30.0
Total Split (%)	15.0%	40.0%	40.0%	15.0%	40.0%	40.0%	15.0%	30.0%	30.0%	15.0%	30.0%	30.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	43.8	34.0	34.0	51.2	38.8	38.8	31.5	20.9	20.9	31.3	20.8	20.8
Actuated g/C Ratio	0.44	0.34	0.34	0.51	0.39	0.39	0.32	0.21	0.21	0.31	0.21	0.21
v/c Ratio	0.55	0.81	0.10	0.47	0.79	0.14	0.55	0.29	0.14	0.35	0.76	0.41
Control Delay	23.0	36.6	0.3	22.1	33.5	1.9	29.4	33.7	0.6	23.8	44.1	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	36.6	0.3	22.1	33.5	1.9	29.4	33.7	0.6	23.8	44.1	7.3
LOS	C	D	A	C	C	A	C	C	A	C	D	A
Approach Delay		33.0			29.9			27.4			32.7	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	41	295	0	47	326	0	62	60	0	63	175	0
Queue Length 95th (ft)	80	376	0	108	#469	14	104	90	0	104	227	55
Internal Link Dist (ft)		548			642			656			525	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	260	1203	631	313	1373	700	275	849	487	428	849	532
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.81	0.10	0.47	0.79	0.14	0.53	0.25	0.13	0.34	0.66	0.38

Intersection Summary









Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
 Natural Cycle: 75
 Control Type: Actuated-Coordinated

Timings
 1: Vollmer Road & Marksheffel Road

Background Traffic Volumes
 AM Peak Hour - Year 2040

Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 31.2 Intersection LOS: C
 Intersection Capacity Utilization 74.2% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	7	41	346	10	26	683
Future Vol, veh/h	7	41	346	10	26	683
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	45	376	11	28	742

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	803	188	0	0	387
Stage 1	376	-	-	-	-
Stage 2	427	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	321	822	-	-	1168
Stage 1	664	-	-	-	-
Stage 2	626	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	313	822	-	-	1168
Mov Cap-2 Maneuver	313	-	-	-	-
Stage 1	664	-	-	-	-
Stage 2	611	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	10.7	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	WBLn2	SWL	SWT
Capacity (veh/h)	-	-	313	822	1168	-
HCM Lane V/C Ratio	-	-	0.024	0.054	0.024	-
HCM Control Delay (s)	-	-	16.8	9.6	8.2	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.2	0.1	-

Timings
1: Vollmer Road & Marksheffel Road

Background Traffic Volumes
PM Peak Hour - Year 2040

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	290	990	120	201	792	202	192	601	150	152	339	290
Future Volume (vph)	290	990	120	201	792	202	192	601	150	152	339	290
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.176			0.093			0.338			0.189		
Satd. Flow (perm)	328	3539	1583	173	3539	1583	630	3539	1583	352	3539	1583
Satd. Flow (RTOR)			118			151			131			315
Lane Group Flow (vph)	315	1076	130	218	861	220	209	653	163	165	368	315
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	25.0	50.0	50.0	20.0	45.0	45.0	20.0	35.0	35.0	15.0	30.0	30.0
Total Split (%)	20.8%	41.7%	41.7%	16.7%	37.5%	37.5%	16.7%	29.2%	29.2%	12.5%	25.0%	25.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	63.2	44.0	44.0	60.7	43.3	43.3	41.4	26.6	26.6	33.5	22.6	22.6
Actuated g/C Ratio	0.53	0.37	0.37	0.51	0.36	0.36	0.34	0.22	0.22	0.28	0.19	0.19
v/c Ratio	0.81	0.83	0.20	0.68	0.67	0.33	0.60	0.83	0.36	0.77	0.55	0.57
Control Delay	34.6	41.3	6.5	40.0	36.7	11.6	35.6	54.7	12.4	52.4	47.4	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.6	41.3	6.5	40.0	36.7	11.6	35.6	54.7	12.4	52.4	47.4	8.9
LOS	C	D	A	D	D	B	D	D	B	D	D	A
Approach Delay		36.9			33.0			44.0			34.1	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	127	395	6	114	310	37	115	252	20	89	136	0
Queue Length 95th (ft)	#251	485	47	#238	388	102	177	318	77	#168	185	79
Internal Link Dist (ft)		573			633			675			528	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	420	1297	655	320	1277	667	365	855	481	216	707	568
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.83	0.20	0.68	0.67	0.33	0.57	0.76	0.34	0.76	0.52	0.55

