UW Health East

Traffic Impact Study

December 2012

SAA DESIGN GROUP
101 E. Badger Road, Madison, WI 53713

Table of Contents

Chapters

Chapter 1 Introduction and Executive Summary 1

Chapter 2 Proposed Development 1

Chapter 3 Existing Conditions 3

Chapter 4 Projected Traffic 5

Chapter 5 Traffic Improvement Analysis 7

Chapter 6 TDM Measures 9

Chapter 7 Recommendations 13

Exhibits

Recommended Improvements & Priority ..... Exhibit 1.1

Site Location Map ..... Exhibit 2.1

Site Plan ..... Exhibit 2.2

Proposed Geometric Improvements to the Eastpark Blvd Site Entrance ..... Exhibit 2.3

Proposed Geometric Improvements to the Portage Road Site Entrance ..... Exhibit 2.4

Study Area Transportation System and Intersections ..... Exhibit 2.5

2011 Existing Peak Hour Traffic Volumes ..... Exhibit 3.1

2011 Existing Peak Hour Level of Service Summary ..... Exhibit 3.2

Existing AM Peak Hour Level of Service. Year 2011 ..... Exhibit 3.3

Existing PM Peak Hour Level of Service, Year 2011 ..... Exhibit 3.4

Projected Peak Hour Background Traffic ..... Exhibit 4.1

UW Hospital East Facility Trip Generation ..... Exhibit 4.2

Trip Distribution and Assignment ..... Exhibit 4.3

Projected Peak Hour Total Traffic ..... Exhibit 4.4

2020 Projected Level of Service Summary ..... Exhibit 4.5

AM Peak Level of Service, 2020 Traffic with Existing Infrastructure ..... Exhibit 4.6

PM Peak Level of Service, 2020 Traffic with Existing Infrastructure ..... Exhibit 4.7

2020 Proposed Improvements Level of Service Summary ..... Exhibit 5.1

AM Peak Level of Service, 2020 Traffic with Intersection Improvements ..... Exhibit 5.2

PM Peak Level of Service, 2020 Traffic with Intersection Improvements ..... Exhibit 5.3

Proposed Geometric Improvements to the American Pkwy/Eastpark Blvd Intersection ..... Exhibit 5.4
Proposed Bike and Pedestrian Route ..... Exhibit 6.1
Existing Bicycle Network Map ..... Exhibit 6.2
Existing Madison Metro Transit Map ..... Exhibit 6.3
Recommended Long Term Improvements ..... Exhibit 7.1

Appendices

Level of Service Definitions ..... Appendix A
2011 Existing Traffic Intersection Analysis Reports ..... Appendix B
2020 Traffic (Existing + Site + 10% Increase) Intersection Analysis Reports ..... Appendix C
2020 Traffic with Improved Infrastructure Intersection Analysis Reports ..... Appendix D

Chapter 1 Introduction and Executive Summary

- Purpose and Study Objectives

UW Health is proposing to construct a new 400,000 square foot medical facility which will include outpatient care, inpatient care, an emergency room, and a wellness center. The new facility will be constructed on 46 acres on the west side of the American Center Development at the northeast corner of the intersection of Portage Road and Hanson Road/Eastpark Boulevard. The purpose of the traffic study is to determine what, if any, additional improvements need to be incorporated into the existing transportation infrastructure to accommodate the proposed development. This includes improvements to the street system, improvements to the transit system, and managing traffic demand from the new facility to more efficiently utilize the existing transportation infrastructure.

- Proposed Development Description

The development will include a 180,000 square foot clinic/outpatient facility, a 150,000 square foot hospital/inpatient facility, a 30,000 square foot wellness center, and a physical plant. The facility will include orthopedic surgery, outpatient services, a 56 bed hospital, emergency services and a helipad. Groundbreaking for the facility is anticipated in early 2013 with completion in 2014. A residential retirement facility may also be constructed as a part of the project.

- Summary of Study Conclusions

The study recommendations include installing turn lanes on the adjacent main roads (Portage Road and Eastpark Boulevard) at the facility driveways, signalization of the intersection of Buttonwood Drive and American Parkway, and the upgrading of the American Parkway/Eastpark Boulevard intersection with additional turn lanes. Improvements to the intersection may also need to include adding an additional lane southbound on American Parkway and continuing the additional lane on to the southbound interstate on-ramp. Long term, consideration should be given to constructing a new north/south public roadway along American Family Drive from Eastpark Boulevard to Hoepker Road. Transit services to the American Center area should be expanded and bike access should be improved. In addition, long term, the construction of a new interchange at I-39/90/94 is also being investigated. These prioritized improvements are summarized on **Exhibit 1.1**.

Chapter 2 Proposed Development

- On Site Development
    - Development Description and Site Location

The development site contains 46 acres in the American Center Development and is bounded by Eastpark Boulevard/Hanson Road on the south, Portage Road on the west, and a private

connector to American Family Drive on the east. The site is just east of the I90/94/39 Interstate System and south of Hoepker Road (**Exhibit 2.1**).

- Land Use and Intensity

The current site is zoned for the proposed development but will require conditional use approval from the City of Madison. With an initial build out of 400,000 square feet, the facility has the capability of some expansion. It is anticipated that the facility will need parking for approximately 1100 vehicles with surface and structured parking included. There is the ability to expand on site surface parking to 1300 vehicles if needed in the future. A separate study and report on parking was conducted on parking demand at other UW Health sites to help determine the new campus parking needs.

- Site Plan

A proposed site plan is shown in **Exhibit 2.2**. This plan includes the building footprint, parking area, supporting facilities, roadway access, and helipad location. Access to the site will be from Eastpark/Hanson Road to the south via a central driveway entrance with a secondary access on Portage Road for employees and trucks loading. A third potential right turn exit only onto the existing American Family private drive has also been planned. Diagrams of the proposed entry point intersections are given in **Exhibits 2.3** and **2.4**. The three access points are interconnected with an internal private ring road that surrounds the perimeter of the site. The ring road is located approximately 200 feet from the main south entrance to allow sufficient room for left turning vehicles to stack exiting onto Eastpark Blvd.

The site is integrated into the existing pedestrian walkway system in the park. Parking will be accommodated with one structured parking ramp for patients with room for 270 vehicles and will be located on the east side of the site. The remainder of the site is surface parked bringing the total parking supply on the site to 1100 spaces with the potential for surface parking expansion for another 200 parking spaces and additional structured parking expansion. The parking areas include patient, staff, handicapped and valet. Transit service with accessible accommodations will also be provided to the site. Storm water is addressed through a series of constructed infiltration areas. Service utilities will be taken from the existing services in the public streets.

- Development Phasing and Timing

The first phase of development will consist of 400,000 square feet and will include outpatient and inpatient services. This first phase will begin construction in 2013 with an estimated completion of 2014. Future expansion could include an additional site retirement and extended stay facility. Currently there is no time frame on the potential expansion of the facility.

- Study Area

    - Site Accessibility

The site is accessible from multiple directions. From the interstate and USH 151 it is accessible via the USH 151/American Parkway interchange, the High Crossing/USH 151 interchange, the I39/90/94/USH 51 interchange via USH 51, or the CTH C/USH 151 interchange via Hoepker Road. From the north it is accessible from Hoepker Road via Portage Road or American Parkway, as well as Hanson Road from USH 51 on the west. The site itself is accessible on two sides from Portage Road and Hanson Road/Eastpark Boulevard.

    - Influence Area

The overall study area for the traffic analysis is bounded by USH 51 on the west, Hoepker Road on the north, USH 151 on the east and I39/90/94 and the USH 151 interchange on the south. The overall study area is shown in **Exhibit 2.5**.

    - Intersections

As shown in **Exhibit 2.5**, the study area includes the following 11 intersections:

1. Nelson Road/High Crossing Blvd (signalized)
2. USH 151/American Parkway (interchange)
3. American Parkway/Eastpark Blvd (signalized)
4. Eastpark Blvd/N. Biltmore (one way stop)
5. Eastpark Blvd/Private Connector road (one way stop)
6. Hanson Road/Eastpark Blvd/Portage Road (roundabout)
7. Hanson Road/USH 51 (one way stop)
8. USH 51/Hoepker Road (signalized)
9. Portage Road/Hoepker Road (four way stop)
10. American Parkway/Hoepker Road (four way stop)
11. American Parkway/Buttonwood Drive (two way stop)

Chapter 3 Existing Conditions

- Physical Characteristics

The existing roadway infrastructure in the area is a mix of improved roadways and existing town roads. The American Center development is served from the interstate system by a series of interchanges at USH 151, High Crossing Boulevard and American Family Parkway. Access from the west is served off of USH 51 which is a four lane facility with at grade intersections. Hoepker Road, north of the site, is an existing rural two lane road between USH 51 and American Parkway, and has been upgraded to an urban four lane section with bike lanes east of American Parkway. Portage Road is an existing rural two lane road north of the site, but has been

upgraded to an urban divided four lane section with bike lanes along the west site frontage. Hanson Road, from Portage Road almost to USH 51, has been improved as a widened two lane road with bike lanes and turn lanes. The American Center internal roadway system is a mix of urban street sections that vary from 60 feet and four lanes on American Parkway, to 40 feet and two lanes on Buttonwood.

Within the study area there are three signalized intersections, two four way stops, and a roundabout. The remaining intersections are two-way stop controlled intersections.

- Traffic Volumes

Peak hour traffic counts were taken at each of the 11 intersections in the study area shown in **Exhibit 2.5**. These counts were taken during the morning and evening peak hours in November, 2011. The results of these counts are shown in **Exhibit 3.1**. As expected, the highest traffic volumes are centered on the American Parkway/151/High Crossing interchange/intersection. The American Parkway corridor north of 151 also carries a high volume of traffic to American Family Drive. USH 51 west of the development and the I-90 system also carry a high volume of traffic into the Madison area. The local roadway system to the west and north of the development carries the least amount of traffic.

- Level of Service

Both the morning and afternoon peak hours were evaluated based on their "Level of Service" or LOS as defined in Appendix A. This modeling was done using Synchro and the Highway Capacity Manual software and reflects the current roadway configuration and geometrics. A summary of the LOS for each intersection included in the analysis is shown in **Exhibit 3.2**. Generally, a LOS D or better is considered an acceptable operations level. This summary includes the overall intersection level of service for both the morning and the afternoon peak hours. **Exhibits 3.3** and **3.4** show a more detailed breakdown of the intersection LOS for each movement during the morning and evening peak hour, respectively. Also included in the analysis summary is the amount of delay for each movement (this is particularly useful with an LOS F to see the extent of the problem). The third parameter is the queue length to determine the extent of any movement delay as well as to determine if the amount of vehicle storage provided for each movement is adequate.

In the morning peak hour, the results of the analysis indicate that the Hanson Road leg of the intersection with USH 51 operates at a LOS F. The overall intersection operates at an LOS B because this is an unsignalized "T" intersection that is stopped on Hanson Road. The volume of traffic on USH 51 does not have sufficient gaps to allow for either a right or left turn onto USH 51 from Hanson Road during the peak hours. The American Parkway/Buttonwood Drive intersection also shows LOS E for several movements, again due to the high volume of through traffic on the main road. Two other signalized American Parkway intersections, High

Crossing/American Parkway and Eastpark Blvd/American Parkway also indicate LOS D for several movements.

In the afternoon peak hour, the results at the Hanson/USH 51 intersection become worse with a fivefold increase in delay for the Hanson leg of the intersection which degrades the overall intersection to LOS F. The American Parkway/Buttonwood Drive intersection continues to show LOS E for several of the stopped movements. Both signalized American Parkway intersections continue to have an LOS D to LOS F in some movements; however the Eastpark intersection degrades to an overall LOS F due to the heavy eastbound right turn and the competing southbound through movement.

In addition to the intersection analysis, there are two heavy interchange ramp movements that were reviewed but are not included in the analysis. One of the ramps is the afternoon southbound ramp from American Parkway to USH 151. The existing on ramp indicates an LOS C. However, the weave between the SB on ramp and the WB I-90 on ramp indicates LOS F.

The second heavily used ramp section is the morning northbound off ramp from USH 151 to American Parkway. The level of service for this movement was not analyzed.

Chapter 4 Projected Traffic

- Traffic Forecasting

Forecasting traffic volumes is generally comprised of two components. The first component is background traffic. This includes traffic that will be generated by development outside of the study area, but results in increased traffic volume within the study area. Site traffic is considered to be traffic that is generated by a specific site or area and then added to the background traffic to develop the total amount of traffic forecast.

- Background Traffic

Background traffic volumes in the Madison area increased markedly during the high growth years but are generally assumed to be less than 1% per year for the purposes of this study. Since the first phase of the hospital will be considered to be constructed by 2014 we are using 2020 as our development design window. In order to accommodate the potential additional development in the area and growth in background traffic, we assumed a 10% increase in background traffic in addition to the full development of the medical facility by 2020. The projected peak background traffic volumes are shown in **Exhibit 4.1.**

- Site Traffic

Site traffic is considered to be new traffic that is generated as a result of a specific development. In this case, the proposed development will result in a 400,000 square foot medical facility. Site traffic is estimated using standard trip generation rates for the known proposed development types.

Trip Generation

The ITE Trip Generation Manual (8th Edition) provides rates of trip generation for hundreds of building uses based on various independent variables such as building square footage, employees and number of beds. For the purposes of this study, the square footage of the facilities was used as the independent variable because it is definable at this phase of the development. The wellness center and clinic are anticipated to generate a similar number of daily trips per 1000 square feet, with fewer morning peak hour trips generated by the wellness center. The trip generation rates for hospitals are about half those estimated for clinics. In addition, hospital employee shifts are generally prior to the peak hour time periods (6:00 a.m. and 3:00 p.m. hospital shifts). For the purposes of this study, the total building square footage included in the trip generation calculations was 425,000 square feet which would provide a rate higher than that actually planned with the initial construction. The breakdown of the trip generation assumptions is shown in **Exhibit 4.2.**

Mode Split

Mode split is considered to be trips that use alternative modes of transportation such as transit, carpooling, walking etc. In this case, the vehicular trip generation figures are assumed to account for all trips with no reduction in mode split, so there is no overall reduction in trip generation.

Trip Distribution and Assignment

Trip distribution is based on where trips to the campus originate. It is assumed that almost all these trips are home based (patient and employee). Trip assignment determines how the trips are allocated to the roadway system. The majority of the trips were assumed to come through the USH 151/American Parkway interchange. Based on this assumption, the trip distribution and assignment have been made as shown in **Exhibit 4.3**. The total projected traffic volumes for 2020, including the existing background traffic, site generated traffic, and 10% overall increase are shown in **Exhibit 4.4**.

- Level of Service Analysis

    - 2020 Future conditions

      The generated site traffic and projected 10% increase in background traffic volumes were modeled on the existing roadway network with Synchro and Highway Capacity Manual software, and reflect the current roadway and geometric conditions. A summary of the LOS for each intersection included in the analysis is shown in **Exhibit 4.5**. Several intersections show degraded and unacceptable levels of service with the additional traffic loads. An unacceptable level of service is considered LOS E or F. **Exhibits 4.6** and **4.7** show a more detailed breakdown of the intersection LOS for each movement during the morning and evening peak hour, respectively.

      Those intersections showing a movement with a level of service deteriorated to unacceptable, without future improvements, include:

      1. American Parkway/Eastpark Blvd
      2. USH 51/Hanson Road
      3. American Parkway/Buttonwood Drive

Chapter 5 Traffic Improvement Analysis

- Site Analysis

  A traffic analysis was completed for the future conditions (2020) based on full build out of the UW Health site as well as a 10% increase in background traffic volumes. This analysis included a review of the driveway approaches to the site including one approach on Eastpark Blvd and one approach on Portage Road. The main approach will be on Eastpark Boulevard that will service the clinic, hospital, and wellness center with a drop off area and parking. The Urgent Care facility will be served off either drive. The employee parking on the west will be serviced from Portage Road as well as truck service and loading dock. The campus is designed with an outer roadway system so that all elements of the campus are internally connected.

  The main entrance will require an eastbound left turn lane on Eastpark Blvd as well as outbound separation for left and right turns at the driveway. In reviewing the queue distance on the outbound movement, particularly the left turn movement in the afternoon peak hour, it is recommended that 200 feet separate the internal road system from the main drive entrance. The Portage Road entrance outbound does not indicate the need to separate the outbound left and right turn movements. The north bound section of Portage Road is currently two lanes near the proposed driveway entrance. The second northbound lane should be dropped as a right turn lane at the new entrance and provided with a wider drive radius and apron because it is the service entrance for trucks.

- Study Area Analysis

The analysis indicates that several intersections that are currently having congestion problems will be further degraded. A prioritized list of the improvements recommended in this report was given in **Exhibit 1.1**. This includes the intersections of American Parkway/Buttonwood, USH 51/Hanson Road, and American Parkway/Eastpark Blvd. A summary of the Level of Service grades obtained with the recommended improvements is given in **Exhibit 5.1**. **Exhibits 5.2** and **5.3** show a detailed breakdown of the intersection LOS for each movement during the morning and evening peak hour, respectively.

The American Parkway/Buttonwood intersection is currently not signalized and suffers from congestion during the peak hour. This intersection will also provide a more direct access route to the hospital than the American Parkway/Eastpark intersection. In addition, signalizing this intersection will help relieve some of the congestion at both of those intersections, particularly the eastbound right turn at American Parkway and Eastpark. For this reason we are recommending that this improvement be the first priority improvement.

If the American Parkway/Buttonwood signalization does not improve the American Parkway/Eastpark intersection particularly for the eastbound right turn movement in the afternoon peak hour, then we are recommending three improvements to address that issue at this intersection. One is to remove the existing median in the intersection to add an additional northbound left turn lane, and restripe the outer eastbound through lane as a through-left. The second improvement is to add an additional southbound lane on American Parkway south of Eastpark Boulevard, continuing on to the southbound interstate on-ramp. A sketch of the proposed improvements to the American Parkway/Eastpark Boulevard intersection is shown in **Exhibit 5.4**. The third improvement is to signalize the Buttonwood/American Parkway intersection to help encourage greater use of that intersection for access to American Parkway and to increase the platooning effect of southbound traffic at the American Parkway/Eastpark Boulevard signalized intersection.

The USH 51/Hanson Road intersection will continue to be a problem as the area develops. There are both airport related constraints as well as environmental constraints on upgrading this intersection. Options for improving the intersection need to be further explored with the WisDOT, Dane County Airport and City of Madison.

The functionality of the American Parkway/High Crossing Blvd signalized intersection could be improved to an acceptable LOS with minor changes to the existing signal timing plan.

The continued pressure on relying on the USH 151/American Parkway interchange as the major access to the area will continue to adversely affect the weave and ramp movements between that interchange and the I-90 interchange. Adding additional lanes on the ramps, encouraging the use of the High Crossing/USH 151 southbound ramp and even metering the ramps may be

interim solutions but ultimately a new interchange off of the I-90 system needs to be investigated.

Chapter 6 TDM Measures

- Existing UW TDM Measures

  The UW Hospital system has a fairly aggressive TDM program at its central campus location. While the new campus on the east side does not have the same urban density and alternative transportation infrastructure, there are existing measures that should be instituted at the new campus.

- Recommended UW TDM Measures

  We recommend a variety of programs and improvements that UWHCA should institutionalize in order to reduce the demand for – and use of – single occupancy vehicles for trips to this new facility. It is very important to note that TDM is not simply one or two elements, and the best TDM program is going to be comprised of a suite of elements that work together (i.e., fee-based onsite parking, free remote parking near a transit stop, and cost competitive – even free – transit passes). Different TDM approaches will work differently for different people, so a comprehensive TDM program holds the promise for the greatest success. With that in mind, the elements below are presented in order of importance, and include both immediate and long-term strategies.

  1. On-Site Parking Management – A parking management strategy that incentivizes the use of alternatives to the single-occupant vehicle should be pursued at UWHCA's ECD, in order to reduce the demand for surface and structured parking and minimize long term construction and maintenance costs to the institution. Examples of possible TDM strategies include:
     a. Assure that ample, convenient, and secure bicycle parking is available at ECD. Strongly consider the use of covered parking and/or bike lockers.
     b. Provide preferred parking to carpools and vanpools, i.e., "close to the door" spots reserved only for such travelers.

  2. TDM education – A comprehensive introduction to UWHCA's TDM program should be a component of staff orientation upon the facility's grand opening, and with every new hire and transfer thereafter. The University of Wisconsin's Transportation Services department is staffed with TDM professionals, who could be engaged to assist in setting up and carrying out an education program; in fact members of their management team have been engaged in the development of this TDM Plan and have expressed a willingness to work with UWHCA on certain elements of the TDM. Although this is listed as a top priority, the content of the educational element includes items as outlined below in this list and therefore cannot be implemented until the scope of TDM for the facility is settled upon.

3. Set up TDM oversight/monitoring infrastructure – Coming out of the gate with the pieces in place to monitor and adapt UWHCA's TDM program is really the only way to assure that the program does not die on the vine. Some basic and easy to implement monitoring steps, such as administering an annual transportation survey over e-mail to all employees, can go a long way in evaluating transportation attitudes and activities. In any event, there are a few monitoring options that might be considered:
    a. Establish a standing committee to monitor and amend TDM over time (employees, administrators, etc.)
    b. Create a position, or assign duties, for TDM at the Hospital.
    c. Engage the University of Wisconsin's Transportation Services department to conduct periodic monitoring and updating of UWHCA's TDM program. This would ideally work in concert with a standing committee.
    d. Work with neighboring businesses (American Family, Alliant, Herzing, etc.) to establish a Transportation Management Association (TMA), which would focus TDM on a "neighborhood" scale. This option is very attractive and could be highly effective, but certainly is dependent on coordination and buy-in from neighboring businesses.

4. Guaranteed ride home – A guaranteed ride home program serves as a "safety net" for people who do not use their own car to get to work. A current program exists which provides vouchers (typically up to $75) for a taxi ride in case of an emergency or other unforeseen circumstance. This is a service currently offered to users of Madison's regional "rideshare" program (www.rideshareetc.org), but UWHCA could establish an "in-house" service, as well.

5. Flexible work scheduling – Where appropriate and feasible, work schedules should be flexible to allow employees to use alternative modes of travel. For example, after 8:00, Metro routes don't arrive in the neighborhood "on the hour". If possible, this should be taken into consideration for scheduling shifts. It should be noted that this recommendation does not promote "staggering" start times per individual, but rather promotes re-examining shift start and end times to best accommodate the use of transit, rideshare, and other alternative modes on fixed schedules.

6. Facilitate carpooling – Ultimately, all employees at the ECD will have the same destination (ECD)**.** Arguably, many clusters of them arrive at and depart from the hospital at right around the same time. The great variable is, of course, where each of these employees begins and ends their workday trips. UWHCA should take the lead in helping to align potential carpoolers, as this is a relatively easy TDM strategy to undertake.
    a. In addition to the "preferred" parking introduced above, UWHCA could literally start making carpooling a more viable option today, simply by connecting its employees to a robust on-line ride matching service (rideshareetc.org). Through their "Home

Access" website on uwhealth.org, UWHCA could simply provide a link to rideshareetc.org along with a brief introduction for "Home Access" users, which is presumed to include all UWHCA employees.

b. Utilize on-site bulletin boards, memoranda, and inter-office mail for those that may not be comfortable using the online service.
c. Provide financial or "reward" based incentives for carpooling and vanpooling, whereby the more occupants in a permitted vehicle the more substantial the reward.

7. Remote parking – There are several rather proximate locations that are worthy of exploration as remote parking sites in order to reduce vehicle trips to the hospital.
    a. UWHCA's "East Clinic" (W. Terrace Drive) provides 500+ parking spaces. This facility is open 8-6 M-F, and our monitoring showed it to be parked at about 75% capacity during those hours. This would appear to be a prime opportunity for remote parking, and would be all the more attractive with improvements in the area like bike facilities, transit service, or a shuttle service.
    b. Within about a mile of the proposed hospital, there is a free park and ride lot (East Park Boulevard) with spaces for about 150 cars. Madison Metro picks up and drops off here during peak periods currently (with supplemental stops at American Family HQ and the UWHCA East Clinic on Terrace).

8. Promote bicycling – Biking (and, for some, walking) to the new campus is a potential option, as the bike and pedestrian network is in place within the neighborhood and southwest into the urban core. An internal path network (primarily for walking, it appears) is established with American Parkway and East Park Boulevard improved with on-street bike lanes, and the East Campus Development proposed bike route (**Exhibit 6.1**) provides extensive internal bicycle circulation within the site. Connecting this internal network to the larger community and regional networks (a map showing the existing City of Madison system is provided in **Exhibit 6.2**) is a goal, and several potential measures to help accomplish this are provided below:
    a. Madison's "B-cycle" is a bike rental program typically sponsored by businesses. This could be yet another opportunity for UWHCA to work as part of a TMA (see Sec. 3.d. above) for the neighborhood to set up a B-cycle network within the business park and some of the surrounding restaurants, hotels, etc. Perhaps a more "remote" location might be the Trek Store or Erik's Bike Shop near the East Towne Mall.
    b. Bikers can use on-street systems in the vicinity of the proposed hospital, with the two best options being:
        i. Eastpark to Hanson to Portage Road provides linkage to east side network
        ii. Eastpark to American Family Parkway to High Crossing also provides linkage
    c. On-site, convenient, secure, and safe bicycle parking, showers, lockers, etc. are important elements of TDM as well.
    d. Site design must maximize linkage to existing facilities

e. Bicycle commuters are also eligible for tax incentives to offset equipment and mileage costs.

