

Wal-Mart
US 16 / Moon Meadows
(DRAFT TRAFFIC IMPACT STUDY)

Rapid City, South Dakota

Prepared for

Wal-Mart Stores, Inc.

At the request of BFA, Inc.

Prepared by
HDR Engineering, Inc.

HDR

SEPTEMBER 2005

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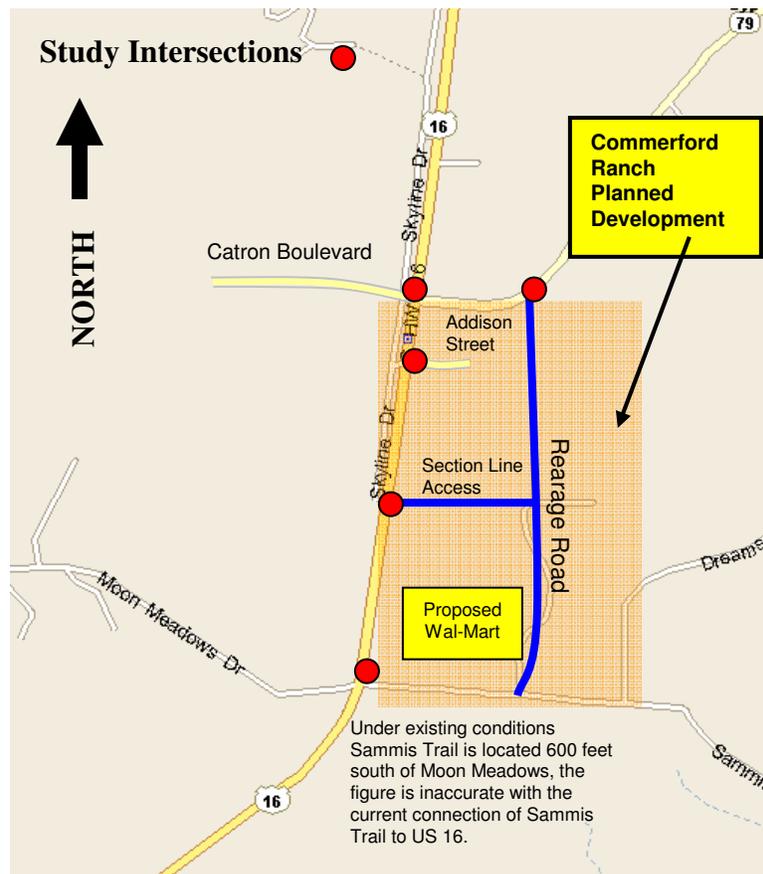
CHAPTER 1: INTRODUCTION

1.1 STUDY PURPOSE

Wal-Mart Stores, Inc. is proposing to open a 203,000 square foot Wal-Mart Superstore on US 16 1 mile south of Catron Boulevard at the intersection of Moon Meadows (north of existing Sammis Trail) south of Rapid City, South Dakota. As part of the planning and design of this new facility, Wal-Mart Stores, Inc. has retained HDR Engineering, Inc. to conduct a traffic study to determine the impacts of this development on the local street network and to identify measures that should be implemented to mitigate these impacts. The study area is shown in Figure 1 (below) and includes the following six study intersections:

- US 16/Catron Boulevard
- US 16/Rearage Road Connection to Catron Boulevard east of US 16
- US 16/Addison Street
- US 16/Section Line Street Access proposed in Master plan
- US 16/Moon Meadows
- US 16/Sammis Trail/Ft. Hayes

FIGURE 1. Study Area



1.2 STUDY METHODOLOGY

The main objective of the study was to determine the traffic impacts of the proposed Wal-Mart Superstore located on the northeast corner of US 16/Moon Meadows intersection. A traffic analysis of the adjacent roadway system was performed to determine any mitigation measures necessary to maintain adequate traffic flow at each of the study area intersections. In order to determine these impacts, the following tasks were performed:

- Existing A.M., Noon, and P.M. peak hour turning movement counts and a geometric inventory for the study area intersections were gathered on January 19th and 20th, 2005. All existing counts were adjusted to represent summer “seasonal” volumes with factors supplied by the South Dakota Department of Transportation (SDDOT).
- The proposed Wal-Mart Superstore trips were estimated for the 2005 Build alternative. (The Wal-Mart Superstore is the only proposed development to be completed in 2005 within the Commerford Ranch Planned Development.)
- 2005 Build traffic volumes were distributed and combined with existing volumes.
- The Wal-Mart Superstore development and proposed Commerford Ranch Development trips were estimated. The traffic analysis zone (TAZ) that included this area was updated in the US 16 Corridor Study model. TAZ 14 was the zone that includes the Commerford Ranch Planned Development. This method was the basis for distribution of generated trips for the 2025 Build Alternative.
- Build traffic volumes were developed that combined existing and proposed trips.
- Future traffic volumes (for year 2025) were assigned using the “Traffix” model developed for the US 16 Corridor Study.
- Capacity analyses were performed for three volume scenarios:
 - Existing traffic volumes
 - Build traffic volumes (existing plus development trips)
 - Future build traffic volumes (year 2025 plus development trips)
- The impacts of the site-generated trips on the surrounding street network were determined.
- Mitigation measures were identified to provide acceptable operations at the study area intersections.

CHAPTER 2: EXISTING CONDITIONS

2.1 EXISTING ROADWAY NETWORK

The study area is located south of Rapid City in South Dakota. The primary roadway facility in the study area is US 16, a north-south route in this area. The location of the proposed Wal-Mart Superstore is in the northeast corner of the US 16 and Moon Meadows intersection. US 16 along this segment is a four-lane divided highway with a depressed grass median and a speed limit of 55 mph. In 2005, the only accesses to the proposed Superstore will be onto US 16. Moon Meadows west of US 16 is a three lane section with a center two-way left-turn lane and a speed limit of 45 mph. This cross section will be maintained east of US 16 as shown on the proposed Wal-Mart Superstore site plan in Figure 4 (page 11). The Commerford Ranch Planned Development shows an “Outer Road” that will provide access to this development via Catron Boulevard at a distance east of US 16 that will allow the construction of a future interchange at Catron Boulevard and US 16. Catron Boulevard is a three-lane section where it will likely connect to “Rearage Road” from the planned development with a speed limit of 45 mph. The existing lane configuration for all study area intersections is shown in Figure 2 (page 5).

US 16/Catron Boulevard

The current eastbound approach of the US 16/Catron intersection includes one left-turn lane, one through lane, and one right-turn lane. The westbound approach includes one left-turn lane and one combination through/right-turn lane. The north and southbound approaches consist of two through lanes, an exclusive left-turn lane, and an exclusive right-turn lane. The northbound right-turn lane is channelized from US 16 to Catron Boulevard; however, this lane does not allow for a free flow movement to eastbound Catron Boulevard.

US 16/Addison Street

The current eastbound approach of the US 16/Addison intersection includes one lane sharing all movements. The westbound approach includes one shared through/left-turn lane and one right-turn lane. The northbound approach consists of one shared through/left-turn lane, one through lane, and an exclusive right-turn lane. The southbound approach consists of two through lanes, an exclusive left-turn lane, and an exclusive right-turn lane.

US 16/Section Line Street Access

The current eastbound approach of the US 16/Section Line Street Access intersection includes one lane sharing all movements. The westbound consists of a dirt utility road. The northbound approach consists of one shared through/left-turn lane and one shared through/right-turn lane.

US 16/Moon Meadows (Sammis Trail to be renamed to Moon Meadows and re-aligned)

Currently Sammis Trail is approximately 600’ south of Moon Meadows. The existing lane geometrics for Moon Meadows are as follows:

- Eastbound approach consists of an exclusive left-turn lane and exclusive right-turn lane.

- Northbound US 16 provides an exclusive left-turn lane and two through lanes.
- Southbound US 16 provides a deceleration/right-turn lane and two through lanes.

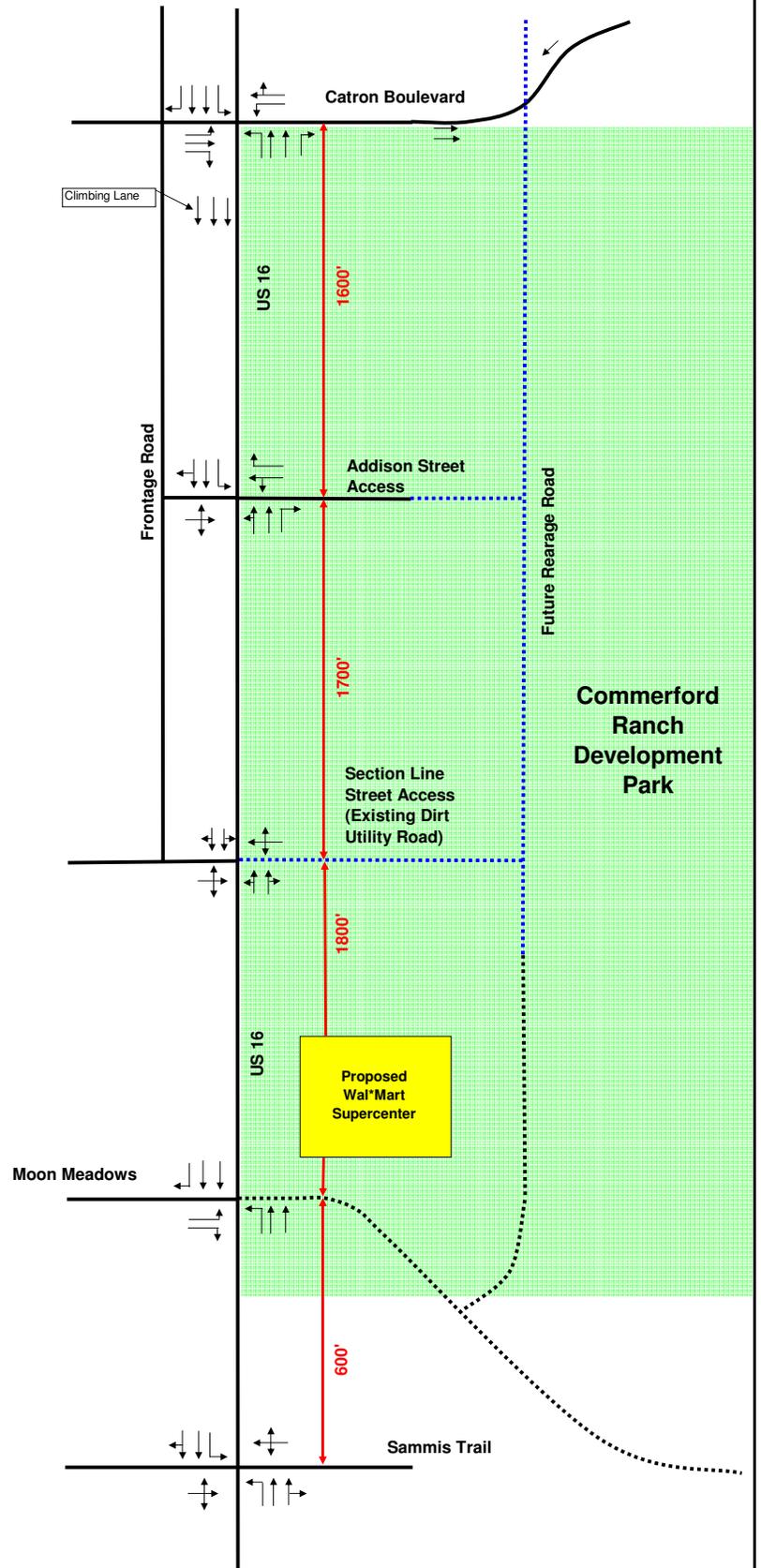
The existing lane geometrics for Sammis Trail/Ft. Hayes intersection area as follows:

- Both the eastbound and westbound approaches consist of one lane sharing all movements.
- The northbound approach consists of an exclusive left-turn lane, one through lane, and one shared through/right-turn lane.
- The southbound approach consists of a deceleration/right-turn lane, one through lane, and a shared through/left-turn lane.

2.2 EXISTING TRAFFIC VOLUMES

Existing turning movement volumes for study area intersections were collected from January 18 through January 20, 2005. The existing “seasonal” A.M. and P.M. peak hour volumes are shown in Figure 3 (page 6). It should be noted that the existing volumes were corrected with a seasonal factor to examine the impacts during a summer month when US 16 experiences higher volumes. The existing “non-seasonal” volumes are shown in the Appendix.

- LEGEND**
- ← Existing Geometrics
 - Proposed Roadways (2005)
 - Proposed Roadways (2025)



Existing Lane Geometry

FIGURE 2

September 2005

LEGEND



Existing Signalized Intersection in 2005

← Turning Movement Volumes

..... Proposed Roadway (2005)

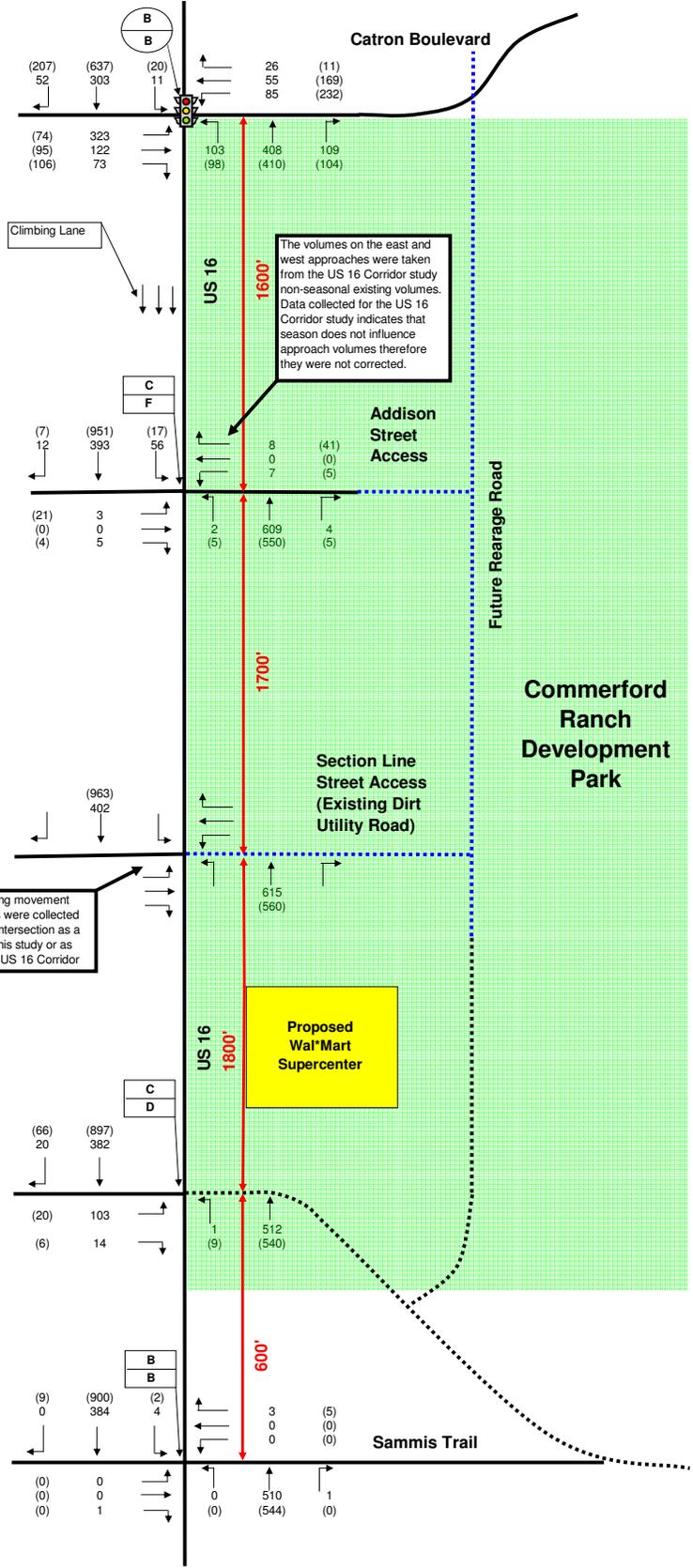
..... Proposed Driveways (2025)

XXX AM Peak Hour Volume
(XXX) PM Peak Hour Volume

B / **B** Signalized AM Peak Hour Intersection Level of Service
Signalized PM Peak Hour Intersection Level of Service

A / **A** Unsignalized AM Peak Hour Worst Approach Level of Service
Unsignalized PM Peak Hour Worst Approach Level of Service

Note: Volumes were collected on the 18-20th of January, 2005. The existing volumes were corrected to be "seasonal" volumes to represent the highest volumes of traffic on this highway. Seasonal volumes represent a "summer month" peak hour.



**Existing "Seasonal" Volumes and Level of Service
(Corrected for Seasonal Variation & Balanced)**

FIGURE 3
September 2005

CHAPTER 3: TRAFFIC PROJECTIONS

3.1 PROPOSED DEVELOPMENT

The proposed 203,000 square foot Wal-Mart Superstore is located north of Moon Meadows and east of US 16. The primary access driveways are located on US 16. The site plan is shown on Figure 4 (page 11). The Wal-Mart Superstore is just one proposed development within the Commerford Ranch Planned Development Park. The proposed Commerford Ranch Development Plan is shown on Figure 5 (page 12) and outlines likely future development that will take place.

3.2 TRIP GENERATION

The volume of traffic (trips) that a facility will generate is dependent upon many factors including, but not limited to: facility type, location, surrounding land uses, socioeconomic characteristics of area residents, traffic volumes on adjacent roadways, and business volume.

Typically trip generation used in traffic analyses is based on field studies of other similar land uses, preferably local studies. In the absence of local studies, trip generation rates are based on average rates documented for similar land uses throughout the United States. A widely used reference is the *Institute of Transportation Engineers' (ITE) Trip Generation Manual*, which provides trip rates for over 100 land use categories based on more than 3,000 individual trip generation studies conducted by agencies, developers and consulting firms. These rates, although gathered on a national scale, have proven to provide acceptable estimates of the average trip generation rates of many common land uses.

This study will review a 2005 build alternative and a 2025 build alternative. The 2005 build alternative analysis consists of estimating traffic generated by the proposed Wal-Mart Superstore. The Wal-Mart Superstore generated traffic volumes were added to the existing traffic volumes to estimate the total trips that would be expected. Prior to adding the site generated traffic to the existing volumes, the traffic was assigned a route that would be in place in 2005 when the proposed store opened. This methodology provided a 2005 build alternative to be evaluated.

The 2025 build alternative was approached differently due to the location of the proposed Wal-Mart Superstore. In March of 2004, the US 16 Corridor Study was completed. The study provided guidance to the SDDOT and City of Rapid City on how to prepare for growth along the US 16 Corridor in this area. The study reviewed the possible land uses adjacent to the study area as well as the growth that would occur outside the study area to determine impacts to this transportation facility by the year 2025 and beyond. It was apparent from the study that this low populated area would be inundated with many types of development over the course of the next 20 years. For this reason, it was determined that forecasting 2025 no-build volumes using existing growth trends would not provide adequate volumes and therefore an unrealistic 2025 build analysis.

It was determined that the best method of providing 2025 build volumes would be to update the US 16 Corridor study “Traffix” model by updating the traffic analysis zone 14 with better land use information. This model is distributing traffic on all planned roadways within the area according to the Rapid City Streets Master Plan that also will aid in providing a better future analysis. Further information regarding the existing model can be concluded from section 6 of the US 16 Corridor Study and can be reviewed on the City of Rapid City website (www.rcgov.org). The 2025 build volumes include all planned future growth in the next 20 years, not just the Commerford Ranch Development.

The *ITE Trip Generation Manual, 7th Edition* was used to determine the number of expected trips generated by the development during the A.M. and P.M. peak hours for the 2005 build analysis. The type of land use chosen to represent the Wal-Mart Superstore was a *Free-Standing Discount Superstore*. This type of land use is “found in mutual operation with a related garden center and/or service station”. As a result, separate land uses were not needed to account for any proposed garden center or gas station shown in the site plan.

It should be noted that the *ITE Trip Generation Manual, 7th Edition* was not available when the US 16 Corridor Study traffic forecasting was completed. The “Traffix” model was updated using the 6th Edition factors to estimate the generated volumes to stay consistent with original model.

TABLE 1. Trip Generation Summary for 2005 Build Alternative

Proposed Land Use	Units	Number of Units	ITE Land Use Code	Weekday A.M. Peak Hour				
				ITE Trip Rate	Trip Generation			
					Total	% Enter	Enter	Exit
Free-Standing Discount Superstore	1,000 GFA	203	813	1.84	373	51%	190	183

Proposed Land Use	Units	Number of Units	ITE Land Use Code	Weekday P.M. Peak Hour				
				ITE Trip Rate	Trip Generation			
					Total	% Enter	Enter	Exit
Free-Standing Discount Superstore	1,000 GFA	203	813	3.87	786	49%	385	401

As stated before, the trip generation and distribution estimate 2025 volumes at each study intersection was completed through the use of the “Traffix” model built for the US 16 Corridor Study to better represent the future traffic volumes in this area. A trip generation table for TAZ 14 and TAZ location map is located in the Appendix of this report. TAZ 14 contains the assumed trip generated volumes from the Commerford Ranch Development. Refer to Figure 5 (page 12) for assumptions made on land uses within the Commerford Ranch Development.

3.3 TRIP DISTRIBUTION AND ASSIGNMENT

The orientation of site-generated traffic with respect to the surrounding roadway network is a function of trip purpose linkages and the accessibility of the existing streets. Trip distribution for the 2005 build alternative was based on the existing distribution as determined from the existing traffic counts. The overall trip distribution for the 2005 build alternative for both the A.M. and P.M. peak hours is shown in Figure 6 (page 13). Trip distribution for the Commerford Ranch Development as part of the 2025 build alternative was based on assumptions regarding future developments along this corridor and existing traffic counts. The trip distribution percentages for entering and exiting the Commerford Ranch Development for the 2025 build alternative for both the A.M. and P.M. peak hours is shown in Figure 7 (page 14). The percentages represent only the Commerford Ranch generated traffic entering into and exiting out of the Commerford Ranch Development.

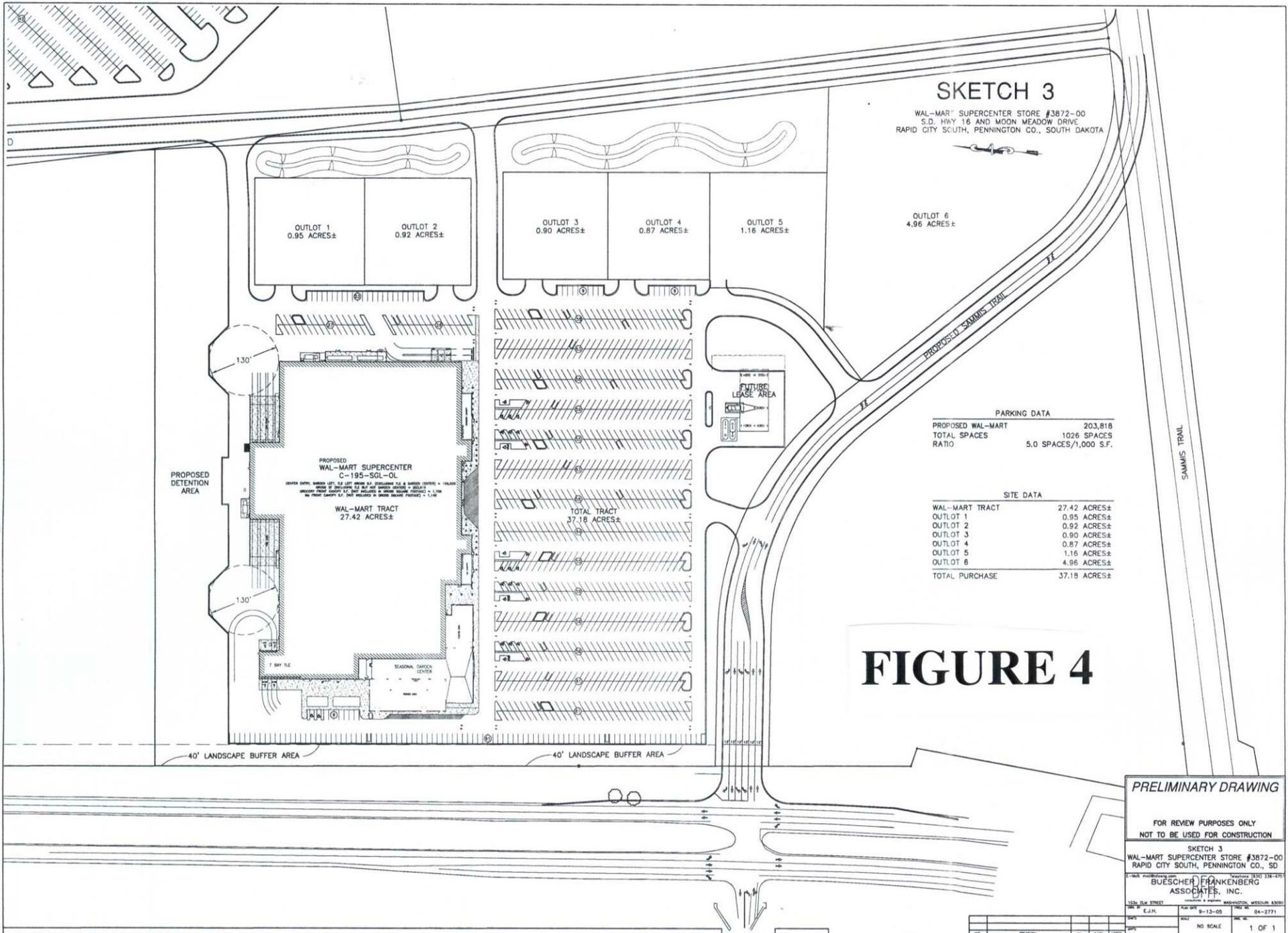
The site-generated trips were assigned to the street network based on the trip distribution, the directionality of the trips (entering vs. exiting), existing turning percentages at intersections, and engineering judgment. Assignment of the trips generated by the proposed Wal-Mart Superstore for the 2005 Build alternative is shown in Figure 6 (page 13). Assignment of the trips generated by the Commerford Ranch Development as part of the 2025 build alternative is shown in Figure 7 (page 14). The volumes represent only the Commerford Ranch generated traffic entering into and exiting out of the Commerford Ranch Development.

3.4 BUILD TRAFFIC VOLUMES

The 2005 build traffic volumes for the proposed Wal-Mart Superstore are shown in Figure 8 (page 15). These volumes represent the existing volumes added to the Wal-Mart generated volumes.

3.5 FUTURE TRAFFIC VOLUMES

Based on future planning by the SDDOT and City of Rapid City, development generated trips along this corridor were added to the existing volumes. The 2025 build traffic (seasonal) volumes are shown on Figure 9 (page 16). The volumes represent all future developments projected until the year 2025 within and outside the study area including the Commerford Ranch Development.



SKETCH 3

WAL-MART SUPERCENTER STORE #3872-00
 S.D. HWY 16 AND MOON MEADOW DRIVE
 RAPID CITY SOUTH, PENNINGTON CO., SOUTH DAKOTA

OUTLOT 1
0.95 ACRES±

OUTLOT 2
0.92 ACRES±

OUTLOT 3
0.90 ACRES±

OUTLOT 4
0.87 ACRES±

OUTLOT 5
1.16 ACRES±

OUTLOT 6
4.96 ACRES±

PROPOSED
WAL-MART SUPERCENTER
C-195-SGL-OL

WAL-MART TRACT
27.42 ACRES±

TOTAL TRACT
37.18 ACRES±

PARKING DATA

PROPOSED WAL-MART	203,818
TOTAL SPACES	1026 SPACES
RATIO	5.0 SPACES/1,000 S.F.

