THE amble

Traffic Impact Study- The Amble Development

Steamboat Springs, Colorado

March 6, 2023

PREPARED FOR:

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Statement of Engineering Qualifications

Scott Burger, PE, PTOE is a Traffic and Transportation Engineer for Consor Engineers. Mr. Burger has 12 years of extensive traffic engineering experience and over 20 years of other varied experience on other transportation engineering disciplines. He has completed numerous transportation studies throughout the State of Colorado. Mr. Burger is a licensed Professional Engineer in the State of Colorado and has his certification as a Professional Traffic Operations Engineer from the Institute of Transportation Engineers.

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1. Project Description

1.1 Project Overview

East West Partners is proposing to develop a property containing approximately 4.35 acres situated just south of the Steamboat Grand Hotel and just west of the Steamboat Resort Gondola Transit Center (GTC). Upon full build out, the development, to be known as The Amble, will consist of 42 individually owned condominiums. At the owner's discretion, they will be able to rent them out to others on a short-term or long-term basis, as regulations and the market permit. Opening of the Amble is scheduled for late 2024.

Vehicular access for the proposed development will be provided via an internal roadway network providing connectivity to the external transportation system at the following location:

- A roadway connecting from the west side of the building to Mt. Werner Circle, forming a 3-way intersection along the west side of Mt. Werner Circle, with stop control on the newly created approach.
- The development will provide structured parking. There will be 42 spaces provided, which is more than the minimum required by the City of Steamboat. The parking spaces will be for condominium residents only.

Figure 1 provides a vicinity map of the proposed project and the surrounding transportation network:

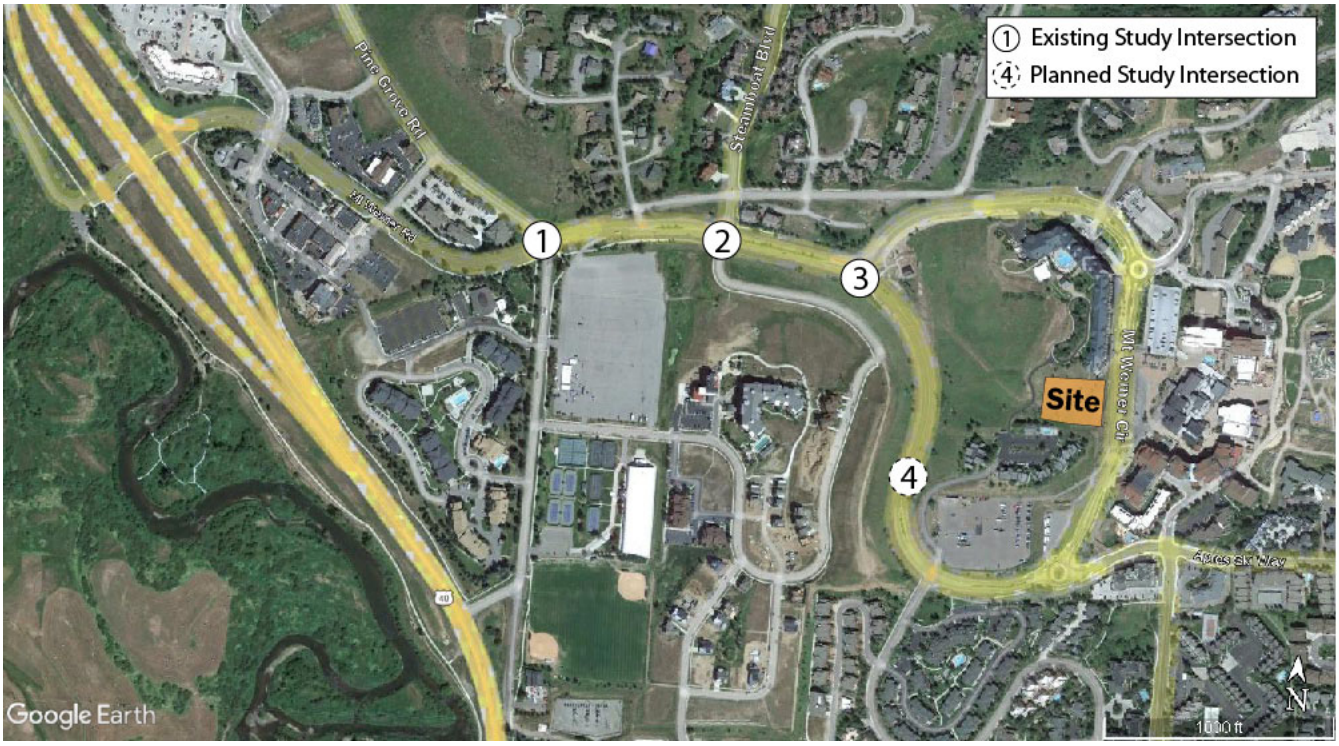
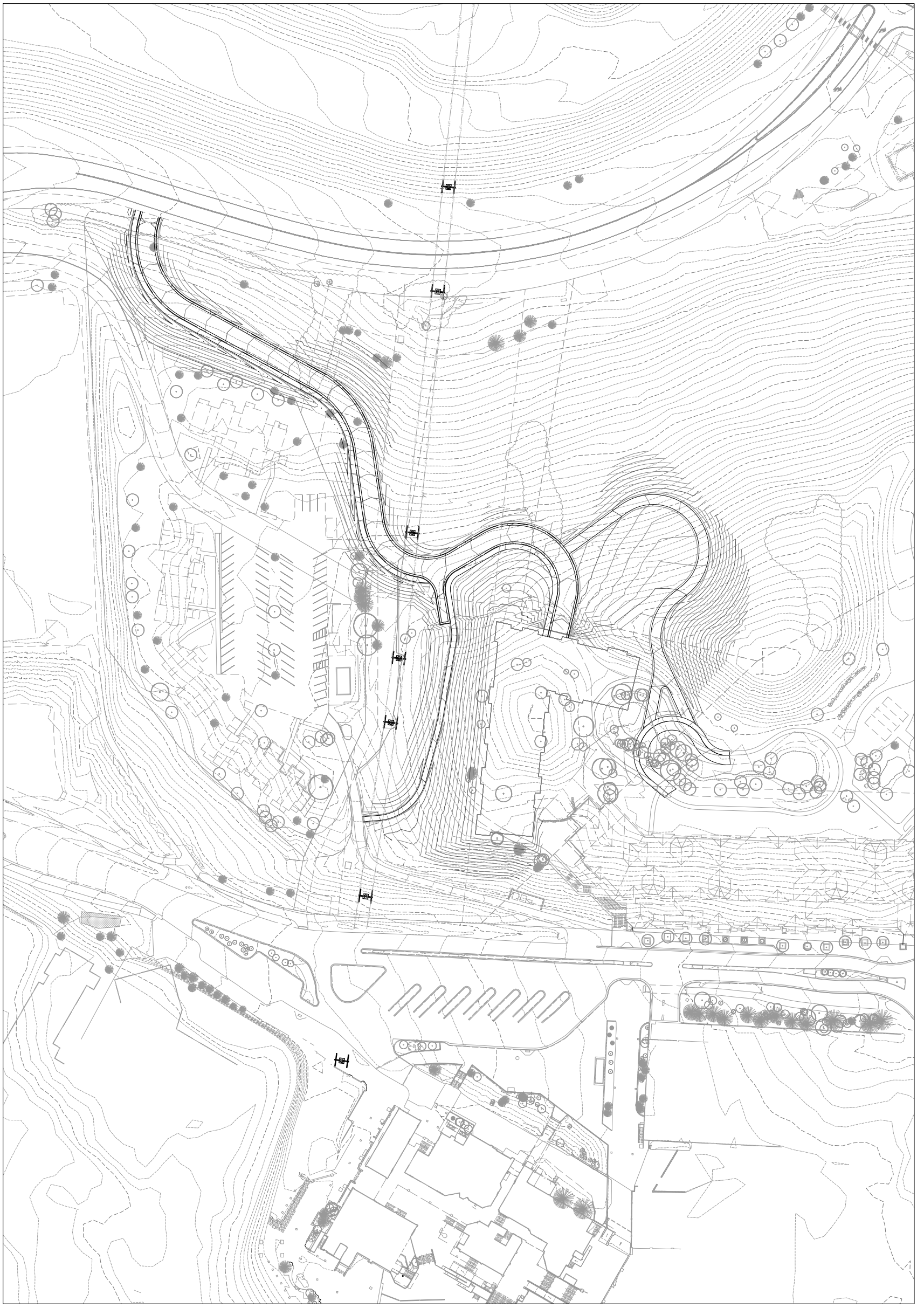


Figure 1: Vicinity Map

Figure 2 shows the preliminary development site plan.

Figure 2- Site Plan



SHEET OF SHEETS

Steamboat Grand Phase II

PROJECT:	2571-001
DATE:	6/18/2021
CONTACT:	RS
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NO.	DATE:	BY:	DESCRIPTION:
			REVIEW SET NOT FOR CONSTRUCTION 6/18/2021

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1.2 Purpose of Study

The purpose of this study is to assess the impact of vehicular trips projected to be generated by the Amble Development within the study area. The study includes 2022 Existing Conditions, 2024 Background, and 2024 Total (projected development build-out) analysis periods.

1.3 Study Area

The study area includes the roadway system leading to and in the vicinity of the development site. The following intersections are included in this study:

1. Mt. Werner Road and Pine Grove Road
2. Mt. Werner Road and Steamboat Boulevard
3. Mt. Werner Circle and Mt. Werner Road
4. Mt. Werner Circle and Site Access

Measures of Effectiveness (MOE's) are provided for each of the intersections, consistent with Traffic Impact Study criteria established by the City of Steamboat Springs. For all scenarios, traffic signal parameters match those used in the Comprehensive Transportation Impact Analysis (CTIA), April 4, 2022, by McDowell Engineering.

2. Existing Conditions

2.1 Existing Conditions Traffic Volumes

Traffic data utilized in this study is provided as part of the Existing Base Area Transportation Operations Overview, October 2022, by Consor Engineers. The volumes are shown in **Figure 3**.

2.2 Existing Transportation System

The transportation network in the vicinity of the development site is described in the following sections.

Study Area Roadways:

- **Mt. Werner Road**- Within the study area (Pine Grove Road to Mt. Werner Circle) is classified as a collector roadway under the jurisdiction of the City of Steamboat Springs. The roadway cross section has a minimum of one eastbound and two westbound through lanes, A second eastbound through lane is added halfway between Pine Grove Rd and Steamboat Blvd. The posted speed limit on the roadway is 35 mph.
- **Pine Grove Road-** Within the study area is classified as a collector roadway under the jurisdiction of the City of Steamboat Springs. The roadway cross section consists of one through lane in each direction and a two-way left turn lane (TWLTL) in the middle. The posted speed limit on the roadway is 30 mph.
- **Steamboat Boulevard-** Within the study area is classified as a collector roadway under the jurisdiction of the City of Steamboat Springs. The roadway cross section consists of one through lane in each direction. The posted speed limit on the roadway is 30 mph.
- **Broomtail Lane-** Within the study area is classified as a local roadway under the jurisdiction of the City of Steamboat Springs. The roadway cross section consists of one through lane in each direction. The posted speed limit on the roadway is 25 mph.
- **Mt. Werner Circle**- Within the study area is classified as a collector roadway under the jurisdiction of the City of Steamboat Springs. It forms a loop with a length just under one mile long, starting and ending at the east end of Mt. Werner Road. The roadway cross section consists of one through lane in each direction, except for an approximately 500-foot-long section north-east of the Mt Werner Road intersection, where there are two through lanes in each direction. The posted speed limit on the roadway is 25mph.

Study Area Intersections:

1. **Mt. Werner Road & Pine Grove Road-** The Mt. Werner Road and Pine Grove Road intersection is a four-legged intersection operating under signalized control. The east leg has two through lanes, and left and right-turn lanes, with approximately 85 and 60 feet of storage, respectively. The west leg has one through lane, and left and right-turn lanes, both with approximately 70 feet of storage. The north leg has one through/left/right lane and the south leg has a through/left lane and a right-turn lane with approximately 60 feet of storage. Crosswalks span the north, east, and south legs of the intersection. For all scenarios, optimized signal timing from the October 2022 Existing Conditions Report by Consor for the intersection were utilized and are appended.
2. **Mt. Werner Road & Steamboat Boulevard / Broomtail Lane-** The Mt. Werner Road and Steamboat Boulevard / Broomtail Lane intersection is a four-legged junction which was recently re-constructed as a roundabout. The west and south legs of the intersection have one inbound lane, while the east leg has two inbound lanes, one of which is utilized as a through/left lane, and the other as a through/right lane. The north leg has a left/through/right lane and a right-turn lane with about 50 feet of storage. All approaches have crosswalks, and the east and west legs of the intersection have pedestrian refuge islands.
3. **Mt. Werner Road & Mt. Werner Circle-** The Mt. Werner Road and Mt. Werner Circle intersection is a three-legged "T" intersection with stop control for southbound traffic. The west leg of the intersection has two inbound lanes, with one left-turn lane and one through lane. The east leg has one through lane and a right-turn lane with approximately 100 feet of storage. The north leg has two inbound lanes, with a left-turn lane and a channelized right-turn lane. There is a pedestrian crossing and refuge island across the east leg of the intersection.

