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BG Project Number: 16-1329L

Access Management Plan

US-36 Corridor

Marysville, Kansas

August 2018 – FINAL REPORT

KDOT Project Number: 36-58 KA-4386-01

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A special thank you needs to be extended to all of the citizens, business owners, special interest groups, City Council Members, and KDOT staff providing invaluable input that helped shape the recommendations in this report.

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EXECUTIVE SUMMARY

PURPOSE

Marysville, Kansas has experienced steady urban growth over the last 100 years. This access management plan is intended to assist the City in making informed growth decisions along the US-36 corridor over the next 20 years. By analyzing existing traffic patterns, the Level of Service (LOS) for various intersections, existing crash patterns, current location of traffic signals, current access control and public input, the following represents corridor strategies and recommendations to improve the public's travel experience and reduce congestion.

PUBLIC INVOLVEMENT

Public outreach and public involvement is a vital part of involving stakeholders, developers and property owners, special interest groups, and governmental entities into the decision-making process and was a critical part of developing this access management plan.

The following is a list of key stakeholders who were involved with the process:

- City of Marysville government
- Marshall County officials
- Various Businesses and Property Owners

Public involvement efforts included the following approach:

- Focused agency stakeholder meetings
- Focused land owner and business meetings
- Public open houses
- Plan summary presentations to the Plan Partners

ACCESS MANAGEMENT

Planning for future growth requires an understanding of the existing property access along the US-36 corridor. The existing corridor was examined by comparing the existing conditions to the requirements as defined by The Kansas Depart of Transportation's (KDOT's) *Access Management Policy*. Both short-term and long-term recommendations are included in this plan to help improve traffic movement, reduce crashes, and better manage vehicle conflict points.

TRAFFIC ANALYSIS AND RECOMMENDATIONS

Having a good understanding of supply versus demand for a given transportation facility also helps shape the proposed recommendations. Demand for a given facility is quantified through traffic flow or traffic volumes. The US-36 corridor was analyzed by reviewing the existing and future estimated Level-of-Service (LOS) at intersections where traffic volume data was available. LOS assigns the facility a grade between A (good) and F (poor) depending on capacity and performance. The existing US-36 corridor is operating at an LOS A or B. With an expected growth of 1.5% per year for the Central Business District and

3.0% per year for the developed region east of the Central Business District over the next 20 years, the LOS service for the facility is expected to operate between an LOS A and C.

The following is a summary of the recommendations of this access management plan. The recommendations are classified into three categories: Short-Term, Development Driven/Continual, and Long-Term Recommendations. Each of them are explained in greater detail throughout the report. Refer to *Figure 1: Recommended Improvements Location Map* to see a general overview of where the improvements are located. Note that KanPlan's 2016 AADT (Annual Average Daily Traffic) was included for quick reference only.

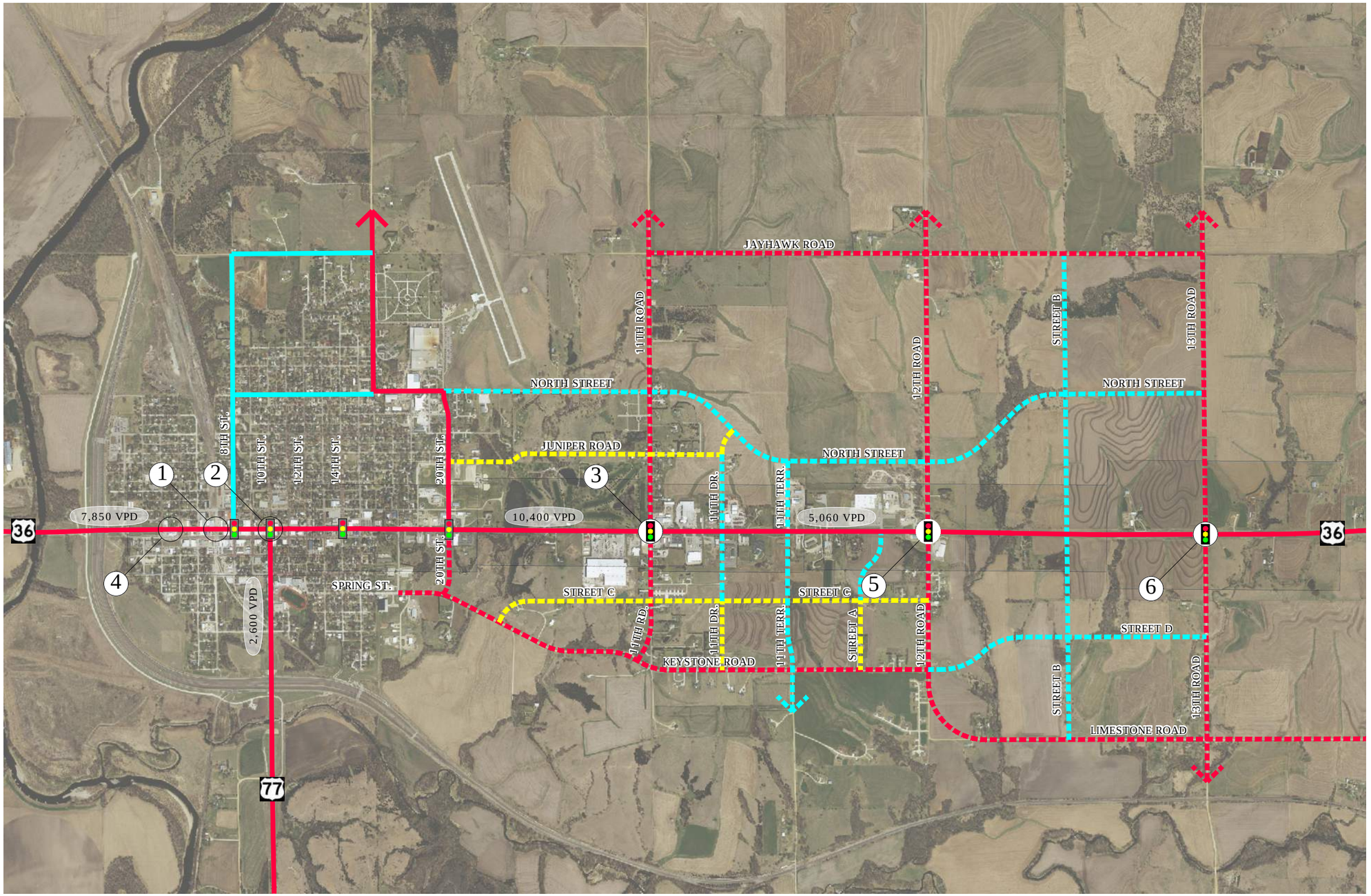
SHORT-TERM RECOMMENDATIONS

- **Signal Upgrades:** Video Detection and Accessible Pedestrian Signal upgrades at all existing signals (except at 20th Street).
- **US-36 & 7th Street Geometric Improvements:** Geometric improvements at 7th Street to allow for better vehicular movement while maintaining access radii to accommodate larger turning vehicles. Extend the shared-use path along 7th Street to the north.
- **US-36 & US-77 (10th Street) Geometric Improvements:** Consider a property acquisition in the southeast corner of US-36 and US-77 (10th Street) to improve sight lines, turning movements and storage length.
- **US-36 & 11th Road Geometric Improvements:** Signalize the intersection, add eastbound and westbound right-turn lanes on US-36, and add both northbound and southbound dedicated left- and right-turn lanes on 11th Road.
- **Pedestrian Facilities:** Provide pedestrian facilities on the north side of US-36 from 20th Street to 11th Road.
- **Existing Pedestrian Facility Upgrades:** Replace old and deteriorating sections of sidewalk along the US-36 corridor.

DEVELOPMENT DRIVEN/CONTINUAL RECOMMENDATIONS

- **Access Consolidations/Closures:**
  - Access closures/consolidations along the US-36 corridor as properties change owners and businesses change types.
  - Restripe the "Central Business District" to include more on-street parking as accesses are consolidated/closed.
- **Long-term Street Network Upgrades:**
  - It is assumed that all "Arterial" and "Collector" streets will be constructed with at least 3-lane sections approaching the highway and all "Local" streets will be constructed as 2-lane sections (unless noted otherwise).
  - 20th Street: Between US-36 and Spring Street/Keystone Road
    - Existing roadway does not exist
    - Future "Arterial" street
  - 11th Road: Between Jayhawk Road and Keystone Road
    - Existing roadway is a 2-lane section with partial bicycle facilities
    - Future "Arterial" street
      - To be constructed as a 3-lane section with on-street bicycle lanes

EXECUTIVE SUMMARY RECOMMENDATIONS



LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Proposed Traffic Signal
- Existing Traffic Signal
- KanPlan's 2016 AADT

RECOMMENDED PROJECTS

Short-Term:

I.D. #1: 7th Street Geometric Improvements

I.D. #2: 10th Street Geometric Improvements

I.D. #3: 11th Road Geometric Improvements

Long-Term:

I.D. #4: 4th to 5th Streets Geometric Improvements

I.D. #5: 12th Road Geometric Improvements

I.D. #6: 13th Road Geometric Improvements

Other Projects:

- Access Consolidations and Closures
- City Street Network Upgrades
- Existing Signal Upgrades
- Pedestrian Facility Upgrades
- Sidewalk Gaps

NORTH 700' 0' 700' SCALE

Figure 1: Recommended Improvements Location Map

- 11th Drive: Between North Street and Keystone Road
  - Existing roadway is a partially constructed, 2-lane, private drive north of US-36
  - Future "Local" street between North Street and Juniper Road and between "Street C" and Keystone Road
  - Future "Collector" street between Juniper Road and "Street C"
- 11th Terrace: Between North Street and Keystone Road
  - Existing roadway does not exist
  - Future "Collector" street
- "Street A": Between US-36 and Keystone Road
  - Existing roadway does not exist
  - Future "Collector" street between US-36 and "Street C"
  - Future "Local" street between "Street C" and Keystone Road
- 12th Road: Between Jayhawk Road and Keystone Road
  - Existing roadway is a 2-lane section
  - Future "Arterial" street
- "Street B": Between Jayhawk Road and Limestone Road
  - Existing roadway does not exist
  - Future "Collector" street
- 13th Road: Between Jayhawk Road and Limestone Road
  - Existing roadway is a 2-lane section
  - Future "Arterial" street
- Jayhawk Road: Between 11th Road and 13th Road
  - Existing roadway is a 2-lane section
  - Future "Arterial" street
- North Road: Between 20th Street and 13th Road
  - Existing roadway is a 2-lane section between 20th Street and 11th Road and does not exist between 11th Road and 13th Road
  - Future "Collector" street
    - To be constructed as a 3-lane section with on-street bicycle lanes between 20th Street and 11th Road
- Juniper Road: Between 20th Street and North Street
  - Existing roadway does not exist
  - Future "Local" street
- "Street C": Between Spring Street and 12th Road
  - Existing roadway does not exist
  - Future "Local" street
- Keystone Road: Between 20th Street and 12th Road
  - Existing roadway is a 2-lane section
  - Future "Arterial" street
- "Street D": Between 12th Road and 13th Road
  - Existing roadway does not exist
  - Future "Collector" street
- Limestone Road: Between 12th Road and 13th Road
  - Existing roadway is a 2-lane section
  - Future "Arterial" street

LONG-TERM RECOMMENDATIONS

- **Sidewalk Gap Project:** New sidewalk is recommended on the south side of US-36 from N. 11th Street to N. 20th Street.
- **US-36 Geometric Improvements between 4th and 5th Streets**: Extend the three-lane section west to 4th Street (accesses should be closed to accommodate the street widening).
- **US-36 & 11th Drive Geometric Improvements:** Once development occurs, build 11th Drive to meet US-36, modify pavement markings on US-36 to add dedicated left-turn lanes, and add both northbound and southbound dedicated left-turn lanes on 11th Drive.
- **US-36 & 11th Terrace Geometric Improvements** Once development occurs, build 11th Terrace to meet US-36, add eastbound and westbound right- and left-turn lanes on US-36, and add both northbound and southbound dedicated left -turn lanes on 11th Terrace.
- **US-36 & Walmart Geometric Improvements:** Once development occurs, build "Street A" to meet US-36, modify pavement markings on US-36 to add dedicated left-turn lanes, and add northbound dedicated left-turn lanes on "Street A".
- **US-36 & 12th Road Geometric Improvements:** Once signal warrants are met at US-36 and 12th Road, signalize the intersection, add eastbound and westbound right-turn lanes on US-36, and add both northbound and southbound dedicated left- and right-turn lanes on 11th Road.
- **US-36 & 12th Terrace ("Street B") Geometric Improvements:** Once development occurs, build 12th Terrace ("Street B") to meet US-36, add eastbound and westbound right- and left-turn lanes on US-36, and add both northbound and southbound dedicated left- and right-turn lanes on 12th Terrace ("Street B").
- **US-36 & 13th Road Geometric Improvements:** Once signal warrants are met at US-36 and 13th Road, signalize the intersection, add eastbound and westbound right-turn lanes on US-36, and add both northbound and southbound dedicated left- and right-turn lanes on 11th Road.

For clarification, it is worth noting that "11th Drive" is sometimes labeled "11th Terrace" when using web-based maps. The street signs located in the field reflect how the streets are labelled within this report.

CHAPTER 1: INTRODUCTION

1.1 CORRIDOR LOCATION

Marysville, Kansas is located in Marshall County in the north-central portion of the state. US-36 highway runs east/west through the center of town and US-77 highway runs north-south following on US-36 for about one mile through town. See *Figure 2: Corridor Location* for project location.

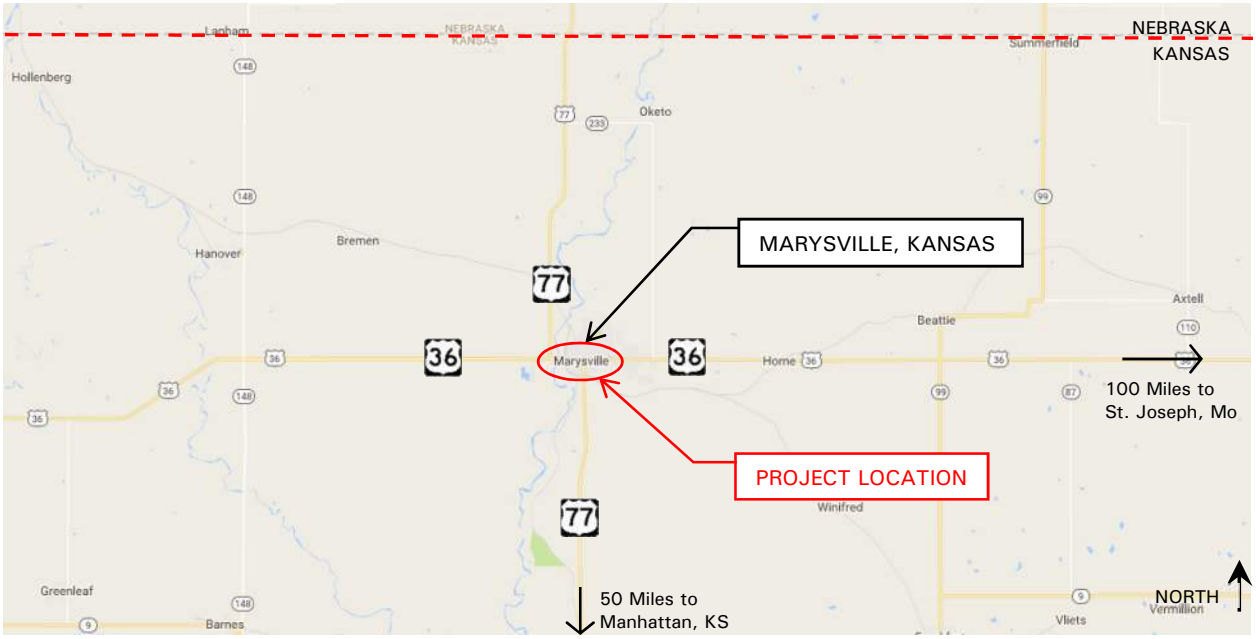


Figure 2: Corridor Location

1.2 STUDY LIMITS

The limits of the study area include US-36 highway from 4th Street to 13th Road. *Figure 3: Study Area* shows the limits of the study area as outlined in the red shading.

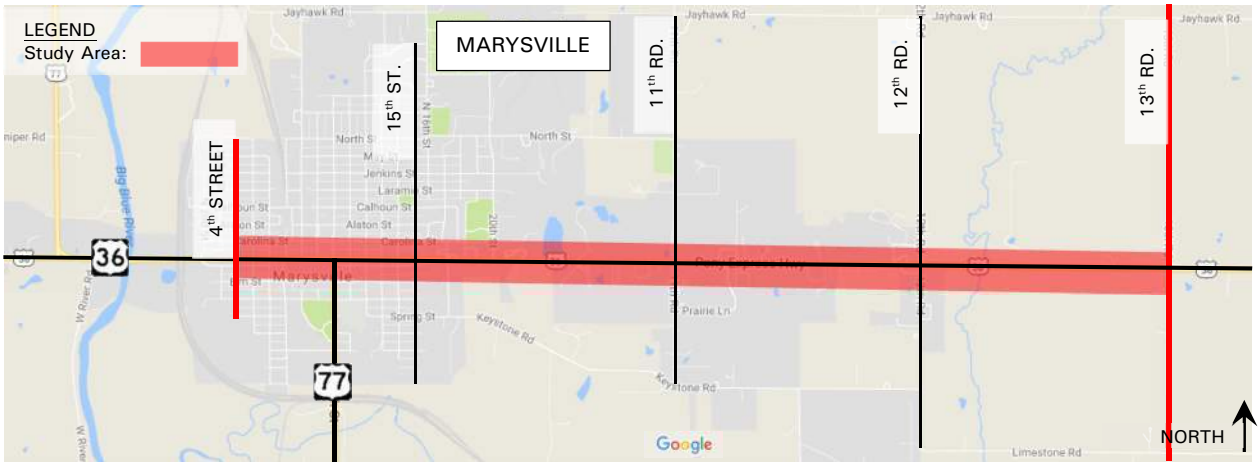


Figure 3: Study Area

1.3 BOUNDARY LIMITS

Also important to the further development of the US-36 corridor is the future development of Marysville. The City of Marysville provided a zoning map which was created in 2013 and is shown in *Figure 4: City of Marysville Zoning Map*. A long-term street classification map was established by comparing the zoning map to the recommendations from the "2005-2025 Comprehensive Plan" for the City of Marysville. *Figure 5: Long-term Street Classification Map* shows these street classifications.

In general, the hierarchy of roads moves people from the smaller 'local streets' (which provide property access) to the midrange 'collector streets' to the larger 'arterial streets' and highways where more focus is given to mobility rather than property access. The intersection of arterial roadways may be good places to install signals (if warranted).

Figure 5: Long-term Street Classification Map shows US-36, US-77 and 20th Street as existing arterial streets. As the area develops, 11th Road, 12th Road, 13th Road, Jayhawk Road, Keystone Road, and Limestone Road should all be considered arterial streets. 8th Street (north of US-36) and North Street (west of 16th Street) have been identified as existing collector streets. In the future, North Street (east of 20th Street), "Street D", 11th Drive, 11th Terrace, "Street A" (north of "Street C"), and "Street B" should be considered future collector streets. Juniper Road, "Street C", 11th Drive (south of "Street C"), and "Street A" (south of "Street C") should be considered future local streets.

Figure 5: Long-term Street Classification Map also shows the approximate AADT (as identified by KDOT's 2017 Traffic Flow Map), the location of existing signals, and the proposed location of future signals (which will be discussed in detail later in this report).

1.4 EXISTING TYPICAL SECTIONS

The typical section along US-36 varies through the study limits. In general, the downtown region consists of a three lane section (an eastbound driving lane, and westbound driving lane, and a two-way left-turn or dedicated left-turn lane) with on-street parallel parking. The driving lanes and central turn lane are approximately 12ft. wide with an approximate 9ft. wide parallel parking region for a total street width of approximately 54ft. The curb and gutter section that is consistent through downtown gives way to shoulders and open ditches just east of 20th Street. A center turn-lane is present for some of but not all of the region from 20th Street to 13th Road. In this section, the driving lanes and center turn lane (where present) are approximately 12ft. wide and the shoulders are approximately 8ft. wide. Sidewalks are inconsistent along the study corridor and are described in greater detail later in this report.

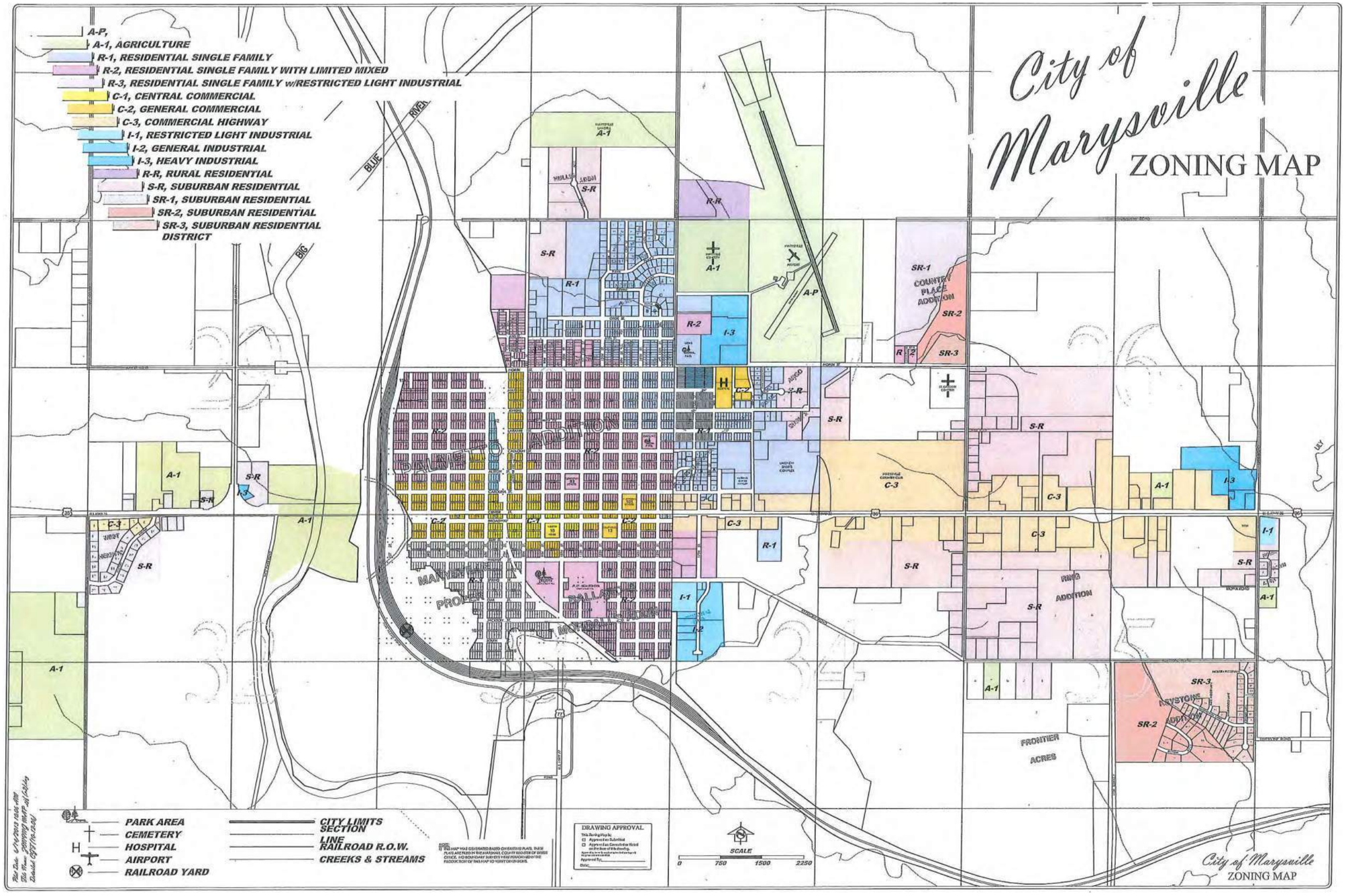
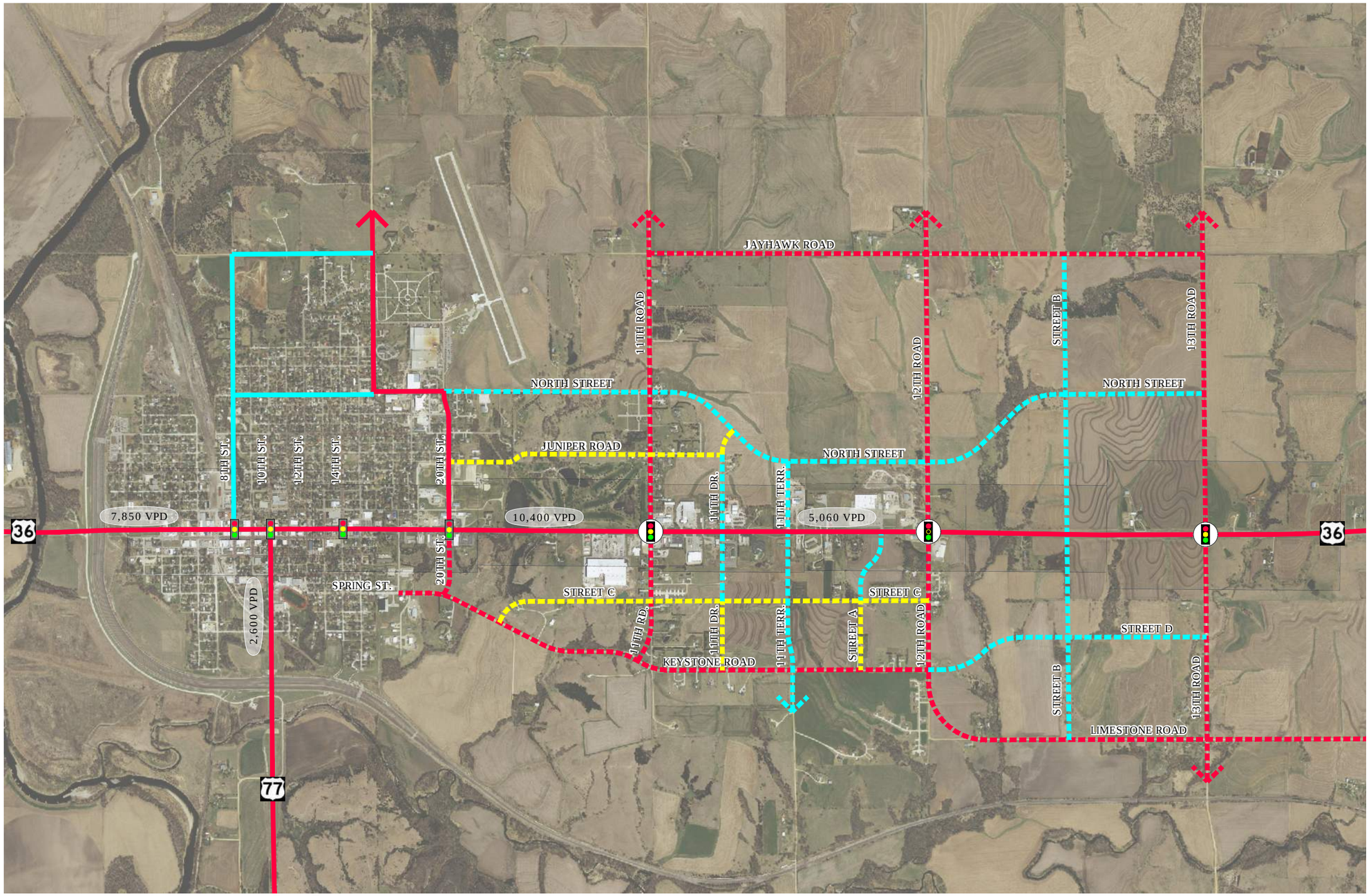


Figure 4: City of Marysville Zoning Map

LONG-TERM STREET CLASSIFICATION MAP



LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Proposed Traffic Signal
- Existing Traffic Signal

NORTH

700' 0' 700'
SCALE

Figure 5: Long-term Street Classification Map

CHAPTER 2: PUBLIC INVOLVEMENT

2.1 PUBLIC INVOLVEMENT SUMMARY

A critical path to developing this corridor plan included reaching out to the public and getting the public involved. Getting stakeholders and community members on the same page helps create partnerships, can strengthen the community, encourages understanding of the plan needs and requirements, builds trust and helps reduce the likelihood of future conflicts. The exchange of ideas and sharing of information helps build public consensus and develops a more successful plan.