9. Madison Metro – It is recognized that expanding transit service is often a very important – but admittedly very costly – strategy for TDM success. Sharing the costs and benefits of improved transit service (vis-a-vis the "TMA" introduced in Sec. 3.d. above) could help to make improved transit more feasible, although it's likely that this is a more long-term goal. Nonetheless, the "neighborhood" within which the new hospital will be developed has at least been introduced to transit. A map of the existing Madison Metro transit stops in the American Center area is given in **Exhibit 6.3**.
    a. Currently, two routes service the area
        i. Route 25 runs a peak service (7:30 – 8:30, 4:30 – 5:40) to American Family HQ, and the Terrace Dr. UWHCA Clinic
        ii. Route 26 runs on the hour from 9:30 – 3:30 (dedicated stop @ American Pkwy & Buttonwood @ :42 of every hour, "East Clinic")
    b. There are many ways to approach incentivizing transit use for employees. Some employers subsidize transit passes in whole or in part, some offer "pre-tax" employee buy-in options. Federal tax law provides tax breaks to both employees and employers for "commuter choice" initiatives. Currently, UWHCA subsidizes bus passes 100%; this is a practice that should be continued with the ECD.

10. Shuttle – As a "multi-campus" institution, there may be considerable merit in UWHCA providing a shuttle from campus to campus, to remote parking locations, and major transit stops. This is probably another initiative that is made all the more effective as a component of the TMA idea introduced in Sec. III.d above.
    a. Potential to run shuttle to park & ride, bus stops, other UWHCA facilities
    b. Potential to partner w/ neighbors on shuttle?
    c. e.g., Madison College operates a campus to campus shuttle – costs $15K to $20K per month

11. Community Car/Zip Car - Community Car is a program that provides shared cars, with most pickup/drop-off locations located on or near the isthmus. They do consider adding cars if a neighborhood shows enough demand, so this might be a long-term option as a "shared" resource with other nearby businesses. Zip car, a similar service, has cars located on the UW Campus.

- UW Health is currently developing a long term strategy for addressing alternative modes of transportation for the campus. The findings and recommendations of the program will be issued in a separate report.

Chapter 7 Recommendations

Recommended transportation related improvements are divided into two categories; short term and long term. Short term improvements should be constructed or investigated within the next five years. Long term improvements should be implemented or explored further within the next five to ten years. The first four short term improvements are considered the responsibility of UW Health /American Family since they are almost exclusively the beneficiary. The remaining improvements both long and short term benefit the overall business park and should be a collective responsibility of the city and the development A prioritized map showing the following recommended improvements was given in **Exhibit 1.1**.

- Short Term Improvements

1. Provide two new access driveways – as a part of the site design, the two entrances to the site should be constructed as recommended (**Exhibits 2.3** & **2.4**) with the main entrance on Eastpark for patients, visitors and employees and a second entrance on Portage Road for employees and delivery. A third limited access point on American Family's private drive is also being discussed that would allow a right turn outbound only at some time in the future.
2. Portage/Hoepker intersection improvements – the additional traffic on Portage Road is projected to be limited and the level of service with the UW Health site is anticipated to be at an LOC C or better. However the city has requested a review of a northbound left turn lane on Portage Road.
3. Adopt and implement a TDM program for the UW Hospital east campus. Such a program, as outlined in this report, would target reducing vehicles trips for employees.
4. Expand transit service to the American Center. As outlined in the TDM program, there is currently limited transit service to the American Center and current service to the UW Health site is nonexistent. Expanding both transit and para-transit service to the new campus needs to be explored with the city.
5. Signalize the Buttonwood/American Parkway intersection – This intersection is not signalized and currently suffers from congestion during the peak hour. Access to USH 151 via American Parkway from the UW Health Campus will be more direct on Buttonwood than Eastpark further exacerbating the problem. Signalizing this intersection would not only reduce congestion, but encourage more use of Buttonwood which may in turn take some of the current pressure off of the right turn eastbound at American Parkway/Eastpark.
6. Consider additional lanes at the American Parkway/Eastpark intersection if the signalization at Buttonwood does not improve the LOS. In the event that the Buttonwood signalization does not improve the level of service at this intersection, particularly the heavy eastbound right turn movement during the afternoon peak hour for vehicles that are trying to access USH 151 southbound, then improvements

to this intersection should be investigated. The capacity of the existing intersection can be improved by restriping the outer eastbound through lane as a through-right, adding additional northbound and westbound left turn lanes, constructing an additional southbound through lane on American Parkway, and continuing the additional lane up the southbound interstate on-ramp. (**Exhibit 5.4**). We are also recommending that WisDOT include the section of USH 151 from the American Parkway Interchange to the I90/94 Interchange in its current study of the I90/94 corridor. This could include the feasibility of ramp metering for the southbound on-ramp.

7. American Parkway/USH 151 southbound on-ramp – Add additional signage for the second southbound USH 151 ramp at High Crossing/Nelson Road. There is an alternative means of access to USH 151 southbound from American Parkway via the High Crossing/Nelson Road intersection. Higher usage of this ramp, particularly in the afternoon peak hour, will take pressure off the southbound on-ramp at American Parkway and USH 151.
8. Improve bicycle access to the UW Health site. The American Center currently has on street and off street bike lanes within the development. Bike access to the American Center is restricted by narrow rural roads that lack shoulders and access restricted highways that do not allow bicycle usage. Focus should be placed on developing a better network of on-road bike connections with the city traveling from the east side to the west side of I-90/94/39.

   A study of the following two intersection/interchanges should also be explored in the short term:

9. New future interchange at Hoepker Road/I90/94. The WisDOT is currently undertaking a study of long term improvements to the I90/94 corridor from the Beltline to the Wisconsin Dells. Given the potential capacity issues of the USH 151 corridor and the expected additional development in the American Family Center and surrounding areas, the feasibility of a new interchange on I-90/94 at Hoepker Road should be explored as a part of that study.
10. Hanson Road/USH 51 intersection - Hanson Road is the most direct connection from USH 51 to the UW Health site and this intersection will continue to have additional pressure from surrounding development. In addition, Hanson Road has an industrial park located on it that is slated for additional development. The traffic analysis of this intersection indicates that it is currently one of the most degraded intersections during both the am and pm peak hours. Improvement options for the USH 51/Hanson Road intersection need to be explored with the city, Dane County Airport, and WisDOT.

- Long Term Improvements (**Exhibit 7.1**)

1. USH 151 Improvements – The section of USH 151 from the American Center interchange to the USH 151/I-90/94 interchange should be explored due to the heavy weaving movements southbound between those two interchanges and the relatively short distance between the two, particularly the southbound on-ramp from the American Center and the westbound and eastbound on-ramps to I-90/94/39.
2. American Family Drive extension to Hoepker Road – American Family is considering extending the current private drive adjacent to the UW Health site to Hoepker Road and allowing public access in the future. If that connection is made In the future, full intersection connection on the south or the east would be provided to the UW to allow another access drive. The current site plan has the ability to accommodate either connection in the future.
3. Portage Road improvements – Portage Road and the intersection at Hoepker Road will need to be upgraded from its current rural standard to an urban standard. The timeframe for this will depend on development in the area, but it may very well be driven by the timeframe for the construction of a new interchange at I90/94 and Hoepker Road.
4. Hoepker Rd/I-90/94 Interchange – This new interchange will provide a secondary access to the American Center as well as direct access to the airport. It will relieve the projected congestion on the USH 151 corridor between I/90/94 and the American Family interchange.
5. Widen Hoepker Rd from Portage Road to American Parkway – this improvement will provide a four lane facility from Portage Road to CTH C. If and when the interchange is constructed, the four lane facility would most likely include the section from Portage Road to the interchange.
6. Signalize American Parkway/Hoepker Road (wiring has already been completed) – this improvement has been programmed and will be implemented once signal warrants for the intersection are met.

Exhibits

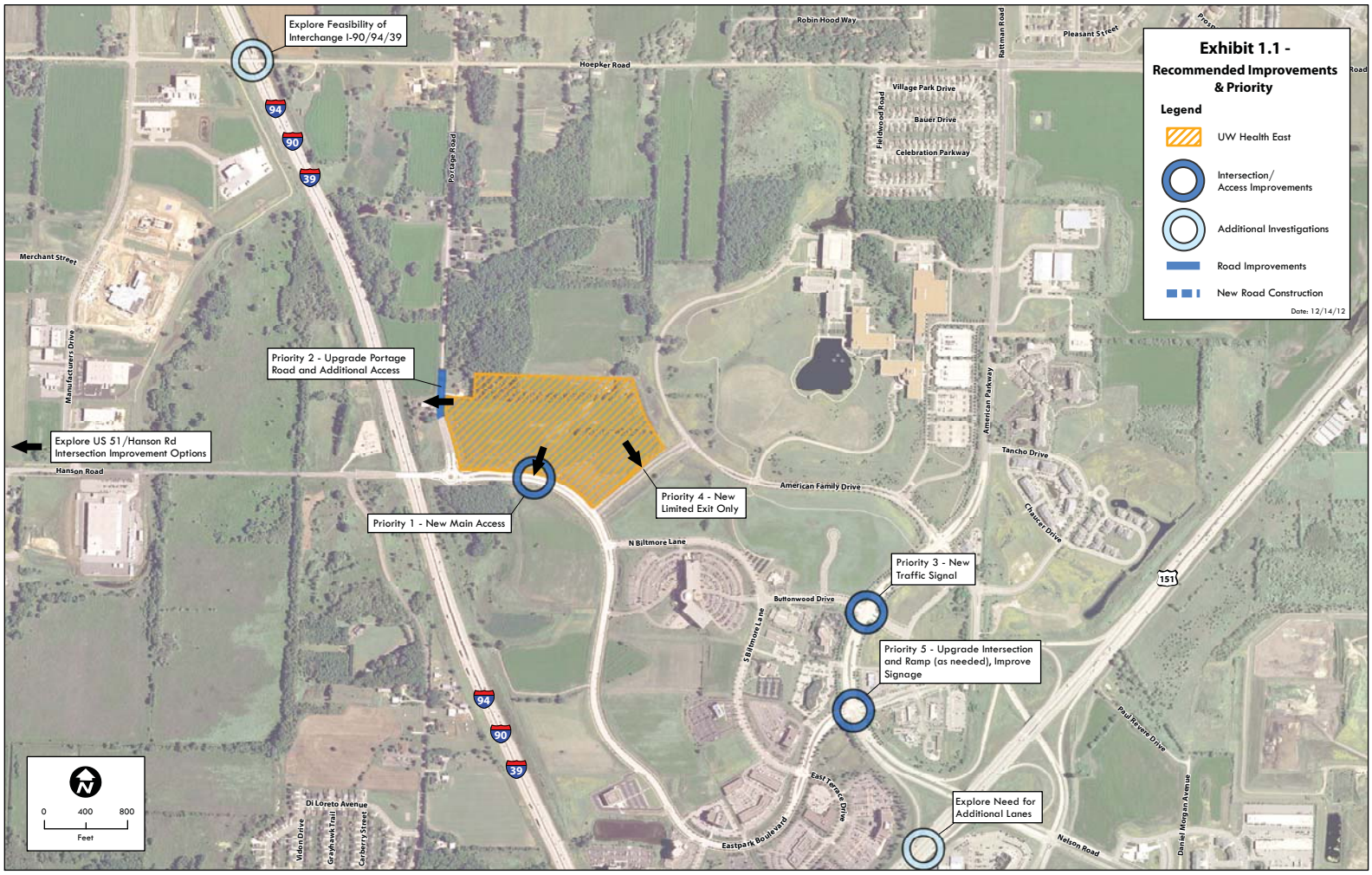


Exhibit 1.1 -
Recommended Improvements & Priority
Legend
UW Health East
Intersection/ Access Improvements
Additional Investigations
Road Improvements
New Road Construction
Date: 12/14/12
Explore Feasibility of Interchange I-90/94/39
Priority 2 - Upgrade Portage Road and Additional Access
Explore US 51/Hanson Rd Intersection Improvement Options
Priority 1 - New Main Access
Priority 4 - New Limited Exit Only
Priority 3 - New Traffic Signal
Priority 5 - Upgrade Intersection and Ramp (as needed), Improve Signage
Explore Need for Additional Lanes
Robin Hood Way
Hoepker Road
Pleasant Street
Rattman Road
Village Park Drive
Fieldwood Road
Bauer Drive
Celebration Parkway
Portage Road
Merchant Street
Manufacturers Drive
Hanson Road
American Parkway
Tancho Drive
American Family Drive
Chancer Drive
N Biltmore Lane
Buttonwood Drive
S Biltmore Lane
East Terrace Drive
Eastpark Boulevard
Paul Revere Drive
Daniel Morgan Avenue
Nelson Road
Di Loreto Avenue
Vidon Drive
Graphawk Trail
Carberry Street
94
90
39
151
0
400
800
Feet

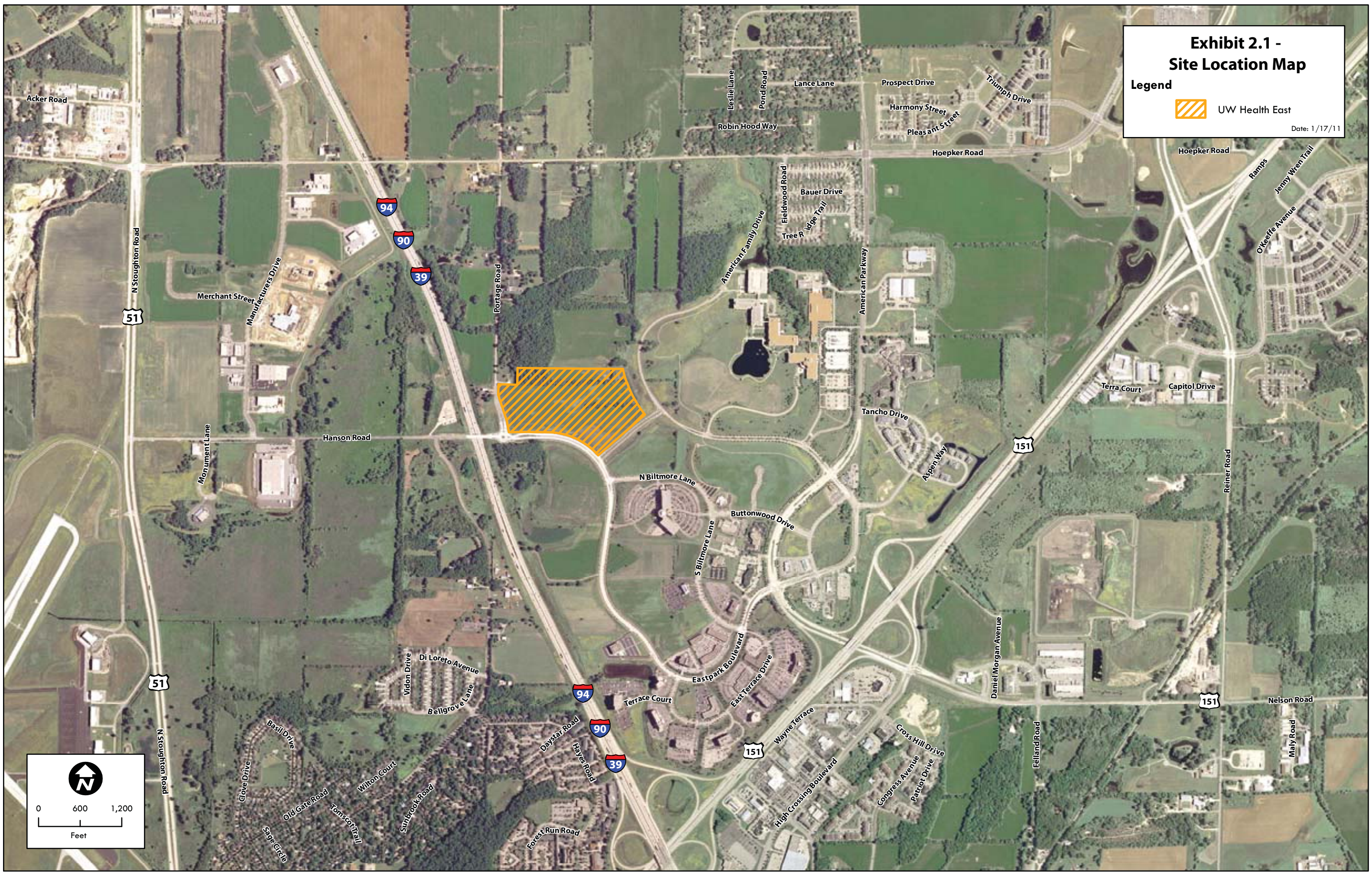


Exhibit 2.1 -
Site Location Map
Legend
UW Health East
Date: 1/17/11
Acker Road
Hoepker Road
N Stoughton Road
Merchant Street
Manufacturers Drive
Portage Road
Hanson Road
Monument Lane
Leslie Lane
Pond Road
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Robin Hood Way
Bauer Drive
Fieldwood Road
Tree Ridge Trail
American Family Drive
American Parkway
Ramps
Jenny Wren Trail
O'Keeffe Avenue
Terra Court
Capitol Drive
Tancho Drive
Aspen Way
N Biltmore Lane
Buttonwood Drive
S Biltmore Lane
Eastpark Boulevard
East Terrace Drive
Terrace Court
Reiner Road
Daniel Morgan Avenue
Nelson Road
Maly Road
Felland Road
Wayne Terrace
Cross Hill Drive
Congress Avenue
Patriot Drive
High Crossing Boulevard
Vidon Drive
Di Loreto Avenue
Bellgrove Lane
Basil Drive
Wilton Court
Clove Drive
Old Gate Road
Tomscot Trail
Sandstone Road
Sage Circle
Daystar Road
Hayes Road
Forest Run Road
94
90
39
51
151
0
600
1,200
Feet

EXHIBIT 2.2: SITE PLAN

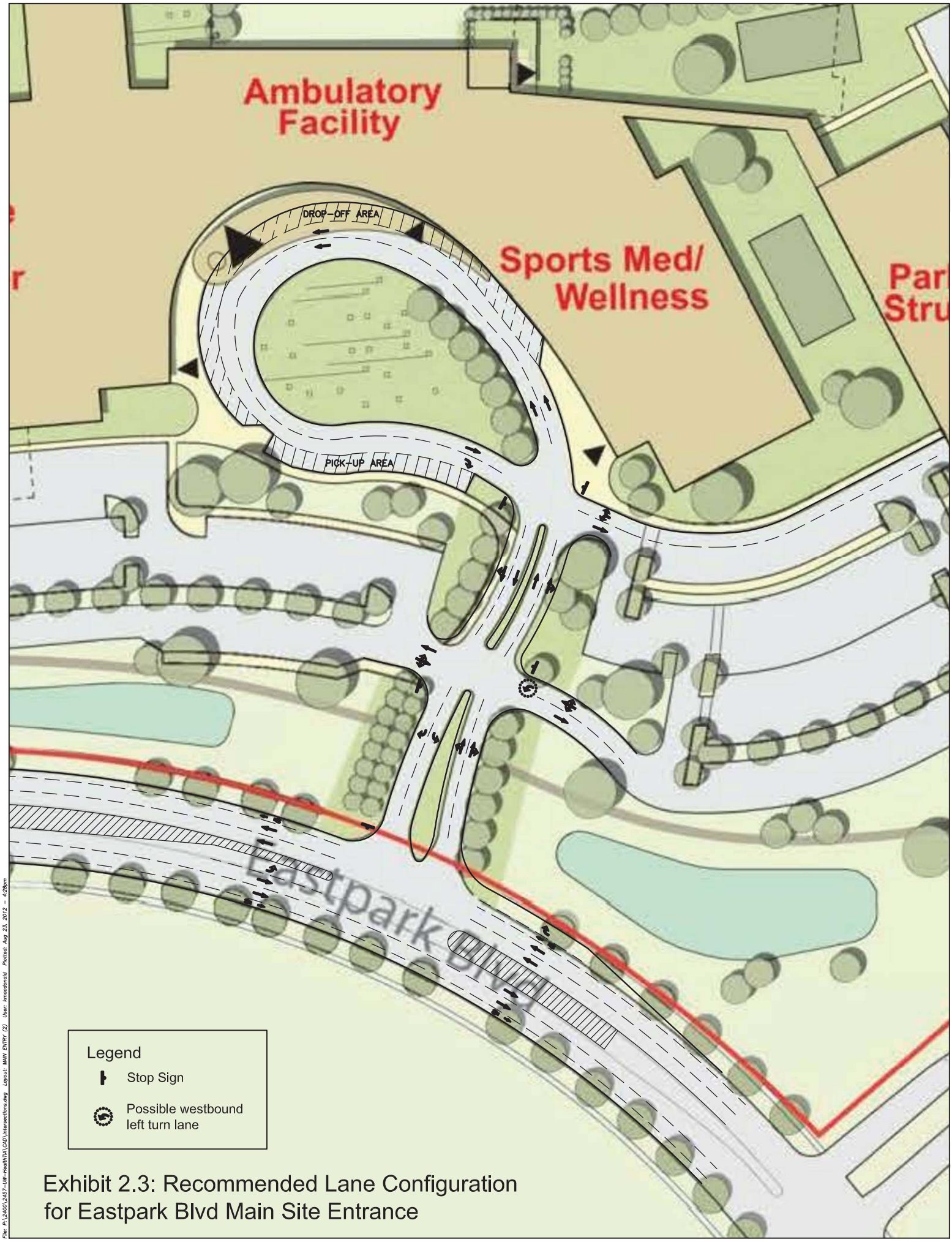
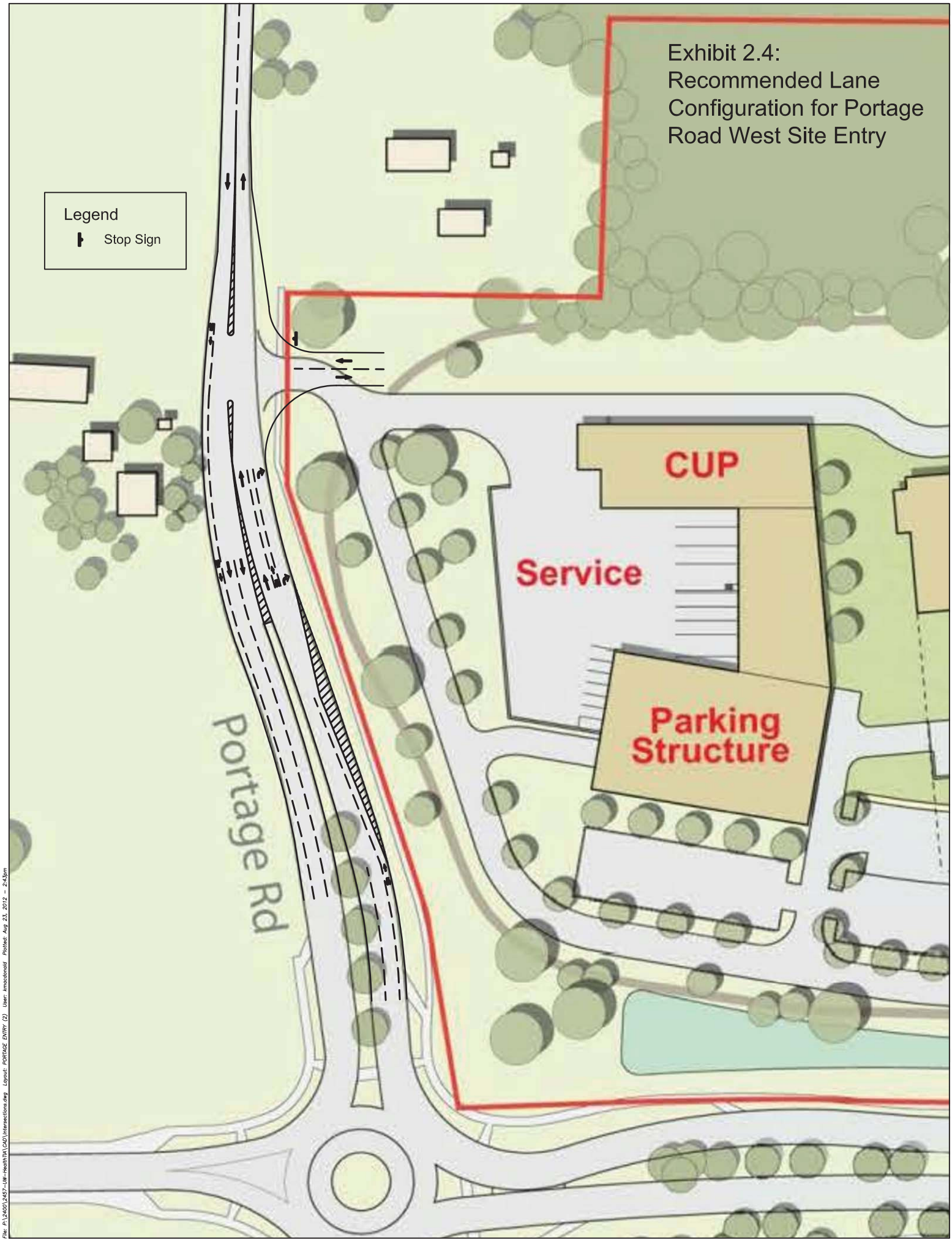