Intersection Summary









Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
 Natural Cycle: 80
 Control Type: Actuated-Coordinated

Timings
 1: Vollmer Road & Marksheffel Road

Background Traffic Volumes
 PM Peak Hour - Year 2040

Maximum v/c Ratio: 0.83
 Intersection Signal Delay: 36.9 Intersection LOS: D
 Intersection Capacity Utilization 81.9% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
25 s	45 s	15 s	35 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
20 s	50 s	20 s	30 s

HCM 6th TWSC
2: Vollmer Road & Business Drive

Background Traffic Volumes
PM Peak Hour - Year 2040

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	6	38	905	15	37	623
Future Vol, veh/h	6	38	905	15	37	623
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	41	984	16	40	677

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1403	492	0	0	1000
Stage 1	984	-	-	-	-
Stage 2	419	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	131	522	-	-	688
Stage 1	323	-	-	-	-
Stage 2	632	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	123	522	-	-	688
Mov Cap-2 Maneuver	123	-	-	-	-
Stage 1	323	-	-	-	-
Stage 2	595	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	15.7	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	WBLn1	WBLn2	SWL	SWT
Capacity (veh/h)	-	-	123	522	688	-
HCM Lane V/C Ratio	-	-	0.053	0.079	0.058	-
HCM Control Delay (s)	-	-	35.9	12.5	10.6	-
HCM Lane LOS	-	-	E	B	B	-
HCM 95th %tile Q(veh)	-	-	0.2	0.3	0.2	-

HCM 6th TWSC
1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2027

Intersection										
Int Delay, s/veh	57.9									
Movement	EBL	EBR	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↙	↗	↙	↗	↙	↑	↗	↙	↑↑	↗
Traffic Vol, veh/h	11	0	0	106	20	236	122	118	394	3
Future Vol, veh/h	11	0	0	106	20	236	122	118	394	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	-	None	-	-	None	-	-	None
Storage Length	235	235	235	-	235	-	150	150	-	235
Veh in Median Storage, #	0	-	0	-	-	0	-	-	0	-
Grade, %	0	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	0	0	115	22	257	133	128	428	3

Major/Minor	Minor2		Minor1		Major1		Major2			
Conflicting Flow All	1109	214	771	257	431	0	0	390	0	0
Stage 1	684	-	301	-	-	-	-	-	-	-
Stage 2	425	-	470	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.93	7.33	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.53	-	6.13	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	-	6.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	3.519	3.319	2.219	-	-	2.219	-	-
Pot Cap-1 Maneuver	175	792	~ 303	781	1127	-	-	1167	-	-
Stage 1	406	-	707	-	-	-	-	-	-	-
Stage 2	606	-	544	-	-	-	-	-	-	-
Platoon blocked, %						-	-	-	-	-
Mov Cap-1 Maneuver	135	792	~ 260	781	1127	-	-	1167	-	-
Mov Cap-2 Maneuver	135	-	~ 260	-	-	-	-	-	-	-
Stage 1	398	-	693	-	-	-	-	-	-	-
Stage 2	507	-	460	-	-	-	-	-	-	-

Approach	EB	NW	NE	SW
HCM Control Delay, s	15.4	178.2	0.4	1.9
HCM LOS	C	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	NWLn2	NWLn3	EBLn1	EBLn2	EBLn3	SWL	SWT	SWR	
Capacity (veh/h)	1127	-	-	260	-	781	135	-	792	1167	-	-
HCM Lane V/C Ratio	0.019	-	-	1.384	-	0.148	0.089	-	0.051	0.11	-	-
HCM Control Delay (s)	8.3	-	-	232	0	10.4	34.2	0	9.8	8.5	-	-
HCM Lane LOS	A	-	-	F	A	B	D	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	19.4	-	0.5	0.3	-	0.2	0.4	-	-