The following is a list of key stakeholders who were involved with the process:

- City of Marysville government
- Marshall County officials
- Various Businesses and Property Owners

Public involvement efforts included the following approach:

- Focused agency stakeholder meetings
- Focused land owner and business meetings
- Public open houses
- Plan summary presentations to the Plan Partners

The following core messages were developed and shared with the community about this plan:

- KDOT and the City of Marysville have partnered to develop a plan that recommends future improvements to better handle traffic demands and supports future economic growth in the area.
- The need for access consolidation/closures will help improve traffic movement, reduce crashes, and create fewer vehicle conflict points.
- The corridor has significant future development possibilities (particularly on the east end) that have the potential to increase traffic volume along US-36.

2.2 STAKEHOLDER AGENCY COORDINATION

Several progress meetings were held throughout the development of this plan. Progress meetings were held with BG Consultants, Marysville City Staff and governing bodies, and KDOT Staff. Meetings were held on:

- December 6th, 2016
- September 5th, 2017
- November 20th, 2017
- December 14th, 2017 – Marysville Planning Commission
- December 27th, 2017 – Marysville City Council

The objective of these meetings was to provide the stakeholders information as to how the plan was developing and for the stakeholders to provide input in the decision-making process. Comments received form these meetings assisted in identifying the analysis needs and

prioritizing key transportation improvement projects. The following list summarizes some of the key comments to come from the progress meetings:

- Majority of the turning movement counts were to come from KDOT's *Road Safety Audit for Marshall County* that was published in January 2013.
- BG was to collect turning movement data at the intersections of US-36 and 7th Street, 8th Street, and 11th Road.
- Existing city information including zoning maps, future growth maps, crash reports, and traffic signal timing were to be provided to BG from the City of Marysville.
- Future development areas were identified south of US-36 between 11th Road and 12th Road as well as north of US-36 between 11th Terrace and Walmart.
- One-on-one stakeholder meetings with local land owners and area business owners were to be coordinated through BG.
- Areas of local concern included the intersection of US-36 and 11th Road, collector access to US-36 between 11th Road and 12th Road, possible future development sites, and the transload facility.

2.3 BUSINESS, LAND OWNER AND DEVELOPER GROUP INPUT

A number of local businesses, property owners, and development groups with interests in the study corridor were engaged through the development of this plan. The purpose of engaging these groups was to identify how the corridor is currently being used by some of the major traffic generators and to gain a better understanding of potential near term private investments that may impact the future needs of the corridor.

In addition to the public input collected in public forums, the following list of interest groups were asked to provide their experience, knowledge, and input regarding the corridor land uses and the level of transportation service provided by US-36.

- Paula Landoll – Landoll Corporation
- Valley Vet Supply
- Union Pacific Railroad
- Rob Peschel, P.S. and Tony Duever, P.E. – CES Group P.A.
- Marshall County Connection, Inc. – Blue River Rail Trail
- Ellen Barber – Marshall County Partnership for Growth

2.4 PUBLIC INPUT

An open house format public meeting was held on November 30th, 2017 at 6:00pm to gain valuable input from the public. A survey form was developed, and BG Staff was available to answer questions and discuss a general overview of how the access management plan was developing. The meeting was attended by eleven (11) people of which eight (8) filled out the survey. The following is a summary of the survey questions and responses:

1. "How do you feel about the existing number of driveway connections to US-36 within the Planning Area?"
   (4) Too many
   (4) Just right
   (0) There's room for more
   - One respondent commented that the number of connections is *Just Right* "from what I see."
   - One respondent commented that the number of connections is *Just Right* "without lots of growth."

Picture 1: Public Meeting at City Hall

2. "Do you LIKE / DISLIKE the on-street parking on US-36 between 5th St. and 12th St.?"
   (5) Like
   (2) Dislike
   (1) Marked through with a question mark
   - One respondent commented that they *Dislike* the on-street parking "because of the semis speeding nearby."
3. "Do you feel like the pedestrian/bicycle needs are being met within the Planning Area?"
   (2) Yes
   (6) No

   The comments included:
   - No - "Love to see bike trails part of the process! Would like to see more along corridor. People would like to ride, but can't."
   - No - "There needs to be more pedestrian walkways."
   - No – "particularly pedestrian needs"
   - No – "Feel the bicycle needs are now met; I do bike and feel more than sufficient and safe. Pedestrian would be more important."
   - No – "We have enough trail and bike paths."
   - Yes – "It's a private thing."
4. "List the top (2) two US-36 improvements you would like to see implemented in the future:"
   - The 12th Road turning improvements.
   - The 11th Terrace road improvements with the future collector street that goes into North Street behind KanEquip to the East. This area is designated for a business park and can't develop without road infrastructure.
   - Stop light at 11th Road intersection.
   - Bigger turning area for stop light at 10th and Center.
   - Get rid of 8th St. stoplight.
   - 11th Rd stoplight.
   - Stoplight at 11th Road.
   - Buried utility lines.

- If a change, do not feel streets need to be widened but could limit parking along highway when possible.
- The 12th Road turning improvements
  - The 11th Terrace road improvements with the future collector street that goes into North Street behind KanEquip to the East. This area is designated for a business park and can't develop without road infrastructure.
- Imp. 12th Rd access to so.
- Light at 11th Rd.
- 11th Road south and stoplight
  - Synchronize stoplights.

5. Additional comments or concerns:
   - Thank you for opening this up to the public.
   - Current businesses need their driveways but empty lots could be looked at.
   - Remove 8th stoplight – put stoplight at 11th Road.
   - One way turns only have to be way in the future.
   - Matthew and Jason very helpful and informative

Reviewing the comments from the survey indicate the most advocated for improvement was the proposed improvements at 11th Road, followed by 12th Road improvements, and improvements at 11th Terrace. Signal warrants were reviewed for the existing signal at 8th Street as part of this study as a result of the survey.

Pictures from the public meeting are shown in *Picture 1: Public Meeting at City Hall*, *Picture 3: Public Meeting at City Hall*, and *Picture 2: Public Meeting at City Hall*.

Picture 3: Public Meeting at City Hall

Picture 2: Public Meeting at City Hall

CHAPTER 3: KDOT'S ACCESS MANAGEMENT POLICY

It is important to understand key characteristics of the highway as defined by The Kansas Department of Transportation's (KDOT's) *Access Management Policy* to properly manage highway access.

3.1 ROUTE CLASSIFICATION

KDOT has developed a *Route Classification System* to better manage and describe the more than 10,000 state highway miles. The system classifies routes based on daily traffic, route continuity, access to major cities, trip length, and route spacing. There are five classification categories: classes A through E. Class A routes describe interstate routes that are fully access-controlled and permit high-speed travel. Class E routes are the lowest classification that describe routes that connect rural residents with other routes. They generally have low traffic volumes and fewer trucks. It is worth noting that any route that is also part of the National Highway system or a designated planned corridor, shall be analyzed as a Class B route regardless of the route classification.

According to KDOT's *Access Permit Map* (https://www.ksdot.org/accessmanagement/), US-36 is a Class B route and part of the National Highway System through the study area. Class B routes are those that are non-interstate routes with limited access, high-speed travel, long distance truck traffic and have statewide significance. US-77 is a Class C route and part of the National Highway System. Any analysis of US-77 will be based on Class B route parameters.

3.2 AREA TYPE

Another key aspect in determining appropriate access placement is the Area Type. KDOT has three distinct Area Types:

- **Central Business District (CBD):** Central Business Districts are areas that are defined by high concentration of businesses, with limited access, on-street parking, and higher volumes of pedestrian/bicycle traffic. See *Picture 4: CBD (US-36 & 9th Street looking East along US-36)* for an example of the CBD within Marysville.
- **Developed:** Developed areas must meet one of the three following criteria: (1) within the corporate limits of a municipality, (2) the speed limit is 40 mph or less, or (3)

Picture 4: CBD (US-36 & 9th Street looking East along US-36)

at least 50% of the frontages abutting the highway have been developed with residences, businesses, and/or industry for a distance of a quarter mile or more. *Picture 5: Developed Area (US-36 at Pizza Hut looking West)* and *Picture 6: Developed Area (US-36 at Walmart looking West)* show developed areas within Marysville.

Picture 5: Developed Area (US-36 at Pizza Hut looking West)

Picture 6: Developed Area (US-36 at Walmart looking West)

- **Undeveloped:** Undeveloped areas are those that don't meet the criteria for CBD's or Developed areas.

Multiple area types are represented throughout the corridor along US-36 and US-77 due to the length of the study area. *Figure 6: Area Type* summarizes these conditions.

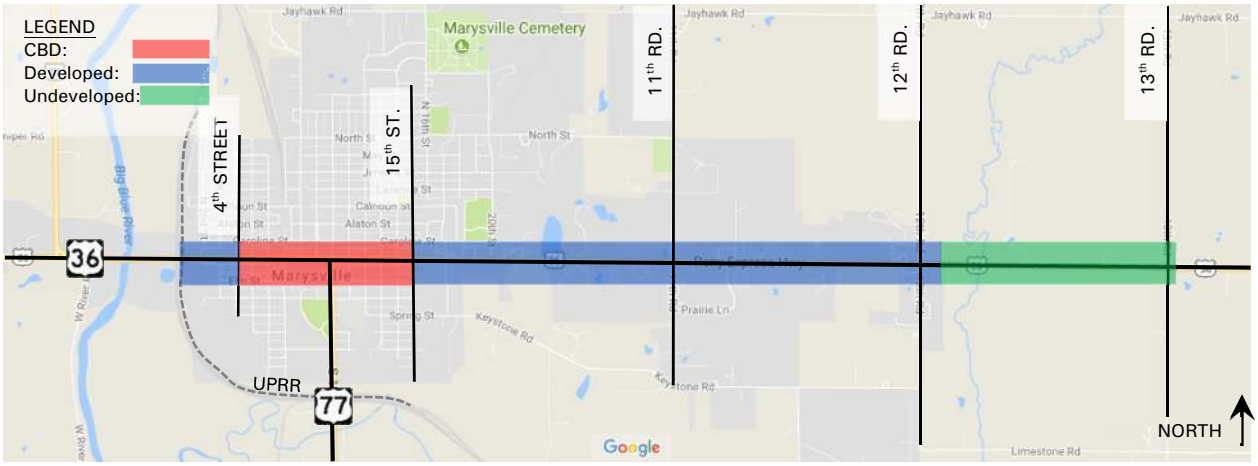


Figure 6: Area Type

3.3 ROUTE ACCESS CONTROL DESIGNATION

Access control designations have been identified by KDOT to represent KDOT's vision of access control along a highway system. Access control designations range from Full Access Control (meaning access to the highway is only allowed via grade-separated interchanges) to Partial Access Control (as defined in the *Access Management Policy*) to No Access Control (meaning that any accesses should adhere to the access spacing criteria as found in KDOT's *Access Management Policy*).

US-36 is defined with a Partial Access Control 3 classification through the study area as shown in Chapter 8.4 of KDOT's *Access Management Policy*. This access control

designation applies to arterial highways within or approaching an urban area or rural, two-lane highways that are likely to remain two-lane highways for the foreseeable future. Partial Access Control 3 routes are to be described by the following access characteristics:

- Access points should be kept to a minimum (either public roads or private entrances). New private access to the highway should not be allowed if the property has reasonable access or reasonable opportunity to gain access from a nearby, lower function roadway.
- Existing access spacing should be preserved or spacing criteria from the *Access Management Policy* should be used, whichever is greater.
- Existing lawful connections and median openings are not required to meet spacing criteria from the *Access Management Policy*. These access points will usually be allowed to remain but should be brought into conformance with the spacing criteria in the *Access Management Policy* when significant change occurs or as changes to the roadway allow. As design projects occur, existing access points between intersections should be removed or relocated.
- When there are existing passing lanes or passing lanes are added, access points should be limited or eliminated within the limits of the passing lane. Public roads and private entrances may need to be closed to minimize conflict points if other reasonable means of access are available.

These characteristics represent the vision KDOT would like to achieve along the US-36 corridor. Meeting this criteria, however, can often be difficult in an existing urban environment due to development patterns that have occurred prior to the implementation of KDOT's *Access Management Policy*.

3.4 ACCESS POINT LOCATION CONSIDERATIONS

3.4.1 INTERSECTION INFLUENCE AREAS

The intersection influence area, as defined by KDOT's *Access Management Policy*, contains both the *physical area* and *functional area* of an intersection as depicted in *Figure 7: Intersection Influence Area Diagram (Source: KDOT's Access Management Policy, Figure 4-16)*. By defining upstream and downstream influence areas for each intersection, preferable access locations can be identified in locations outside of the defined influence areas.

Intersection influence areas are determined by defining the following distances (which are shown in *Figure 8: Intersection Functional Lengths (Source: KDOT's Access Management Policy, Figure 4-17)*:

- d_1 = distance traveled during perception reaction time
- d_2 = distance traveled during deceleration when coming to a stop
- d_3 = the actual queue *storage length*
- d_4 = downstream functional distance

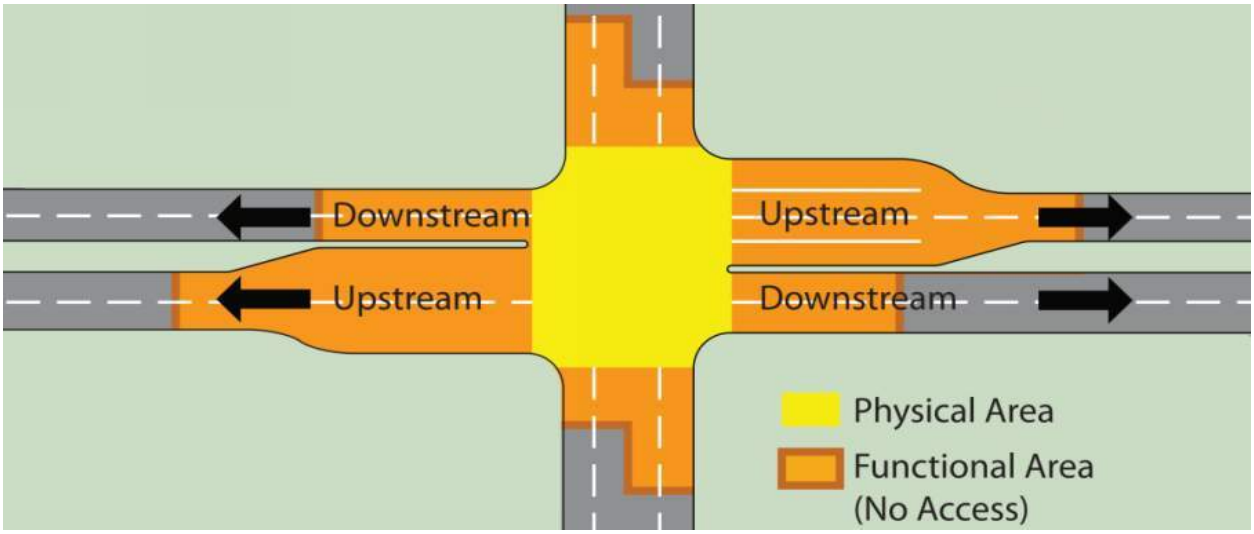


Figure 7: Intersection Influence Area Diagram (Source: KDOT's Access Management Policy, Figure 4-16)

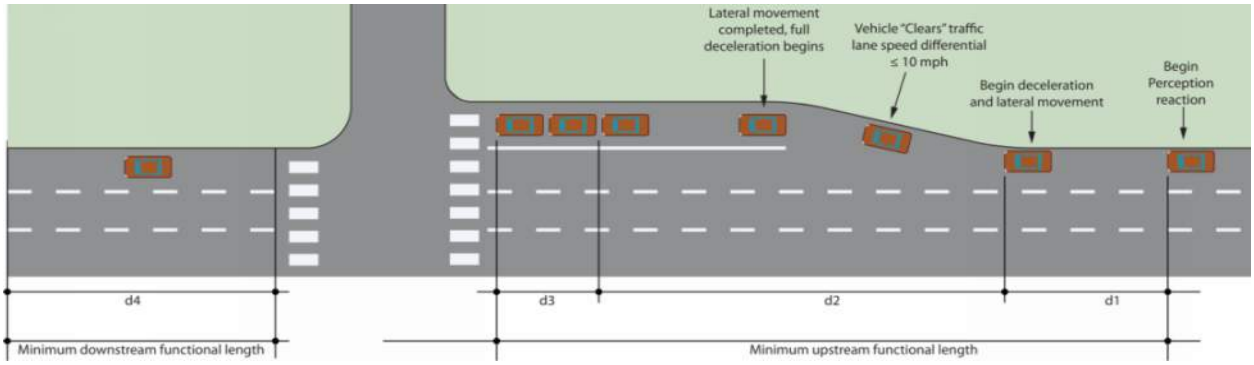


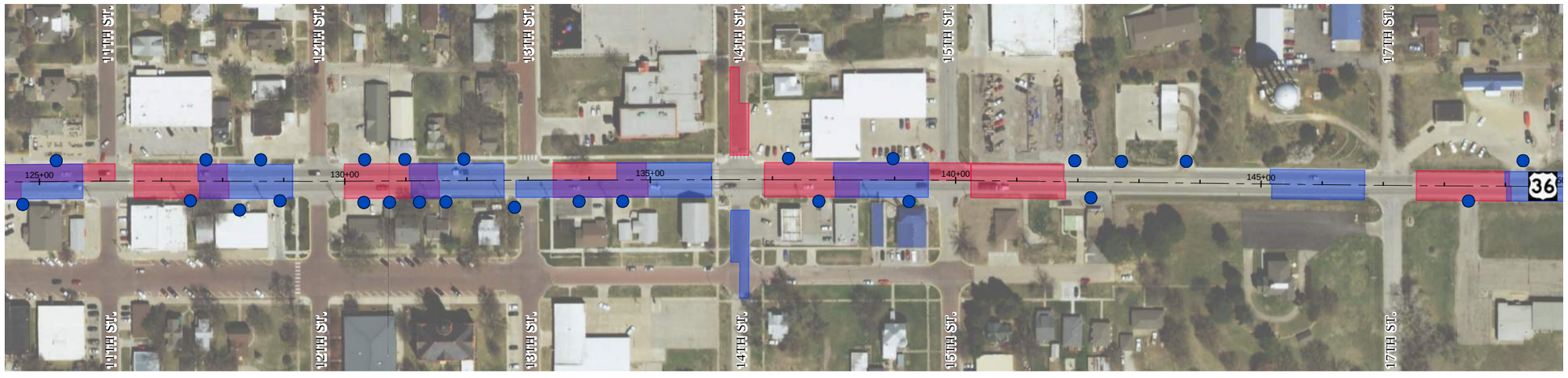
Figure 8: Intersection Functional Lengths (Source: KDOT's Access Management Policy, Figure 4-17)

Influence areas along the US-36 corridor have been estimated according to KDOT's *Access Management Policy*. Individual d1, d2, d3, and d4 lengths have been listed in Appendix B for each intersection along US-36 from 4th Street to 12th Road. The influence areas are also shown in *Figure 9: Intersection Influence Areas (1 of 3)*, *Figure 10: Intersection Influence Areas (2 of 3)*, and *Figure 11: Intersection Influence Areas (3 of 3)*.

Intersection influence area calculations indicate:

- there are no available opportunities to access US-36 between 4th Street and 15th Street and between 17th Street and 18th Street.
- between 15th Street and 17th Street there is an opportunity for access to US-36 of about 335ft.
- between 18th Street and 20th Street there is a short access window of about 200ft.
- between 20th Street and 11th Road there is an opportunity for access to US-36 of about 3,300ft.
- between 11th Road and 11th Drive there is an access window of about 720ft.
- between 11th Drive and 12th Road there is an opportunity for access to US-36 of about 3,200ft.

INTERSECTION INFLUENCE AREAS

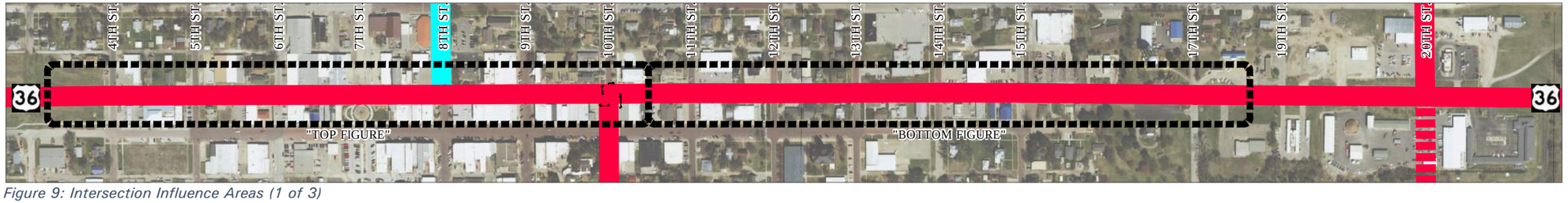


LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Functional Intersection Influence Area
- Existing Access Point

NORTH
100' 0' 100'
SCALE

LOCATION KEY:



NORTH
250' 0' 250'
SCALE

Figure 9: Intersection Influence Areas (1 of 3)

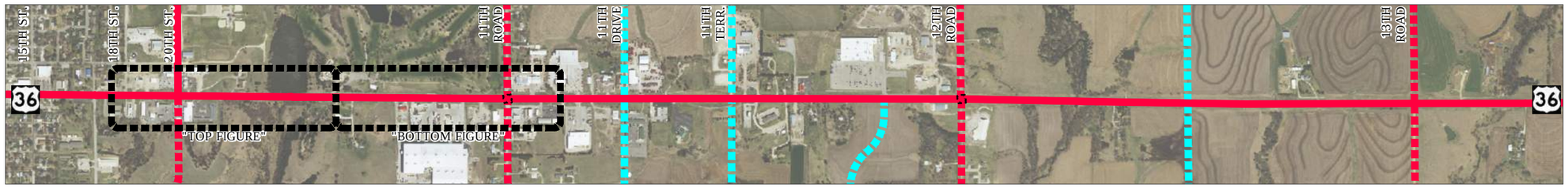
INTERSECTION INFLUENCE AREAS

LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Functional Intersection Influence Area
- Existing Access Point

NORTH 100' 0' 100' SCALE

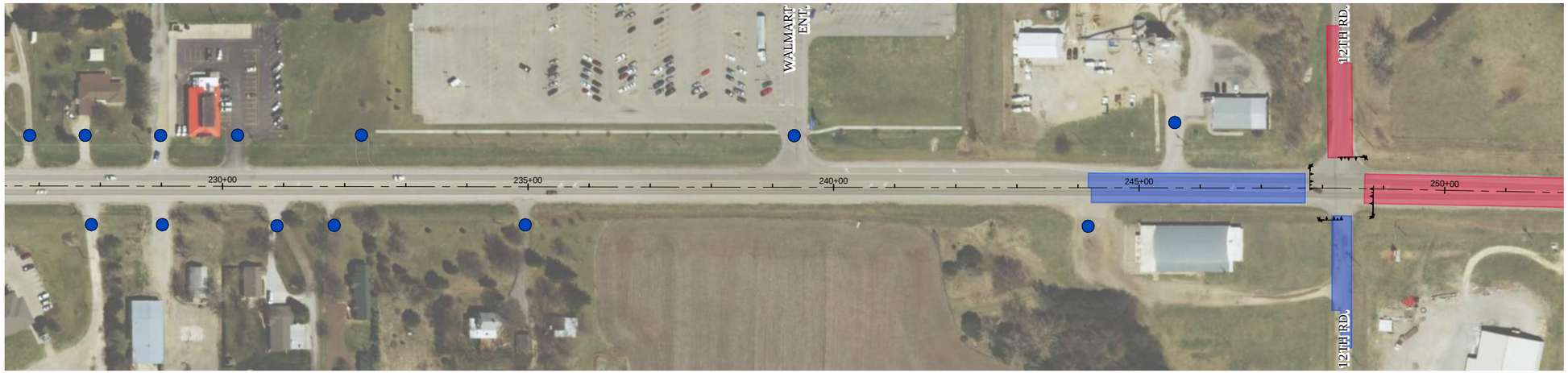
LOCATION KEY:



NORTH 700' 0' 700' SCALE

Figure 10: Intersection Influence Areas (2 of 3)

INTERSECTION INFLUENCE AREAS

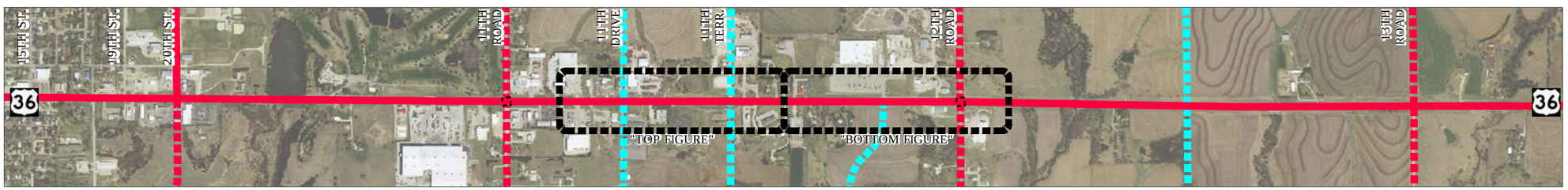


LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Functional Intersection Influence Area
- Existing Access Point

NORTH
100' 0' 100'
SCALE

LOCATION KEY:



NORTH
700' 0' 700'
SCALE

Figure 11: Intersection Influence Areas (3 of 3)

Influence areas were considered along several of the local side streets but due to the relatively long influence areas compared to the short distances between the highway and parallel streets/alleyways, it was determined that corner clearance may be better measure to restrict local side street accesses that are nearing US-36 in some areas. It should be noted that every effort should be made to meet influence area requirements but at a minimum corner clearance can help keep new accesses from encroaching upon the highway. In developed areas, corner clearance is measured from the edge of curb line of the highway to the edge or curb line of the access. Minimum distances are shown in *Table 1: Corner Clearance Distances (Source: KDOT's Access Management Policy)*.