SITE DATA

WAL-MART TRACT	27.42 ACRES±
OUTLOT 1	0.95 ACRES±
OUTLOT 2	0.92 ACRES±
OUTLOT 3	0.90 ACRES±
OUTLOT 4	0.87 ACRES±
OUTLOT 5	1.16 ACRES±
OUTLOT 6	4.96 ACRES±
TOTAL PURCHASE	37.18 ACRES±

FIGURE 4

PRELIMINARY DRAWING

FOR REVIEW PURPOSES ONLY
 NOT TO BE USED FOR CONSTRUCTION

SKETCH 3
 WAL-MART SUPERCENTER STORE #3872-00
 RAPID CITY SOUTH, PENNINGTON CO., SD

PREPARED BY: BUESCHER FRANKENBERG ASSOCIATES, INC.

1520 8th STREET WASHINGTON, MISSOURI 63090

DATE: E.J.H. 8-13-05 DRAWING NO: 04-2771

NO.	REVISION	BY	DATE	APP'D.

NO SCALE 1 OF 1

Assumed Land Uses for Commerford Ranch

- 1. Office 120,000 SF
- 2. Office 90,000 SF
- 3. Office 100,000 SF
- 4. Retail 160,000 SF
- 5. Box Store 154,000 SF
- 6. Superstore 203,000 SF
- 7. Retail 64,000 SF
- 8. Restaurant 6,000 SF

**MASTER PLAN
FOR
COMMERFORD RANCH**

WAL-MART SUPERCENTER STORE #92884-00
S.D. HWY 16 AND MOON MEADOW DRIVE
RAPID CITY SOUTH, PENNINGTON CO., SOUTH DAKOTA



Review appendix table for generated trips.

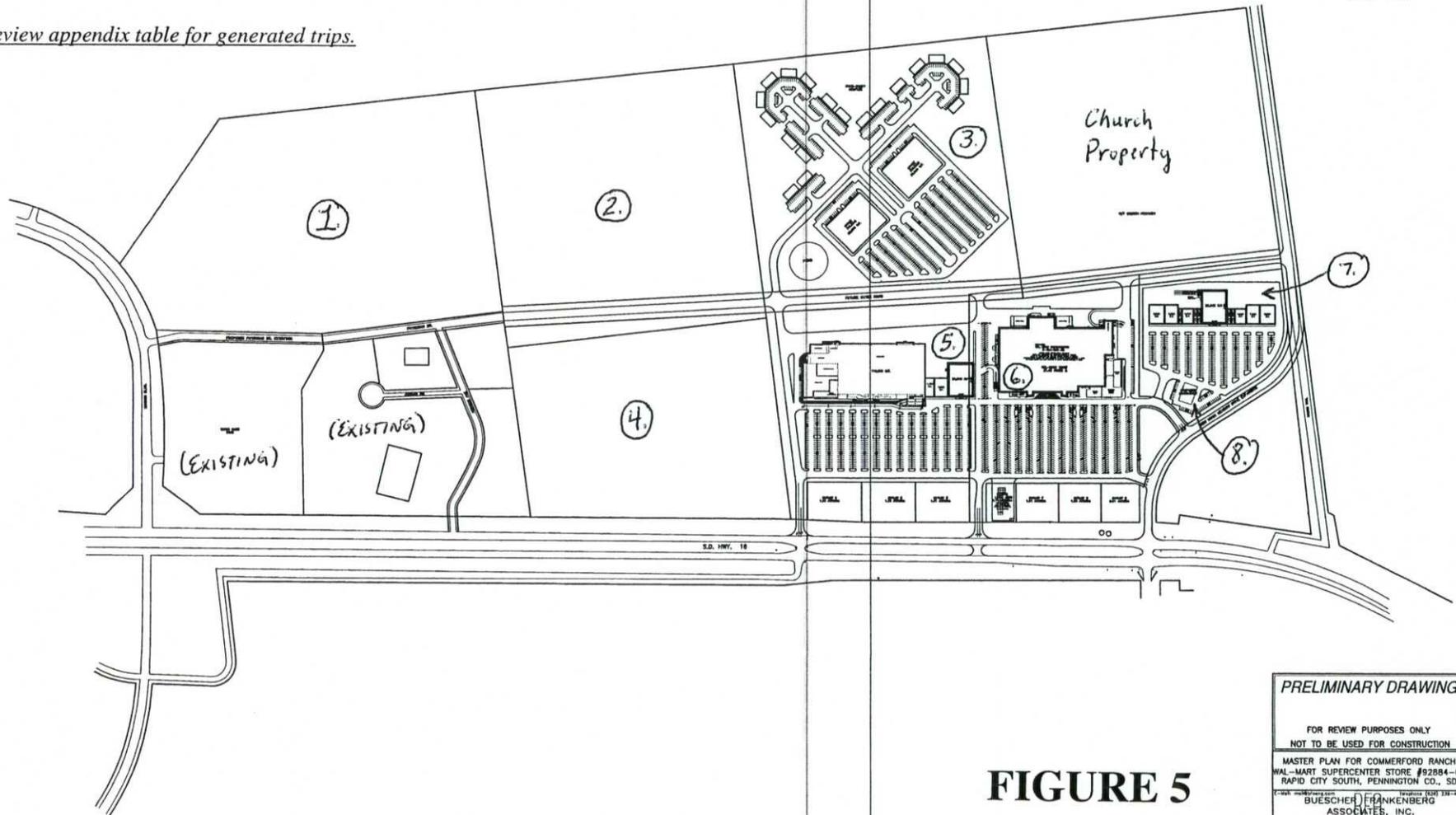


FIGURE 5

PRELIMINARY DRAWING

FOR REVIEW PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

MASTER PLAN FOR COMMERFORD RANCH
WAL-MART SUPERCENTER STORE #92884-00
RAPID CITY SOUTH, PENNINGTON CO., SD

DESIGNED BY: BUESCHER FRANKENBERG ASSOCIATES, INC.

1034 OLIVE STREET, WASHINGTON, MISSOURI 63090

DATE: 11/19/04 PROJECT NO: 04-2771

SCALE: 1"=400' SHEET NO: 1 OF 1

NO.	REVISION	BY	DATE	APP'D

LEGEND



Existing Signalized Intersection in 2005

← Trip Generated Volumes

..... Proposed Roadway (2005)

..... Proposed Roadways (2025)

XXX AM Peak Hour Volume

(XXX) PM Peak Hour Volume



AM (PM) Trip Distribution



Moon Meadows

Proposed Wal*Mart Supercenter

Commerford Ranch Development Park

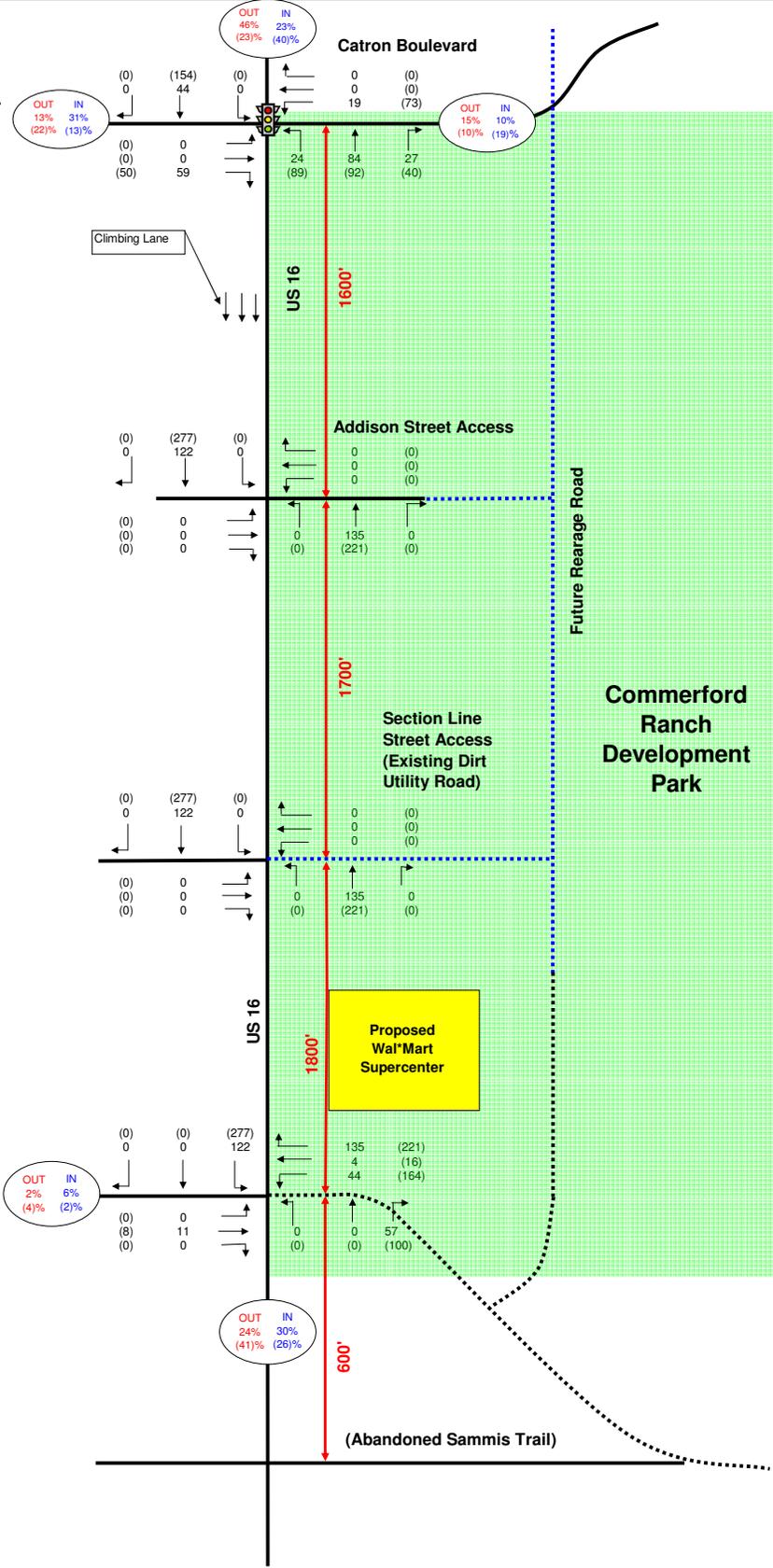
Catron Boulevard

Addison Street Access

Section Line Street Access (Existing Dirt Utility Road)

Future Rearrage Road

(Abandoned Sammis Trail)



Forecasted Directional Distribution and Assignment for 2005 Build Alternative (Wal*Mart Generated Trips Only)

FIGURE 6

September 2005

LEGEND



Existing Signalized Intersection in 2005

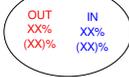
← Trip Generated Volumes

..... Proposed Roadway (2005)

..... Proposed Roadways (2025)

XXX AM Peak Hour Volume

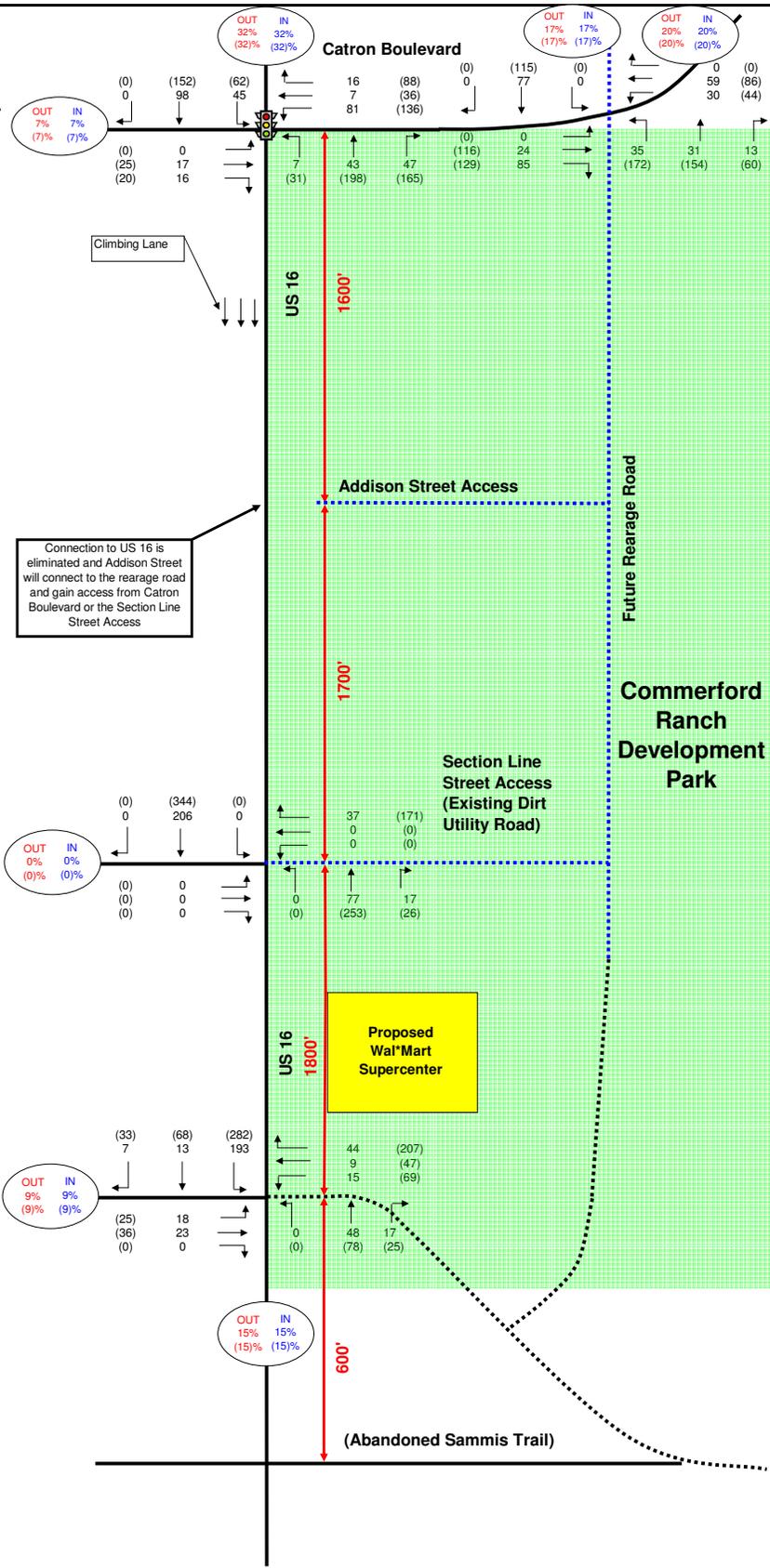
(XXX) PM Peak Hour Volume



AM (PM) Trip Distribution



Moon Meadows



Connection to US 16 is eliminated and Addison Street will connect to the rearage road and gain access from Catron Boulevard or the Section Line Street Access



Forecasted Directional Distribution and Assignment as part of the 2025 Build Alternative (The percentages given represent Commerford Ranch generated trips only)

FIGURE 7
September 2005

LEGEND



Existing Signalized Intersection in 2005

← Turning Movement Volumes

..... Proposed Roadway (2005)

..... Proposed Driveways (2025)

XXX AM Peak Hour Volume
(XXX) PM Peak Hour Volume



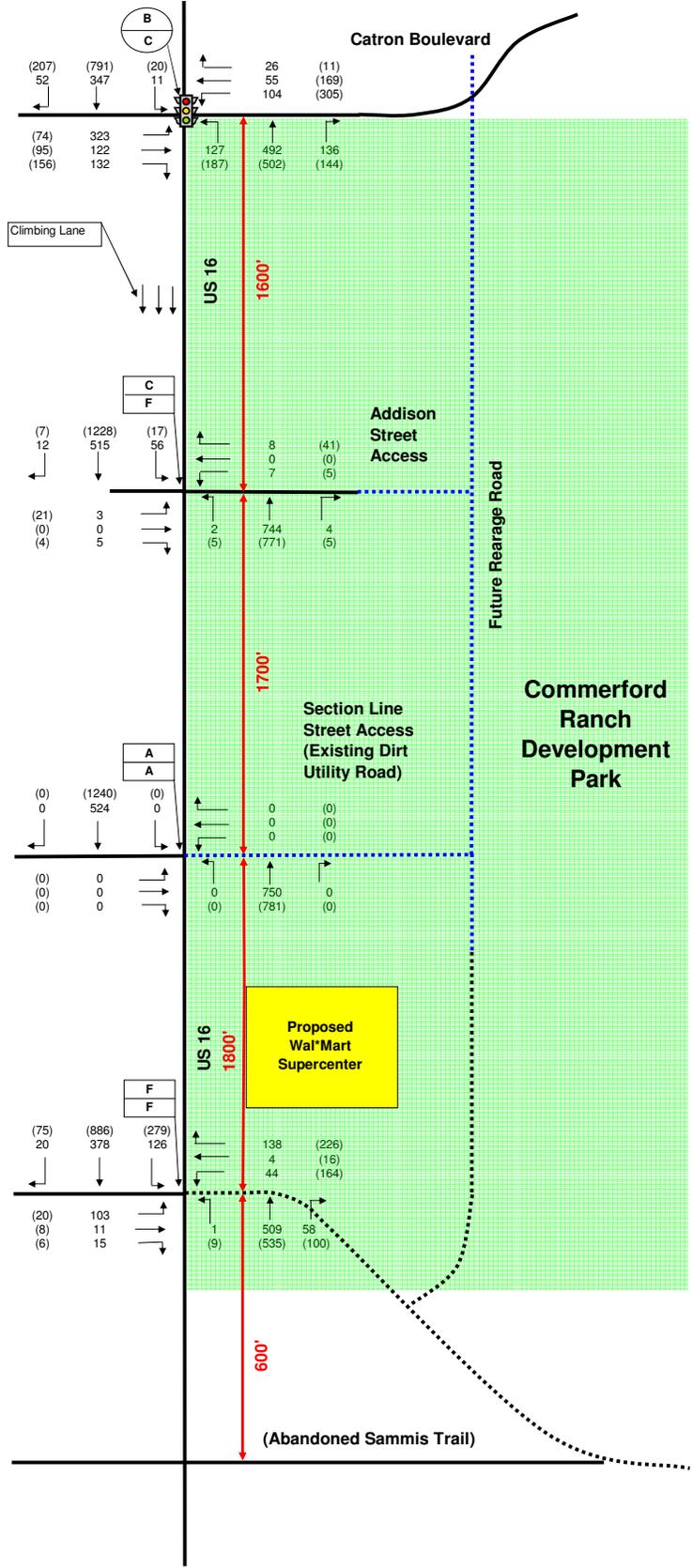
Signalized AM Peak Hour Intersection Level of Service
Signalized PM Peak Hour Intersection Level of Service



Unsignalized AM Peak Hour Worst Approach Level of Service
Unsignalized PM Peak Hour Worst Approach Level of Service



Moon Meadows



2005 "Seasonal" Build Volumes and Level of Service
(Moon Meadows Realigned to Sammis Trail)

FIGURE 8
September 2005

LEGEND



Existing Signalized Intersection in 2005

← Turning Movement Volumes

..... Proposed Roadway (2005)

..... Proposed Roadway (2025)

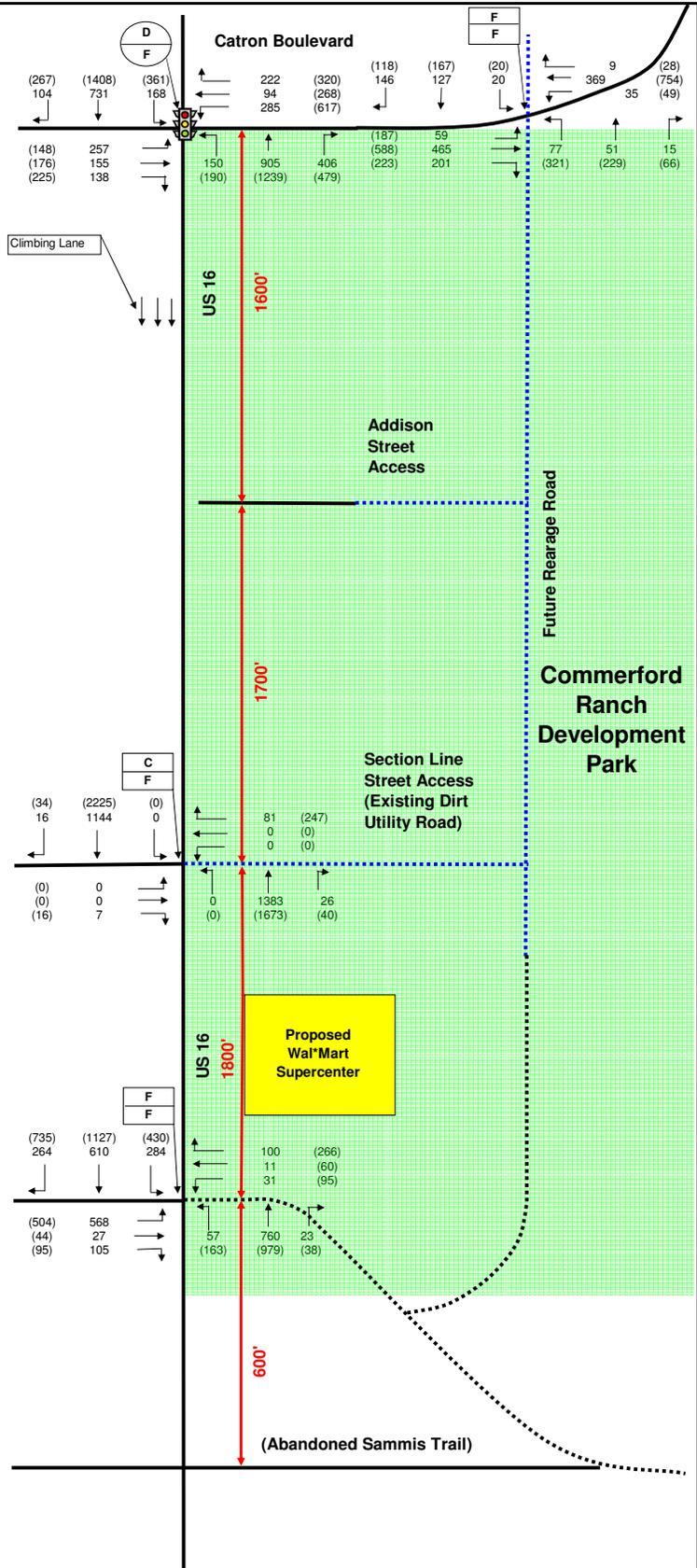
XXX AM Peak Hour Volume
(XXX) PM Peak Hour Volume



Signalized AM Peak Hour Intersection Level of Service
Signalized PM Peak Hour Intersection Level of Service



Unsignalized AM Peak Hour Worst Approach Level of Service
Unsignalized PM Peak Hour Worst Approach Level of Service



2025 Build "Seasonal" Build Volumes and Level of Service (Moon Meadows Realigned to Sammis Trail)

FIGURE 9

September 2005

CHAPTER 4: OPERATIONAL ANALYSIS

4.1 ANALYSIS DESCRIPTION

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason, the concept of *level of service* (LOS) was developed to correlate numerical traffic operational data to subjective descriptions of traffic performance at intersections. Each lane of traffic has delay associated with it and therefore a correlating LOS. The weighted average delay for each of these lanes of traffic for a signalized intersection is the intersection LOS. LOS categories range from LOS “A” (best) to LOS “F” (worst) as shown in Table 2.

TABLE 2. Level of Service Description

Level of Service	SIGNALIZED Intersection Control Delay (sec)	UNSIGNALIZED Intersection Control Delay (sec)	Intersection LOS Description
A	≤ 10.0	≤ 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, regular delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: Latest Version of the *Highway Capacity Manual*, Transportation Research Board, (Using Synchro Version 6.0)

The intersection capacity analyses were completed with Synchro 6.0 software. Synchro replicates the analysis procedures defined in the latest version of the *Highway Capacity Manual*. This manual provides procedures for the analysis of both signalized and unsignalized intersections. It should be noted that stop controlled intersections are analyzed by identifying the amount of delay at each approach that conflict with other intersection movements (i.e. all movements except the free flow through lanes), thus approach LOS is reported for unsignalized intersections.

LOS “C” has generally been established as the standard for planning of transportation facilities for peak hour traffic conditions. However, LOS “D” is often accepted in urbanized areas where the cost or impacts to provide LOS “C” is prohibitive. For this study, LOS “C” for the overall intersection was used as the minimum standard.

A review of the analyses for each volume scenario is provided below. Summary LOS output reports of the analysis are included in the Appendix.

4.2 EXISTING CONDITIONS ANALYSIS

A capacity analysis was performed using the existing A.M. and P.M. peak hour traffic volumes on the existing roadway network. The existing peak hour traffic volumes and LOS are shown in Figure 3 (page 6). The signalized intersection at Catron Boulevard/US 16 operates at LOS “B” during both peak hours. The westbound approach (worst approach) of the two-way stop controlled intersection of Addison Street/US 16 operates at LOS “C” during the A.M. peak hour. The eastbound approach (worst approach) of the two-way stop controlled intersection of Addison Street/US 16 operates at LOS “F” during the P.M. peak hour. The stop controlled eastbound approach (worst approach) of the tee intersection at Moon Meadows/US 16 operates at LOS “C” and LOS “D” during the A.M. and P.M. peak hours, respectively. The westbound approach (worst approach) of the stop controlled intersection of Sammis Trail/Ft. Hayes/US 16 operates at LOS “B” during both peak hours. The study intersections operate at an acceptable LOS during the A.M. peak hour with two intersections in the P.M. peak hour operating below an acceptable LOS.