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

HCM 6th TWSC
2: Vollmer Road & Access A/Business Drive

Total Traffic Volumes
AM Peak Hour - Year 2027

Intersection												
Int Delay, s/veh	6.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↶	↷		↶	↷		↶	↷	↶	↷	↶	↷
Traffic Vol, veh/h	11	0	87	136	0	34	20	363	194	13	746	3
Future Vol, veh/h	11	0	87	136	0	34	20	363	194	13	746	3
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	-	-	None	-	-	None
Storage Length	150	-	-	0	-	-	200	-	200	200	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	0	95	148	0	37	22	395	211	14	811	3

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1402	1489	406	873	1281	395	814	0	0	606	0	0
Stage 1	839	839	-	439	439	-	-	-	-	-	-	-
Stage 2	563	650	-	434	842	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.53	6.93	7.33	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.53	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.53	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	3.319	3.519	4.019	3.319	2.219	-	-	2.219	-	-
Pot Cap-1 Maneuver	108	123	595	257	165	653	811	-	-	970	-	-
Stage 1	327	380	-	596	577	-	-	-	-	-	-	-
Stage 2	510	464	-	571	379	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	99	118	595	209	158	653	811	-	-	970	-	-
Mov Cap-2 Maneuver	99	118	-	209	158	-	-	-	-	-	-	-
Stage 1	318	375	-	580	561	-	-	-	-	-	-	-
Stage 2	468	451	-	473	374	-	-	-	-	-	-	-

Approach	EB	WB	NE	SW
HCM Control Delay, s	16	46.6	0.3	0.1
HCM LOS	C	E		

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	EBLn2	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	811	-	-	99	595	209	653	970	-	-
HCM Lane V/C Ratio	0.027	-	-	0.121	0.159	0.707	0.057	0.015	-	-
HCM Control Delay (s)	9.6	-	-	46.3	12.2	55.5	10.8	8.8	-	-
HCM Lane LOS	A	-	-	E	B	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.6	4.5	0.2	0	-	-

HCM 6th TWSC
3: Access B & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	3.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↗
Traffic Vol, veh/h	22	0	0	23	0	26
Future Vol, veh/h	22	0	0	23	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	0	0	25	0	28

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	24
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	-	0	1052
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	1052
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	1052	-	-	-
HCM Lane V/C Ratio	0.027	-	-	-
HCM Control Delay (s)	8.5	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

HCM 6th TWSC
4: Brush Top Road & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	7.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↑	↖	↗
Traffic Vol, veh/h	0	0	23	0	0	22
Future Vol, veh/h	0	0	23	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	25	0	0	24

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	1	0	51
Stage 1	-	-	-	-	1
Stage 2	-	-	-	-	50
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1622	-	958
Stage 1	-	-	-	-	1022
Stage 2	-	-	-	-	972
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1622	-	944
Mov Cap-2 Maneuver	-	-	-	-	872
Stage 1	-	-	-	-	1022
Stage 2	-	-	-	-	957

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	1084	-	-	1622	-
HCM Lane V/C Ratio	-	0.022	-	-	0.015	-
HCM Control Delay (s)	0	8.4	-	-	7.3	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-

HCM 6th TWSC
1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2027

Intersection										
Int Delay, s/veh	69									
Movement	EBL	EBR	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↙	↗	↙	↗	↙	↗	↗	↙	↗	↗
Traffic Vol, veh/h	7	0	0	149	65	447	139	135	325	12
Future Vol, veh/h	7	0	0	149	65	447	139	135	325	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	-	None	-	-	None	-	-	None
Storage Length	235	235	235	-	235	-	150	150	-	235
Veh in Median Storage, #	0	-	0	-	-	0	-	-	0	-
Grade, %	0	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	0	0	162	71	486	151	147	353	13