Table 1: Corner Clearance Distances (Source: KDOT's Access Management Policy)

Highway Area Type	Design Distance [ft]
Undeveloped	155
Developed	115
CBD	85

Because US-36 serves an existing, well-developed urban environment, some flexibility will need to be considered for existing access points. Further analysis of access spacing will be discussed to help identify places where existing access points can be eliminated or consolidated.

3.4.2 ACCESS SPACING (UNSIGNALIZED AND SIGNALIZED)

Reviewing access spacing criteria as set forth in KDOT's *Access Management Policy* will help establish a starting point for acceptable access locations (both entrances and side streets). The *Access Management Policy* identifies separate criteria for signalized and unsignalized accesses. Access spacing takes into account the route classification, area type, and the posted speed limit. *Figure 12: US-36 Corridor Speed Limits* shows the various speed limits throughout the US-36 corridor through Marysville.

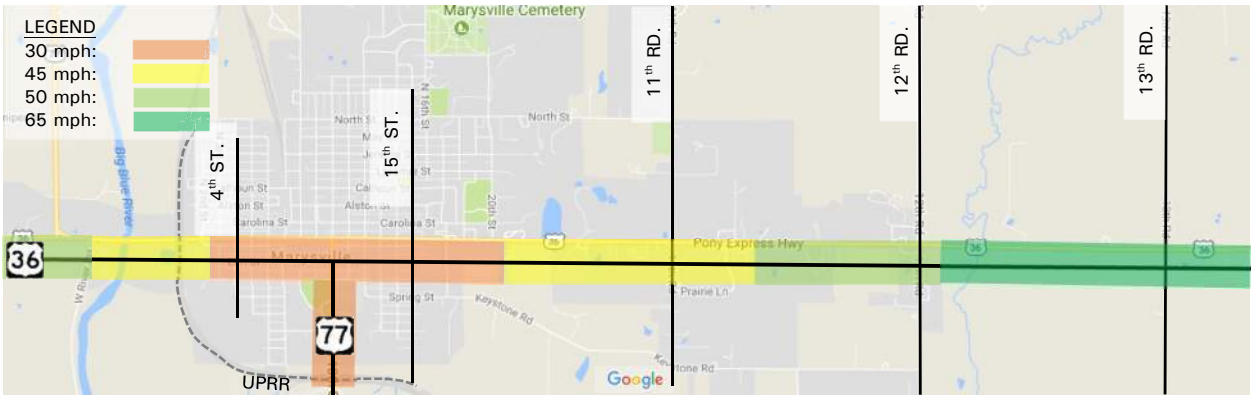


Figure 12: US-36 Corridor Speed Limits

When access is provided to properties on opposite sides of a highway, it is preferable for the driveways to be aligned across from one another. Consideration for appropriate offsets can be applied when aligning driveways cannot be achieved. KDOT's *Access Management Policy* outlines minimum offset distances for accesses on opposite sides of the roadway. Minimum offset distances are dependent upon access type and posted speed limit (see Table

4-9 in KDOT's *Access Management Policy*). Realigning offset accesses can help with safety and traffic flow issues and eliminate overlapping turning movements.

The US-36 corridor is a crowded corridor. Meeting both access spacing requirements and intersection influence areas will be challenging.

Unsignalized Spacing

Unsignalized access spacing is shown in Table 2: Unsignalized Access Spacing. By identifying the route classification, area type and speed limit the appropriate spacing between accesses can be determined (distances between access points are measured from the centerline of one access to the centerline of another access).

Table 2: Unsignalized Access Spacing

Access Route Classification	Area Type	Speed Limit			
		30mph	45mph	50mph	65mph
B	Undeveloped	n/a	515′	610′	955′
	Developed	225′	450′	535′	n/a
	CBD	155′	n/a	n/a	n/a

Within the Central Business District, from 4th Street to 15th Street, both intersection influence areas and current access spacing requirements as set forth by KDOT's *Access Management Policy* indicate no access should be allowed between the intersections. It is the recommendation of this report that all accesses between street intersections within the Central Business District be removed. *Figure 13: Long-term Access Changes (1 of 3)* shows how the corridor could look if all access points are removed. Existing access locations that are recommended to be removed or relocated are represented by blue cross-hatched regions. Pavement markings should be modified so that all left-turn lanes and two-way left-turn lanes can be maximized and on-street parking can be added from intersection to intersection. Pavement markings shown on the following figures are schematic in nature and will need to be designed to meet current *Manual on Uniform Traffic Control Devices (MUTCD)* standards when they are implemented, this includes but is not limited to the parking spacing, lane markings, turn lane lengths, crosswalk marking, and symbols.

From 15th Street to 17th Street, accesses should be limited to the region outside of the intersection influence areas with an access spacing of at least 225′. Eliminating several of the access points and allowing for shared accesses which are aligned on both sides of US-36 (as shown on *Figure 13: Long-term Access Changes (1 of 3)*) can maintain access to current and future businesses.

From 17th Street to 18th Street, all accesses should be eliminated as shown on *Figure 13: Long-term Access Changes (1 of 3)* and on *Figure 14: Long-term Access Changes (2 of 3)*. A shared access should be built that aligns with 18th Street for the businesses on the south side to have access. An example of what this shared access could look like is shown on *Figure 14: Long-term Access Changes (2 of 3)*.

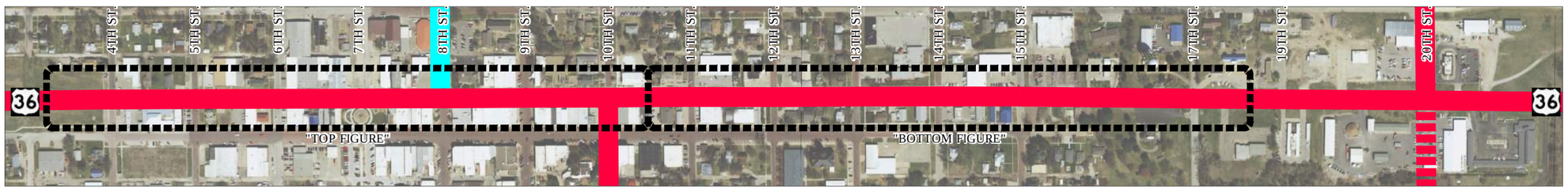
LONG-TERM ACCESS CHANGES

LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Consolidated/Relocated Entrance
- New Entrance Location
- Existing Pavement
- Proposed Geometric Improvement

NORTH
100' 0' 100'
SCALE

LOCATION KEY:



NORTH
250' 0' 250'
SCALE

Figure 13: Long-term Access Changes (1 of 3)

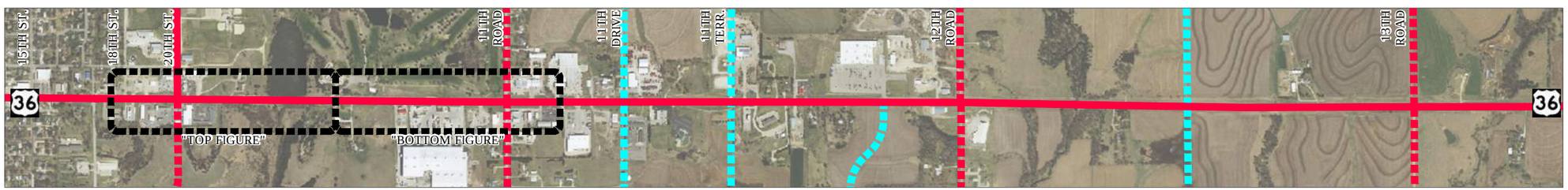
LONG-TERM ACCESS CHANGES

LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Consolidated/Relocated Entrance
- New Entrance Location
- Existing Pavement
- Proposed Geometric Improvement

NORTH
100' 0' 100'
SCALE

LOCATION KEY:



NORTH
700' 0' 700'
SCALE

Figure 14: Long-term Access Changes (2 of 3)

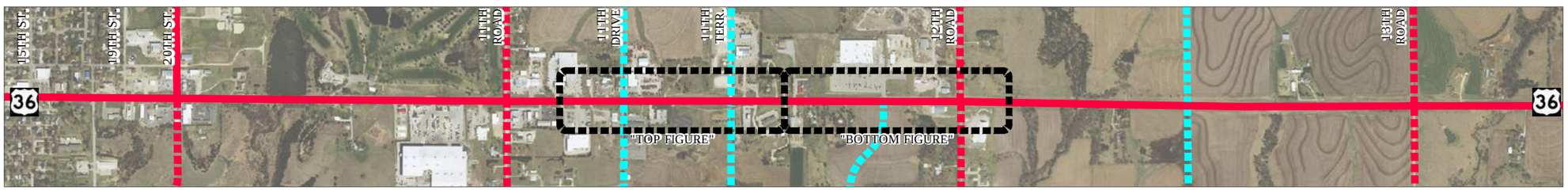
LONG-TERM ACCESS CHANGES

LEGEND

- Existing Arterial Street
- Existing Collector Street
- Future Arterial Street
- Future Collector Street
- Future Local Street
- Consolidated/Relocated Entrance
- New Entrance Location
- Existing Pavement
- Proposed Geometric Improvement

NORTH 100' 0' 100' SCALE

LOCATION KEY:



NORTH 700' 0' 700' SCALE

Figure 15: Long-term Access Changes (3 of 3)

Between 18th Street and 20th Street, intersection influence areas and spacing requirements indicate there is room for only one aligned access location half way between the intersections. All other accesses should be removed. This is shown on *Figure 14: Long-term Access Changes (2 of 3)*.

Consolidating and realigning access points will also be important between 20th Street and 11th Road. Accesses should be limited to outside the intersection influence areas. Within the 30mph speed zone access spacing should be a minimum of 225' and within the 45mph speed zone spacing should be at least 450'. Possible consolidation reconfiguration for the various access locations is shown on *Figure 14: Long-term Access Changes (2 of 3)*.

Between 11th Road and 11th Drive, consolidating accesses to align at the one-third points should allow accesses to remain outside of the intersection influence areas while maintaining an access spacing of greater than 450'. This will require property owners to share accesses. A possible arrangement is shown in *Figure 14: Long-term Access Changes (2 of 3)* and in *Figure 15: Long-term Access Changes (3 of 3)*.

From 11th Drive to 11th Terrace, realigned access to the halfway point would keep them outside of the intersection influence areas and meet spacing requirements. This configuration is shown in *Figure 15: Long-term Access Changes (3 of 3)*.

The section between 11th Terrace and 12th Road will be more challenging to meet access spacing requirements due to the mix of existing residential properties and existing commercial properties. It will be important to implement good access management practices and engineering judgement as properties are redeveloped. *Figure 15: Long-term Access Changes (3 of 3)* shows an example access layout that consolidates and realigns many of the accesses to meet the 535ft. spacing requirement.

Signalized Spacing

Signalized spacing, which is dependent upon the signal cycle length and the route speed limit, is shown in *Table 3: Signalized Access Spacing.* Where adjacent signals have different cycle lengths, it is appropriate to use the longer cycle length for analysis. Because traffic signals introduce interrupted traffic flow along the US-36 corridor, extensive delays can be avoided by synchronizing the signals. In addition, traffic signal spacing should also consider turning treatments, roadway functional classification and purpose, and adequate storage lengths for traffic queues.

The US-36 corridor has four existing intersections that are traffic signal controlled: 8th Street, US-77 (10th Street), 14th Street, and 20th Street. Marysville Staff provided the existing signal cycle lengths for each of these intersections. *Table 4: Existing Signal Cycles and Spacing* summarizes the cycle lengths for each traffic signal as well as the distance between signals. Currently, the only traffic signal controlled intersection that meets the spacing requirements set forth by KDOT's *Access Management Policy* is the intersection of US-36 and 20th Street.

Table 3: Signalized Access Spacing

Cycle Length [sec]	Speed Limit		
	30mph	45mph	50mph
60	1,320	1,980	2,200
70	1,540	2,310	2,590
80	1,760	2,640	2,940
90	1,980	2,970	3,300
100	2,200	3,300	3,670
110	2,420	3,630	4,040
120	2,640	3,960	4,400

Table 4: Existing Signal Cycles and Spacing

Intersection	Speed Limit [mph]	Min. Cycle Length [sec]	Max. Cycle Length [sec]	Distance between Signals [ft]	Req'd Distance between Signals [ft]	Meets Req'd Spacing?
US-36 & 8th St.	30	n/a	60			
				690	1,672	No
US-36 & 10th St.	30	n/a	76			
				1,380	1,672	No
US-36 & 14th St.	30	42	62			
				2,030	1,364	Yes
US-36 & 20th St.	30	62	not given			

3.4.3 SIGHT DISTANCE (STOPPING AND INTERSECTION)

Sight distance is an important aspect for driveway placement. Driver's need a clear view of an access from the highway to allow time to slow down or stop (stopping sight distance) if required. Driver's also need a clear view of the highway from an access in order to select an appropriate gap in traffic to cross or turn (intersection sight distance). KDOT's *Access Management Policy* outlines the proceed for measuring both stopping sight distance and intersection sight distance.

After a driver perceives the need to stop, stopping sight distance is the distance required for a vehicle on the highway to come to a complete stop at a comfortable deceleration rate. It is dependent upon the grade of the surrounding terrain and is calculated by adding together the perception-reaction distance and the braking distance. The perception-reaction distance is the distance traveled by a vehicle between the time the driver perceives an object that requires the driver to stop to when the driver applies the brakes. The braking distance is the distance required by a vehicle to come to a stop once the brakes have been applied. The required stopping sight distance on level terrain is shown in *Table 5: Stopping Sight Distance on Level Terrain (Source: KDOT's Access Management Policy*). The required stopping sight distance for uphill or downhill grades is shown in *Table 6: Stopping Sight Distance on Grades (Source: KDOT's Access Management Policy*).

Table 5: Stopping Sight Distance on Level Terrain (Source: KDOT's Access Management Policy)

Posted Speed [mph]	Design Distance [ft]
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

Table 6: Stopping Sight Distance on Grades (Source: KDOT's Access Management Policy)

Posted Speed [mph]	Design Distance [ft]					
	Downgrades			Upgrades		
	3%	6%	9%	3%	6%	9%
20	116	120	126	109	107	104
25	158	165	173	147	143	140
30	205	215	227	200	184	179
35	257	271	287	237	229	222
40	315	333	354	289	278	269
45	378	400	427	344	331	320
50	446	474	507	405	388	375
55	520	553	593	469	450	433
60	598	638	686	538	515	495
65	682	728	785	612	584	561
70	771	825	891	690	658	631

The required sight distances shown in the above tables represent the minimum sight distance that must be available for all new access points. If the distance is not available, relocation of the access needs to be evaluated.

Achieving appropriate access placement and spacing throughout the US-36 corridor will take time. There are other short-term improvements that could be implemented as an intermediate step to improve traffic movement, reduce crashes, and create fewer vehicle conflict points. These options include changing or limiting accesses to one-way entrances, restricting left-turning movements by installing right-in/right-out accesses controlled by islands or implementing a three-quarter access that uses a restrictive median island to eliminate left-turns out of an access.

It should be noted that when executing any part of this corridor plan, accesses should be designed by a professional engineer licensed to practice in the State of Kansas and all new/relocated access points will need approval through KDOT's access permitting process.

CHAPTER 4: TRAFFIC ANALYSIS

It is important to have a good understanding of supply versus demand for a given transportation facility. In transportation engineering, demand is quantified through traffic flow or traffic volumes. Supply is characterized by the capacity of the infrastructure and the operating condition(s) describes how well the capacity serves the demand. By comparing the existing and projected traffic demands for US-36 infrastructure deficiencies, recommendations can be made to improve the operating condition of the corridor.

Analysis of the corridor was primarily focused on reviewing the existing and future expected Level-of-Service (LOS) at intersections where traffic volume data was available. The traffic analysis was based on the *2010 Highway Capacity Manual*. Using performance measures like speed, traffic density, driver experienced delay, etc., the LOS assigns the facility a grade between A (good) and F (poor) depending on capacity and performance.

The LOS for at-grade intersections can be defined as a function of the average delay (in seconds per vehicle) experienced by individual drivers as shown in *Table 7: Level of Service Criteria*.

Table 7: Level of Service Criteria

Level of Service (LOS)	Average Vehicle Control Delay (sec/veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤10	≤10
B	10-15	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	>80	>50

4.1 REGIONAL GROWTH RATES

KDOT's 2017 Traffic Flow Map establishes the Annual Average Daily Traffic (AADT) for traffic counts recorded in calendar year 2016 (which can be found on KDOT's Access Permit Map). This data is shown in *Figure 16: AADT Traffic Flow*.

The future estimated 20-year growth for through the Central Business District region east to 11th Road, has been estimated to be 1.5% per year by comparing the existing 2016 Traffic Flow Map to those published by KDOT over the last 20 years. Because this region is heavily developed already, this growth will be mainly characterized by background traffic growth through the region. The 7,850 daily traffic volume may grow to an estimated 10,575 by 2036 and the 680 Heavy Commercial Vehicles may grow to an estimated 916 by 2036. If traffic volumes should increase beyond 15,000 vehicles per day, the criteria for on-street parking and the corridor crash data should be reevaluated. On-street, parallel parking can become more difficult for drivers to navigate at these higher traffic volumes. Between 20th Street and 11th Road the 10,400 daily traffic volume may grow to an estimated 14,008 by 2036 and the 640 Heavy Commercial Vehicles may grow to an estimated 863 by 2036.

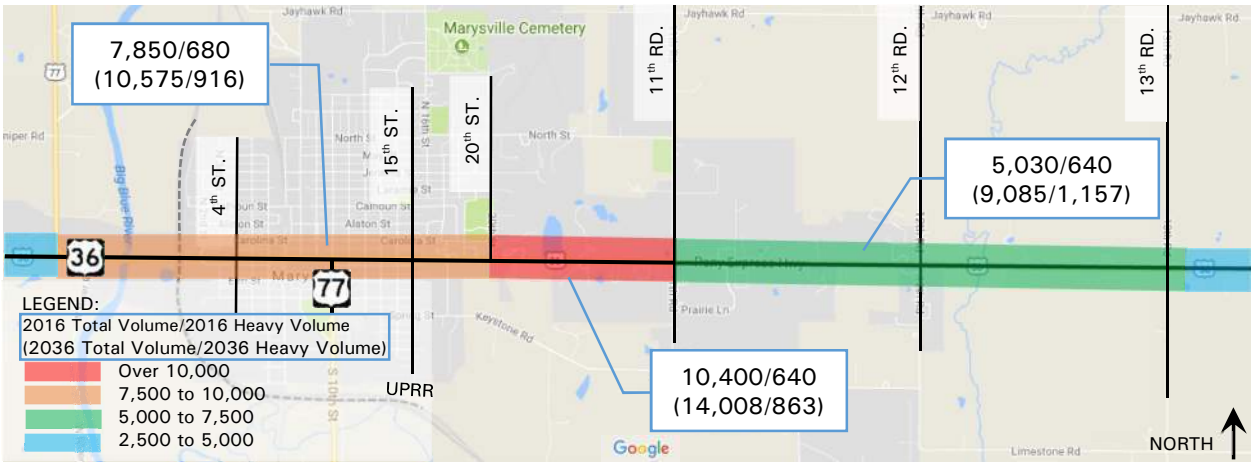
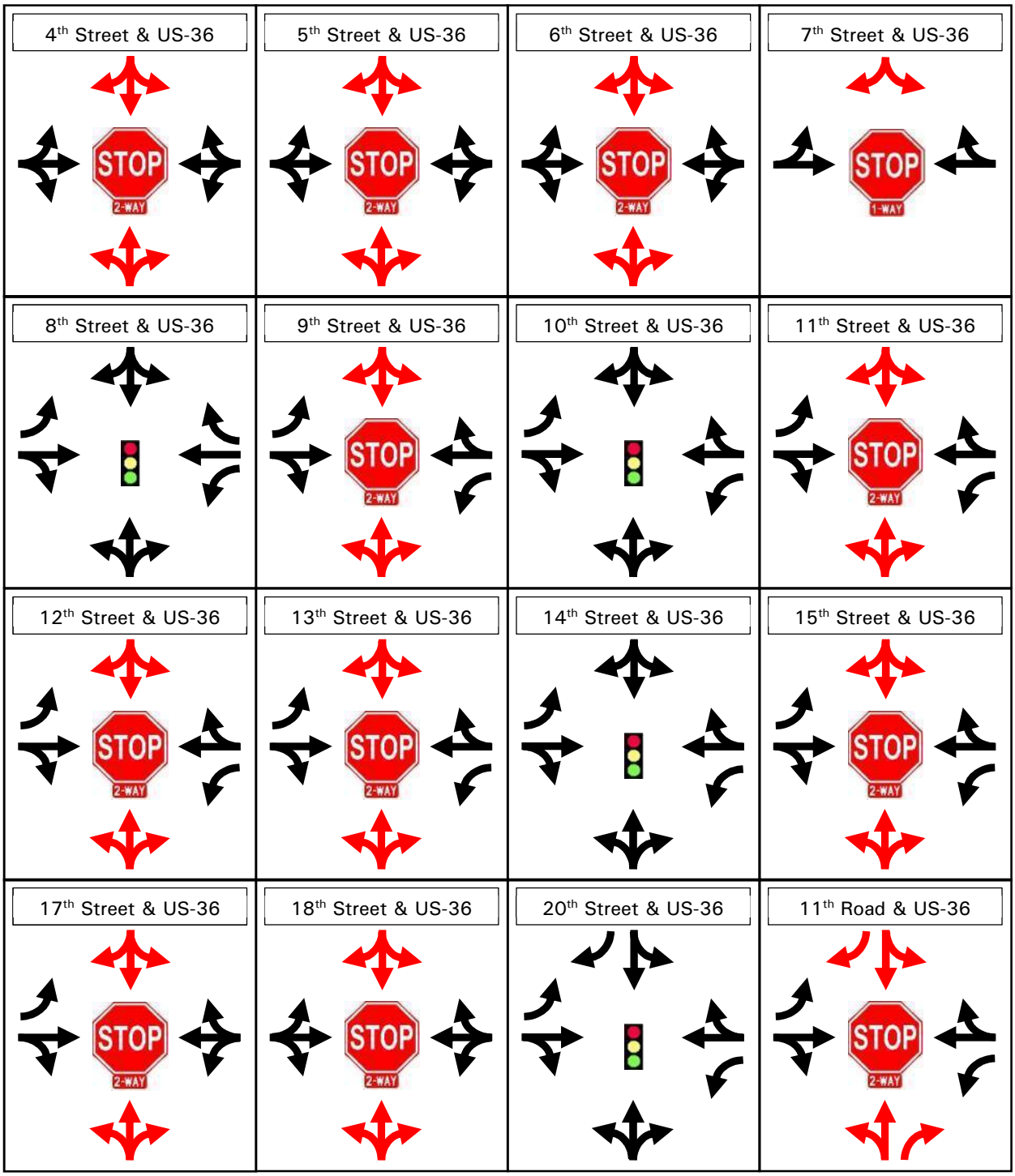


Figure 16: AADT Traffic Flow (Source: KanPlan)

The 20-year estimated growth rate for the Developed region east of 11th Road has been estimated to be 3% per year. It is estimated that the 5,030 daily traffic volume may grow to an estimated 9,085 by 2036 and the 640 Heavy Commercial Vehicles may grow to an estimated 1,157 by 2036. This growth will be influenced by not only background traffic growth through the region but also the expected economic development in the areas identified in Marysville's future zoning map (*Figure 4: City of Marysville Zoning Map*). There are still a few undeveloped commercial lots between 11th Road and 12th Road while the region between 12th Road and 13th Road has yet to develop commercially. There is also a lot of space that has been dedicated to residential construction between 11th Road and 13th Road.

4.2 TRAFFIC OPERATIONS (EXISTING CONDITIONS)

Current intersection configurations are show in *Figure 17: Existing Intersection Configuration*.



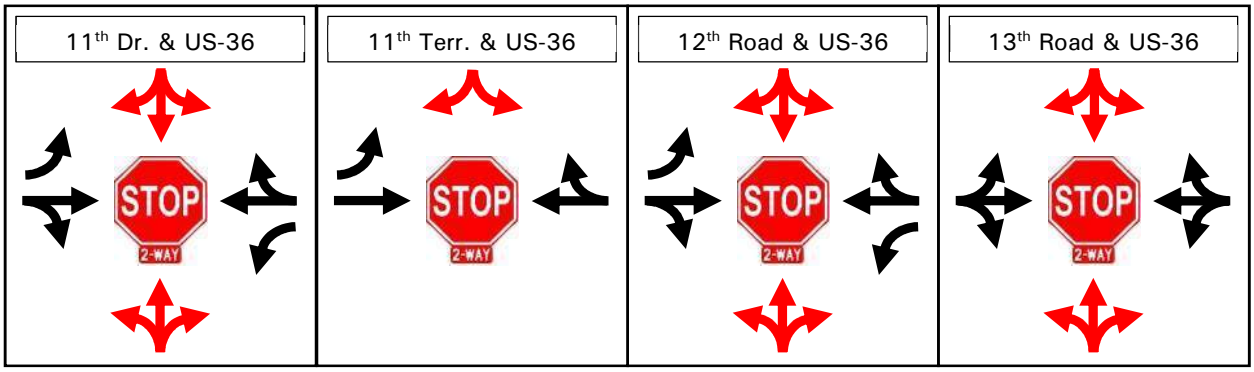


Figure 17: Existing Intersection Configuration

4.3 TRAFFIC VOLUMES (EXISTING)

Existing peak hour traffic volumes at key intersections were obtained from KDOT's *Road Safety Audit for Marshall County* that was published in January 2013. Peak hour turning movements were collected between July 2011 and October 2011 at the intersections of 6th Street, 8th Street, US-77 (10th Street), 11th Street, 14th Street, 15th Street, 17th Street and 20th Street with US-36. The peak hour counts were taken between 6:00am and 8:00am and between 4:00pm and 6:00pm. Since the traffic counts were obtained in 2011, the traffic volumes have been adjusted by using the estimated growth rates that were established previously. The intersections of 6th Street, 8th Street, US-77 (10th Street), 11th Street and 14th Street were adjusted from the 2011 traffic volumes to 2017 traffic volumes using an estimated growth rate of 1.5% per year. The intersections of 15th Street, 17th Street and 20th Street were adjusted from the 2011 traffic volumes to 2017 traffic volumes using an estimated growth rate of 3.0% per year.

Current peak hour turning movements for the intersection of 11th Road and US-36 were taken on September 21st, 2017 as a part of this study.