Exhibit 2.3: Recommended Lane Configuration for Eastpark Blvd Main Site Entrance



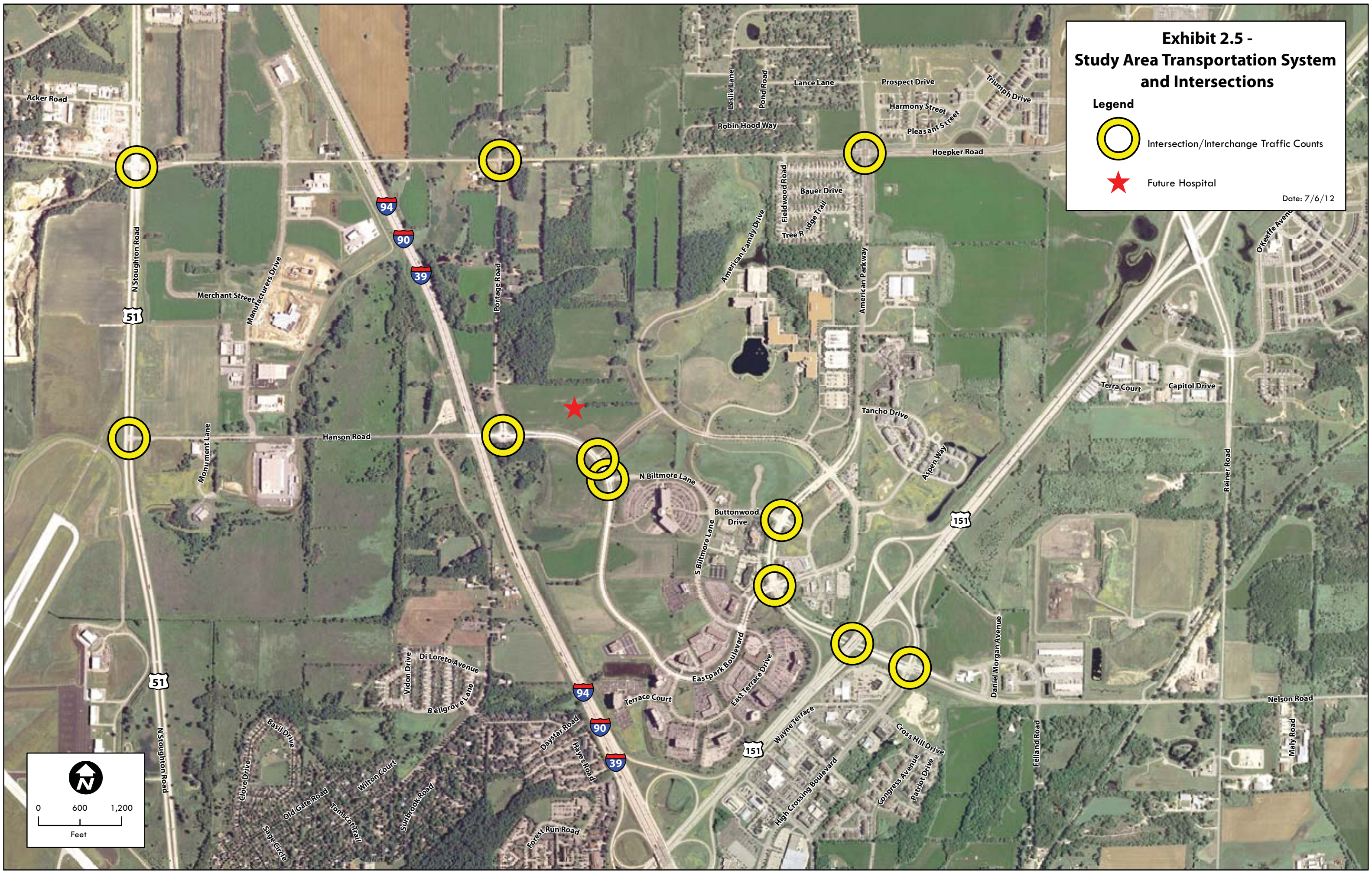


Exhibit 2.5 -
Study Area Transportation System
and Intersections
Legend
Intersection/Interchange Traffic Counts
Future Hospital
Date: 7/6/12
Acker Road
Hoepker Road
Hanson Road
N Stoughton Road
Portage Road
Merchant Street
Manufacturers Drive
Monument Lane
Leslie Lane
Pond Road
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Robin Hood Way
Fieldwood Road
Bauer Drive
American Family Drive
American Parkway
Tancho Drive
Aspen Way
Terra Court
Capitol Drive
N Biltmore Lane
Buttonwood Drive
S Biltmore Lane
Eastpark Boulevard
East Terrace Drive
Terrace Court
Wayne Terrace
High Crossing Boulevard
Congress Avenue
Cross Hill Drive
Daniel Morgan Avenue
Nelson Road
Reiner Road
Felland Road
Maly Road
Vidon Drive
Di Loreto Avenue
Bellgrove Lane
Daystar Road
Hayes Road
Forest Run Road
Basil Drive
Clove Drive
Old Gate Road
Wilton Court
94
90
39
51
151
0
600
1,200
Feet

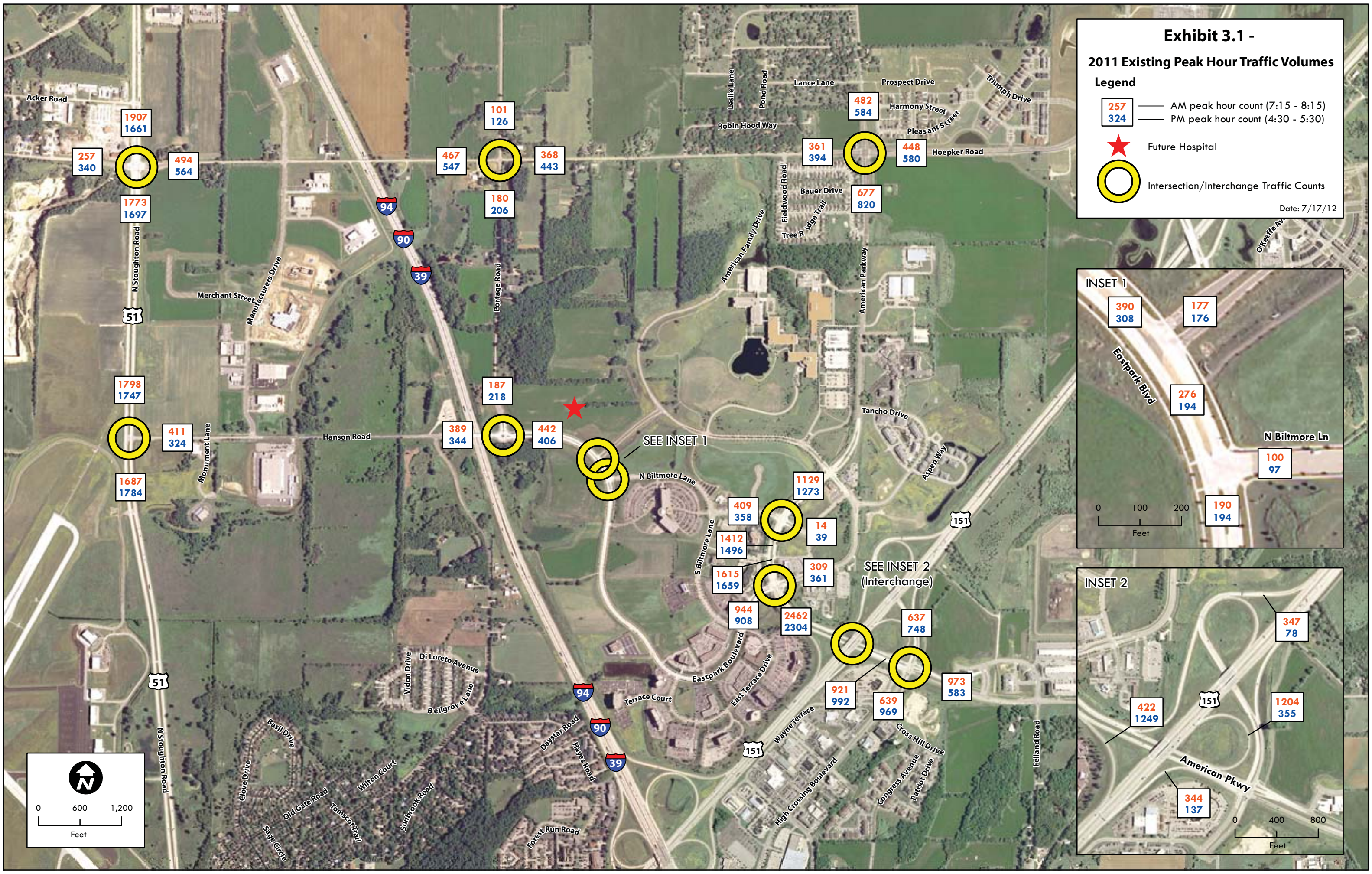


Exhibit 3.1 -
2011 Existing Peak Hour Traffic Volumes
Legend
257 324
AM peak hour count (7:15 - 8:15)
PM peak hour count (4:30 - 5:30)
Future Hospital
Intersection/Interchange Traffic Counts
Date: 7/17/12
INSET 1
390 308
177 176
276 194
N Biltmore Ln
100 97
190 194
Eastpark Blvd
0 100 200
Feet
INSET 2
347 78
422 1249
1204 355
344 137
American Pkwy
151
0 400 800
Feet
1907 1661
257 340
494 564
1773 1697
101 126
467 547
368 443
180 206
482 584
361 394
448 580
677 820
1798 1747
411 324
1687 1784
187 218
389 344
442 406
SEE INSET 1
1129 1273
409 358
14 39
1412 1496
1615 1659
309 361
944 908
2462 2304
SEE INSET 2 (Interchange)
637 748
921 992
639 969
973 583
Acker Road
N Stoughton Road
Merchant Street
Manufacturers Drive
Portage Road
Hanson Road
Monument Lane
Hoepker Road
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Robin Hood Way
Leslie Lane
Pond Road
Fieldwood Road
Bauer Drive
Tree Ridge Trail
American Family Drive
American Parkway
Tancho Drive
Aspen Way
N Biltmore Lane
S Biltmore Lane
Eastpark Boulevard
East Terrace Drive
Terrace Court
Wayne Terrace
High Crossing Boulevard
Cross Hill Drive
Congress Avenue
Patriot Drive
Felland Road
Vidon Drive
Di Loreto Avenue
Bellgrove Lane
Daystar Road
Hayes Road
Basil Drive
Wilton Court
Clove Drive
Old Gate Road
Tomscot Trail
Starbrook Road
Sage Circle
Forest Run Road
94
90
39
51
151
0 600 1,200
Feet

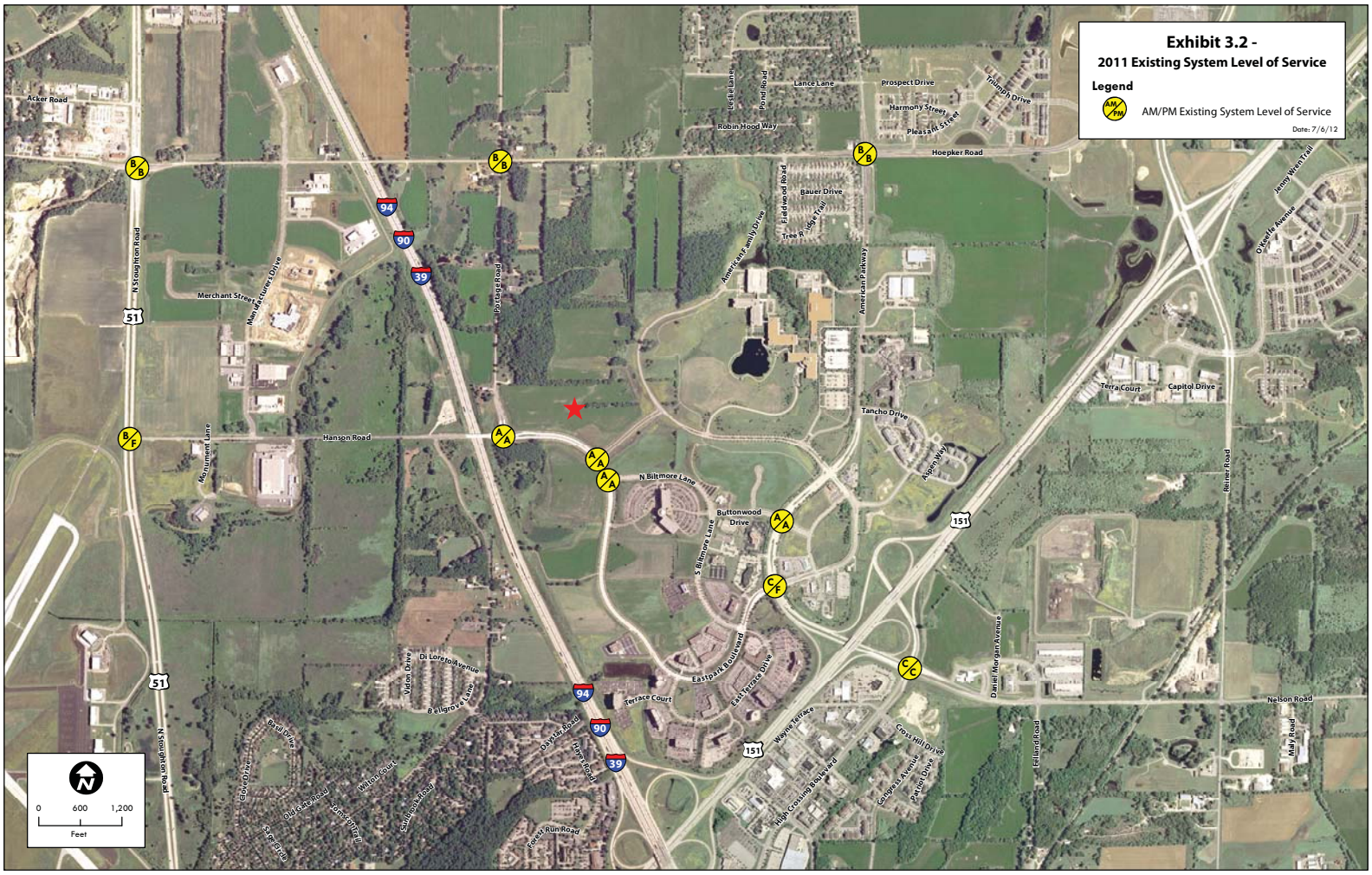


Exhibit 3.2 -
2011 Existing System Level of Service
Legend
AM/PM Existing System Level of Service
Date: 7/6/12
Acker Road
N Stoughton Road
Merchant Street
Manufacturer Drive
Portage Road
Hanson Road
Monument Lane
Robin Hood Way
Lance Lane
Pond Road
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Hoepker Road
Fieldwood Road
Bauer Drive
Tree Trail
American Parkway
Amerikanex Parkway
Jenny Wren Trail
O'Keefe Avenue
Terra Court
Capitol Drive
Tancho Drive
Aspen Way
Reiner Road
N Biltmore Lane
Buttonwood Drive
S Biltmore Lane
Eastpark Boulevard
Eastgate Drive
Terrace Court
Daniel Morgan Avenue
Nelson Road
Wayne Terrace
Cross Hill Drive
Gregg Lee Avenue
Patton Drive
High Crossing Boulevard
Felland Road
Mary Road
Di Lorsto Avenue
Vidon Drive
Beilagrove Lane
Douglas Road
Henry Road
Jersey Run Road
Wilson Court
Old Red Bridge Road
Carl Drive
Opal Drive
Sandy Point Road
Sandy Point Trail
Sandy Point Circle
0
600
1,200
Feet
51
94
90
39
151

Exhibit 3.3: AM Peak LOS, Year 2011 Existing Conditions

Weekday AM Peak Hour															
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound		
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
High Crossing/ American Pkwy	Traffic Signal	C 27.3	D 45.5 22	C 23.6 84	B 19.8 20	C 29.7 73	C 20.4 83	B 18.2 12	C 24.1 144	C 25.5 48	C 24.1 22	D 39.6 #193	C 25.2 44	 0 0
American Pkwy/ Eastpark Blvd	Traffic Signal	C 24.7	D 41.6 37	D 38.6 8	B 11.3 21	D 39.9 #145	C 26.6 38	 0 0	D 47.8 #575	A 8.6 150	A 6.3 14	C 34.9 22	D 38.4 107	 0 0
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 2.9	 0 0	 0 0	 0 0	A 8.8 4	 0 0	A 8.8 4	 0 0	A 0.0 0	A 0.0 0	A 0.4 4	A 1.5 4	 0 0
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 3.0	0	0	0	B 13.5	0	A 8.4	0	A 0	A 0	A 7.6	A 3.1	0
Hanson Road/ Portage Road	Round About*	A 5.0	A 5.4	A 5.7	0	A 3.8	0	A 3.4	0	0	0	A 4.2	A 4.1	0
USH 51/ Hanson Road	Stop 2-way	B 11.0	 0 0	 0 0	 0 0	F 117.9 211	 0 0	F 117.9 211	 0 0	A 0.0 0	A 0.0 0	A 8.8 17	A 0 0	 0 0
USH 51/ Hoepker Road	Traffic Signal	B 18.7	C 22.3 18	C 23.8 74	C 22.0	D 50.8 104	C 23.2 57	C 22.0 21	C 32.5 35	B 11.4 91	B 10.1 12	D 35.2 101	B 14.3 #408	A 7.5 13
Hoepker Road/ Portage Road	Stop 4-way	B 10.3	B 11.2	B 11.2	B 11.2	A 10.0	A 10.0	A 6.3	A 8.2	A 8.2	A 7.3	A 9.7	A 9.7	A 9.7
Hoepker Road/ American Parkway	Stop 4-way*	B 13.1	B 11.4 5	B 11.2 10	B 10.1 5	B 10.8 3	B 11.1 10	B 11.9 28	C 16.0 60	B 12.1 28	A 9.2 3	B 10.5 5	B 14.8 58	B 12.7 40
American Pkwy/ Buttonwood Drive	Stop 2-way	A 2.7	D 32.0 4	E 39.6 1	B 10.0 4	E 49.7 4	C 19.3 2	C 19.3 2	B 10.1 36	A 0.0 0	A 0.0 0	A 9.2 1	A 0.0 0	A 0.0 0

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

Exhibit 3.4: PM Peak LOS, Year 2011 Existing Conditions

Weekday PM Peak Hour															
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound		
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
High Crossing/ American Pkwy	Traffic Signal	C 25.3	D 35.9 #135	B 19.1 95	B 18.1 50	D 35.7 #83	B 18.9 26	B 18.4 11	D 37.8 #187	B 18.9 113	B 16.8 28	F 119.5 24	C 22.6 26	 0 0
American Pkwy/ Eastpark Blvd	Traffic Signal	F 94.5	D 42.6 83	D 35.9 25	F 286 #495	E 57.1 #234	C 23.3 17	 0 0	C 33.9 163	A 8.5 61	A 8.1 21	C 20.8 46	C 30.8 345	 0 0
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 3.2	 0 0	 0 0	 0 0	A 9.2 8	 0 0	A 9.2 8	 0 0	A 0.0 0	A 0.0 0	A 4.1 1	A 0.0 0	 0 0
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 3.7	 0 0	 0 0	 0 0	A 7.7	 0 0	A 1.8	 0 0	A 0	A 0	B 10.7	A 9.6	 0 0
Hanson Road/ Portage Road	Round About*	A 4.7	A 3.8	A 3.9	 0 0	A 5.3	 0 0	A 4.7	 0 0	 0 0	 0 0	A 3.9	 0 0	A 4.2
USH 51/ Hanson Road	Stop 2-way	F 55.9	 0 0	 0 0	 0 0	F 521.1 485	 0 0	F 521.1 485	 0 0	A 0.0 0	A 0.0 0	B 13.6 11	A 0.0 0	 0 0
USH 51/ Hoepker Road	Traffic Signal	B 15.1	C 23.3 6	C 26.4 89	C 23.4 26	C 24.1 31	C 26.9 #96	C 23.6 41	D 35.9 44	B 12.3 210	A 8.0 22	D 35.5 53	A 8.9 95	A 7.4 6
Hoepker Road/ Portage Road	Stop 4-way	B 12.4	C 15.0	C 15.0	C 15.0	B 10.8	B 10.8	A 7.0	B 11.6	B 11.6	A 7.7	A 10.0	A 10.0	A 10.0
Hoepker Road/ American Parkway	Stop 4-way*	B 14.8	B 11.6 15	C 21.8 143	B 13.2 55	B 12.3 13	B 12.9 25	B 11.8 15	B 12.7 15	B 12.6 20	B 10.7 10	B 11.8 8	B 12.3 18	B 11.5 13
American Pkwy/ Buttonwood Drive	Stop 2-way	A 3.7	E 38.1 21	E 37.0 5	B 14.2 51	E 47.5 2	B 10.5 1	B 10.5 1	A 10.0 5	A 0.0 0	A 0.0 0	A 8.3 1	A 0.0 0	A 0.0 0

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

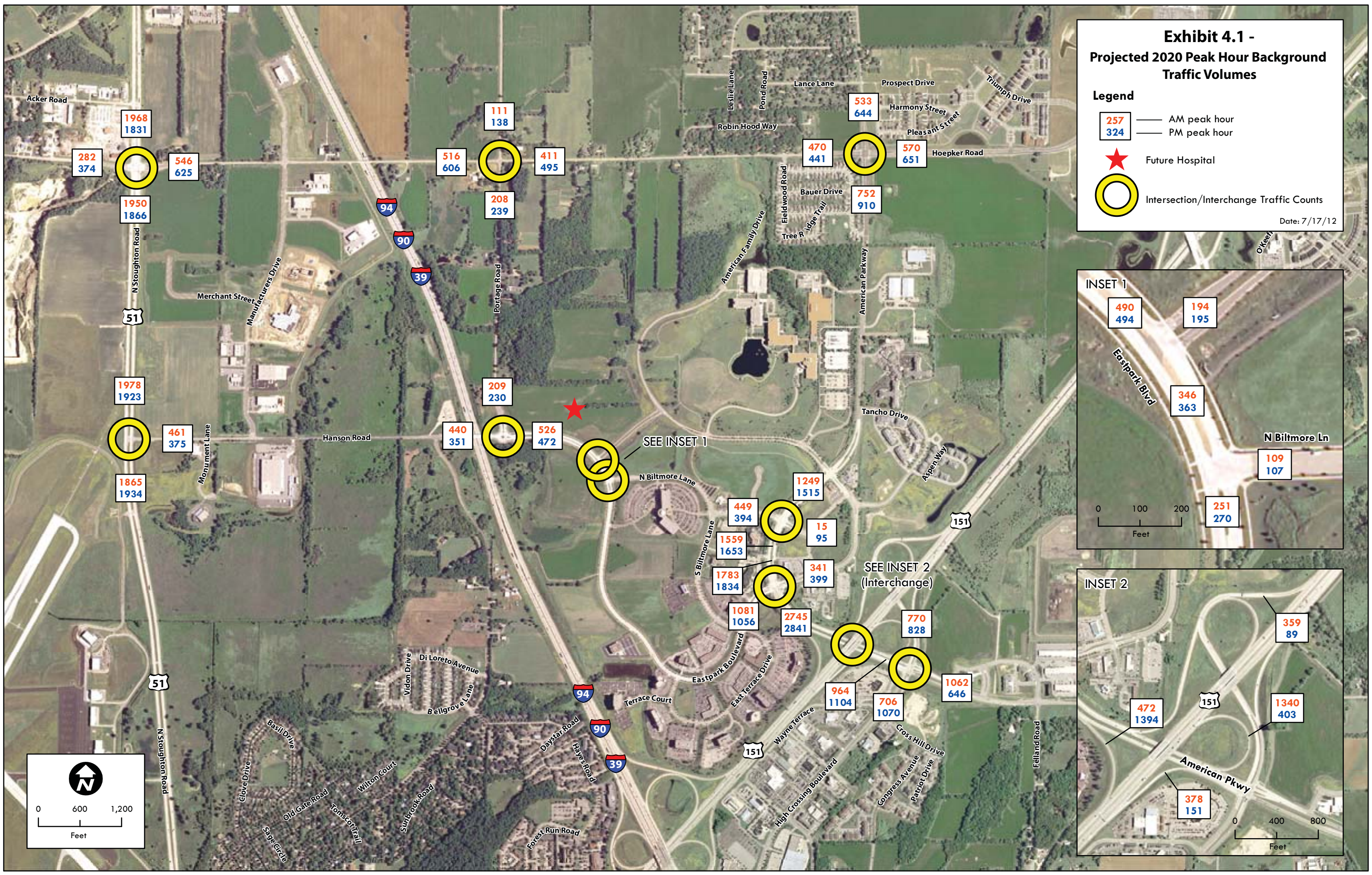


Exhibit 4.1 -
Projected 2020 Peak Hour Background Traffic Volumes
Legend
257
324
AM peak hour
PM peak hour
Future Hospital
Intersection/Interchange Traffic Counts
Date: 7/17/12
Acker Road
1968
1831
282
374
546
625
1950
1866
111
138
516
606
411
495
208
239
533
644
470
441
570
651
752
910
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Hoepker Road
Robin Hood Way
Leslie Lane
Pond Road
Fieldwood Road
Bauer Drive
Tree Ridge Trail
American Family Drive
American Parkway
N Stoughton Road
Merchant Street
Manufacturers Drive
Portage Road
1978
1923
461
375
1865
1934
209
230
440
351
526
472
Hanson Road
Monument Lane
SEE INSET 1
N Biltmore Lane
Tancho Drive
Aspen Way
1249
1515
449
394
15
95
1559
1653
S Biltmore Lane
1783
1834
341
399
1081
1056
2745
2841
SEE INSET 2
(Interchange)
770
828
964
1104
706
1070
1062
646
Eastpark Boulevard
East Terrace Drive
Terrace Court
Wayne Terrace
High Crossing Boulevard
Cross Hill Drive
Congress Avenue
Patriot Drive
Felland Road
Di Loreto Avenue
Vidon Drive
Bellgrove Lane
Daystar Road
Hayes Road
Basil Drive
Clove Drive
Wilton Court
Old Gate Road
Tomscot Trail
Starbrook Road
Sage Circle
Forest Run Road
N Stoughton Road
94
90
39
51
151
0
600
1,200
Feet
INSET 1
490
494
194
195
Eastpark Blvd
346
363
N Biltmore Ln
109
107
251
270
0
100
200
Feet
INSET 2
359
89
472
1394
1340
403
378
151
American Pkwy
0
400
800
Feet

Exhibit 4.2 UW HEALTH EAST FACILITY TRIP GENERATION

Land Use	Peak Hour Trip Generation Rate			AM		PM		WEEKDAY	
				IN	OUT	IN	OUT	IN	OUT
Health/Fitness Club (Code 492) 31,000 sf	Weekday AM Peak 1.38 trip per 1,000 sf	Weekday PM Peak 3.53 trips per 1,000 sf	Weekday 32.93 trips per 1,000 sf	45%	55%	57%	43%	50%	50%
Wellness Center Generation	43	110	1021	19	24	63	47	511	510
Medical-Dental Office Building (Code 720) 102,000 SF	Weekday AM Peak 2.3 trips per 1,000 sf	Weekday PM Peak 3.46 trips per 1,000sf	Weekday 36.13 trips per 1,000sf	79%	21%	27%	73%	50%	50%
Clinic Generation	235	353	3686	186	49	95	258	1843	1843
Hospital (Code 610) 274,000 SF	Weekday AM Peak 1.12 trips per 1,000 sf	Weekday PM Peak 1.14 trips per 1,000 sf	Weekday 16.5 trips per 1,000sf	59%	41%	42%	58%	50%	50%
Hospital Generation	307	313	4521	181	126	131	182	2261	2260
Nursing Home (Code 620) 28,000 SF	Weekday AM Peak 0.55 trips per 1,000 sf	Weekday PM Peak 0.74 trips per 1,000 sf	Weekday 7.58 trips per 1,000sf	71%	29%	52%	48%	50%	50%
Nursing Home Generation	16	21	213	11	5	11	10	107	106
Total Trips Generated	601	797	9441	397	204	300	497	4722	4719
(0%) Linked Trips	0	0	0	0	0	0	0	0	0
(0%) Alternate Modes	0	0	0	0	0	0	0	0	0
Total New Trips	601	797	9441	397	204	300	497	4722	4719

Source: ITE Trip Generation, 8th Edition, 2008.