Major/Minor	Minor2	Minor1	Major1	Major2
Conflicting Flow All	1432	177	1099	486
Stage 1	647	-	628	-
Stage 2	785	-	471	-
Critical Hdwy	7.33	6.93	7.33	6.23
Critical Hdwy Stg 1	6.53	-	6.13	-
Critical Hdwy Stg 2	6.13	-	6.53	-
Follow-up Hdwy	3.519	3.319	3.519	3.319
Pot Cap-1 Maneuver	103	836	~ 178	580
Stage 1	427	-	470	-
Stage 2	385	-	543	-
Platoon blocked, %				
Mov Cap-1 Maneuver	63	836	~ 145	580
Mov Cap-2 Maneuver	63	-	~ 145	-
Stage 1	401	-	442	-
Stage 2	261	-	445	-

Approach	EB	NW	NE	SW
HCM Control Delay, s	23.5	268.7	0.8	2.7
HCM LOS	C	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	NWLn2	NWLn3	EBLn1	EBLn2	EBLn3	SWL	SWT	SWR
Capacity (veh/h)	1191	-	-	145	-	580	63	-	836	945	-
HCM Lane V/C Ratio	0.059	-	-	1.777	-	0.279	0.121	-	0.03	0.155	-
HCM Control Delay (s)	8.2	-	-	\$ 429	0	13.6	69.8	0	9.4	9.5	-
HCM Lane LOS	A	-	-	F	A	B	F	A	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	19.1	-	1.1	0.4	-	0.1	0.5	-

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

HCM 6th TWSC
2: Vollmer Road & Access A/Business Drive

Total Traffic Volumes
PM Peak Hour - Year 2027

Intersection												
Int Delay, s/veh	10.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗		↖	↗		↖	↑	↗	↖	↑↑	↗
Traffic Vol, veh/h	7	0	54	126	0	31	65	613	277	18	555	12
Future Vol, veh/h	7	0	54	126	0	31	65	613	277	18	555	12
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	-	-	None	-	-	None
Storage Length	150	-	-	0	-	-	200	-	200	200	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	0	59	137	0	34	71	666	301	20	603	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1619	1752	302	1150	1464	666	616	0	0	967	0	0
Stage 1	643	643	-	808	808	-	-	-	-	-	-	-
Stage 2	976	1109	-	342	656	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.53	6.93	7.33	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.53	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.53	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	3.319	3.519	4.019	3.319	2.219	-	-	2.219	-	-
Pot Cap-1 Maneuver	75	85	695	164	128	458	962	-	-	710	-	-
Stage 1	429	468	-	374	393	-	-	-	-	-	-	-
Stage 2	301	284	-	647	461	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	64	77	695	139	115	458	962	-	-	710	-	-
Mov Cap-2 Maneuver	64	77	-	139	115	-	-	-	-	-	-	-
Stage 1	397	455	-	346	364	-	-	-	-	-	-	-
Stage 2	258	263	-	576	448	-	-	-	-	-	-	-

Approach	EB	WB	NE	SW
HCM Control Delay, s	17.4	110.8	0.6	0.3
HCM LOS	C	F		

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	EBLn2	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	962	-	-	64	695	139	458	710	-	-
HCM Lane V/C Ratio	0.073	-	-	0.119	0.084	0.985	0.074	0.028	-	-
HCM Control Delay (s)	9	-	-	68.7	10.7	134.8	13.5	10.2	-	-
HCM Lane LOS	A	-	-	F	B	F	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.4	0.3	7	0.2	0.1	-	-

HCM 6th TWSC
3: Access B & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	1.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷		↷
Traffic Vol, veh/h	14	0	0	77	0	16
Future Vol, veh/h	14	0	0	77	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	0	0	84	0	17

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	-	-	15
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.318
Pot Cap-1 Maneuver	-	0	-	0	1065
Stage 1	-	0	-	0	-
Stage 2	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	1065
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	1065	-	-	-
HCM Lane V/C Ratio	0.016	-	-	-
HCM Control Delay (s)	8.4	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

