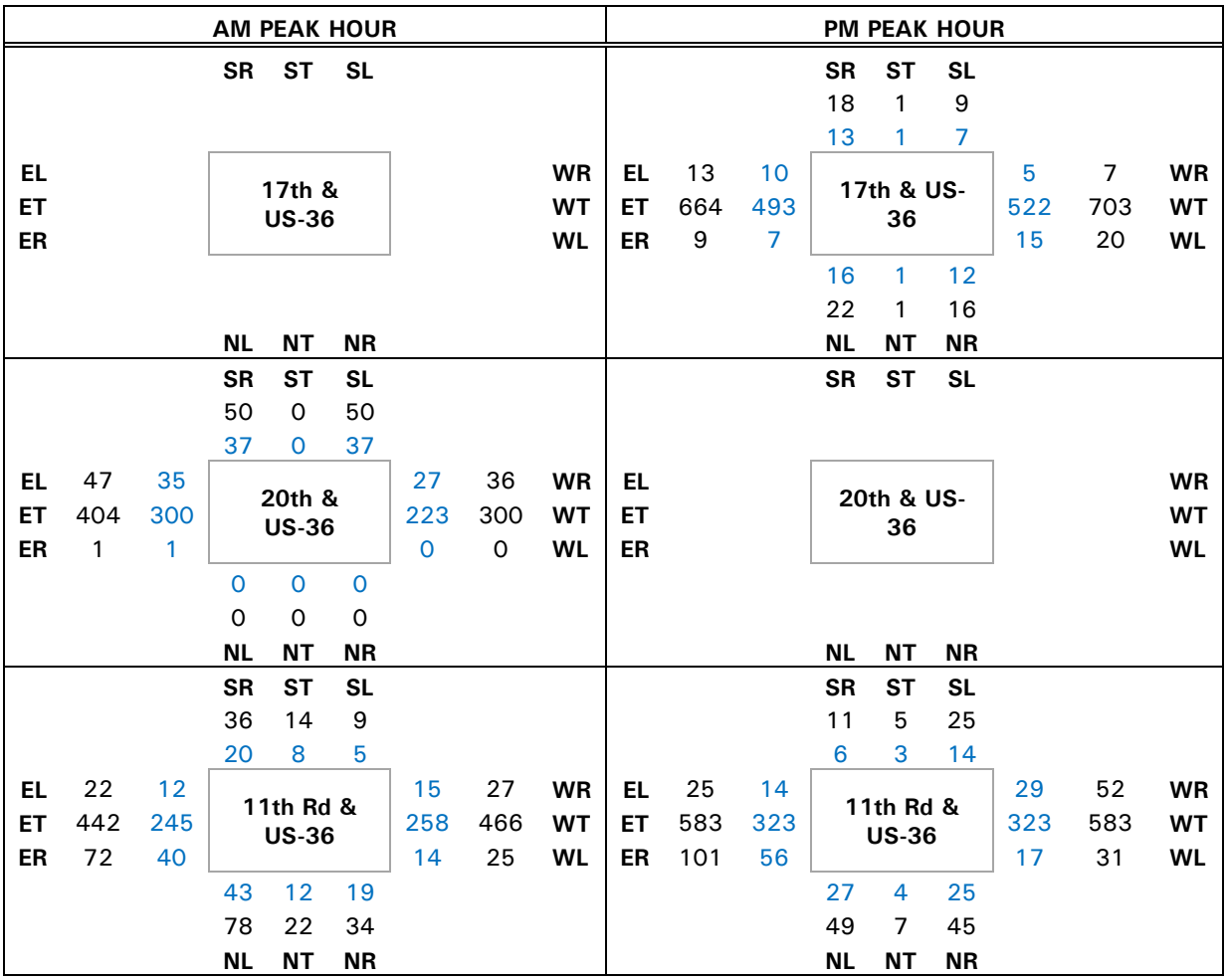
See *Figure 18: Peak Hour Turning Movements* for a summary of the projected 2017 and 2037 Peak Hour Volumes. Note that any information that was not available was left blank.

AM PEAK HOUR						PM PEAK HOUR					
	SR	ST	SL				SR	ST	SL		
							5	4	22		
							4	3	16		
EL					WR	EL	11	8		25	34	WR
ET		6th & US-36			WT	ET	290	215	6th & US-36	370	498	WT
ER					WL	ER	19	14		36	48	WL
							26	15	42			
							35	20	57			
	NL	NT	NR				NL	NT	NR			

[PROJECTED 2017 DATA]
[PROJECTED 2037 DATA]

AM PEAK HOUR										PM PEAK HOUR									
			SR	ST	SL								SR	ST	SL				
			22	30	28								69	38	54				
			16	22	21								51	28	40				
EL	44	33				12	16	WR		EL	31	23				23	31	WR	
ET	334	248	8th & US-36			172	232	WT		ET	357	265	8th & US-36			331	446	WT	
ER	40	30				16	22	WL		ER	22	16				34	46	WL	
			7	11	2								17	34	49				
			9	15	3								23	46	66				
			NL	NT	NR								NL	NT	NR				
			SR	ST	SL								SR	ST	SL				
			5	23	5								15	16	5				
			4	17	4								11	12	4				
EL	0	0				210	283	WR		EL	9	7				8	11	WR	
ET	0	0	10th & US-36			139	187	WT		ET	438	325	10th & US-36			386	520	WT	
ER	0	0				77	104	WL		ER	62	46				112	151	WL	
			268	36	15								50	15	126				
			361	48	20								67	20	170				
			NL	NT	NR								NL	NT	NR				
			SR	ST	SL								SR	ST	SL				
			15	4	11														
			11	3	8														
EL	16	12				27	36	WR		EL								WR	
ET	392	291	11th & US-36			321	432	WT		ET			11th & US-36					WT	
ER	3	2				25	34	WL		ER								WL	
			2	2	12														
			3	3	16														
			NL	NT	NR								NL	NT	NR				
			SR	ST	SL								SR	ST	SL				
			16	3	28								15	16	28				
			12	2	21								11	12	21				
EL	4	3				7	9	WR		EL	12	9				11	15	WR	
ET	385	286	14th & US-36			302	407	WT		ET	614	456	14th & US-36			500	673	WT	
ER	26	19				4	5	WL		ER	26	19				11	15	WL	
			5	2	3								14	7	20				
			7	3	4								19	9	27				
			NL	NT	NR								NL	NT	NR				
			SR	ST	SL								SR	ST	SL				
													65	5	12				
													48	4	9				
EL								WR		EL	66	49				34	46	WR	
ET			15th & US-36					WT		ET	576	428	15th & US-36			499	672	WT	
ER								WL		ER	15	11				20	27	WL	
													3	11	8				
													4	15	11				
			NL	NT	NR								NL	NT	NR				

[PROJECTED 2017 DATA]
[PROJECTED 2037 DATA]



[PROJECTED 2017 DATA]
[PROJECTED 2037 DATA]

Figure 18: Peak Hour Turning Movements

4.4 TRAFFIC ANALYSIS SUMMARY

Several *Synchro* models were made to analyze the existing US-36 corridor using the regional growth rates, the existing traffic operating conditions, and exiting traffic volumes. A comparison can be made for how the corridor operates under 2017 traffic volumes versus 2037 traffic volumes if no improvements are made along the US-36 corridor. *Table 8: AM Peak LOS (Existing Operating Conditions)* compares the LOS and delay for the major intersections along US-36 during the AM Peak Hour under 2017 traffic volumes to 2037 traffic volumes.

Table 8: AM Peak LOS (Existing Operating Conditions)

Location	Intersection Operation	Year	Signalized Intersection Operations		Eastbound		Westbound		Northbound		Southbound	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
8th St.	Signal	2017	A	9.5	A	9.6	A	8.5	B	13.1	B	11.7
		2037	B	10.4	B	10.9	A	9.1	B	13.0	B	11.8
11th St.	Stop	2017			A	<1	A	<1	B	10.7	B	11.6
		2037			A	<1	A	<1	B	11.9	B	13.2
14th St.	Signal	2017	A	9.5	A	9.2	A	9.4	B	14.0	B	12.6
		2037	B	10.8	B	10.6	B	10.7	B	14.1	B	12.8
20th St.	Signal	2017	A	6.0	A	6.0	A	5.6	n/a	n/a	A	7.8
		2037	A	6.7	A	6.7	A	6.2	n/a	n/a	A	8.6
11th Rd.	Stop	2017			A	<1	A	<1	B	11.8	B	10.7
		2037			A	<1	A	<1	C	18.1	B	13.5

Table 9: PM Peak LOS (Existing Operating Conditions) compares the LOS and delay for the major intersections along US-36 during the PM Peak Hour under 2017 traffic volumes to 2037 traffic volumes.

Table 9: PM Peak LOS (Existing Operating Conditions)

Location	Intersection Operation	Year	Signalized Intersection Operations		Eastbound		Westbound		Northbound		Southbound	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
6th St.	Stop	2017			A	<1	A	<1	B	14.8	C	18.0
		2037			A	<1	A	1.1	C	23.1	D	29.9
8th St.	Signal	2017	A	10.0	A	9.9	B	10.1	A	9.3	B	10.2
		2037	B	11.3	B	11.2	B	11.8	A	9.4	B	11.2
10th St.	Signal	2017	B	17.7	B	19.9	B	18.3	B	12.1	B	15.3
		2037	C	23.4	C	25.7	C	24.3	B	17.5	B	14.8
14th St.	Signal	2017	B	12.0	B	11.6	B	12.3	B	11.1	B	13.8
		2037	B	16.2	B	15.5	B	17.5	B	11.0	B	14.0
15th St.	Stop	2017			A	<1	A	<1	B	14.5	B	13.8
		2037			A	<1	A	<1	C	19.6	C	18.5
17th St.	Stop	2017			A	<1	A	<1	B	14.1	B	13.5
		2037			A	<1	A	<1	C	18.8	C	16.9
11th Rd.	Stop	2017			A	<1	A	<1	B	11.9	B	12.2
		2037			A	<1	A	<1	C	18.1	C	18.5

A summary of the *Synchro* model reports have been included in *Appendix C- Synchro Models*.

4.5 PEDESTRIAN/BICYCLE ACCOMMODATIONS

The continued development of the US-36 corridor through Marysville presents challenges and opportunities for improving bicycle and pedestrian access and safety. The following section outlines the needs and solutions that will provide a roadmap for systematically integrating bicycle and pedestrian infrastructure improvements in the US-36 corridor. The following information is based on field observations, public input, and guidance from City officials. Physical and environmental constraints are incorporated as well as existing bicycle and pedestrian infrastructure and relevant design standards.

4.5.1 PEDESTRIAN ACCOMMODATIONS

General Pedestrian Accommodations

4th Street marks the beginning of the existing sidewalks along the US-36 corridor. The region from 4th Street to 17th Street experiences regular pedestrian traffic, is more populated, and has the greatest concentration of sidewalks along the corridor. The sidewalks on the north side of US-36 in this region are generally continuous with approximately 20 curb cuts and 11 intersecting streets. The quality of these sidewalks varies greatly. The sidewalks along the south side are mostly located along the backside of commercial buildings and are not as continuous – while there are significantly less curb cuts, there are still many intersecting streets and large parking lots.

The area east of 17th Street is not as developed but does contain many commercial businesses, a golf course, and a large shopping center. Although there is a short section of sidewalks that extend along the north side of US-36 between 17th Street and 20th Street, very few other sidewalks extend through this region. Most pedestrians walk along the shoulder of US-36, in landscaped borders where available, or in the adjacent business parking lots. The Wal-Mart on the north side of US-36 does have a short section of sidewalk running parallel to the highway. There are no sidewalks along the south side of US-36 from 15th Street to the Wal-Mart, approximately 1.9 miles. The potential to improve pedestrian accommodations still exists as properties are redeveloped or as public infrastructure is rehabilitated. Improvements to the corridor can be made by establishing sidewalk policies and standards and by identifying and prioritizing the sidewalk improvements that are needed.

There are a few marked crosswalks across US-36 and all of these are in areas with the highest populations, employers, service providers, and retail destinations. The following signalized intersections along US-36 through Marysville contain marked crosswalks:

- 8th Street
- US-77 (10th Street)
- 14th Street

The following intersections have marked crosswalks but are not signalized:

- 4th Street
- 11th Street

- 12th Street

One area of pedestrian significance is the intersection of 7th Street and US-36. This is a 3-way intersection with traffic moving uncontrolled east/west and is stop controlled for southbound 7th Street traffic. 7th Street does not continue south past US-36. Instead, this area contains a public park with a statue that serves as a point of interest. This park also acts as the focal point in the City's downtown district. This area has regular pedestrian traffic and currently does not have crosswalks for pedestrians to cross US-36 – pedestrians would need to go a block east to the signalized intersection at 8th for the nearest crosswalk.

It is important to note the plan for a multi-use trail north of US-36 – The Blue River Trail. This trail was converted from an old railroad bed as part of the Kansas Rails-to-Trails plan and extends from Jayhawk Road to the Nebraska border and beyond. Continuing this trail into the downtown area can enhance connectivity of transportation infrastructure. There is also a paved multi-use path going south from downtown toward the intersection of Jackson and 10th Street.

Pedestrian Gap Study at 7th Street

A pedestrian gap study was used to determine the size and number of gaps in vehicular traffic in which a pedestrian could cross the street during peak hours at US-36 and 7th Street. This area is of particular interest given that it is the proposed location for the Blue River Trail to connect into downtown Marysville.

On September 19th, 2017, 24 hour traffic counts were collected at 7th Street and US-36 through the use of a video camera. The AM peak hour was determined to be between 7:15am-8:15am and the PM peak hour was determined to be between 4:30pm-5:30pm.

Using the *2010 Highway Capacity Manual* the critical headway gap can be determined using Equation 19-69. The critical headway gap is the minimum amount of time that a single pedestrian needs to perceive in order to attempt a crossing. The equation is as follows:

$$t_c = \frac{L}{S_p} + t_s$$

where:

t_c = critical headway for a single pedestrian (s)
L = crosswalk length (ft)
S_p = average pedestrian walking speed (ft/s), and
t_s = pedestrian start-up time and end clearance time (s)

US-36 is roughly 42ft wide where 7th Street intersects the highway. The on-street parking is observed to be about 6ft wide. Using an assumed crosswalk length of 42ft (street width less the on-street parking), an average pedestrian walking speed of 3.5ft/s, and a default pedestrian start-up time and end clearance time of 3s, the critical headway gap was determined to be 15s.

The number of gaps (defined as the time duration in seconds measured between the rear bumper of one vehicle and the front bumper of a consecutive vehicle across the same point in space) were observed during both the AM Peak Hour and the PM Peak Hour. Of the 503 gaps observed during the AM Peak Hour, only 61 gaps (12%) were observed as having an adequate amount of time for a single pedestrian to attempt a crossing. Of the 710 gaps observed during the PM Peak hour, only 79 gaps (11%) were observed as having an adequate amount of time for a single pedestrian to attempt a crossing.

If the crosswalk length were limited 24ft (two 12ft lanes) through the installation of sidewalk "bulb-outs" and using the same walking speed, and end clearance time, the headway gap decreases to 10s. This would increase the number of adequate gaps during the AM Peak hour to 115 (23%) and 138 (14%) adequate gaps during the PM Peak hour.

At this time, the intersection does not warrant the installation of a pedestrian-hybrid beacon. This warrant analysis, however, should be revaluated if the shared-use path/extension of Blue River Trail into downtown is completed.

Appropriate pedestrian accommodations will need to be made at the intersection of US-36 and 7th Street at the time at which the Blue River Trail is extended to meet downtown Marysville, All accommodations should be designed to meet current *Manual on Uniform Traffic Control Devices (MUTCD)* standards when they are implemented.

4.5.2 BICYCLE ACCOMMODATIONS

Few bicycle accommodations, such as bicycle lanes, bicycle paths or bicycle routes, have been established along the US-36 study corridor. Bicyclists can ride on US-36, but few were observed doing so. Travel via bicycle on US-36 must occur primarily in the vehicular driving lanes or on shoulders, where shoulders exist, presenting an obstacle to this mode of travel for bicyclists not comfortable with travelling among a significant number of commercial vehicles and turning vehicles. The City of Marysville has implemented an on-street bike lane system on the west side of 11th Road to the north of US-36.

Origins and Destinations

There are many origins and destinations within and surrounding the US-36 corridor. These areas include the adjacent housing developments and apartments that feed into the corridor from adjoining streets and driveways, commercial zones such as schools, institutions, recreational facilities, major employers, and other public and private facilities that are within a short walk or bicycle ride of the corridor. Providing adequate infrastructure for all modes of travel is important to consider with improvement projects.

4.6 CRASH DATA

Crash data was provided through KDOT's *Road Safety Audit for Marshall County (RSA)* that was published in January 2013. Crash data along the US-36 corridor within the study limits are shown in *Table 10: US-36 Corridor Characteristics (Source: KDOT's RSA,* 2013).

Table 10: US-36 Corridor Characteristics (Source: KDOT's RSA, 2013)

From	To	Length (m)	Speed (mph)	Lanes	Edge of Travel (ft)	Crashes (crash/mvmi)				Notes
						ADT	Crashes (08-10)	Rate	Critical Rate	
4th Street	**8th Street**	0.259	30	2	Curb & Gutter	6,332	3	1.67	5.96	1,3
8th Street	**End of Parallel Parking (70ft W of 12th St)**	0.236	30	3	Curb & Gutter	7,481	31	16.04	5.85	1,4
End of Parallel Parking (70ft W of 12th St)	**15th Street**	0.219	30	3	Curb & Gutter	9,310	11	4.93	5.64	5
15th Street	**110 ft E of 20th Street**	0.341	30	2	Curb & Gutter	9,883	11	2.98	5.04	6
110 ft E of 20th Street	**400 ft E of 20th Street**	0.060	45	2	Curb & Gutter	8,910	3	5.12	8.47	7
400 ft E of 20th Street	**0.35 mile E of 20th St.**	0.265	45	2	10 paved	8,910	1	0.39	5.44	8
0.35 mile E of 20th Street	**185 ft W of Marysville Christian Fellowship Church Ent.**	0.715	45	3	10 paved	7,458	8	1.37	4.62	9
185 ft W of Marysville Christian Fellowship Church Ent.	**12th Road**	0.672	50	3	10 paved	5,670	2	0.48	4.91	10
12th Road	**ECL Maryville**	0.066	50	2	10 paved	4,950	3	8.39	10.28	11

Notes:
1. Curb & Gutter with parallel parking on both sides of the road.
2. Not used.
3. The crashes included 1 rear-end, 1 angle, and 1 pedestrian.
4. The crashes included 4 angle, 2 backed into, 18 rear-end, 3 sideswipe (same direction), 2 parked vehicle, 1 pedestrian and 1 fixed object.
5. The crashes included 1 animal (9%), 3 angle, 6 rear-3nd, and 1 fixed object.
6. The crashes included 1 animal (9%), 2 angle, 2 sideswipe (opposite), 5 rear-end, and 1 fixed object.
7. The crashes included 3 animal (100%) crashes.
8. 1 fixed object crash.
9. The crashes included 1 animal (13%), 4 angle, 2 rear-end, and 1 sideswipe (opposite).
10. The crashes included 1 animal (50%) and 1 sideswipe (same direction).
11. The crashes included 2 animal (67%) and 1 angle.

The Kansas Department of Transportation publishes five-year statistics for crash data on both public roadways and highways. The five-year (2012-2016) crash rate for urban, 2-lane, undivided highways with partial access control was found to be 1.516. The five-year (2012-2016) crash rate for urban, 2-lane, undivided highways with no access control was found to be 2.218. The average crash rate for rural and urban intersections is 5 and 10,

respectively. These numbers represent the statewide average crash rate as the number of crashes per 1,000,000 vehicle miles.

Crash data along for intersections along the US-36 corridor within the study limits are shown in *Table 11: US-36 Intersection Characteristics (Source: KDOT's RSA, 2013*).

Table 11: US-36 Intersection Characteristics (Source: KDOT's RSA, 2013)

Intersection	Signing		Crashes (crash/mvmi)				Notes
	North Leg	South Leg	ADT	Crashes (08-10)	Rate	Critical Rate	
4th Street	R1-1	R1-1	5,702	0	0.00	18.64	1
5th Street	R1-1	R1-1	6,152	0	0.00	18.29	2
6th Street	R1-1	R1-1	8,508	0	0.00	16.96	
7th Street	R1-1		6,581	0	0.00	18.00	3
8th Street	Traffic Signal		12,889	2	1.42	15.57	
9th Street	R1-1	R1-1	5,892	2	3.10	18.49	4
10th St/US-77	Traffic Signal		16,085	17	9.65	14.95	
11th Street	R1-1	R1-1	7,872	3	3.48	17.26	
12th Street	R1-1	R1-1	9,352	2	1.95	16.61	
13th Street	R1-1	R1-1	9,352	0	0.00	16.61	
14th Street	Traffic Signal		17,083	2	1.07	14.80	
15th Street	R1-1	R1-1	12,324	4	2.96	15.71	
17th Street	R1-1	R1-1	12,096	1	0.75	15.76	
Masonic Temple Entrance		R1-1	10,100	0	0.00	16.35	
19th Street	R1-1		10,121	1	0.90	16.34	
20th Street	R1-1		15,390	0	0.00	15.07	5
11th Road	R1-1	R1-1	14,539	5	3.14	15.23	
Walmart Ent.	R1-1		12,053	1	0.76	15.77	
12th Road	R1-1 W3-1	R1-1 W3-1 (worded)	6,070	2	3.01	18.35	

Notes:
1. Pedestrian crossing on west leg of intersection with signs and markings present.
2. Parallel parking on the shoulder starts and continues to the east to 11th Street.
3. 7th Street is very wide due to the removal of railroad tracks and at field review it was observed that there was no traffic control (i.e. stop sign) at the intersection or pavement markings to provide guidance as to the correct travel paths. It was also observed that vehicles were being parked in the middle of the roadway. The city was asked to install a stop sign at this location and due to confusion as to which entity (the city or railroad) still owns the property that the railroad tracks were removed from, the city has only installed a temporary stop sign. Discussions have been started with both the city and Union Pacific Railroad to determine the correct ownership of the property and to determine the appropriate traffic control devices needed at this intersection.
4. TWLTL starts here and continue east to 15th Street.
5. Right and left turn lanes on 20th Street.

The critical crash rate, as shown in the tables, is a function of the average crash rate, the traffic volume, and a desired level of confidence. The critical crash rate can be used to determine whether an intersection or roadway segment is experiencing a number of crashes that are above the statistical range of crashes that could occur. This generally is an indicator of potential safety concerns for a given region.

An area of potential concern along US-36 highway is the region between 8th Street and the End of the Parallel Parking (70ft west of 12th Street). Comparing the data between *Table*

10 and *Table 11* it is suspected that majority of the reported 31 crashes are happening at the intersection of US-36 and 10th Street/US-77. Recommendations for this intersection are presented later in this report. Crash rates along all other regions with the study area are below the critical crash rate and are comparable to the average crash rates within the state of Kansas.

4.7 TRAFFIC SIGNAL ANALYSIS

The *Manual on Uniform Traffic Control Devices (MUTCD)* establishes criteria for traffic signal installation based on traffic conditions, pedestrian characteristics, and physical characteristics. Nine warrants are included in the *MUTCD* in which a traffic signal may improve the traffic operations at an intersection. A traffic signal should not be installed unless1 or more of these warrants is satisfied. Also, satisfaction of one or more of the 9 traffic signal warrants shall not in itself require the installation of a traffic control signal.

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

4.7.1 KDOT'S ROAD SAFETY AUDIT RESULTS

Traffic signal warrant analyses were performed as part of KDOT's *Road Safety Audit for Marshall County (RSA)* that was published in January 2013. The 2013 *RSA* evaluated traffic signal warrants for the intersections of US-36 and 6th Street, 8th Street, US-77 (10th Street), 11th Street, 14th Street, 20th Street, the Wal-Mart Entrance, and at 11th Road.

Table 12: Traffic Signal Warrant Analysis (from KDOT's RSA, 2013) shows the results from the traffic warrant analysis.

The following recommendations regarding traffic signals along US-36 were included in the 2013 *RSA*:

- Reduced signal warrant criteria were satisfied at the intersections of US-36 and 20th Street, 11th Road, and the Wal-Mart entrance. However, the crash rates are below the statewide average and the intersections appears to be operating safely, BTST is not recommending installation of signals at these locations at this time.
- Long-term Recommendation:
    - Based on the results of the data, the city might consider the following for future signal prioritization, provided it fits within city plans:
        1. US-36 and 11th Road (has most number of crashes and meets most warranting criteria based on volume among the 3 intersections)
        2. US-36 and Wal-Mart Entrance (2nd in volume warranting criteria)

3. US-36 and 20th Street (resubmit Geometric Improvement (GI) and include signal system with next GI opportunity)**

**At the time of this study, a geometric improvement project had already been completed at this intersection based on the recommendations from the RSA.

Table 12: Traffic Signal Warrant Analysis (from KDOT's RSA, 2013)

Location	Date	Signal Warrants Satisfied (Yes/No) and Hours Met					Notes
		1A	1B	1 Combined	2	3	
6th Street	2/6/2007	No, 0 hours	No, 3 hours	No, 3 hours (Condition A) and 7 hours (Condition B)	No, 1 hour	No, 0 hours	
8th Street	8/17/2011	No, 2 hours	No, 7 hours	No, 7 hours (Condition A) and 12 hours (Condition B)	No, 2 hours	No, 0 hours	1, 3
US-77 (10th St.)	8/17/2011	Yes, 12 hours	Yes, 12 hours	Yes, 12 hours (Condition A) and 12 hours (Condition B)	Yes, 12 hours	Yes, 4 hours	1
11th Street	2/7/2007	No, 0 hours	No, 0 hours	No, 0 hours (Condition A) and 2 hours (Condition B)	No, 0 hours	No, 0 hours	
14th Street	8/17/2011	No, 0 hours	No, 5 hours	No, 0 hours (Condition A) and 7 hours (Condition B)	No, 1 hour	No, 0 hours	1, 4
20th Street	8/10/2011	No, 2 hours	Yes, 9 hours	No, 6 hours (Condition A) and 12 hours (Condition B)	Yes, 7 hours	Yes, 2 hours	2, 5
Wal-Mart Entrance	8/10/2011	Yes, 9 hours	No, 1 hour	Yes, 11 hours (Condition A) and 8 hours (Condition B)	Yes, 8 hours	Yes, 2 hours	2
11th Road	10/27/2011	Yes, 11 hours	Yes, 9 hours	Yes, 13 hours (Condition A) and 12 hours (Condition B)	Yes, 8 hours	Yes, 2 hours	2

Notes:
1. Existing Signal
2. Signal Warrant Criteria Satisfied for vehicular volumes, however, warrant 7 (crash experience) is not satisfied.
3. Warrant criteria close to being satisfied
4. Installed in past for school/pedestrians
5. Has been installed since the *RSA* was published

4.7.2 US-36 AND 8TH STREET

An updated traffic signal warrant analysis was performed at US-36 and 8th Street after receiving public input during the public involvement stages of this study. The results are shown below in *Table 13: Traffic Signal Warrant Analysis (US-36 & 8th Street)*.