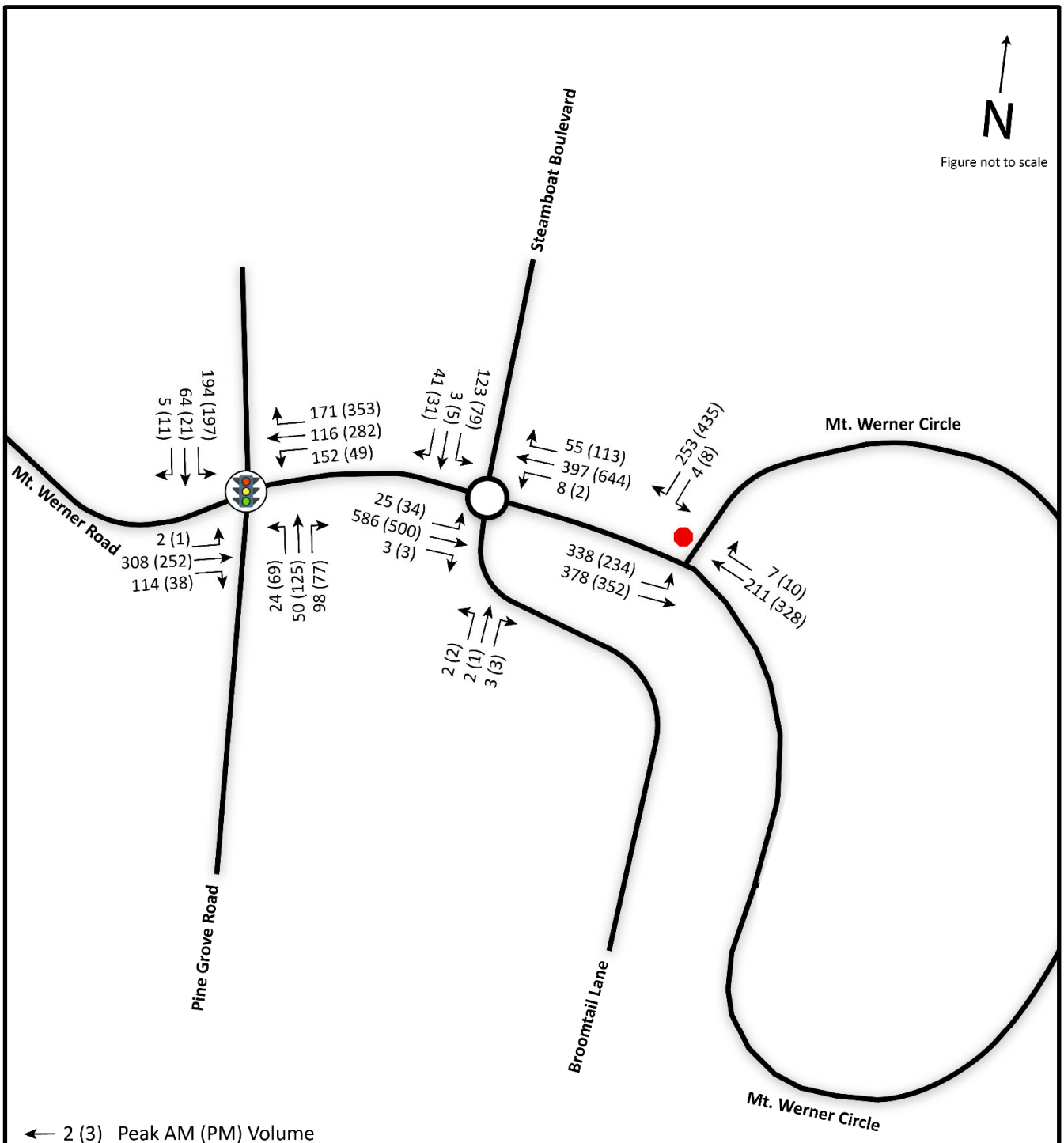
2.3 Existing Conditions Operational Analysis

To establish a baseline upon which to evaluate and compare the traffic impacts of the proposed Amble Development on study intersections, peak hour analyses were performed for the existing conditions scenario.

Traffic operations were assessed using Level of Service (LOS) techniques documented in the Highway Capacity Manual (HCM) 6th Edition using the software programs Synchro v11 and RODEL. Results were assessed from the peak hour in Synchro and Peak 60 minute interval in RODEL, and are reported using LOS and vehicle delay. LOS is described by a letter designation ranging from A to F, with LOS A representing the best possible operating conditions and LOS F representing over-capacity or congested conditions. Unsignalized and signalized intersections differ in their delay thresholds and are expressed in the form of an uppercase letter. The delay limits associated with each LOS are shown below in **Table 1**.

Table 1: Level of Service Delay Quantities

LOS	Average Vehicle Control Delay (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	≤10	≤10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	>80	>50



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Traffic Volumes
2022 Existing Traffic

Figure 3

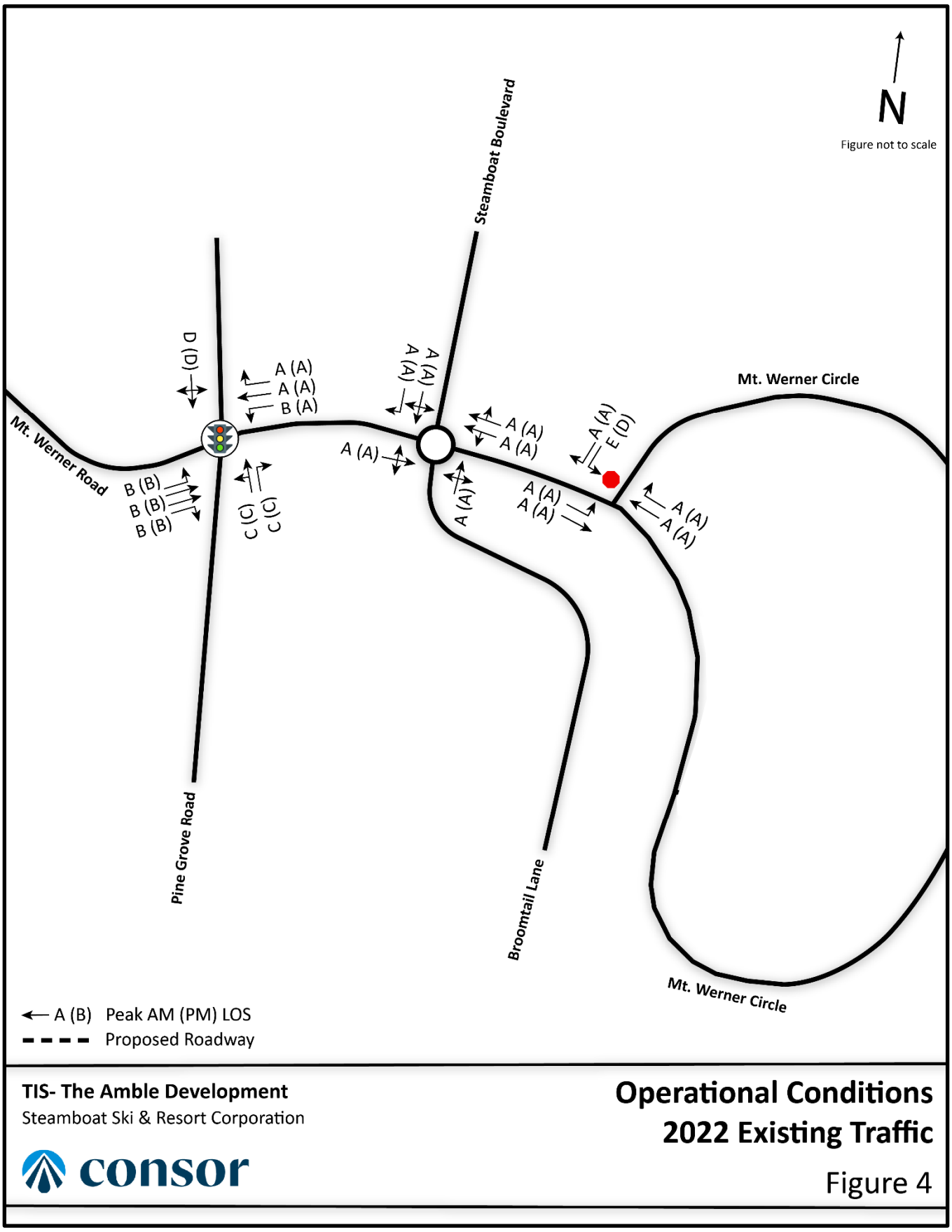
The results of the Existing Conditions analysis are summarized in **Table 2**. **Appendix B** contains detailed Synchro 11 and RODEL capacity analysis reports.

Table 2: Existing Conditions Model Results

Intersection / Lane Group	Control	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1. Mt. Werner Road / Pine Grove Road					
Eastbound Left	Permitted	B	13.1	B	11.6
Eastbound Through		B	17.3	B	14.5
Eastbound Right		B	14.6	B	12.0
Westbound Left	Prot-Perm	B	11.3	A	9.9
Westbound Through		A	7.5	A	8.0
Westbound Right		A	0.0	A	0.0
Northbound Left/Through	Permitted	C	25.1	C	28.4
Northbound Right		C	26.4	C	25.7
Southbound Left/Through/Right	Permitted	D	37.3	D	52.8
Intersection	**Signal**	**C**	**21.2**	**C**	**23.6**
2. Mt. Werner Road / Steamboat Blvd.					
Eastbound Left/Through/Right		A	9.7	A	7.1
Westbound Left/Through		A	4.3	A	5.1
Westbound Through/Right		A	4.5	A	5.4
Northbound Left/Through/Right		A	5.3	A	4.4
Southbound Left/Through/Right		A	5.2	A	5.9
Southbound Right		A	4.9	A	5.4
Intersection	**Roundabout**	**A**	**6.4**	**A**	**6.0**
3. Mt. Werner Road / Mt. Werner Circle					
Eastbound Left		A	8.7	A	8.8
Eastbound Through		A	0.0	A	0.0
Westbound Through		A	0.0	A	0.0
Westbound Right		A	0.0	A	0.0
Southbound Left	Stop	E	36.7	D	30.1
Southbound Right		A	0.0	A	0.0
Intersection	**One-Way Stop**	**A**	**3.3**	**A**	**2.5**

As shown in **Table 2 and Figure 4**, all the existing study area intersections are shown to be operating at acceptable levels of service (LOS D or better) overall, as well as all lane groups apart from:

- The southbound left-turn lane at the Mt. Werner Road & Mt. Werner Circle intersection experiences a poor level of service (LOS E) in the AM Peak Hour, but it is noted that the volume is only four vehicles.



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Operational Conditions
2022 Existing Traffic

Figure 4

3. Project Traffic

Trip Generation

Trip generation projections for the proposed Amble Development were forecast using the *Trip Generation Manual, 11th Edition* by the Institute of Transportation Engineers (ITE). Land Use 260 (see below) was used for trip generation rates for the first submittal of this report. The City asked that we consider Land Use 265 (see below). A comparison of the two land use types is as follows:

1. Land Use 260, Recreational Homes: The category description states that a recreational home is either:
    1. A second home used by its owner periodically for recreation
    2. Rented on a seasonal basis

   The sites used to establish the trip generation rates were surveyed in the 1980s, the 2000s, and the 2010s. There were six studies used to establish the rates for weekdays and 9 to 18 studies for the weekend rates.

2. Land Use 265, Timeshare: The category description states that a timeshare is a development where multiple purchasers buy interests in the same property and each purchaser receives the right to use the facility for a period of time each year.

   The sites used to establish the trip generation rates were surveyed in the 1980s and the 2000s. There were 13 to 14 studies used to establish the rates for weekdays. The weekend rates are based on one study, which doesn't provide a good basis for application to the Amble.

Neither of these categories completely matches the characteristics of the Amble, but the Recreational Home category is a much closer match. The ITE trip generation surveys generally predate the era during which short term rentals became prevalent. With the limited parking supply at the Amble, it is expected that trip generation won't appreciably increase during short term rental usage periods. If four single renters occupy the unit, the limited parking supply is expected to constrain them to one vehicle per unit.

For these reasons, the Recreational Homes land use was determined to be the most appropriate one. The categories chosen were as follows:

- AM peak: Sunday, Peak Hour of Generator (used fitted curve equation)
- PM peak: Friday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

Table 3a provides the associated trip generation rates associated with the Amble Development (Code 260- Recreational Homes). These rates were then applied to the unit number to obtain estimated vehicle trips, shown in **Table 3b**.

Table 3a: Development Trip Generation Rates

ITE Code	Land Use	Unit	Time Period					
			AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
260	Recreational Homes	DU	0.70	0.95	1.65	0.65	0.46	1.11

Table 3b: Development Total Trips Generated

ITE Code	Land Use	Size	Time Period					
			AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
260	Recreational Homes	42 DU	30	41	71	28	20	48

Trip generation reductions because of internal trip capture were not considered to be relevant for the proposed development. Trip generation reductions are proposed due to the high likelihood of vehicle trips being replaced by pedestrian trips, given the development's proximity to the Steamboat Mountain base area and other amenities. The assumed percentage of total trips that will be pedestrian trips are as follows:

- In the AM Peak Hour, 20% of entering trips and 40% of exiting trips
- In the PM Peak Hour, 15% of entering trips and 5% of exiting trips.

These reductions were determined by engineering judgement after consideration of typical usage patterns that are expected.

Table 3c contains the updated vehicle trip estimates after accounting for the reductions due to pedestrian trips.