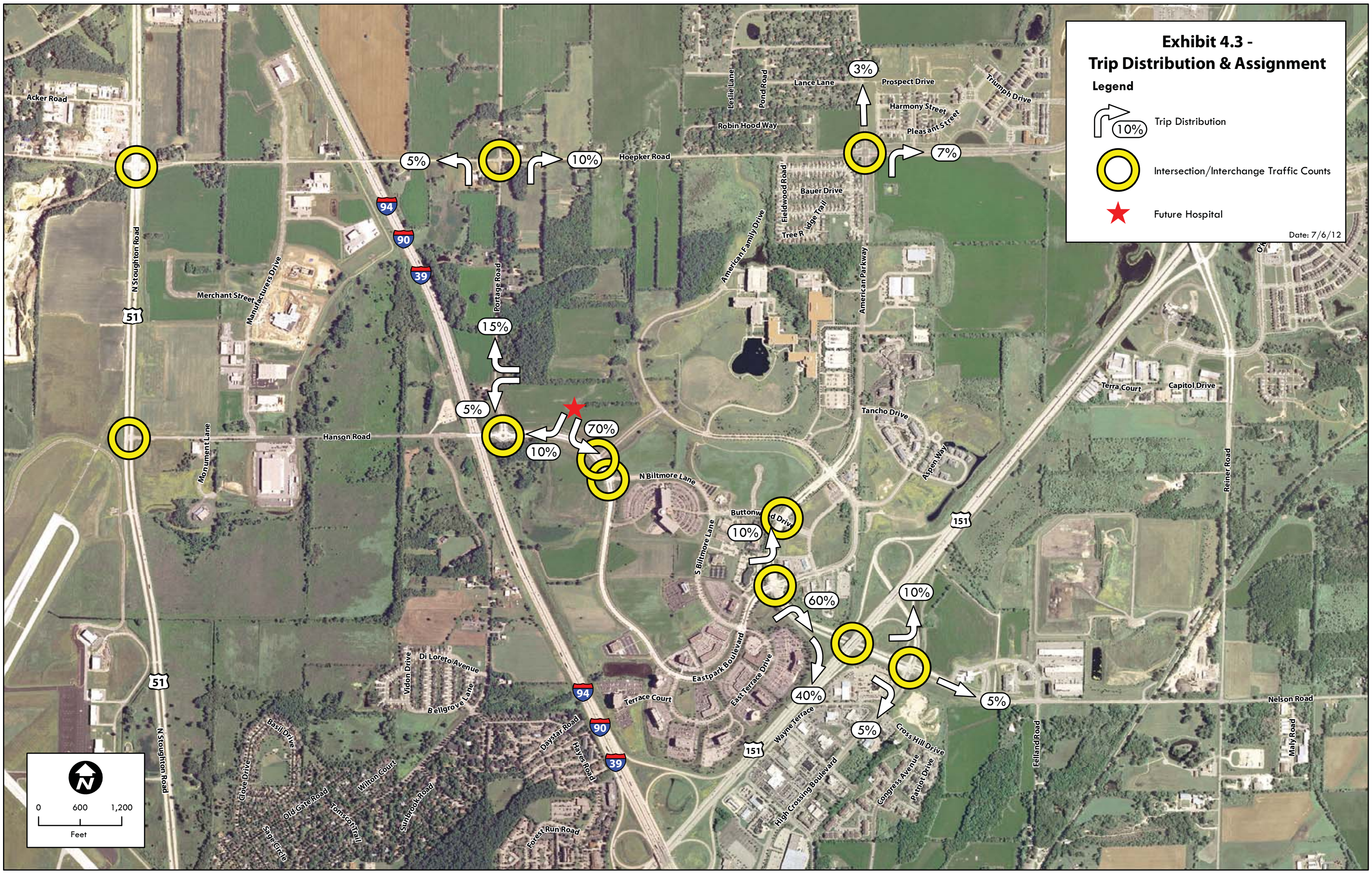


Exhibit 4.3 -
Trip Distribution & Assignment
Legend
10%
Trip Distribution
Intersection/Interchange Traffic Counts
Future Hospital
Date: 7/6/12
3%
5%
10%
7%
15%
5%
70%
10%
10%
60%
10%
40%
5%
5%
Hoepker Road
Hanson Road
Acker Road
N Stoughton Road
Merchant Street
Manufacturers Drive
Portage Road
Monument Lane
N Biltmore Lane
S Biltmore Lane
Eastpark Boulevard
East Terrace Drive
Terrace Court
American Family Drive
American Parkway
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Robin Hood Way
Leslie Lane
Pond Road
Fieldwood Road
Bauer Drive
Tancho Drive
Aspen Way
Terra Court
Capitol Drive
Reiner Road
Nelson Road
Felland Road
Maly Road
Wayne Terrace
High Crossing Boulevard
Cross Hill Drive
Congress Avenue
Patton Drive
Vidon Drive
Di Loreto Avenue
Bellgrove Lane
Daystar Road
Hayes Road
Forest Run Road
Basil Drive
Wilton Court
Old Gate Road
Tonisson Trail
Glove Drive
51
94
90
39
151
0
600
1,200
Feet

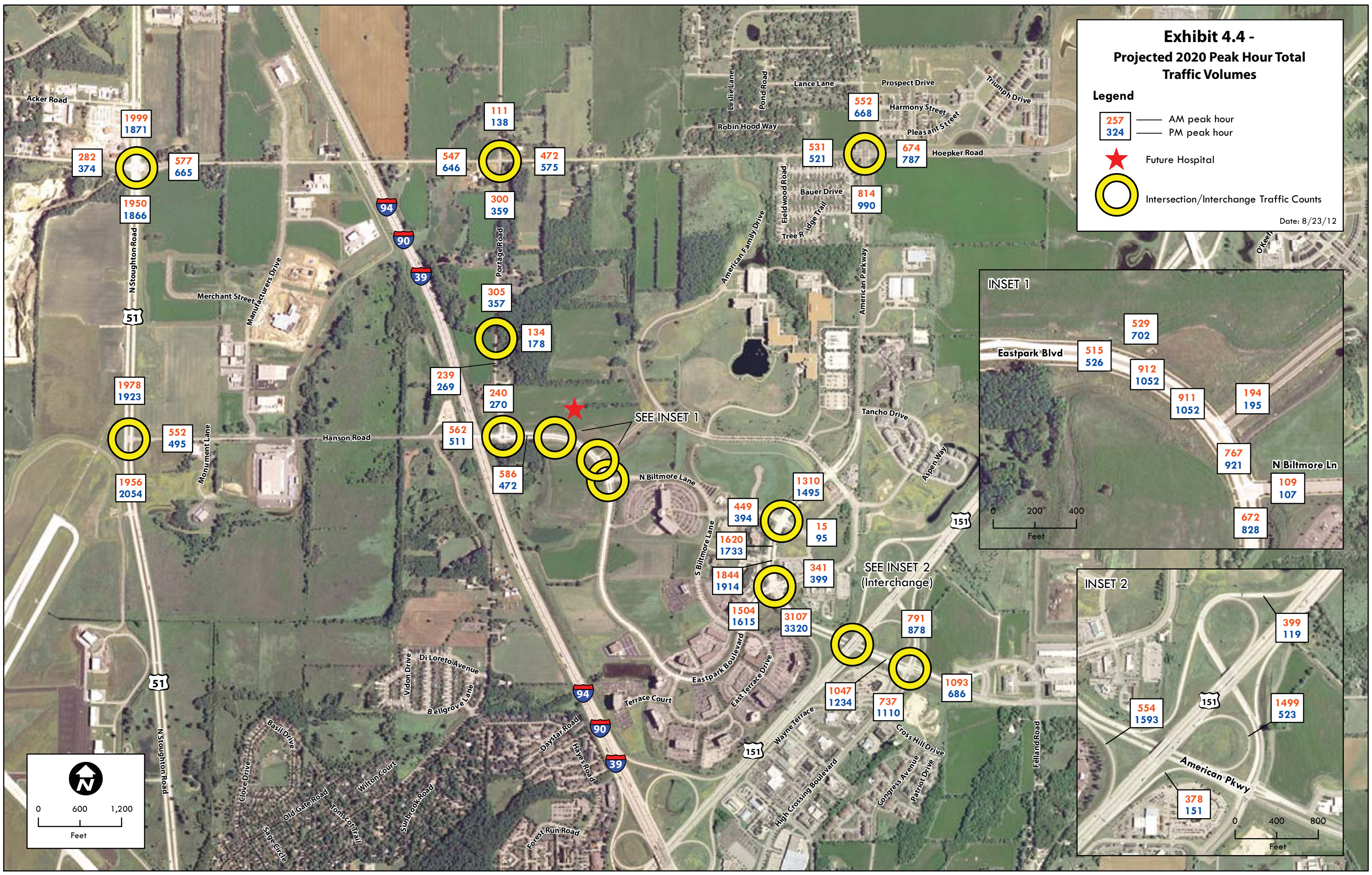


Exhibit 4.4 -
Projected 2020 Peak Hour Total Traffic Volumes
Legend
257
324
AM peak hour
PM peak hour
Future Hospital
Intersection/Interchange Traffic Counts
Date: 8/23/12
INSET 1
Eastpark Blvd
N Biltmore Ln
INSET 2
American Pkwy
SEE INSET 1
SEE INSET 2 (Interchange)
Acker Road
N Stoughton Road
Merchant Street
Manufacturers Drive
Portage Road
Hanson Road
Monument Lane
Hoepker Road
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Lance Lane
Robin Hood Way
Leslie Lane
Pond Road
Bauer Drive
Fieldwood Road
Tree Ridge Trail
American Family Drive
American Parkway
Tancho Drive
Aspen Way
N Biltmore Lane
S Biltmore Lane
Eastpark Boulevard
East Terrace Drive
Terrace Court
Wayne Terrace
High Crossing Boulevard
Cross Hill Drive
Congress Avenue
Patriot Drive
Felland Road
Di Loreto Avenue
Vidon Drive
Bellgrove Lane
Daystar Road
Hayes Road
Forest Run Road
Basil Drive
Wilton Court
Old Gate Road
Tomscott Trail
Clove Drive
Sage Circle
Studebaker Road
1999
1871
282
374
577
665
1950
1866
111
138
547
646
472
575
300
359
552
668
531
521
674
787
814
990
305
357
134
178
239
269
240
270
1978
1923
552
495
1956
2054
562
511
586
472
1310
1495
449
394
15
95
1620
1733
1844
1914
341
399
1504
1615
3107
3320
791
878
1047
1234
737
1110
1093
686
529
702
515
526
912
1052
911
1052
194
195
767
921
109
107
672
828
399
119
554
1593
1499
523
378
151
0
200
400
Feet
0
400
800
Feet
0
600
1,200
Feet

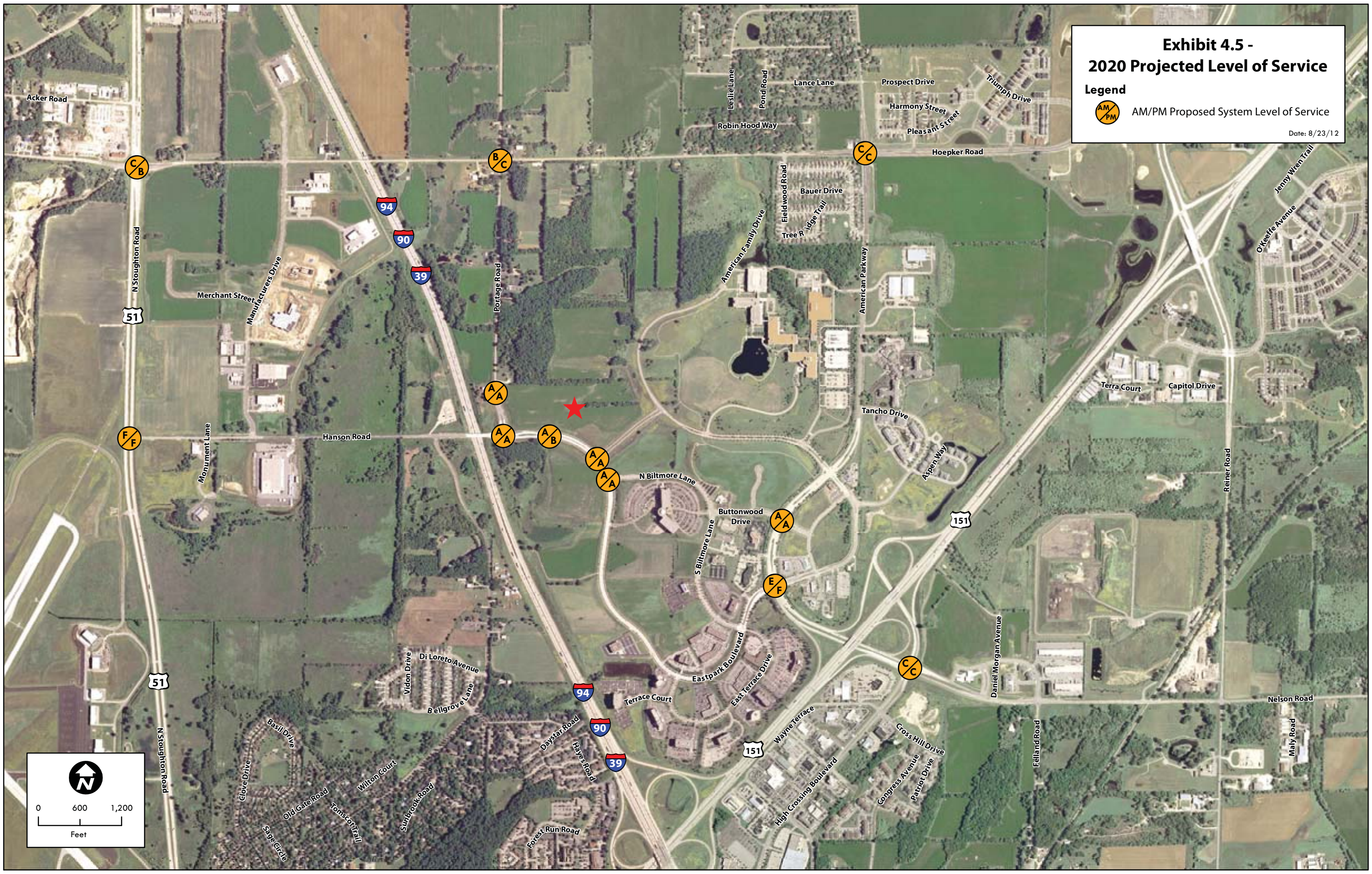


Exhibit 4.5 -
2020 Projected Level of Service
Legend
AM/PM Proposed System Level of Service
Date: 8/23/12
Hoepker Road
Hanson Road
Nelson Road
N Stoughton Road
Portage Road
American Parkway
American Family Drive
N Biltmore Lane
S Biltmore Lane
Eastpark Boulevard
Terrace Court
Buttonwood Drive
Tancho Drive
Terra Court
Capitol Drive
Reiner Road
Daniel Morgan Avenue
Acker Road
Merchant Street
Manufacturers Drive
Monument Lane
0 600 1,200
Feet

Exhibit 4.6: AM Peak LOS, 2020 Traffic with Existing Infrastructure

Weekday AM Peak Hour															
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound			
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
High Crossing/ American Pkwy	Traffic Signal	C 34.4	E 55.1 33	C 25.6 97	C 22.8 25	E 56.0 #100	C 24.0 100	C 21.1 14	D 40.6 164	C 28.0 63	C 26.2 24	D 49.1 #212	C 24.2 54	0 0	
American Pkwy/ Eastpark Blvd	Traffic Signal	E 79.6	D 42.6 63	D 37.4 9	B 11.4 80	E 58.8 #167	C 27.2 42	0 0	F 217.5 #1021	A 9.0 167	A 6.4 14	D 36.1 23	D 43.9 #133	0 0	
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 1.5	0 0	0 0	0 0	B 10.6 6	0 0	B 10.6 6	0 0	A 0.0 0	A 0.0 0	A 3.8 6	A 0.0 0	0 0	
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 1.7	0 0	0 0	0 0	C 22.6 4	0 0	A 9.6 1	0 0	A 0.0 0	A 0.0 0	A 8.8 14	A 0.0 0	0 0	
Hanson Road/ Portage Road	Round About*	A 5.8	A 6.3 25	A 6.7 25	0 0	A 4.4 0	0 0	A 3.5 0	0 0	0 0	0 0	A 4.5 0	A 4.4 0	0 0	
USH 51/ Hanson Road	Stop 2-way	F 56.7	0 0	0 0	0 0	F 555.7 517	0 0	F 555.7 517	0 0	A 0.0 0	A 0.0 0	A 9.4 21	A 0 0	0 0	
USH 51/ Hoepker Road	Traffic Signal	C 20.6	C 23.7 22	C 25.4 94	C 23.4 19	D 54.3 #166	C 24.8 71	C 23.5 28	D 43.6 40	B 13.6 96	B 11.9 12	C 32.1 128	B 16.0 #380	A 7.7 11	
Hoepker Road/ Portage Road	Stop 4-way	B 12.5	B 13.7	B 13.7	B 13.7	B 13.2	B 13.2	A 6.7	A 9.2	A 9.2	A 8.2	B 10.6	B 10.6	B 10.6	
Hoepker Road/ American Pkwy	Stop 4-way*	C 15.9	B 12.4 8	B 12.5 13	B 11.4 10	B 11.5 3	B 13.0 23	B 14.1 40	C 20.1 93	C 16.8 68	A 9.8 3	B 11.4 5	C 17.9 78	B 14.7 48	
American Pkwy/ Buttonwood Drive	Stop 2-way	A 3.0	E 41.9 7	F 52.6 1	B 10.5 5	F 75.6 6	D 26.7 4	D 26.7 4	B 11.3 48	A 0.0 0	A 0.0 0	A 9.6 25	A 0.0 0	A 0.0 0	
Main Site Access/ Eastpark Blvd	Stop 1-way	A 2.6	A 8.1 3	A 0.0 0	0 0	0 0	A 0.0 0	A 0.0 0	0 0	0 0	0 0	B 13.2 26	0 0	A 8.5 2	
West Site Access/ Portage Road	Stop 1-way	A 2.8	0 0	0 0	0 0	A 9.4 4	0 0	A 9.4 4	0 0	A 0.0 0	A 0.0 0	A 2.2 3	A 2.2 3	0 0	

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

Exhibit 4.7: PM Peak LOS, 2020 Traffic with Existing Infrastructure

Weekday AM Peak Hour														
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound		
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
High Crossing/ American Pkwy	Traffic Signal	C 30.4	D 48.6 #184	C 21.4 120	C 20.0 54	D 49.5 #94	C 22.0 36	C 21.3 12	E 55.4 #225	C 20.4 132	B 17.8 29	C 33.7 27	C 23.8 31	 0 0
American Pkwy/ Eastpark Blvd	Traffic Signal	F 195.5	D 48.8 142	D 36.9 26	F 476.0 #1302	F 234.2 #298	C 26.6 13	 0 0	E 63.0 #490	B 10.1 80	A 9.6 25	C 28.2 55	E 77.4 #503	 0 0
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 1.3	 0 0	 0 0	 0 0	B 10.7 12	 0 0	B 10.7 12	 0 0	A 0.0 0	A 0.0 0	A 1.3 2	A 0.0 0	 0 0
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 1.8	0	0	0	C 16.9	0	B 10.7	0	A 0	A 0	A 8.3	A 0.4	0
Hanson Road/ Portage Road	Round About*	A 5.2	A 4.2	A 4.3	0	A 6.3	0	A 5.0	0	0	0	A 4.2	A 4.6	0
USH 51/ Hanson Road	Stop 2-way	F 1366	 0 0	 0 0	 0 0	F N/A N/A	 0 0	F N/A N/A	 0 0	A 0 0	A 0 0	C 15.9 15	A 0.0 0	 0 0
USH 51/ Hoepker Road	Traffic Signal	B 16.7	C 22.7 7	C 26.9 #105	C 22.8 27	C 23.5 33	C 27.4 #114	C 23.1 47	C 27.2 47	B 15.1 240	A 8.8 22	C 33.5 #70	B 10.4 106	A 8.4 6
Hoepker Road/ Portage Road	Stop 4-way	C 16.6	C 21.6	C 21.6	C 21.6	C 15.5	C 15.5	A 7.7	C 15.2	C 15.2	A 9.4	B 11.2	B 11.2	B 11.2
Hoepker Road/ American Pkwy	Stop 4-way*	C 18.1	B 12.5 18	D 29.6 230	C 16.9 85	B 13.1 15	C 15.4 40	B 13.3 23	B 14.3 23	B 14.8 33	B 11.4 10	B 12.7 8	B 13.7 20	B 12.6 15
American Pkwy/ Buttonwood Drive	Stop 2-way	A 4.3	F 57.4 34	F 52.5 8	C 16.6 69	F 74.6 4	B 11.4 2	B 11.4 2	B 10.6 7	A 0.0 0	A 0.0 0	A 8.7 1	A 0.0 0	A 0.0 0
Main Site Access/ Eastpark Blvd	Stop 1-way	B 11.5	A 8.9 3	A 0.0 0	 0 0	 0 0	A 0.0 0	A 0.0 0	 0 0	 0 0	 0 0	D 33.4 172	 0 0	A 9.7 5
West Site Access/ Portage Road	Stop 1-way	A 3.7	 0 0	 0 0	 0 0	B 10.4 12	 0 0	B 10.4 12	 0 0	A 0.0 0	A 0.0 0	A 4.7 3	A 4.7 3	 0 0