Table 13: Traffic Signal Warrant Analysis (US-36 & 8th Street)

Location	Date	Signal Warrants Satisfied (Yes/No)					Notes
		1A	1B	1 Combined	2	3	
8th Street	8/17/2011	No	No	No	No	n/a	1
Notes: 1. Existing Signal							

The intersection of US-36 and 8th Street currently does not meet signal warrant criteria based solely on traffic volume. A *Synchro* analysis was also performed to compare LOS and expected delay at the intersection if the existing signals were removed and replaced with stop signs on 8th Street (keeping US-36 free flowing). The results of the analysis are shown in *Table 14: US-36 and 8th Street Synchro Analysis*.

Table 14: US-36 and 8th Street Synchro Analysis

Peak Hour	Intersection Operation	Year	Signalized Intersection Operations		Eastbound		Westbound		Northbound		Southbound	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
AM Peak	Signal	2017	A	9.5	A	9.6	A	8.5	B	13.1	B	11.7
		2037	B	10.4	B	10.9	A	9.1	B	13.0	B	11.8
PM Peak	Signal	2017	A	10.0	A	9.9	B	10.1	A	9.3	B	10.2
		2037	B	11.3	B	11.2	B	11.8	A	9.4	B	11.2
AM Peak	Stop	2017			A	<1	A	<1	B	11.7	B	11.6
		2037			A	<1	A	<1	B	13.2	B	13.3
PM Peak	Stop	2017			A	<1	A	<1	B	13.1	B	13.9
		2037			A	<1	A	<1	C	17.3	C	20.0

A preliminary analysis of replacing the existing signal at US-36 and 8th Street with stop signs on 8th Street would indicate that the intersection would still operate at a LOS A or LOS B as it currently does with a LOS C along the side street by 2037. The delay experienced by drivers on US-36 would greatly decrease with the removal of the signal and stay the same or increase on 8th Street. Replacing the signal with stop signs is one option to improve the current delay experienced by drivers on US-36. If the existing traffic signal remains in operation, installing a vehicle detection system is an option to improve the efficiency of the intersection and reduce delay experienced by drivers.

CHAPTER 5: TRANSPORTATION RECOMMENDATIONS

5.1 ACCESS MANAGEMENT

The following recommendations are provided based on the analysis included in this study. The recommendations are made as a general guideline to be implemented where possible for new and existing accesses.

- Within the Central Business District, from 4th Street to 15th Street, all accesses between street intersections within the Central Business District be removed. Pavement markings should be modified so that all left-turn lanes and two-way left-turn lanes can be maximized and on-street parking is added from intersection to intersection (see *Figure 13: Long-term Access Changes (1 of 3)*).
- From 15th Street to 17th Street, accesses should be limited to the region outside of the intersection influence areas with an access spacing of at least 225' between access locations. Eliminating access points and creating shared access points which are aligned on both sides of US-36 will be key to ensuring current and future businesses still have access to the highway.
- From 17th Street to 18th Street, all accesses should be eliminated. A shared access should be built that aligns with 18th Street for the businesses on the south side to have access.
- Between 18th Street and 20th Street, intersection influence areas and spacing requirements would indicate there is room for only one aligned access location half way between the intersections. All other accesses should be removed.
- Consolidating and realigning accesses points will be key between 20th Street and 11th Road. Accesses should be limited to outside the intersection influence areas. Within the 30mph speed zone access spacing should be a minimum of 225' and within the 45mph speed zone spacing should be at least 450'.
- Between 11th Road and 11th Drive, consolidating accesses to align at the one-third points should allow accesses to remain outside of the intersection influence areas while maintaining an access spacing of greater than 450'. This will require property owners to share accesses.
- From 11th Drive to 11th Terrace, accesses should be realigned at the halfway point.
- The section between 11th Terrace and 12th Road will be more challenging to meet access spacing requirements due to the mix of existing residential properties and commercial properties. An example layout that consolidates and realigns many of the access points to meet the required 535' spacing was shown earlier in this report.

Due to relatively consistent truck traffic along the US-36 corridor, all new driving and turn lanes should be designed to a 12' width to accommodate a WB-67 truck.

Achieving appropriate access spacing throughout the US-36 corridor will take time. There are other short-term improvements that could be implemented as an intermediate step to improve traffic movement, reduce crashes, and create fewer vehicle conflict points. These options include:

- Changing or limiting accesses to one-way entrances

- Restricting left-turning movements by installing right-in/right-out accesses controlled by islands (as shown in *Figure 19: Right-in/Right-out Access (Source: KDOT's Access Management's Policy)*)

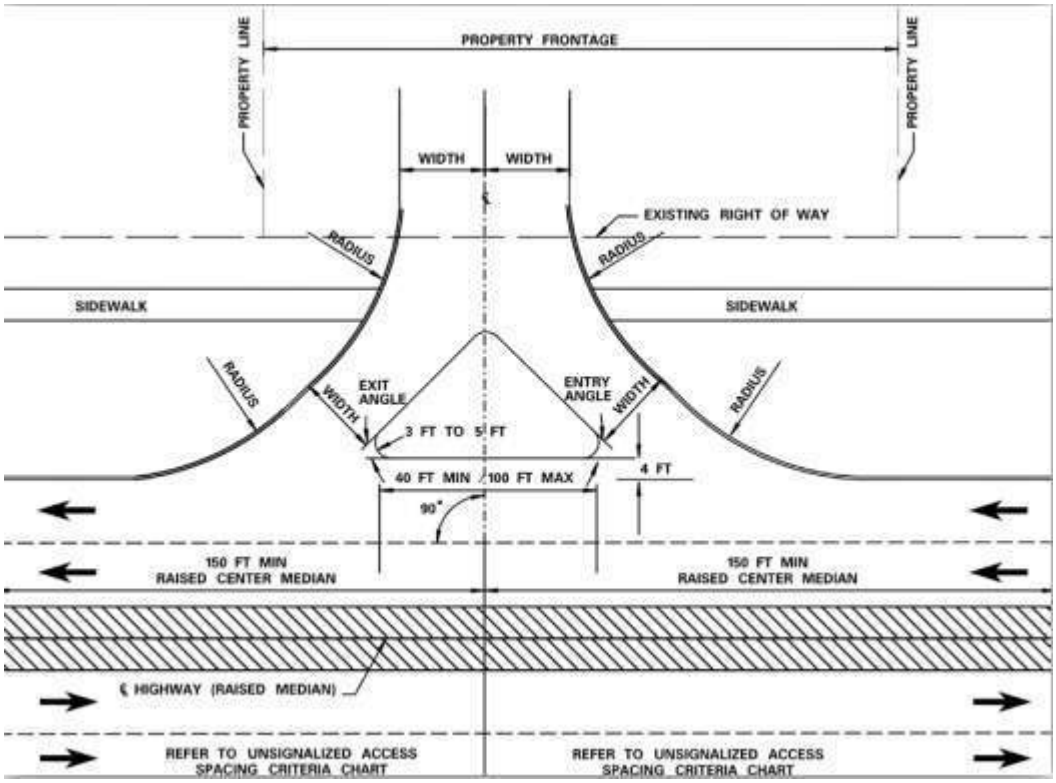


Figure 19: Right-in/Right-out Access (Source: KDOT's Access Management's Policy)

- Implementing a three-quarter access (as shown in *Figure 20: Three-quarter Access (Source: KDOT's Access Management Policy)*) that uses a restrictive median island to eliminate left-turns out of an access.

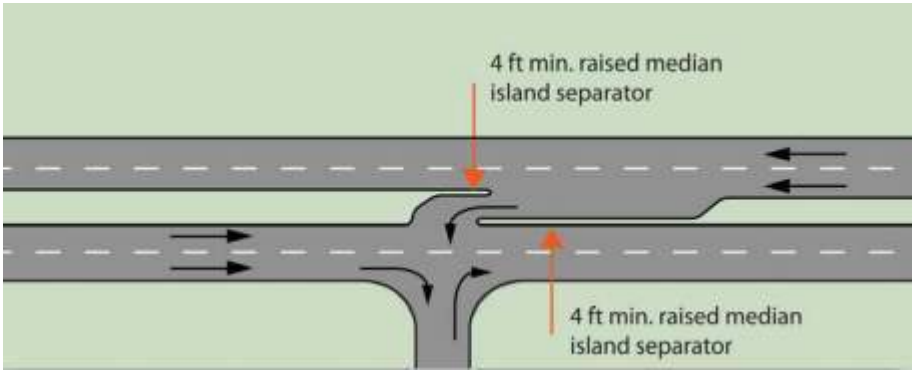


Figure 20: Three-quarter Access (Source: KDOT's Access Management Policy)

It should be noted that when executing any part of this corridor plan, accesses should be designed by licensed engineer. Accesses will need to be designed taking into account intersection sight distance, stopping sight distance, pavement thickness, access width and radii, etc.

5.2 GEOMETRIC IMPROVEMENTS

Several areas have been identified along the US-36 corridor that are in need of various levels of geometric improvements. These areas/intersections include US-36 between 4th and 5th Streets, 7th Street, US-77 (10th Street), 11th Road, 11th Drive, 11th Terrace, Wal-Mart Entrance, 12th Road, 12th Terrace, and 13th Road.

5.2.1 US-36 BETWEEN 4TH AND 5TH STREETS

Figure 21: Proposed Improvements along US-36 between 4th and 5th Streets

Marysville Central Business District should be extended to include the segment of road between 4th and 5th Streets along US-36. This will require the extension of the existing three lane section west to 4th Street. Accesses should be removed and on-street parking should be included. *Figure 21: Proposed Improvements along US-36 between 4th and 5th Streets* shows these improvements.

Estimated Cost of Improvements: $300,000

5.2.2 US-36 AND 7TH STREET

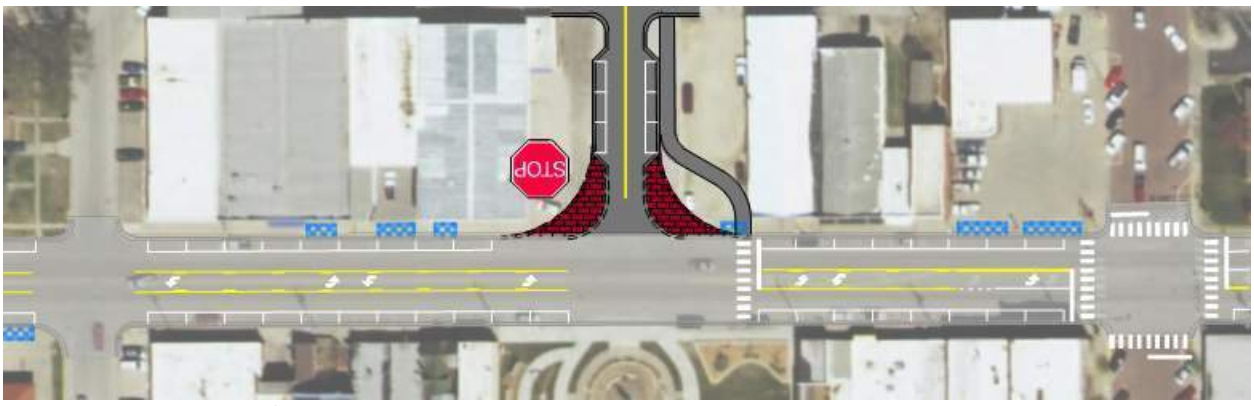


Figure 22: US-36 and 7th Street Proposed Improvements

7th Street has been identified as a possible truck route for large turning vehicles. 7th Street should be reconfigured so as limit the street width for non-commercial vehicles while making use of decorative concrete aprons to allow for the turning movements of larger commercial vehicles. The multi-use path from downtown could be extended to the north to provide a

link to the Blue River Trail at the time of construction. Accommodations for pedestrians will need to be considered if the rail trail is to be extension is built. Nearby accesses on US-36 should be removed and the pavement markings should be modified to extend the center two-way left-turn lanes and to include more on-street parking. 7th Street should remain a stop-controlled intersection. *Figure 22: US-36 and 7th Street Proposed Improvements* shows these improvements.

Estimated Cost of Intersection Improvements: $550,000

5.2.3 US-36 AND US-77 (10TH STREET)

Figure 23: US-36 and US-77 (10th Street) Proposed Improvements

The intersection US-36 and 10th Street (US-77 south of US-36) currently has very tight turning movement restrictions east of 10th Street. Turning movements paths and left-turn storage lengths could be greatly improved by acquiring the property in the southeast corner. The removal of this building would allow for better sight lines and larger corner radii. Pavement markings should be modified accordingly. *Figure 23: US-36 and US-77 (10th Street)* Proposed Improvements shows the location of proposed building to be acquired.

Estimated Cost of Intersection Improvements: $850,000

5.2.4 US-36 AND 11TH ROAD

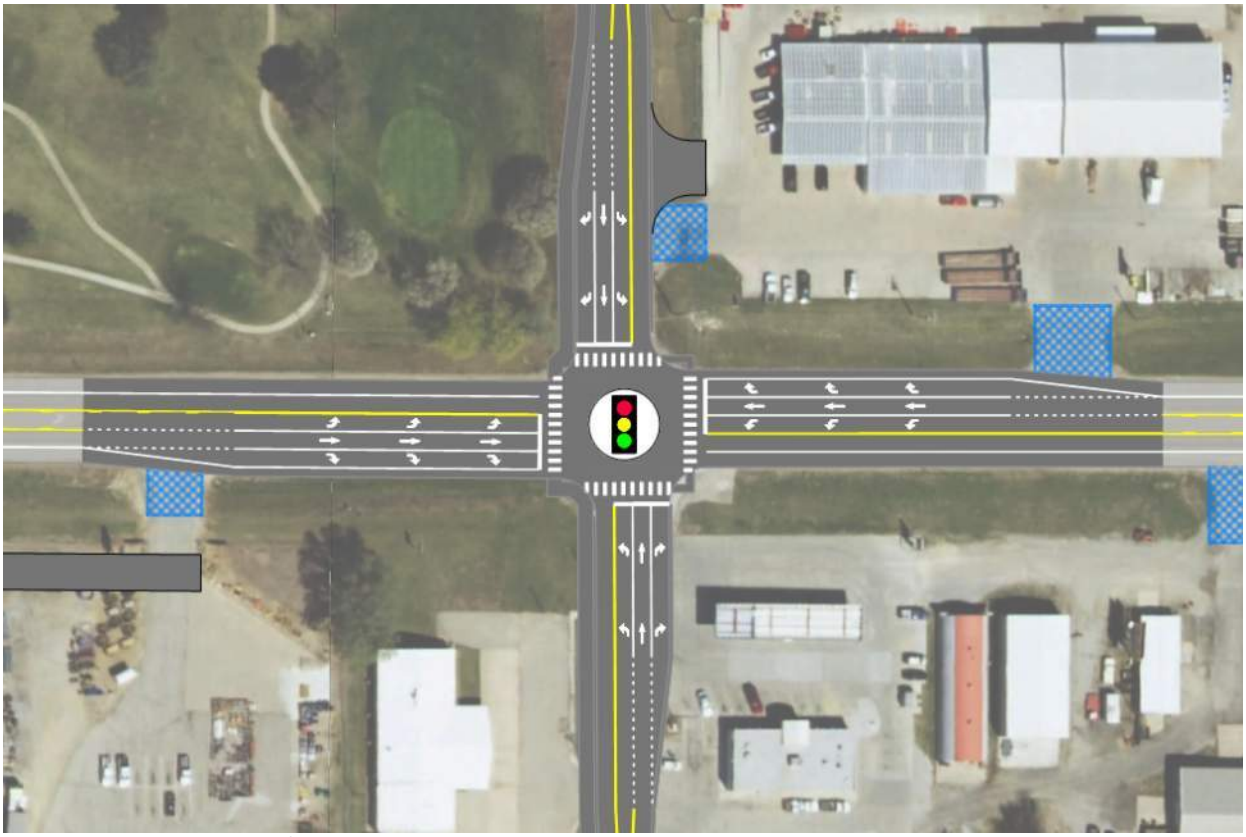


Figure 24: US-36 and 11th Road Proposed Improvements

11th Road should be considered a future Arterial Street. 11th Road should be constructed as a three-lane section with bicycle lanes. Once signal warrants are met the intersection should be signalized. Eastbound and westbound right-turn lanes should be added to US-36. At the intersection, 11th Road should include both dedicated left- and right-turn lanes. Accommodations for bicycle facilities should be incorporated. Long-term accommodations should include bicycle lanes on 11th Road. Short-term bicycle facilities should include a shared-use path and crosswalks at the intersection. *Figure 24: US-36 and 11th Road Proposed Improvements* shows the recommendations with the short-term bicycle accommodations.

Table 15: US-36 and 11th Road LOS

	Year	Signalized		Eastbound		Westbound		Northbound		Southbound	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Prior to Improvements	2017			A	<1	A	<1	B	11.9	B	12.2
	2037			A	<1	A	<1	C	18.1	C	18.5
After Improvements	2017	B	14.5	B	15.0	B	15.8	A	6.1	A	7.9
	2037	A	9.7	B	10.1	A	8.2	B	13.4	B	16

Estimated Cost of Intersection Improvements: $1,500,000

5.2.5 US-36 AND 11TH DRIVE

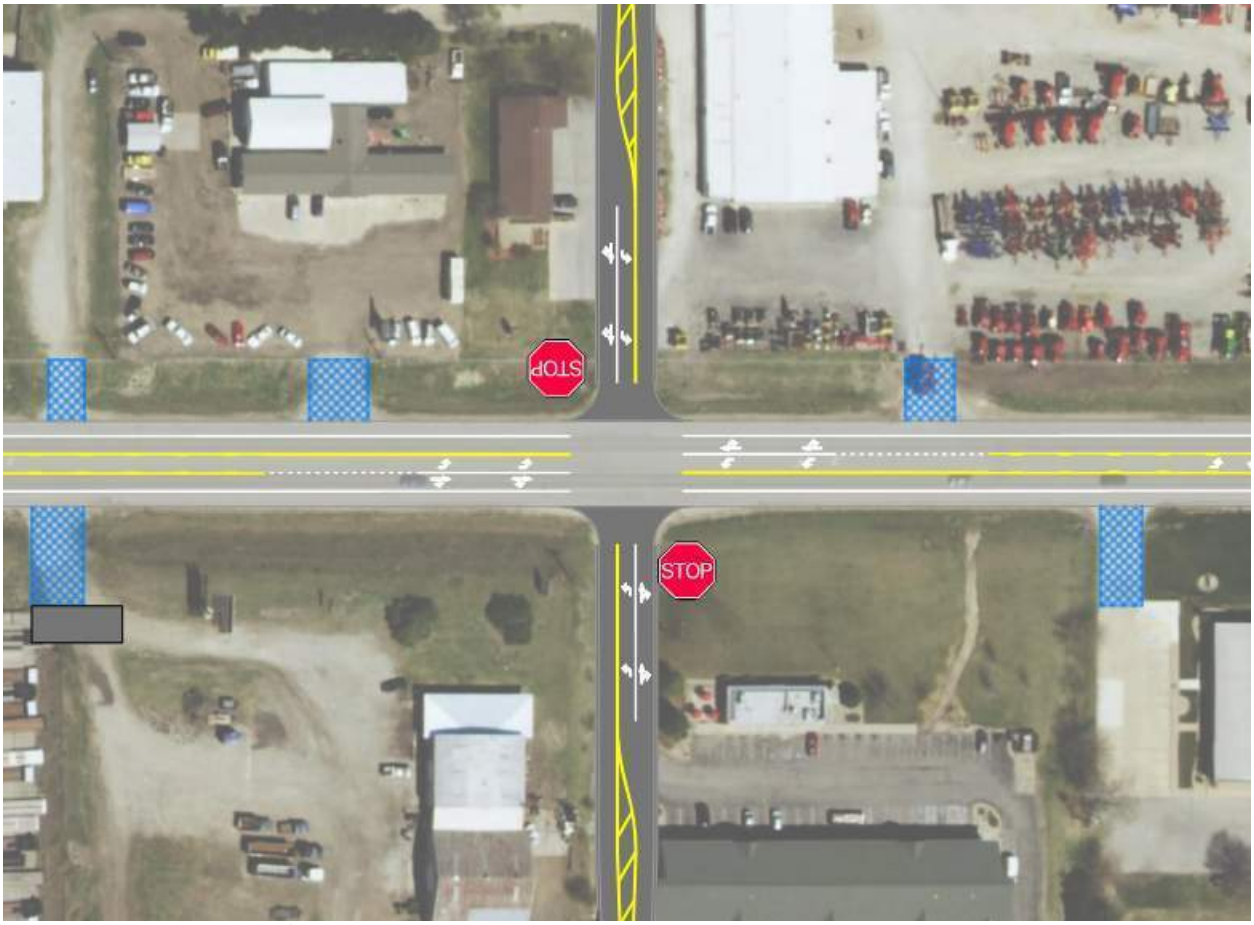


Figure 25: US-36 and 11th Drive Proposed Improvements

11th Drive is to be considered a future Collector Street. 11th Drive should be constructed as a two-lane section. The intersection should be stop-controlled on 11th Drive. Pavement markings on US-36 highway should be modified to include left-turn lanes. Nearby accesses should be relocated and consolidated in accordance to the recommendations of this report. *Figure 25: US-36 and 11th Drive Proposed Improvements* shows these recommendations.

Estimated Cost of Intersection Improvements: $650,000

5.2.6 US-36 AND 11TH TERRACE

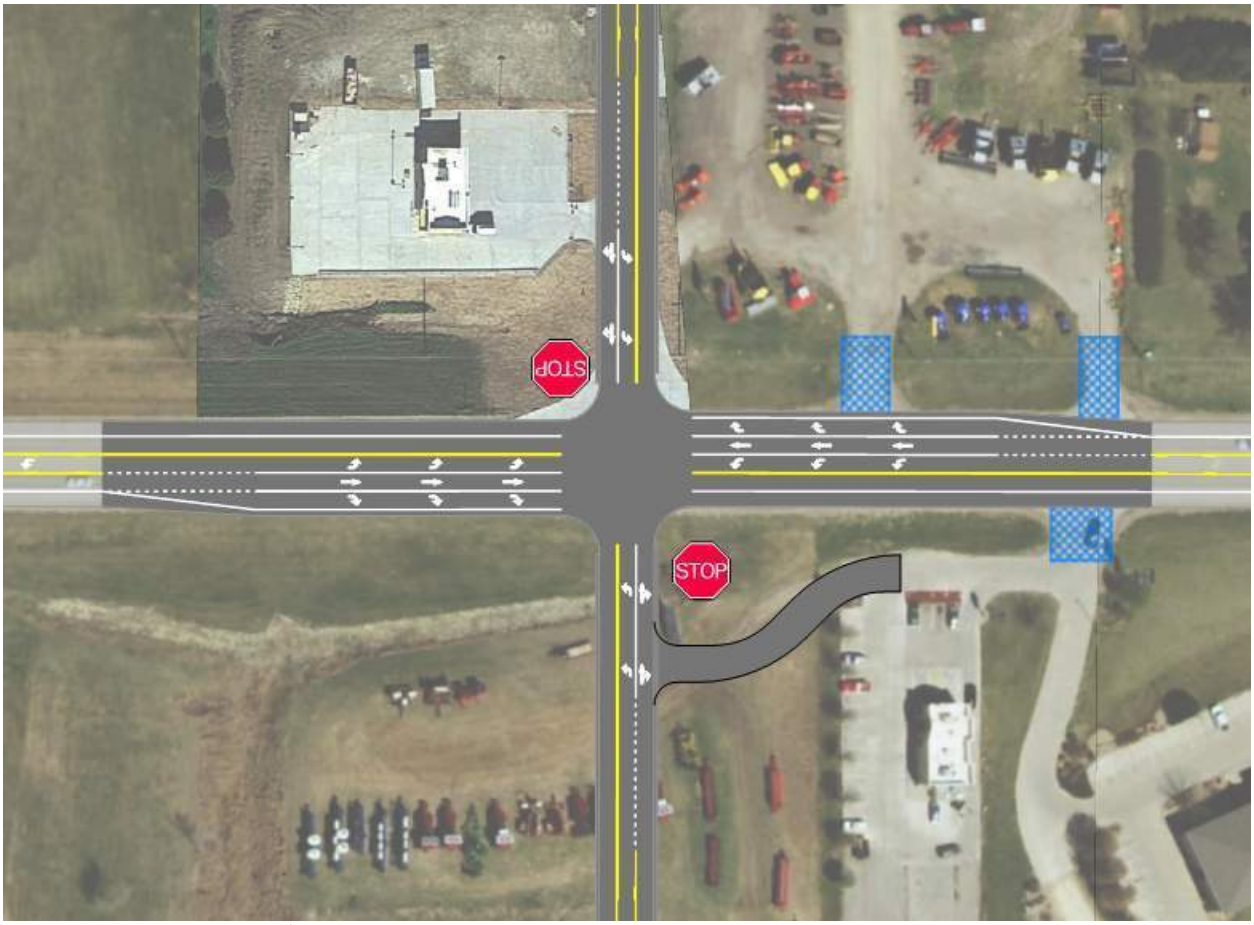


Figure 26: US-36 and 11th Terrace Proposed Improvements

11th Terrace is to be considered a future Collector Street and should be constructed as a 3-lane section. The intersection should be stop-controlled along 11th Terrace with dedicated left-turn lanes. US-36 should be modified to include dedicated right-turn lanes. *Figure 26: US-36 and 11th Terrace Proposed Improvements* shows these improvements.

Estimated Cost of Intersection Improvements: $1,300,000

5.2.7 US-36 AND WAL-MART ENTRANCE/"STREET A"

Figure 27: US-36 and Wal-Mart Entrance ("Street A") Proposed Improvements

When future development drives the need for the extension of a street south of Wal-Mart, the future street, "Street A" is to be considered a future Collector Street. This street should be constructed as a three-lane section approaching US-36. The intersection should be stop-controlled along the side street. Pavement markings on US-36 highway should be modified to include dedicated left-turn lanes. Nearby accesses should be relocated and consolidated in accordance to the recommendations of this report. *Figure 27: US-36 and Wal-Mart Entrance ("Street A") Proposed Improvements* shows these recommendations.