Table 3c: Development Total Trips Generated with Pedestrian Trip Reduction

ITE Code	Land Use	Size	Time Period					
			AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
260	Recreational Homes	42 DU	24	25	49	24	19	43

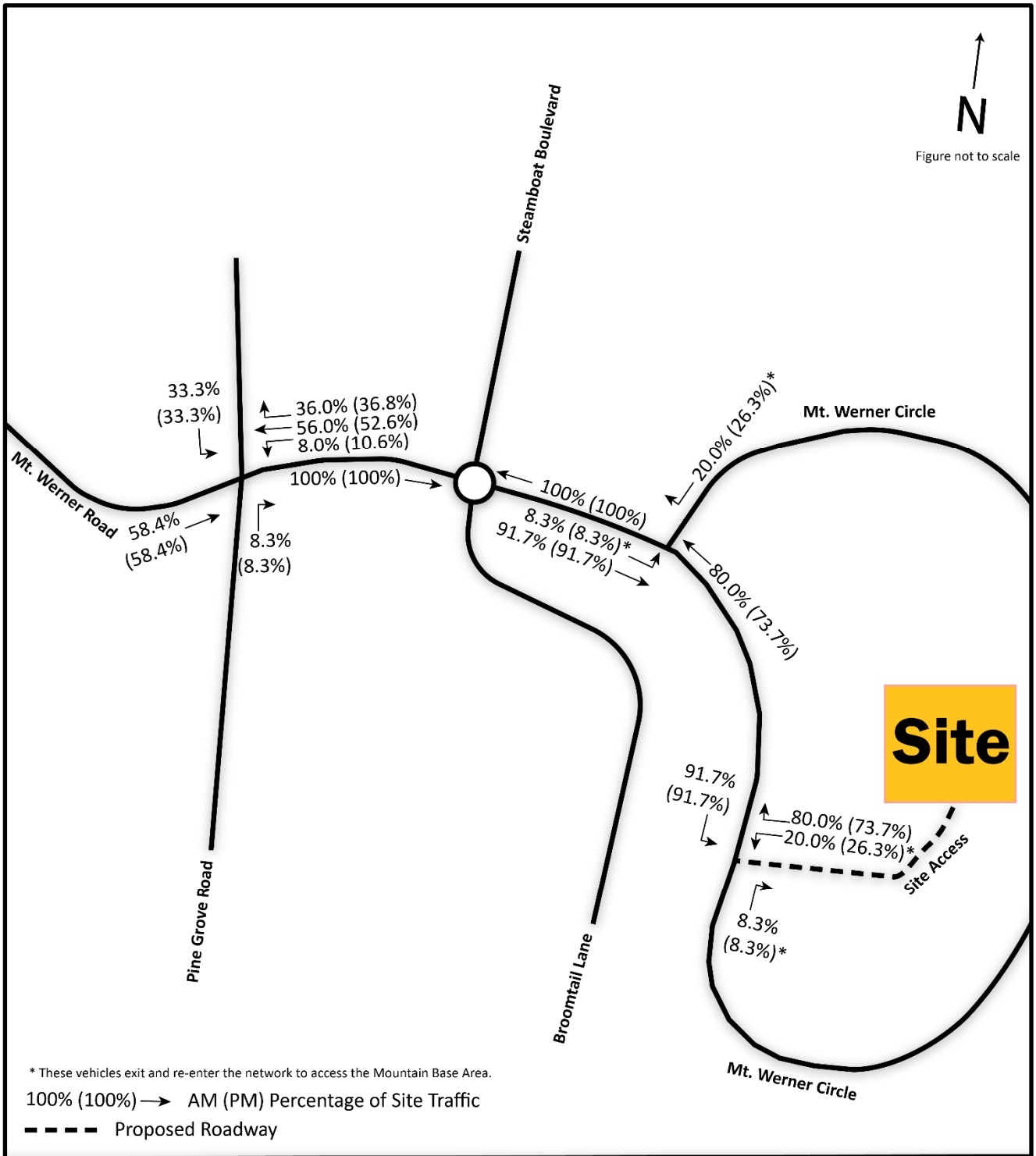
Trip Distribution

The distribution of the projected vehicular trips generated by the proposed Amble development was based on the following factors:

- Current and projected traffic patterns throughout the surrounding transportation system; and
- Potential trip origins and destinations such as nearby shopping centers, employment centers, and amenities.

Because of the lack of available parking in the base area and the close pedestrian proximity, it was assumed that the vast majority of vehicles will come from and go to areas beyond the Pine Grove signal. It was assumed that the vehicles making an inbound right will make a stop within the base area on the way to the Amble. It was assumed that the vehicles making an outbound left will make a stop within the base area and then head down the hill.

Figure 5 illustrates the Project Traffic trip distribution patterns for the proposed development. **Figure 6** shows the Project Traffic volumes.



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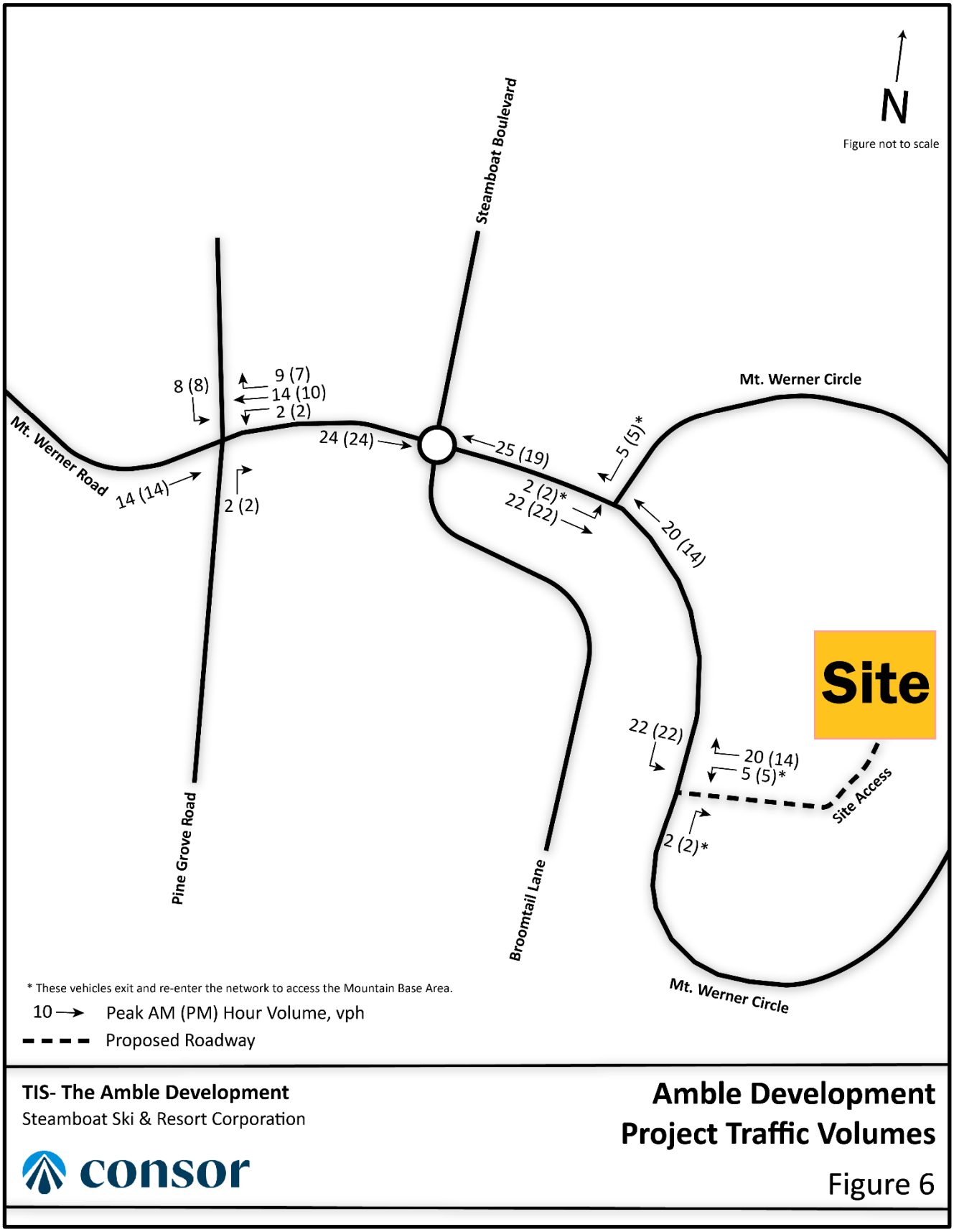
Project Traffic Distribution

Figure 5



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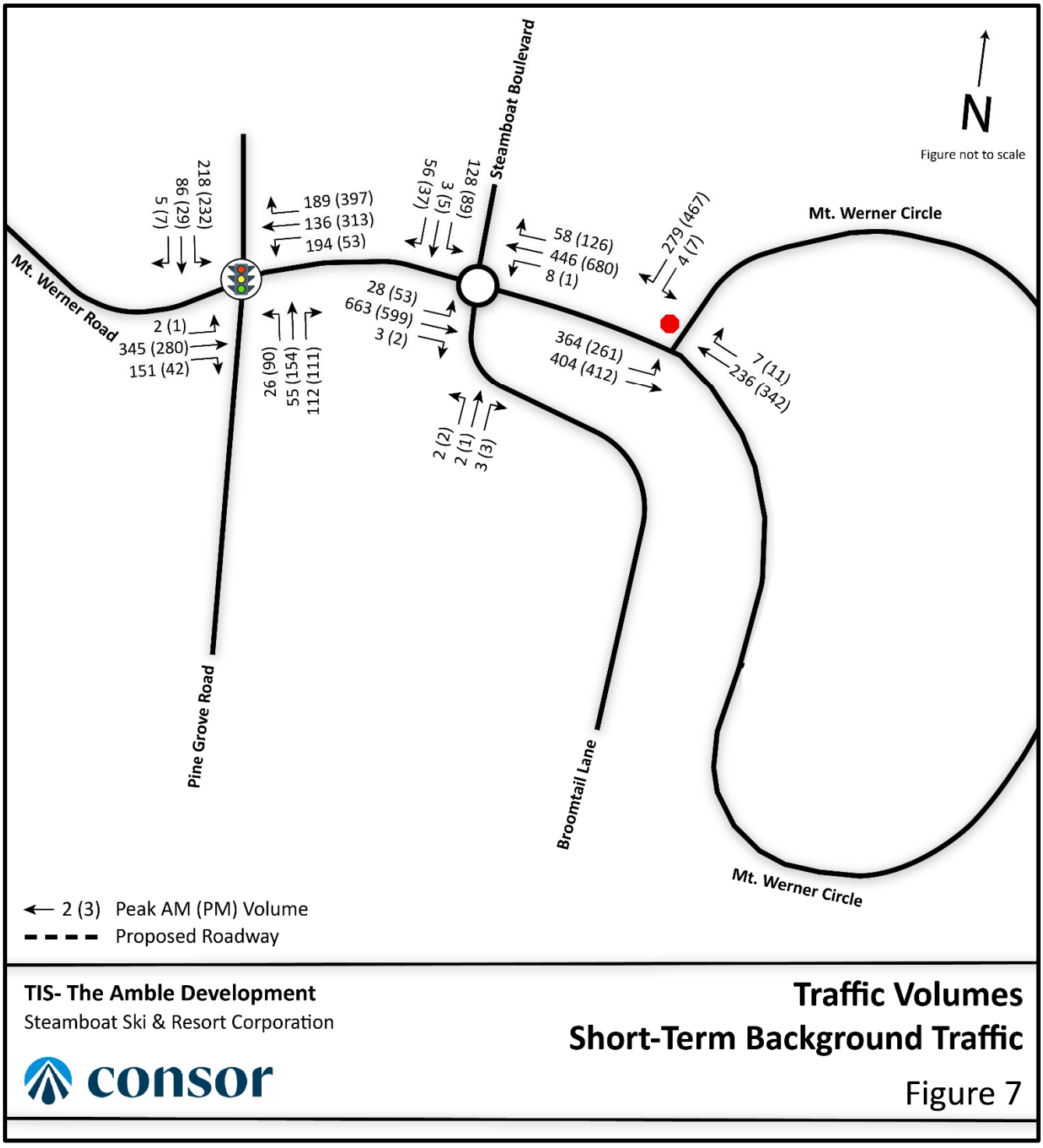
Project Traffic Volumes

Figure 6

4. Short-Term Background Conditions

4.1 Short-Term Background Traffic Volumes

The Short-Term Background Traffic volumes utilized in this study are the 2024 Total volumes (Figure 26) from the Comprehensive Transportation Impact Analysis (CTIA), April 4, 2022, by McDowell Engineering. The CTIA used a 2.0% annual growth rate for the study area west of Steamboat Boulevard. The volumes are shown in **Figure 7**.