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

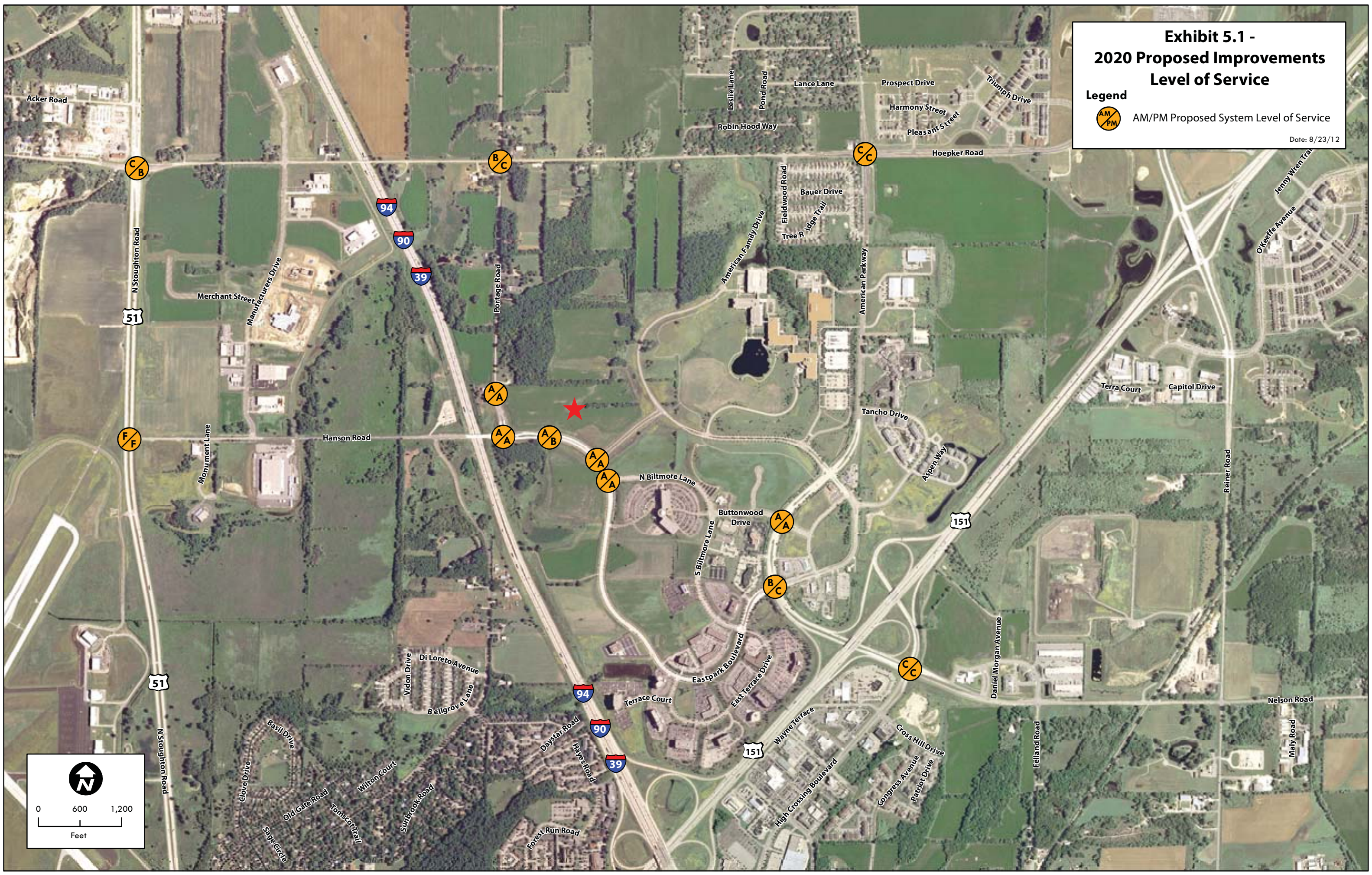


Exhibit 5.1 -
2020 Proposed Improvements
Level of Service
Legend
AM/PM Proposed System Level of Service
Date: 8/23/12
Acker Road
Hoepker Road
Hanson Road
N Stoughton Road
Portage Road
Merchant Street
Manufacturers Drive
Monument Lane
Leslie Lane
Pond Road
Lance Lane
Prospect Drive
Harmony Street
Pleasant Street
Triumph Drive
Robin Hood Way
Bauer Drive
Fieldwood Road
American Family Drive
American Parkway
O'Keeffe Avenue
Terra Court
Capitol Drive
Tancho Drive
Aspen Way
N Biltmore Lane
Buttonwood Drive
S Biltmore Lane
Reiner Road
Daniel Morgan Avenue
Eastpark Boulevard
East Terrace Drive
Terrace Court
Nelson Road
Di Loreto Avenue
Vidon Drive
Bellgrove Lane
Daystar Road
Hayes Road
Wayne Terrace
High Crossing Boulevard
Cross Hill Drive
Congress Avenue
Patriot Drive
Felland Road
Maly Road
Basil Drive
Clove Drive
Old Gate Road
Wilton Court
Forest Run Road
94
90
39
51
151
0
600
1,200
Feet

Exhibit 5.2: AM Peak LOS, 2020 Traffic with Intersection Improvements

Weekday AM Peak Hour														
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound		
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
High Crossing/ American Pkwy	Traffic Signal	C 34.4	E 55.1 33	C 25.6 97	C 22.8 25	E 56.0 #100	C 24.0 100	C 21.1 14	D 40.6 164	C 28.0 63	C 26.2 24	D 49.1 #212	C 24.2 54	0 0
American Pkwy/ Eastpark Blvd	Traffic Signal	B 15.6	C 28.8 50	C 25.9 15	C 25.9 15	B 19.9 70	B 18.2 31	B 18.2 31	B 19.1 208	A 9.9 174	A 6.8 16	C 22.0 19	C 23.7 90	C 23.7 90
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 1.5	0 0	0 0	0 0	B 10.6 6	0 0	B 10.6 6	0 0	A 0.0 0	A 0.0 0	A 3.8 6	A 0.0 0	0 0
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 1.7	0 0	0 0	0 0	C 22.6 4	0 0	A 9.6 1	0 0	A 0.0 0	A 0.0 0	A 8.8 14	A 0.0 0	0 0
Hanson Road/ Portage Road	Round About*	A 5.8	A 6.3 25	A 6.7 25	0 0	A 4.4 0	0 0	A 3.5 0	0 0	0 0	0 0	A 4.5 0	A 4.4 0	0 0
USH 51/ Hanson Road	Stop 2-way	F 56.7	0 0	0 0	0 0	F 555.7 517	0 0	F 555.7 517	0 0	A 0.0 0	A 0.0 0	A 9.4 21	A 0 0	0 0
USH 51/ Hoepker Road	Traffic Signal	C 20.6	C 23.7 22	C 25.4 94	C 23.4 19	D 54.3 #166	C 24.8 71	C 23.5 28	D 43.6 40	B 13.6 96	B 11.9 12	C 32.1 128	B 16.0 #380	A 7.7 11
Hoepker Road/ Portage Road	Stop 4-way	B 12.5	B 13.7	B 13.7	B 13.7	B 13.2	B 13.2	A 6.7	A 9.2	A 9.2	A 8.2	B 10.6	B 10.6	B 10.6
Hoepker Road/ American Pkwy	Stop 4-way*	C 15.9	B 12.4 8	B 12.5 13	B 11.4 10	B 11.5 3	B 13.0 23	B 14.1 40	C 20.1 93	C 16.8 68	A 9.8 3	B 11.4 5	C 17.9 78	B 14.7 48
American Pkwy/ Buttonwood Drive	Traffic Signal	A 9.2	B 16.4 8	B 16.2 0	B 16.2 0	B 16.2 3	B 16.2 3	B 16.2 3	C 21.3 #251	A 6.0 63	A 6.0 63	A 4.9 4	A 5.6 36	A 5.6 36
Main Site Access/ Eastpark Blvd	Stop 1-way	A 2.6	A 8.1 3	A 0.0 0	0 0	0 0	A 0.0 0	A 0.0 0	0 0	0 0	0 0	B 13.2 26	0 0	A 8.5 2
West Site Access/ Portage Road	Stop 1-way	A 2.8	0 0	0 0	0 0	A 9.4 4	0 0	A 9.4 4	0 0	A 0.0 0	A 0.0 0	A 2.2 3	A 2.2 3	0 0

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

Exhibit 5.3: PM Peak LOS, 2020 Traffic with Intersection Improvements

Weekday AM Peak Hour														
Location	Traffic Control	Int.	Eastbound			Westbound			Northbound			Southbound		
		LOS	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
High Crossing/ American Pkwy	Traffic Signal	C 30.4	D 48.6 #184	C 21.4 120	C 20.0 54	D 49.5 #94	C 22.0 36	C 21.3 12	E 55.4 #225	C 20.4 132	B 17.8 29	C 33.7 27	C 23.8 31	 0 0
American Pkwy/ Eastpark Blvd	Traffic Signal	C 26.5	C 29.8 104	C 28.7 72	C 28.7 72	C 23.0 97	B 16.4 13	B 16.4 13	C 25.8 #134	B 12.2 83	B 11.4 29	B 18.5 44	C 32.3 #370	C 32.3 #370
Eastpark Blvd/ N. Biltmore Lane	Stop 1-way	A 1.3	 0 0	 0 0	 0 0	B 10.7 12	 0 0	B 10.7 12	 0 0	A 0.0 0	A 0.0 0	A 1.3 2	A 0.0 0	 0 0
Eastpark Blvd/ American Family Dr Link	Stop 1-way*	A 1.8	 0	 0	 0	C 16.9	 0	B 10.7	 0	A 0	A 0	A 8.3	A 0.4	 0
Hanson Road/ Portage Road	Round About*	A 5.2	A 4.2	A 4.3	 0	A 6.3	 0	A 5.0	 0	 0	 0	A 4.2	A 4.6	 0
USH 51/ Hanson Road	Stop 2-way	F 1366	 0 0	 0 0	 0 0	F N/A N/A	 0 0	F N/A N/A	 0 0	A 0 0	A 0 0	C 15.9 15	A 0.0 0	 0 0
USH 51/ Hoepker Road	Traffic Signal	B 16.7	C 22.7 7	C 26.9 #105	C 22.8 27	C 23.5 33	C 27.4 #114	C 23.1 47	C 27.2 47	B 15.1 240	A 8.8 22	C 33.5 #70	B 10.4 106	A 8.4 6
Hoepker Road/ Portage Road	Stop 4-way	C 16.6	C 21.6	C 21.6	C 21.6	C 15.5	C 15.5	A 7.7	C 15.2	C 15.2	A 9.4	B 11.2	B 11.2	B 11.2
Hoepker Road/ American Pkwy	Stop 4-way*	C 18.1	B 12.5 18	D 29.6 230	C 16.9 85	B 13.1 15	C 15.4 40	B 13.3 23	B 14.3 23	B 14.8 33	B 11.4 10	B 12.7 8	B 13.7 20	B 12.6 15
American Pkwy/ Buttonwood Drive	Traffic Signal	A 8.0	A 9.9 20	B 10.8 42	B 10.8 42	A 9.4 0	A 9.4 0	A 9.4 0	A 9.0 26	A 6.7 42	A 6.7 42	A 6.1 9	A 7.6 75	A 7.6 75
Main Site Access/ Eastpark Blvd	Stop 1-way	B 11.5	A 8.9 3	A 0.0 0	 0 0	 0 0	A 0.0 0	A 0.0 0	 0 0	 0 0	 0 0	D 33.4 172	 0 0	A 9.7 5
West Site Access/ Portage Road	Stop 1-way	A 3.7	 0 0	 0 0	 0 0	B 10.4 12	 0 0	B 10.4 12	 0 0	A 0.0 0	A 0.0 0	A 4.7 3	A 4.7 3	 0 0

* - Level of Service calculated using HCM 2010 methods.

- 95th percentile volume exceeds capacity; queue may be longer.

Key (except roundabout):

Intersection	Lane
Intersection LOS Average Delay (seconds)	Lane LOS Control delay (seconds) Queue length 95th Percentile (feet)

Boxes that are shaded are approaches that are modeled at LOS E or below.

Exhibit 5.4: Proposed Geometric Improvements to the American Pkwy/Eastpark Blvd Intersection

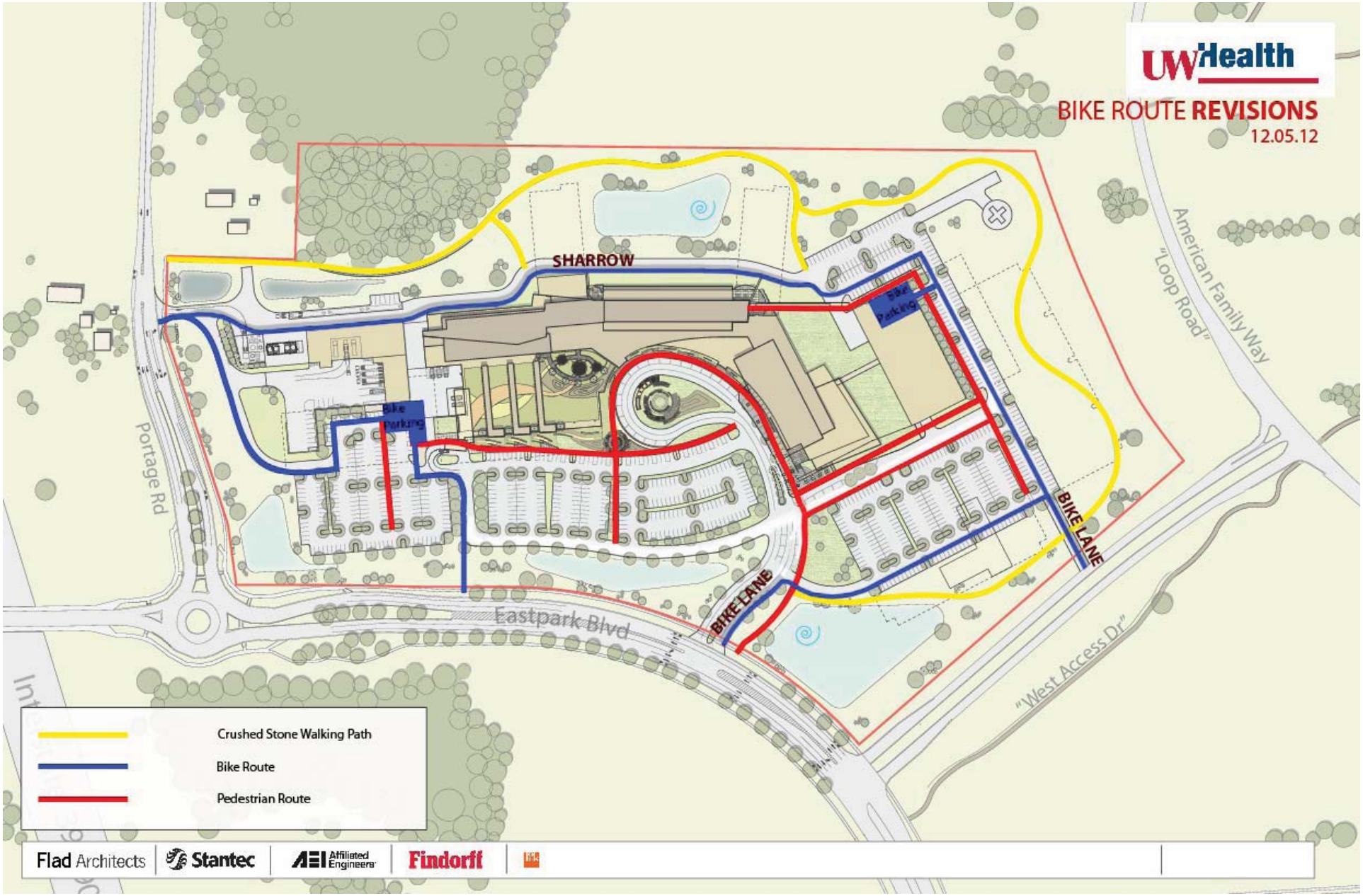
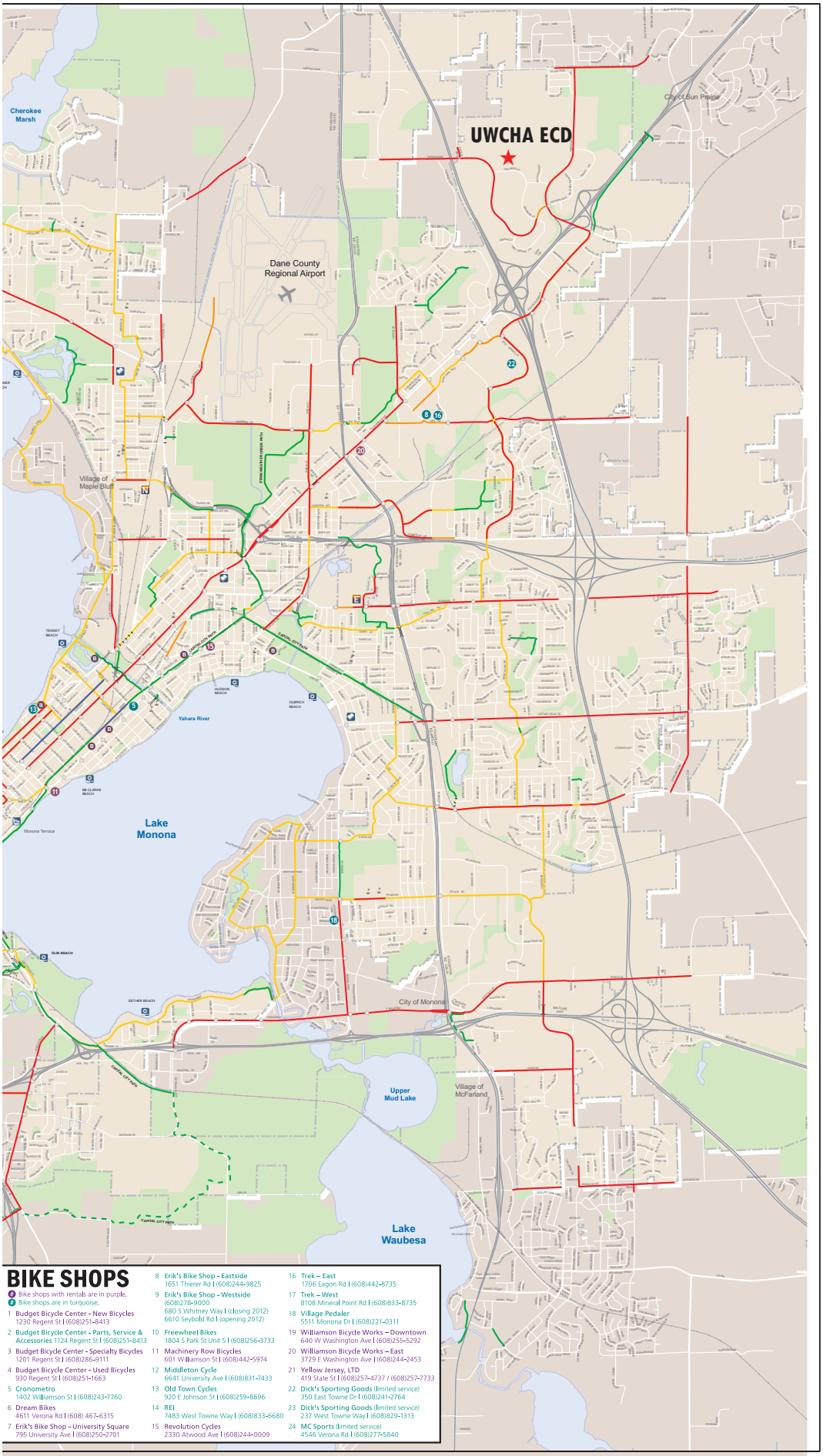


EXHIBIT 6.1: PROPOSED BIKE AND PEDESTRIAN ROUTE

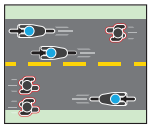


CITY OF MADISON BIKE MAP

Explanation of Bicycling Network & Features

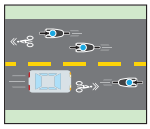
PLEASE NOTE

Select your route to match your skill and comfort level.
Obey all traffic signs, signals and laws.
Ride courteously and safely.



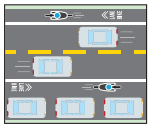
OFF STREET PAVED PATH

Off street paved paths are shared use routes for cyclists, pedestrians and other non-motorized traffic. Ride responsibly and share the path. Slow down when approaching other traffic and give an audible warning before passing. When not passing, keep to the right.



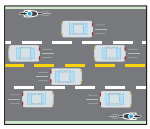
BICYCLE BOULEVARD

Bicycle boulevards are low speed, low (motor vehicle) traffic volume, local streets that are designated for use primarily by bicyclists. Motor vehicles are welcome on bicycle boulevards. Special blue street signs and shared lane (sharrow) pavement markings signify that motor vehicles must be attentive to the large numbers of cyclists and lower their speeds.



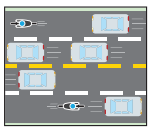
BIKE LANE OR PAVED SHOULDER

A bicycle lane is a separate lane on the street for bicyclists. This lane is sometimes shared with parked cars, buses or right turning vehicles.



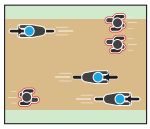
WIDE CURB LANE

A wide curb lane is the traffic lane next to the curb (the right most lane) which is extra wide so a motorist can safely pass a bicyclist without having to change lanes. There is no line painted on the street separating motorists from the bicyclists.



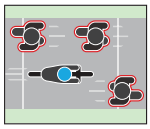
ON STREET ROUTE

On street routes are sections of bike routes, on streets, which have "bike route"signs, but do not have other bicycle facilities. These "on street routes" are often used by bicyclists, who are comfortable sharing the road with motor vehicles, to access areas not yet served by other bicycle facilities.



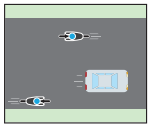
OFF STREET UNPAVED PATH

An off street, unpaved path is similar in use to the mixed-use, paved path described above, but may have rugged terrain more suitable for mountain bikes.



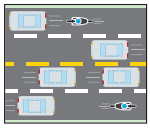
BICYCLE ROUTE ON SIDEWALK

Due to difficult roadway conditions in a few areas, bike routes on sidewalks help insure route continuity. Bicycling is allowed on sidewalks, EXCEPT where buildings are not set back from the sidewalk (such as commercial districts). Always yield to pedestrians.



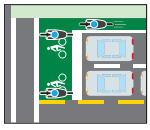
LOCAL STREET

Local or collector streets, without bicycle facilities, have relatively low traffic volumes and lower speeds.



THROUGH STREET (HIGHER TRAFFIC VOLUMES)

Arterial streets, without bicycle facilities, have higher volumes and speeds. These street are not recommended for inexperienced cyclists.



BIKE BOXES

Bike boxes are rectangles, painted on the pavement at intersections, which move car traffic back several feet from the crossing and allow space for bicyclists to position themselves in front of waiting traffic. Bike boxes are intended to reduce bicycle and car collisions, especially those between drivers turning right and bicyclists going straight by providing greater visibility.

BIKE SHOPS

Bike shops with rentals are in purple.
Bike shops are in turquoise.

1 Budget Bicycle Center - New Bicycles
1230 Regent St | (608)251-8413

2 Budget Bicycle Center - Parts, Service & Accessories 1124 Regent St | (608)251-8413

3 Budget Bicycle Center - Specialty Bicycles
1201 Regent St | (608)286-9111

4 Budget Bicycle Center - Used Bicycles
930 Regent St | (608)251-1663

5 Cronometro
1402 Williamson St | (608)243-7760

6 Dream Bikes
4611 Verona Rd | (608) 467-6315

7 Erik's Bike Shop - University Square
795 University Ave | (608)250-2701

8 Erik's Bike Shop - Eastside
1651 Thierer Rd | (608)244-9825

9 Erik's Bike Shop - Westside
(608)278-9000
680 S Whitney Way | (closing 2012)
6610 Seybold Rd | (opening 2012)

10 Freewheel Bikes
1804 S Park St Unit 5 | (608)256-3733

11 Machinery Row Bicycles
601 Williamson St | (608)442-5974

12 Middleton Cycle
6641 University Ave | (608)831-7433

13 Old Town Cycles
920 E Johnson St | (608)259-8696

14 REI
7483 West Towne Way | (608)833-6680

15 Revolution Cycles
2330 Atwood Ave | (608)244-0009

16 Trek – East
1706 Eagon Rd | (608)442-8735

17 Trek – West
8108 Mineral Point Rd | (608)833-8735

18 Village Pedaler
5511 Monona Dr | (608)221-0311

19 Williamson Bicycle Works – Downtown
640 W Washington Ave | (608)255-5292

20 Williamson Bicycle Works – East
3729 E Washington Ave | (608)244-2453

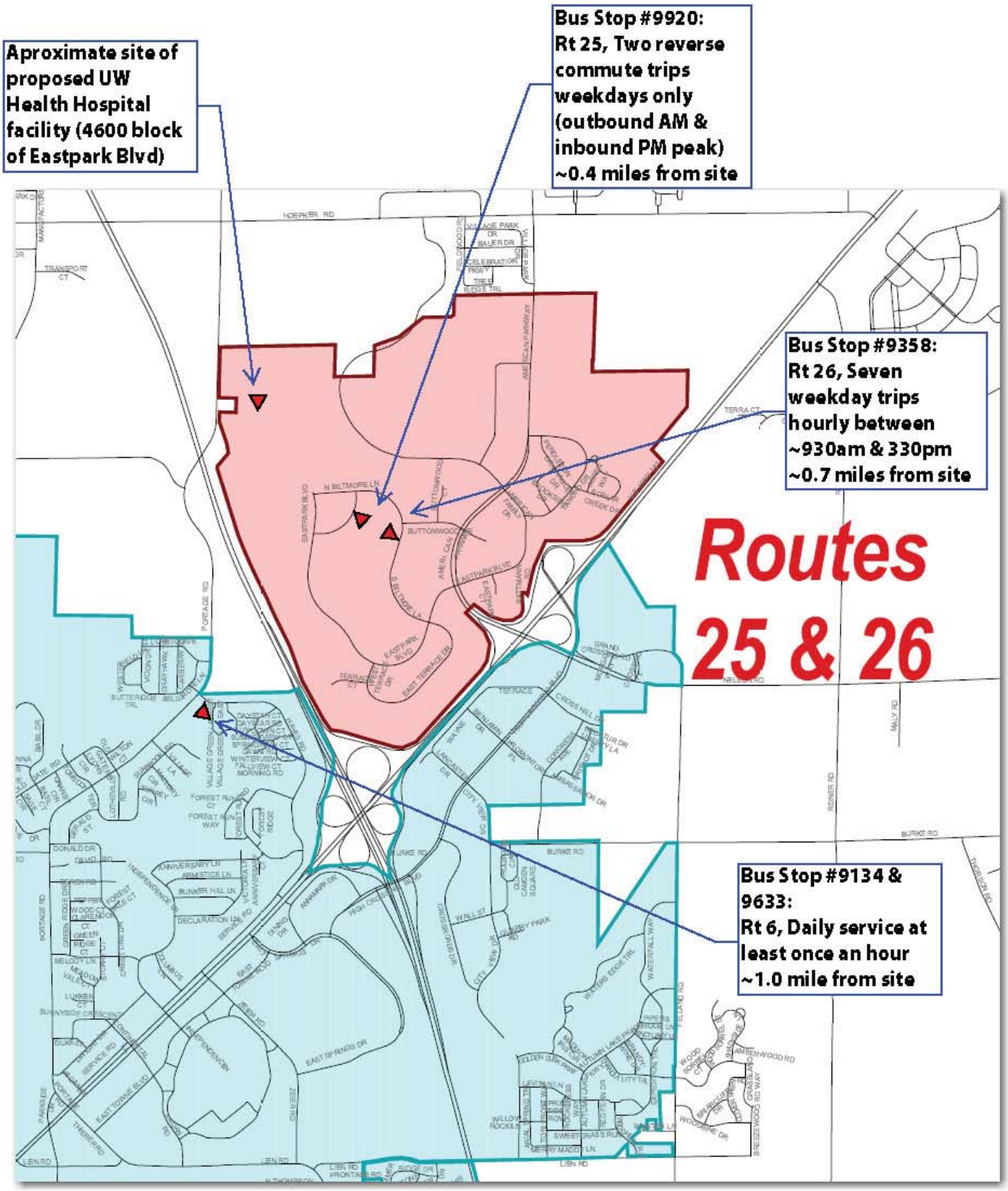
21 Yellow Jersey, LTD
419 State St | (608)257-4737 / (608)257-7733

22 Dick's Sporting Goods (limited service)
350 East Towne Dr | (608)241-2764

23 Dick's Sporting Goods (limited service)
237 West Towne Way | (608)829-1313

24 MC Sports (limited service)
4546 Verona Rd | (608)277-5840

EXIBIT 6.2: Madison Bike Network (Excerpt)



Paratransit service area in red (American Center area) time-restricted between 730am and 530pm on weekdays only, based on weekday-only service hours of Routes 25 and 26.