Estimated Cost of Intersection Improvements: $400,000

5.2.8 US-36 AND 12TH ROAD

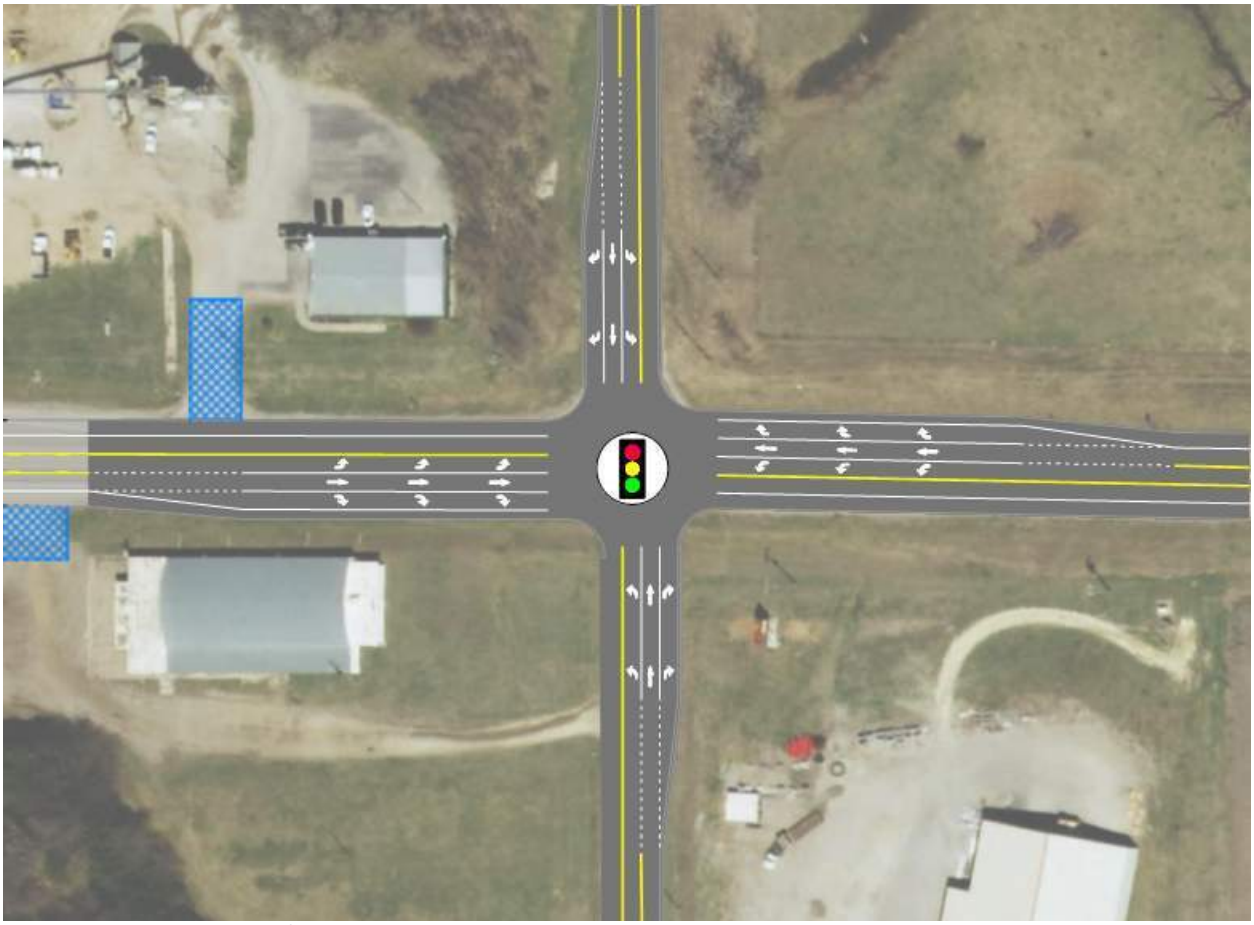


Figure 28: US-36 and 12th Road Proposed Improvements

12th Road should be considered a future Arterial Street. 12th Road should be constructed as a three-lane section. Once signal warrants are met the intersection should be signalized. Eastbound and westbound right-turn lanes should be added to US-36. At the intersection, 12th Road should include both dedicated left- and right-turn lanes. *Figure 28: US-36 and 12th Road Proposed Improvements* shows these recommendations.

Estimated Cost of Intersection Improvements: $1,700,000

5.2.9 US-36 AND 12TH TERRACE/"STREET B"

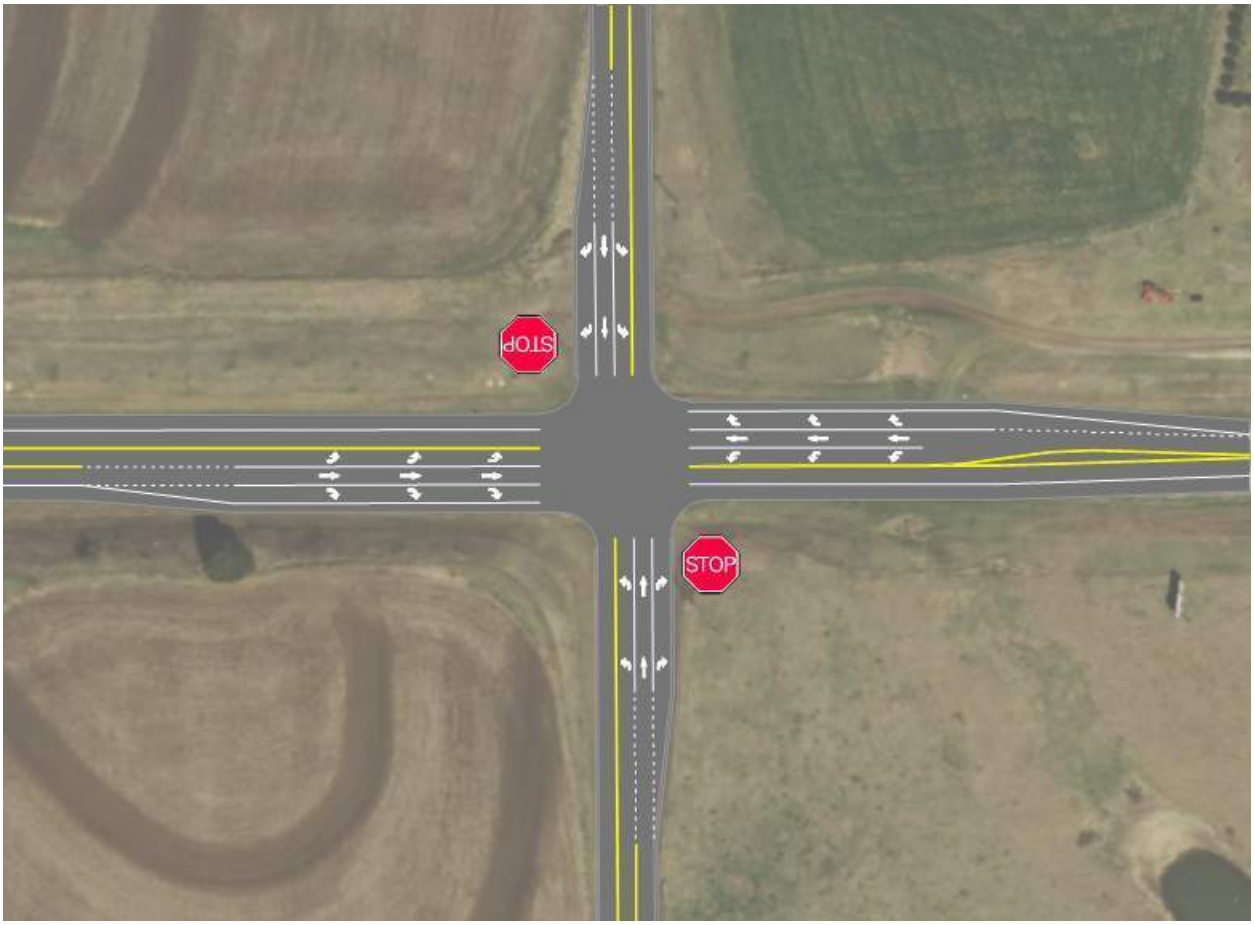


Figure 29: US-36 and 12th Terrace ("Street B") Proposed Improvements

12th Terrace ("Street B") is to be considered a future Collector Street and should be constructed as a 3-lane section. The intersection should be stop-controlled along 12th Terrace ("Street B") with dedicated left- and right-turn lanes. US-36 should be modified to include dedicated right-turn lanes. *Figure 29: US-36 and 12th Terrace ("Street* B") Proposed Improvements shows these improvements.

Estimated Cost of Intersection Improvements: $1,350,000

5.2.10 US-36 AND 13TH ROAD

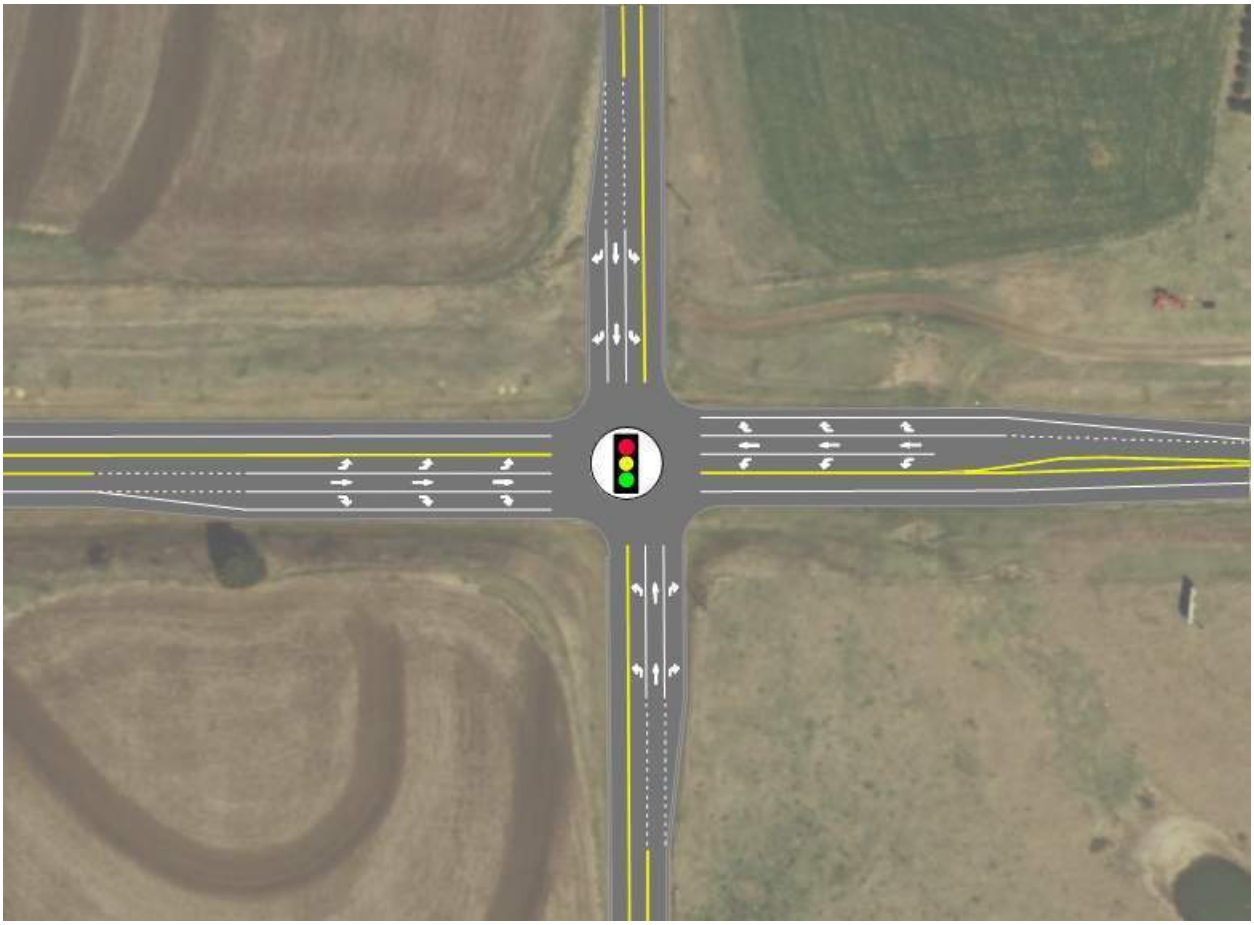


Figure 30: US-36 and 13th Road Proposed Improvements

13th Road should be considered a future Arterial Street. 13th Road should be constructed as a three-lane section. Once signal warrants are met the intersection should be signalized. Eastbound and westbound right-turn lanes should be added to US-36. At the intersection, 13th Road should include both dedicated left- and right-turn lanes. *Figure 30: US-36 and 13th Road Proposed Improvements* shows these recommendations.

Estimated Cost of Intersection Improvements: $1,700,000

5.3 TRAFFIC SIGNALS

Three of the four existing traffic signals along the US-36 corridor (located at 8th Street, 10th Street, and 14th Street) need to be upgraded. Upgrading these signals will make use of intersection detection reducing the delay experienced by US-36 travelers, allow for signal timing optimization and coordination through the central business district, incorporate an emergency vehicle prioritization, and allow for pushbutton activated pedestrian crossings. The 10th Street signal upgrade is included with the recommended 10th Street geometric improvements.

Estimated Cost of 8th Street and 14th Street Signal Upgrades: $50,000 Each

5.4 PEDESTRIAN/BICYCLE FACILITIES

5.4.1 PEDESTRIAN FACILITIES

Improvements to pedestrian access throughout the corridor primarily involve constructing new sidewalk or replacing old and deteriorating sections of sidewalk. The following maps (*Figure 31: Pedestrian Infrastructure (1 of 3)*, *Figure 32: Pedestrian Infrastructure (2 of 3)*, and *Figure 33: Pedestrian Infrastructure (3 of 3)*) indicate the areas throughout the corridor with existing sidewalk in good condition, existing sidewalk needing replaced, and areas where new sidewalk is suggested. In summary, there is approximately 650' of existing sidewalk that needs replaced. New sidewalk is recommended on the south side of US-36 from N. 11th Street to N. 20th Street and on the north side of US-36 from N. 20th Street east to connect to the existing sidewalk in front of the Wal-Mart.

Estimated Cost of Sidewalk Improvements: $500,000

5.4.2 BICYCLE FACILITIES

Cycling facilities throughout the city are generally abundant. Bicyclists have good access throughout the residential areas where there is primarily local traffic. Bicyclists are encouraged to use Broadway Street as a primary means of east/west traffic within the downtown district. Adding designated "Bike Route" signs will help focus cycling traffic to Broadway Street. Both the shared used path south of Broadway and the Blue River Trail north of Broadway are excellent means of accessing the downtown district. Utilizing residential streets that cross US-36 at signalized intersections are also good ways for north/south bicycling traffic. Access to the east side of Marysville's more industrialized area by means of bicycle is best done by taking North Street or Keystone Road. 11th Road north of US-36 already contains a bike lane on the west side of the street. Currently, cycling traffic in both the north and south direction utilizes this bike lane. Adding designated bicycling lanes to both sides of 11th Road and North Street or constructing a 10' wide shared-use path would help improve bicycling safety. Bicycling on sidewalks is generally undesirable due to decreased visibility with turning traffic – but at times this is still safer than riding on a busy street, especially if the bicyclist is uncomfortable with traveling on the street. Bicyclists accessing businesses on US-36 should be encouraged to utilize future sidewalk, as there is currently no sidewalk east of N. 20th Street.

Estimated Cost of "Bike Route" signage: $10,000

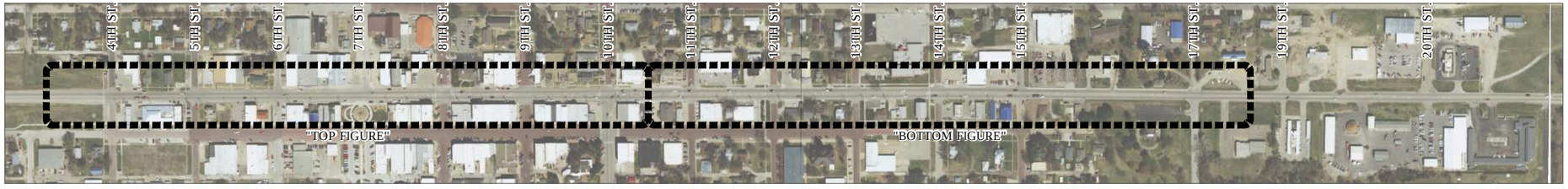
PEDESTRIAN INFRASTRUCTURE

LEGEND

- Existing Sidewalk
- Existing Sidewalk Needing Replaced
- Construct New Sidewalk

NORTH 100' 0' 100' SCALE

LOCATION KEY:



NORTH 250' 0' 250' SCALE

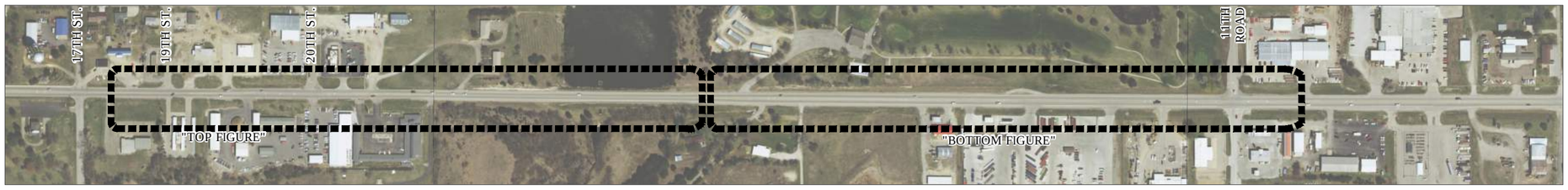
Figure 31: Pedestrian Infrastructure (1 of 3)

PEDESTRIAN INFRASTRUCTURE

LEGEND
- Existing Sidewalk
- Existing Sidewalk Needing Replaced
- Construct New Sidewalk

NORTH
100' 0' 100'
SCALE

LOCATION KEY:



NORTH
250' 0' 250'
SCALE

Figure 32: Pedestrian Infrastructure (2 of 3)

PEDESTRIAN INFRASTRUCTURE

LEGEND

- Existing Sidewalk
- Existing Sidewalk Needing Replaced
- Construct New Sidewalk

NORTH 100' 0' 100' SCALE

LOCATION KEY:

NORTH 250' 0' 250' SCALE

Figure 33: Pedestrian Infrastructure (3 of 3)

CHAPTER 6: IMPLEMENTATION

No.	Project Description	Timing	Trigger	Project Cost [in millions]	Agency
1.	Access Consolidations/Closures	Continual	As redevelopment occurs		City KDOT Private
2.	Street Network Upgrades	Continual	As redevelopment occurs		City
3.	Pedestrian Facilities Improvements	Short/Long Term	As redevelopment occurs	$0.50	City Private
4.	Signal Upgrades	Short Term		$0.05	City
5.	US-36 between 4th and 5th Streets Geometric Improvements	Long Term		$0.30	City KDOT
6.	US-36 & 7th Street Geometric Improvements	Short Term		$0.55	City KDOT
7.	US-36 & US-77 (10th Street) Geometric Improvements	Short Term		$0.85	City KDOT
8.	US-36 & 11th Road Geometric Improvements	Short Term		$1.50	City KDOT
9.	US-36 & 11th Drive Geometric Improvements	Long Term	As development occurs	$0.65	City KDOT
10.	US-36 & 11th Terrace Geometric Improvements	Long Term	As development occurs	$1.30	City KDOT
11.	US-36 & Walmart Geometric Improvements	Long Term	As development occurs	$0.40	City KDOT
12.	US-36 & 12th Road Geometric Improvements	Long Term	Once signal warrants are met	$1.70	City KDOT
13.	US-36 & 12th Terr. Geometric Improvements	Long Term	As development occurs	$1.35	City KDOT
14.	US-36 & 13th Road Geometric Improvements	Long Term	Once signal warrants are met	$1.70	City KDOT

APPENDIX A - PUBLIC INVOLVEMENT

A.1 MEETINGS

PUBLIC MEETING SIGN-IN SHEET

6:00 p.m., November 30, 2017

US-36 Access Management Plan

Name	Phone	Email
DENNIS SCHROELLER	7855622754	
William Boeye	785-562-8303	
Karen Hughes	785-562-5303	
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Terry H. Hughes	785-562-5303	MSTAMALC@SBCGLOBAL.NET
Janet Connell	785-562-8507	jlcdogs@gmail.com
Bob CONNELL	785 562 5554	BCZIPPY AT GMAIL.COM
Ellen Barker	785-207-7598	chasemarshallcountyks@gmail.com
Tony Duever	785-562-6915	tduever@cesengineering.com

APPENDIX B - CALCULATIONS

B.1 INTERSECTION INFLUENCE AREAS

US-36 & N. 4th Street														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 5th Street														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 6th Street														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 7th Street														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
7th St.	North Leg	20	Developed/CBD	N	Stop Sign	20	*	25		45	39	60	85	144	85
*Assumed															

US-36 & N. 8th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	Signal				78	65	87	78	155	230	155
	East Leg	30	Developed/CBD	N	Signal				138	65	87	138	155	290	155
N. 8th St.	South Leg	20	Developed/CBD	N	Signal	77	*	30	31	45	39	60	85	144	85
	North Leg	20	Developed/CBD	N	Signal	94	*	30	38	45	39	60	85	144	85
*PM Peak															

US-36 & N. 9th Street														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & US-77 (N. 10th Street)														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	Signal				83	65	87	83	155	235	155
	East Leg	30	Developed/CBD	N	Signal				157	65	87	157	155	309	155
N. 10th St.	South Leg	20	Developed/CBD	N	Signal	131	*	30	46	45	39	60	85	144	85
	North Leg	20	Developed/CBD	N	Signal	18	*	30	14	45	39	60	85	144	85
*PM Peak															

US-36 & N. 11th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 12th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 13th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 14th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	Signal				168	65	87	168	155	320	155
	East Leg	30	Developed/CBD	N	Signal				186	65	87	186	155	338	155
N. 14th St.	South Leg	20	Developed/CBD	N	Signal	37	*	30	23	45	39	60	85	144	85
	North Leg	20	Developed/CBD	N	Signal	40	*	30	27	45	39	60	85	144	85
*PM Peak															

US-36 & N. 15th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 17th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 18th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	None					65	87	0	155	152	155
	East Leg	30	Developed/CBD	N	None					65	87	0	155	152	155

US-36 & N. 20th Street															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	30	Developed/CBD	N	Signal				33	65	87	33	155	185	155
	East Leg	30	Developed/CBD	N	Signal				31	65	87	31	155	183	155
N. 20th St.	North Leg	30	Developed/CBD	N	Signal	34	*	30	10	65	87	60	155	212	155
*PM Peak															

US-36 & 11th Road															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	45	Developed/CBD	N	None					100	195	0	295	295	295
	East Leg	45	Developed/CBD	N	None					100	195	0	295	295	295
11th Road	South Leg	30	Developed/CBD	N	Stop Sign	50	*	32		65	87	64	155	216	155
	North Leg	30	Developed/CBD	N	Stop Sign	50	*	32		65	87	64	155	216	155
*Assumed															

US-36 & 11th Drive														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	45	Developed/CBD	N	None					100	195	0	295	295	295
	East Leg	45	Developed/CBD	N	None					100	195	0	295	295	295

US-36 & 11th Terrace														
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	45	Developed/CBD	N	None					100	195	0	295	295	295
	East Leg	45	Developed/CBD	N	None					100	195	0	295	295	295

US-36 & 12th Road															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	50	Developed/CBD	N	None					110	240	0	355	350	355
	East Leg	50	Developed/CBD	N	None					110	240	0	355	350	355
12th Road	South Leg	30	Developed/CBD	N	Stop Sign	50	*	32		65	87	64	155	216	155
	North Leg	30	Developed/CBD	N	Stop Sign	50	*	32		65	87	64	155	216	155
*Assumed															

US-36 & 13th Road															
		Speed [mph]	Area Type	Lateral Shift?	Stop Control	Peak Hour [vph]		Vehicle Width [ft]	95% Queue [ft]	d1 [ft]	d2 [ft]	d3 [ft]	d4 [ft]	U.S. [ft]	D.S. [ft]
US-36	West Leg	65	Undeveloped	N	None					110	406	0	645	516	645
	East Leg	65	Undeveloped	N	None					110	406	0	645	516	645
12th Road	South Leg	30	Undeveloped	N	Stop Sign	50	*	32		65	87	64	155	216	155
	North Leg	30	Undeveloped	N	Stop Sign	50	*	32		65	87	64	155	216	155
*Assumed															

APPENDIX C - SYNCHRO MODELS

C.1 2017 AM PEAK HOUR (EXISTING OPERATING CONDITIONS)

Synchro Model
6: US-36 & N. 8th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	248	30	16	172	12	7	11	2	21	22	16
Future Volume (vph)	33	248	30	16	172	12	7	11	2	21	22	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	75		75	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.984				0.850		0.988			0.964	
Flt Protected	0.950			0.950				0.982			0.982	
Satd. Flow (prot)	1770	1833	0	1770	1863	1583	0	1807	0	0	1763	0
Flt Permitted	0.640			0.555				0.932			0.920	
Satd. Flow (perm)	1192	1833	0	1034	1863	1583	0	1715	0	0	1652	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				36		2			17	
Link Speed (mph)		30			30			20			20	
Link Distance (ft)		694			680			497			526	
Travel Time (s)		15.8			15.5			16.9			17.9	
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
Adj. Flow (vph)	36	270	33	17	187	13	8	12	2	23	24	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	36	303	0	17	187	13	0	22	0	0	64	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	23.0	23.0		23.0	23.0	23.0	23.0	23.0		23.0	23.0	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	25.0	25.0		25.0	25.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%	58.3%	41.7%	41.7%		41.7%	41.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	30.0	30.0		30.0	30.0	30.0		20.0			20.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50	0.50		0.33			0.33	
v/c Ratio	0.06	0.33		0.03	0.20	0.02		0.04			0.11	
Control Delay	8.2	9.7		7.9	9.1	1.2		13.1			11.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	8.2	9.7		7.9	9.1	1.2		13.1			11.7	
LOS	A	A		A	A	A		B			B	
Approach Delay		9.6			8.5			13.1			11.7	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	6	57		3	35	0		5			11	
Queue Length 95th (ft)	18	102		11	66	3		18			34	
Internal Link Dist (ft)		614			600			417			446	
Turn Bay Length (ft)	85			75		75						
Base Capacity (vph)	596	924		517	931	809		573			562	
Starvation Cap Reductn	0	0		0	0	0		0			0	

Baseline

Synchro 10 Light Report
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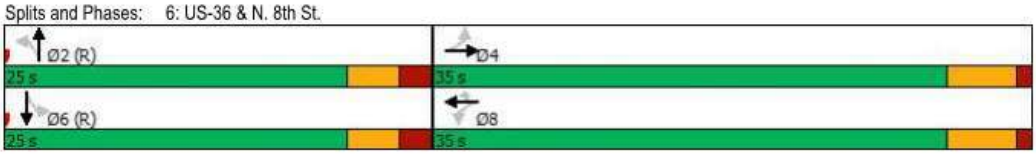
Synchro Model
6: US-36 & N. 8th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.06	0.33		0.03	0.20	0.02		0.04			0.11	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.33			
Intersection Signal Delay: 9.5		Intersection LOS: A	
Intersection Capacity Utilization 35.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 6: US-36 & N. 8th St.



Synchro Model
12: US-36 & N. 11th St.