4.2 Short-Term Background Operational Analysis

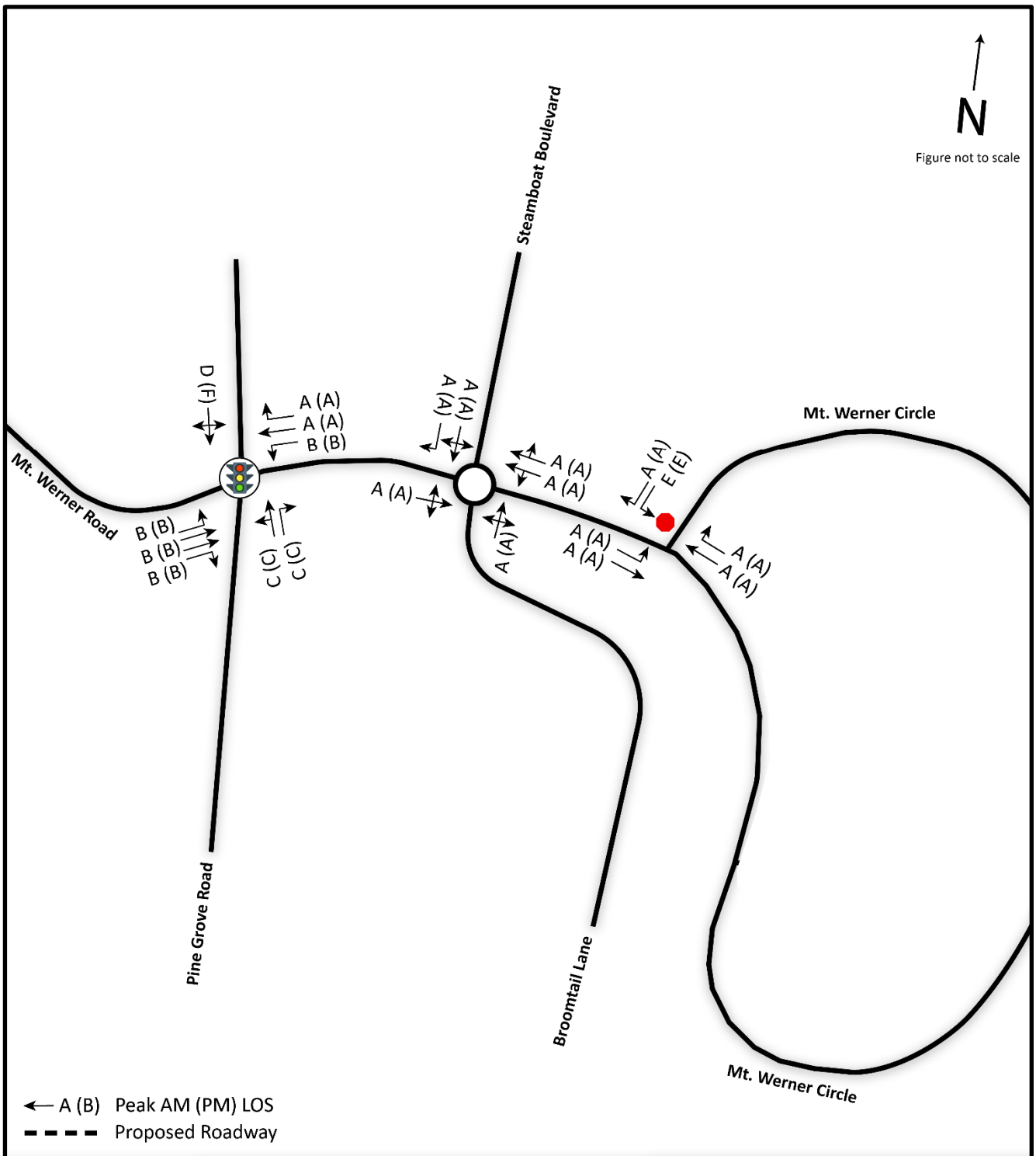
Table 4 shows the Synchro and RODEL model results. **Figure 8** shows the Level of Service by movement for this scenario.

Table 4: Short-Term Background Model Results

Intersection / Lane Group	Control	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1. Mt. Werner Road / Pine Grove Road					
Eastbound Left	Permitted	B	13.9	B	11.7
Eastbound Through		B	19.1	B	14.9
Eastbound Right		B	16.1	B	12.2
Westbound Left	Prot-Perm	B	12.4	B	10.1
Westbound Through		A	7.6	A	8.1
Westbound Right		A	0.0	A	0.0
Northbound Left/Through	Permitted	C	25.3	C	30.3
Northbound Right		C	26.9	C	26.9
Southbound Left/Through/Right	Permitted	D	49.0	F	139.9
Intersection	**Signal**	**C**	**24.6**	**D**	**42.5**
2. Mt. Werner Road / Steamboat Blvd.					
Eastbound Left/Through/Right		A	9.8	A	8.6
Westbound Left/Through		A	4.3	A	5.4
Westbound Through/Right		A	4.5	A	5.8
Northbound Left/Through/Right		A	5.3	A	5.0
Southbound Left/Through/Right		A	5.2	A	6.3
Southbound Right		A	4.9	A	5.7
Intersection	**Roundabout**	**A**	**7.2**	**A**	**6.9**
3. Mt. Werner Road / Mt. Werner Circle					
Eastbound Left		A	8.9	A	9.0
Eastbound Through		A	0.0	A	0.0
Westbound Through		A	0.0	A	0.0
Westbound Right		A	0.0	A	0.0
Southbound Left	Stop	E	44.3	E	36.7
Southbound Right		A	0.0	A	0.0
Intersection	**One-Way Stop**	**A**	**3.4**	**A**	**2.5**

As shown in **Table 4** and **Figure 8**, all the Short-Term Background study area intersections are shown to be operating at acceptable levels of service (LOS "D" or better) overall, as well as all lane groups apart from:

- The southbound left-turn lane at the Mt. Werner Road & Mt. Werner Circle intersection experiences a poor level of service (LOS E) in both the AM and PM Peak Hours, degrading from an LOS D in the Existing PM Peak Hour.



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Operational Conditions
Short-Term Background Traffic

Figure 8

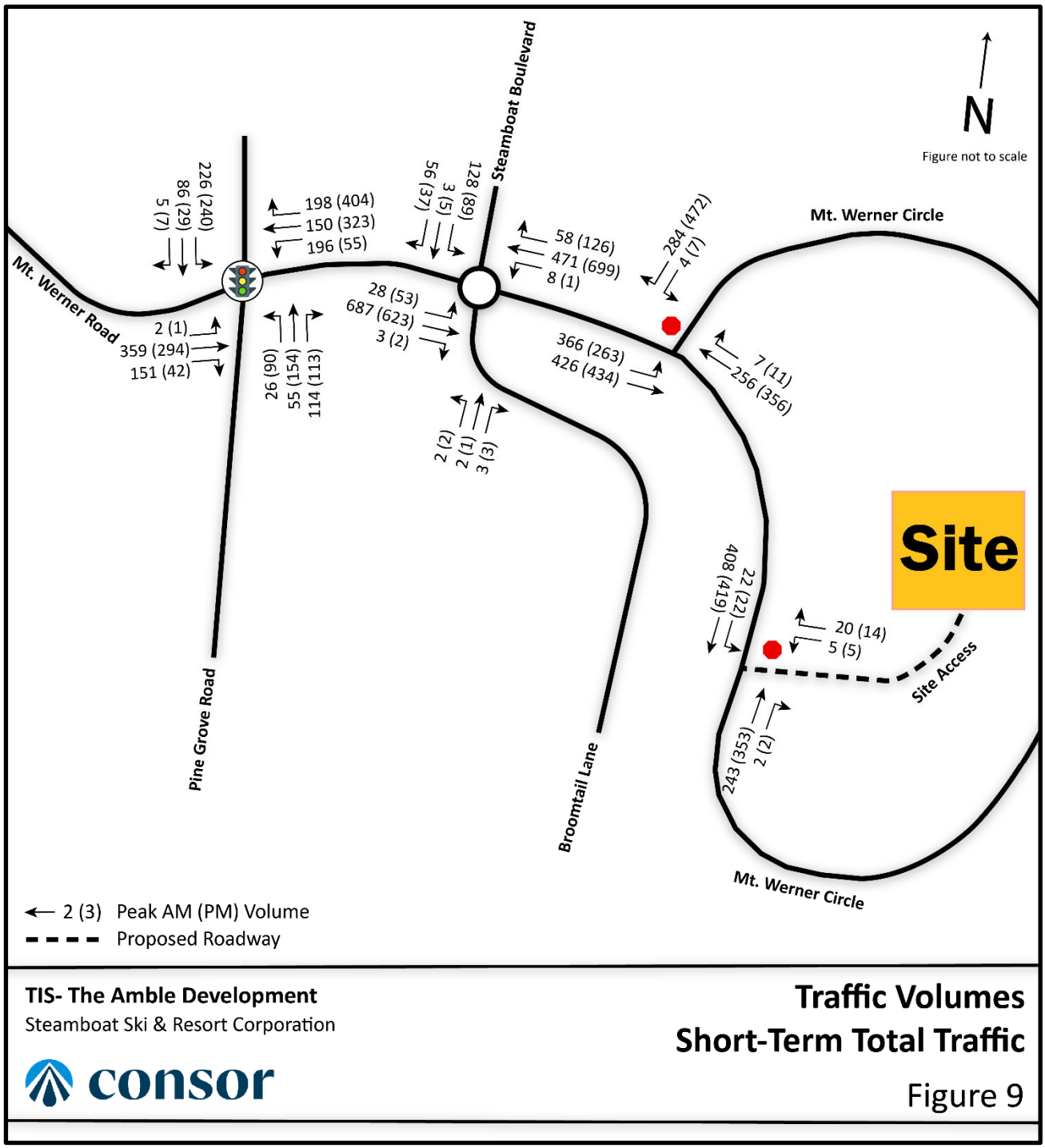
5. Short-Term Total Conditions

The Short-Term Total (Total) analysis adds in the following intersection, described in detail in Section 6.1:

- Mt. Werner Circle & Site Access

5.1 Short-Term Total Traffic Volumes

Project Traffic was added to the Short-Term Background Traffic to obtain the Short-Term Total Traffic volumes. The Short-Term Total Traffic volumes are shown in **Figure 9**.



5.2 Short-Term Total Operational Analysis

Table 5 shows the Synchro and RODEL model results. **Figure 10** shows the Level of Service by movement.

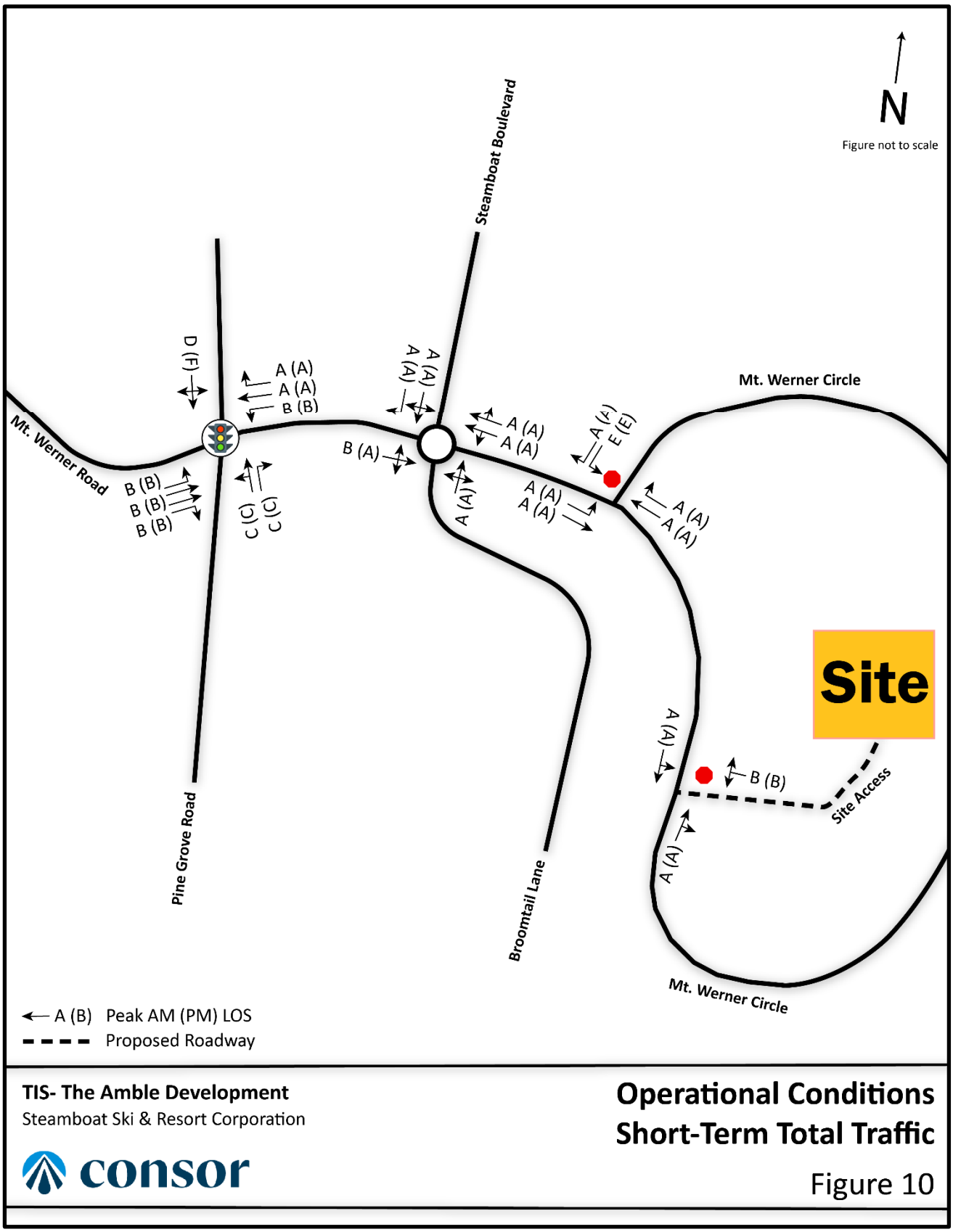
Table 5: Short-Term Total Model Results

Intersection / Lane Group	Control	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1. Mt. Werner Road / Pine Grove Road					
Eastbound Left	Permitted	B	13.9	B	11.7
Eastbound Through		B	19.5	B	15.2
Eastbound Right		B	16.2	B	12.2
Westbound Left	Prot-Perm	B	12.6	B	10.2
Westbound Through		A	7.6	A	8.2
Westbound Right		A	0.0	A	0.0
Northbound Left/Through	Permitted	C	25.3	C	30.3
Northbound Right		C	27.0	C	26.9
Southbound Left/Through/Right	Permitted	D	52.3	F	153.0
Intersection	**Signal**	**C**	**25.4**	**D**	**45.2**
2. Mt. Werner Road / Steamboat Blvd.					
Eastbound Left/Through/Right		B	10.2	A	9.0
Westbound Left/Through		A	4.4	A	5.4
Westbound Through/Right		A	4.6	A	5.9
Northbound Left/Through/Right		A	5.4	A	5.1
Southbound Left/Through/Right		A	5.4	A	6.4
Southbound Right		A	5.0	A	5.8
Intersection	**Roundabout**	**A**	**7.4**	**A**	**7.1**
3. Mt. Werner Road / Mt. Werner Circle					
Eastbound Left		A	9.0	A	9.1
Eastbound Through		A	0.0	A	0.0
Westbound Through		A	0.0	A	0.0
Westbound Right		A	0.0	A	0.0
Southbound Left	Stop	E	47.5	E	39.1
Southbound Right		A	0.0	A	0.0
Intersection	**One-Way Stop**	**A**	**3.3**	**A**	**2.5**
4. Mt. Werner Circle / Site Access					
Westbound Left/Right	Stop	B	10.9	B	12.4
Northbound Through/Right		A	0.0	A	0.0
Southbound Through/Left		A	0.4	A	0.4
Intersection	**One-Way Stop**	**A**	**0.6**	**A**	**0.5**

As shown in **Table 5**, all of the Short-Term Total study area intersections are shown to be operating at acceptable levels of service (LOS "D" or better) overall, as well as all lane groups apart from:

- The southbound left-turn movement at the Mt. Werner Road & Mt. Werner Circle intersection experiences a poor level of service (LOS E) in both the AM and PM Peak Hours, degrading from an LOS D in the Existing PM Peak Hour.