HCM 6th TWSC
4: Brush Top Road & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2027

Intersection						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↑	↖	↗
Traffic Vol, veh/h	0	0	77	0	0	14
Future Vol, veh/h	0	0	77	0	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	84	0	0	15
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	1	0	169	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	168	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	821	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1622	-	778	1084
Mov Cap-2 Maneuver	-	-	-	-	741	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	817	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	7.3	8.4			
HCM LOS			A			
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	1084	-	-	1622	-
HCM Lane V/C Ratio	-	0.014	-	-	0.052	-
HCM Control Delay (s)	0	8.4	-	-	7.3	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	0	-	-	0.2	-

Timings
1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2040

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	125	975	66	159	1023	90	136	202	133	135	515	187
Future Volume (vph)	125	975	66	159	1023	90	136	202	133	135	515	187
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.136			0.120			0.210			0.614		
Satd. Flow (perm)	253	3539	1583	224	3539	1583	391	3539	1583	1144	3539	1583
Satd. Flow (RTOR)			142			142			145			203
Lane Group Flow (vph)	136	1060	72	173	1112	98	148	220	145	147	560	203
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	13.0	46.0	46.0	14.0	47.0	47.0	13.0	28.0	28.0	12.0	27.0	27.0
Total Split (%)	13.0%	46.0%	46.0%	14.0%	47.0%	47.0%	13.0%	28.0%	28.0%	12.0%	27.0%	27.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	48.7	40.0	40.0	53.7	42.8	42.8	29.5	20.5	20.5	27.5	19.5	19.5
Actuated g/C Ratio	0.49	0.40	0.40	0.54	0.43	0.43	0.30	0.20	0.20	0.28	0.20	0.20
v/c Ratio	0.57	0.75	0.10	0.61	0.74	0.13	0.66	0.30	0.33	0.41	0.81	0.43
Control Delay	21.4	29.8	0.3	24.7	27.9	1.5	39.3	34.5	7.8	28.3	48.4	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	29.8	0.3	24.7	27.9	1.5	39.3	34.5	7.8	28.3	48.4	7.9
LOS	C	C	A	C	C	A	D	C	A	C	D	A
Approach Delay		27.2			25.7			28.3			36.1	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	40	298	0	52	314	0	66	61	0	66	177	0
Queue Length 95th (ft)	72	378	0	#130	396	13	#121	95	49	114	239	58
Internal Link Dist (ft)		945			642			663			525	
Turn Bay Length (ft)	155		155	155		155	155		155	155		155
Base Capacity (vph)	245	1415	718	282	1512	757	225	778	461	358	743	492
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.75	0.10	0.61	0.74	0.13	0.66	0.28	0.31	0.41	0.75	0.41

Intersection Summary









Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
 Natural Cycle: 75
 Control Type: Actuated-Coordinated

Timings
 1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
 AM Peak Hour - Year 2040

Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 28.8 Intersection LOS: C
 Intersection Capacity Utilization 75.9% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
13 s	47 s	12 s	28 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
14 s	46 s	13 s	27 s

HCM 6th TWSC
2: Vollmer Road & Access A/Business Drive

Total Traffic Volumes
AM Peak Hour - Year 2040

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↵	↵		↵	↵		↵	↕	↵	↵	↕	↵
Traffic Vol, veh/h	82	0	5	7	0	41	2	348	10	26	688	26
Future Vol, veh/h	82	0	5	7	0	41	2	348	10	26	688	26
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	-	-	None	-	-	None
Storage Length	115	-	-	0	-	-	155	-	155	155	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	89	0	5	8	0	45	2	378	11	28	748	28

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	997	1197	374	812	1214	189	776	0	0	389	0	0
Stage 1	804	804	-	382	382	-	-	-	-	-	-	-
Stage 2	193	393	-	430	832	-	-	-	-	-	-	-
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	198	185	623	271	180	821	836	-	-	1166	-	-
Stage 1	343	394	-	612	611	-	-	-	-	-	-	-
Stage 2	790	604	-	574	382	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	184	180	623	263	175	821	836	-	-	1166	-	-
Mov Cap-2 Maneuver	184	180	-	263	175	-	-	-	-	-	-	-
Stage 1	342	385	-	611	610	-	-	-	-	-	-	-
Stage 2	745	603	-	555	373	-	-	-	-	-	-	-