EXHIBIT 6.3: EXISTING MADISON METRO TRANSIT MAP

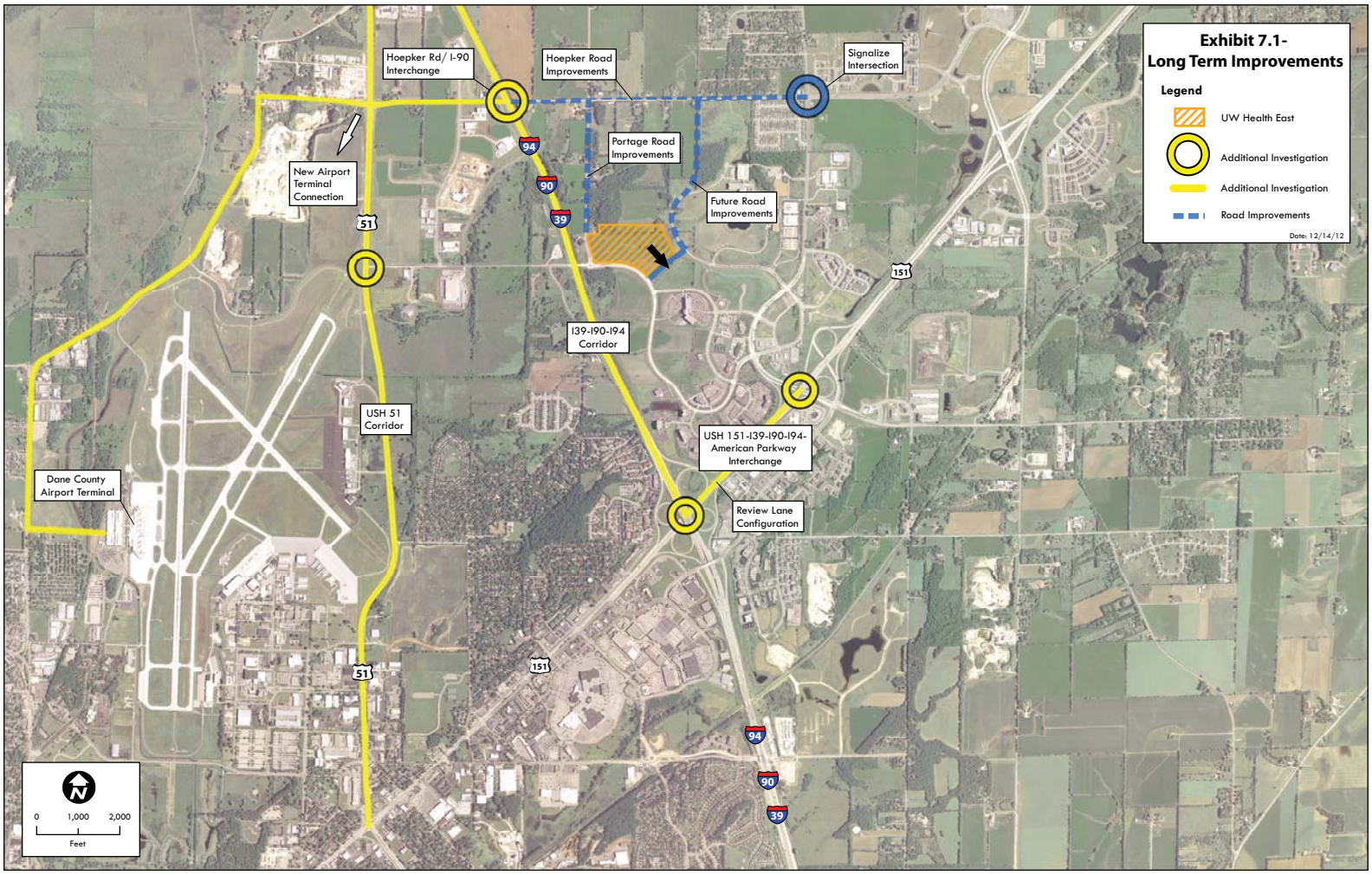


Exhibit 7.1-
Long Term Improvements
Legend
UW Health East
Additional Investigation
Additional Investigation
Road Improvements
Date: 12/14/12
Hoepker Rd/ I-90 Interchange
Hoepker Road Improvements
Signalize Intersection
Portage Road Improvements
Future Road Improvements
New Airport Terminal Connection
I39-I90-I94 Corridor
USH 51 Corridor
USH 151-I39-I90-I94-American Parkway Interchange
Review Lane Configuration
Dane County Airport Terminal
94
90
39
51
151
0
1,000
2,000
Feet

Appendices

Appendix A

Level of Service Definitions

LEVEL OF SERVICE CONDITIONS FOR SIGNALIZED INTERSECTIONS

Level of Service	Definition	Delay per Vehicles (seconds)
A	Very short delay, with extremely favorable progression. Most vehicles arrive during the green phase and do not stop at all.	≤10.0
B	Good progression, with more vehicles stopping than for Level of Service A, causing higher levels of average delay.	>10 and ≤20.0
C	Light congestion, with individual cycle failures beginning to appear. Number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.	>20.0 and ≤35.0
D	Congestion is more noticeable, with longer delays resulting from a combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop and the proportion of vehicles not stopping declines.	>35.0 and ≤55.0
E	Limit of acceptable delay, high delays result from poor progression, high cycle lengths, and high v/c ratios.	>55.0 and ≤80.0
F	Unacceptable delay occurring, with oversaturation.	>80.0
Source: *Highway Capacity Manual,* 2000.		

LEVEL OF SERVICE CONDITIONS FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Definition	Delay per Vehicles (seconds)
A	Represents a free-flow operation. All drivers find freedom of operation. Very rarely more than one vehicle in queue.	≤10.0
B	Represents reasonably free-flow operation. Some drivers begin to consider the delay troublesome. Seldom there is more than one vehicle in queue.	>10 and ≤15.0
C	Represents a traffic flow with speeds near or at free-flow speed. Ability to maneuver within the traffic stream is noticeably restricted. Most drivers feel restricted, but tolerably so. Often there is more than one vehicle in queue.	>15.0 and ≤25.0
D	Represents speeds that begin to decline with increased density. Ability to maneuver within the traffic stream is noticeably limited. Drivers feel restricted. Most often, there is more than one vehicle in queue.	>25.0 and ≤35.0
E	Represents operation at its capacity. Drivers find delays approaching intolerable levels. There is frequently more than one vehicle in queue. This level denotes a state in which the demand is close or equal to the probable maximum number of vehicles that can be accommodated by the movement.	>35.0 and ≤50.0
F	Represents a breakdown of vehicle flow. Very constrained flow. Represents an intersection failure situation that is caused by geometric and/or operational constraints external to the intersection.	>50.0

Source: *Highway Capacity Manual,* 2000.

Appendix B

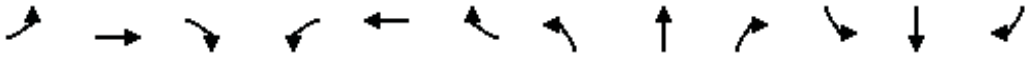
2011 Existing Traffic

Intersection Analysis Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	100	22	134	71	40	28	328	14	135	1247	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.70	1.00	1.00	0.68	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1310	1863	1794	1269	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.85	0.85	0.85	0.86	0.86	0.86	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	16	118	26	156	83	47	31	364	16	145	1341	24
RTOR Reduction (vph)	0	0	22	0	0	40	0	0	9	0	0	12
Lane Group Flow (vph)	16	118	4	156	83	7	31	364	7	145	1341	12
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	8.8	8.8	8.8	8.8	8.8	8.8	2.0	25.5	25.5	6.9	30.4	30.4
Effective Green, g (s)	8.8	8.8	8.8	8.8	8.8	8.8	2.0	25.5	25.5	6.9	30.4	30.4
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.03	0.42	0.42	0.11	0.50	0.50
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	191	272	262	186	272	255	59	1499	671	203	1787	799
v/s Ratio Prot		0.06			0.04		0.02	0.10		c0.08	c0.38	
v/s Ratio Perm	0.01		0.00	c0.12		0.00			0.00			0.01
v/c Ratio	0.08	0.43	0.01	0.84	0.31	0.03	0.53	0.24	0.01	0.71	0.75	0.02
Uniform Delay, d1	22.2	23.4	22.0	25.0	23.0	22.0	28.6	11.1	10.0	25.7	11.9	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4	0.0	25.8	0.2	0.0	3.8	0.2	0.0	9.5	2.4	0.0
Delay (s)	22.3	23.8	22.0	50.8	23.2	22.0	32.5	11.4	10.1	35.2	14.3	7.5
Level of Service	C	C	C	D	C	C	C	B	B	D	B	A
Approach Delay (s)		23.4			38.1			12.9			16.2	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	60.2	Sum of lost time (s)	19.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	131	92	19	193	5	5	10	17	3	37	42
Peak Hour Factor	0.81	0.81	0.81	0.86	0.86	0.86	0.73	0.73	0.73	0.85	0.85	0.85
Hourly flow rate (vph)	5	162	114	22	224	6	7	14	23	4	44	49

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	280	247	6	21	23	96
Volume Left (vph)	5	22	0	7	0	4
Volume Right (vph)	114	0	6	0	23	49
Hadj (s)	-0.21	0.08	-0.67	0.20	-0.67	-0.27
Departure Headway (s)	5.0	5.3	4.5	6.2	5.3	5.7
Degree Utilization, x	0.39	0.36	0.01	0.04	0.03	0.15
Capacity (veh/h)	687	661	764	523	600	578
Control Delay (s)	11.2	10.0	6.3	8.2	7.3	9.7
Approach Delay (s)	11.2	9.9		7.7		9.7
Approach LOS	B	A		A		A

Intersection Summary				
Delay	10.3			
HCM Level of Service	B			
Intersection Capacity Utilization	34.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	13.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	10	62	77	191	121	20	25	40	26	28	318	66
Peak Hour Factor	0.68	0.68	0.68	0.87	0.87	0.87	0.76	0.76	0.76	0.91	0.91	0.91
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	15	91	113	220	139	23	33	53	34	31	349	73
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	11.6	14.2	10.9	13.6
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	21%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	79%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	25	40	26	10	41	98	191	121	20	28	212
Left Turning Volume	0	40	0	0	41	21	0	121	0	0	212
Through Volume	0	0	26	0	0	77	0	0	20	0	0
Right Turning Volume	25	0	0	10	0	0	191	0	0	28	0
Lane Flow Rate	33	53	34	15	61	144	220	139	23	31	233
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.074	0.111	0.066	0.032	0.122	0.267	0.448	0.265	0.039	0.062	0.438
Departure Headway, Hd	8.094	7.594	6.894	7.843	7.343	6.792	7.347	6.847	6.147	7.269	6.769
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	445	475	523	459	491	533	487	522	577	490	529
Service Time	5.794	5.294	4.594	5.543	5.043	4.492	5.139	4.639	3.939	5.059	4.559
HCM Lane V/C Ratio	0.074	0.112	0.065	0.033	0.124	0.27	0.452	0.266	0.04	0.063	0.44
HCM Control Delay	11.4	11.2	10.1	10.8	11.1	11.9	16	12.1	9.2	10.5	14.8
HCM Lane LOS	B	B	B	B	B	B	C	B	A	B	B
HCM 95th Percentile Queue	0.2	0.4	0.2	0.1	0.4	1.1	2.4	1.1	0.1	0.2	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	1	24	1	2	3	323	694	2	5	368	54
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.63	0.63	0.63	0.50	0.50	0.50	0.94	0.94	0.94	0.81	0.81	0.81
Hourly flow rate (vph)	8	2	38	2	4	6	344	738	2	6	454	67
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								1			1	
Upstream signal (ft)								991				
pX, platoon unblocked												
vC, conflicting volume	1441	1928	185	1629	1960	247	521			740		
vC1, stage 1 conf vol	500	500		1427	1427							
vC2, stage 2 conf vol	941	1428		203	533							
vCu, unblocked vol	1441	1928	185	1629	1960	247	521			740		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	98	95	98	95	99	67			99		
cM capacity (veh/h)	141	105	826	82	88	753	1041			862		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	8	1	39	4	8	344	295	295	150	6	182	182
Volume Left	8	0	0	2	0	344	0	0	0	6	0	0
Volume Right	0	0	38	0	6	0	0	0	2	0	0	0
cSH	141	105	755	85	260	1041	1700	1700	1700	862	1700	1700
Volume to Capacity	0.06	0.01	0.05	0.05	0.03	0.33	0.17	0.17	0.09	0.01	0.11	0.11
Queue Length 95th (ft)	4	1	4	4	2	36	0	0	0	1	0	0
Control Delay (s)	32.0	39.6	10.0	49.7	19.3	10.1	0.0	0.0	0.0	9.2	0.0	0.0
Lane LOS	D	E	B	E	C	B				A		
Approach Delay (s)	14.3			29.4		3.2				0.1		
Approach LOS	B			D								

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	40.4%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	7	91	94	75	16	676	1177	107	10	317	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3539	1583	1770	3447		2006	5085	1794	2006	4943	
Flt Permitted	0.70	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.37	1.00	
Satd. Flow (perm)	1481	3539	1583	1770	3447		2006	5085	1794	775	4943	
Peak-hour factor, PHF	0.80	0.80	0.80	0.93	0.93	0.93	0.79	0.79	0.79	0.94	0.94	0.94
Adj. Flow (vph)	29	9	114	101	81	17	856	1490	135	11	337	77
RTOR Reduction (vph)	0	0	40	0	13	0	0	0	50	0	41	0
Lane Group Flow (vph)	29	9	74	101	85	0	856	1490	85	11	373	0
Turn Type	Perm	NA	pm+ov	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases		4	1	3	8		1	6			2	
Permitted Phases	4		4						6	2		
Actuated Green, G (s)	5.7	5.7	44.2	9.2	20.4		38.5	55.4	55.4	10.9	10.9	
Effective Green, g (s)	5.7	5.7	44.2	9.2	20.4		38.5	55.4	55.4	10.9	10.9	
Actuated g/C Ratio	0.06	0.06	0.50	0.10	0.23		0.44	0.63	0.63	0.12	0.12	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0	2.5	2.5	4.0		2.5	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	96	230	905	185	801		880	3209	1132	96	614	
v/s Ratio Prot		0.00	0.04	c0.06	0.02		c0.43	0.29			c0.08	
v/s Ratio Perm	c0.02		0.01						0.05	0.01		
v/c Ratio	0.30	0.04	0.08	0.55	0.11		0.97	0.46	0.08	0.11	0.61	
Uniform Delay, d1	39.2	38.5	11.3	37.3	26.5		24.1	8.5	6.3	34.2	36.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.4	0.1	0.0	2.6	0.1		23.7	0.1	0.0	0.7	2.0	
Delay (s)	41.6	38.6	11.3	39.9	26.6		47.8	8.6	6.3	34.9	38.4	
Level of Service	D	D	B	D	C		D	A	A	C	D	
Approach Delay (s)		18.7			33.4			22.0			38.3	
Approach LOS		B			C			C			D	

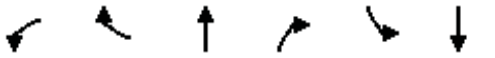
Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	87.8	Sum of lost time (s)	23.5
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	264	58	85	281	60	206	124	54	229	112	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3379	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3379	
Peak-hour factor, PHF	0.78	0.78	0.78	0.82	0.82	0.82	0.75	0.75	0.75	0.71	0.71	0.71
Adj. Flow (vph)	131	338	74	104	343	73	275	165	72	323	158	14
RTOR Reduction (vph)	0	0	61	0	0	57	0	0	65	0	10	0
Lane Group Flow (vph)	131	338	13	104	343	16	275	165	7	323	162	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	2.9	10.0	10.0	5.7	12.8	12.8	12.6	5.8	5.8	12.9	6.1	
Effective Green, g (s)	2.9	10.0	10.0	5.7	12.8	12.8	12.6	5.8	5.8	12.9	6.1	
Actuated g/C Ratio	0.05	0.17	0.17	0.10	0.22	0.22	0.21	0.10	0.10	0.22	0.10	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	169	601	305	171	769	606	417	348	156	375	350	
v/s Ratio Prot	0.04	c0.10		c0.06	c0.10	0.01	0.14	0.05		c0.19	c0.05	
v/s Ratio Perm			0.01						0.00			
v/c Ratio	0.78	0.56	0.04	0.61	0.45	0.03	0.66	0.47	0.05	0.86	0.46	
Uniform Delay, d1	27.7	22.4	20.4	25.5	20.0	18.1	21.2	25.1	24.0	22.1	24.9	
Progression Factor	0.99	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.1	1.2	0.1	4.2	0.4	0.0	2.9	0.4	0.0	17.4	0.4	
Delay (s)	45.5	23.6	19.8	29.7	20.4	18.2	24.1	25.5	24.1	39.6	25.2	
Level of Service	D	C	B	C	C	B	C	C	C	D	C	
Approach Delay (s)		28.3			21.9			24.5			34.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	58.9	Sum of lost time (s)	25.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	27	4	69	156
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.61	0.61	0.86	0.86	0.85	0.85
Hourly flow rate (vph)	5	39	31	5	81	184
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	288	18			36	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	288	18			36	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	96			95	
cM capacity (veh/h)	644	1056			1573	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	21	15	142	122
Volume Left	5	0	0	81	0
Volume Right	39	0	5	0	0
cSH	986	1700	1700	1573	1700
Volume to Capacity	0.04	0.01	0.01	0.05	0.07
Queue Length 95th (ft)	4	0	0	4	0
Control Delay (s)	8.8	0.0	0.0	4.4	0.0
Lane LOS	A			A	
Approach Delay (s)	8.8	0.0		2.4	
Approach LOS	A				

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh):	3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	151	220	34	17	5	3
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.75	0.75	0.50	0.50
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	172	250	45	23	10	6
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	68	0	0	0	513	23
Stage 1	0	0	0	0	45	0
Stage 2	0	0	0	0	468	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1529	-	-	-	491	1059
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	597	-
Mov Capacity-1 Maneuver	1529	-	-	-	436	1059
Mov Capacity-2 Maneuver	-	-	-	-	436	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	530.1	-

Approach	SE	NW	SW
HCM Control Delay (s)	3.1	0	11.588
HCM LOS	A	A	B

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					436	1059
HCM Control Delay (s)	-	-	7.652	-	13.5	8.4
HCM Lane VC Ratio	0	-	0.112	-	0.023	0.006
HCM Lane LOS	-	-	A	-	B	A
HCM 95th Percentile Queue (veh)	0	-	0.378	-	0.07	0.017

Intersection	
Intersection Delay (sec/veh)	5.0
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	415	68	175
Demand Flow Rate (pc/h)	423	69	179
Vehicles Circulating (pc/h)	136	41	64
Vehicles Exiting (pc/h)	107	518	41
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	5.6	3.8	4.1
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	LTR
Right Turn Channelized				Yield		
Lane Utilization	0.470	0.530	1.000		0.531	0.469
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	199	224	64	5	95	84
Capacity, Entry Lane (pc/h)	1020	1027	1098	1085	1077	1080
Entry HV Adjustment Factor	0.979	0.981	0.980	0.980	0.976	0.979
Flow Rate, Entry (vph)	195	220	63	5	93	82
Capacity, Entry (vph)	999	1008	1076	1063	1051	1058
Volume to Capacity Ratio	0.195	0.218	0.058	0.005	0.088	0.078
Control Delay (sec/veh)	5.4	5.7	3.8	3.4	4.2	4.1
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	1	1	0	0	0	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	72	69	298	78	192	1239
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.94	0.94	0.90	0.90
Hourly flow rate (vph)	96	92	317	83	213	1377
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1432	159			400	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1432	159			400	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	6	89			82	
cM capacity (veh/h)	102	859			1155	

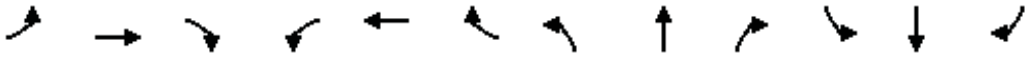
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	188	159	159	83	213	688	688
Volume Left	96	0	0	0	213	0	0
Volume Right	92	0	0	83	0	0	0
cSH	187	1700	1700	1700	1155	1700	1700
Volume to Capacity	1.00	0.09	0.09	0.05	0.18	0.40	0.40
Queue Length 95th (ft)	211	0	0	0	17	0	0
Control Delay (s)	117.9	0.0	0.0	0.0	8.8	0.0	0.0
Lane LOS	F				A		
Approach Delay (s)	117.9	0.0			1.2		
Approach LOS	F						

Intersection Summary			
Average Delay	11.0		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	115	52	27	121	134	44	962	111	56	501	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.67	1.00	1.00	0.67	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1246	1863	1794	1250	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.86	0.86	0.86	0.88	0.88	0.88	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	2	134	60	31	138	152	51	1119	129	61	545	7
RTOR Reduction (vph)	0	0	52	0	0	132	0	0	64	0	0	3
Lane Group Flow (vph)	2	134	8	31	138	20	51	1119	65	61	545	4
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	8.1	8.1	8.1	8.1	8.1	8.1	3.0	31.1	31.1	3.5	31.6	31.6
Effective Green, g (s)	8.1	8.1	8.1	8.1	8.1	8.1	3.0	31.1	31.1	3.5	31.6	31.6
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.05	0.50	0.50	0.06	0.51	0.51
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	164	245	236	164	245	229	86	1784	798	100	1813	811
v/s Ratio Prot		0.07			c0.07		0.03	c0.32		0.03	c0.15	
v/s Ratio Perm	0.00		0.00	0.02		0.01			0.04			0.00
v/c Ratio	0.01	0.55	0.03	0.19	0.56	0.09	0.59	0.63	0.08	0.61	0.30	0.00
Uniform Delay, d1	23.3	25.1	23.4	23.9	25.1	23.6	28.8	11.1	7.9	28.4	8.7	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	1.3	0.0	0.2	1.8	0.1	7.1	1.2	0.1	7.0	0.3	0.0
Delay (s)	23.3	26.4	23.4	24.1	26.9	23.6	35.9	12.3	8.0	35.5	8.9	7.4
Level of Service	C	C	C	C	C	C	D	B	A	D	A	A
Approach Delay (s)		25.5			25.1			12.8			11.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	42	259	13	10	131	4	90	50	32	7	11	12
Peak Hour Factor	0.95	0.95	0.95	0.67	0.67	0.67	0.75	0.75	0.75	0.63	0.63	0.63
Hourly flow rate (vph)	44	273	14	15	196	6	120	67	43	11	17	19

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	331	210	6	187	43	48
Volume Left (vph)	44	15	0	120	0	11
Volume Right (vph)	14	0	6	0	43	19
Hadj (s)	0.04	0.07	-0.67	0.36	-0.67	-0.16
Departure Headway (s)	5.8	5.9	5.2	6.5	5.5	6.4
Degree Utilization, x	0.53	0.34	0.01	0.34	0.06	0.08
Capacity (veh/h)	601	579	653	511	606	495
Control Delay (s)	15.0	10.8	7.0	11.6	7.7	10.0
Approach Delay (s)	15.0	10.7		10.8		10.0
Approach LOS	C	B		B		A

Intersection Summary				
Delay	12.4			
HCM Level of Service	B			
Intersection Capacity Utilization	48.5%	ICU Level of Service		A
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	14.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	53	140	24	58	79	44	79	317	225	34	117	19
Peak Hour Factor	0.83	0.83	0.83	0.82	0.82	0.82	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	64	169	29	71	96	54	88	352	250	38	130	21
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	12.4	12.2	17.4	11.9
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	66%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	34%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	79	317	225	53	93	71	58	79	44	34	78
Left Turning Volume	0	317	0	0	93	47	0	79	0	0	78
Through Volume	0	0	225	0	0	24	0	0	44	0	0
Right Turning Volume	79	0	0	53	0	0	58	0	0	34	0
Lane Flow Rate	88	352	250	64	112	85	71	96	54	38	87
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.176	0.658	0.418	0.146	0.241	0.177	0.163	0.209	0.106	0.087	0.188
Departure Headway, Hd	7.354	6.854	6.154	8.215	7.715	7.477	8.321	7.821	7.121	8.299	7.799
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	491	532	588	438	467	482	433	461	505	433	461
Service Time	5.054	4.554	3.854	5.933	5.433	5.196	6.042	5.542	4.842	6.023	5.523
HCM Lane V/C Ratio	0.179	0.662	0.425	0.146	0.24	0.176	0.164	0.208	0.107	0.088	0.189
HCM Control Delay	11.6	21.8	13.2	12.3	12.9	11.8	12.7	12.6	10.7	11.8	12.3
HCM Lane LOS	B	C	B	B	B	B	B	B	B	B	B
HCM 95th Percentile Queue	0.6	5.7	2.2	0.5	1	0.6	0.6	0.8	0.4	0.3	0.7