The addition of development-generated traffic adds delay to some movements but does not cause the projected level of service to degrade further than in the Short-Term Background Scenario.



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Operational Conditions
Short-Term Total Traffic

Figure 10

6. Site Access and Circulation Evaluation

6.1 Site Access

The proposed site access is on the southeast portion of Mt. Werner Circle. It is proposed to be a full-movement three-legged "T" intersection with stop control for traffic coming from the Amble site. Sight distance at the intersection has been checked using AASHTO criteria. To meet the criteria, the existing deciduous trees located immediately south of the proposed access would need to be removed.

6.2 Circulation

Since the development is a singular building with parking provided on the ground level, vehicular and pedestrian circulation around the site is anticipated to be minimal. A large amount of pedestrian traffic is anticipated to the east of the development to connect with the Steamboat GTC and mountain base area. In the summer, some bicycle trips could originate from the development, travel down the Site Access roadway, and connect to the bicycle lanes on Mt. Werner Circle.

7. Additional Analysis

Site Contribution

Percent contribution of the Amble Development site traffic was calculated for the Mt. Werner Road & Pine Grove Road and Mt. Werner Road & Mt. Werner Circle intersections according to the procedures outlined in Section 6.4.9 of the 2022 City of Steamboat Springs Engineering Standards. They are as follows:

Table 6: Calculated Site Traffic Contribution by Intersection

Intersection	Site Traffic Contribution
1. Mt Werner Road & Pine Grove Road	3.33%
3. Mt Werner Road & Mt Werner Circle	3.65%

Detailed calculations associated with the site traffic contribution can be found in **Appendix C**.

8. Alternative Modes Summary

As described earlier, it is expected that pedestrian trips will be a common mode of travel for those staying at the Amble. The proximity of the development to the Steamboat Gondola Transit Center (GTC) and resort base also raises the potential for transit trips to many amenities. The Steamboat Springs Transit Red, Green, Orange, Purple, and ExpressSST Lines all stop at the GTC, with the Red and Purple Lines passing through the west side of Mt. Werner Circle past the site access intersection. These transit services, as well as a potential connection to bicycle lanes on the west side of Mt. Werner Circle and an extensive sidewalk network to the east of the development, provide alternative means of travel for residents and visitors at the Amble.

It is still anticipated that trips originating from the Amble would predominantly utilize automobiles, mainly because the timing of transit trips to the resort base area do not primarily align with the peak hours calculated from the IDAX Traffic counts and observed as part of this study. Additionally, amenities that would be frequented at times like grocery stores, coffee shops, restaurants, and drug stores are located primarily near US-40, at a large enough distance that people would likely opt to drive.

9. Summary and Recommendations

Analysis Summary

The following tables summarize the model results for all scenarios in the AM and PM peak hours:

Table 7: AM Peak Hour Model Results Comparison

Intersection / Lane Group	Control	2022 Existing		Short Term Background		Short Term Total	
		AM Peak LOS	AM Peak Delay	AM Peak LOS	AM Peak Delay	AM Peak LOS	AM Peak Delay
1. Mt. Werner Road / Pine Grove Road							
Eastbound Left	Permitted	B	13.1	B	13.9	B	13.9
Eastbound Through		B	17.3	B	19.1	B	19.5
Eastbound Right		B	14.6	B	16.1	B	16.2
Westbound Left	Prot-Perm	B	11.3	B	12.4	B	12.6
Westbound Through		A	7.5	A	7.6	A	7.6
Westbound Right		A	0.0	A	0.0	A	0.0
Northbound Left/Through	Permitted	C	25.1	C	25.3	C	25.3
Northbound Right		C	26.4	C	26.9	C	27.0
Southbound Left/Through/Right	Permitted	D	37.3	D	49.0	D	52.3
Intersection	**Signal**	**C**	**21.2**	**C**	**24.6**	**C**	**25.4**
2. Mt. Werner Road / Steamboat Blvd.							
Eastbound Left/Through/Right		A	9.7	A	9.8	B	10.2
Westbound Left/Through		A	4.3	A	4.3	A	4.4
Westbound Through/Right		A	4.5	A	4.5	A	4.6
Northbound Left/Through/Right		A	5.3	A	5.3	A	5.4
Southbound Left/Through/Right		A	5.2	A	5.2	A	5.4
Southbound Right		A	4.9	A	4.9	A	5.0
Intersection	**Roundabout**	**A**	**6.4**	**A**	**7.2**	**A**	**7.4**
3. Mt. Werner Road / Mt. Werner Circle							
Eastbound Left		A	8.7	A	8.9	A	9.0
Eastbound Through		A	0.0	A	0.0	A	0.0
Westbound Through		A	0.0	A	0.0	A	0.0
Westbound Right		A	0.0	A	0.0	A	0.0
Southbound Left	Stop	E	36.7	E	44.3	E	47.5
Southbound Right		A	0.0	A	0.0	A	0.0
Intersection	**One-Way Stop**	**A**	**3.3**	**A**	**3.4**	**A**	**3.3**
4. Mt. Werner Circle / Site Access							
Westbound Left/Right	Stop	N/A	N/A	N/A	N/A	B	10.9
Northbound Through/Right		N/A	N/A	N/A	N/A	A	0.0
Southbound Through/Left		N/A	N/A	N/A	N/A	A	0.4
Intersection	**One-Way Stop**	**N/A**	**N/A**	**N/A**	**N/A**	**A**	**0.6**

Certain movements, such as the southbound left turn at the Mt. Werner Road and Mt. Werner Circle intersection and the southbound left and eastbound through at the Mt. Werner Road and Pine Grove Road intersection, experience high delays because of limited gaps and limited signal time, respectively. Operations along Mt. Werner Road are projected to remain stable with added development traffic.

Table 8: PM Peak Hour Model Results Comparison

Intersection / Lane Group	Control	2022 Existing		Short Term Background		Short Term Total	
		AM Peak LOS	AM Peak Delay	AM Peak LOS	AM Peak Delay	AM Peak LOS	AM Peak Delay
1. Mt. Werner Road / Pine Grove Road							
Eastbound Left	Permitted	B	11.6	B	11.7	B	11.7
Eastbound Through		B	14.5	B	14.9	B	15.2
Eastbound Right		B	12	B	12.2	B	12.2
Westbound Left	Prot-Perm	A	9.9	B	10.1	B	10.2
Westbound Through		A	8	A	8.1	A	8.2
Westbound Right		A	0	A	0.0	A	0.0
Northbound Left/Through	Permitted	C	28.4	C	30.3	C	30.3
Northbound Right		C	25.7	C	26.9	C	26.9
Southbound Left/Through/Right	Permitted	D	52.8	F	139.9	F	153.0
Intersection	**Signal**	**C**	**23.6**	**D**	**42.5**	**D**	**45.2**
2. Mt. Werner Road / Steamboat Blvd.							
Eastbound Left/Through/Right		A	7.1	A	8.6	A	9.0
Westbound Left/Through		A	5.1	A	5.4	A	5.4
Westbound Through/Right		A	5.4	A	5.8	A	5.9
Northbound Left/Through/Right		A	4.4	A	5.0	A	5.1
Southbound Left/Through/Right		A	5.9	A	6.3	A	6.4
Southbound Right		A	5.4	A	5.7	A	5.8
Intersection	**Roundabout**	**A**	**6.0**	**A**	**6.9**	**A**	**7.1**
3. Mt. Werner Road / Mt. Werner Circle							
Eastbound Left		A	8.8	A	9.0	A	9.1
Eastbound Through		A	0.0	A	0.0	A	0.0
Westbound Through		A	0.0	A	0.0	A	0.0
Westbound Right		A	0.0	A	0.0	A	0.0
Southbound Left	Stop	D	30.1	E	36.7	E	39.1
Southbound Right		A	0.0	A	0.0	A	0.0
Intersection	**One-Way Stop**	**A**	**2.5**	**A**	**2.5**	**A**	**2.5**
4. Mt. Werner Circle / Site Access							
Westbound Left/Right	Stop	N/A	N/A	N/A	N/A	B	12.4
Northbound Through/Right		N/A	N/A	N/A	N/A	A	0.0
Southbound Through/Left		N/A	N/A	N/A	N/A	A	0.4
Intersection	**One-Way Stop**	**N/A**	**N/A**	**N/A**	**N/A**	**A**	**0.5**

Evening peak hour operations are projected to be similar to those of the morning peak hour. Certain movements experience higher delays as compared to the morning peak hour. However, these movements do not experience a large increase in delay due either to Background Traffic growth or to Project Traffic, and are still within the acceptable range.

The summary of projected average delays at the Mt. Werner Circle / Site Access intersection is as follows:

- Overall is 0.6 (LOS A) and 0.5 seconds (LOS A) for AM and PM Peak hours.
- Southbound through / inbound left-turn lane is 0.4 seconds (LOS A) for AM and PM Peak hours.
- Inbound left-turn movement is 7.8 and 8.1 seconds (LOS A) for AM and PM Peak hours.
- Outbound left / right lane is 10.9 and 12.4 seconds (LOS B) for AM and PM Peak hours.

Recommendations

Based on the analyses contained in this study, the project team believes that the Amble Development will not negatively impact or materially change the traffic operations or intersection delays studied. No geometric or operational improvements are recommended for the existing study area roadways and intersections. At the proposed Mt. Werner Circle and Site Access intersection, the overall average delay would be very minimal. A separate turn lane for inbound left-turning traffic would improve safety, but is not required to meet LOS criteria. For outbound traffic, the projected average delays of about 11 to 12 seconds are well below the LOS criteria of 35 seconds. Given that the average delay for outbound traffic will be minimal and that sight distance will be adequate to see through traffic coming from each direction, a full-movement outbound configuration is recommended.

Appendix A

Traffic Impact Study Scope Approval Form

Attachment A
TRAFFIC IMPACT STUDY – SCOPE APPROVAL FORM

Prior to starting a traffic impact study, a Scope Approval Form must be submitted for review and signed by the City Public Works Director. It shall be included in every traffic study submittal as Attachment A. This Scope Approval Form is for City requirements only. Consultants must contact CDOT to determine requirements related to access permits and work in CDOT right-of-way.

Project Information

Project Name:	The Amble (Residential Condos)
Project Location:	Steamboat Ski Base Area
Developer Name/ Contact:	Ryan Stone, Managing Partner, East West Partners 303-319-6172 rstone@ewpartners.com
Traffic Engineer Name/ Contact:	Scott Burger, Senior Transportation Engineer, CONSOR 303-868-9767 scott.burger@consoreng.com

Study Parameters

Type of Study Required:

☐ Trip Generation Letter ☐ Long-term Traffic Study
☒ Short-term Traffic Study ☐ Trip Evaluation Letter

Traffic Counts

☒ Winter Zone ☐ Summer Zone

☒ Counts w/in last 2 years are available By: IDAX Date conducted: 12/31/2021
☐ New counts will be collected on _____

☐ Existing counts will be estimated based on: _____

% growth rate: _____

Seasonal Adjustment Factor applied (ratio): _____

☒ Future counts will be estimated based on a ~~0.5~~ _____% growth rate.

Growth Rates are required to match the 2022 Comprehensive Transportation Impact Analysis by Mcdowell

Peak Hours Analyzed

☒ AM Peak Hour ☒ PM peak hour ☐ Other _____

Trip Generation Rates

☒ From ITE ☐ Other (cite) _____
☐ No passby or mode split (typical)
☒ Passby or mode split (describe) Across from Steamboat Base. Some ped trips.

Trip Distribution – Attach sketch A-1

Study Parameters

List of Study Area Intersections

1.	Mt. Werner Road	Pine Grove Road
2.	Mt. Werner Road	Steamboat Boulevard
3.	Mt. Werner Road	Mt. Werner Circle
4.	Mt. Werner Circle	Site Access
5.		
6.		
7.		