4.3 2005 BUILD CONDITIONS ANALYSIS

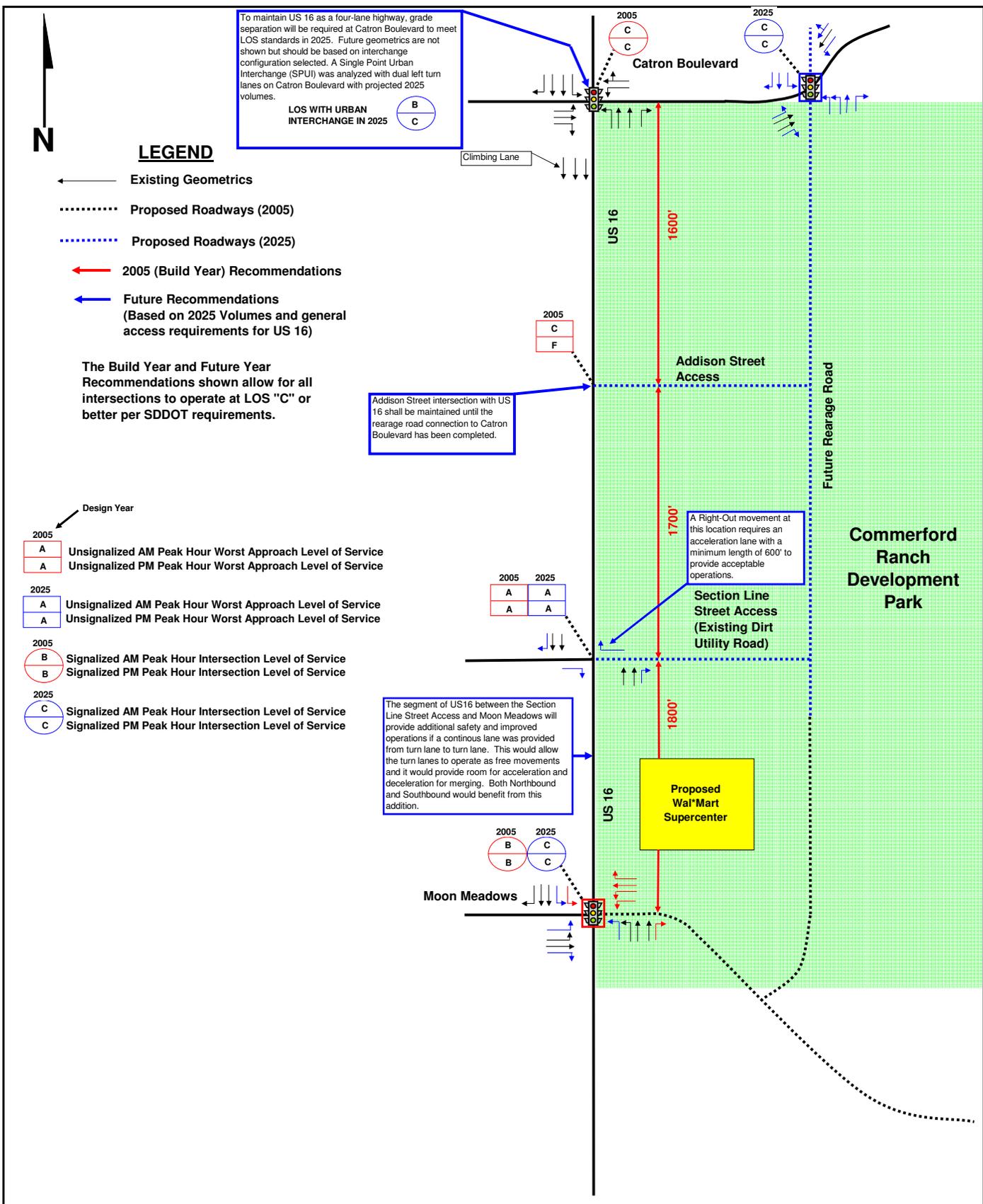
A capacity analysis was performed using the 2005 “seasonal” build A.M. and P.M. peak hour traffic volumes on the existing roadway network with Moon Meadows realigned and tied into Sammis Trail east of US 16. The 2005 peak hour traffic volumes and LOS are shown in Figure 8 (page 15). The signalized intersection at Catron Boulevard/US 16 operates at LOS “B” and LOS “C” during the A.M. and P.M. peak hours, respectively. The westbound approach (worst approach) of the two-way stop controlled intersection of Addison Street/US 16 operates at LOS “C” during the A.M. peak hour. The eastbound approach (worst approach) of the two-way stop controlled intersection of Addison Street/US 16 operates at LOS “F” during the P.M. peak hour. The westbound approach (worst approach) of the two-way stop controlled intersection of Moon Meadows/US 16 operates at LOS “F” during both peak hours. Two of the four intersections analyzed operate below an acceptable LOS in at least one of the peak hours.

Due to the speed and terrain on US 16, the proposed intersection geometrics for Moon Meadows included exclusive left and right turn lanes for both northbound and southbound US 16 for this analysis.

4.4 2025 BUILD CONDITIONS ANALYSIS

A capacity analysis was performed using the 2025 build “seasonal” A.M. and P.M. peak hour traffic volumes on the existing roadway network. The 2025 “seasonal” build peak hour traffic volumes and LOS are shown in Figure 9 (page 16). The signalized intersection at Catron Boulevard/US 16 operates at LOS “D” and LOS “F” during the A.M. and P.M. peak hours, respectively. The northbound approach (worst approach) of the two-way stop controlled intersection of Catron Boulevard/Rearage Road operates at LOS “F” during both peak hours. The westbound approach (worst approach) of the two-way stop controlled intersection of Section Line Street Access/US 16 operates at LOS “C” and LOS “F” during the A.M. and P.M. peak hours, respectively. The eastbound approach (worst approach) of the two-way stop controlled

intersection of Moon Meadows/US 16 operates at LOS “F” during both peak hours. All intersections analyzed operate below an acceptable LOS in at least one of the peak hours.



To maintain US 16 as a four-lane highway, grade separation will be required at Catron Boulevard to meet LOS standards in 2025. Future geometrics are not shown but should be based on interchange configuration selected. A Single Point Urban Interchange (SPUI) was analyzed with dual left turn lanes on Catron Boulevard with projected 2025 volumes.

LOS WITH URBAN INTERCHANGE IN 2025

LEGEND

- ← Existing Geometrics
- Proposed Roadways (2005)
- Proposed Roadways (2025)
- ← 2005 (Build Year) Recommendations
- ← Future Recommendations (Based on 2025 Volumes and general access requirements for US 16)

The Build Year and Future Year Recommendations shown allow for all intersections to operate at LOS "C" or better per SDDOT requirements.

Addison Street intersection with US 16 shall be maintained until the rearage road connection to Catron Boulevard has been completed.

A Right-Out movement at this location requires an acceleration lane with a minimum length of 600' to provide acceptable operations.

The segment of US16 between the Section Line Street Access and Moon Meadows will provide additional safety and improved operations if a continous lane was provided from turn lane to turn lane. This would allow the turn lanes to operate as free movements and it would provide room for acceleration and deceleration for merging. Both Northbound and Southbound would benefit from this addition.

Design Year

2005	A	Unsignalized AM Peak Hour Worst Approach Level of Service
2005	A	Unsignalized PM Peak Hour Worst Approach Level of Service
2025	A	Unsignalized AM Peak Hour Worst Approach Level of Service
2025	A	Unsignalized PM Peak Hour Worst Approach Level of Service
2005	B	Signalized AM Peak Hour Intersection Level of Service
2005	B	Signalized PM Peak Hour Intersection Level of Service
2025	C	Signalized AM Peak Hour Intersection Level of Service
2025	C	Signalized PM Peak Hour Intersection Level of Service

2005	A	2025	A
2005	A	2025	A

2005	B	2025	C
2005	B	2025	C



2005 Build and 2025 Build Recommendations

FIGURE 10

September 2005

CHAPTER 5: FINDINGS AND RECOMMENDATIONS

This section summarizes the findings and recommendations based upon the construction of the proposed Wal-Mart Superstore located in the northeast corner of the Moon Meadows/US 16 intersection south of Rapid City, South Dakota.

The findings are as follows:

- Traffic operations are acceptable at two of four study area intersections under 2005 existing volume conditions. Addison Street and Moon Meadows operates below acceptable LOS standards in the P.M. peak hour.
- Under the 2005 Build volume conditions, the intersections of Moon Meadows (realigned with Sammis Trail)/US 16 and Addison Street/US 16 operate below acceptable LOS standards.
- All intersections operate below acceptable LOS standards under the 2025 build volume conditions.

The recommendations are as follows:

It is recommended that this study be updated as development in this area increases to allow for proper planning. Wal-Mart makes up only a moderate portion of the future traffic that is forecasted and further studies will validate or provide more current recommendations to allow for safe growth.

5.1 US 16/Catron Boulevard

- Opening day geometric improvements include:
 - None – Both the east and west approaches experience high volumes of left turning movements opening day with volumes generated for this study. Actual volumes should be reviewed after the construction of the store to determine if additional turn lanes are warranted. The analysis completed on the volumes projected indicates the existing geometrics are sufficient.
- Future geometric improvements (prior to horizon year):
 - Intersection reconstructed to include grade separation. SDDOT anticipates the construction of an interchange at this location within the next ten years. A Single Point Urban Interchange (SPUI) was analyzed for the 2025 volumes condition and will require the following geometrics to provide an acceptable LOS:
 - ❖ Westbound approach – dual left-turn lanes, one through lane, and an exclusive right-turn lane.
 - ❖ Eastbound approach – dual left-turn lanes, one through lane, and an exclusive right-turn lane.
 - ❖ Northbound approach – single left-turn lane and right-turn lane.
 - ❖ Southbound approach – single left-turn lane and right turn lane.

(Due to the complexity of modifying a SPUI, dual left-turn lanes should be considered on all approaches along with two through lanes in the east and west direction.)

5.2 Catron Boulevard/Rearage Road (Outer Road)

- Opening day geometric improvements include:
 - Access will not be constructed prior to opening day.
- Future geometrics include (prior to the horizon year):
 - Westbound approach – one through lane, one shared through/right-turn lane, and an exclusive left-turn lane.
 - Eastbound approach – two through lanes, an exclusive right-turn lane, and an exclusive left-turn lane.
 - Northbound approach – dual left-turn lanes, one through lane, and exclusive right-turn lane.

- Southbound approach – one through lane, one exclusive right-turn lane, and one exclusive left-turn lane.
 - ❖ It is recommended that this intersection be signalized when warrants are met. No warrant analysis was done for this study.
 - ❖ Adequate spacing to US 16 should be considered when designing the rearage road.
 - ❖ It is recommended due to the volumes on the rearage road that a minimum of 80' of right-of-way be dedicated to account for expansion. If the section will have a raised concrete or grass median, 100' of right-of-way shall be dedicated.

5.3 US 16/Addison Street

- Opening day geometric improvements include:
 - None –No geometric additions would improve the LOS significantly as the volumes are low on both the east and west approaches. The LOS is unacceptable in the P.M. peak hour due to the high mainline volumes with few gaps.
- Future geometrics include (prior to the horizon year):
 - Remove access to US 16 and relocate to Catron Boulevard per recommendations in the US 16 Corridor Study.

5.4 US 16/Section Line Street Access

- Opening day geometric improvements include:
 - Access will not be constructed prior to opening day.
- Future geometrics include (prior to the horizon year):
 - Northbound US 16 – add deceleration/right-turn lane and add acceleration lane from westbound to northbound US 16. The acceleration lane shall be a minimum of 600' in length.
 - Southbound approach – add deceleration/right-turn lane.
 - ❖ It is recommended that the segment between Moon Meadows/Sammis Trail to the Section line on US 16 have an aux. lane both northbound and southbound to connect the turn lanes to enhance operations. Moon Meadows/Sammis Trail will experience high turning volumes on the east and west approaches which will benefit from long acceleration/deceleration lanes or an aux. lane.

5.5 US 16/Moon Meadows

- Opening day geometric improvements include:
 - The US 16/Moon Meadows intersection should be constructed with the following geometrics:

- ❖ Westbound approach shall consist of one through lane, one exclusive right-turn lane, and dual left-turn lanes.
- ❖ Eastbound approach requires no additional lanes but shall be reconstructed to prevent offset lanes.
- ❖ Northbound approach requires a deceleration/right-turn lane.
- ❖ Southbound approach requires a left-turn lane.
- It is recommended that the intersection of US 16/Moon Meadows be signalized by opening day. Signal Warrant documentation is included in the Appendix. It was determined that Warrant #2 was satisfied for the 2005 build condition with right-turns removed.
- Moon Meadows/Sammis Trail will require a minimum of 80' of right-of-way dedicated for future expansion to allow a four-lane section to be constructed.
- Future geometrics include (prior to the horizon year):
 - ❖ Eastbound approach – add a left-turn lane to improve the approach to have dual left-turn lanes.
 - ❖ Southbound approach – add a left-turn lane to improve the approach to have dual left-turn lanes.
 - ❖ Northbound approach – add a left-turn lane to improve the approach to have dual left-turn lanes.

5.6 US 16/Sammis Trail/Ft. Hayes

- Opening day geometric improvements include:
 - Eliminate connection of Sammis Trail to US 16. Construct Moon Meadows to connect into Sammis Trail per recommendations in the US 16 Corridor Study.
- Future geometrics include (prior to the horizon year):
 - Eliminate Ft. Hayes connection to US 16. Access to US should be gained via Moon Meadows. (2005 Build Analysis assumed this intersection would not have access to US 16.)

APPENDIX

(Comment Response Memo)
(TAZ 14 – Map and Updated Projections)
(Moon Meadows/US 16 Warrant Study)
(Synchro Printouts)
(Supporting Data Collection information)

Comment Response Memo

To: Monica Heller, South Dakota Department of Transportation Corridor Preservation Specialist	
From: Jason Kjenstad, HDR	Project: Wal*Mart - Rapid City
CC: Dan Staton-Region Traffic Engineer SDDOT, Gary Engel-Area Engineer SDDOT, Pat Beaudette-Rapid City Planning Office, Joe Feldmann - BFA, Inc.	
Date: 08/16/05	Job No: 20494

X:\MRKTING\Walmart\South Rapid City\Review Comment Response
Memo.doc

Document2

RE: US 16 Wal*Mart Traffic Impact Study

Monica Heller (Inclusive of all SDDOT Comments)

1. **Part #1 - The 2025 volumes at the intersection of US 16/Moon Meadows and not significantly higher than the 2005 volumes. Part #2 - Since the 2025 volumes were determined using the "Traffix" model, provide more information on the roadway network in the area assumed to be in place by 2025. (Part #1) Figure 8 (2005 "Seasonal" Build Volumes and Level of Service) in the draft report represents a combination of existing volumes and Wal*Mart generated trips. Due to the store location along realigned Sammis Trail a majority of the traffic generated by Wal*Mart enters/exits the development park at the new combined Sammis Trail/Moon Meadows/US 16 intersection. As indicated on Figure 8 the only other movements entering/exiting the development that does not enter/exit at Sammis Trail/Moon Meadows/US 16 intersection is the southbound left turn movement (25 veh.-am/55 veh.-pm) and westbound right turn movement (54 veh.-am/88 veh.-pm) at the Section Line Access. Since the future rearage road connecting to Catron Boulevard will not be built opening day, almost all vehicles entering/exiting in from the north must use the Sammis Trail/Moon Meadows/US 16 intersection. When comparing the overall volumes at the intersection, the 2025 volumes show an increase with the exception of vehicles exiting to the south from the east. One consideration would be that the generated traffic through the residential/ commercial development has more access locations in 2025 than in 2005. Since the US 16 traffix model was created for a much larger area/purpose than just the Commerford Ranch Development Park, the distribution percentages within the model do not match what was used for the 2005 analysis.**

(Part #2 - 2025 Analysis Only with access at Moon Meadows/US 16, Section Line Access/US 16, and at Catron Boulevard) The traffix model relies on manual distribution paths and percentages related to the overall model in comparison to just one development. The development of these percentages involved computations related to the land uses throughout the study area rather than just within Commerford Ranch. Assignments of trips from individual zones were both to and from other internal zones. The internal-to-internal trips for non-residential land-uses were reduced to avoid double counting at both their ends: example – an outbound residential generated trip bound for a commercial use would be doubled-counted as an inbound trip at the commercial end if this reduction were not applied. The reduction was made consistently throughout the model rather than adjusted for a specific traffic analysis zone. At the area-wide scale for which the US 16 model was created, this approach provides acceptable accuracy. At each individual zone level, its accuracy is lessened.

In the draft study, Figure 7 represents Commerford Ranch generated trips only and are discounted because they only show reduced trip generation of TAZ 14 and don't include trips generated by other zones. For this reason assigned trips are less than might be expected. As shown in Figure 9, the final assignment shows all other TAZ trips added in which increases the volumes in and out of the development.

With a great deal of residential development located east of the Commerford Ranch Development, internal trips will make-up a portion of the traffic and will not show up on the local network due to our evaluation of the intersections on to US 16 and Catron Boulevard only. This is the primary reason the 2025 volumes shown on Figure 9 don't add compute to what the ITE manual would generate if no adjustments were made.

Currently, the only commercial development with an option to construct in Commerford Ranch is a proposed Wal-Mart. Wal-Mart generated traffic as shown in the 2005 analysis at one access location can be handled with proposed improvements at Sammis Trail/US 16/Moon Meadows and with access to Catron Boulevard in the future operations will only improve. All other land uses as a part of the 2025 analysis were assumed no differently than land uses assumed for the original traffic model run. For this reason, it was determined prior to beginning the study that this methodology would be appropriate.

One major benefit of using the traffic model is that the intersections evaluated also show large generated volumes entering/exiting to other developments. If Commerford Ranch was evaluated without consideration for high growth areas in the other traffic analysis zones, some of the intersections evaluated would show better levels of service than actually likely. This would be the case at Moon Meadows and at Catron Boulevard if just a standard percentage increase was used on the existing traffic volumes as typically done for traffic impact studies for a horizon year analysis.

When comparing Figure 8 and Figure 9, US 16 through this area is experiencing a three percent growth rate when using volumes generated with the traffic model.

2. A directional access only (right in/right out/left in) shall be permitted at the section line. This access will be restricted to a right in/right out only when an interchange is constructed at the intersection of US 16/Catron Blvd. Traffic shall be redistributed based on this restriction in access. The current Wal-Mart site plan does not show access to the Section Line to be constructed in 2005. The 2005 Build analysis was revised with this change. For the 2025 Build PM analysis, the 247 westbound right-turns (as shown on Figure 9) were reassigned with 50 % added to the intersection of Moon Meadows and 50% added to the rearage road intersection. Initially, the 247 was allowed to use the section line access but the LOS attained as a stop-controlled approach was not acceptable. A right-turn at this location would be effective only if it was a free movement and sufficient distance was allowed for acceleration and merging. It is recommended that the acceleration lane be a minimum of 600 feet in length. The analysis proves that acceptable LOS can be attained without the use of this access location for exiting purposes.
3. The right in/right out shown on Figure 5 between the section line and Moon Meadows will not be permitted. The site plan will be updated and show the access removed.
4. It appears all of the right turn volumes are included in the signal warrants. Part #1 - What would be the results if the right turns were not included? Part #2 - After this information is received and reviewed the SDDOT will make a final determination on when the signal may be turned on. Part #3 - At this time it is anticipated that WalMart shall be responsible for installing a signal at the relocated Sammis Trail/US16. (Part #1) The warrant analysis will be re-evaluated with no right turns used. The conclusion was that the requirements for Warrant #2 are still met for a minimum of 4 hours. The updated warrant study will replace the warrant study in the draft report. (Part #2) It is understood by all parties involved that the South Dakota Department of Transportation shall make the final determination as to when a signal shall be installed at the intersection of Moon Meadows/US 16/Sammis Trail. (Part #3) Agreements made between Wal-Mart, City of Rapid City, and the South Dakota Department of Transportation will not be addressed in the Traffic Impact Study.
5. The lane configuration at US 16/Catron should reflect three lanes EB (L, T, and R) and two lanes WB (L and TR). This intersection is also operated split phase (EB and WB) due to safety concerns. The analysis should reflect existing lane configuration and signal phasing. The study will be updated prior to final submittal to represent existing conditions as stated above.
6. The lane configuration at US 16/Addison Street should reflect one lanes EB (LTR), two lanes WB (LT and R), and three lanes SB (L, T, and TR). The study will be updated prior to final submittal to represent existing conditions as stated above.
7. (Information Only) The US 16 Study Corridor model gives a comprehensive look at this area in 2025, in order to verify that Commerford Ranch will allow for acceptable operations in 2025 an independent analysis was completed. A typical future or horizon year analysis was completed using a 2% growth per year for 20 years. The analysis assumed a 10% internal capture percentage due to the multi-use development. The study also assumed a signal at all full access intersections in 2025. This information on a site specific level along with the information from the US 16 traffic model as shown in the draft traffic impact study will be useful in preparing for the growth this development will bring to Rapid City. The Appendix contains the independent study for the 2025 build volumes as typically done for traffic impact studies in South Dakota.

Appendix

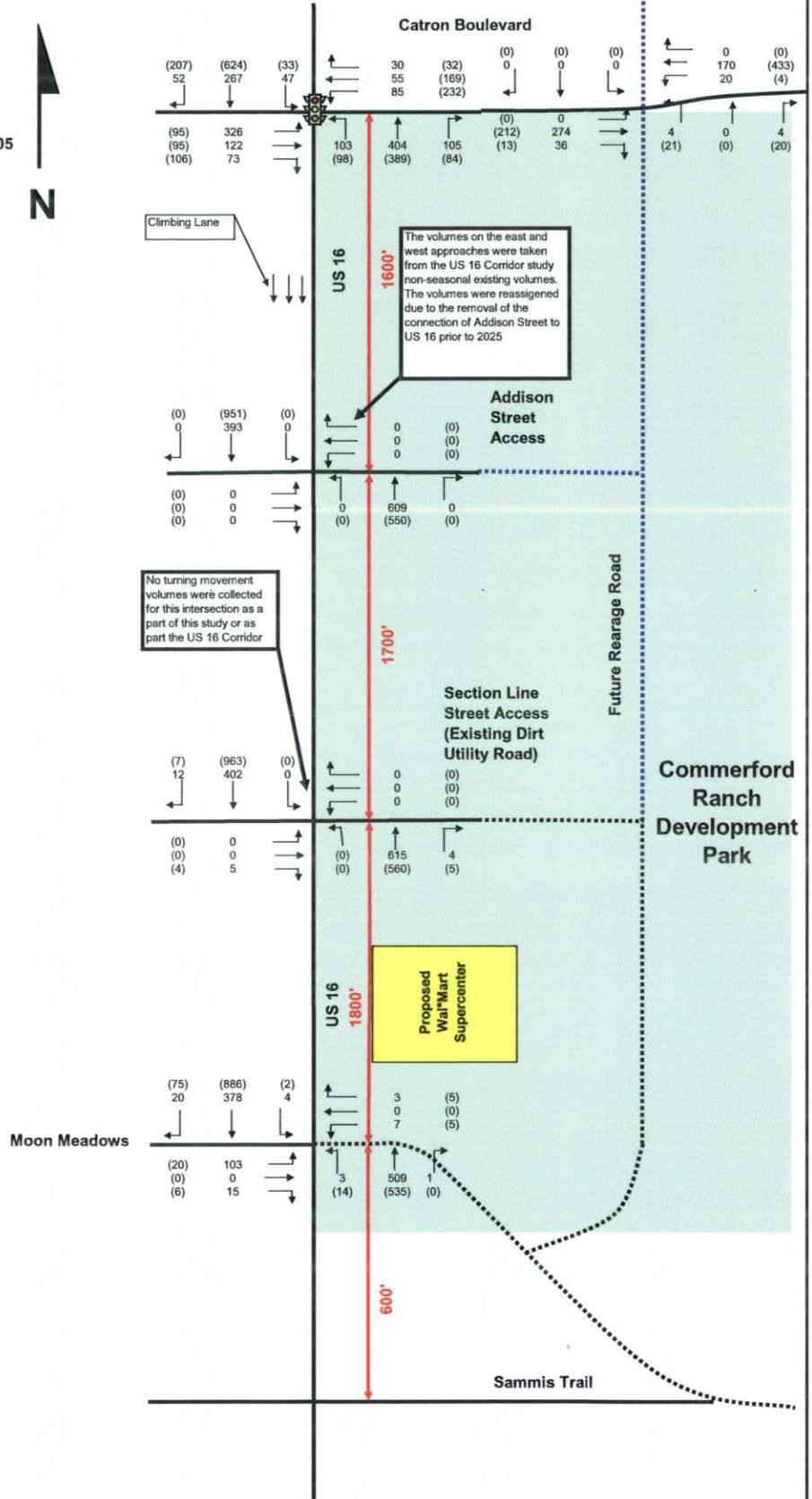
The information contained in the appendix relates to Question #7 in the Comment Response Memo.

Assumptions for 2025 analysis:

- 2% Growth per year for 20 years.
- The full access intersections are signalized.
- 10% internal capture applied to ITE generated trips.
- Trip assignment percentages were based on percentages created by the traffic model for all existing roadways in 2025. The same percentages are shown in the draft report for the 2025 analysis.

LEGEND

-  Existing Signalized Intersection in 2005
-  Turning Movement Volumes
-  Proposed Roadway (2005)
-  Proposed Driveways (2025)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume



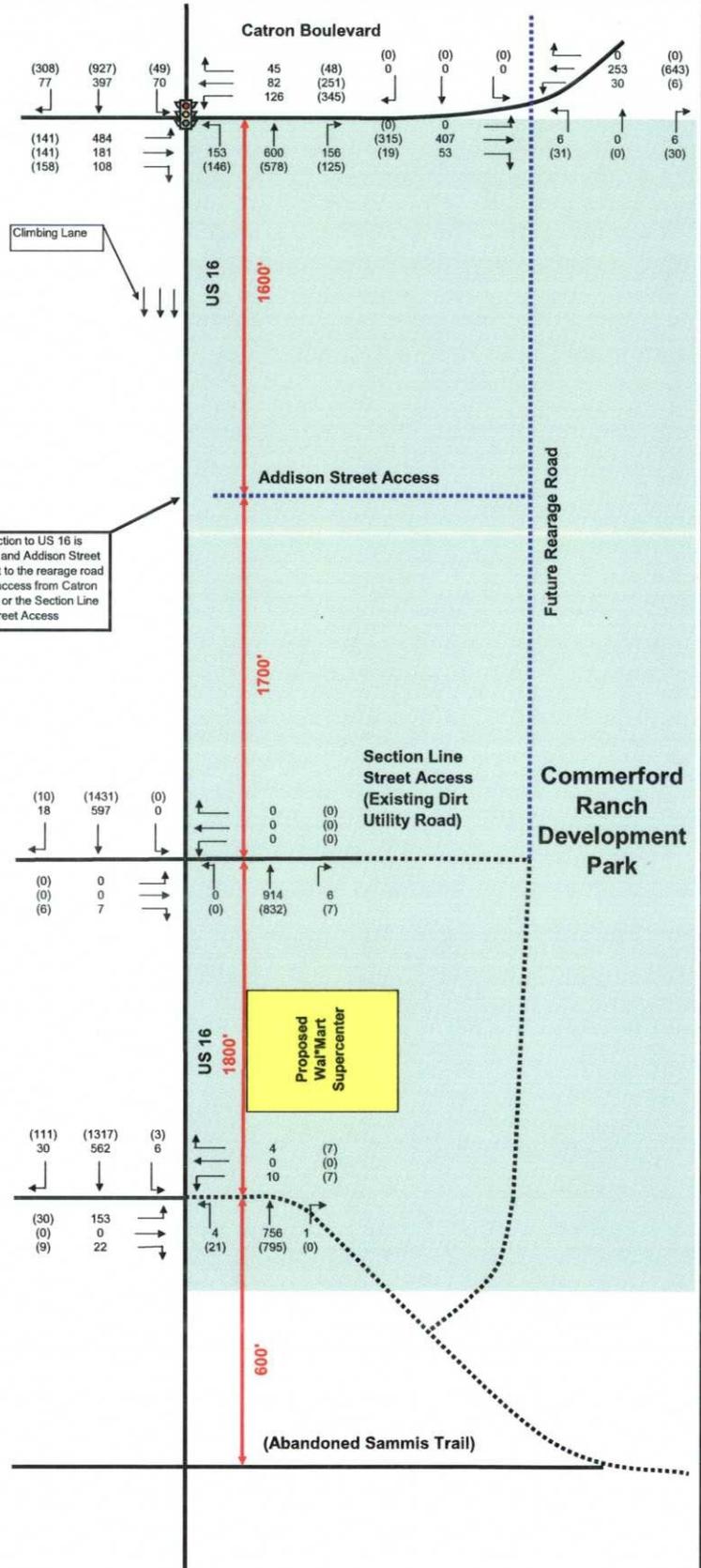
**Existing "Seasonal" Volumes and Level of Service
(Combined Sammis Trail and Moon Meadows - Reassigned Addison
Drive Traffic to Rearage Road)**

Figure 1 for Memo

August 2005

LEGEND

-  Existing Signalized Intersection in 2005
-  Future No-Build Volumes (2% Growth per year for 20 years)
-  Proposed Roadway (2005)
-  Proposed Roadways (2025)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume



2025 No-Build Volumes (Existing volumes multiplied with a 2% growth factor for 20 years with Addison Street trips reassigned to the rearage road)

Figure 2 for Memo
August 2005

LEGEND



Existing Signalized Intersection in 2005

← Commerford Ranch Generated Volumes

..... Proposed Roadway (2005)

..... Proposed Roadways (2025)

XXX AM Peak Hour Volume
(XXX) PM Peak Hour Volume

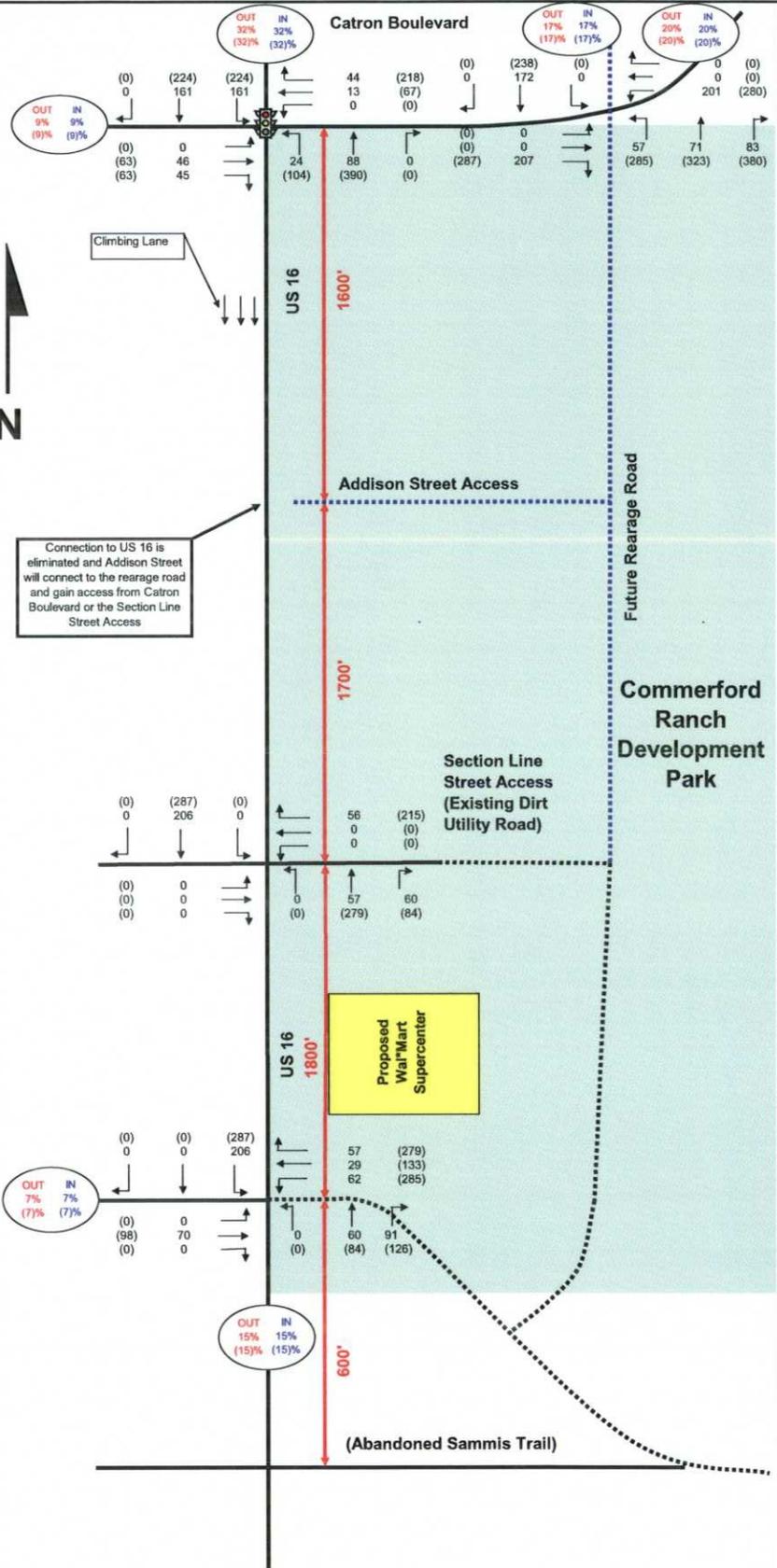


AM (PM) Trip Distribution

Commerford Ranch Generated Trips					
ITE	AM		PM		
	IN	OUT	IN	OUT	
ITE	1119	461	1556	2111	
Note: Analysis assumed a 10% reduction in total trips generated to account for internal capture.					
-10%	-112	-46	-156	-211	
Total	1007	415	1400	1900	

Note: Refer to Commerford Ranch Master Plan for Assumed Land Uses and Trips Generated for Each Land Use.