Approach	EB		WB		NE		SW	
HCM Control Delay, s	39.9		11		0.1		0.3	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	EBLn2	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	836	-	-	184	623	263	821	1166	-	-
HCM Lane V/C Ratio	0.003	-	-	0.484	0.009	0.029	0.054	0.024	-	-
HCM Control Delay (s)	9.3	-	-	41.7	10.8	19.1	9.6	8.2	-	-
HCM Lane LOS	A	-	-	E	B	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	2.4	0	0.1	0.2	0.1	-	-

HCM 6th TWSC
3: Access B & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2040

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1123	6	0	1346	0	43
Future Vol, veh/h	1123	6	0	1346	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1221	7	0	1463	0	47

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	611
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	437
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	437
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	437	-	-	-
HCM Lane V/C Ratio	0.107	-	-	-
HCM Control Delay (s)	14.2	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-

HCM 6th TWSC
4: Brush Top Road & Marksheffel Road

Total Traffic Volumes
AM Peak Hour - Year 2040

Intersection						
Int Delay, s/veh	4.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↑
Traffic Vol, veh/h	1086	7	28	1318	44	43
Future Vol, veh/h	1086	7	28	1318	44	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	155	-	115	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1180	8	30	1433	48	47

























Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1188	0	1957
Stage 1	-	-	-	-	1180
Stage 2	-	-	-	-	777
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	583	-	56
Stage 1	-	-	-	-	254
Stage 2	-	-	-	-	414
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	583	-	53
Mov Cap-2 Maneuver	-	-	-	-	53
Stage 1	-	-	-	-	254
Stage 2	-	-	-	-	393

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	117.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	53	451	-	-	583	-
HCM Lane V/C Ratio	0.902	0.104	-	-	0.052	-
HCM Control Delay (s)	218.5	13.9	-	-	11.5	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	3.9	0.3	-	-	0.2	-

Timings
1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2040

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	293	1038	123	281	872	202	198	604	198	152	345	296
Future Volume (vph)	293	1038	123	281	872	202	198	604	198	152	345	296
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.152			0.106			0.368			0.222		
Satd. Flow (perm)	283	3539	1583	197	3539	1583	685	3539	1583	414	3539	1583
Satd. Flow (RTOR)			142			181			201			296
Lane Group Flow (vph)	318	1128	134	305	948	220	215	657	215	165	375	322
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	20.0	45.0	45.0	18.0	43.0	43.0	13.0	26.0	26.0	11.0	24.0	24.0
Total Split (%)	20.0%	45.0%	45.0%	18.0%	43.0%	43.0%	13.0%	26.0%	26.0%	11.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	54.4	39.0	39.0	51.7	37.6	37.6	29.0	20.0	20.0	25.0	18.0	18.0
Actuated g/C Ratio	0.54	0.39	0.39	0.52	0.38	0.38	0.29	0.20	0.20	0.25	0.18	0.18
v/c Ratio	0.87	0.82	0.19	1.00	0.71	0.31	0.75	0.93	0.45	0.90	0.59	0.61
Control Delay	42.4	33.2	3.8	79.2	30.4	6.6	46.3	60.7	9.5	75.3	41.9	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.4	33.2	3.8	79.2	30.4	6.6	46.3	60.7	9.5	75.3	41.9	11.5
LOS	D	C	A	E	C	A	D	E	A	E	D	B
Approach Delay		32.6			36.9			47.7			37.0	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	117	333	0	~145	270	16	105	218	7	78	116	14
Queue Length 95th (ft)	#264	419	33	#320	344	65	#201	#326	69	#173	165	96
Internal Link Dist (ft)		945			642			663			525	
Turn Bay Length (ft)	155		155	155		155	155		155	155		155
Base Capacity (vph)	378	1380	703	306	1332	708	285	707	477	184	637	527
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.82	0.19	1.00	0.71	0.31	0.75	0.93	0.45	0.90	0.59	0.61
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												