Key Analysis items

- [x] Existing + site traffic at study intersections
- [x] Peak Hour LOS at study intersections
- [ ] CDOT Access Permit Required (consult with CDOT prior to approval of scope)
- [x] % Site contribution to intersection/road segment at Intersections 1 and 3
- [ ] Auxiliary lane evaluation at _____
- [ ] Traffic signal warrants at _____
- [ ] Four-way stop sign warrants at _____
- [ ] Queuing Analysis at _____
- [ ] Other _____

Approvals

Scott Burger 09-20-22

Prepared By: Date

Please note that the approval of this scope approval form shall not be construed as an approval of the proposed use, but rather a methodology for evaluation of the proposed use. During the city development review process, the proposed use will be reviewed by city staff for compliance with code, standards, and community planning documents.

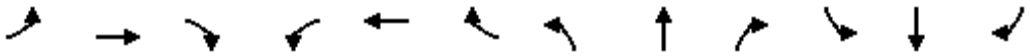
APPROVED
to be generally in accordance with CITY ENGINEERING STANDARDS
03/02/2023

Appendix B

Traffic Model Output Forms

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	308	114	152	116	171	24	50	98	194	64	5
Future Volume (veh/h)	2	308	114	152	116	171	24	50	98	194	64	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1856	1900	1781	1752	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	2	335	124	165	126	0	26	54	107	211	70	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	3	0	8	10	0	0	0	0	0	0	0
Cap, veh/h	673	857	743	506	1997		181	353	447	317	86	6
Arrive On Green	0.46	0.46	0.46	0.07	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1285	1856	1610	1697	3328	1610	461	1271	1610	892	308	21
Grp Volume(v), veh/h	2	335	124	165	126	0	80	0	107	286	0	0
Grp Sat Flow(s),veh/h/ln	1285	1856	1610	1697	1664	1610	1732	0	1610	1221	0	0
Q Serve(g_s), s	0.1	10.7	4.0	4.3	1.4	0.0	0.0	0.0	4.6	17.7	0.0	0.0
Cycle Q Clear(g_c), s	0.1	10.7	4.0	4.3	1.4	0.0	2.9	0.0	4.6	20.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.32		1.00	0.74		0.02
Lane Grp Cap(c), veh/h	673	857	743	506	1997		534	0	447	409	0	0
V/C Ratio(X)	0.00	0.39	0.17	0.33	0.06		0.15	0.00	0.24	0.70	0.00	0.00
Avail Cap(c_a), veh/h	673	857	743	649	1997		534	0	447	409	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.1	15.9	14.1	10.9	7.5	0.0	24.5	0.0	25.1	32.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.3	0.5	0.4	0.1	0.0	0.6	0.0	1.3	5.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.6	1.5	1.5	0.5	0.0	1.4	0.0	1.9	6.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.1	17.3	14.6	11.3	7.5	0.0	25.1	0.0	26.4	37.3	0.0	0.0
LnGrp LOS	B	B	B	B	A		C	A	C	D	A	A
Approach Vol, veh/h		461			291	A		187			286	
Approach Delay, s/veh		16.5			9.7			25.8			37.3	
Approach LOS		B			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.4	47.6		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	6.3	12.7		22.6		3.4		6.6				
Green Ext Time (p_c), s	0.2	2.3		0.4		0.8		0.7				

Intersection Summary			
HCM 6th Ctrl Delay		21.2	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	1.6	1.00
2	West Leg - MWR (EB)	0	1.000	3.2	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	4.7	1.00

Operational Results

HCM 2016 - 2022 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	79	89		413		893	968		0.088	0.092	
2	West Leg - MWR (EB)		616		138			1221			0.505	
3	South Leg - Broomtail Ln (NB)		7		741			742			0.009	
4	East Leg - MWR (WB)	218	246		32		1316	1316		0.166	0.187	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	4.9	4.6		4.7	0.3	0.3		A	A		A
2	West Leg - MWR (EB)		8.5		8.5		3.0			A		A
3	South Leg - Broomtail Ln (NB)		4.9		4.9		0.0			A		A
4	East Leg - MWR (WB)	4.1	4.3		4.2	0.6	0.7		A	A		A

HCM 2016 - 2022 AM Peak 15 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	88	99		459		854	929		0.103	0.107	
2	West Leg - MWR (EB)		684		154			1204			0.568	
3	South Leg - Broomtail Ln (NB)		8		824			691			0.012	
4	East Leg - MWR (WB)	242	273		35		1313	1313		0.184	0.208	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	5.2	4.9		5.0	0.3	0.4		A	A		A
2	West Leg - MWR (EB)		9.7		9.7		3.7			A		A
3	South Leg - Broomtail Ln (NB)		5.3		5.3		0.0			A		A
4	East Leg - MWR (WB)	4.3	4.5		4.4	0.7	0.8		A	A		A

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	338	378	211	7	4	253
Future Vol, veh/h	338	378	211	7	4	253
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	0	0	0	10
Mvmt Flow	367	411	229	8	4	275

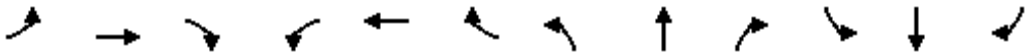
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	237	0	-	0	1374	-
Stage 1	-	-	-	-	229	-
Stage 2	-	-	-	-	1145	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1342	-	-	-	162	0
Stage 1	-	-	-	-	814	0
Stage 2	-	-	-	-	306	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1342	-	-	-	118	-
Mov Cap-2 Maneuver	-	-	-	-	118	-
Stage 1	-	-	-	-	592	-
Stage 2	-	-	-	-	306	-

Approach	EB	WB	SB
HCM Control Delay, s	4.1	0	36.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1342	-	-	-	118	-
HCM Lane V/C Ratio	0.274	-	-	-	0.037	-
HCM Control Delay (s)	8.7	-	-	-	36.7	0
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	1.1	-	-	-	0.1	-

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	252	38	49	282	353	69	125	77	197	21	11
Future Volume (veh/h)	1	252	38	49	282	353	69	125	77	197	21	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1841	1900	1530	1841	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	1	274	41	53	307	0	75	136	84	214	23	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	4	0	25	4	0	0	0	0	0	0	0
Cap, veh/h	617	907	793	491	2098		206	351	447	271	23	11
Arrive On Green	0.49	0.49	0.49	0.04	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1089	1841	1610	1457	3497	1610	546	1265	1610	706	84	40
Grp Volume(v), veh/h	1	274	41	53	307	0	211	0	84	249	0	0
Grp Sat Flow(s),veh/h/ln	1089	1841	1610	1457	1749	1610	1811	0	1610	830	0	0
Q Serve(g_s), s	0.0	8.0	1.2	1.5	3.5	0.0	0.0	0.0	3.6	16.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.0	1.2	1.5	3.5	0.0	8.4	0.0	3.6	25.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.36		1.00	0.86		0.05
Lane Grp Cap(c), veh/h	617	907	793	491	2098		557	0	447	305	0	0
V/C Ratio(X)	0.00	0.30	0.05	0.11	0.15		0.38	0.00	0.19	0.82	0.00	0.00
Avail Cap(c_a), veh/h	617	907	793	658	2098		557	0	447	305	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.6	13.6	11.9	9.8	7.9	0.0	26.5	0.0	24.8	37.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.9	0.1	0.1	0.1	0.0	2.0	0.0	0.9	15.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.3	0.4	0.5	1.2	0.0	4.0	0.0	1.5	6.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.6	14.5	12.0	9.9	8.0	0.0	28.4	0.0	25.7	52.8	0.0	0.0
LnGrp LOS	B	B	B	A	A		C	A	C	D	A	A
Approach Vol, veh/h		316			360	A		295			249	
Approach Delay, s/veh		14.1			8.3			27.6			52.8	
Approach LOS		B			A			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.7	50.3		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	3.5	10.0		27.0		5.5		10.4				
Green Ext Time (p_c), s	0.1	1.7		0.0		2.1		1.3				

Intersection Summary			
HCM 6th Ctrl Delay		23.6	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	2.5	1.00
2	West Leg - MWR (EB)	0	1.000	3.5	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	3.0	1.00

Operational Results

HCM 2016 - 2022 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	54	61		656		707	780		0.076	0.078	
2	West Leg - MWR (EB)		542		90			1269			0.427	
3	South Leg - Broomtail Ln (NB)		6		622			822			0.007	
4	East Leg - MWR (WB)	359	404		42		1326	1326		0.271	0.305	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	5.9	5.4		5.6	0.2	0.3		A	A		A
2	West Leg - MWR (EB)		7.1		7.1		2.2			A		A
3	South Leg - Broomtail Ln (NB)		4.4		4.4		0.0			A		A
4	East Leg - MWR (WB)	5.1	5.4		5.3	1.1	1.3		A	A		A

HCM 2016 - 2022 PM Peak 15 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	60	68		730		659	731		0.091	0.093	
2	West Leg - MWR (EB)		602		100			1257			0.479	
3	South Leg - Broomtail Ln (NB)		7		692			773			0.009	
4	East Leg - MWR (WB)	398	449		46		1320	1320		0.302	0.340	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	6.5	5.9		6.2	0.3	0.3		A	A		A
2	West Leg - MWR (EB)		7.9		7.9		2.7			A		A
3	South Leg - Broomtail Ln (NB)		4.7		4.7		0.0			A		A
4	East Leg - MWR (WB)	5.4	5.8		5.6	1.3	1.5		A	A		A

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	234	352	328	10	8	435
Future Vol, veh/h	234	352	328	10	8	435
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	0	0	0	6
Mvmt Flow	254	383	357	11	9	473

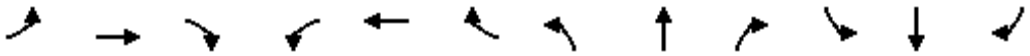
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	368	0	-	0	1248	-
Stage 1	-	-	-	-	357	-
Stage 2	-	-	-	-	891	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1202	-	-	-	193	0
Stage 1	-	-	-	-	713	0
Stage 2	-	-	-	-	404	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1202	-	-	-	152	-
Mov Cap-2 Maneuver	-	-	-	-	152	-
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	404	-

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	30.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1202	-	-	-	152	-
HCM Lane V/C Ratio	0.212	-	-	-	0.057	-
HCM Control Delay (s)	8.8	-	-	-	30.1	0
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0.8	-	-	-	0.2	-

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	345	151	194	136	189	26	55	112	218	86	5
Future Volume (veh/h)	2	345	151	194	136	189	26	55	112	218	86	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1856	1900	1796	1767	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	2	375	164	211	148	0	28	60	122	237	93	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	3	0	7	9	0	0	0	0	0	0	0
Cap, veh/h	641	827	718	484	2014		176	354	447	302	92	5
Arrive On Green	0.45	0.45	0.45	0.09	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1259	1856	1610	1711	3357	1610	444	1274	1610	841	330	18
Grp Volume(v), veh/h	2	375	164	211	148	0	88	0	122	335	0	0
Grp Sat Flow(s),veh/h/ln	1259	1856	1610	1711	1678	1610	1717	0	1610	1189	0	0
Q Serve(g_s), s	0.1	12.6	5.7	5.6	1.7	0.0	0.0	0.0	5.3	21.8	0.0	0.0
Cycle Q Clear(g_c), s	0.1	12.6	5.7	5.6	1.7	0.0	3.2	0.0	5.3	25.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.32		1.00	0.71		0.01
Lane Grp Cap(c), veh/h	641	827	718	484	2014		530	0	447	399	0	0
V/C Ratio(X)	0.00	0.45	0.23	0.44	0.07		0.17	0.00	0.27	0.84	0.00	0.00
Avail Cap(c_a), veh/h	641	827	718	600	2014		530	0	447	399	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.8	17.3	15.4	11.7	7.5	0.0	24.6	0.0	25.4	34.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.8	0.7	0.6	0.1	0.0	0.7	0.0	1.5	14.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.5	2.1	2.0	0.6	0.0	1.5	0.0	2.2	8.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.9	19.1	16.1	12.4	7.6	0.0	25.3	0.0	26.9	49.0	0.0	0.0
LnGrp LOS	B	B	B	B	A		C	A	C	D	A	A
Approach Vol, veh/h		541			359	A		210			335	
Approach Delay, s/veh		18.2			10.4			26.2			49.0	
Approach LOS		B			B			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.9	46.1		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	7.6	14.6		27.0		3.7		7.3				
Green Ext Time (p_c), s	0.3	2.7		0.0		1.0		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		24.6	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Scheme Summary

Control Data

Control Data and Model Parameters

Amble Development TIS	2024 Synthetic Flow Profile (veh)
Background	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	1.6	1.00
2	West Leg - MWR (EB)	0	1.000	3.2	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	4.7	1.00

Operational Results

HCM 2016 - 2024 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	88	100		461		852	927		0.103	0.108	
2	West Leg - MWR (EB)		696		143			1215			0.573	
3	South Leg - Broomtail Ln (NB)		7		826			689			0.010	
4	East Leg - MWR (WB)	243	273		35		1313	1313		0.185	0.208	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	5.2	4.9		5.0	0.3	0.4		A	A		A
2	West Leg - MWR (EB)		9.8		9.8		4.0			A		A
3	South Leg - Broomtail Ln (NB)		5.3		5.3		0.0			A		A
4	East Leg - MWR (WB)	4.3	4.5		4.4	0.7	0.8		A	A		A

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	364	404	236	7	4	279
Future Vol, veh/h	364	404	236	7	4	279
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	0	9
Mvmt Flow	396	439	257	8	4	303