Moon Meadows



Commerford Ranch Generated Trips for 2025 Build Analysis
(Trip Assignment Percentages taken from Traffix Model Distribution)

Figure 3 for Memo

August 2005

LEGEND



Assumed Signalized Intersections in 2025

← Turning Movement Volumes

..... Proposed Roadway (2005)

..... Proposed Roadway (2025)

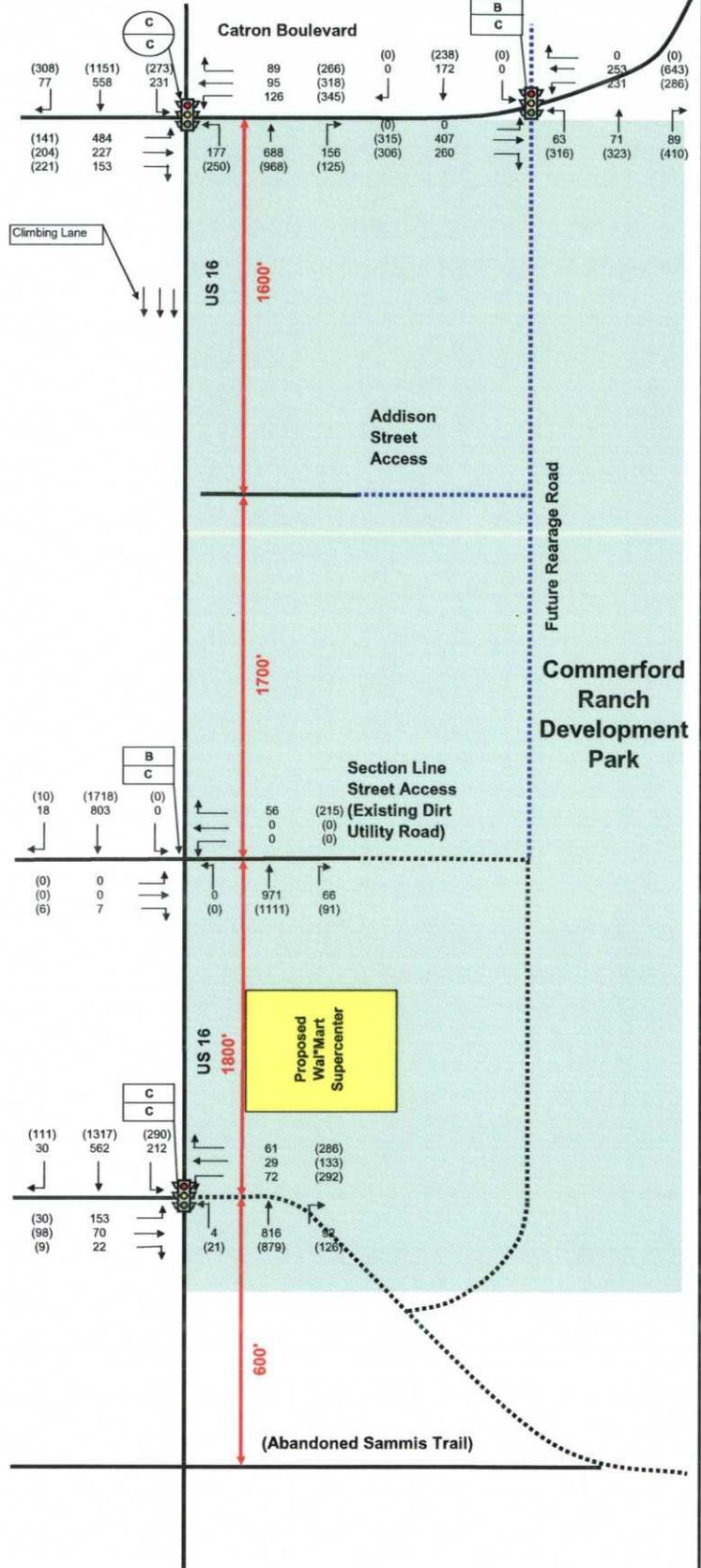
XXX AM Peak Hour Volume
(XXX) PM Peak Hour Volume

B
B

 Signalized AM Peak Hour Intersection Level of Service
Signalized PM Peak Hour Intersection Level of Service

A
A

 Unsignalized AM Peak Hour Worst Approach Level of Service
Unsignalized PM Peak Hour Worst Approach Level of Service

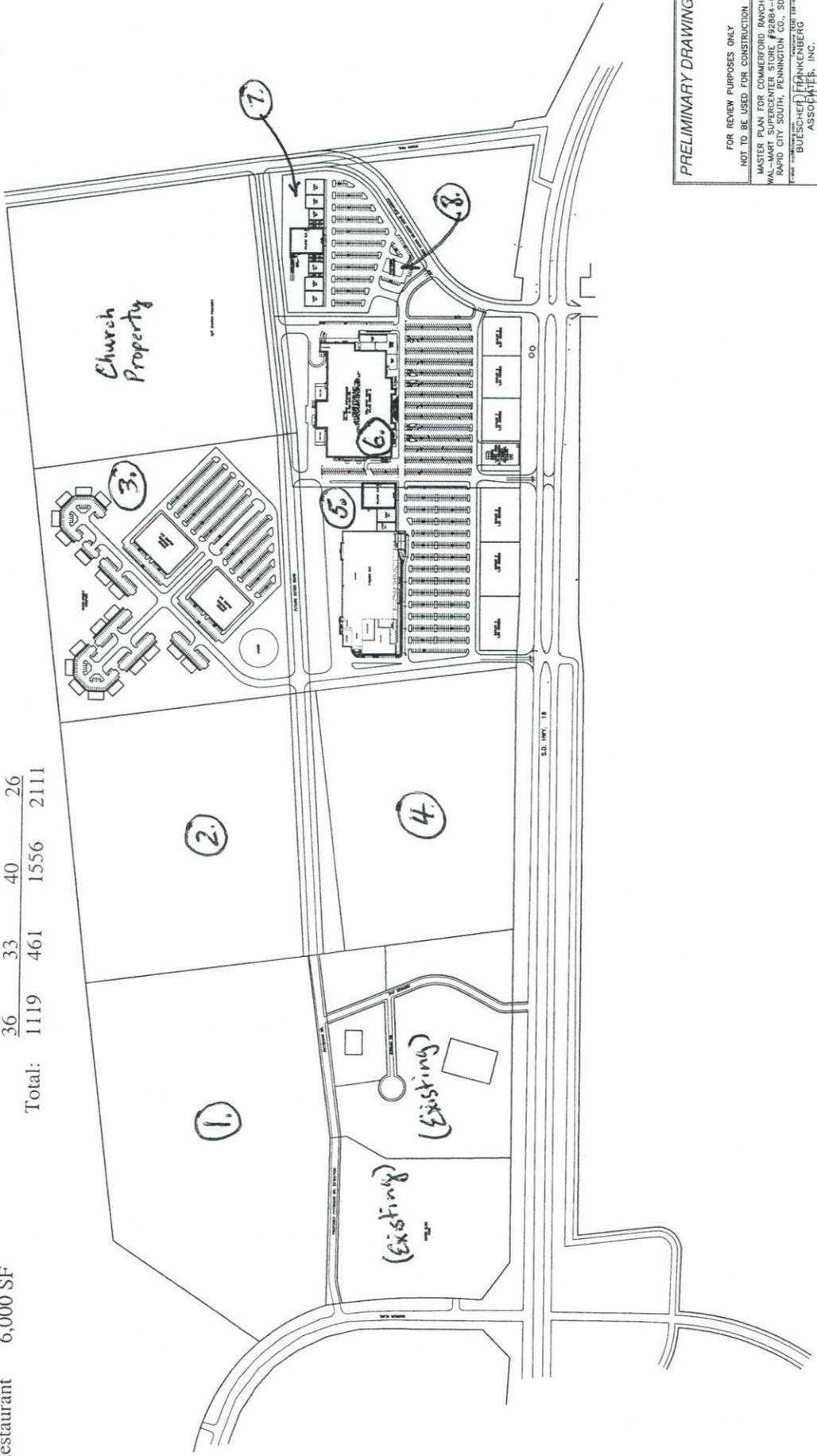


MASTER PLAN FOR COMMERFORD RANCH

WAL-MART SUPERCENTER STORE #92884-00
S.D. HWY 16 AND MOON MEADOW DRIVE
RAPID CITY SOUTH, PENNINGTON CO., SOUTH DAKOTA



Assumed Land Uses for Commerford Ranch	ITE Generated Trips			
	AM		PM	
	In	Out	In	Out
1. Office 120,000 SF	227	28	35	217
2. Office 90,000 SF	179	22	30	185
3. Office 100,000 SF	195	24	32	196
4. Retail 160,000 SF	129	82	411	445
5. Box Store 154,000 SF	88	41	390	390
6. Superstore 203,000 SF	190	183	393	409
7. Retail 64,000 SF	75	48	225	243
8. Restaurant 6,000 SF	36	33	40	26
Total:	1119	461	1556	2111



PRELIMINARY DRAWING

FOR REVIEW PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

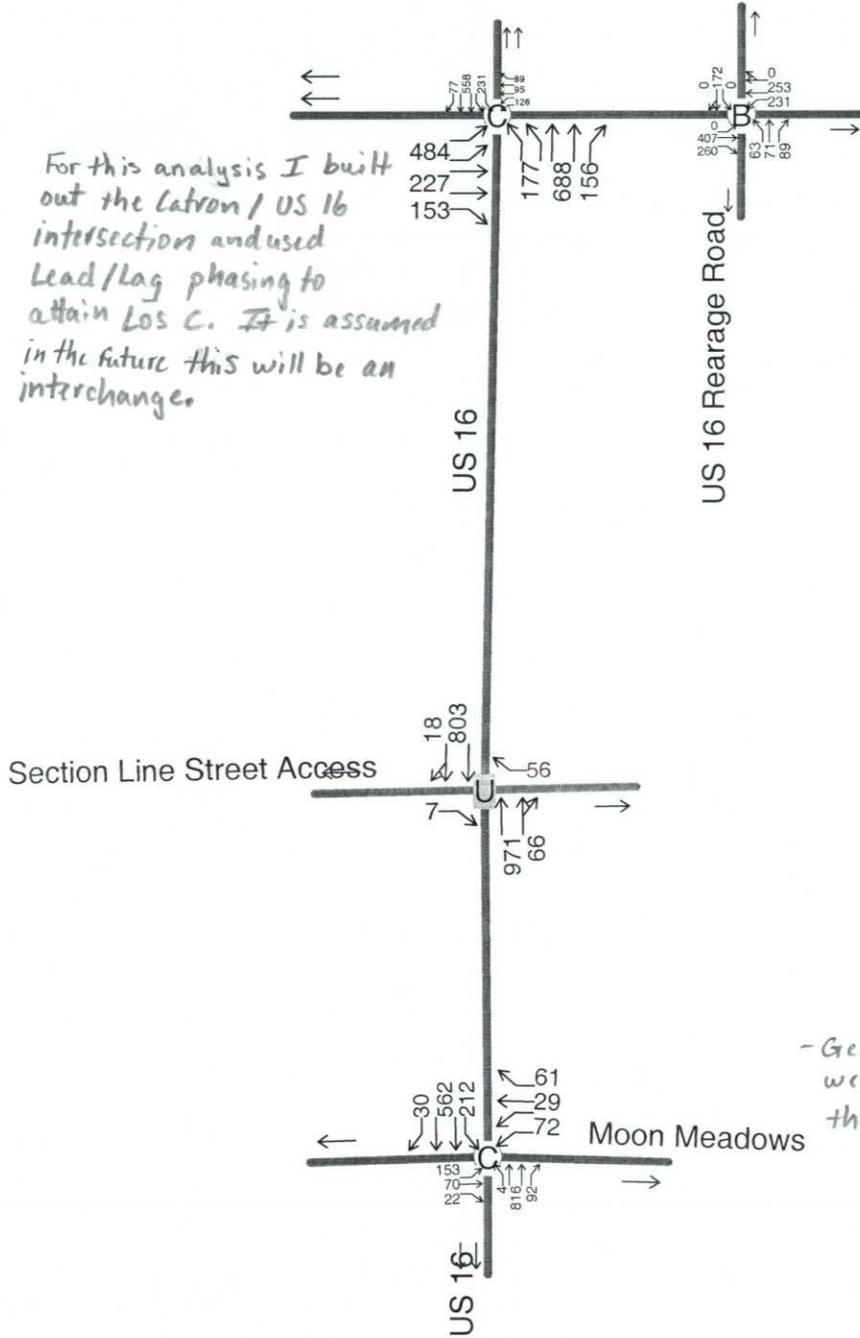
MASTER PLAN FOR COMMERFORD RANCH
WAL-MART SUPERCENTER STORE #92884-00
RAPID CITY SOUTH, PENNINGTON CO., SD

DESIGNED BY: BUESCHER FRANKENBERG ASSOCIATES, INC.
DATE: 11/10/04
SCALE: 1" = 400'

NO.	DESCRIPTION	BY	DATE	APP.

2025 Build Volumes for Memo - AM Peak Hour

For this analysis I built out the Catron / US 16 intersection and used Lead/Lag phasing to attain LOS C. It is assumed in the future this will be an interchange.



Commerford Ranch Volumes added to Future No-Build Volumes

HCM Signalized Intersection Capacity Analysis 3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Fr't	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3252	3353	1500	3252	3353	1500	3252	3353	1500	3252	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3252	3353	1500	3252	3353	1500	3252	3353	1500	3252	3353	1500
Volume (vph)	484	227	153	126	95	89	177	688	156	231	558	77
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	526	247	166	137	103	97	192	748	170	251	607	84
RTOR Reduction (vph)	0	0	95	0	0	13	0	0	111	0	0	46
Lane Group Flow (vph)	526	247	71	137	103	84	192	748	59	251	607	38
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	16.1	14.0	30.1	8.3	6.2	22.3	16.1	16.1	24.4	16.1	16.1	32.2
Effective Green, g (s)	16.1	14.0	30.1	8.3	6.2	22.3	16.1	16.1	24.4	16.1	16.1	32.2
Actuated g/C Ratio	0.23	0.20	0.43	0.12	0.09	0.32	0.23	0.23	0.35	0.23	0.23	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	743	666	640	383	295	474	743	766	604	743	766	770
v/s Ratio Prot	c0.16	0.07	0.06	0.04	0.03	0.05	0.06	c0.22	c0.03	0.08	c0.18	0.02
v/s Ratio Perm			0.05			0.02			0.08			0.03
v/c Ratio	0.71	0.37	0.11	0.36	0.35	0.18	0.26	0.98	0.10	0.34	0.79	0.05
Uniform Delay, d1	25.0	24.4	12.2	28.6	30.3	17.5	22.3	27.0	15.6	22.7	25.6	10.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1	0.4	0.1	0.6	0.7	0.2	0.8	27.3	0.1	1.2	8.2	0.0
Delay (s)	28.1	24.8	12.2	29.2	31.0	17.6	23.1	54.3	15.7	24.0	33.9	10.7
Level of Service	C	C	B	C	C	B	C	D	B	C	C	B
Approach Delay (s)		24.4			26.4			43.0			29.2	
Approach LOS		C			C			D			C	
Intersection Summary												
HCM Average Control Delay			32.2				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			70.5				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			58.3%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 5: Catron Blvd & US 16 Rearage Road

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	0.95		1.00	1.00	1.00		1.00	
Fr _t		1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	
Fl _t Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1765	1500	1676	3353		1676	1765	1500		1765	
Fl _t Permitted		1.00	1.00	0.24	1.00		0.59	1.00	1.00		1.00	
Satd. Flow (perm)		1765	1500	421	3353		1049	1765	1500		1765	
Volume (vph)	0	407	260	231	253	0	63	71	89	0	172	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	442	283	251	275	0	68	77	97	0	187	0
RTOR Reduction (vph)	0	0	188	0	0	0	0	0	66	0	0	0
Lane Group Flow (vph)	0	442	95	251	275	0	68	77	31	0	187	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2			1	6
Permitted Phases	4		4	8			2		2		6	
Actuated Green, G (s)		18.9	18.9	29.9	29.9		18.2	18.2	18.2		11.9	
Effective Green, g (s)		18.9	18.9	29.9	29.9		18.2	18.2	18.2		11.9	
Actuated g/C Ratio		0.34	0.34	0.53	0.53		0.32	0.32	0.32		0.21	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)		595	505	381	1787		366	573	487		374	
v/s Ratio Prot		0.25		c0.08	0.08		0.01	0.04			c0.11	
v/s Ratio Perm			0.19	c0.27			0.05		0.06			
v/c Ratio		0.74	0.19	0.66	0.15		0.19	0.13	0.06		0.50	
Uniform Delay, d ₁		16.5	13.2	9.0	6.7		14.4	13.4	13.1		19.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d ₂		5.0	0.2	4.1	0.0		0.2	0.1	0.1		1.1	
Delay (s)		21.4	13.4	13.1	6.7		14.7	13.5	13.1		20.5	
Level of Service		C	B	B	A		B	B	B		C	
Approach Delay (s)		18.3			9.8			13.7			20.5	
Approach LOS		B			A			B			C	
Intersection Summary												
HCM Average Control Delay			15.2			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			56.1			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			62.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

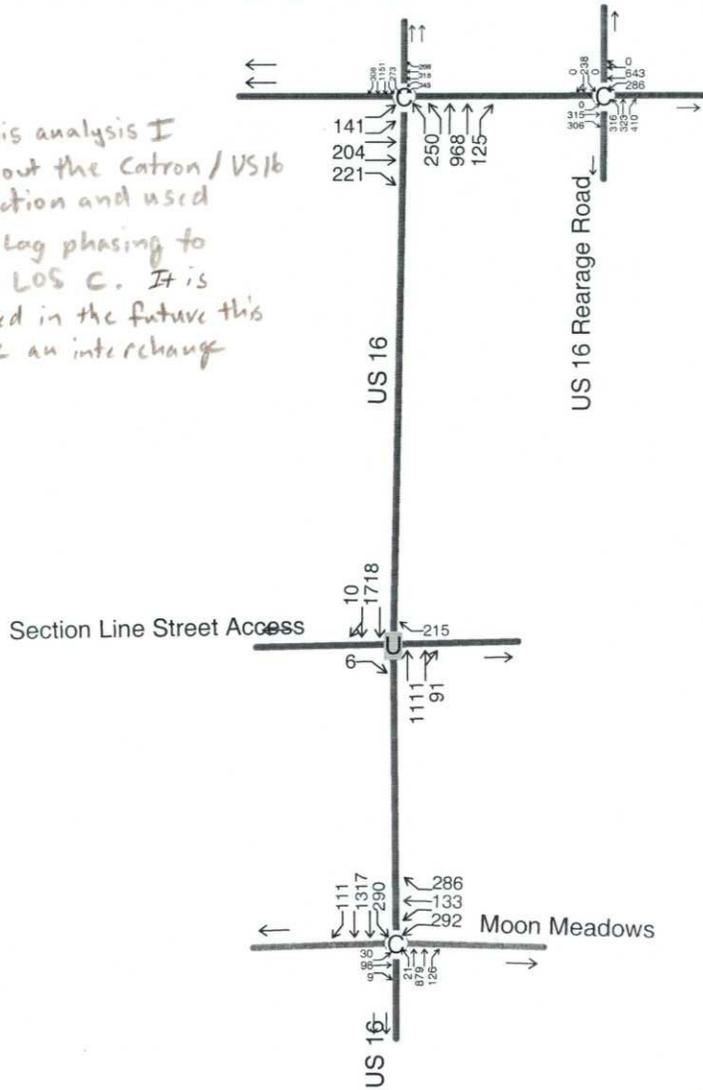
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	7	0	0	56	0	971	66	0	803	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	8	0	0	61	0	1055	72	0	873	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1471	2010	446	1535	1984	564	892			1127		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1471	2010	446	1535	1984	564	892			1127		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	87	100			100		
cM capacity (veh/h)	77	58	560	78	61	469	756			615		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	8	61	704	424	582	311						
Volume Left	0	0	0	0	0	0						
Volume Right	8	61	0	72	0	20						
cSH	560	469	1700	1700	1700	1700						
Volume to Capacity	0.01	0.13	0.41	0.25	0.34	0.18						
Queue Length (ft)	1	11	0	0	0	0						
Control Delay (s)	11.5	13.8	0.0	0.0	0.0	0.0						
Lane LOS	B	B										
Approach Delay (s)	11.5	13.8	0.0		0.0							
Approach LOS	B	B										
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			40.9%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fr _t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Fl _t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	3252	1765	1500	1676	3353	1500	1676	3353	1500
Fl _t Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	153	70	22	72	29	61	4	816	92	212	562	30
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	166	76	24	78	32	66	4	887	100	230	611	33
RTOR Reduction (vph)	0	0	20	0	0	61	0	0	67	0	0	15
Lane Group Flow (vph)	166	76	4	78	32	5	4	887	33	230	611	18
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.7	10.4	10.4	3.8	5.5	5.5	0.7	22.4	22.4	14.6	36.3	36.3
Effective Green, g (s)	8.7	10.4	10.4	3.8	5.5	5.5	0.7	22.4	22.4	14.6	36.3	36.3
Actuated g/C Ratio	0.13	0.15	0.15	0.06	0.08	0.08	0.01	0.33	0.33	0.22	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	217	273	232	184	144	123	17	1118	500	364	1811	810
v/s Ratio Prot	c0.10	0.04		0.02	0.02		0.00	c0.26		c0.14	0.18	
v/s Ratio Perm			0.02			0.04			0.07			0.02
v/c Ratio	0.76	0.28	0.02	0.42	0.22	0.04	0.24	0.79	0.07	0.63	0.34	0.02
Uniform Delay, d ₁	28.3	25.1	24.1	30.6	28.8	28.4	33.0	20.3	15.3	23.9	8.7	7.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d ₂	14.8	0.6	0.0	1.6	0.8	0.1	7.0	3.9	0.1	3.6	0.1	0.0
Delay (s)	43.0	25.6	24.1	32.2	29.6	28.6	40.0	24.3	15.3	27.4	8.8	7.2
Level of Service	D	C	C	C	C	C	D	C	B	C	A	A
Approach Delay (s)		36.4			30.4			23.4			13.6	
Approach LOS		D			C			C			B	
Intersection Summary												
HCM Average Control Delay			21.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			67.2				Sum of lost time (s)		16.0			
Intersection Capacity Utilization			61.8%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

2025 Build Volumes for Memo — PM PEAK HOUR

For this analysis I built out the Catron / US16 intersection and used Lead/Lag phasing to attain LOS C. It is assumed in the future this will be an interchange



Geometrics shown here would be the minimum needed to allow for at least LOS C.