Intersection	
Intersection Delay (sec/veh):	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	30	10	249	2	1	10	47	425	1	15	772	21
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	200		0	200		0
Median Width		12			12			16			16	
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
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	33	11	271	2	1	11	51	462	1	16	839	23
Number of Lanes	1	2	0	0	2	0	1	3	0	1	3	0

Major/Minor		Minor 1			Minor 1			Major 1			Major 2	
Conflicting Flow Rate - All	1171	1449537190053719568			1460	232	862	0	0	463	0	0
Stage 1	883	883	0	565	9.3651441132769375E2948257522271E199					0	0	0
Stage 2	288	565	1953719003		8.88756379490056653181269E59882E-313					0	0	0
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	0	0
Pot Capacity-1 Maneuver	203	130	~	~	128	655	456	-	-	705	-	-
Stage 1	240	362	-	396	506	-	-	-	-	-	-	-
Stage 2	638	506	-	~	357	-	-	-	-	-	-	-
Mov Capacity-1 Maneuver	-	127	~	~	125.1	655	456	-	-	705	-	-
Mov Capacity-2 Maneuver	-	127	-	~	125.1	-	-	-	-	-	-	-
Stage 1	240	353.7	-	396	# 0	-	-	-	-	-	-	-
Stage 2	# 0	# 0	-	~	348.8	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	-1.073	-1.192	1.4	0.2
HCM LOS	N	N	A	A

Lane	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (vph)				~	~	-	~	-			
HCM Control Delay (s)	13.888	-	-	~	~	-	~	-	10.227	-	-
HCM Lane VC Ratio	0.112	-	-	~	~	-	~	-	0.023	-	-
HCM Lane LOS	B	-	-	-	-	-	-	-	B	-	-
HCM 95th Percentile Queue (veh)	0.376	-	-	~	~	-	~	-	0.071	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	36	609	137	18	16	157	391	117	37	1127	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3539	1583	1770	3289		2006	5085	1794	2006	5071	
Flt Permitted	0.73	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.48	1.00	
Satd. Flow (perm)	1546	3539	1583	1770	3289		2006	5085	1794	1014	5071	
Peak-hour factor, PHF	0.68	0.68	0.68	0.93	0.93	0.93	0.86	0.86	0.86	0.81	0.81	0.81
Adj. Flow (vph)	99	53	896	147	19	17	183	455	136	46	1391	26
RTOR Reduction (vph)	0	0	14	0	12	0	0	0	56	0	1	0
Lane Group Flow (vph)	99	53	882	147	24	0	183	455	80	46	1416	0
Turn Type	Perm	NA	pm+ov	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases		4	1	3	8		1	6			2	
Permitted Phases	4		4						6	2		
Actuated Green, G (s)	10.1	10.1	26.2	9.5	25.1		16.1	52.3	52.3	30.2	30.2	
Effective Green, g (s)	10.1	10.1	26.2	9.5	25.1		16.1	52.3	52.3	30.2	30.2	
Actuated g/C Ratio	0.11	0.11	0.29	0.11	0.28		0.18	0.59	0.59	0.34	0.34	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0	2.5	2.5	4.0		2.5	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	175	400	570	188	923		361	2975	1050	343	1713	
v/s Ratio Prot		0.01	c0.28	c0.08	0.01		0.09	0.09			c0.28	
v/s Ratio Perm	0.06		0.28						0.04	0.05		
v/c Ratio	0.57	0.13	1.55	0.78	0.03		0.51	0.15	0.08	0.13	0.83	
Uniform Delay, d1	37.6	35.7	31.6	38.9	23.3		33.1	8.5	8.1	20.5	27.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.0	0.2	254.8	18.2	0.0		0.8	0.0	0.0	0.2	3.6	
Delay (s)	42.6	35.9	286.4	57.1	23.3		33.9	8.5	8.1	20.8	30.8	
Level of Service	D	D	F	E	C		C	A	A	C	C	
Approach Delay (s)		250.7			50.5			14.4			30.5	
Approach LOS		F			D			B			C	

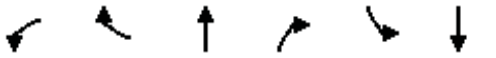
Intersection Summary			
HCM Average Control Delay	94.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	89.4	Sum of lost time (s)	17.5
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	262	287	212	76	65	46	165	360	93	16	63	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3415	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3415	
Peak-hour factor, PHF	0.89	0.89	0.89	0.79	0.79	0.79	0.81	0.81	0.81	0.76	0.76	0.76
Adj. Flow (vph)	294	322	238	96	82	58	204	444	115	21	83	1
RTOR Reduction (vph)	0	0	182	0	0	46	0	0	86	0	1	0
Lane Group Flow (vph)	294	322	56	96	82	12	204	444	29	21	83	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	6.3	13.7	13.7	4.7	12.1	12.1	7.8	14.6	14.6	0.9	7.7	
Effective Green, g (s)	6.3	13.7	13.7	4.7	12.1	12.1	7.8	14.6	14.6	0.9	7.7	
Actuated g/C Ratio	0.11	0.23	0.23	0.08	0.21	0.21	0.13	0.25	0.25	0.02	0.13	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	370	830	421	142	733	577	260	885	396	26	450	
v/s Ratio Prot	c0.09	c0.09		0.05	0.02	0.00	c0.10	c0.13		0.01	0.02	
v/s Ratio Perm			0.03						0.02			
v/c Ratio	0.79	0.39	0.13	0.68	0.11	0.02	0.78	0.50	0.07	0.81	0.18	
Uniform Delay, d1	25.4	18.8	17.7	26.1	18.8	18.4	24.5	18.8	16.7	28.7	22.6	
Progression Factor	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.5	0.3	0.1	9.6	0.1	0.0	13.3	0.2	0.0	90.8	0.1	
Delay (s)	35.9	19.1	18.1	35.7	18.9	18.4	37.8	18.9	16.8	119.5	22.6	
Level of Service	D	B	B	D	B	B	D	B	B	F	C	
Approach Delay (s)		24.6			25.6			23.7			42.0	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	69	129	1	22	59
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.90	0.90	0.88	0.88
Hourly flow rate (vph)	6	86	143	1	25	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	227	72			144	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	227	72			144	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	91			98	
cM capacity (veh/h)	728	975			1436	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	92	96	49	47	45
Volume Left	6	0	0	25	0
Volume Right	86	0	1	0	0
cSH	953	1700	1700	1436	1700
Volume to Capacity	0.10	0.06	0.03	0.02	0.03
Queue Length 95th (ft)	8	0	0	1	0
Control Delay (s)	9.2	0.0	0.0	4.1	0.0
Lane LOS	A			A	
Approach Delay (s)	9.2	0.0		2.1	
Approach LOS	A				

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	21.5%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh):	3.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	19	62	188	10	19	129
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.90	0.90	0.86	0.86
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	26	86	209	11	22	150
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	220	0	0	0	305	104
Stage 1	0	0	0	0	209	0
Stage 2	0	0	0	0	96	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1343	-	-	-	663	930
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	917	-
Mov Capacity-1 Maneuver	1343	-	-	-	649.7	930
Mov Capacity-2 Maneuver	-	-	-	-	649.7	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	898.7	-

Approach	SE	NW	SW
HCM Control Delay (s)	1.8	0	9.741
HCM LOS	A	A	A

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					650	930
HCM Control Delay (s)	-	-	7.734	-	10.7	9.6
HCM Lane VC Ratio	0	-	0.02	-	0.034	0.161
HCM Lane LOS	-	-	A	-	B	A
HCM 95th Percentile Queue (veh)	0	-	0.06	-	0.105	0.574

Intersection	
Intersection Delay (sec/veh)	4.7
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	149	364	55
Demand Flow Rate (pc/h)	152	371	56
Vehicles Circulating (pc/h)	19	61	224
Vehicles Exiting (pc/h)	261	110	61
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	3.9	5.1	4.1
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	TR
Right Turn Channelized				Yield		
Lane Utilization	0.467	0.533	1.000		0.339	0.661
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	71	81	224	147	19	37
Capacity, Entry Lane (pc/h)	1114	1115	1083	1063	955	966
Entry HV Adjustment Factor	0.988	0.976	0.980	0.980	1.000	0.973
Flow Rate, Entry (vph)	70	79	220	144	19	36
Capacity, Entry (vph)	1100	1089	1061	1042	955	940
Volume to Capacity Ratio	0.064	0.073	0.207	0.138	0.020	0.038
Control Delay (sec/veh)	3.8	3.9	5.3	4.7	3.9	4.2
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	0	0	1	0	0	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	101	106	1067	63	59	515
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.86	0.86	0.80	0.80	0.95	0.95
Hourly flow rate (vph)	117	123	1334	79	62	542
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1729	667			1412	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1729	667			1412	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	69			87	
cM capacity (veh/h)	69	401			479	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	241	667	667	79	62	271	271
Volume Left	117	0	0	0	62	0	0
Volume Right	123	0	0	79	0	0	0
cSH	123	1700	1700	1700	479	1700	1700
Volume to Capacity	1.96	0.39	0.39	0.05	0.13	0.16	0.16
Queue Length 95th (ft)	485	0	0	0	11	0	0
Control Delay (s)	521.1	0.0	0.0	0.0	13.6	0.0	0.0
Lane LOS	F				B		
Approach Delay (s)	521.1	0.0			1.4		
Approach LOS	F						

Intersection Summary			
Average Delay	55.9		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

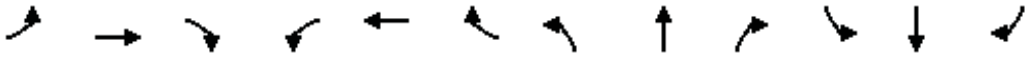
2020 Traffic

(Existing + Site + 10% Increase)

Intersection Analysis Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	100	22	134	71	51	28	328	14	155	1247	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.70	1.00	1.00	0.67	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1300	1863	1794	1256	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.85	0.85	0.85	0.86	0.86	0.86	0.90	0.90	0.90	0.93	0.93	0.93
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	18	129	28	171	91	65	34	401	17	183	1475	26
RTOR Reduction (vph)	0	0	24	0	0	55	0	0	10	0	0	12
Lane Group Flow (vph)	18	129	4	171	91	10	34	401	7	183	1475	14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	10.5	10.5	10.5	10.5	10.5	10.5	2.1	26.5	26.5	10.0	34.4	34.4
Effective Green, g (s)	10.5	10.5	10.5	10.5	10.5	10.5	2.1	26.5	26.5	10.0	34.4	34.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.03	0.40	0.40	0.15	0.52	0.52
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	207	296	285	200	296	277	56	1421	636	268	1845	825
v/s Ratio Prot		0.07			0.05		0.02	0.11		c0.10	c0.42	
v/s Ratio Perm	0.01		0.00	c0.14		0.01			0.00			0.01
v/c Ratio	0.09	0.44	0.02	0.85	0.31	0.04	0.61	0.28	0.01	0.68	0.80	0.02
Uniform Delay, d1	23.7	25.1	23.4	27.0	24.5	23.5	31.5	13.3	11.9	26.5	13.0	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4	0.0	27.3	0.2	0.0	12.1	0.3	0.0	5.6	3.1	0.0
Delay (s)	23.7	25.4	23.4	54.3	24.8	23.5	43.6	13.6	11.9	32.1	16.0	7.7
Level of Service	C	C	C	D	C	C	D	B	B	C	B	A
Approach Delay (s)		24.9			40.0			15.8			17.7	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	66.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	131	112	59	193	5	16	10	38	3	37	42
Peak Hour Factor	0.81	0.81	0.81	0.86	0.86	0.86	0.73	0.73	0.73	0.85	0.85	0.85
Hourly flow rate (vph)	5	178	152	75	247	6	24	15	57	4	48	54

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	335	322	6	39	57	106
Volume Left (vph)	5	75	0	24	0	4
Volume Right (vph)	152	0	6	0	57	54
Hadj (s)	-0.23	0.15	-0.67	0.34	-0.67	-0.27
Departure Headway (s)	5.4	5.7	4.9	6.8	5.8	6.2
Degree Utilization, x	0.50	0.51	0.01	0.07	0.09	0.18
Capacity (veh/h)	641	613	707	460	542	515
Control Delay (s)	13.7	13.2	6.7	9.2	8.2	10.6
Approach Delay (s)	13.7	13.1		8.6		10.6
Approach LOS	B	B		A		B

Intersection Summary				
Delay	12.5			
HCM Level of Service	B			
Intersection Capacity Utilization	48.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	15.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	10	104	77	219	201	20	25	47	41	28	330	66
Peak Hour Factor	0.68	0.68	0.68	0.87	0.87	0.87	0.76	0.76	0.76	0.91	0.91	0.91
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	15	153	113	252	231	23	33	62	54	31	363	73
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	13.6	18.1	12.1	16.1
HCM LOS	B	C	B	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	31%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	69%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	25	47	41	10	69	112	219	201	20	28	220
Left Turning Volume	0	47	0	0	69	35	0	201	0	0	220
Through Volume	0	0	41	0	0	77	0	0	20	0	0
Right Turning Volume	25	0	0	10	0	0	219	0	0	28	0
Lane Flow Rate	33	62	54	15	102	164	252	231	23	31	242
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.081	0.143	0.115	0.035	0.225	0.341	0.553	0.476	0.043	0.069	0.508
Departure Headway, Hd	8.851	8.351	7.651	8.449	7.949	7.467	7.914	7.414	6.714	8.071	7.571
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	405	429	468	424	452	481	456	485	533	444	476
Service Time	6.612	6.112	5.412	6.204	5.704	5.221	5.662	5.162	4.462	5.818	5.318
HCM Lane V/C Ratio	0.081	0.145	0.115	0.035	0.226	0.341	0.553	0.476	0.043	0.07	0.508
HCM Control Delay	12.4	12.5	11.4	11.5	13	14.1	20.1	16.8	9.8	11.4	17.9
HCM Lane LOS	B	B	B	B	B	B	C	C	A	B	C
HCM 95th Percentile Queue	0.3	0.5	0.4	0.1	0.9	1.6	3.7	2.7	0.1	0.2	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	1	24	1	2	3	323	715	2	5	408	54
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.63	0.63	0.63	0.50	0.50	0.50	0.94	0.94	0.94	0.81	0.81	0.81
Hourly flow rate (vph)	9	2	42	2	4	7	378	837	2	7	554	73
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								1			1	
Upstream signal (ft)								991				
pX, platoon unblocked												
vC, conflicting volume	1648	2199	221	1835	2235	280	627			839		
vC1, stage 1 conf vol	604	604		1594	1594							
vC2, stage 2 conf vol	1044	1595		241	641							
vCu, unblocked vol	1648	2199	221	1835	2235	280	627			839		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	98	95	96	92	99	60			99		
cM capacity (veh/h)	106	77	782	57	53	717	950			791		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	9	1	42	4	9	378	335	335	170	7	222	222
Volume Left	9	0	0	2	0	378	0	0	0	7	0	0
Volume Right	0	0	42	0	7	0	0	0	2	0	0	0
cSH	106	77	695	55	174	950	1700	1700	1700	791	1700	1700
Volume to Capacity	0.08	0.02	0.06	0.08	0.05	0.40	0.20	0.20	0.10	0.01	0.13	0.13
Queue Length 95th (ft)	7	1	5	6	4	48	0	0	0	1	0	0
Control Delay (s)	41.9	52.6	10.5	75.6	26.7	11.3	0.0	0.0	0.0	9.6	0.0	0.0
Lane LOS	E	F	B	F	D	B				A		
Approach Delay (s)	16.7			43.0		3.5				0.1		
Approach LOS	C			E								

Intersection Summary				
Average Delay	3.0			
Intersection Capacity Utilization	44.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	7	214	94	75	16	915	1177	107	10	317	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3539	1583	1770	3446		2006	5085	1794	2006	4886	
Flt Permitted	0.68	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.38	1.00	
Satd. Flow (perm)	1444	3539	1583	1770	3446		2006	5085	1794	804	4886	
Peak-hour factor, PHF	0.80	0.80	0.80	0.93	0.93	0.93	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	60	10	294	111	89	19	1274	1639	149	12	371	131
RTOR Reduction (vph)	0	0	25	0	15	0	0	0	55	0	71	0
Lane Group Flow (vph)	60	10	269	111	93	0	1274	1639	94	12	431	0
Turn Type	Perm	NA	pm+ov	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases		4	1	3	8		1	6			2	
Permitted Phases	4		4						6	2		
Actuated Green, G (s)	7.8	7.8	47.9	7.4	20.7		40.1	56.6	56.6	10.5	10.5	
Effective Green, g (s)	7.8	7.8	47.9	7.4	20.7		40.1	56.6	56.6	10.5	10.5	
Actuated g/C Ratio	0.09	0.09	0.54	0.08	0.23		0.45	0.63	0.63	0.12	0.12	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0	2.5	2.5	4.0		2.5	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	126	309	955	147	799		901	3223	1137	95	575	
v/s Ratio Prot		0.00	0.13	c0.06	0.03		c0.64	0.32			c0.09	
v/s Ratio Perm	c0.04		0.04						0.05	0.01		
v/c Ratio	0.48	0.03	0.28	0.76	0.12		1.41	0.51	0.08	0.13	0.75	
Uniform Delay, d1	38.8	37.3	11.3	40.1	27.1		24.6	8.8	6.3	35.3	38.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.8	0.1	0.1	18.7	0.1		192.9	0.2	0.0	0.8	5.8	
Delay (s)	42.6	37.4	11.4	58.8	27.2		217.5	9.0	6.4	36.1	43.9	
Level of Service	D	D	B	E	C		F	A	A	D	D	
Approach Delay (s)		17.3			43.2			95.6			43.8	
Approach LOS		B			D			F			D	

Intersection Summary			
HCM Average Control Delay	79.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	89.3	Sum of lost time (s)	23.5
Intersection Capacity Utilization	92.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	264	58	85	281	60	206	144	54	250	123	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3346	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3346	
Peak-hour factor, PHF	0.78	0.78	0.78	0.82	0.82	0.82	0.75	0.75	0.75	0.71	0.71	0.71
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	172	372	82	114	377	80	302	211	79	387	191	33
RTOR Reduction (vph)	0	0	66	0	0	63	0	0	70	0	20	0
Lane Group Flow (vph)	172	372	16	114	377	17	302	211	9	387	204	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	4.0	12.7	12.7	5.4	14.1	14.1	12.5	8.0	8.0	16.5	12.0	
Effective Green, g (s)	4.0	12.7	12.7	5.4	14.1	14.1	12.5	8.0	8.0	16.5	12.0	
Actuated g/C Ratio	0.06	0.19	0.19	0.08	0.21	0.21	0.19	0.12	0.12	0.25	0.18	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	205	670	340	142	744	586	363	422	189	421	598	
v/s Ratio Prot	0.05	0.11		c0.06	c0.11	0.01	0.16	c0.06		c0.23	c0.06	
v/s Ratio Perm			0.01						0.01			
v/c Ratio	0.84	0.56	0.05	0.80	0.51	0.03	0.83	0.50	0.05	0.92	0.34	
Uniform Delay, d1	31.2	24.6	22.2	30.3	23.4	21.1	26.3	27.7	26.2	24.7	24.1	
Progression Factor	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	23.9	1.0	0.1	25.6	0.5	0.0	14.3	0.3	0.0	24.4	0.1	
Delay (s)	55.1	25.6	22.8	56.0	24.0	21.1	40.6	28.0	26.2	49.1	24.2	
Level of Service	E	C	C	E	C	C	D	C	C	D	C	
Approach Delay (s)		33.3			30.0			34.2			39.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	34.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	67.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	305	4	69	299
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.61	0.61	0.86	0.86	0.85	0.85
Hourly flow rate (vph)	5	43	390	5	89	387
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	765	198			395	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	765	198			395	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			92	
cM capacity (veh/h)	314	810			1160	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	49	260	135	218	258
Volume Left	5	0	0	89	0
Volume Right	43	0	5	0	0
cSH	689	1700	1700	1160	1700
Volume to Capacity	0.07	0.15	0.08	0.08	0.15
Queue Length 95th (ft)	6	0	0	6	0
Control Delay (s)	10.6	0.0	0.0	3.8	0.0
Lane LOS	B			A	
Approach Delay (s)	10.6	0.0		1.8	
Approach LOS	B				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

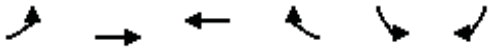
Intersection	
Intersection Delay (sec/veh):	1.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	151	363	312	17	5	3
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.75	0.75	0.50	0.50
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	172	412	416	23	10	6
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	439	0	0	0	965	208
Stage 1	0	0	0	0	416	0
Stage 2	0	0	0	0	549	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1116	-	-	-	253	797
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	542	-
Mov Capacity-1 Maneuver	1116	-	-	-	214	797
Mov Capacity-2 Maneuver	-	-	-	-	214	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	458.5	-

Approach	SE	NW	SW
HCM Control Delay (s)	2.6	0	17.725
HCM LOS	A	A	C

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					214	797
HCM Control Delay (s)	-	-	8.811	-	22.6	9.6
HCM Lane VC Ratio	0	-	0.154	-	0.047	0.008
HCM Lane LOS	-	-	A	-	C	A
HCM 95th Percentile Queue (veh)	0	-	0.543	-	0.146	0.023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	40	371	37	278	143	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	444	44	302	155	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	346				353	22
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	346				353	22
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				74	98
cM capacity (veh/h)	1209				596	1050

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1	SB 2
Volume Total	43	222	222	22	22	302	155	22
Volume Left	43	0	0	0	0	0	155	0
Volume Right	0	0	0	0	0	302	0	22
cSH	1209	1700	1700	1700	1700	1700	596	1050
Volume to Capacity	0.04	0.13	0.13	0.01	0.01	0.18	0.26	0.02
Queue Length 95th (ft)	3	0	0	0	0	0	26	2
Control Delay (s)	8.1	0.0	0.0	0.0	0.0	0.0	13.2	8.5
Lane LOS	A						B	A
Approach Delay (s)	0.7			0.0			12.6	
Approach LOS							B	

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh)	5.8
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	573	127	206
Demand Flow Rate (pc/h)	584	129	210
Vehicles Circulating (pc/h)	149	74	124
Vehicles Exiting (pc/h)	185	659	74
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	6.5	4.4	4.5
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	LTR
Right Turn Channelized				Yield		
Lane Utilization	0.469	0.531	1.000		0.529	0.471
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	274	310	124	5	111	99
Capacity, Entry Lane (pc/h)	1010	1018	1073	1049	1030	1036
Entry HV Adjustment Factor	0.983	0.980	0.980	0.980	0.984	0.978
Flow Rate, Entry (vph)	269	304	122	5	109	97
Capacity, Entry (vph)	993	997	1052	1029	1013	1013
Volume to Capacity Ratio	0.271	0.305	0.116	0.005	0.108	0.096
Control Delay (sec/veh)	6.3	6.7	4.4	3.5	4.5	4.4
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	1	1	0	0	0	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	31	33	20	60	154
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	34	39	22	65	184
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	365	31			61	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	365	31			61	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	97			96	
cM capacity (veh/h)	582	1037			1540	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	46	26	35	249
Volume Left	12	0	0	65
Volume Right	34	0	22	0
cSH	861	1700	1700	1540
Volume to Capacity	0.05	0.02	0.02	0.04
Queue Length 95th (ft)	4	0	0	3
Control Delay (s)	9.4	0.0	0.0	2.2
Lane LOS	A			A
Approach Delay (s)	9.4	0.0		2.2
Approach LOS	A			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

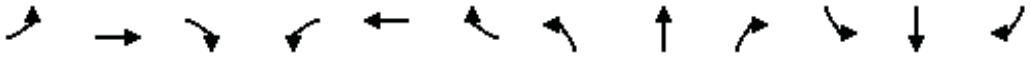
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	103	69	298	138	192	1239
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.94	0.94	0.90	0.90
Hourly flow rate (vph)	151	101	349	161	235	1514
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1575	174			510	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1575	174			510	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	88			78	
cM capacity (veh/h)	78	839			1051	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	252	174	174	161	235	757	757
Volume Left	151	0	0	0	235	0	0
Volume Right	101	0	0	161	0	0	0
cSH	123	1700	1700	1700	1051	1700	1700
Volume to Capacity	2.04	0.10	0.10	0.09	0.22	0.45	0.45
Queue Length 95th (ft)	517	0	0	0	21	0	0
Control Delay (s)	555.7	0.0	0.0	0.0	9.4	0.0	0.0
Lane LOS	F				A		
Approach Delay (s)	555.7	0.0			1.3		
Approach LOS	F						

Intersection Summary			
Average Delay	56.7		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	115	52	27	121	159	44	962	111	71	501	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.66	1.00	1.00	0.66	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1231	1863	1794	1236	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.86	0.86	0.86	0.88	0.88	0.88	0.86	0.86	0.86	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	3	147	67	34	151	199	56	1230	142	85	599	7
RTOR Reduction (vph)	0	0	58	0	0	172	0	0	75	0	0	4
Lane Group Flow (vph)	3	147	9	34	151	27	56	1230	67	85	599	3
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	8.1	8.1	8.1	8.1	8.1	8.1	4.7	28.7	28.7	4.6	28.6	28.6
Effective Green, g (s)	8.1	8.1	8.1	8.1	8.1	8.1	4.7	28.7	28.7	4.6	28.6	28.6
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.08	0.48	0.48	0.08	0.47	0.47
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	165	250	241	166	250	234	138	1682	752	135	1676	750
v/s Ratio Prot		0.08			c0.08		0.03	c0.35		0.05	c0.17	
v/s Ratio Perm	0.00		0.01	0.03		0.02			0.04			0.00
v/c Ratio	0.02	0.59	0.04	0.20	0.60	0.11	0.41	0.73	0.09	0.63	0.36	0.00
Uniform Delay, d1	22.7	24.6	22.8	23.3	24.6	23.0	26.5	12.7	8.7	27.1	10.1	8.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	2.3	0.0	0.2	2.8	0.1	0.7	2.3	0.1	6.5	0.4	0.0
Delay (s)	22.7	26.9	22.8	23.5	27.4	23.1	27.2	15.1	8.8	33.5	10.4	8.4
Level of Service	C	C	C	C	C	C	C	B	A	C	B	A
Approach Delay (s)		25.5			24.8			14.9			13.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.4	Sum of lost time (s)	19.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	42	259	28	40	131	4	115	50	82	7	11	12
Peak Hour Factor	0.95	0.95	0.95	0.67	0.67	0.67	0.75	0.75	0.75	0.63	0.63	0.63
Hourly flow rate (vph)	49	300	32	66	215	7	169	73	120	12	19	21