2017 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	291	2	25	321	27	2	2	12	8	3	11
Future Volume (Veh/h)	12	291	2	25	321	27	2	2	12	8	3	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	13	316	2	27	349	29	2	2	13	9	3	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)		349			1029							
pX, platoon unblocked												
vC, conflicting volume	378			318			760	775	317	774	762	364
vC1, stage 1 conf vol							343	343		418	418	
vC2, stage 2 conf vol							416	432		356	344	
vCu, unblocked vol	378			318			760	775	317	774	762	364
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	98	98	99	98
cM capacity (veh/h)	1180			1242			497	486	724	493	489	681

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	13	318	27	378	17	24
Volume Left	13	0	27	0	2	9
Volume Right	0	2	0	29	13	12
cSH	1180	1700	1242	1700	651	571
Volume to Capacity	0.01	0.19	0.02	0.22	0.03	0.04
Queue Length 95th (ft)	1	0	2	0	2	3
Control Delay (s)	8.1	0.0	8.0	0.0	10.7	11.6
Lane LOS	A		A		B	B
Approach Delay (s)	0.3		0.5		10.7	11.6
Approach LOS					B	B

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	30.8%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
15: US-36 & N. 14th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	286	19	4	302	7	5	2	3	21	2	12
Future Volume (vph)	3	286	19	4	302	7	5	2	3	21	2	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.991			0.996			0.959			0.954	
Flt Protected	0.950			0.950				0.976			0.971	
Satd. Flow (prot)	1770	1846	0	1770	1855	0	0	1743	0	0	1726	0
Flt Permitted	0.547			0.551				0.921			0.874	
Satd. Flow (perm)	1019	1846	0	1026	1855	0	0	1645	0	0	1553	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			3			3			13	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		1029			341			457			627	
Travel Time (s)		23.4			7.8			15.6			14.3	
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
Adj. Flow (vph)	3	311	21	4	328	8	5	2	3	23	2	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	3	332	0	4	336	0	0	10	0	0	38	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	24.0	24.0		24.0	24.0		23.0	23.0		23.0	23.0	
Total Split (s)	39.0	39.0		39.0	39.0		23.0	23.0		23.0	23.0	
Total Split (%)	62.9%	62.9%		62.9%	62.9%		37.1%	37.1%		37.1%	37.1%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	33.0	33.0		33.0	33.0			18.0			18.0	
Actuated g/C Ratio	0.53	0.53		0.53	0.53			0.29			0.29	
v/c Ratio	0.01	0.34		0.01	0.34			0.02			0.08	
Control Delay	7.0	9.2		7.0	9.4			14.0			12.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.0	9.2		7.0	9.4			14.0			12.6	
LOS	A	A		A	A			B			B	
Approach Delay		9.2			9.4			14.0			12.6	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	63		1	65			2			7	
Queue Length 95th (ft)	4	109		4	112			11			26	
Internal Link Dist (ft)		949			261			377			547	
Turn Bay Length (ft)	125			75								
Base Capacity (vph)	542	986		546	988			479			460	
Starvation Cap Reductn	0	0		0	0			0			0	

Baseline

Synchro 10 Light Report
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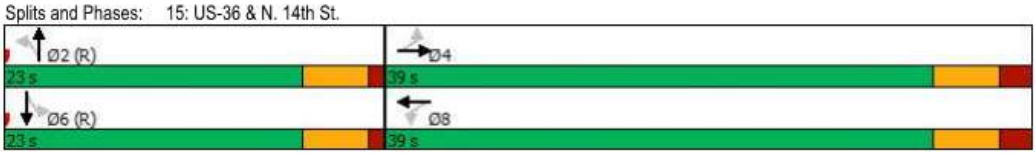
Synchro Model
15: US-36 & N. 14th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.34		0.01	0.34			0.02			0.08	

Intersection Summary			
Area Type:	Other		
Cycle Length: 62			
Actuated Cycle Length: 62			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.34			
Intersection Signal Delay: 9.5		Intersection LOS: A	
Intersection Capacity Utilization 33.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 15: US-36 & N. 14th St.



Synchro Model
24: US-36 & 20th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	300	1	0	223	27	0	0	0	37	0	37
Future Volume (vph)	35	300	1	0	223	27	0	0	0	37	0	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	100		0	0		0	0		60
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt					0.984							0.850
Flt Protected	0.950										0.950	
Satd. Flow (prot)	1770	1863	0	1863	1833	0	0	1863	0	0	1770	1583
Flt Permitted	0.593										0.909	
Satd. Flow (perm)	1105	1863	0	1863	1833	0	0	1863	0	0	1693	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14							68
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		971			3848			371			570	
Travel Time (s)		22.1			87.5			8.4			13.0	
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
Adj. Flow (vph)	38	326	1	0	242	29	0	0	0	40	0	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	327	0	0	271	0	0	0	0	0	40	40
Turn Type	Perm	NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0		6.0	6.0		6.0	6.0		8.0	8.0	8.0
Minimum Split (s)	14.0	14.0		12.0	12.0		12.0	12.0		14.0	14.0	14.0
Total Split (s)	24.0	24.0		24.0	24.0		24.0	24.0		24.0	24.0	24.0
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
Act Effct Green (s)	24.1	24.1			24.1						8.3	8.3
Actuated g/C Ratio	0.69	0.69			0.69						0.24	0.24
v/c Ratio	0.05	0.26			0.21						0.10	0.09
Control Delay	5.8	6.0			5.6						12.6	2.9
Queue Delay	0.0	0.0			0.0						0.0	0.0
Total Delay	5.8	6.0			5.6						12.6	2.9
LOS	A	A			A						B	A
Approach Delay		6.0			5.6						7.8	
Approach LOS		A			A						A	
Queue Length 50th (ft)	4	39			29						9	0
Queue Length 95th (ft)	13	77			61						21	9

Baseline

Synchro 10 Light Report
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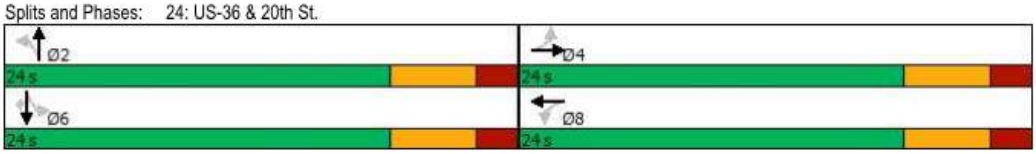
Synchro Model
24: US-36 & 20th St.

2017 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		891			3768			291			490	
Turn Bay Length (ft)	185											60
Base Capacity (vph)	786	1325			1308						893	868
Starvation Cap Reductn	0	0			0						0	0
Spillback Cap Reductn	0	0			0						0	0
Storage Cap Reductn	0	0			0						0	0
Reduced v/c Ratio	0.05	0.25			0.21						0.04	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 48			
Actuated Cycle Length: 35			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.26			
Intersection Signal Delay: 6.0		Intersection LOS: A	
Intersection Capacity Utilization 42.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 24: US-36 & 20th St.



Synchro Model
27: US-36 & 11th Rd.

2017 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	245	40	14	258	15	43	12	19	5	8	20
Future Volume (Veh/h)	12	245	40	14	258	15	43	12	19	5	8	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	13	266	43	15	280	16	47	13	21	5	9	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									3			4
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	296			309			639	640	288	627	653	288
vC1, stage 1 conf vol							314	314		318	318	
vC2, stage 2 conf vol							326	326		309	335	
vCu, unblocked vol	296			309			639	640	288	627	653	288
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			91	98	97	99	98	97
cM capacity (veh/h)	1265			1252			549	541	752	553	535	751

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	13	309	15	296	81	36
Volume Left	13	0	15	0	47	5
Volume Right	0	43	0	16	21	22
cSH	1265	1700	1252	1700	739	1229
Volume to Capacity	0.01	0.18	0.01	0.17	0.11	0.03
Queue Length 95th (ft)	1	0	1	0	9	2
Control Delay (s)	7.9	0.0	7.9	0.0	11.8	10.7
Lane LOS	A		A		B	B
Approach Delay (s)	0.3		0.4		11.8	10.7
Approach LOS					B	B

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	32.0%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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C.2 2017 PM PEAK HOUR (EXISTING OPERATING CONDITIONS)

Synchro Model
3: US-36 & N. 6th St.

2017 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	215	14	36	370	25	26	15	42	16	3	4
Future Volume (Veh/h)	8	215	14	36	370	25	26	15	42	16	3	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	9	234	15	39	402	27	28	16	46	17	3	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					694							
pX, platoon unblocked	0.96						0.96	0.96		0.96	0.96	0.96
vC, conflicting volume	429			249			758	766	242	807	760	416
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	385			249			728	736	242	778	730	370
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	99			97			91	95	94	94	99	99
cM capacity (veh/h)	1127			1317			312	320	797	265	323	648

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	258	468	90	24
Volume Left	9	39	28	17
Volume Right	15	27	46	4
cSH	1127	1317	456	302
Volume to Capacity	0.01	0.03	0.20	0.08
Queue Length 95th (ft)	1	2	18	6
Control Delay (s)	0.4	0.9	14.8	18.0
Lane LOS	A	A	B	C
Approach Delay (s)	0.4	0.9	14.8	18.0
Approach LOS			B	C

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	48.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
6: US-36 & N. 8th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	265	16	34	331	23	17	34	49	40	28	51
Future Volume (vph)	23	265	16	34	331	23	17	34	49	40	28	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	75		75	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.992				0.850		0.934			0.942	
Flt Protected	0.950			0.950				0.992			0.983	
Satd. Flow (prot)	1770	1848	0	1770	1863	1583	0	1726	0	0	1725	0
Flt Permitted	0.501			0.553				0.949			0.884	
Satd. Flow (perm)	933	1848	0	1030	1863	1583	0	1651	0	0	1551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				36		53			55	
Link Speed (mph)		30			30			20			20	
Link Distance (ft)		694			680			497			526	
Travel Time (s)		15.8			15.5			16.9			17.9	
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
Adj. Flow (vph)	25	288	17	37	360	25	18	37	53	43	30	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	305	0	37	360	25	0	108	0	0	128	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	23.0	23.0		23.0	23.0	23.0	23.0	23.0		23.0	23.0	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	25.0	25.0		25.0	25.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%	58.3%	41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	30.0	30.0		30.0	30.0	30.0	20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	30.0	30.0		30.0	30.0	30.0		20.0			20.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50	0.50		0.33			0.33	
v/c Ratio	0.05	0.33		0.07	0.39	0.03		0.18			0.23	
Control Delay	8.2	10.0		8.3	10.9	2.5		9.3			10.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	8.2	10.0		8.3	10.9	2.5		9.3			10.2	
LOS	A	B		A	B	A		A			B	
Approach Delay		9.9			10.1			9.3			10.2	
Approach LOS		A			B			A			B	
Queue Length 50th (ft)	4	59		6	74	0		13			18	
Queue Length 95th (ft)	15	105		19	128	8		43			51	

Baseline

Synchro 10 Light Report
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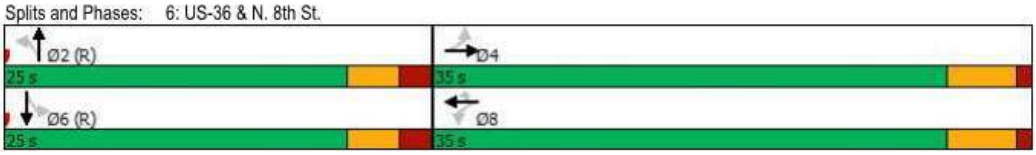
Synchro Model
6: US-36 & N. 8th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		614			600			417			446	
Turn Bay Length (ft)	85			75		75						
Base Capacity (vph)	466	927		515	931	809		585			553	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.05	0.33		0.07	0.39	0.03		0.18			0.23	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.39			
Intersection Signal Delay: 10.0		Intersection LOS: A	
Intersection Capacity Utilization 46.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 6: US-36 & N. 8th St.



Synchro Model
9: US-36 & N. 10th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	325	46	112	386	8	50	15	126	4	12	11
Future Volume (vph)	7	325	46	112	386	8	50	15	126	4	12	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	60		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.981			0.997			0.911			0.944	
Flt Protected	0.950			0.950				0.987			0.993	
Satd. Flow (prot)	1770	1827	0	1770	1857	0	0	1675	0	0	1746	0
Flt Permitted	0.357			0.385				0.916			0.963	
Satd. Flow (perm)	665	1827	0	717	1857	0	0	1554	0	0	1693	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			2			128			12	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		680			349			478			553	
Travel Time (s)		15.5			7.9			16.3			12.6	
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
Adj. Flow (vph)	8	353	50	122	420	9	54	16	137	4	13	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	403	0	122	429	0	0	207	0	0	29	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	10.0	23.0		10.0	23.0		23.0	23.0		23.0	23.0	
Total Split (s)	15.0	35.0		15.0	35.0		25.0	25.0		25.0	25.0	
Total Split (%)	20.0%	46.7%		20.0%	46.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	10.0	30.0		10.0	30.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)	40.0	30.0		40.0	30.0			20.0			20.0	
Actuated g/C Ratio	0.53	0.40		0.53	0.40			0.27			0.27	
v/c Ratio	0.02	0.55		0.23	0.58			0.41			0.06	
Control Delay	6.3	20.2		7.9	21.3			12.1			15.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	6.3	20.2		7.9	21.3			12.1			15.3	
LOS	A	C		A	C			B			B	
Approach Delay		19.9			18.3			12.1			15.3	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	1	136		22	150			28			6	
Queue Length 95th (ft)	6	219		43	239			83			25	

Baseline

Synchro 10 Light Report
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Synchro Model
9: US-36 & N. 10th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		600			269			398			473	
Turn Bay Length (ft)	65			60								
Base Capacity (vph)	502	737		522	744			508			460	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.02	0.55		0.23	0.58			0.41			0.06	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 56.6%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 9: US-36 & N. 10th St.

Synchro Model
15: US-36 & N. 14th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	456	19	11	500	11	14	7	20	21	12	11
Future Volume (vph)	9	456	19	11	500	11	14	7	20	21	12	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.994			0.997			0.934			0.966	
Flt Protected	0.950			0.950				0.984			0.977	
Satd. Flow (prot)	1770	1852	0	1770	1857	0	0	1712	0	0	1758	0
Flt Permitted	0.361			0.391				0.924			0.885	
Satd. Flow (perm)	672	1852	0	728	1857	0	0	1608	0	0	1592	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			3			22			12	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		1029			341			457			627	
Travel Time (s)		23.4			7.8			15.6			14.3	
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
Adj. Flow (vph)	10	496	21	12	543	12	15	8	22	23	13	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	517	0	12	555	0	0	45	0	0	48	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	24.0	24.0		24.0	24.0		23.0	23.0		23.0	23.0	
Total Split (s)	39.0	39.0		39.0	39.0		23.0	23.0		23.0	23.0	
Total Split (%)	62.9%	62.9%		62.9%	62.9%		37.1%	37.1%		37.1%	37.1%	
Maximum Green (s)	33.0	33.0		33.0	33.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	33.0	33.0		33.0	33.0			18.0			18.0	
Actuated g/C Ratio	0.53	0.53		0.53	0.53			0.29			0.29	
v/c Ratio	0.03	0.52		0.03	0.56			0.09			0.10	
Control Delay	7.2	11.7		7.3	12.4			11.1			13.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	11.7		7.3	12.4			11.1			13.8	
LOS	A	B		A	B			B			B	
Approach Delay		11.6			12.3			11.1			13.8	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	2	113		2	126			6			10	
Queue Length 95th (ft)	8	188		9	207			26			31	

Baseline

Synchro 10 Light Report
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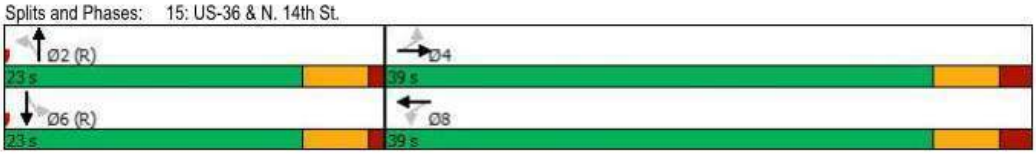
Synchro Model
15: US-36 & N. 14th St.

2017 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		949			261			377			547	
Turn Bay Length (ft)	125			75								
Base Capacity (vph)	357	988		387	989			482			470	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.03	0.52		0.03	0.56			0.09			0.10	

Intersection Summary			
Area Type:	Other		
Cycle Length: 62			
Actuated Cycle Length: 62			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 12.0		Intersection LOS: B	
Intersection Capacity Utilization 44.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 15: US-36 & N. 14th St.



Synchro Model
18: US-36 & N. 15th St.

2017 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	428	11	20	499	34	3	11	8	9	4	48
Future Volume (Veh/h)	49	428	11	20	499	34	3	11	8	9	4	48
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	53	465	12	22	542	37	3	12	9	10	4	52
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		341										
pX, platoon unblocked				0.83			0.83	0.83	0.83	0.83	0.83	
vC, conflicting volume	579			477			1217	1200	471	1190	1188	560
vC1, stage 1 conf vol							577	577		604	604	
vC2, stage 2 conf vol							640	623		586	583	
vCu, unblocked vol	579			273			1161	1140	266	1129	1125	560
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			98			99	96	99	97	99	90
cM capacity (veh/h)	995			1076			302	338	644	346	354	527

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	53	477	22	579	24	66
Volume Left	53	0	22	0	3	10
Volume Right	0	12	0	37	9	52
cSH	995	1700	1076	1700	404	475
Volume to Capacity	0.05	0.28	0.02	0.34	0.06	0.14
Queue Length 95th (ft)	4	0	2	0	5	12
Control Delay (s)	8.8	0.0	8.4	0.0	14.5	13.8
Lane LOS	A		A		B	B
Approach Delay (s)	0.9		0.3		14.5	13.8
Approach LOS					B	B

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	46.7%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
21: US-36 & N. 17th St.

2017 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	493	10	15	522	5	16	1	12	7	1	13
Future Volume (Veh/h)	7	493	10	15	522	5	16	1	12	7	1	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	8	536	11	16	567	5	17	1	13	8	1	14
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)		1068			971							
pX, platoon unblocked				0.92			0.92	0.92	0.92	0.92	0.92	
vC, conflicting volume	572			547			1174	1162	542	1167	1164	570
vC1, stage 1 conf vol							558	558		602	602	
vC2, stage 2 conf vol							616	604		566	563	
vCu, unblocked vol	572			462			1144	1131	456	1137	1135	570
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			95	100	98	98	100	97
cM capacity (veh/h)	1001			1009			362	377	555	365	375	521

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	8	547	588	31	23
Volume Left	8	0	16	17	8
Volume Right	0	11	5	13	14
cSH	1001	1700	1009	425	447
Volume to Capacity	0.01	0.32	0.02	0.07	0.05
Queue Length 95th (ft)	1	0	1	6	4
Control Delay (s)	8.6	0.0	0.4	14.1	13.5
Lane LOS	A		A	B	B
Approach Delay (s)	0.1		0.4	14.1	13.5
Approach LOS				B	B

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	49.9%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
27: US-36 & 11th Rd.

2017 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	323	56	17	323	29	27	4	25	14	3	6
Future Volume (Veh/h)	14	323	56	17	323	29	27	4	25	14	3	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	15	351	61	18	351	32	29	4	27	15	3	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									3			4
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	383			412			804	830	382	800	845	367
vC1, stage 1 conf vol							412	412		403	403	
vC2, stage 2 conf vol							392	419		396	442	
vCu, unblocked vol	383			412			804	830	382	800	845	367
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			94	99	96	97	99	99
cM capacity (veh/h)	1175			1147			487	471	666	478	465	678

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	15	412	18	383	60	25
Volume Left	15	0	18	0	29	15
Volume Right	0	61	0	32	27	7
cSH	1175	1700	1147	1700	883	660
Volume to Capacity	0.01	0.24	0.02	0.23	0.07	0.04
Queue Length 95th (ft)	1	0	1	0	5	3
Control Delay (s)	8.1	0.0	8.2	0.0	11.9	12.2
Lane LOS	A		A		B	B
Approach Delay (s)	0.3		0.4		11.9	12.2
Approach LOS					B	B

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	37.1%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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C.3 2037 AM PEAK HOUR (EXISTING OPERATING CONDITIONS)

Synchro Model
6: US-36 & N. 8th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	334	40	22	232	16	9	15	3	28	30	22
Future Volume (vph)	44	334	40	22	232	16	9	15	3	28	30	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	75		75	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.984				0.850		0.986			0.963	
Flt Protected	0.950			0.950				0.983			0.983	
Satd. Flow (prot)	1770	1833	0	1770	1863	1583	0	1805	0	0	1763	0
Flt Permitted	0.603			0.458				0.926			0.915	
Satd. Flow (perm)	1123	1833	0	853	1863	1583	0	1701	0	0	1641	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14				36		3			24	
Link Speed (mph)		30			30			20			20	
Link Distance (ft)		694			680			497			526	
Travel Time (s)		15.8			15.5			16.9			17.9	
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
Adj. Flow (vph)	48	363	43	24	252	17	10	16	3	30	33	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	406	0	24	252	17	0	29	0	0	87	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	23.0	23.0		23.0	23.0	23.0	23.0	23.0		23.0	23.0	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	25.0	25.0		25.0	25.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%	58.3%	41.7%	41.7%		41.7%	41.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	30.0	30.0		30.0	30.0	30.0		20.0			20.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50	0.50		0.33			0.33	
v/c Ratio	0.09	0.44		0.06	0.27	0.02		0.05			0.15	
Control Delay	8.4	11.1		8.3	9.7	1.6		13.0			11.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	8.4	11.1		8.3	9.7	1.6		13.0			11.8	
LOS	A	B		A	A	A		B			B	
Approach Delay		10.9			9.1			13.0			11.8	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	8	83		4	49	0		6			15	
Queue Length 95th (ft)	23	143		14	87	5		21			42	
Internal Link Dist (ft)		614			600			417			446	
Turn Bay Length (ft)	85			75		75						
Base Capacity (vph)	561	923		426	931	809		569			563	
Starvation Cap Reductn	0	0		0	0	0		0			0	

Baseline

Synchro 10 Light Report
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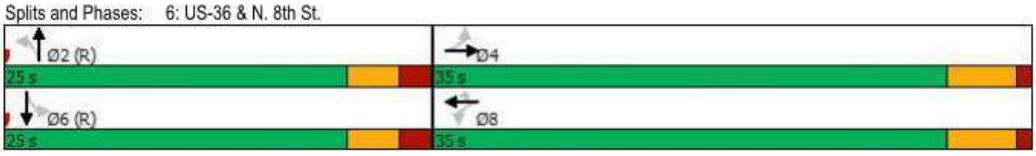
Synchro Model
6: US-36 & N. 8th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.09	0.44		0.06	0.27	0.02		0.05			0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.44			
Intersection Signal Delay: 10.4		Intersection LOS: B	
Intersection Capacity Utilization 42.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 6: US-36 & N. 8th St.



Synchro Model
12: US-36 & N. 11th St.

2037 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	392	3	34	432	36	3	3	16	11	4	15
Future Volume (Veh/h)	16	392	3	34	432	36	3	3	16	11	4	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	17	426	3	37	470	39	3	3	17	12	4	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)		349			1029							
pX, platoon unblocked	0.91						0.91	0.91		0.91	0.91	0.91
vC, conflicting volume	509			429			1024	1044	428	1042	1026	490
vC1, stage 1 conf vol							462	462		564	564	
vC2, stage 2 conf vol							562	583		478	463	
vCu, unblocked vol	416			429			979	1002	428	999	982	395
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			99	99	97	97	99	97
cM capacity (veh/h)	1045			1130			396	395	627	389	399	598

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	17	429	37	509	23	32
Volume Left	17	0	37	0	3	12
Volume Right	0	3	0	39	17	16
cSH	1045	1700	1130	1700	544	473
Volume to Capacity	0.02	0.25	0.03	0.30	0.04	0.07
Queue Length 95th (ft)	1	0	3	0	3	5
Control Delay (s)	8.5	0.0	8.3	0.0	11.9	13.2
Lane LOS	A		A		B	B
Approach Delay (s)	0.3		0.6		11.9	13.2
Approach LOS					B	B

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	38.7%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
15: US-36 & N. 14th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	385	26	5	407	9	7	3	4	28	3	16
Future Volume (vph)	4	385	26	5	407	9	7	3	4	28	3	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.991			0.997			0.964			0.954	
Flt Protected	0.950			0.950				0.974			0.971	
Satd. Flow (prot)	1770	1846	0	1770	1857	0	0	1749	0	0	1726	0
Flt Permitted	0.445			0.450				0.904			0.863	
Satd. Flow (perm)	829	1846	0	838	1857	0	0	1623	0	0	1534	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			3			4			17	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		1029			341			457			627	
Travel Time (s)		23.4			7.8			15.6			14.3	
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
Adj. Flow (vph)	4	418	28	5	442	10	8	3	4	30	3	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	446	0	5	452	0	0	15	0	0	50	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	24.0	24.0		24.0	24.0		23.0	23.0		23.0	23.0	
Total Split (s)	39.0	39.0		39.0	39.0		23.0	23.0		23.0	23.0	
Total Split (%)	62.9%	62.9%		62.9%	62.9%		37.1%	37.1%		37.1%	37.1%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	33.0	33.0		33.0	33.0			18.0			18.0	
Actuated g/C Ratio	0.53	0.53		0.53	0.53			0.29			0.29	
v/c Ratio	0.01	0.45		0.01	0.46			0.03			0.11	
Control Delay	7.0	10.6		7.0	10.8			14.1			12.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.0	10.6		7.0	10.8			14.1			12.8	
LOS	A	B		A	B			B			B	
Approach Delay		10.6			10.7			14.1			12.8	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	1	92		1	95			3			9	
Queue Length 95th (ft)	4	154		5	158			15			31	
Internal Link Dist (ft)		949			261			377			547	
Turn Bay Length (ft)	125			75								
Base Capacity (vph)	441	986		446	989			474			457	
Starvation Cap Reductn	0	0		0	0			0			0	

Baseline

Synchro 10 Light Report
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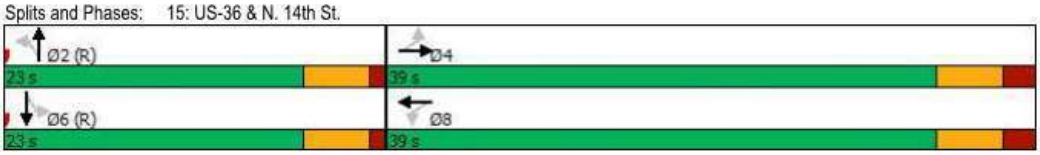
Synchro Model
15: US-36 & N. 14th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.45		0.01	0.46			0.03			0.11	

Intersection Summary			
Area Type:	Other		
Cycle Length: 62			
Actuated Cycle Length: 62			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 10.8		Intersection LOS: B	
Intersection Capacity Utilization 39.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 15: US-36 & N. 14th St.