Commerford Ranch Volumes added to Future No-Build Volumes

HCM Signalized Intersection Capacity Analysis
 3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Fr't	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3252	3353	1500	3252	3353	1500	3252	3353	1500	3252	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3252	3353	1500	3252	3353	1500	3252	3353	1500	3252	3353	1500
Volume (vph)	141	204	221	345	318	266	250	968	125	273	1151	308
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	153	222	240	375	346	289	272	1052	136	297	1251	335
RTOR Reduction (vph)	0	0	15	0	0	74	0	0	56	0	0	34
Lane Group Flow (vph)	153	222	225	375	346	215	272	1052	80	297	1251	301
Turn Type	Prot	pm+ov		Prot	pm+ov		Prot	pm+ov		Prot	pm+ov	
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases		4			8			2			6	
Actuated Green, G (s)	13.9	13.4	29.4	15.3	14.8	34.1	16.0	41.0	56.3	19.3	44.3	58.2
Effective Green, g (s)	13.9	13.4	29.4	15.3	14.8	34.1	16.0	41.0	56.3	19.3	44.3	58.2
Actuated g/C Ratio	0.13	0.13	0.28	0.15	0.14	0.32	0.15	0.39	0.54	0.18	0.42	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	431	428	420	474	473	487	496	1309	861	598	1415	889
v/s Ratio Prot	0.05	0.07	c0.09	c0.12	0.10	0.11	0.08	c0.31	0.02	0.09	c0.37	0.05
v/s Ratio Perm			0.07			0.08			0.07			0.17
v/c Ratio	0.35	0.52	0.54	0.79	0.73	0.44	0.55	0.80	0.09	0.50	0.88	0.34
Uniform Delay, d1	41.5	42.8	32.0	43.3	43.2	28.0	41.2	28.4	11.9	38.5	28.0	12.8
Progression Factor	1.00	1.00	1.00	1.01	1.00	0.79	0.63	0.49	0.05	1.00	1.00	1.00
Incremental Delay, d2	0.5	1.1	1.3	7.4	4.8	0.5	3.6	4.5	0.0	2.9	8.4	0.2
Delay (s)	42.0	43.9	33.3	51.2	48.2	22.6	29.6	18.4	0.6	41.4	36.3	13.1
Level of Service	D	D	C	D	D	C	C	B	A	D	D	B
Approach Delay (s)	39.3			42.0			18.8			33.0		
Approach LOS	D			D			B			C		
Intersection Summary												
HCM Average Control Delay	31.5		HCM Level of Service				C					
HCM Volume to Capacity ratio	0.79											
Actuated Cycle Length (s)	105.0		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	70.8%		ICU Level of Service				C					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 5: Catron Blvd & US 16 Rearage Road

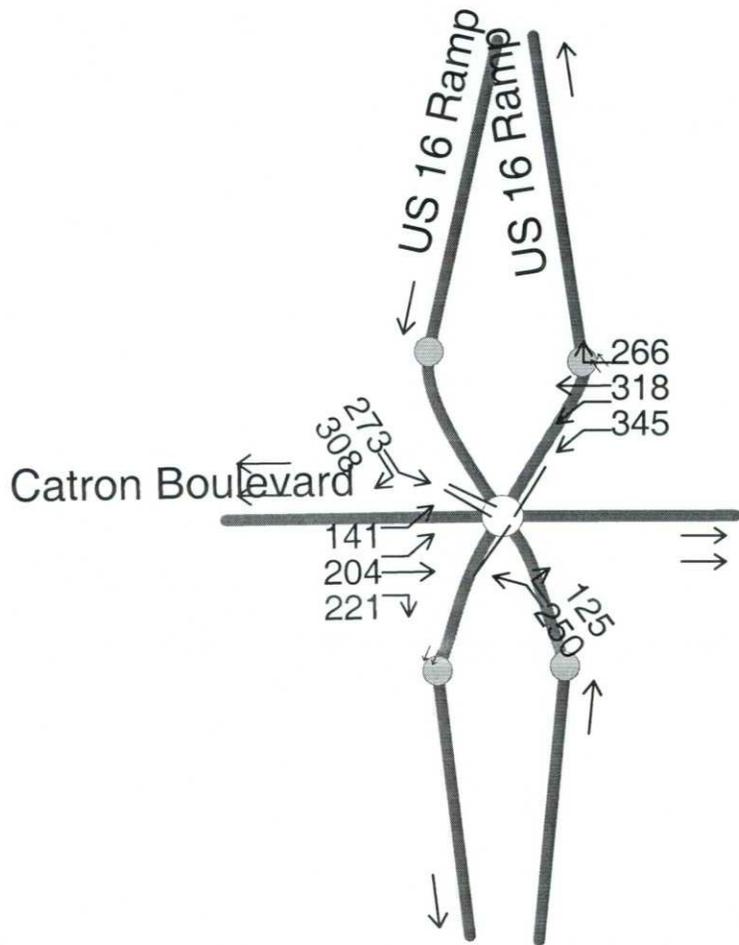
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	0.95		1.00	1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1765	1500	1676	3353		1676	1765	1500		1765	
Flt Permitted		1.00	1.00	0.23	1.00		0.32	1.00	1.00		1.00	
Satd. Flow (perm)		1765	1500	404	3353		569	1765	1500		1765	
Volume (vph)	0	315	306	286	643	0	316	323	410	0	238	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	342	333	311	699	0	343	351	446	0	259	0
RTOR Reduction (vph)	0	0	247	0	0	0	0	0	240	0	0	0
Lane Group Flow (vph)	0	342	86	311	699	0	343	351	206	0	259	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)		27.1	27.1	48.6	48.6		48.4	48.4	48.4		25.1	
Effective Green, g (s)		27.1	27.1	48.6	48.6		48.4	48.4	48.4		25.1	
Actuated g/C Ratio		0.26	0.26	0.46	0.46		0.46	0.46	0.46		0.24	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)		456	387	399	1552		466	814	691		422	
v/s Ratio Prot		0.19		c0.13	0.21		c0.14	0.20			0.15	
v/s Ratio Perm			0.22	0.23			c0.20		0.30			
v/c Ratio		0.75	0.22	0.78	0.45		0.74	0.43	0.30		0.61	
Uniform Delay, d1		35.8	30.7	20.9	19.1		20.5	19.0	17.7		35.6	
Progression Factor		0.43	0.53	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		6.4	0.3	9.3	0.2		6.0	1.7	1.1		6.5	
Delay (s)		21.7	16.7	30.2	19.3		26.4	20.7	18.8		42.2	
Level of Service		C	B	C	B		C	C	B		D	
Approach Delay (s)		19.2			22.7			21.7			42.2	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM Average Control Delay			23.2			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			105.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			79.3%			ICU Level of Service			D			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	6	0	0	215	0	1111	91	0	1718	10
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
Hourly flow rate (vph)	0	0	7	0	0	234	0	1208	99	0	1867	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2710	3179	939	2197	3135	653	1878			1307		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2710	3179	939	2197	3135	653	1878			1307		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	98	100	100	43	100			100		
cM capacity (veh/h)	4	10	265	24	11	410	316			526		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	7	234	805	501	1245	633						
Volume Left	0	0	0	0	0	0						
Volume Right	7	234	0	99	0	11						
cSH	265	410	1700	1700	1700	1700						
Volume to Capacity	0.02	0.57	0.47	0.29	0.73	0.37						
Queue Length (ft)	2	86	0	0	0	0						
Control Delay (s)	18.9	24.8	0.0	0.0	0.0	0.0						
Lane LOS	C	C										
Approach Delay (s)	18.9	24.8	0.0		0.0							
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			60.5%		ICU Level of Service					B		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	3252	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	30	98	9	292	133	286	21	879	126	290	1317	111
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	107	10	317	145	311	23	955	137	315	1432	121
RTOR Reduction (vph)	0	0	9	0	0	244	0	0	86	0	0	51
Lane Group Flow (vph)	33	107	1	317	145	67	23	955	51	315	1432	70
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.6	13.2	13.2	12.9	22.5	22.5	2.1	39.4	39.4	23.5	60.8	60.8
Effective Green, g (s)	3.6	13.2	13.2	12.9	22.5	22.5	2.1	39.4	39.4	23.5	60.8	60.8
Actuated g/C Ratio	0.03	0.13	0.13	0.12	0.21	0.21	0.02	0.38	0.38	0.22	0.58	0.58
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	57	222	189	400	378	321	34	1258	563	375	1942	869
v/s Ratio Prot	0.02	0.06		c0.10	0.08		0.01	0.28		c0.19	c0.43	
v/s Ratio Perm			0.01			0.21			0.09			0.08
v/c Ratio	0.58	0.48	0.01	0.79	0.38	0.21	0.68	0.76	0.09	0.84	0.74	0.08
Uniform Delay, d1	50.0	42.7	40.2	44.7	35.3	33.9	51.1	28.7	21.2	39.0	16.2	9.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.35	0.45	0.48
Incremental Delay, d2	13.5	1.6	0.0	10.3	0.7	0.3	42.2	4.3	0.3	9.1	1.4	0.1
Delay (s)	63.4	44.4	40.2	55.1	36.0	34.2	93.3	33.0	21.5	61.8	8.8	4.8
Level of Service	E	D	D	E	D	C	F	C	C	E	A	A
Approach Delay (s)		48.3			43.1			32.8			17.5	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM Average Control Delay			28.1	HCM Level of Service				C				
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			105.0	Sum of lost time (s)				12.0				
Intersection Capacity Utilization			70.2%	ICU Level of Service				C				
Analysis Period (min)			15									
c Critical Lane Group												



Commerford Ranch Volumes
Analysis utilizing SPUI at Catron/US 16

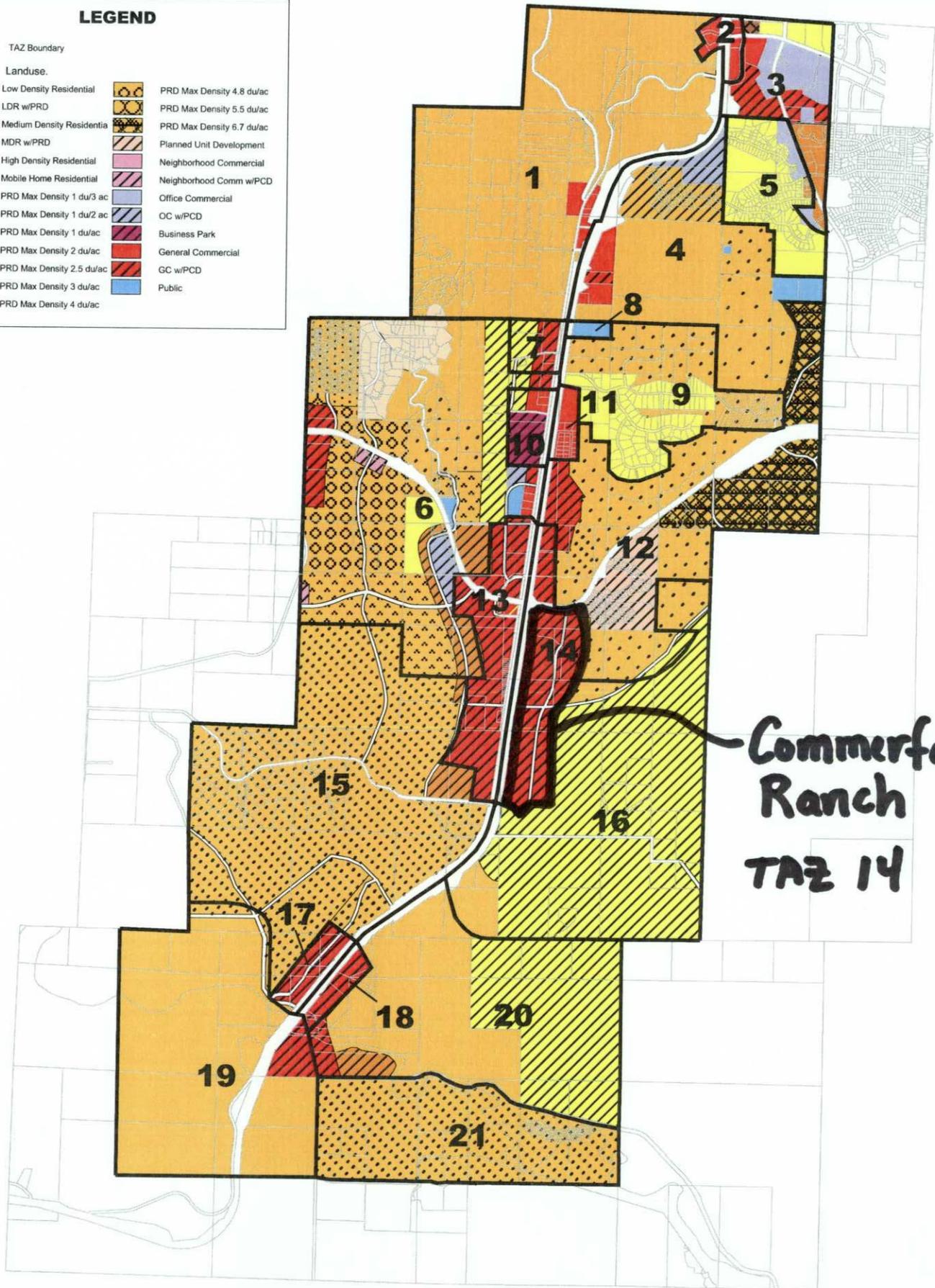
HCM Signalized Intersection Capacity Analysis
 3: Catron Boulevard & US 16 Ramp

											
Movement	EBL	EBT	EBR2	WBL	WBT	WBR2	SEL	SER2	NWL	NWR2	
Lane Configurations											
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	
Fr't	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500	
Volume (vph)	141	204	221	345	318	266	273	308	250	125	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	153	222	240	375	346	289	297	335	272	136	
RTOR Reduction (vph)	0	0	168	0	0	179	0	272	0	122	
Lane Group Flow (vph)	153	222	72	375	346	110	297	63	272	14	
Turn Type	Prot		Perm	Prot		Perm	Protcustom		Protcustom		
Protected Phases	7	4		3	8		6		2		
Permitted Phases			4			8		3		7	
Actuated Green, G (s)	3.1	13.6	13.6	7.6	18.1	18.1	13.2	7.6	13.2	3.1	
Effective Green, g (s)	5.6	16.1	16.1	10.1	20.6	20.6	15.7	10.1	15.7	5.6	
Actuated g/C Ratio	0.10	0.30	0.30	0.19	0.38	0.38	0.29	0.19	0.29	0.10	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	338	527	448	609	675	573	488	281	488	156	
v/s Ratio Prot	0.05	0.13		0.12	c0.20		c0.18		0.16		
v/s Ratio Perm			0.16			0.19		0.22		0.09	
v/c Ratio	0.45	0.42	0.16	0.62	0.51	0.19	0.61	0.22	0.56	0.09	
Uniform Delay, d1	22.7	15.2	13.9	20.1	12.8	11.1	16.5	18.6	16.2	21.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.5	0.2	1.9	0.7	0.2	2.2	0.4	1.4	0.3	
Delay (s)	23.7	15.7	14.1	22.0	13.5	11.3	18.6	19.0	17.5	22.1	
Level of Service	C	B	B	C	B	B	B	B	B	C	
Approach Delay (s)		17.1			16.0						
Approach LOS		B			B						
Intersection Summary											
HCM Average Control Delay			17.4				HCM Level of Service		B		
HCM Volume to Capacity ratio			0.68								
Actuated Cycle Length (s)			53.9				Sum of lost time (s)		8.0		
Intersection Capacity Utilization			62.4%				ICU Level of Service		B		
Analysis Period (min)			15								
c	Critical Lane Group										

TAZ 14 – Maps and Updated Projections

LEGEND

	TAZ Boundary		
Landuse.			
	Low Density Residential		PRD Max Density 4.8 du/ac
	LDR w/PRD		PRD Max Density 5.5 du/ac
	Medium Density Residential		PRD Max Density 6.7 du/ac
	MDR w/PRD		Planned Unit Development
	High Density Residential		Neighborhood Commercial
	Mobile Home Residential		Neighborhood Comm w/PCD
	PRD Max Density 1 du/3 ac		Office Commercial
	PRD Max Density 1 du/2 ac		OC w/PCD
	PRD Max Density 1 du/ac		Business Park
	PRD Max Density 2 du/ac		General Commercial
	PRD Max Density 2.5 du/ac		GC w/PCD
	PRD Max Density 3 du/ac		Public
	PRD Max Density 4 du/ac		



**Commerford
Ranch
TAZ 14**



US HIGHWAY 16 CORRIDOR STUDY
TAZ BOUNDARY MAP

FIGURE 6-1

**2005 Warrant Study
US 16 & Moon Meadows**

Intersection of Moon Meadows and US 16 (Existing Non-seasonal Volumes)

	From North			From East			From South			From West			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6:30	3	34	0	0	0	0	0	103	2	2	0	25	169
6:45	5	27	0	0	0	0	0	65	0	0	0	23	120
7:00	3	23	0	0	0	0	0	87	0	3	0	21	137
7:15	3	49	0	0	0	0	0	117	0	3	0	17	189
7:30	2	40	0	0	0	0	0	127	1	6	0	22	198
7:45	6	41	0	0	0	0	0	95	0	4	0	25	171
8:00	4	28	0	0	0	0	0	77	0	3	0	8	120
8:15	2	40	0	0	0	0	0	88	0	2	0	13	145
8:30	1	41	0	0	0	0	0	89	0	1	0	8	140
8:45	3	44	0	0	0	0	0	84	1	2	0	5	139
9:00	2	40	0	0	0	0	0	52	1	2	0	4	101
9:15	2	32	0	0	0	0	0	58	2	1	0	7	102
11:30	2	48	0	0	0	0	0	62	2	3	0	1	118
11:45	4	46	0	0	0	0	0	57	1	0	0	3	111
12:00	4	62	0	0	0	0	0	63	2	1	0	9	141
12:15	5	49	0	0	0	0	0	51	1	0	0	8	114
12:30	7	56	0	0	0	0	0	55	3	3	0	7	131
12:45	3	57	0	0	0	0	0	45	1	0	0	6	112
13:00	5	62	0	0	0	0	0	41	3	0	0	4	115
13:15	6	48	0	0	0	0	0	71	2	1	0	3	131
15:30	9	74	0	0	0	0	0	58	1	2	0	3	147
15:45	8	77	0	0	0	0	0	72	3	2	0	3	165
16:00	14	109	0	0	0	0	0	70	3	1	0	4	201
16:15	10	99	0	0	0	0	0	67	1	1	0	6	184
16:30	11	97	0	0	0	0	0	69	1	1	0	5	184
16:45	8	97	0	0	0	0	0	80	5	2	0	4	196
17:00	15	118	0	0	0	0	0	62	1	3	0	5	204
17:15	23	121	0	0	0	0	0	76	2	0	0	5	227
17:30	14	91	0	0	0	0	0	44	4	2	0	8	163
17:45	12	78	0	0	0	0	0	40	4	0	0	2	136
18:00	12	86	0	0	0	0	0	27	4	2	0	2	133
18:15	14	69	0	0	0	0	0	34	2	2	0	3	124

Intersection of Sammis Trail and US 16 (Existing Non-seasonal Volumes)

	From North			From East			From South			From West			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6:30	0	53	0	1	0	0	0	88	0	0	0	1	143
6:45	0	35	0	0	0	0	0	71	0	0	0	0	106
7:00	0	31	2	0	0	0	0	105	0	0	0	1	139
7:15	0	45	0	1	0	0	1	103	0	0	0	0	150
7:30	0	41	0	1	0	0	0	199	0	0	0	0	241
7:45	0	59	1	2	0	0	1	116	0	0	0	0	179
8:00	0	40	0	1	0	0	0	78	0	0	0	0	119
8:15	0	59	0	1	0	0	0	72	1	0	0	0	133
8:30	0	38	0	1	0	0	0	83	0	0	0	0	122
8:45	0	47	0	2	0	0	0	68	0	0	0	0	117
9:00	0	39	0	0	0	0	0	53	0	0	0	1	93
9:15	1	50	1	2	0	0	0	57	0	0	0	0	111
11:30	0	58	1	0	1	0	0	53	0	0	0	1	114
11:45	1	51	0	0	0	0	0	69	0	0	0	2	123
12:00	1	51	2	2	0	0	1	63	1	0	0	1	122
12:15	1	52	0	1	0	0	0	74	0	0	0	0	128
12:30	0	53	0	1	0	0	0	58	0	0	0	0	112
12:45	0	51	2	1	0	0	0	54	0	0	0	0	108
13:00	1	61	0	1	0	0	0	54	1	0	0	0	118
13:15	2	65	4	1	0	0	0	63	1	0	0	0	136
15:30	0	93	2	1	0	0	0	60	0	0	0	0	156
15:45	1	89	1	1	0	0	0	70	0	1	0	1	164
16:00	1	86	0	1	0	1	0	71	0	0	1	0	161
16:15	2	92	1	1	0	0	0	85	0	0	1	0	182
16:30	0	93	2	2	0	0	0	77	0	0	0	0	174
16:45	0	105	1	3	0	0	0	80	0	0	0	0	189
17:00	1	113	0	0	0	0	0	66	0	0	0	0	180
17:15	0	104	4	0	0	0	0	63	0	0	0	0	171
17:30	0	95	1	0	0	0	0	63	0	0	0	0	159
17:45	0	100	0	2	0	1	1	41	0	0	0	0	145
18:00	0	72	0	0	0	0	0	37	1	0	0	0	110
18:15	1	74	0	0	0	0	0	41	0	0	1	0	117

Intersection of Moon Meadows and US 16 (these volumes assume that Sammis Trail is realigned to Moon Meadows)

(Existing intersections of Moon Meadows and Sammis Trail are combined)

	From North			From East			From South			From West			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6:30	3	34	0	1	0	0	0	88	2	2	0	26	156
6:45	5	27	0	0	0	0	0	71	0	0	0	23	126
7:00	3	23	2	0	0	0	0	105	0	3	0	22	158
7:15	3	49	0	1	0	0	1	103	0	3	0	17	177
7:30	2	40	0	1	0	0	0	199	1	6	0	22	271
7:45	6	41	1	2	0	0	1	116	0	4	0	25	196
8:00	4	28	0	1	0	0	0	78	0	3	0	8	122
8:15	2	40	0	1	0	0	0	72	1	2	0	13	131
8:30	1	41	0	1	0	0	0	83	0	1	0	8	135
8:45	3	44	0	2	0	0	0	68	1	2	0	5	125
9:00	2	40	0	0	0	0	0	53	1	2	0	5	103
9:15	3	32	1	2	0	0	0	57	2	1	0	7	105
11:30	2	48	1	0	1	0	0	53	2	3	0	2	112
11:45	5	46	0	0	0	0	0	69	1	0	0	5	126
12:00	5	62	2	2	0	0	1	63	3	1	0	10	149
12:15	6	49	0	1	0	0	0	74	1	0	0	8	139
12:30	7	56	0	1	0	0	0	58	3	3	0	7	135
12:45	3	57	2	1	0	0	0	54	1	0	0	6	124
13:00	6	62	0	1	0	0	0	54	4	0	0	4	131
13:15	8	48	4	1	0	0	0	63	3	1	0	3	131
15:30	9	74	2	1	0	0	0	60	1	2	0	3	152
15:45	9	77	1	1	0	0	0	70	3	3	0	4	168
16:00	15	109	0	1	0	1	0	71	3	1	1	4	206
16:15	12	99	1	1	0	0	0	85	1	1	1	6	207
16:30	11	97	2	2	0	0	0	77	1	1	0	5	196
16:45	8	97	1	3	0	0	0	80	5	2	0	4	200
17:00	16	118	0	0	0	0	0	66	1	3	0	5	209
17:15	23	121	4	0	0	0	0	63	2	0	0	5	218
17:30	14	91	1	0	0	0	0	63	4	2	0	8	183
17:45	12	78	0	2	0	1	1	41	4	0	0	2	141
18:00	12	86	0	0	0	0	0	37	5	2	0	2	144
18:15	15	69	0	0	0	0	0	41	2	2	1	3	133

Intersection of Moon Meadows and US 16 (these volumes assume that Sammis Trail is realigned to Moon Meadows and Seasonal Corrected)

	From North			From East			From South			From West			Percentage of Peak Hour	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left		
6:30	3	61	0	1	0	0	0	88	2	2	0	26	183	
6:45	5	48	0	0	0	0	0	71	0	0	0	23	147	
7:00	3	41	2	0	0	0	0	105	0	3	0	22	176	
7:15	3	87	0	1	0	0	1	103	0	3	0	17	215	721 86%
Hour 1	14	237	2	2	0	0	1	367	2	8	0	88		
7:30	2	71	0	1	0	0	0	199	1	6	0	22	302	
7:45	6	73	1	2	0	0	1	116	0	4	0	25	228	
8:00	4	50	0	1	0	0	0	78	0	3	0	8	144	
8:15	2	71	0	1	0	0	0	72	1	2	0	13	162	836 100%
Hour 2	14	265	1	5	0	0	1	465	2	15	0	68		
8:30	1	73	0	1	0	0	0	83	0	1	0	8	167	
8:45	3	78	0	2	0	0	0	68	1	2	0	5	159	
9:00	2	71	0	0	0	0	0	53	1	2	0	5	134	
9:15	3	57	1	2	0	0	0	57	2	1	0	7	130	590 71%
Hour 3	9	279	1	5	0	0	0	261	4	6	0	25		
11:30	2	85	1	0	1	0	0	94	2	3	0	2	191	
11:45	5	82	0	0	0	0	0	123	1	0	0	5	216	
12:00	5	110	2	2	0	0	1	112	3	1	0	10	247	
12:15	6	87	0	1	0	0	0	132	1	0	0	8	235	888 106%
Hour 4	18	365	3	3	1	0	1	461	7	4	0	25		
12:30	7	100	0	1	0	0	0	103	3	3	0	7	224	
12:45	3	101	2	1	0	0	0	96	1	0	0	6	211	
13:00	6	110	0	1	0	0	0	96	4	0	0	4	221	
13:15	8	85	4	1	0	0	0	112	3	1	0	3	218	874 63%
Hour 5	24	397	6	4	0	0	0	408	11	4	0	20		
15:30	9	132	2	1	0	0	0	107	1	2	0	3	257	
15:45	9	137	1	1	0	0	0	125	3	3	0	4	283	
16:00	15	194	0	1	0	1	0	126	3	1	1	4	346	
16:15	12	176	1	1	0	0	0	151	1	1	1	6	351	1236 89%
Hour 6	45	639	4	4	0	1	0	509	8	7	2	17		
16:30	11	173	2	2	0	0	0	137	1	1	0	5	332	
16:45	8	173	1	3	0	0	0	142	5	2	0	4	338	
17:00	16	210	0	0	0	0	0	117	1	3	0	5	353	
17:15	23	215	4	0	0	0	0	112	2	0	0	5	362	1384 100%
Hour 7	58	771	7	5	0	0	0	509	9	6	0	19		
17:30	14	162	1	0	0	0	0	112	4	2	0	8	303	
17:45	12	139	0	2	0	1	1	73	4	0	0	2	234	
18:00	12	153	0	0	0	0	0	66	5	2	0	2	240	
18:15	15	123	0	0	0	0	0	73	2	2	1	3	219	996 72%
Hour 8	53	577	1	2	0	1	1	324.0	15	6	1	15		

Intersection of Moon Meadows and US 16 (Wal*Mart Generated volumes shown as a percentage of the Peak Hour Volume - Refer to Figure 6)

Hours 2 and 7 represent the AM and PM Peak Hours

	From North			From East			From South			From West			Percentage of Peak Hour
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
													86%
Hour 1	0	0	105	116	3	38	49	0	0	0	9	0	
													100%
Hour 2	0	0	122	135	4	44	57	0	0	0	11	0	
													71%
Hour 3	0	0	87	96	3	31	40	0	0	0	8	0	
													106%
Hour 4	0	0	129	143	4	47	60	0	0	0	12	0	
													63%
Hour 5	0	0	175	139	10	103	63	0	0	0	5	0	
													89%
Hour 6	0	0	247	197	14	146	89	0	0	0	7	0	
													100%
Hour 7	0	0	277	221	16	164	100	0	0	0	8	0	
													72%
Hour 8	0	0	199	159	12	118	72	0	0	0	6	0	

Intersection of Moon Meadows and US 16 (these volumes assume that Sammis Trail is realigned to Moon Meadows and Seasonal Corrected with Wal*Mart generated trips added in)

	From North			From East			From South			From West		
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
Hour 1	14	237	107	118	3	38	50	367	2	8	9	88
Hour 2	14	265	123	140	4	44	58	465	2	15	11	68
Hour 3	9	279	88	101	3	31	40	261	4	6	8	25
Hour 4	18	365	132	146	5	47	61	461	7	4	12	25
Hour 5	24	397	181	143	10	103	63	408	11	4	5	20
Hour 6	45	639	251	201	14	147	89	509	8	7	9	17
Hour 7	58	771	284	226	16	164	100	509	9	6	8	19
Hour 8	53	577	200	161	12	119	73	324	15	6	7	15

Intersection Data:

Town/City: **South of Rapid City** Population: County: **Pennington**
 Major Street: **US 16** North/South Route? **Yes** Posted Speed: **55** No. of Lanes/one approach: **2**
 Minor Street1: **Moon Meadows** No. of Lanes/one approach: **2**
 Minor Street2:
 Date of Count: **Jan 19 2005** Weather: **Highs in the 60's - Very nice for season**
 Time Count Started: **6:30 AM** Site Code:
 Time Count Finished: **6:30 PM** Is this site used as a school crossing? **No**
 Count Interval: **0:15** minutes Comments from counters

Does the minor street an entrance to an office complex, manufacturing plant, industrial complex, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time? **No**

Is this intersection a "T" intersection? **No**

Has an Intersection Delay Study been done on this intersection? **No** If yes, what is the avg. delay per Stopped vehicle? seconds equals **0** vehicle-hours

Distance to the nearest traffic control signal along major route? **###** feet

Has an Pedestrian Gap Study been done on this intersection? **No** If yes, what is the Gap delay per hour? gaps/hour equals **0** gaps/hour

What is the average speed of pedestrians? **4.00** ft/sec

Is this intersection now or will be a school crossing location? **No** If yes, are there or have there been warning signs & flashers? **No**

Are there school speed zones posted for this intersection? **No**

Is a crossing guard used (past or present) to help students? **No**

What is the average minimum # of students during the highest crossing hour? **0**

Is there a problem with lack of platooning on the major route? **No**

If yes, would a signal at this intersection help with platooning? **No**

Has any alternatives been attempted to reduce accidents? **No**

What is the number of accidents (12 month period) that could be possibly avoided from the addition of a signal at this location? **0**

Is this location an intersection of two or more major routes? **no** If yes, what is the % volume increase expected in 5 years? **0%** equals **100%** of existing volumes

Has a weekend volume count been taken? **No** If yes, enter the five peak volumes (total entering intersection) from the weekend count. **No**

Insert correct actual count data into table below then,

Look at cells A15 to O33 on sheet "Warrant 2", are 4 or more red dots above the blue line? **yes**

Look at cells A39 to O64 on sheet "Warrant 3", are 1 or more red dots above the blue line? **yes**

Look at cells AF11 to AN30 on sheet "Warrant 8", are 4 or more red dots above the blue line?