Timings
 1: Vollmer Road & Marksheffel Road

Total Traffic Volumes
 PM Peak Hour - Year 2040

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 37.9

Intersection LOS: D

Intersection Capacity Utilization 87.7%

ICU Level of Service E

Analysis Period (min) 15









~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road

 Ø1	 Ø2 (R)	 Ø3	 Ø4
20 s	43 s	11 s	26 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
18 s	45 s	13 s	24 s

HCM 6th TWSC
2: Vollmer Road & Access A/Business Drive

Total Traffic Volumes
PM Peak Hour - Year 2040

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↵	↶		↵	↶		↵	↶↶	↶	↵	↶↶	↶
Traffic Vol, veh/h	51	0	3	6	0	38	6	911	15	37	626	86
Future Vol, veh/h	51	0	3	6	0	38	6	911	15	37	626	86
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	-	-	None	-	-	None
Storage Length	115	-	-	0	-	-	155	-	155	155	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	55	0	3	7	0	41	7	990	16	40	680	93

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1269	1780	340	1424	1857	495	773	0	0	1006	0	0
Stage 1	760	760	-	1004	1004	-	-	-	-	-	-	-
Stage 2	509	1020	-	420	853	-	-	-	-	-	-	-
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	125	81	656	96	73	520	838	-	-	684	-	-
Stage 1	364	413	-	259	318	-	-	-	-	-	-	-
Stage 2	515	312	-	581	374	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	109	76	656	91	68	520	838	-	-	684	-	-
Mov Cap-2 Maneuver	109	76	-	91	68	-	-	-	-	-	-	-
Stage 1	361	389	-	257	315	-	-	-	-	-	-	-
Stage 2	470	310	-	544	352	-	-	-	-	-	-	-

Approach	EB		WB		NE		SW		
HCM Control Delay, s	64.9		17.3		0.1		0.5		
HCM LOS	F		C						

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	EBLn2	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	838	-	-	109	656	91	520	684	-	-
HCM Lane V/C Ratio	0.008	-	-	0.509	0.005	0.072	0.079	0.059	-	-
HCM Control Delay (s)	9.3	-	-	68.1	10.5	47.6	12.5	10.6	-	-
HCM Lane LOS	A	-	-	F	B	E	B	B	-	-
HCM 95th %tile Q(veh)	0	-	-	2.3	0	0.2	0.3	0.2	-	-

HCM 6th TWSC
3: Access B & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2040

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	1427	22	0	1366	0	27
Future Vol, veh/h	1427	22	0	1366	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1551	24	0	1485	0	29

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	776
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	340
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	340
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	340	-	-	-
HCM Lane V/C Ratio	0.086	-	-	-
HCM Control Delay (s)	16.6	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

HCM 6th TWSC
4: Brush Top Road & Marksheffel Road

Total Traffic Volumes
PM Peak Hour - Year 2040

Intersection						
Int Delay, s/veh	6.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↑
Traffic Vol, veh/h	1422	23	92	1274	27	27
Future Vol, veh/h	1422	23	92	1274	27	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	155	-	115	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1546	25	100	1385	29	29

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	1571	0	2439 773
Stage 1	-	-	-	-	1546 -
Stage 2	-	-	-	-	893 -
Critical Hdwy	-	-	4.14	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.22	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	416	-	~ 26 342
Stage 1	-	-	-	-	162 -
Stage 2	-	-	-	-	360 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	416	-	~ 20 342
Mov Cap-2 Maneuver	-	-	-	-	~ 20 -
Stage 1	-	-	-	-	162 -
Stage 2	-	-	-	-	274 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	\$ 333.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	20	342	-	-	416	-
HCM Lane V/C Ratio	1.467	0.086	-	-	0.24	-
HCM Control Delay (s)	\$ 650.6	16.5	-	-	16.4	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	4	0.3	-	-	0.9	-

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