Baseline

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Synchro Model
24: US-36 & 20th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	404	1	0	300	36	0	0	0	50	0	50
Future Volume (vph)	47	404	1	0	300	36	0	0	0	50	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	100		0	0		0	0		60
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt					0.984							0.850
Flt Protected	0.950										0.950	
Satd. Flow (prot)	1770	1863	0	1863	1833	0	0	1863	0	0	1770	1583
Flt Permitted	0.544										0.889	
Satd. Flow (perm)	1013	1863	0	1863	1833	0	0	1863	0	0	1656	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14							68
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		971			3848			371			570	
Travel Time (s)		22.1			87.5			8.4			13.0	
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
Adj. Flow (vph)	51	439	1	0	326	39	0	0	0	54	0	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	440	0	0	365	0	0	0	0	0	54	54
Turn Type	Perm	NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0		6.0	6.0		6.0	6.0		8.0	8.0	8.0
Minimum Split (s)	14.0	14.0		12.0	12.0		12.0	12.0		14.0	14.0	14.0
Total Split (s)	24.0	24.0		24.0	24.0		24.0	24.0		24.0	24.0	24.0
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
Act Effct Green (s)	23.7	23.7			23.7						8.3	8.3
Actuated g/C Ratio	0.68	0.68			0.68						0.24	0.24
v/c Ratio	0.07	0.35			0.29						0.14	0.13
Control Delay	6.0	6.8			6.2						12.8	4.4
Queue Delay	0.0	0.0			0.0						0.0	0.0
Total Delay	6.0	6.8			6.2						12.8	4.4
LOS	A	A			A						B	A
Approach Delay		6.7			6.2						8.6	
Approach LOS		A			A						A	
Queue Length 50th (ft)	5	56			42						10	0
Queue Length 95th (ft)	18	113			89						28	15

Baseline

Synchro 10 Light Report
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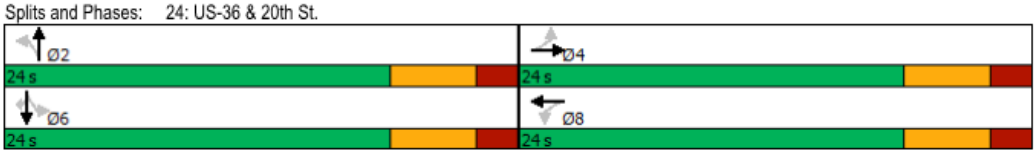
Synchro Model
24: US-36 & 20th St.

2037 AM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		891			3768			291			490	
Turn Bay Length (ft)	185											60
Base Capacity (vph)	705	1297			1280						877	871
Starvation Cap Reductn	0	0			0						0	0
Spillback Cap Reductn	0	0			0						0	0
Storage Cap Reductn	0	0			0						0	0
Reduced v/c Ratio	0.07	0.34			0.29						0.06	0.06

Intersection Summary			
Area Type:	Other		
Cycle Length: 48			
Actuated Cycle Length: 34.7			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.35			
Intersection Signal Delay: 6.7		Intersection LOS: A	
Intersection Capacity Utilization 48.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 24: US-36 & 20th St.



Synchro Model
27: US-36 & 11th Rd.

2037 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	442	72	25	466	27	78	22	34	9	14	36
Future Volume (Veh/h)	22	442	72	25	466	27	78	22	34	9	14	36
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	24	480	78	27	507	29	85	24	37	10	15	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									3			4
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	536			558			1155	1157	519	1134	1182	522
vC1, stage 1 conf vol							567	567		576	576	
vC2, stage 2 conf vol							588	590		558	606	
vCu, unblocked vol	536			558			1155	1157	519	1134	1182	522
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			75	94	93	97	96	93
cM capacity (veh/h)	1032			1013			339	370	557	342	363	555

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	24	558	27	536	146	64
Volume Left	24	0	27	0	85	10
Volume Right	0	78	0	29	37	39
cSH	1032	1700	1013	1700	463	907
Volume to Capacity	0.02	0.33	0.03	0.32	0.32	0.07
Queue Length 95th (ft)	2	0	2	0	33	6
Control Delay (s)	8.6	0.0	8.7	0.0	18.1	13.5
Lane LOS	A		A		C	B
Approach Delay (s)	0.4		0.4		18.1	13.5
Approach LOS					C	B

Intersection Summary					
Average Delay	2.9				
Intersection Capacity Utilization	46.4%	ICU Level of Service		A	
Analysis Period (min)	15				

Baseline

Synchro 10 Light Report
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C.4 2037 PM PEAK HOUR (EXISTING OPERATING CONDITIONS)

Synchro Model
3: US-36 & N. 6th St.

2037 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	290	19	48	498	34	35	20	57	22	4	5
Future Volume (Veh/h)	11	290	19	48	498	34	35	20	57	22	4	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	12	315	21	52	541	37	38	22	62	24	4	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					694							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	578			336			1020	1032	326	1086	1024	560
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	476			336			967	980	326	1040	971	455
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	99			96			81	90	91	84	98	99
cM capacity (veh/h)	978			1223			197	213	716	151	215	545

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	348	630	122	33
Volume Left	12	52	38	24
Volume Right	21	37	62	5
cSH	978	1223	319	177
Volume to Capacity	0.01	0.04	0.38	0.19
Queue Length 95th (ft)	1	3	43	17
Control Delay (s)	0.4	1.1	23.1	29.9
Lane LOS	A	A	C	D
Approach Delay (s)	0.4	1.1	23.1	29.9
Approach LOS			C	D

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	61.9%	ICU Level of Service	B	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
6: US-36 & N. 8th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	357	22	46	446	31	23	46	66	54	38	69
Future Volume (vph)	31	357	22	46	446	31	23	46	66	54	38	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	75		75	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.991				0.850		0.934			0.942	
Flt Protected	0.950			0.950				0.992			0.983	
Satd. Flow (prot)	1770	1846	0	1770	1863	1583	0	1726	0	0	1725	0
Flt Permitted	0.388			0.453				0.936			0.860	
Satd. Flow (perm)	723	1846	0	844	1863	1583	0	1628	0	0	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				36		72			68	
Link Speed (mph)		30			30			20			20	
Link Distance (ft)		694			680			497			526	
Travel Time (s)		15.8			15.5			16.9			17.9	
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
Adj. Flow (vph)	34	388	24	50	485	34	25	50	72	59	41	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	412	0	50	485	34	0	147	0	0	175	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	23.0	23.0		23.0	23.0	23.0	23.0	23.0		23.0	23.0	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	25.0	25.0		25.0	25.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%	58.3%	41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	30.0	30.0		30.0	30.0	30.0	20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	30.0	30.0		30.0	30.0	30.0		20.0			20.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50	0.50		0.33			0.33	
v/c Ratio	0.09	0.44		0.12	0.52	0.04		0.25			0.32	
Control Delay	8.8	11.4		8.9	12.7	3.2		9.4			11.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	8.8	11.4		8.9	12.7	3.2		9.4			11.2	
LOS	A	B		A	B	A		A			B	
Approach Delay		11.2			11.8			9.4			11.2	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	6	87		9	109	0		19			27	
Queue Length 95th (ft)	19	148		25	183	11		54			68	

Baseline

Synchro 10 Light Report
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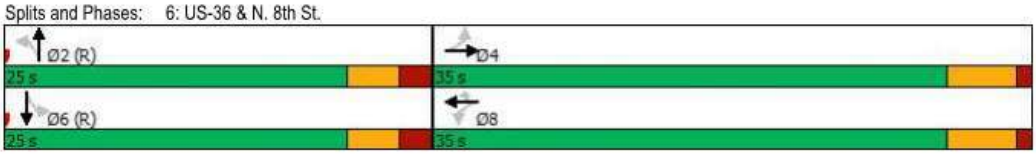
Synchro Model
6: US-36 & N. 8th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		614			600			417			446	
Turn Bay Length (ft)	85			75		75						
Base Capacity (vph)	361	926		422	931	809		590			548	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.09	0.44		0.12	0.52	0.04		0.25			0.32	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Pretimed			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 11.3		Intersection LOS: B	
Intersection Capacity Utilization 56.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 6: US-36 & N. 8th St.



Synchro Model
9: US-36 & N. 10th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	438	62	151	520	11	67	20	170	5	16	15
Future Volume (vph)	9	438	62	151	520	11	67	20	170	5	16	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	60		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.981			0.997			0.911			0.943	
Flt Protected	0.950			0.950				0.987			0.993	
Satd. Flow (prot)	1770	1827	0	1770	1857	0	0	1675	0	0	1744	0
Flt Permitted	0.205			0.239				0.906			0.956	
Satd. Flow (perm)	382	1827	0	445	1857	0	0	1537	0	0	1679	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			2			127			16	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		680			349			478			553	
Travel Time (s)		15.5			7.9			16.3			12.6	
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
Adj. Flow (vph)	10	476	67	164	565	12	73	22	185	5	17	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	543	0	164	577	0	0	280	0	0	38	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	10.0	23.0		10.0	23.0		23.0	23.0		23.0	23.0	
Total Split (s)	15.0	35.0		15.0	35.0		25.0	25.0		25.0	25.0	
Total Split (%)	20.0%	46.7%		20.0%	46.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	10.0	30.0		10.0	30.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)	40.0	30.0		40.0	30.0			20.0			20.0	
Actuated g/C Ratio	0.53	0.40		0.53	0.40			0.27			0.27	
v/c Ratio	0.03	0.74		0.40	0.78			0.56			0.08	
Control Delay	6.4	26.1		9.9	28.4			17.5			14.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	6.4	26.1		9.9	28.4			17.5			14.8	
LOS	A	C		A	C			B			B	
Approach Delay		25.7			24.3			17.5			14.8	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	2	205		30	226			58			8	
Queue Length 95th (ft)	7	322		55	#389			132			29	

Baseline

Synchro 10 Light Report
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Synchro Model
9: US-36 & N. 10th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		600			269			398			473	
Turn Bay Length (ft)	65			60								
Base Capacity (vph)	388	737		414	744			503			459	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.03	0.74		0.40	0.78			0.56			0.08	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 23.4		Intersection LOS: C	
Intersection Capacity Utilization 69.6%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 9: US-36 & N. 10th St.

Synchro Model
15: US-36 & N. 14th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	614	26	15	673	15	19	9	27	28	16	15
Future Volume (vph)	12	614	26	15	673	15	19	9	27	28	16	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt		0.994			0.997			0.935			0.966	
Flt Protected	0.950			0.950				0.983			0.977	
Satd. Flow (prot)	1770	1852	0	1770	1857	0	0	1712	0	0	1758	0
Flt Permitted	0.212			0.252				0.909			0.871	
Satd. Flow (perm)	395	1852	0	469	1857	0	0	1583	0	0	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			3			29			16	
Link Speed (mph)		30			30			20			30	
Link Distance (ft)		1029			341			457			627	
Travel Time (s)		23.4			7.8			15.6			14.3	
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
Adj. Flow (vph)	13	667	28	16	732	16	21	10	29	30	17	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	695	0	16	748	0	0	60	0	0	63	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	24.0	24.0		24.0	24.0		23.0	23.0		23.0	23.0	
Total Split (s)	39.0	39.0		39.0	39.0		23.0	23.0		23.0	23.0	
Total Split (%)	62.9%	62.9%		62.9%	62.9%		37.1%	37.1%		37.1%	37.1%	
Maximum Green (s)	33.0	33.0		33.0	33.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	33.0	33.0		33.0	33.0			18.0			18.0	
Actuated g/C Ratio	0.53	0.53		0.53	0.53			0.29			0.29	
v/c Ratio	0.06	0.70		0.06	0.76			0.12			0.14	
Control Delay	8.0	15.6		7.9	17.7			11.0			14.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	8.0	15.6		7.9	17.7			11.0			14.0	
LOS	A	B		A	B			B			B	
Approach Delay		15.5			17.5			11.0			14.0	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	2	176		3	199			8			13	
Queue Length 95th (ft)	10	292		11	332			32			37	

Baseline

Synchro 10 Light Report
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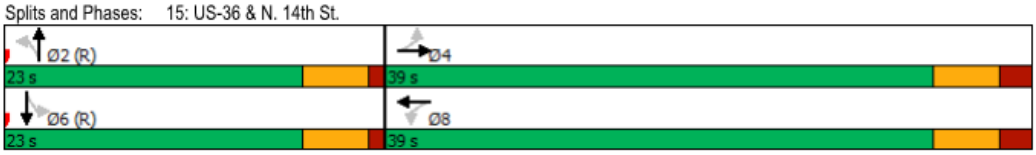
Synchro Model
15: US-36 & N. 14th St.

2037 PM Peak (Existing Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		949			261			377			547	
Turn Bay Length (ft)	125			75								
Base Capacity (vph)	210	988		249	989			480			466	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.06	0.70		0.06	0.76			0.13			0.14	

Intersection Summary			
Area Type:	Other		
Cycle Length: 62			
Actuated Cycle Length: 62			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 16.2		Intersection LOS: B	
Intersection Capacity Utilization 53.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 15: US-36 & N. 14th St.



Synchro Model
18: US-36 & N. 15th St.

2037 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	576	15	27	672	46	4	15	11	12	5	65
Future Volume (Veh/h)	66	576	15	27	672	46	4	15	11	12	5	65
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	72	626	16	29	730	50	4	16	12	13	5	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)		341										
pX, platoon unblocked				0.73			0.73	0.73	0.73	0.73	0.73	
vC, conflicting volume	780			642			1640	1616	634	1603	1599	755
vC1, stage 1 conf vol							778	778		813	813	
vC2, stage 2 conf vol							862	838		790	786	
vCu, unblocked vol	780			317			1692	1660	306	1642	1637	755
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	91			97			98	93	98	94	98	83
cM capacity (veh/h)	837			902			176	231	532	230	248	409

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	72	642	29	780	32	89
Volume Left	72	0	29	0	4	13
Volume Right	0	16	0	50	12	71
cSH	837	1700	902	1700	279	355
Volume to Capacity	0.09	0.38	0.03	0.46	0.11	0.25
Queue Length 95th (ft)	7	0	2	0	10	24
Control Delay (s)	9.7	0.0	9.1	0.0	19.6	18.5
Lane LOS	A		A		C	C
Approach Delay (s)	1.0		0.3		19.6	18.5
Approach LOS					C	C

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	58.6%	ICU Level of Service	B	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
21: US-36 & N. 17th St.

2037 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	664	9	20	703	7	22	1	16	9	1	18
Future Volume (Veh/h)	13	664	9	20	703	7	22	1	16	9	1	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	14	722	10	22	764	8	24	1	17	10	1	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)		1068			971							
pX, platoon unblocked				0.78			0.78	0.78	0.78	0.78	0.78	
vC, conflicting volume	772			732			1588	1571	727	1580	1572	768
vC1, stage 1 conf vol							755	755		812	812	
vC2, stage 2 conf vol							832	816		768	760	
vCu, unblocked vol	772			513			1612	1591	506	1602	1593	768
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			90	100	96	96	100	95
cM capacity (veh/h)	843			819			250	274	440	254	272	402

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	14	732	794	42	31
Volume Left	14	0	22	24	10
Volume Right	0	10	8	17	20
cSH	843	1700	819	304	334
Volume to Capacity	0.02	0.43	0.03	0.14	0.09
Queue Length 95th (ft)	1	0	2	12	8
Control Delay (s)	9.3	0.0	0.7	18.8	16.9
Lane LOS	A		A	C	C
Approach Delay (s)	0.2		0.7	18.8	16.9
Approach LOS				C	C

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	64.1%	ICU Level of Service	C	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
27: US-36 & 11th Rd.

2037 PM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	583	101	31	583	52	49	7	45	25	5	11
Future Volume (Veh/h)	25	583	101	31	583	52	49	7	45	25	5	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	27	634	110	34	634	57	53	8	49	27	5	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									3			4
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	691			744			1454	1502	689	1447	1528	662
vC1, stage 1 conf vol							743	743		730	730	
vC2, stage 2 conf vol							710	759		716	798	
vCu, unblocked vol	691			744			1454	1502	689	1447	1528	662
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			96			81	97	89	90	98	97
cM capacity (veh/h)	904			864			279	290	446	259	281	462

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	27	744	34	691	110	44
Volume Left	27	0	34	0	53	27
Volume Right	0	110	0	57	49	12
cSH	904	1700	864	1700	505	361
Volume to Capacity	0.03	0.44	0.04	0.41	0.22	0.12
Queue Length 95th (ft)	2	0	3	0	21	10
Control Delay (s)	9.1	0.0	9.3	0.0	18.1	18.5
Lane LOS	A		A		C	C
Approach Delay (s)	0.3		0.4		18.1	18.5
Approach LOS					C	C

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	53.5%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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C.5 REMOVAL OF SIGNALS AT 8TH STREET SCENARIO

Synchro Model
6: US-36 & N. 8th St.

2017 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	248	30	16	172	12	7	11	2	21	22	16
Future Volume (Veh/h)	33	248	30	16	172	12	7	11	2	21	22	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	36	270	33	17	187	13	8	12	2	23	24	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					680							
pX, platoon unblocked												
vC, conflicting volume	200			303			608	592	286	571	596	187
vC1, stage 1 conf vol							358	358		221	221	
vC2, stage 2 conf vol							250	234		350	375	
vCu, unblocked vol	200			303			608	592	286	571	596	187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			99	98	100	96	96	98
cM capacity (veh/h)	1372			1258			548	544	753	568	538	855

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	36	303	17	187	13	22	64
Volume Left	36	0	17	0	0	8	23
Volume Right	0	33	0	0	13	2	17
cSH	1372	1700	1258	1700	1700	559	609
Volume to Capacity	0.03	0.18	0.01	0.11	0.01	0.04	0.11
Queue Length 95th (ft)	2	0	1	0	0	3	9
Control Delay (s)	7.7	0.0	7.9	0.0	0.0	11.7	11.6
Lane LOS	A		A			B	B
Approach Delay (s)	0.8		0.6			11.7	11.6
Approach LOS						B	B

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	32.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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Synchro Model
6: US-36 & N. 8th St.

2017 PM Peak (Proposed Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	265	16	34	331	23	17	34	49	40	28	51
Future Volume (Veh/h)	23	265	16	34	331	23	17	34	49	40	28	51
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	25	288	17	37	360	25	18	37	53	43	30	55
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					680							
pX, platoon unblocked	0.92						0.92	0.92		0.92	0.92	0.92
vC, conflicting volume	385			305			850	806	296	844	789	360
vC1, stage 1 conf vol							346	346		434	434	
vC2, stage 2 conf vol							504	459		410	355	
vCu, unblocked vol	294			305			797	749	296	790	731	267
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			96	92	93	90	94	92
cM capacity (veh/h)	1172			1256			411	465	743	425	473	714

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	25	305	37	360	25	108	128
Volume Left	25	0	37	0	0	18	43
Volume Right	0	17	0	0	25	53	55
cSH	1172	1700	1256	1700	1700	555	530
Volume to Capacity	0.02	0.18	0.03	0.21	0.01	0.19	0.24
Queue Length 95th (ft)	2	0	2	0	0	18	23
Control Delay (s)	8.1	0.0	8.0	0.0	0.0	13.1	13.9
Lane LOS	A		A			B	B
Approach Delay (s)	0.6		0.7			13.1	13.9
Approach LOS						B	B

Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	43.1%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
Page 1

Synchro Model
6: US-36 & N. 8th St.

2037 AM Peak (Existing Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	334	40	22	232	16	9	15	3	28	30	22
Future Volume (Veh/h)	44	334	40	22	232	16	9	15	3	28	30	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	48	363	43	24	252	17	10	16	3	30	33	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					680							
pX, platoon unblocked												
vC, conflicting volume	269			406			821	798	384	770	802	252
vC1, stage 1 conf vol							480	480		300	300	
vC2, stage 2 conf vol							340	317		470	502	
vCu, unblocked vol	269			406			821	798	384	770	802	252
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			98	97	100	94	93	97
cM capacity (veh/h)	1295			1153			443	462	663	464	453	787

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	48	406	24	252	17	29	87
Volume Left	48	0	24	0	0	10	30
Volume Right	0	43	0	0	17	3	24
cSH	1295	1700	1153	1700	1700	470	518
Volume to Capacity	0.04	0.24	0.02	0.15	0.01	0.06	0.17
Queue Length 95th (ft)	3	0	2	0	0	5	15
Control Delay (s)	7.9	0.0	8.2	0.0	0.0	13.2	13.3
Lane LOS	A		A			B	B
Approach Delay (s)	0.8		0.7			13.2	13.3
Approach LOS						B	B

Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	39.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
Page 1

Synchro Model
6: US-36 & N. 8th St.

2037 PM Peak (Proposed Operating Conditions)
HCM Unsignalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	357	22	46	446	31	23	46	66	54	38	69
Future Volume (Veh/h)	31	357	22	46	446	31	23	46	66	54	38	69
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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)	34	388	24	50	485	34	25	50	72	59	41	75
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					680							
pX, platoon unblocked	0.86						0.86	0.86		0.86	0.86	0.86
vC, conflicting volume	519			412			1148	1087	400	1138	1065	485
vC1, stage 1 conf vol							468	468		585	585	
vC2, stage 2 conf vol							680	619		553	480	
vCu, unblocked vol	357			412			1090	1019	400	1078	993	317
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			96			91	86	89	81	89	88
cM capacity (veh/h)	1031			1147			283	366	650	303	377	621

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	34	412	50	485	34	147	175
Volume Left	34	0	50	0	0	25	59
Volume Right	0	24	0	0	34	72	75
cSH	1031	1700	1147	1700	1700	438	412
Volume to Capacity	0.03	0.24	0.04	0.29	0.02	0.34	0.42
Queue Length 95th (ft)	3	0	3	0	0	36	52
Control Delay (s)	8.6	0.0	8.3	0.0	0.0	17.3	20.0
Lane LOS	A		A			C	C
Approach Delay (s)	0.7		0.7			17.3	20.0
Approach LOS						C	C

Intersection Summary				
Average Delay	5.1			
Intersection Capacity Utilization	52.7%	ICU Level of Service		A
Analysis Period (min)	15			

Baseline

Synchro 10 Light Report
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C.6 SIGNALIZING 11TH ROAD

Synchro Model
27: US-36 & 11th Rd.

2017 PM Peak (Proposed Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	323	56	17	323	29	27	4	25	14	3	6
Future Volume (vph)	14	323	56	17	323	29	27	4	25	14	3	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	100		100	100		100
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.406			0.406			0.756			0.755		
Satd. Flow (perm)	756	1863	1583	756	1863	1583	1408	1863	1583	1406	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109			109			109			109
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3848			1647			1088			1216	
Travel Time (s)		58.3			25.0			24.7			27.6	
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
Adj. Flow (vph)	15	351	61	18	351	32	29	4	27	15	3	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	15	351	61	18	351	32	29	4	27	15	3	7
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	10.0	40.0	40.0	10.0	40.0	40.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (%)	16.7%	66.7%	66.7%	16.7%	66.7%	66.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Maximum Green (s)	5.5	35.5	35.5	5.5	35.5	35.5	5.5	5.5	5.5	5.5	5.5	5.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
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
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	14.0	13.2	13.2	14.0	13.2	13.2	18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.33	0.31	0.31	0.33	0.31	0.31	0.44	0.44	0.44	0.44	0.44	0.44
v/c Ratio	0.04	0.61	0.11	0.05	0.61	0.06	0.05	0.00	0.04	0.02	0.00	0.01
Control Delay	7.9	17.6	1.5	8.0	17.6	0.2	10.9	11.0	0.1	11.0	11.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	17.6	1.5	8.0	17.6	0.2	10.9	11.0	0.1	11.0	11.0	0.0

Baseline

Synchro 10 Light Report
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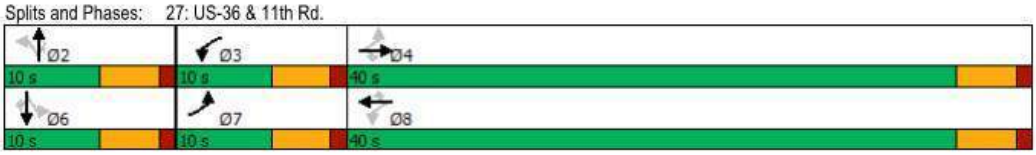
Synchro Model
27: US-36 & 11th Rd.

2017 PM Peak (Proposed Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	B	A	B	B	A	B	B	A
Approach Delay		15.0			15.8			6.1			7.9	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	2	63	0	3	63	0	3	1	0	2	0	0
Queue Length 95th (ft)	9	160	8	10	160	0	23	7	0	15	6	0
Internal Link Dist (ft)		3768			1567			1008			1136	
Turn Bay Length (ft)	200		200	200		200	100		100	100		100
Base Capacity (vph)	383	1604	1378	383	1604	1378	615	814	753	614	814	753
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.22	0.04	0.05	0.22	0.02	0.05	0.00	0.04	0.02	0.00	0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 42.6			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 14.5		Intersection LOS: B	
Intersection Capacity Utilization 36.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 27: US-36 & 11th Rd.



Baseline

Synchro 10 Light Report
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Synchro Model
27: US-36 & 11th Rd.

2037 PM Peak (Proposed Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	583	101	31	583	52	49	7	45	25	5	11
Future Volume (vph)	25	583	101	31	583	52	49	7	45	25	5	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	100		100	100		100
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. 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
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.300			0.257			0.754			0.752		
Satd. Flow (perm)	559	1863	1583	479	1863	1583	1405	1863	1583	1401	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			110			109			109			109
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3848			1647			1088			1216	
Travel Time (s)		58.3			25.0			24.7			27.6	
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
Adj. Flow (vph)	27	634	110	34	634	57	53	8	49	27	5	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	634	110	34	634	57	53	8	49	27	5	12
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	10.0	40.0	40.0	10.0	40.0	40.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (%)	16.7%	66.7%	66.7%	16.7%	66.7%	66.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Maximum Green (s)	5.5	35.5	35.5	5.5	35.5	35.5	5.5	5.5	5.5	5.5	5.5	5.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
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
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	20.4	18.8	18.8	21.0	20.3	20.3	6.2	6.2	6.2	6.2	6.2	6.2
Actuated g/C Ratio	0.54	0.50	0.50	0.55	0.54	0.54	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.05	0.69	0.13	0.07	0.63	0.06	0.23	0.03	0.14	0.12	0.02	0.03
Control Delay	2.7	11.9	2.0	2.7	9.2	0.6	22.9	21.3	1.8	22.0	21.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.7	11.9	2.0	2.7	9.2	0.6	22.9	21.3	1.8	22.0	21.4	0.2

Baseline

Synchro 10 Light Report
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Synchro Model
27: US-36 & 11th Rd.

2037 PM Peak (Proposed Operating Conditions)
Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	A	A	C	C	A	C	C	A
Approach Delay		10.1			8.2			13.4			16.0	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	2	57	0	2	57	0	7	1	0	3	1	0
Queue Length 95th (ft)	5	207	15	6	207	4	47	14	5	29	10	0
Internal Link Dist (ft)		3768			1567			1008			1136	
Turn Bay Length (ft)	200		200	200		200	100		100	100		100
Base Capacity (vph)	497	1611	1384	476	1611	1384	228	303	349	228	303	349
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.39	0.08	0.07	0.39	0.04	0.23	0.03	0.14	0.12	0.02	0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 37.9			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 9.7		Intersection LOS: A	
Intersection Capacity Utilization 50.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 27: US-36 & 11th Rd.