Look at cells BB11 to BJ34 on sheet "Warrant 8", are 1 or more red dots above the blue line?

Print out sheets "Warrant 1 thru 8" and "Summary" sheet. Review with Traffic Engineer. Is a traffic signal recommended at this time? **no**

Reprint "Summary" sheet.

Time Period	Southbound				Westbound				Northbound				Eastbound				VPH (100%) Major Street	VPH (100%) Minor Street	Peak 15min. Totals	Peak hour Totals	Ped. 4 hour Totals	Ped. 1 hour Total
	US 16		Moon Meadows		US 16		Moon Meadows		US 16		Moon Meadows		US 16		Moon Meadows							
	Rt.	Thru	Lt.	Peds	Rt.	Thru	Lt.	Peds	Rt.	Thru	Lt.	Peds	Rt.	Thru	Lt.	Peds						
1 6:30 AM to 6:45 AM																	0					
2 6:45 AM to 7:00 AM																	0					
3 7:00 AM to 7:15 AM																	0					
4 7:15 AM to 7:30 AM	14	237		107		3	38			50	367	2			9	88	777	97	874	874	0	
5 7:30 AM to 7:45 AM																	0		874		0	
6 7:45 AM to 8:00 AM																	0		874		0	
7 8:00 AM to 8:15 AM																	0		874		0	
8 8:15 AM to 8:30 AM	14	265		123		4	44			58	465	2			11	68	927	79	1006	1006	0	
9 8:30 AM to 8:45 AM																	0		1006		0	
10 8:45 AM to 9:00 AM																	0		1006		0	
11 9:00 AM to 9:15 AM																	0		1006		0	
12 9:15 AM to 9:30 AM	9	279		88		3	31			40	261	4			8	25	681	34	715	715	0	
13 9:30 AM to 9:45 AM																	0		715		0	
14 9:45 AM to 10:00 AM																	0		715		0	
15 10:00 AM to 10:15 AM																	0		715		0	
16 10:15 AM to 10:30 AM																	0		0		0	
17 10:30 AM to 10:45 AM																	0		0		0	
18 10:45 AM to 11:00 AM																	0		0		0	
19 11:00 AM to 11:15 AM																	0		0		0	
20 11:15 AM to 11:30 AM																	0		0		0	
21 11:30 AM to 11:45 AM																	0		0		0	
22 11:45 AM to 12:00 PM																	0		0		0	
23 12:00 PM to 12:15 PM																	0		0		0	
24 12:15 PM to 12:30 PM	18	365		132		5	47			61	461	7			12	25	1044	52	1096	1096	0	

Warrant 1, Eight-Hour Vehicular Volume

Sheet 1 of 2

Support:

The Minimum Vehicular Volume, Condition A, is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

The Interruption of Continuous Traffic, Condition B, is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Standard:

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

- A. The vehicles per hour given in both of the 100% columns of Condition A in the following table exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection, or**
- B. The vehicles per hour given in both of the 100% columns of Condition B in the following table exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection.**

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

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in 100% columns may be adjusted to show 70% of the standard values.

The 70% option was used for this warrant.

Standard:

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

- A. The vehicles per hour given in both of the 80% columns of Condition A in the following table exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection and**
- B. The vehicles per hour given in both of the 80% columns of Condition B in the following table exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection.**

These major street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

Warrant 1, Eight-Hour Vehicular Volume

Sheet 2 of 2

Hour Starting at	Actual Counts		Condition A (70%)			Condition A (80%)			Condition B (70%)			Condition B (80%)											
	Major	Minor	Major	Minor	Complies Yes(1), No(0)																		
6:30 AM	777	97	420	140	0	480	160	0	630	70	1	720	80	1									
7:30 AM	927	79	420	140	0	480	160	0	630	70	1	720	80	0									
8:30 AM	681	34	420	140	0	480	160	0	630	70	0	720	80	0									
9:30 AM	0	0	420	140	0	480	160	0	630	70	0	720	80	0									
10:30 AM	0	0	420	140	0	480	160	0	630	70	0	720	80	0									
11:30 AM	1044	52	420	140	0	480	160	0	630	70	0	720	80	0									
12:30 PM	1084	113	420	140	0	480	160	0	630	70	1	720	80	1									
1:30 PM	0	0	420	140	0	480	160	0	630	70	0	720	80	0									
2:30 PM	0	0	420	140	0	480	160	0	630	70	0	720	80	0									
3:30 PM	1541	161	420	140	1	480	160	1	630	70	1	720	80	1									
4:30 PM	1731	180	420	140	1	480	160	1	630	70	1	720	80	1									
5:30 PM	1242	131	420	140	0	480	160	0	630	70	1	720	80	1									
No. of Hours Complying to Condition					2						2						6						5

Guidance:

The combination of Conditions A and B should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Conclusion:

- This location does not meet the minimum requirement of 8 hours for Condition A (70%).**
- This location does not meet the minimum requirement of 8 hours for Condition B (70%).**
- This location does not meet the minimum requirement of 8 hours for Condition A (80%).**
- This location does not meet the minimum requirement of 8 hours for Condition B (80%).**

This location does not comply with this warrant.

Warrant 2, Four-Hour Vehicular Volume

Sheet 1 of 1

Support:

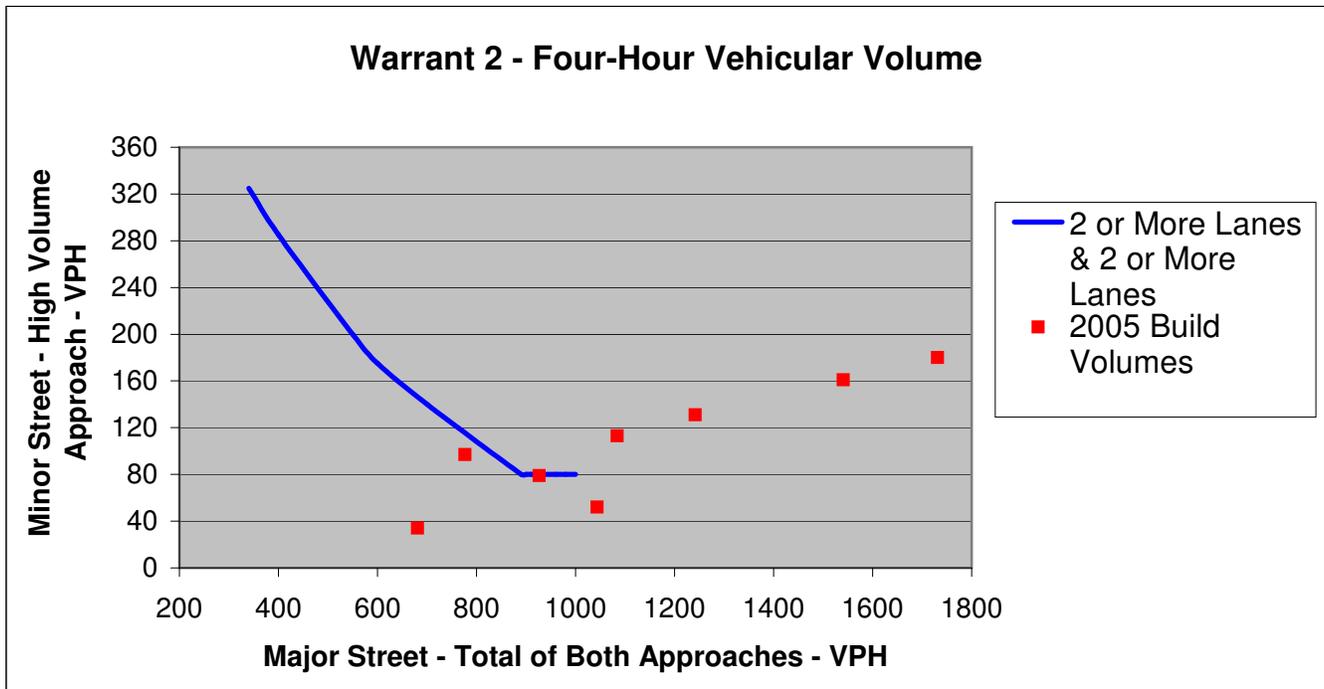
The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor-street approach (one direction only) all fall above the following curve for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the curve may be adjust as per the M.U.T.C.D. Figure 4C-2.



Conclusion:

If 4 or more red dots fall above the blue line then this intersection complies with this warrant. Blue curve data has been adjusted as per M.U.T.C.D. Figure 4C-2.

This intersection meets the minimum criteria set forth for this warrant.

Synchro Printouts

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1678		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.55	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1678		962	3353	1500	799	3353	1500
Volume (vph)	323	122	73	85	55	26	103	408	109	11	303	52
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	367	139	83	97	62	30	117	464	124	12	344	59
RTOR Reduction (vph)	0	0	60	0	26	0	0	0	80	0	0	38
Lane Group Flow (vph)	367	139	23	97	66	0	117	464	44	12	344	21
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	14.3	14.3	14.3	7.0	7.0		18.2	18.2	18.2	18.2	18.2	18.2
Effective Green, g (s)	14.3	14.3	14.3	7.0	7.0		18.2	18.2	18.2	18.2	18.2	18.2
Actuated g/C Ratio	0.28	0.28	0.28	0.14	0.14		0.35	0.35	0.35	0.35	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	465	490	417	228	228		340	1185	530	282	1185	530
v/s Ratio Prot	c0.22	0.08		c0.06	0.05			c0.14			0.10	
v/s Ratio Perm			0.06				0.12		0.08	0.02		0.04
v/c Ratio	0.79	0.28	0.06	0.43	0.29		0.34	0.39	0.08	0.04	0.29	0.04
Uniform Delay, d1	17.2	14.6	13.6	20.4	20.0		12.3	12.5	11.1	10.9	12.0	10.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.7	0.3	0.1	1.3	0.7		2.8	1.0	0.3	0.3	0.6	0.1
Delay (s)	25.9	14.9	13.7	21.7	20.7		15.0	13.5	11.4	11.2	12.6	11.1
Level of Service	C	B	B	C	C		B	B	B	B	B	B
Approach Delay (s)		21.6			21.2			13.4				12.4
Approach LOS		C			C			B				B
Intersection Summary												
HCM Average Control Delay			16.5				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			51.5				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			52.2%				ICU Level of Service		A			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis
 6: Sammis Trail & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	1	0	0	3	0	510	1	4	384	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	1	0	0	3	0	580	1	5	436	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	739	1026	218	809	1026	290	436			581		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	739	1026	218	809	1026	290	436			581		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	303	232	786	271	232	706	1120			989		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	1	3	0	386	194	5	291	145				
Volume Left	0	0	0	0	0	5	0	0				
Volume Right	1	3	0	0	1	0	0	0				
cSH	786	706	1700	1700	1700	989	1700	1700				
Volume to Capacity	0.00	0.00	0.00	0.23	0.11	0.00	0.17	0.09				
Queue Length (ft)	0	0	0	0	0	0	0	0				
Control Delay (s)	9.6	10.1	0.0	0.0	0.0	8.7	0.0	0.0				
Lane LOS	A	B				A						
Approach Delay (s)	9.6	10.1	0.0			0.1						
Approach LOS	A	B										
Intersection Summary												
Average Delay			0.1									
Intersection Capacity Utilization			24.9%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	0	5	7	0	8	2	609	4	56	393	12
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	3	0	6	8	0	9	2	692	5	64	447	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	940	1282	230	1053	1284	346	460			697		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	940	1282	230	1053	1284	346	460			697		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	95	100	99	100			93		
cM capacity (veh/h)	203	152	772	169	152	650	1097			895		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	9	8	9	233	461	5	64	298	162			
Volume Left	3	8	0	2	0	0	64	0	0			
Volume Right	6	0	9	0	0	5	0	0	14			
cSH	377	169	650	1097	1700	1700	895	1700	1700			
Volume to Capacity	0.02	0.05	0.01	0.00	0.27	0.00	0.07	0.18	0.10			
Queue Length (ft)	2	4	1	0	0	0	6	0	0			
Control Delay (s)	14.8	27.3	10.6	0.1	0.0	0.0	9.3	0.0	0.0			
Lane LOS	B	D	B	A			A					
Approach Delay (s)	14.8	18.4		0.0			1.1					
Approach LOS	B	C										
Intersection Summary												
Average Delay				0.9								
Intersection Capacity Utilization			43.1%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	615	0	0	402	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	0	0	0	0	699	0	0	457	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	806	1156	228	927	1156	349	457			699		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	806	1156	228	927	1156	349	457			699		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	273	195	774	223	195	647	1100			894		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	0	0	349	349	228	228						
Volume Left	0	0	0	0	0	0						
Volume Right	0	0	0	0	0	0						
cSH	1700	1700	1100	1700	894	1700						
Volume to Capacity	0.00	0.00	0.00	0.21	0.00	0.13						
Queue Length (ft)	0	0	0	0	0	0						
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0	0.0								
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			21.3%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

										
Movement	EBL	EBR	NBL	NBT	SBT	SBR				
Lane Configurations				 	 					
Sign Control	Stop			Free		Free				
Grade	0%			0%		0%				
Volume (veh/h)	103	14	1	512	382	20				
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88				
Hourly flow rate (vph)	117	16	1	582	434	23				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None									
Median storage veh										
Upstream signal (ft)										
pX, platoon unblocked										
vC, conflicting volume	727	217	457							
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	727	217	457							
tC, single (s)	6.8	6.9	4.1							
tC, 2 stage (s)										
tF (s)	3.5	3.3	2.2							
p0 queue free %	67	98	100							
cM capacity (veh/h)	359	787	1100							
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3		
Volume Total	117	16	1	291	291	217	217	23		
Volume Left	117	0	1	0	0	0	0	0		
Volume Right	0	16	0	0	0	0	0	23		
cSH	359	787	1100	1700	1700	1700	1700	1700		
Volume to Capacity	0.33	0.02	0.00	0.17	0.17	0.13	0.13	0.01		
Queue Length (ft)	35	2	0	0	0	0	0	0		
Control Delay (s)	19.8	9.7	8.3	0.0	0.0	0.0	0.0	0.0		
Lane LOS	C	A	A							
Approach Delay (s)	18.6		0.0				0.0			
Approach LOS	C									
Intersection Summary										
Average Delay			2.1							
Intersection Capacity Utilization			27.6%		ICU Level of Service		A			
Analysis Period (min)			15							

HCM Signalized Intersection Capacity Analysis
 3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1749		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.30	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1749		538	3353	1500	817	3353	1500
Volume (vph)	74	95	106	232	169	11	98	410	104	20	637	207
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	84	108	120	264	192	12	111	466	118	23	724	235
RTOR Reduction (vph)	0	0	104	0	4	0	0	0	67	0	0	133
Lane Group Flow (vph)	84	108	16	264	200	0	111	466	51	23	724	102
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	7.7	7.7	7.7	12.6	12.6		24.6	24.6	24.6	24.6	24.6	24.6
Effective Green, g (s)	7.7	7.7	7.7	12.6	12.6		24.6	24.6	24.6	24.6	24.6	24.6
Actuated g/C Ratio	0.14	0.14	0.14	0.22	0.22		0.43	0.43	0.43	0.43	0.43	0.43
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	227	239	203	371	387		233	1450	649	353	1450	649
v/s Ratio Prot	0.05	0.06		c0.16	0.12			0.14			c0.22	
v/s Ratio Perm			0.08				0.21		0.08	0.03		0.16
v/c Ratio	0.37	0.45	0.08	0.71	0.52		0.48	0.32	0.08	0.07	0.50	0.16
Uniform Delay, d1	22.4	22.7	21.5	20.5	19.5		11.5	10.6	9.5	9.4	11.7	9.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	1.4	0.2	6.3	1.2		6.8	0.6	0.2	0.4	1.2	0.5
Delay (s)	23.4	24.0	21.7	26.8	20.6		18.4	11.2	9.7	9.8	12.9	10.3
Level of Service	C	C	C	C	C		B	B	A	A	B	B
Approach Delay (s)		23.0			24.1			12.1			12.2	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay			15.8			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			56.9			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			56.5%			ICU Level of Service				B		
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis
 6: Sammis Trail & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	5	0	544	0	2	900	9
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	0	0	6	0	618	0	2	1023	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1347	1651	516	1134	1656	309	1033			618		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1347	1651	516	1134	1656	309	1033			618		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	108	98	504	157	97	687	668			958		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	0	6	0	412	206	2	682	351				
Volume Left	0	0	0	0	0	2	0	0				
Volume Right	0	6	0	0	0	0	0	10				
cSH	1700	687	1700	1700	1700	958	1700	1700				
Volume to Capacity	0.00	0.01	0.00	0.24	0.12	0.00	0.40	0.21				
Queue Length (ft)	0	1	0	0	0	0	0	0				
Control Delay (s)	0.0	10.3	0.0	0.0	0.0	8.8	0.0	0.0				
Lane LOS	A	B				A						
Approach Delay (s)	0.0	10.3	0.0			0.0						
Approach LOS	A	B										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			36.6%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free				Free
Grade		0%			0%			0%				0%
Volume (veh/h)	21	0	4	5	0	41	5	550	5	17	951	7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	24	0	5	6	0	47	6	625	6	19	1081	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1494	1765	544	1220	1764	312	1089			631		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1494	1765	544	1220	1764	312	1089			631		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	69	100	99	96	100	93	99			98		
cM capacity (veh/h)	78	81	483	132	81	683	637			948		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	28	6	47	214	417	6	19	720	368			
Volume Left	24	6	0	6	0	0	19	0	0			
Volume Right	5	0	47	0	0	6	0	0	8			
cSH	90	132	683	637	1700	1700	948	1700	1700			
Volume to Capacity	0.32	0.04	0.07	0.01	0.25	0.00	0.02	0.42	0.22			
Queue Length (ft)	30	3	5	1	0	0	2	0	0			
Control Delay (s)	62.8	33.5	10.7	0.4	0.0	0.0	8.9	0.0	0.0			
Lane LOS	F	D	B	A			A					
Approach Delay (s)	62.8	13.1		0.1			0.2					
Approach LOS	F	B										
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization			44.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	560	0	0	963	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	0	0	0	0	636	0	0	1094	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1412	1731	547	1184	1731	318	1094			636		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1412	1731	547	1184	1731	318	1094			636		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	98	87	481	145	87	678	633			943		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	0	0	318	318	547	547						
Volume Left	0	0	0	0	0	0						
Volume Right	0	0	0	0	0	0						
cSH	1700	1700	633	1700	943	1700						
Volume to Capacity	0.00	0.00	0.00	0.19	0.00	0.32						
Queue Length (ft)	0	0	0	0	0	0						
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0	0.0								
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			31.4%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Sign Control	Stop			Free	Free			
Grade	0%			0%	0%			
Volume (veh/h)	20	6	9	540	897	66		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88		
Hourly flow rate (vph)	23	7	10	614	1019	75		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type	None							
Median storage veh)								
Upstream signal (ft)								
pX, platoon unblocked								
vC, conflicting volume	1347	510	1094					
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	1347	510	1094					
tC, single (s)	6.8	6.9	4.1					
tC, 2 stage (s)								
tF (s)	3.5	3.3	2.2					
p0 queue free %	84	99	98					
cM capacity (veh/h)	140	509	633					
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	23	7	10	307	307	510	510	75
Volume Left	23	0	10	0	0	0	0	0
Volume Right	0	7	0	0	0	0	0	75
cSH	140	509	633	1700	1700	1700	1700	1700
Volume to Capacity	0.16	0.01	0.02	0.18	0.18	0.30	0.30	0.04
Queue Length (ft)	14	1	1	0	0	0	0	0
Control Delay (s)	35.6	12.2	10.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	B	B					
Approach Delay (s)	30.2		0.2				0.0	
Approach LOS	D							
Intersection Summary								
Average Delay			0.6					
Intersection Capacity Utilization			36.2%	ICU Level of Service	A			
Analysis Period (min)			15					

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1680		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.52	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1680		925	3353	1500	706	3353	1500
Volume (vph)	323	122	132	104	55	26	127	492	136	11	347	52
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	351	133	143	113	60	28	138	535	148	12	377	57
RTOR Reduction (vph)	0	0	105	0	24	0	0	0	95	0	0	37
Lane Group Flow (vph)	351	133	38	113	64	0	138	535	53	12	377	20
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	13.9	13.9	13.9	7.4	7.4		18.6	18.6	18.6	18.6	18.6	18.6
Effective Green, g (s)	13.9	13.9	13.9	7.4	7.4		18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.27	0.27	0.27	0.14	0.14		0.36	0.36	0.36	0.36	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	449	473	402	239	240		332	1202	538	253	1202	538
v/s Ratio Prot	c0.21	0.08		c0.07	0.05			c0.16				0.11
v/s Ratio Perm			0.10				0.15		0.10	0.02		0.04
v/c Ratio	0.78	0.28	0.10	0.47	0.27		0.42	0.45	0.10	0.05	0.31	0.04
Uniform Delay, d1	17.6	15.0	14.3	20.5	19.8		12.6	12.7	11.1	10.9	12.0	10.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.6	0.3	0.1	1.5	0.6		3.8	1.2	0.4	0.4	0.7	0.1
Delay (s)	26.2	15.4	14.4	21.9	20.4		16.4	13.9	11.4	11.2	12.7	11.0
Level of Service	C	B	B	C	C		B	B	B	B	B	B
Approach Delay (s)		21.2		21.3			13.9				12.5	
Approach LOS		C		C			B				B	
Intersection Summary												
HCM Average Control Delay			16.5	HCM Level of Service				B				
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			51.9	Sum of lost time (s)				12.0				
Intersection Capacity Utilization			54.6%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	0	5	7	0	8	2	744	4	56	515	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
Hourly flow rate (vph)	3	0	5	8	0	9	2	809	4	61	560	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1105	1505	286	1220	1508	404	573			813		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1105	1505	286	1220	1508	404	573			813		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	94	100	99	100			92		
cM capacity (veh/h)	153	111	710	127	110	596	996			810		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	9	8	9	272	539	4	61	373	200			
Volume Left	3	8	0	2	0	0	61	0	0			
Volume Right	5	0	9	0	0	4	0	0	13			
cSH	300	127	596	996	1700	1700	810	1700	1700			
Volume to Capacity	0.03	0.06	0.01	0.00	0.32	0.00	0.08	0.22	0.12			
Queue Length (ft)	2	5	1	0	0	0	6	0	0			
Control Delay (s)	17.3	35.1	11.1	0.1	0.0	0.0	9.8	0.0	0.0			
Lane LOS	C	E	B	A			A					
Approach Delay (s)	17.3	22.3		0.0			0.9					
Approach LOS	C	C										
Intersection Summary												
Average Delay				0.8								
Intersection Capacity Utilization			50.6%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	750	0	0	524	0	
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	
Hourly flow rate (vph)	0	0	0	0	0	0	0	815	0	0	570	0	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type		None			None								
Median storage veh													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	977	1385	285	1100	1385	408	570			815			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	977	1385	285	1100	1385	408	570			815			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	100	100	100	100	100	100	100			100			
cM capacity (veh/h)	205	142	712	167	142	593	999			808			
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	0	0	408	408	285	285							
Volume Left	0	0	0	0	0	0							
Volume Right	0	0	0	0	0	0							
cSH	1700	1700	999	1700	808	1700							
Volume to Capacity	0.00	0.00	0.00	0.24	0.00	0.17							
Queue Length (ft)	0	0	0	0	0	0							
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0							
Lane LOS	A	A											
Approach Delay (s)	0.0	0.0	0.0	0.0									
Approach LOS	A	A											
Intersection Summary													
Average Delay			0.0										
Intersection Capacity Utilization			25.2%		ICU Level of Service								A
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop		Stop		Free		Free						
Grade	0%		0%		0%		0%						
Volume (veh/h)	103	11	15	44	4	138	1	509	58	126	378	20	
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	
Hourly flow rate (vph)	112	12	16	48	4	150	1	553	63	137	411	22	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage veh													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1116	1303	205	1057	1262	277	433			616			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1116	1303	205	1057	1262	277	433			616			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	0	91	98	67	97	79	100			86			
cM capacity (veh/h)	112	136	801	146	144	721	1123			960			
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	
Volume Total	112	28	48	4	150	1	277	277	63	137	205	205	
Volume Left	112	0	48	0	0	1	0	0	0	137	0	0	
Volume Right	0	16	0	0	150	0	0	0	63	0	0	0	
cSH	112	262	146	144	721	1123	1700	1700	1700	960	1700	1700	
Volume to Capacity	1.00	0.11	0.33	0.03	0.21	0.00	0.16	0.16	0.04	0.14	0.12	0.12	
Queue Length (ft)	162	9	33	2	19	0	0	0	0	12	0	0	
Control Delay (s)	157.9	20.4	41.2	30.7	11.3	8.2	0.0	0.0	0.0	9.4	0.0	0.0	
Lane LOS	F	C	E	D	B	A					A		
Approach Delay (s)	130.2		18.8		0.0						2.3		
Approach LOS	F		C										
Intersection Summary													
Average Delay			15.3										
Intersection Capacity Utilization			44.9%		ICU Level of Service						A		
Analysis Period (min)			15										