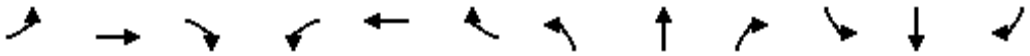
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	265	0	-	0	1488	-
Stage 1	-	-	-	-	257	-
Stage 2	-	-	-	-	1231	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1311	-	-	-	138	0
Stage 1	-	-	-	-	791	0
Stage 2	-	-	-	-	278	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1311	-	-	-	96	-
Mov Cap-2 Maneuver	-	-	-	-	96	-
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	278	-

Approach	EB	WB	SB
HCM Control Delay, s	4.2	0	44.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1311	-	-	-	96	-
HCM Lane V/C Ratio	0.302	-	-	-	0.045	-
HCM Control Delay (s)	8.9	-	-	-	44.3	0
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	1.3	-	-	-	0.1	-

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	280	42	53	313	397	90	154	111	232	29	7
Future Volume (veh/h)	1	280	42	53	313	397	90	154	111	232	29	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1856	1900	1589	1841	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	1	304	46	58	340	0	98	167	121	252	32	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	3	0	21	4	0	0	0	0	0	0	0
Cap, veh/h	599	911	790	487	2098		219	337	447	231	20	5
Arrive On Green	0.49	0.49	0.49	0.04	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1057	1856	1610	1513	3497	1610	593	1213	1610	563	72	18
Grp Volume(v), veh/h	1	304	46	58	340	0	265	0	121	292	0	0
Grp Sat Flow(s),veh/h/ln	1057	1856	1610	1513	1749	1610	1806	0	1610	653	0	0
Q Serve(g_s), s	0.0	9.0	1.3	1.6	3.9	0.0	0.0	0.0	5.3	13.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.0	1.3	1.6	3.9	0.0	11.1	0.0	5.3	25.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.37		1.00	0.86		0.03
Lane Grp Cap(c), veh/h	599	911	790	487	2098		556	0	447	256	0	0
V/C Ratio(X)	0.00	0.33	0.06	0.12	0.16		0.48	0.00	0.27	1.14	0.00	0.00
Avail Cap(c_a), veh/h	599	911	790	658	2098		556	0	447	256	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.7	14.0	12.0	10.0	8.0	0.0	27.4	0.0	25.4	40.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.1	0.1	0.2	0.0	2.9	0.0	1.5	99.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.7	0.5	0.5	1.3	0.0	5.2	0.0	2.2	12.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	14.9	12.2	10.1	8.1	0.0	30.3	0.0	26.9	139.9	0.0	0.0
LnGrp LOS	B	B	B	B	A		C	A	C	F	A	A
Approach Vol, veh/h		351			398	A		386			292	
Approach Delay, s/veh		14.6			8.4			29.2			139.9	
Approach LOS		B			A			C			F	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.8	50.2		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	3.6	11.0		27.0		5.9		13.1				
Green Ext Time (p_c), s	0.1	1.9		0.0		2.4		1.6				

Intersection Summary			
HCM 6th Ctrl Delay		42.5	
HCM 6th LOS		D	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Scheme Summary

Control Data

Control Data and Model Parameters

Amble Development TIS	2024 Synthetic Flow Profile (veh)
Background	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	2.5	1.00
2	West Leg - MWR (EB)	0	1.000	3.5	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	3.0	1.00

Operational Results

HCM 2016 - 2024 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	62	69		693		683	755		0.091	0.091	
2	West Leg - MWR (EB)		658		101			1256			0.524	
3	South Leg - Broomtail Ln (NB)		6		752			734			0.008	
4	East Leg - MWR (WB)	383	431		60		1303	1303		0.294	0.331	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	6.3	5.7		6.0	0.3	0.3		A	A		A
2	West Leg - MWR (EB)		8.6		8.6		3.3			A		A
3	South Leg - Broomtail Ln (NB)		5.0		5.0		0.0			A		A
4	East Leg - MWR (WB)	5.4	5.8		5.6	1.2	1.5		A	A		A

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	261	412	342	11	7	467
Future Vol, veh/h	261	412	342	11	7	467
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	0	0	0	5
Mvmt Flow	284	448	372	12	8	508

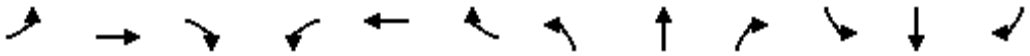
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	384	0	-	0	1388	-
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	1016	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1186	-	-	-	159	0
Stage 1	-	-	-	-	702	0
Stage 2	-	-	-	-	353	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	121	-
Mov Cap-2 Maneuver	-	-	-	-	121	-
Stage 1	-	-	-	-	534	-
Stage 2	-	-	-	-	353	-

Approach	EB	WB	SB
HCM Control Delay, s	3.5	0	36.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1186	-	-	-	121	-
HCM Lane V/C Ratio	0.239	-	-	-	0.063	-
HCM Control Delay (s)	9	-	-	-	36.7	0
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	0.9	-	-	-	0.2	-

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	359	151	196	150	198	26	55	114	226	86	5
Future Volume (veh/h)	2	359	151	196	150	198	26	55	114	226	86	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1856	1900	1796	1781	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	2	390	164	213	163	0	28	60	124	246	93	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	3	0	7	8	0	0	0	0	0	0	0
Cap, veh/h	633	826	716	475	2031		176	355	447	304	89	5
Arrive On Green	0.44	0.44	0.44	0.09	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1242	1856	1610	1711	3385	1610	445	1278	1610	847	320	17
Grp Volume(v), veh/h	2	390	164	213	163	0	88	0	124	344	0	0
Grp Sat Flow(s),veh/h/ln	1242	1856	1610	1711	1692	1610	1723	0	1610	1184	0	0
Q Serve(g_s), s	0.1	13.3	5.7	5.7	1.8	0.0	0.0	0.0	5.4	21.8	0.0	0.0
Cycle Q Clear(g_c), s	0.1	13.3	5.7	5.7	1.8	0.0	3.2	0.0	5.4	25.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.32		1.00	0.72		0.01
Lane Grp Cap(c), veh/h	633	826	716	475	2031		531	0	447	397	0	0
V/C Ratio(X)	0.00	0.47	0.23	0.45	0.08		0.17	0.00	0.28	0.87	0.00	0.00
Avail Cap(c_a), veh/h	633	826	716	590	2031		531	0	447	397	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.9	17.6	15.4	11.9	7.6	0.0	24.6	0.0	25.4	34.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.9	0.7	0.7	0.1	0.0	0.7	0.0	1.5	17.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.8	2.1	2.0	0.6	0.0	1.5	0.0	2.3	9.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.9	19.5	16.2	12.6	7.6	0.0	25.3	0.0	27.0	52.3	0.0	0.0
LnGrp LOS	B	B	B	B	A		C	A	C	D	A	A
Approach Vol, veh/h		556			376	A		212			344	
Approach Delay, s/veh		18.5			10.4			26.3			52.3	
Approach LOS		B			B			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.0	46.0		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	7.7	15.3		27.0		3.8		7.4				
Green Ext Time (p_c), s	0.3	2.7		0.0		1.1		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		25.4	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Scheme Summary

Control Data

Control Data and Model Parameters

Amble Development TIS	2024 Synthetic Flow Profile (veh)
Total	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	1.6	1.00
2	West Leg - MWR (EB)	0	1.000	3.1	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	4.5	1.00

Operational Results

HCM 2016 - 2024 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	88	100		486		833	908		0.106	0.110	
2	West Leg - MWR (EB)		720		143			1217			0.592	
3	South Leg - Broomtail Ln (NB)		7		850			676			0.010	
4	East Leg - MWR (WB)	254	287		35		1315	1315		0.193	0.218	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	5.4	5.0		5.2	0.4	0.4		A	A		A
2	West Leg - MWR (EB)		10.2		10.2		4.3			B		B
3	South Leg - Broomtail Ln (NB)		5.4		5.4		0.0			A		A
4	East Leg - MWR (WB)	4.4	4.6		4.5	0.7	0.8		A	A		A

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	366	426	256	7	4	284
Future Vol, veh/h	366	426	256	7	4	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	0	9
Mvmt Flow	398	463	278	8	4	309

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	286	0	-	0	1537	-
Stage 1	-	-	-	-	278	-
Stage 2	-	-	-	-	1259	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1288	-	-	-	129	0
Stage 1	-	-	-	-	774	0
Stage 2	-	-	-	-	270	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1288	-	-	-	89	-
Mov Cap-2 Maneuver	-	-	-	-	89	-
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	SB
HCM Control Delay, s	4.2	0	47.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1288	-	-	-	89	-
HCM Lane V/C Ratio	0.309	-	-	-	0.049	-
HCM Control Delay (s)	9	-	-	-	47.5	0
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	1.3	-	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	20	243	2	22	408
Future Vol, veh/h	5	20	243	2	22	408
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, %	0	0	0	0	0	5
Mvmt Flow	5	22	264	2	24	443

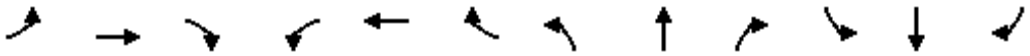
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	756	265	0	0	266	0
Stage 1	265	-	-	-	-	-
Stage 2	491	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	379	779	-	-	1310	-
Stage 1	784	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	370	779	-	-	1310	-
Mov Cap-2 Maneuver	370	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	604	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	638	1310	-
HCM Lane V/C Ratio	-	-	0.043	0.018	-
HCM Control Delay (s)	-	-	10.9	7.8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

HCM 6th Signalized Intersection Summary
1: Pine Grove Rd & Mt Werner Rd

03/04/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	294	42	55	323	404	90	154	113	240	29	7
Future Volume (veh/h)	1	294	42	55	323	404	90	154	113	240	29	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1856	1900	1589	1841	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	1	320	46	60	351	0	98	167	123	261	32	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	3	0	21	4	0	0	0	0	0	0	0
Cap, veh/h	593	910	789	477	2098		220	338	447	232	19	5
Arrive On Green	0.49	0.49	0.49	0.04	0.60	0.00	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1046	1856	1610	1513	3497	1610	594	1215	1610	565	69	17
Grp Volume(v), veh/h	1	320	46	60	351	0	265	0	123	301	0	0
Grp Sat Flow(s),veh/h/ln	1046	1856	1610	1513	1749	1610	1809	0	1610	651	0	0
Q Serve(g_s), s	0.0	9.6	1.3	1.7	4.0	0.0	0.0	0.0	5.4	13.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.6	1.3	1.7	4.0	0.0	11.1	0.0	5.4	25.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	0.37		1.00	0.87		0.03
Lane Grp Cap(c), veh/h	593	910	789	477	2098		557	0	447	256	0	0
V/C Ratio(X)	0.00	0.35	0.06	0.13	0.17		0.48	0.00	0.28	1.18	0.00	0.00
Avail Cap(c_a), veh/h	593	910	789	647	2098		557	0	447	256	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.7	14.1	12.0	10.1	8.0	0.0	27.4	0.0	25.4	40.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.1	0.1	0.2	0.0	2.9	0.0	1.5	112.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.0	0.5	0.5	1.4	0.0	5.2	0.0	2.2	13.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	15.2	12.2	10.2	8.2	0.0	30.3	0.0	26.9	153.0	0.0	0.0
LnGrp LOS	B	B	B	B	A		C	A	C	F	A	A
Approach Vol, veh/h		367			411	A		388			301	
Approach Delay, s/veh		14.8			8.5			29.2			153.0	
Approach LOS		B			A			C			F	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.9	50.1		30.0		60.0		30.0				
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0		5.0				
Max Green Setting (Gmax), s	14.0	34.0		25.0		54.0		25.0				
Max Q Clear Time (g_c+I1), s	3.7	11.6		27.0		6.0		13.1				
Green Ext Time (p_c), s	0.1	2.0		0.0		2.4		1.6				

Intersection Summary			
HCM 6th Ctrl Delay		45.2	
HCM 6th LOS		D	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Scheme Summary

Control Data

Control Data and Model Parameters

Amble Development TIS	2024 Synthetic Flow Profile (veh)
Total	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	North Leg - Steamboat Blvd (SB)	0	2	2	2	1
2	West Leg - MWR (EB)	90	1	1	2	2
3	South Leg - Broomtail Ln (NB)	180	1	1	2	1
4	East Leg - MWR (WB)	270	2	2	1	1

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	North Leg - Steamboat Blvd (SB)	HCM	1350	1420		HCM	0.92	0.85	
2	West Leg - MWR (EB)	HCM		1420		HCM		0.85	
3	South Leg - Broomtail Ln (NB)	HCM		1420		HCM		0.85	
4	East Leg - MWR (WB)	HCM	1420	1420		HCM	0.91	0.91	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	North Leg - Steamboat Blvd (SB)	0.47	0.53	None	0	1.000	0.90
2	West Leg - MWR (EB)	0.00	1.00	None	0	1.000	0.90
3	South Leg - Broomtail Ln (NB)	0.00	1.00	None	0	1.000	0.90
4	East Leg - MWR (WB)	0.47	0.53	None	0	1.000	0.90

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	North Leg - Steamboat Blvd (SB)	0	1.000	2.5	1.00
2	West Leg - MWR (EB)	0	1.000	3.4	1.00
3	South Leg - Broomtail Ln (NB)	0	1.000	0.0	1.00
4	East Leg - MWR (WB)	0	1.000	2.9	1.00

Operational Results

HCM 2016 - 2024 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	North Leg - Steamboat Blvd (SB)	62	69		712		671	743		0.092	0.093	
2	West Leg - MWR (EB)		682		101			1257			0.543	
3	South Leg - Broomtail Ln (NB)		6		775			719			0.008	
4	East Leg - MWR (WB)	392	441		60		1304	1304		0.301	0.338	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	North Leg - Steamboat Blvd (SB)	6.4	5.8		6.1	0.3	0.3		A	A		A
2	West Leg - MWR (EB)		9.0		9.0		3.5			A		A
3	South Leg - Broomtail Ln (NB)		5.1		5.1		0.0			A		A
4	East Leg - MWR (WB)	5.4	5.9		5.7	1.3	1.5		A	A		A