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1600		1676	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.25	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1676	1600		1676	1765	1500	438	3353	1500	712	3353	1500
Volume (vph)	74	95	156	305	169	11	187	502	144	20	791	207
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	103	170	332	184	12	203	546	157	22	860	225
RTOR Reduction (vph)	0	67	0	0	0	10	0	0	79	0	0	113
Lane Group Flow (vph)	80	206	0	332	184	2	203	546	78	22	860	112
Turn Type	Split		Split		Perm	Perm		Perm	Perm		Perm	Perm
Protected Phases	4	4		8	8			2			6	
Permitted Phases						8	2		2	6		6
Actuated Green, G (s)	14.1	14.1		18.0	18.0	18.0	44.0	44.0	44.0	44.0	44.0	44.0
Effective Green, g (s)	14.1	14.1		18.0	18.0	18.0	44.0	44.0	44.0	44.0	44.0	44.0
Actuated g/C Ratio	0.16	0.16		0.20	0.20	0.20	0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	268	256		342	361	306	219	1675	749	356	1675	749
v/s Ratio Prot	0.05	c0.17		c0.20	0.10			0.16			0.26	
v/s Ratio Perm						0.01	c0.46		0.10	0.03		0.15
v/c Ratio	0.30	0.80		0.97	0.51	0.01	0.93	0.33	0.10	0.06	0.51	0.15
Uniform Delay, d1	32.6	35.7		34.8	31.1	27.9	20.6	13.2	11.6	11.4	14.8	11.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	16.5		40.7	1.1	0.0	44.4	0.5	0.3	0.3	1.1	0.4
Delay (s)	33.3	52.2		75.5	32.3	27.9	64.9	13.7	11.9	11.7	16.0	12.4
Level of Service	C	D		E	C	C	E	B	B	B	B	B
Approach Delay (s)		47.9			59.3			24.9			15.2	
Approach LOS		D			E			C			B	
Intersection Summary												
HCM Average Control Delay			30.2									HCM Level of Service C
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			88.1									Sum of lost time (s) 12.0
Intersection Capacity Utilization			80.6%									ICU Level of Service D
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis
 9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free				Free
Grade		0%			0%			0%				0%
Volume (veh/h)	21	0	4	5	0	41	5	771	5	17	1228	7
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
Hourly flow rate (vph)	23	0	4	5	0	45	5	838	5	18	1335	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1850	2230	671	1558	2228	419	1342			843		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1850	2230	671	1558	2228	419	1342			843		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	45	100	99	93	100	92	99			98		
cM capacity (veh/h)	41	41	399	74	41	583	509			788		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	27	5	45	285	559	5	18	890	453			
Volume Left	23	5	0	5	0	0	18	0	0			
Volume Right	4	0	45	0	0	5	0	0	8			
cSH	48	74	583	509	1700	1700	788	1700	1700			
Volume to Capacity	0.56	0.07	0.08	0.01	0.33	0.00	0.02	0.52	0.27			
Queue Length (ft)	53	6	6	1	0	0	2	0	0			
Control Delay (s)	150.4	57.8	11.7	0.4	0.0	0.0	9.7	0.0	0.0			
Lane LOS	F	F	B	A			A					
Approach Delay (s)	150.4	16.7		0.1			0.1					
Approach LOS	F	C										
Intersection Summary												
Average Delay				2.3								
Intersection Capacity Utilization			52.7%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	0	0	781	0	0	1240	0
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	849	0	0	1348	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1772	2197	674	1523	2197	424	1348			849		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1772	2197	674	1523	2197	424	1348			849		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	53	44	397	81	44	578	507			785		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	0	0	424	424	674	674						
Volume Left	0	0	0	0	0	0						
Volume Right	0	0	0	0	0	0						
cSH	1700	1700	507	1700	785	1700						
Volume to Capacity	0.00	0.00	0.00	0.25	0.00	0.40						
Queue Length (ft)	0	0	0	0	0	0						
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0		0.0							
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			39.5%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop		Stop		Free		Free						
Grade	0%		0%		0%		0%						
Volume (veh/h)	20	8	6	164	16	226	9	535	100	279	886	75	
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	
Hourly flow rate (vph)	22	9	7	178	17	246	10	582	109	303	963	82	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	2134	2279	482	1700	2252	291	1045			690			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	2134	2279	482	1700	2252	291	1045			690			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	0	66	99	0	35	65	99			66			
cM capacity (veh/h)	7	26	531	32	27	706	662			900			
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	
Volume Total	22	15	178	17	246	10	291	291	109	303	482	482	
Volume Left	22	0	178	0	0	10	0	0	0	303	0	0	
Volume Right	0	7	0	0	246	0	0	0	109	0	0	0	
cSH	7	43	32	27	706	662	1700	1700	1700	900	1700	1700	
Volume to Capacity	3.28	0.35	5.51	0.65	0.35	0.01	0.17	0.17	0.06	0.34	0.28	0.28	
Queue Length (ft)	Err	30	Err	51	39	1	0	0	0	37	0	0	
Control Delay (s)	Err	127.3	Err	274.2	12.8	10.5	0.0	0.0	0.0	11.0	0.0	0.0	
Lane LOS	F	F	F	F	B	B					B		
Approach Delay (s)	5934.2		4056.9		0.1						2.5		
Approach LOS	F		F										
Intersection Summary													
Average Delay			796.9										
Intersection Capacity Utilization			58.2%		ICU Level of Service						B		
Analysis Period (min)			15										

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1680		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.52	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1680		919	3353	1500	720	3353	1500
Volume (vph)	323	122	132	104	55	26	127	492	136	11	347	52
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	351	133	143	113	60	28	138	535	148	12	377	57
RTOR Reduction (vph)	0	0	107	0	24	0	0	0	86	0	0	33
Lane Group Flow (vph)	351	133	36	113	64	0	138	535	62	12	377	24
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	15.1	15.1	15.1	7.9	7.9		25.0	25.0	25.0	25.0	25.0	25.0
Effective Green, g (s)	15.1	15.1	15.1	7.9	7.9		25.0	25.0	25.0	25.0	25.0	25.0
Actuated g/C Ratio	0.25	0.25	0.25	0.13	0.13		0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	444	378	221	221		383	1397	625	300	1397	625
v/s Ratio Prot	c0.21	0.08		c0.07	0.05			c0.16				0.11
v/s Ratio Perm			0.10				0.15		0.10	0.02		0.04
v/c Ratio	0.83	0.30	0.10	0.51	0.29		0.36	0.38	0.10	0.04	0.27	0.04
Uniform Delay, d1	21.2	18.2	17.2	24.3	23.5		12.0	12.1	10.6	10.4	11.5	10.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.54	0.54	0.25	1.00	1.00	1.00
Incremental Delay, d2	13.1	0.4	0.1	2.0	0.7		2.5	0.8	0.3	0.2	0.5	0.1
Delay (s)	34.3	18.6	17.3	26.2	24.2		9.1	7.3	2.9	10.6	12.0	10.5
Level of Service	C	B	B	C	C		A	A	A	B	B	B
Approach Delay (s)		27.1			25.4			6.8			11.8	
Approach LOS		C			C			A			B	
Intersection Summary												
HCM Average Control Delay			15.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			60.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			54.6%				ICU Level of Service		A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Volume (veh/h)	3	0	5	7	0	8	2	744	4	56	515	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
Hourly flow rate (vph)	3	0	5	8	0	9	2	809	4	61	560	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1105	1505	286	1220	1508	404	573			813		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1105	1505	286	1220	1508	404	573			813		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	94	100	99	100			92		
cM capacity (veh/h)	153	111	710	127	110	596	996			810		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	9	8	9	272	539	4	61	373	200			
Volume Left	3	8	0	2	0	0	61	0	0			
Volume Right	5	0	9	0	0	4	0	0	13			
cSH	300	127	596	996	1700	1700	810	1700	1700			
Volume to Capacity	0.03	0.06	0.01	0.00	0.32	0.00	0.08	0.22	0.12			
Queue Length (ft)	2	5	1	0	0	0	6	0	0			
Control Delay (s)	17.3	35.1	11.1	0.1	0.0	0.0	9.8	0.0	0.0			
Lane LOS	C	E	B	A			A					
Approach Delay (s)	17.3	22.3		0.0			0.9					
Approach LOS	C	C										
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			50.6%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	750	0	0	524	0
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	815	0	0	570	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	977	1385	285	1100	1385	408	570			815		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	977	1385	285	1100	1385	408	570			815		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	205	142	712	167	142	593	999			808		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	0	0	543	272	380	190						
Volume Left	0	0	0	0	0	0						
Volume Right	0	0	0	0	0	0						
cSH	1700	1700	1700	1700	1700	1700						
Volume to Capacity	0.00	0.00	0.32	0.16	0.22	0.11						
Queue Length (ft)	0	0	0	0	0	0						
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0						
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0	0.0								
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			25.2%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1676	1613		1676	1765	1500	1676	3353	1500	1676	3353	1500	
Flt Permitted	0.76	1.00		0.49	1.00	1.00	0.51	1.00	1.00	0.40	1.00	1.00	
Satd. Flow (perm)	1333	1613		861	1765	1500	902	3353	1500	708	3353	1500	
Volume (vph)	103	11	15	44	4	138	1	509	58	126	378	20	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	112	12	16	48	4	150	1	553	63	137	411	22	
RTOR Reduction (vph)	0	15	0	0	0	130	0	0	37	0	0	11	
Lane Group Flow (vph)	112	13	0	48	4	21	1	553	26	137	411	11	
Turn Type	pm+pt			pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases	4			8		8	2		2	6		6	
Actuated Green, G (s)	9.6	5.3		15.4	8.2	8.2	25.4	24.6	24.6	35.5	30.7	30.7	
Effective Green, g (s)	9.6	5.3		15.4	8.2	8.2	25.4	24.6	24.6	35.5	30.7	30.7	
Actuated g/C Ratio	0.16	0.09		0.26	0.14	0.14	0.42	0.41	0.41	0.59	0.51	0.51	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	238	142		319	241	205	392	1375	615	530	1716	768	
v/s Ratio Prot	c0.03	0.02		0.02	0.00		0.00	c0.16		c0.03	0.12		
v/s Ratio Perm	0.04			0.02		0.10	0.00		0.04	0.12		0.01	
v/c Ratio	0.47	0.09		0.15	0.02	0.10	0.00	0.40	0.04	0.26	0.24	0.01	
Uniform Delay, d1	22.7	25.1		17.1	22.4	22.7	10.0	12.5	10.6	7.5	8.2	7.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.46	0.37	
Incremental Delay, d2	1.5	0.3		0.2	0.0	0.2	0.0	0.9	0.1	0.3	0.3	0.0	
Delay (s)	24.2	25.4		17.4	22.4	22.9	10.0	13.4	10.8	4.0	4.1	2.7	
Level of Service	C	C		B	C	C	A	B	B	A	A	A	
Approach Delay (s)		24.4			21.6			13.1			4.0		
Approach LOS		C			C			B			A		
Intersection Summary													
HCM Average Control Delay			11.9									HCM Level of Service	B
HCM Volume to Capacity ratio			0.42										
Actuated Cycle Length (s)			60.0									Sum of lost time (s)	12.0
Intersection Capacity Utilization			44.9%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1748		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.25	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1748		438	3353	1500	711	3353	1500
Volume (vph)	74	95	156	305	169	11	187	502	144	20	791	207
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	103	170	332	184	12	203	546	157	22	860	225
RTOR Reduction (vph)	0	0	98	0	2	0	0	0	79	0	0	113
Lane Group Flow (vph)	80	103	72	332	194	0	203	546	79	22	860	113
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	10.7	10.7	10.7	22.3	22.3		45.0	45.0	45.0	45.0	45.0	45.0
Effective Green, g (s)	10.7	10.7	10.7	22.3	22.3		45.0	45.0	45.0	45.0	45.0	45.0
Actuated g/C Ratio	0.12	0.12	0.12	0.25	0.25		0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	199	210	178	415	433		219	1677	750	356	1677	750
v/s Ratio Prot	0.05	0.06		c0.20	0.11			0.16			0.26	
v/s Ratio Perm			0.11				c0.46		0.10	0.03		0.15
v/c Ratio	0.40	0.49	0.41	0.80	0.45		0.93	0.33	0.10	0.06	0.51	0.15
Uniform Delay, d1	36.7	37.1	36.7	31.8	28.6		21.0	13.4	11.9	11.6	15.1	12.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.64	0.49	0.29	1.00	1.00	1.00
Incremental Delay, d2	1.3	1.8	1.5	10.6	0.7		43.3	0.5	0.3	0.3	1.1	0.4
Delay (s)	38.0	38.9	38.2	42.3	29.4		56.8	7.1	3.7	11.9	16.3	12.6
Level of Service	D	D	D	D	C		E	A	A	B	B	B
Approach Delay (s)		38.4			37.5			17.6			15.4	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM Average Control Delay			22.9				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)				12.0	
Intersection Capacity Utilization			70.5%				ICU Level of Service				C	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

9: Addison Street & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free				Free
Grade		0%			0%			0%				0%
Volume (veh/h)	21	0	4	5	0	41	5	771	5	17	1228	7
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
Hourly flow rate (vph)	23	0	4	5	0	45	5	838	5	18	1335	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1850	2230	671	1558	2228	419	1342			843		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1850	2230	671	1558	2228	419	1342			843		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	45	100	99	93	100	92	99			98		
cM capacity (veh/h)	41	41	399	74	41	583	509			788		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3			
Volume Total	27	5	45	285	559	5	18	890	453			
Volume Left	23	5	0	5	0	0	18	0	0			
Volume Right	4	0	45	0	0	5	0	0	8			
cSH	48	74	583	509	1700	1700	788	1700	1700			
Volume to Capacity	0.56	0.07	0.08	0.01	0.33	0.00	0.02	0.52	0.27			
Queue Length (ft)	53	6	6	1	0	0	2	0	0			
Control Delay (s)	150.4	57.8	11.7	0.4	0.0	0.0	9.7	0.0	0.0			
Lane LOS	F	F	B	A			A					
Approach Delay (s)	150.4	16.7		0.1			0.1					
Approach LOS	F	C										
Intersection Summary												
Average Delay				2.3								
Intersection Capacity Utilization			52.7%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Volume (veh/h)	0	0	0	0	0	0	0	781	0	0	1240	0	
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	
Hourly flow rate (vph)	0	0	0	0	0	0	0	849	0	0	1348	0	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage veh													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1772	2197	674	1523	2197	424	1348			849			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1772	2197	674	1523	2197	424	1348			849			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	100	100	100	100	100	100	100			100			
cM capacity (veh/h)	53	44	397	81	44	578	507			785			
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	0	0	566	283	899	449							
Volume Left	0	0	0	0	0	0							
Volume Right	0	0	0	0	0	0							
cSH	1700	1700	1700	1700	1700	1700							
Volume to Capacity	0.00	0.00	0.33	0.17	0.53	0.26							
Queue Length (ft)	0	0	0	0	0	0							
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0							
Lane LOS	A	A											
Approach Delay (s)	0.0	0.0	0.0	0.0									
Approach LOS	A	A											
Intersection Summary													
Average Delay			0.0										
Intersection Capacity Utilization			39.5%		ICU Level of Service								A
Analysis Period (min)			15										

HCM Signalized Intersection Capacity Analysis

15: Moon Meadows & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1676	1649		1676	1765	1500	1676	3353	1500	1676	3353	1500	
Flt Permitted	1.00	1.00		0.71	1.00	1.00	0.24	1.00	1.00	0.38	1.00	1.00	
Satd. Flow (perm)	1765	1649		1261	1765	1500	420	3353	1500	671	3353	1500	
Volume (vph)	20	8	6	164	16	226	9	535	100	279	886	75	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	22	9	7	178	17	246	10	582	109	303	963	82	
RTOR Reduction (vph)	0	7	0	0	0	212	0	0	57	0	0	29	
Lane Group Flow (vph)	22	9	0	178	17	34	10	582	52	303	963	53	
Turn Type	pm+pt			pm+pt			Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6		6
Permitted Phases	4			8		8	2		2	6		6	
Actuated Green, G (s)	4.1	1.6		19.1	12.6	12.6	43.9	42.9	42.9	62.9	57.9	57.9	
Effective Green, g (s)	4.1	1.6		19.1	12.6	12.6	43.9	42.9	42.9	62.9	57.9	57.9	
Actuated g/C Ratio	0.05	0.02		0.21	0.14	0.14	0.49	0.48	0.48	0.70	0.64	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	78	29		330	247	210	219	1598	715	648	2157	965	
v/s Ratio Prot	0.01	0.01		c0.08	0.01		0.00	0.17		c0.08	0.29		
v/s Ratio Perm	0.01			0.03		0.16	0.02		0.07	c0.24		0.05	
v/c Ratio	0.28	0.31		0.54	0.07	0.16	0.05	0.36	0.07	0.47	0.45	0.05	
Uniform Delay, d1	41.5	43.7		31.3	33.6	34.1	16.9	14.9	12.8	9.9	8.0	5.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.54	0.16	
Incremental Delay, d2	2.0	6.1		1.7	0.1	0.4	0.1	0.6	0.2	0.4	0.6	0.1	
Delay (s)	43.5	49.8		33.0	33.7	34.4	17.0	15.6	13.0	5.4	4.9	1.0	
Level of Service	D	D		C	C	C	B	B	B	A	A	A	
Approach Delay (s)		46.2			33.8			15.2			4.8		
Approach LOS		D			C			B			A		
Intersection Summary													
HCM Average Control Delay			13.3									HCM Level of Service	B
HCM Volume to Capacity ratio			0.59										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	12.0
Intersection Capacity Utilization			58.2%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1579		1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.28	1.00	1.00	0.20	1.00	1.00
Satd. Flow (perm)	1676	1765	1500	1676	1579		494	3353	1500	360	3353	1500
Volume (vph)	257	155	138	285	94	222	150	905	406	168	731	104
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	168	150	310	102	241	163	984	441	183	795	113
RTOR Reduction (vph)	0	0	109	0	81	0	0	0	216	0	0	55
Lane Group Flow (vph)	279	168	41	310	262	0	163	984	225	183	795	58
Turn Type	Split		Perm	Split			Perm		Perm	Perm		Perm
Protected Phases	4	4		8	8			2				6
Permitted Phases			4				2		2	6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		46.0	46.0	46.0	46.0	46.0	46.0
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		46.0	46.0	46.0	46.0	46.0	46.0
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.51	0.51	0.51	0.51	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	298	314	267	298	281		252	1714	767	184	1714	767
v/s Ratio Prot	c0.17	0.10		0.18	c0.22			0.29			0.24	
v/s Ratio Perm			0.10				0.33		0.29	c0.51		0.08
v/c Ratio	0.94	0.54	0.16	1.04	0.93		0.65	0.57	0.29	0.99	0.46	0.08
Uniform Delay, d1	36.5	33.6	31.3	37.0	36.5		16.1	15.2	12.7	21.9	14.1	11.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	35.3	1.8	0.3	63.0	36.2		12.2	1.4	1.0	65.0	0.9	0.2
Delay (s)	71.8	35.4	31.6	100.0	72.7		28.2	16.6	13.6	86.8	15.0	11.4
Level of Service	E	D	C	F	E		C	B	B	F	B	B
Approach Delay (s)		51.4			85.7			17.0			26.7	
Approach LOS		D			F			B			C	
Intersection Summary												
HCM Average Control Delay		36.3			HCM Level of Service			D				
HCM Volume to Capacity ratio		1.03										
Actuated Cycle Length (s)		90.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		84.2%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

5: Catron Blvd & US 16 Rearage Road

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	59	465	201	35	369	9	77	51	15	20	127	146
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
Hourly flow rate (vph)	64	505	218	38	401	10	84	55	16	22	138	159
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)		1201										
pX, platoon unblocked												
vC, conflicting volume	411			724			1453	1230	362	907	1334	406
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	411			724			1453	1230	362	907	1334	406
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			96			0	65	97	86	0	73
cM capacity (veh/h)	1144			874			0	159	635	153	138	594
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	317	471	449	84	72	22	297					
Volume Left	64	0	38	84	0	22	0					
Volume Right	0	218	10	0	16	0	159					
cSH	1144	1700	874	0	192	153	234					
Volume to Capacity	0.06	0.28	0.04	Err	0.37	0.14	1.27					
Queue Length (ft)	4	0	3	Err	40	12	380					
Control Delay (s)	2.1	0.0	1.3	Err	34.6	32.5	192.6					
Lane LOS	A		A	F	D	D	F					
Approach Delay (s)	0.9		1.3	Err		181.6						
Approach LOS				F		F						
Intersection Summary												
Average Delay				Err								
Intersection Capacity Utilization			79.6%		ICU Level of Service			D				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control	Stop			Stop				Free			Free		
Grade	0%			0%				0%			0%		
Volume (veh/h)	0	0	7	0	0	81	0	1383	26	0	1144	16	
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	
Hourly flow rate (vph)	0	0	8	0	0	88	0	1503	28	0	1243	17	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None			None									
Median storage veh													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	2092	2784	630	2147	2778	766	1261			1532			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	2092	2784	630	2147	2778	766	1261			1532			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	100	100	98	100	100	75	100			100			
cM capacity (veh/h)	22	19	424	27	19	345	547			431			
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	8	88	752	780	622	639							
Volume Left	0	0	0	0	0	0							
Volume Right	8	88	0	28	0	17							
cSH	424	345	547	1700	431	1700							
Volume to Capacity	0.02	0.25	0.00	0.46	0.00	0.38							
Queue Length (ft)	1	25	0	0	0	0							
Control Delay (s)	13.6	18.9	0.0	0.0	0.0	0.0							
Lane LOS	B	C											
Approach Delay (s)	13.6	18.9	0.0	0.0									
Approach LOS	B	C											
Intersection Summary													
Average Delay			0.6										
Intersection Capacity Utilization			53.2%			ICU Level of Service						A	
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis

15: Moon Meadows & US 16

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Sign Control	Stop		Stop		Free			Free						
Grade	0%		0%		0%			0%						
Volume (veh/h)	568	27	105	31	11	100	57	760	23	284	610	264		
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		
Hourly flow rate (vph)	617	29	114	34	12	109	62	826	25	309	663	287		
Pedestrians														
Lane Width (ft)														
Walking Speed (ft/s)														
Percent Blockage														
Right turn flare (veh)														
Median type	None			None										
Median storage (veh)														
Upstream signal (ft)														
pX, platoon unblocked														
vC, conflicting volume	1932	2255	332	2028	2517	413	950			851				
vC1, stage 1 conf vol														
vC2, stage 2 conf vol														
vCu, unblocked vol	1932	2255	332	2028	2517	413	950			851				
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1				
tC, 2 stage (s)														
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2				
p0 queue free %	0	0	83	0	22	82	91			61				
cM capacity (veh/h)	8	23	664	0	15	588	719			783				
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3		
Volume Total	617	143	34	12	109	62	413	413	25	309	332	332		
Volume Left	617	0	34	0	0	62	0	0	0	309	0	0		
Volume Right	0	114	0	0	109	0	0	0	25	0	0	0		
cSH	8	97	0	15	588	719	1700	1700	1700	783	1700	1700		
Volume to Capacity	76.47	1.47	Err	0.78	0.18	0.09	0.24	0.24	0.01	0.39	0.20	0.20		
Queue Length (ft)	Err	269	Err	48	17	7	0	0	0	47	0	0		
Control Delay (s)	Err	337.4	Err	482.5	12.5	10.5	0.0	0.0	0.0	12.6	0.0	0.0		
Lane LOS	F	F	F	F	B	B				B				
Approach Delay (s)	8177.1		Err			0.7				3.1				
Approach LOS	F		F											
Intersection Summary														
Average Delay			Err											
Intersection Capacity Utilization			88.7%			ICU Level of Service			E					
Analysis Period (min)			15											

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1676	1765	1500		1705	1500	1676	3353	1500	1676	3353	1500	
Flt Permitted	0.95	1.00	1.00		0.97	1.00	0.08	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1676	1765	1500		1705	1500	150	3353	1500	1676	3353	1500	
Volume (vph)	148	176	225	617	268	320	190	1239	479	361	1408	267	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	161	191	245	671	291	348	207	1347	521	392	1530	290	
RTOR Reduction (vph)	0	0	24	0	0	96	0	0	194	0	0	95	
Lane Group Flow (vph)	161	191	221	0	962	252	207	1347	327	392	1530	195	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Prot		Perm	
Protected Phases	4	4		8	8			2		1		6	
Permitted Phases			4			8	2		2			6	
Actuated Green, G (s)	17.0	17.0	17.0		38.0	38.0	65.0	65.0	65.0	14.0	83.0	83.0	
Effective Green, g (s)	17.0	17.0	17.0		38.0	38.0	65.0	65.0	65.0	14.0	83.0	83.0	
Actuated g/C Ratio	0.11	0.11	0.11		0.25	0.25	0.43	0.43	0.43	0.09	0.55	0.55	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	190	200	170		432	380	65	1453	650	156	1855	830	
v/s Ratio Prot	0.10	0.11			c0.56			0.40		c0.23	0.46		
v/s Ratio Perm			0.16			0.23	c1.38		0.35			0.19	
v/c Ratio	0.85	0.95	1.30		2.23	0.66	3.18	0.93	0.50	2.51	0.82	0.23	
Uniform Delay, d1	65.2	66.1	66.5		56.0	50.3	42.5	40.3	30.8	68.0	27.5	17.2	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	27.8	50.4	171.3		559.5	4.3	1021.9	11.6	2.8	699.4	4.3	0.7	
Delay (s)	93.1	116.5	237.8		615.5	54.6	1064.4	51.9	33.6	767.4	31.9	17.9	
Level of Service	F	F	F		F	D	F	D	C	F	C	B	
Approach Delay (s)		160.0			466.5			148.3			160.4		
Approach LOS		F			F			F			F		
Intersection Summary													
HCM Average Control Delay			221.0									HCM Level of Service	F
HCM Volume to Capacity ratio			2.62										
Actuated Cycle Length (s)			150.0									Sum of lost time (s)	16.0
Intersection Capacity Utilization			131.3%									ICU Level of Service	H
Analysis Period (min)			15										
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis

5: Catron Blvd & US 16 Rearage Road

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	187	588	223	49	754	28	321	229	66	20	167	118
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
Hourly flow rate (vph)	203	639	242	53	820	30	349	249	72	22	182	128
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)		1201										
pX, platoon unblocked												
vC, conflicting volume	850			882			2327	2123	441	1864	2229	835
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	850			882			2327	2123	441	1864	2229	835
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	74			93			0	0	87	0	0	59
cM capacity (veh/h)	784			763			0	34	564	0	29	311
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	523	562	903	349	321	22	310					
Volume Left	203	0	53	349	0	22	0					
Volume Right	0	242	30	0	72	0	128					
cSH	784	1700	763	0	43	0	47					
Volume to Capacity	0.26	0.33	0.07	Err	7.43	Err	6.63					
Queue Length (ft)	26	0	6	Err	Err	Err	Err					
Control Delay (s)	6.5	0.0	1.9	Err	Err	Err	Err					
Lane LOS	A		A	F	F	F	F					
Approach Delay (s)	3.1		1.9	Err		Err						
Approach LOS				F		F						
Intersection Summary												
Average Delay				Err								
Intersection Capacity Utilization			125.9%		ICU Level of Service			H				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Free			Free	
Grade	0%			0%				0%			0%	
Volume (veh/h)	0	0	16	0	0	247	0	1673	40	0	2225	34
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
Hourly flow rate (vph)	0	0	17	0	0	268	0	1818	43	0	2418	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3615	4299	1228	3067	4296	931	2455				1862	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3615	4299	1228	3067	4296	931	2455				1862	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	0	100	90	100	100	0	100				100	
cM capacity (veh/h)	0	2	170	5	2	268	187				320	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	17	268	1212	650	1612	843						
Volume Left	0	0	0	0	0	0						
Volume Right	17	268	0	43	0	37						
cSH	170	268	1700	1700	1700	1700						
Volume to Capacity	0.10	1.00	0.71	0.38	0.95	0.50						
Queue Length (ft)	8	251	0	0	0	0						
Control Delay (s)	28.6	96.1	0.0	0.0	0.0	0.0						
Lane LOS	D	F										
Approach Delay (s)	28.6	96.1	0.0	0.0								
Approach LOS	D	F										
Intersection Summary												
Average Delay			5.7									
Intersection Capacity Utilization			76.1%			ICU Level of Service			D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop		Stop		Free		Free					
Grade	0%		0%		0%		0%					
Volume (veh/h)	504	44	95	95	60	266	163	979	38	430	1127	735
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
Hourly flow rate (vph)	548	48	103	103	65	289	177	1064	41	467	1225	799
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3368	3620	612	3093	4377	532	2024			1105		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3368	3620	612	3093	4377	532	2024			1105		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	76	0	0	41	36			25		
cM capacity (veh/h)	0	0	436	0	0	492	277			627		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	548	151	103	65	289	177	532	532	41	467	612	612
Volume Left	548	0	103	0	0	177	0	0	0	467	0	0
Volume Right	0	103	0	0	289	0	0	0	41	0	0	0
cSH	0	1	0	0	492	277	1700	1700	1700	627	1700	1700
Volume to Capacity	Err	101.65	Err	457.50	0.59	0.64	0.31	0.31	0.02	0.75	0.36	0.36
Queue Length (ft)	Err	Err	Err	Err	93	101	0	0	0	165	0	0
Control Delay (s)	Err	Err	Err	Err	22.2	38.5	0.0	0.0	0.0	25.6	0.0	0.0
Lane LOS	F	F	F	F	C	E				D		
Approach Delay (s)	Err	Err		5.3		4.8						
Approach LOS	F	F										
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			99.9%		ICU Level of Service						F	
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500	
Volume (vph)	257	155	138	285	94	222	150	905	406	168	731	104	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	279	168	150	310	102	241	163	984	441	183	795	113	
RTOR Reduction (vph)	0	0	37	0	0	27	0	0	130	0	0	54	
Lane Group Flow (vph)	279	168	113	310	102	214	163	984	311	183	795	59	
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7	
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	11.4	12.0	19.0	12.0	12.6	19.4	7.0	28.2	40.2	6.8	28.0	39.4	
Effective Green, g (s)	11.4	12.0	19.0	12.0	12.6	19.4	7.0	28.2	40.2	6.8	28.0	39.4	
Actuated g/C Ratio	0.15	0.16	0.25	0.16	0.17	0.26	0.09	0.38	0.54	0.09	0.37	0.53	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	494	282	460	520	297	468	304	1261	804	295	1252	788	
v/s Ratio Prot	0.09	c0.10	0.03	0.10	0.06	c0.05	0.05	c0.29	0.09	0.06	c0.24	0.02	
v/s Ratio Perm			0.07			0.11			0.21			0.05	
v/c Ratio	0.56	0.60	0.24	0.60	0.34	0.46	0.54	0.78	0.39	0.62	0.63	0.08	
Uniform Delay, d1	29.5	29.2	22.3	29.2	27.5	23.4	32.5	20.7	10.2	32.9	19.3	8.8	
Progression Factor	1.00	1.00	1.00	0.51	0.47	0.36	0.72	0.63	1.01	1.00	1.00	1.00	
Incremental Delay, d2	1.5	3.4	0.3	1.8	0.7	0.7	1.2	3.3	0.2	4.0	2.5	0.0	
Delay (s)	31.0	32.6	22.6	16.8	13.8	9.2	24.7	16.3	10.5	36.9	21.8	8.8	
Level of Service	C	C	C	B	B	A	C	B	B	D	C	A	
Approach Delay (s)		29.3			13.5			15.5			23.0		
Approach LOS		C			B			B			C		
Intersection Summary													
HCM Average Control Delay			19.4									HCM Level of Service	B
HCM Volume to Capacity ratio			0.66										
Actuated Cycle Length (s)			75.0									Sum of lost time (s)	12.0
Intersection Capacity Utilization			62.0%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
 5: Catron Blvd & US 16 Rearage Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	3353	1500	1676	3341		3252	1765	1500	1676	1765	1500
Flt Permitted	0.38	1.00	1.00	0.29	1.00		0.95	1.00	1.00	0.72	1.00	1.00
Satd. Flow (perm)	677	3353	1500	509	3341		3252	1765	1500	1273	1765	1500
Volume (vph)	59	465	201	35	369	9	77	51	15	20	127	146
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	505	218	38	401	10	84	55	16	22	138	159
RTOR Reduction (vph)	0	0	171	0	3	0	0	0	5	0	0	73
Lane Group Flow (vph)	64	505	47	38	408	0	84	55	11	22	138	86
Turn Type	Perm		Perm	Perm			Prot		Perm	Perm		Perm
Protected Phases		4			8		5	2				6
Permitted Phases	4		4	8					2	6		6
Actuated Green, G (s)	16.2	16.2	16.2	16.2	16.2		6.1	50.8	50.8	40.7	40.7	40.7
Effective Green, g (s)	16.2	16.2	16.2	16.2	16.2		6.1	50.8	50.8	40.7	40.7	40.7
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.08	0.68	0.68	0.54	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	724	324	110	722		264	1195	1016	691	958	814
v/s Ratio Prot		c0.15			0.12		c0.03	0.03				0.08
v/s Ratio Perm	0.09		0.15	0.07					0.01	0.02		0.11
v/c Ratio	0.44	0.70	0.15	0.35	0.56		0.32	0.05	0.01	0.03	0.14	0.11
Uniform Delay, d1	25.5	27.1	23.8	24.9	26.3		32.5	4.0	3.9	8.0	8.5	8.3
Progression Factor	0.97	0.99	1.43	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.6	0.2	1.9	1.0		0.7	0.1	0.0	0.1	0.3	0.3
Delay (s)	26.5	29.3	34.1	26.8	27.3		33.2	4.1	4.0	8.1	8.8	8.6
Level of Service	C	C	C	C	C		C	A	A	A	A	A
Approach Delay (s)		30.4			27.2			19.8				8.7
Approach LOS		C			C			B				A
Intersection Summary												
HCM Average Control Delay			24.6			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.34									
Actuated Cycle Length (s)			75.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			40.6%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	0	0	0	0	1464	26	0	1144	16
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	1591	28	0	1243	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2039	2863	622	2213	2852	796	1261			1620		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2039	2863	622	2213	2852	796	1261			1620		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	33	16	430	24	17	330	547			398		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	0	0	796	796	28	622	622	17				
Volume Left	0	0	0	0	0	0	0	0				
Volume Right	0	0	0	0	28	0	0	17				
cSH	1700	1700	1700	1700	1700	1700	1700	1700				
Volume to Capacity	0.00	0.00	0.47	0.47	0.02	0.37	0.37	0.01				
Queue Length (ft)	0	0	0	0	0	0	0	0				
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0					0.0				
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			46.1%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 		 	 		 	 	 	 	 	 	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Volume (vph)	568	27	112	31	11	181	57	760	23	284	603	264
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	617	29	122	34	12	197	62	826	25	309	655	287
RTOR Reduction (vph)	0	0	104	0	0	0	0	0	14	0	0	81
Lane Group Flow (vph)	617	29	18	34	12	197	62	826	11	309	655	206
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	16.1	10.9	10.9	6.6	1.4	17.8	3.7	25.1	31.7	16.4	37.8	53.9
Effective Green, g (s)	16.1	10.9	10.9	6.6	1.4	17.8	3.7	25.1	31.7	16.4	37.8	53.9
Actuated g/C Ratio	0.21	0.15	0.15	0.09	0.02	0.24	0.05	0.33	0.42	0.22	0.50	0.72
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	698	257	218	286	33	436	160	1122	634	711	1690	1078
v/s Ratio Prot	c0.19	0.02		0.01	0.01	c0.10	0.02	c0.25	0.00	0.10	0.20	0.06
v/s Ratio Perm			0.08			0.03			0.01			0.13
v/c Ratio	0.88	0.11	0.08	0.12	0.36	0.45	0.39	0.74	0.02	0.43	0.39	0.19
Uniform Delay, d1	28.5	27.8	27.7	31.5	36.4	24.4	34.6	22.0	12.6	25.3	11.5	3.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.71	0.49	2.18
Incremental Delay, d2	12.8	0.2	0.2	0.2	6.7	0.7	1.6	4.3	0.0	0.4	0.6	0.1
Delay (s)	41.3	28.0	27.9	31.7	43.1	25.2	36.1	26.3	12.6	18.2	6.2	7.6
Level of Service	D	C	C	C	D	C	D	C	B	B	A	A
Approach Delay (s)		38.7			27.0			26.6			9.5	
Approach LOS		D			C			C			A	
Intersection Summary												
HCM Average Control Delay			22.8	HCM Level of Service				C				
HCM Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			75.0	Sum of lost time (s)				12.0				
Intersection Capacity Utilization			64.5%	ICU Level of Service				C				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Catron Blvd & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 			 			 	 		 	 	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Volume (vph)	148	176	225	617	287	424	171	1135	479	361	1408	267
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	161	191	245	671	312	461	186	1234	521	392	1530	290
RTOR Reduction (vph)	0	0	6	0	0	12	0	0	51	0	0	94
Lane Group Flow (vph)	161	191	239	671	312	449	186	1234	470	392	1530	196
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	11.4	14.3	21.6	19.0	21.9	33.9	7.3	38.7	57.7	12.0	43.4	54.8
Effective Green, g (s)	11.4	14.3	21.6	19.0	21.9	33.9	7.3	38.7	57.7	12.0	43.4	54.8
Actuated g/C Ratio	0.11	0.14	0.22	0.19	0.22	0.34	0.07	0.39	0.58	0.12	0.43	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	371	252	384	618	387	569	237	1298	866	390	1455	822
v/s Ratio Prot	0.05	c0.11	0.05	c0.21	0.18	0.10	0.06	c0.37	0.11	0.12	c0.46	0.04
v/s Ratio Perm			0.12			0.21			0.23			0.15
v/c Ratio	0.43	0.76	0.62	1.09	0.81	0.79	0.78	0.95	0.54	1.01	1.05	0.24
Uniform Delay, d1	41.3	41.2	35.5	40.5	37.0	29.8	45.6	29.7	13.0	44.0	28.3	11.8
Progression Factor	1.00	1.00	1.00	0.68	0.69	0.56	0.95	0.73	1.12	1.00	1.00	1.00
Incremental Delay, d2	0.8	12.3	3.1	58.6	9.8	6.0	7.6	8.7	0.3	46.9	38.4	0.2
Delay (s)	42.1	53.4	38.6	86.1	35.2	22.6	50.7	30.4	14.9	90.9	66.7	11.9
Level of Service	D	D	D	F	D	C	D	C	B	F	E	B
Approach Delay (s)		44.3			54.9			28.2			63.8	
Approach LOS		D			D			C			E	
Intersection Summary												
HCM Average Control Delay	48.7		HCM Level of Service				D					
HCM Volume to Capacity ratio	1.02											
Actuated Cycle Length (s)	100.0				Sum of lost time (s)				16.0			
Intersection Capacity Utilization	87.9%		ICU Level of Service				E					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

5: Catron Blvd & US 16 Rearage Road

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	3353	1500	1676	3335		3252	1765	1500	1676	1765	1500
Flt Permitted	0.25	1.00	1.00	0.35	1.00		0.95	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	436	3353	1500	611	3335		3252	1765	1500	803	1765	1500
Volume (vph)	187	588	223	49	754	28	444	229	66	20	167	118
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	203	639	242	53	820	30	483	249	72	22	182	128
RTOR Reduction (vph)	0	0	122	0	3	0	0	0	41	0	0	93
Lane Group Flow (vph)	203	639	120	53	847	0	483	249	31	22	182	35
Turn Type	Perm		Perm	Perm			Prot		Perm	Perm		Perm
Protected Phases		4			8		5	2				6
Permitted Phases	4		4	8					2	6		6
Actuated Green, G (s)	49.4	49.4	49.4	49.4	49.4		17.5	42.6	42.6	21.1	21.1	21.1
Effective Green, g (s)	49.4	49.4	49.4	49.4	49.4		17.5	42.6	42.6	21.1	21.1	21.1
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49		0.18	0.43	0.43	0.21	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	1656	741	302	1647		569	752	639	169	372	317
v/s Ratio Prot		0.19			0.25		c0.15	0.14				c0.10
v/s Ratio Perm	c0.47		0.16	0.09					0.05	0.03		0.09
v/c Ratio	0.94	0.39	0.16	0.18	0.51		0.85	0.33	0.05	0.13	0.49	0.11
Uniform Delay, d1	24.0	15.8	13.9	14.0	17.2		40.0	19.2	16.8	32.0	34.7	31.9
Progression Factor	0.83	0.88	1.08	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	34.9	0.1	0.1	0.3	0.3		11.3	1.2	0.1	1.6	4.5	0.7
Delay (s)	54.8	14.0	15.1	14.3	17.4		51.3	20.4	17.0	33.6	39.3	32.6
Level of Service	D	B	B	B	B		D	C	B	C	D	C
Approach Delay (s)		21.9			17.2			38.6			36.3	
Approach LOS		C			B			D			D	
Intersection Summary												
HCM Average Control Delay			26.4				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			69.9%				ICU Level of Service				C	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 12: Section Line Street Access & US 16

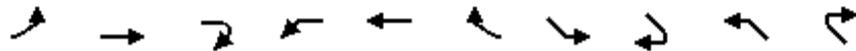
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	0	0	1797	40	0	2225	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	0	1953	43	0	2418	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3395	4415	1209	3162	4409	977	2455			1997		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3395	4415	1209	3162	4409	977	2455			1997		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	3	1	175	4	1	250	187			284		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	0	0	977	977	43	1209	1209	37				
Volume Left	0	0	0	0	0	0	0	0				
Volume Right	0	0	0	0	43	0	0	37				
cSH	1700	1700	1700	1700	1700	1700	1700	1700				
Volume to Capacity	0.00	0.00	0.57	0.57	0.03	0.71	0.71	0.02				
Queue Length (ft)	0	0	0	0	0	0	0	0				
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	A	A										
Approach Delay (s)	0.0	0.0	0.0			0.0						
Approach LOS	A	A										
Intersection Summary												
Average Delay			0.0									
Intersection Capacity Utilization			68.3%	ICU Level of Service	C							
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
 15: Moon Meadows & US 16

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 			 			 	 		 	 	
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	3252	3353	1500	3252	3353	1500
Volume (vph)	504	44	111	95	60	390	163	979	38	430	1111	735
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	548	48	121	103	65	424	177	1064	41	467	1208	799
RTOR Reduction (vph)	0	0	109	0	0	0	0	0	20	0	0	134
Lane Group Flow (vph)	548	48	12	103	65	424	177	1064	21	467	1208	665
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.7	10.3	10.3	16.2	7.8	30.1	7.8	35.2	51.4	22.3	49.7	68.4
Effective Green, g (s)	18.7	10.3	10.3	16.2	7.8	30.1	7.8	35.2	51.4	22.3	49.7	68.4
Actuated g/C Ratio	0.19	0.10	0.10	0.16	0.08	0.30	0.08	0.35	0.51	0.22	0.50	0.68
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	608	182	155	527	138	512	254	1180	771	725	1666	1026
v/s Ratio Prot	c0.17	0.03		0.03	0.04	c0.18	0.05	c0.32	0.01	0.14	0.36	0.15
v/s Ratio Perm			0.08			0.10			0.02			0.39
v/c Ratio	0.90	0.26	0.08	0.20	0.47	0.83	0.70	0.90	0.03	0.64	0.73	0.65
Uniform Delay, d1	39.7	41.4	40.6	36.3	44.1	32.5	44.9	30.8	12.0	35.2	19.8	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.60	2.43
Incremental Delay, d2	16.5	0.8	0.2	0.2	2.5	10.6	8.1	11.2	0.0	0.5	0.7	0.3
Delay (s)	56.3	42.1	40.8	36.4	46.7	43.1	53.0	41.9	12.0	30.4	12.5	22.2
Level of Service	E	D	D	D	D	D	D	D	B	C	B	C
Approach Delay (s)		52.7			42.4			42.5			19.0	
Approach LOS		D			D			D			B	
Intersection Summary												
HCM Average Control Delay			32.5			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			79.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Catron Boulevard & US 16 Ramp



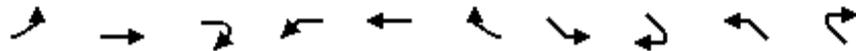
Movement	EBL	EBT	EBR2	WBL	WBT	WBR2	SEL	SER2	NWL	NWR2
Lane Configurations	↖↗	↑	↖	↖↗	↑	↖	↖	↖	↖	↖
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500
Volume (vph)	257	155	138	285	94	222	168	104	150	406
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	168	150	310	102	241	183	113	163	441
RTOR Reduction (vph)	0	0	109	0	0	188	0	92	0	337
Lane Group Flow (vph)	279	168	41	310	102	53	183	21	163	104
Turn Type	Prot		Perm	Prot		Perm	Protcustom		Protcustom	
Protected Phases	7	4		3	8		6		2	
Permitted Phases			4			8		3		7
Actuated Green, G (s)	8.3	10.0	10.0	5.9	7.6	7.6	10.5	5.9	10.5	8.3
Effective Green, g (s)	10.8	12.5	12.5	8.4	10.1	10.1	13.0	8.4	13.0	10.8
Actuated g/C Ratio	0.24	0.27	0.27	0.18	0.22	0.22	0.28	0.18	0.28	0.24
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	765	481	408	595	388	330	475	275	475	353
v/s Ratio Prot	0.09	0.10		0.10	0.06		c0.11		0.10	
v/s Ratio Perm			0.10			0.16		0.08		0.29
v/c Ratio	0.36	0.35	0.10	0.52	0.26	0.16	0.39	0.08	0.34	0.29
Uniform Delay, d1	14.7	13.4	12.5	16.9	14.8	14.5	13.2	15.5	13.1	14.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.4	0.1	0.8	0.4	0.2	0.5	0.1	0.4	0.5
Delay (s)	15.0	13.9	12.6	17.8	15.2	14.7	13.8	15.6	13.5	14.9
Level of Service	B	B	B	B	B	B	B	B	B	B
Approach Delay (s)		14.1			16.2					
Approach LOS		B			B					

Intersection Summary

HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: Catron Boulevard & US 16 Ramp



Movement	EBL	EBT	EBR2	WBL	WBT	WBR2	SEL	SER2	NWL	NWR2
Lane Configurations	↔↔	↑	↔	↔↔	↑	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3252	1765	1500	3252	1765	1500	1676	1500	1676	1500
Volume (vph)	148	176	225	617	287	424	361	267	171	479
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	161	191	245	671	312	461	392	290	186	521
RTOR Reduction (vph)	0	0	184	0	0	338	0	213	0	234
Lane Group Flow (vph)	161	191	61	671	312	123	392	77	186	287
Turn Type	Prot		Perm	Prot		Perm	Protcustom		Protcustom	
Protected Phases	7	4		3	8		6		2	
Permitted Phases			4			8		3		7
Actuated Green, G (s)	13.4	13.6	13.6	14.6	14.8	14.8	17.1	14.6	17.1	13.4
Effective Green, g (s)	15.9	16.1	16.1	17.1	17.3	17.3	19.6	17.1	19.6	15.9
Actuated g/C Ratio	0.25	0.25	0.25	0.26	0.27	0.27	0.30	0.26	0.30	0.25
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	798	439	373	858	471	400	507	396	507	368
v/s Ratio Prot	0.05	0.11		0.21	0.18		c0.23		0.11	
v/s Ratio Perm			0.16			0.31		0.19		0.35
v/c Ratio	0.20	0.44	0.16	0.78	0.66	0.31	0.77	0.19	0.37	0.78
Uniform Delay, d1	19.4	20.5	19.1	22.1	21.1	19.0	20.6	18.5	17.7	22.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.7	0.2	4.7	3.5	0.4	7.2	0.2	0.5	10.2
Delay (s)	19.5	21.2	19.3	26.8	24.6	19.4	27.8	18.7	18.2	33.1
Level of Service	B	C	B	C	C	B	C	B	B	C
Approach Delay (s)		20.0			24.0					
Approach LOS		B			C					

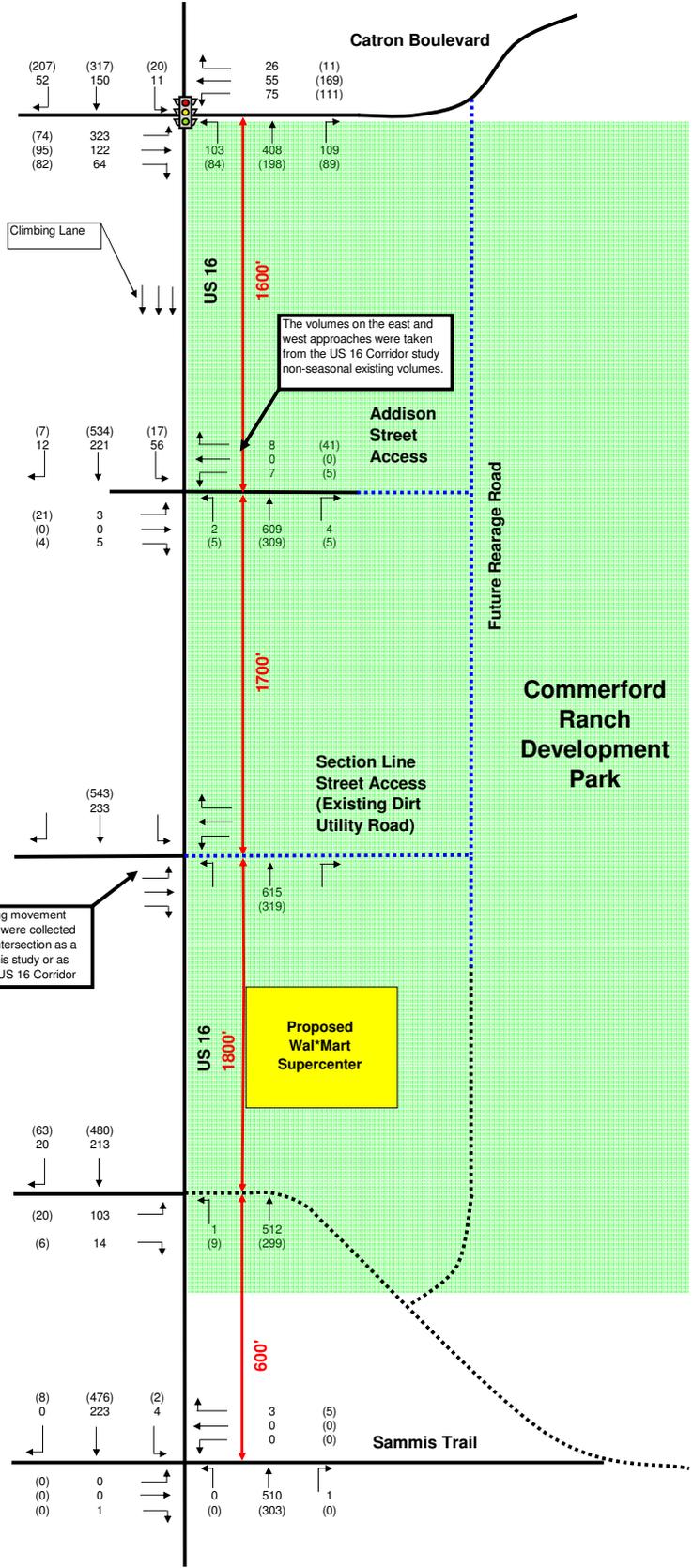
Intersection Summary

HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	64.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Supporting Information

LEGEND

-  Existing Signalized Intersection in 2005
-  Turning Movement Volumes
-  Proposed Roadway (2005)
-  Proposed Roadways (2025)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume



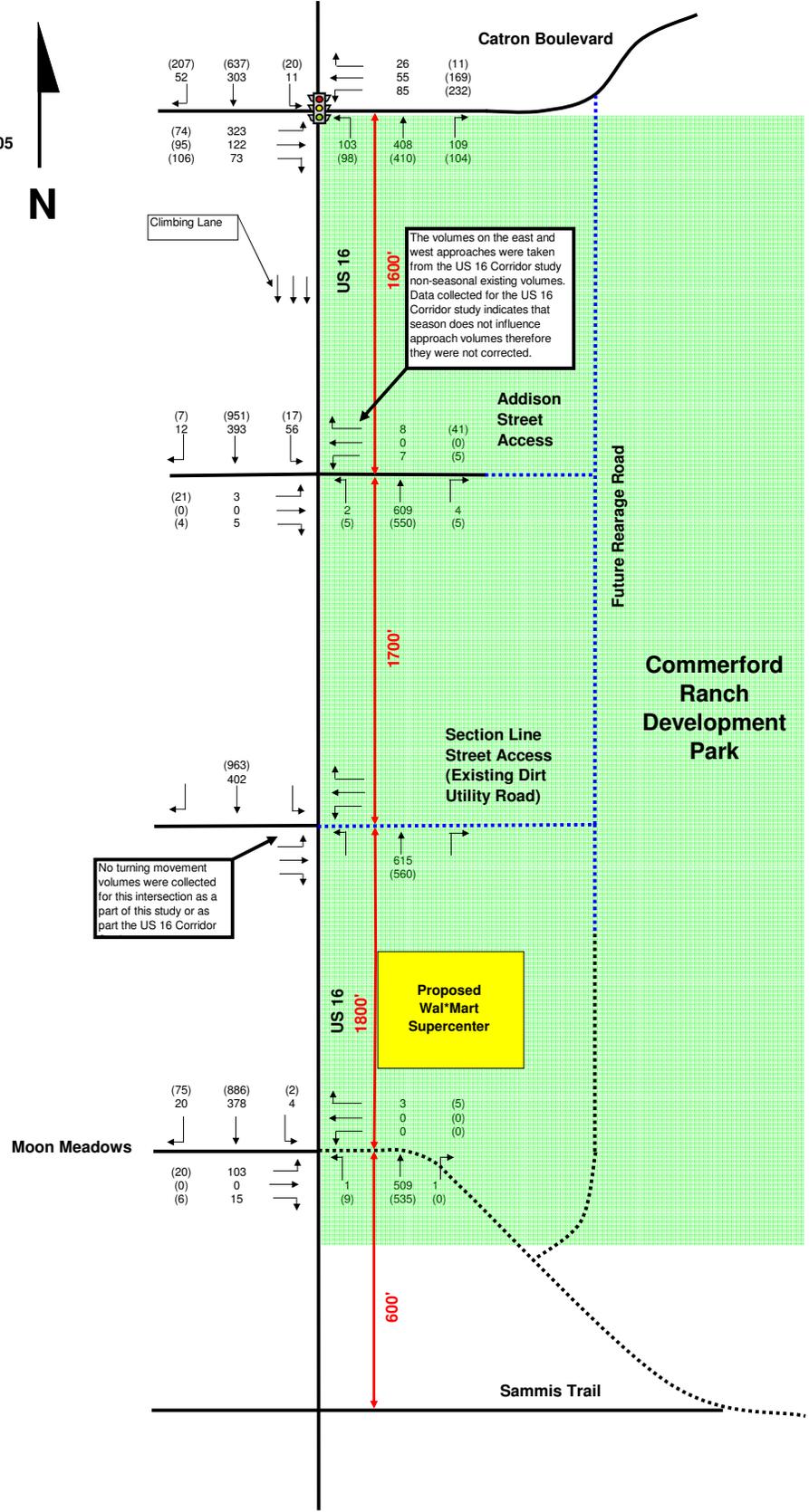
Existing "Non-Seasonal" Volumes (Balanced)

Balanced Raw Volumes

September 2005

LEGEND

-  Existing Signalized Intersection in 2005
-  Turning Movement Volumes
-  Proposed Roadway (2005)
-  Proposed Driveways (2025)
- XXX AM Peak Hour Volume
- (XXX) PM Peak Hour Volume



**Existing "Seasonal" Volumes and Level of Service
(Combined Sammis Trail and Moon Meadows)**

Combined Moon Meadows & Sammis Trail

September 2005