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	263	434	356	11	7	472
Future Vol, veh/h	263	434	356	11	7	472
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	65	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	5	0	0	0	5
Mvmt Flow	286	472	387	12	8	513

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	399	0	-	0	1431	-
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	1044	-
Critical Hdwy	4.1	-	-	-	6.4	-
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	-
Pot Cap-1 Maneuver	1171	-	-	-	150	0
Stage 1	-	-	-	-	691	0
Stage 2	-	-	-	-	342	0
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1171	-	-	-	113	-
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	522	-
Stage 2	-	-	-	-	342	-

Approach	EB	WB	SB
HCM Control Delay, s	3.4	0	39.1
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1171	-	-	-	113	-
HCM Lane V/C Ratio	0.244	-	-	-	0.067	-
HCM Control Delay (s)	9.1	-	-	-	39.1	0
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	1	-	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	14	353	2	22	419
Future Vol, veh/h	5	14	353	2	22	419
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, %	0	0	0	0	0	5
Mvmt Flow	5	15	384	2	24	455

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	888	385	0	0	386	0
Stage 1	385	-	-	-	-	-
Stage 2	503	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	317	667	-	-	1184	-
Stage 1	692	-	-	-	-	-
Stage 2	612	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	308	667	-	-	1184	-
Mov Cap-2 Maneuver	308	-	-	-	-	-
Stage 1	692	-	-	-	-	-
Stage 2	595	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	510	1184	-
HCM Lane V/C Ratio	-	-	0.04	0.02	-
HCM Control Delay (s)	-	-	12.4	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Appendix C

ITE Trip Generation Information

Site Percent Contribution Calculations

Recreational Homes
(260)

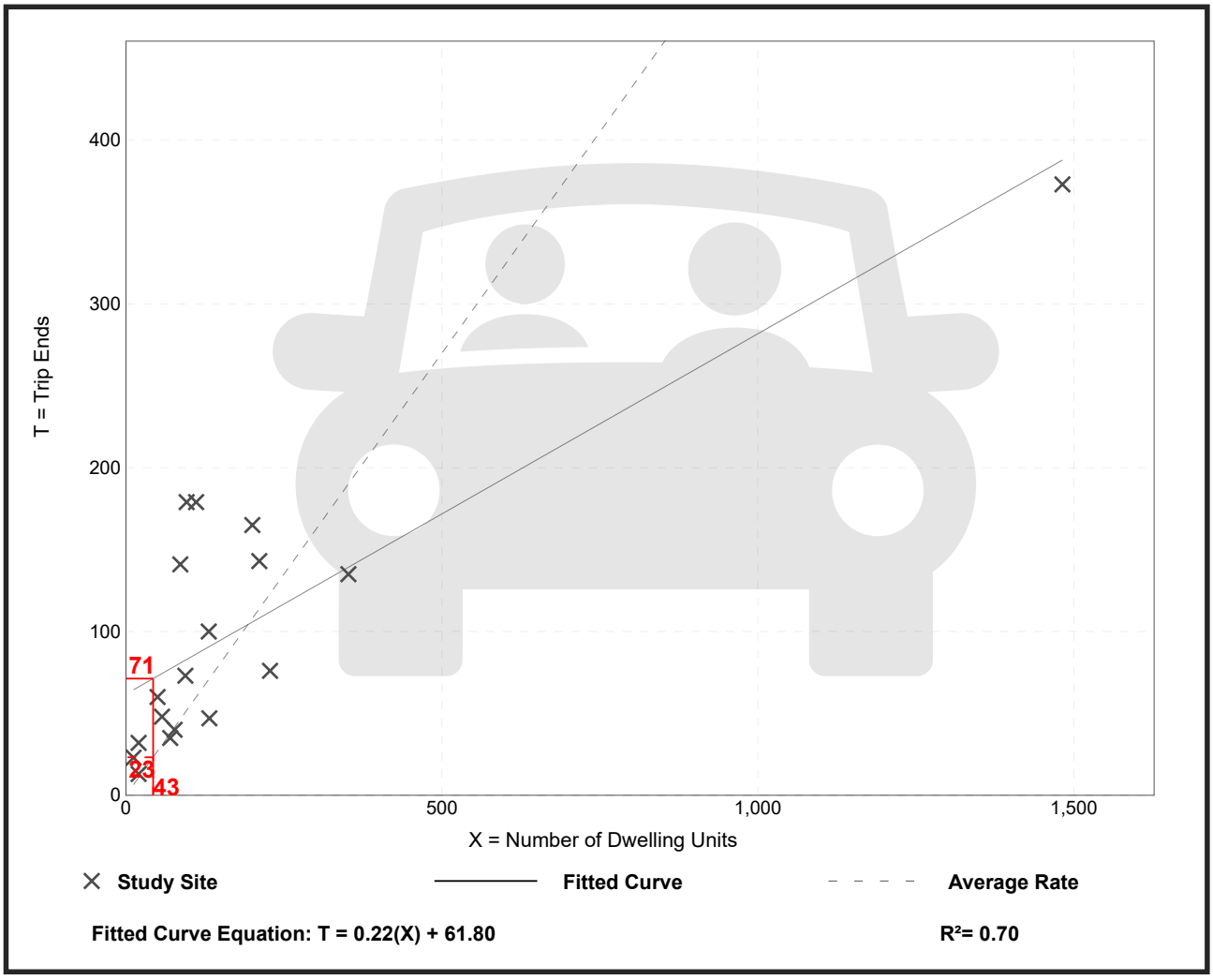
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Sunday, Peak Hour of Generator**

Setting/Location: **Rural**
Number of Studies: 18
Avg. Num. of Dwelling Units: 191
Directional Distribution: 42% entering, 58% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.54	0.25 - 1.92	0.45

Data Plot and Equation



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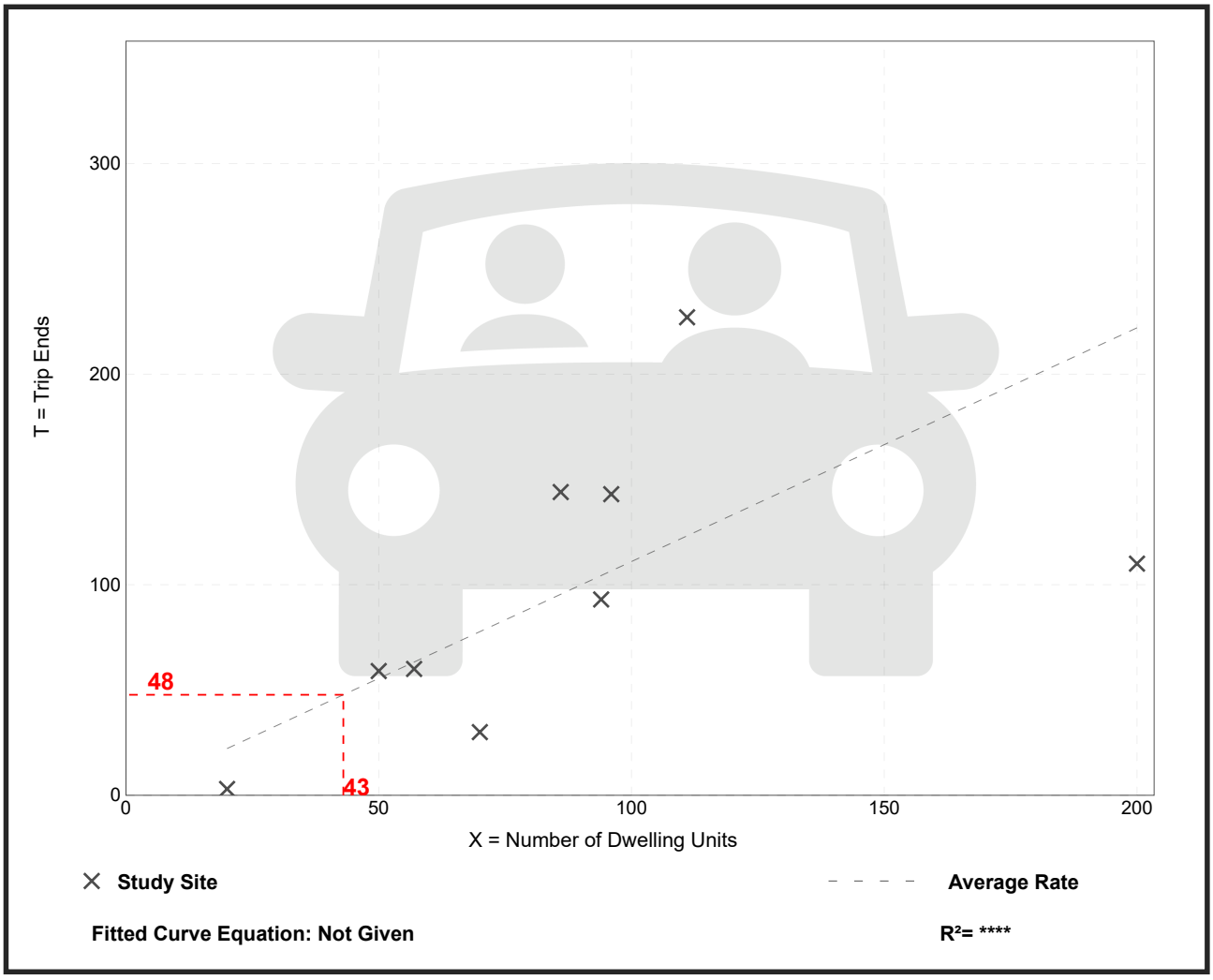
Recreational Homes
(260)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Friday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **Rural**
Number of Studies: 9
Avg. Num. of Dwelling Units: 87
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.11	0.15 - 2.05	0.60

Data Plot and Equation



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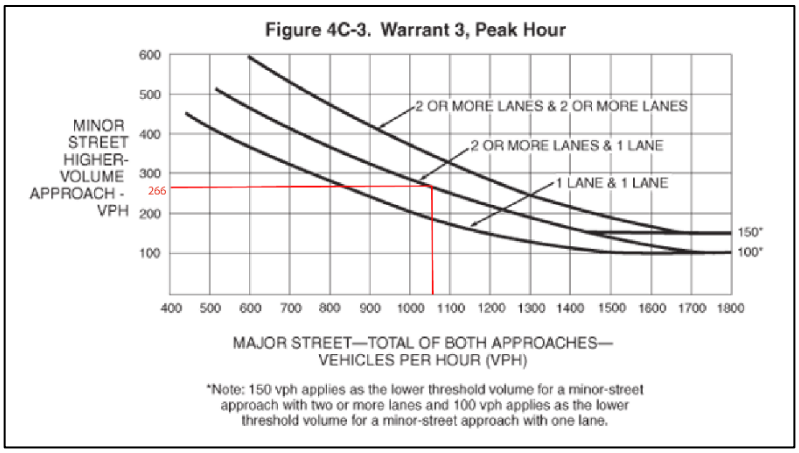
Percent Site Contribution Calculations

Intersection 1- Mt. Werner Road & Pine Grove Road:

AM Peak Hour

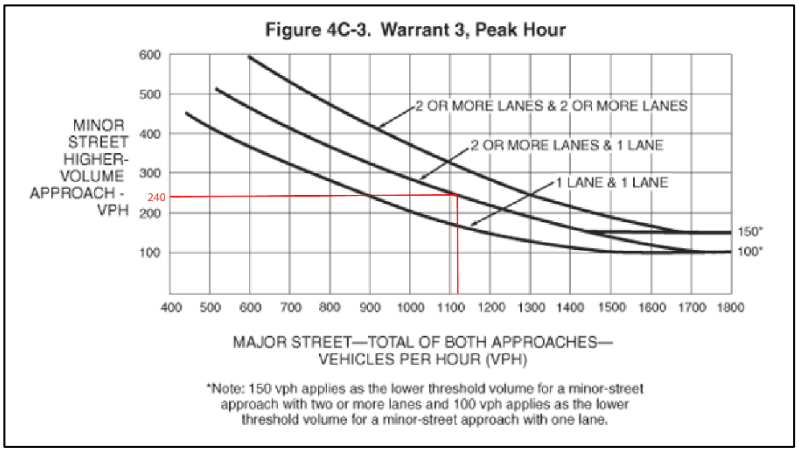
I	Sum of volume on minor approaches	512
II	Sum of site generated volume on minor approaches	8
III	Sum of volume on major approaches	1056
IV	Necessary volume on higher minor street approach to satisfy Warrant 3, Peak Hour given major street sum (From MUTCD 2009 Figure 4C-3)	266
V	% Site Contribution (II/IV)	3.01%



PM Peak Hour

I	Sum of volume on minor approaches	633
II	Sum of site generated volume on minor approaches	8
III	Sum of volume on major approaches	1119
IV	Necessary volume on higher minor street approach to satisfy Warrant 3, Peak Hour given major street sum (From MUTCD 2009 Figure 4C-3)	240
V	% Site Contribution (II/IV)*	3.33%

*The higher of the two peak hours is taken.



Intersection 3- Mt. Werner Road & Mt. Werner Circle:

AM Peak Hour

I	Total volume	1343
II	Total site-generated volume	49
III	% Site Contribution (II/I)*	3.65%

*The higher of the two peak hours is taken.

PM Peak Hour

I	Total volume	1543
II	Total site-generated volume	43
III	% Site Contribution (II/I)	2.79%