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	381	281	7	242	120	52
Volume Left (vph)	49	66	0	169	0	12
Volume Right (vph)	32	0	7	0	120	21
Hadj (s)	0.01	0.15	-0.67	0.38	-0.67	-0.16
Departure Headway (s)	6.4	6.7	5.8	7.1	6.0	7.4
Degree Utilization, x	0.68	0.52	0.01	0.48	0.20	0.11
Capacity (veh/h)	545	517	579	476	559	409
Control Delay (s)	21.6	15.5	7.7	15.2	9.4	11.2
Approach Delay (s)	21.6	15.3		13.3		11.2
Approach LOS	C	C		B		B

Intersection Summary				
Delay	16.6			
HCM Level of Service	C			
Intersection Capacity Utilization	56.0%	ICU Level of Service		B
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	18.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	53	190	24	79	109	44	79	332	260	34	126	19
Peak Hour Factor	0.83	0.83	0.83	0.82	0.82	0.82	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	64	229	29	96	133	54	88	369	289	38	140	21
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	14.3	14	22.7	13.1
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	73%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	27%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	79	332	260	53	127	87	79	109	44	34	84
Left Turning Volume	0	332	0	0	127	63	0	109	0	0	84
Through Volume	0	0	260	0	0	24	0	0	44	0	0
Right Turning Volume	79	0	0	53	0	0	79	0	0	34	0
Lane Flow Rate	88	369	289	64	153	105	96	133	54	38	93
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.192	0.755	0.535	0.155	0.349	0.235	0.236	0.307	0.114	0.094	0.22
Departure Headway, Hd	7.868	7.368	6.668	8.726	8.226	8.034	8.826	8.326	7.626	9	8.5
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	456	491	540	411	436	446	407	431	468	397	421
Service Time	5.622	5.122	4.422	6.492	5.992	5.799	6.594	6.094	5.394	6.773	6.273
HCM Lane V/C Ratio	0.193	0.752	0.535	0.156	0.351	0.235	0.236	0.309	0.115	0.096	0.221
HCM Control Delay	12.5	29.6	16.9	13.1	15.4	13.3	14.3	14.8	11.4	12.7	13.7
HCM Lane LOS	B	D	C	B	C	B	B	B	B	B	B
HCM 95th Percentile Queue	0.7	9.2	3.4	0.6	1.6	0.9	0.9	1.3	0.4	0.3	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	10	249	2	1	10	47	475	1	15	802	21
Sign Control		Stop			Stop			Free			Free	
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	12	298	2	1	12	56	568	1	18	959	25
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								986				
pX, platoon unblocked												
vC, conflicting volume	1322	1689	332	1340	1701	190	984			569		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1322	1689	332	1340	1701	190	984			569		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	86	55	95	99	99	92			98		
cM capacity (veh/h)	103	84	664	50	82	820	698			999		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	36	8	302	3	13	56	227	227	115	18	384	384
Volume Left	36	0	0	2	0	56	0	0	0	18	0	0
Volume Right	0	0	298	0	12	0	0	0	1	0	0	0
cSH	103	84	608	55	574	698	1700	1700	1700	999	1700	1700
Volume to Capacity	0.35	0.10	0.50	0.05	0.02	0.08	0.13	0.13	0.07	0.02	0.23	0.23
Queue Length 95th (ft)	34	8	69	4	2	7	0	0	0	1	0	0
Control Delay (s)	57.4	52.5	16.6	74.6	11.4	10.6	0.0	0.0	0.0	8.7	0.0	0.0
Lane LOS	F	F	C	F	B	B				A		
Approach Delay (s)	21.7			23.6		1.0				0.2		
Approach LOS	C			C								

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	40.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	36	908	137	18	16	337	391	117	37	1127	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3539	1583	1770	3287		2006	5085	1794	2006	5052	
Flt Permitted	0.73	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	1540	3539	1583	1770	3287		2006	5085	1794	968	5052	
Peak-hour factor, PHF	0.68	0.68	0.68	0.93	0.93	0.93	0.86	0.86	0.86	0.81	0.81	0.81
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	189	58	1469	162	21	19	431	500	150	50	1530	69
RTOR Reduction (vph)	0	0	4	0	13	0	0	0	62	0	4	0
Lane Group Flow (vph)	189	58	1465	162	27	0	431	500	88	50	1595	0
Turn Type	Perm	NA	pm+ov	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases		4	1	3	8		1	6			2	
Permitted Phases	4		4						6	2		
Actuated Green, G (s)	19.2	19.2	44.3	7.5	32.2		25.1	63.2	63.2	32.1	32.1	
Effective Green, g (s)	19.2	19.2	44.3	7.5	32.2		25.1	63.2	63.2	32.1	32.1	
Actuated g/C Ratio	0.18	0.18	0.41	0.07	0.30		0.23	0.59	0.59	0.30	0.30	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0	2.5	2.5	4.0		2.5	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	275	633	741	124	985		469	2992	1056	289	1510	
v/s Ratio Prot		0.02	c0.46	c0.09	0.01		0.21	0.10			c0.32	
v/s Ratio Perm	0.12		0.46						0.05	0.05		
v/c Ratio	0.69	0.09	1.98	1.31	0.03		0.92	0.17	0.08	0.17	1.06	
Uniform Delay, d1	41.3	36.8	31.6	50.0	26.5		40.2	10.1	9.6	27.8	37.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.5	0.1	444.5	184.2	0.0		22.9	0.0	0.0	0.4	39.7	
Delay (s)	48.8	36.9	476.0	234.2	26.6		63.0	10.1	9.6	28.2	77.4	
Level of Service	D	D	F	F	C		E	B	A	C	E	
Approach Delay (s)		414.1			193.1			31.2			75.9	
Approach LOS		F			F			C			E	

Intersection Summary			
HCM Average Control Delay	195.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.59		
Actuated Cycle Length (s)	107.4	Sum of lost time (s)	17.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	312	312	237	76	80	46	180	360	93	16	63	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3416	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3416	
Peak-hour factor, PHF	0.89	0.89	0.89	0.79	0.79	0.79	0.81	0.81	0.81	0.76	0.76	0.76
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	386	386	293	106	111	64	244	489	126	23	91	1
RTOR Reduction (vph)	0	0	221	0	0	51	0	0	91	0	1	0
Lane Group Flow (vph)	386	386	72	106	111	13	244	489	35	23	91	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	8.3	16.3	16.3	5.2	13.2	13.2	9.3	18.1	18.1	2.0	10.8	
Effective Green, g (s)	8.3	16.3	16.3	5.2	13.2	13.2	9.3	18.1	18.1	2.0	10.8	
Actuated g/C Ratio	0.13	0.25	0.25	0.08	0.20	0.20	0.14	0.27	0.27	0.03	0.16	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	431	873	442	139	707	557	274	969	433	52	558	
v/s Ratio Prot	c0.11	c0.11		0.06	0.03	0.00	c0.13	c0.14		0.01	0.03	
v/s Ratio Perm			0.04						0.02			
v/c Ratio	0.90	0.44	0.16	0.76	0.16	0.02	0.89	0.50	0.08	0.44	0.16	
Uniform Delay, d1	28.5	21.1	19.5	29.8	21.9	21.3	27.9	20.2	17.8	31.5	23.8	
Progression Factor	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	20.1	0.4	0.2	19.7	0.1	0.0	27.5	0.2	0.0	2.2	0.1	
Delay (s)	48.6	21.4	20.0	49.5	22.0	21.3	55.4	20.4	17.8	33.7	23.8	
Level of Service	D	C	C	D	C	C	E	C	B	C	C	
Approach Delay (s)		30.9			32.2			30.0			25.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	18.5
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	69	339	1	22	407
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.90	0.90	0.88	0.88
Hourly flow rate (vph)	7	95	414	1	28	509
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	724	208			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	724	208			416	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	88			98	
cM capacity (veh/h)	352	798			1140	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	276	139	197	339
Volume Left	7	0	0	28	0
Volume Right	95	0	1	0	0
cSH	735	1700	1700	1140	1700
Volume to Capacity	0.14	0.16	0.08	0.02	0.20
Queue Length 95th (ft)	12	0	0	2	0
Control Delay (s)	10.7	0.0	0.0	1.3	0.0
Lane LOS	B			A	
Approach Delay (s)	10.7	0.0		0.5	
Approach LOS	B				

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

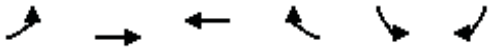
Intersection	
Intersection Delay (sec/veh):	1.8

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	19	410	398	10	19	129
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.90	0.90	0.86	0.86
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	26	569	442	11	22	150
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	453	0	0	0	780	221
Stage 1	0	0	0	0	442	0
Stage 2	0	0	0	0	338	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1105	-	-	-	332	782
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	694	-
Mov Capacity-1 Maneuver	1105	-	-	-	324	782
Mov Capacity-2 Maneuver	-	-	-	-	324	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	677.3	-

Approach	SE	NW	SW
HCM Control Delay (s)	0.4	0	11.496
HCM LOS	A	A	B

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					324	782
HCM Control Delay (s)	-	-	8.338	-	16.9	10.7
HCM Lane VC Ratio	0	-	0.024	-	0.068	0.192
HCM Lane LOS	-	-	A	-	C	B
HCM 95th Percentile Queue (veh)	0	-	0.073	-	0.218	0.706



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	30	81	317	210	348	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	97	379	228	378	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	607				493	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	607				493	190
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				23	93
cM capacity (veh/h)	967				488	820

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1	SB 2
Volume Total	33	48	48	190	190	228	378	54
Volume Left	33	0	0	0	0	0	378	0
Volume Right	0	0	0	0	0	228	0	54
cSH	967	1700	1700	1700	1700	1700	488	820
Volume to Capacity	0.03	0.03	0.03	0.11	0.11	0.13	0.77	0.07
Queue Length 95th (ft)	3	0	0	0	0	0	172	5
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	0.0	33.4	9.7
Lane LOS	A						D	A
Approach Delay (s)	2.2			0.0			30.4	
Approach LOS							D	

Intersection Summary			
Average Delay	11.5		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh)	5.2
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	242	463	75
Demand Flow Rate (pc/h)	247	472	76
Vehicles Circulating (pc/h)	21	87	311
Vehicles Exiting (pc/h)	366	181	87
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	4.3	5.9	4.5
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	TR
Right Turn Channelized				Yield		
Lane Utilization	0.470	0.530	1.000		0.276	0.724
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	116	131	311	161	21	55
Capacity, Entry Lane (pc/h)	1112	1113	1063	1036	895	909
Entry HV Adjustment Factor	0.980	0.979	0.980	0.980	1.000	0.982
Flow Rate, Entry (vph)	114	128	305	158	21	54
Capacity, Entry (vph)	1090	1090	1042	1015	895	892
Volume to Capacity Ratio	0.104	0.118	0.293	0.156	0.023	0.061
Control Delay (sec/veh)	4.2	4.3	6.3	5.0	4.2	4.6
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	0	0	1	1	0	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	25	75	175	15	45	28
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	82	209	16	49	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	341	209			226	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	341	209			226	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	90			96	
cM capacity (veh/h)	632	831			1343	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	109	209	16	82
Volume Left	27	0	0	49
Volume Right	82	0	16	0
cSH	770	1700	1700	1343
Volume to Capacity	0.14	0.12	0.01	0.04
Queue Length 95th (ft)	12	0	0	3
Control Delay (s)	10.4	0.0	0.0	4.7
Lane LOS	B			A
Approach Delay (s)	10.4	0.0		4.7
Approach LOS	B			

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	176	106	1067	108	59	515
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.86	0.86	0.80	0.80	0.95	0.95
Hourly flow rate (vph)	225	136	1467	148	68	596
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1902	734			1616	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1902	734			1616	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	63			83	
cM capacity (veh/h)	50	363			400	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	361	734	734	148	68	298	298
Volume Left	225	0	0	0	68	0	0
Volume Right	136	0	0	148	0	0	0
cSH	75	1700	1700	1700	400	1700	1700
Volume to Capacity	4.84	0.43	0.43	0.09	0.17	0.18	0.18
Queue Length 95th (ft)	Err	0	0	0	15	0	0
Control Delay (s)	Err	0.0	0.0	0.0	15.9	0.0	0.0
Lane LOS	F				C		
Approach Delay (s)	Err	0.0			1.6		
Approach LOS	F						

Intersection Summary			
Average Delay	1366.1		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Appendix D

2020 Traffic

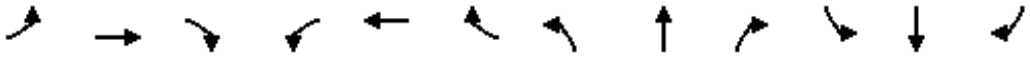
(Existing + Site + 10% Increase)

with Improved Infrastructure

Intersection Analysis Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	100	22	134	71	51	28	328	14	155	1247	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.70	1.00	1.00	0.67	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1300	1863	1794	1256	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.85	0.85	0.85	0.86	0.86	0.86	0.90	0.90	0.90	0.93	0.93	0.93
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	18	129	28	171	91	65	34	401	17	183	1475	26
RTOR Reduction (vph)	0	0	24	0	0	55	0	0	10	0	0	12
Lane Group Flow (vph)	18	129	4	171	91	10	34	401	7	183	1475	14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	10.5	10.5	10.5	10.5	10.5	10.5	2.1	26.5	26.5	10.0	34.4	34.4
Effective Green, g (s)	10.5	10.5	10.5	10.5	10.5	10.5	2.1	26.5	26.5	10.0	34.4	34.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.03	0.40	0.40	0.15	0.52	0.52
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	207	296	285	200	296	277	56	1421	636	268	1845	825
v/s Ratio Prot		0.07			0.05		0.02	0.11		c0.10	c0.42	
v/s Ratio Perm	0.01		0.00	c0.14		0.01			0.00			0.01
v/c Ratio	0.09	0.44	0.02	0.85	0.31	0.04	0.61	0.28	0.01	0.68	0.80	0.02
Uniform Delay, d1	23.7	25.1	23.4	27.0	24.5	23.5	31.5	13.3	11.9	26.5	13.0	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4	0.0	27.3	0.2	0.0	12.1	0.3	0.0	5.6	3.1	0.0
Delay (s)	23.7	25.4	23.4	54.3	24.8	23.5	43.6	13.6	11.9	32.1	16.0	7.7
Level of Service	C	C	C	D	C	C	D	B	B	C	B	A
Approach Delay (s)		24.9			40.0			15.8			17.7	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	66.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	131	112	59	193	5	16	10	38	3	37	42
Peak Hour Factor	0.81	0.81	0.81	0.86	0.86	0.86	0.73	0.73	0.73	0.85	0.85	0.85
Hourly flow rate (vph)	5	178	152	75	247	6	24	15	57	4	48	54

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	335	322	6	39	57	106
Volume Left (vph)	5	75	0	24	0	4
Volume Right (vph)	152	0	6	0	57	54
Hadj (s)	-0.23	0.15	-0.67	0.34	-0.67	-0.27
Departure Headway (s)	5.4	5.7	4.9	6.8	5.8	6.2
Degree Utilization, x	0.50	0.51	0.01	0.07	0.09	0.18
Capacity (veh/h)	641	613	707	460	542	515
Control Delay (s)	13.7	13.2	6.7	9.2	8.2	10.6
Approach Delay (s)	13.7	13.1		8.6		10.6
Approach LOS	B	B		A		B

Intersection Summary				
Delay	12.5			
HCM Level of Service	B			
Intersection Capacity Utilization	48.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	15.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	10	104	77	219	201	20	25	47	41	28	330	66
Peak Hour Factor	0.68	0.68	0.68	0.87	0.87	0.87	0.76	0.76	0.76	0.91	0.91	0.91
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	15	153	113	252	231	23	33	62	54	31	363	73
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	13.6	18.1	12.1	16.1
HCM LOS	B	C	B	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	31%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	69%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	25	47	41	10	69	112	219	201	20	28	220
Left Turning Volume	0	47	0	0	69	35	0	201	0	0	220
Through Volume	0	0	41	0	0	77	0	0	20	0	0
Right Turning Volume	25	0	0	10	0	0	219	0	0	28	0
Lane Flow Rate	33	62	54	15	102	164	252	231	23	31	242
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.081	0.143	0.115	0.035	0.225	0.341	0.553	0.476	0.043	0.069	0.508
Departure Headway, Hd	8.851	8.351	7.651	8.449	7.949	7.467	7.914	7.414	6.714	8.071	7.571
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	405	429	468	424	452	481	456	485	533	444	476
Service Time	6.612	6.112	5.412	6.204	5.704	5.221	5.662	5.162	4.462	5.818	5.318
HCM Lane V/C Ratio	0.081	0.145	0.115	0.035	0.226	0.341	0.553	0.476	0.043	0.07	0.508
HCM Control Delay	12.4	12.5	11.4	11.5	13	14.1	20.1	16.8	9.8	11.4	17.9
HCM Lane LOS	B	B	B	B	B	B	C	C	A	B	C
HCM 95th Percentile Queue	0.3	0.5	0.4	0.1	0.9	1.6	3.7	2.7	0.1	0.2	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1	24	1	2	3	323	715	2	5	408	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	14	12	12	14	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95		1.00	0.91		1.00	0.91	
Frt	1.00	0.86			0.92		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3032			3229		1888	5083		1888	4996	
Flt Permitted	0.75	1.00			0.94		0.40	1.00		0.32	1.00	
Satd. Flow (perm)	1394	3032			3047		801	5083		627	4996	
Peak-hour factor, PHF	0.63	0.63	0.63	0.50	0.50	0.50	0.94	0.94	0.94	0.81	0.81	0.81
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	9	2	42	2	4	7	378	837	2	7	554	73
RTOR Reduction (vph)	0	32	0	0	5	0	0	0	0	0	28	0
Lane Group Flow (vph)	9	12	0	0	8	0	378	839	0	7	599	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0	16.0			16.0		36.0	36.0		36.0	36.0	
Effective Green, g (s)	16.0	16.0			16.0		36.0	36.0		36.0	36.0	
Actuated g/C Ratio	0.27	0.27			0.27		0.60	0.60		0.60	0.60	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	372	809			813		481	3050		376	2998	
v/s Ratio Prot		0.00						0.16			0.12	
v/s Ratio Perm	c0.01				0.00		c0.47			0.01		
v/c Ratio	0.02	0.01			0.01		0.79	0.27		0.02	0.20	
Uniform Delay, d1	16.2	16.2			16.2		9.1	5.7		4.9	5.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.0			0.0		12.2	0.2		0.1	0.1	
Delay (s)	16.4	16.2			16.2		21.3	6.0		4.9	5.6	
Level of Service	B	B			B		C	A		A	A	
Approach Delay (s)		16.3			16.2			10.7			5.6	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	7	43	94	75	16	915	1177	107	10	317	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0		5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.91	1.00	1.00	0.91	
Frt	1.00	0.87		1.00	0.97		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3085		1770	3446		3891	5085	1794	2006	4886	
Flt Permitted	0.68	1.00		0.40	1.00		0.31	1.00	1.00	0.33	1.00	
Satd. Flow (perm)	1444	3085		745	3446		1260	5085	1794	687	4886	
Peak-hour factor, PHF	0.80	0.80	0.80	0.93	0.93	0.93	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	60	10	59	111	89	19	1274	1639	149	12	371	131
RTOR Reduction (vph)	0	53	0	0	11	0	0	0	67	0	87	0
Lane Group Flow (vph)	60	16	0	111	97	0	1274	1639	82	12	415	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases		4		3	8		1	6			2	
Permitted Phases	4			8			6		6	2		
Actuated Green, G (s)	7.1	7.1		16.9	16.9		35.8	35.8	35.8	12.3	12.3	
Effective Green, g (s)	7.1	7.1		16.9	16.9		35.8	35.8	35.8	12.3	12.3	
Actuated g/C Ratio	0.11	0.11		0.26	0.26		0.55	0.55	0.55	0.19	0.19	
Clearance Time (s)	6.0	6.0		5.5	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0		2.5	4.0		2.5	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	158	339		263	900		1409	2814	993	131	929	
v/s Ratio Prot		0.01		c0.03	0.03		c0.24	0.32			0.09	
v/s Ratio Perm	0.04			c0.08			c0.26		0.05	0.02		
v/c Ratio	0.38	0.05		0.42	0.11		0.90	0.58	0.08	0.09	0.45	
Uniform Delay, d1	26.8	25.8		19.1	18.2		10.6	9.5	6.8	21.6	23.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.1	0.1		0.8	0.1		8.5	0.4	0.0	0.4	0.5	
Delay (s)	28.8	25.9		19.9	18.2		19.1	9.9	6.8	22.0	23.7	
Level of Service	C	C		B	B		B	A	A	C	C	
Approach Delay (s)		27.2			19.1			13.6			23.6	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	64.7	Sum of lost time (s)	11.5
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	264	58	85	281	60	206	144	54	250	123	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3346	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3346	
Peak-hour factor, PHF	0.78	0.78	0.78	0.82	0.82	0.82	0.75	0.75	0.75	0.71	0.71	0.71
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	172	372	82	114	377	80	302	211	79	387	191	33
RTOR Reduction (vph)	0	0	66	0	0	63	0	0	70	0	20	0
Lane Group Flow (vph)	172	372	16	114	377	17	302	211	9	387	204	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	4.0	12.7	12.7	5.4	14.1	14.1	12.5	8.0	8.0	16.5	12.0	
Effective Green, g (s)	4.0	12.7	12.7	5.4	14.1	14.1	12.5	8.0	8.0	16.5	12.0	
Actuated g/C Ratio	0.06	0.19	0.19	0.08	0.21	0.21	0.19	0.12	0.12	0.25	0.18	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	205	670	340	142	744	586	363	422	189	421	598	
v/s Ratio Prot	0.05	0.11		c0.06	c0.11	0.01	0.16	c0.06		c0.23	c0.06	
v/s Ratio Perm			0.01						0.01			
v/c Ratio	0.84	0.56	0.05	0.80	0.51	0.03	0.83	0.50	0.05	0.92	0.34	
Uniform Delay, d1	31.2	24.6	22.2	30.3	23.4	21.1	26.3	27.7	26.2	24.7	24.1	
Progression Factor	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	23.9	1.0	0.1	25.6	0.5	0.0	14.3	0.3	0.0	24.4	0.1	
Delay (s)	55.1	25.6	22.8	56.0	24.0	21.1	40.6	28.0	26.2	49.1	24.2	
Level of Service	E	C	C	E	C	C	D	C	C	D	C	
Approach Delay (s)		33.3			30.0			34.2			39.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	34.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	67.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	305	4	69	299
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.61	0.61	0.86	0.86	0.85	0.85
Hourly flow rate (vph)	5	43	390	5	89	387
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	765	198			395	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	765	198			395	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			92	
cM capacity (veh/h)	314	810			1160	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	49	260	135	218	258
Volume Left	5	0	0	89	0
Volume Right	43	0	5	0	0
cSH	689	1700	1700	1160	1700
Volume to Capacity	0.07	0.15	0.08	0.08	0.15
Queue Length 95th (ft)	6	0	0	6	0
Control Delay (s)	10.6	0.0	0.0	3.8	0.0
Lane LOS	B			A	
Approach Delay (s)	10.6	0.0		1.8	
Approach LOS	B				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

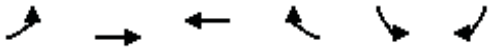
Intersection	
Intersection Delay (sec/veh):	1.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	151	363	312	17	5	3
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.75	0.75	0.50	0.50
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	172	412	416	23	10	6
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	439	0	0	0	965	208
Stage 1	0	0	0	0	416	0
Stage 2	0	0	0	0	549	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1116	-	-	-	253	797
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	542	-
Mov Capacity-1 Maneuver	1116	-	-	-	214	797
Mov Capacity-2 Maneuver	-	-	-	-	214	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	458.5	-

Approach	SE	NW	SW
HCM Control Delay (s)	2.6	0	17.725
HCM LOS	A	A	C

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					214	797
HCM Control Delay (s)	-	-	8.811	-	22.6	9.6
HCM Lane VC Ratio	0	-	0.154	-	0.047	0.008
HCM Lane LOS	-	-	A	-	C	A
HCM 95th Percentile Queue (veh)	0	-	0.543	-	0.146	0.023



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	40	371	37	278	143	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	444	44	332	171	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	377				362	22
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	377				362	22
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				71	98
cM capacity (veh/h)	1178				586	1050

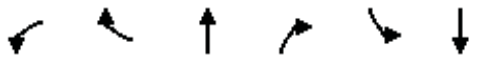
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1	SB 2
Volume Total	48	222	222	22	22	332	171	24
Volume Left	48	0	0	0	0	0	171	0
Volume Right	0	0	0	0	0	332	0	24
cSH	1178	1700	1700	1700	1700	1700	586	1050
Volume to Capacity	0.04	0.13	0.13	0.01	0.01	0.20	0.29	0.02
Queue Length 95th (ft)	3	0	0	0	0	0	30	2
Control Delay (s)	8.2	0.0	0.0	0.0	0.0	0.0	13.7	8.5
Lane LOS	A						B	A
Approach Delay (s)	0.8			0.0			13.0	
Approach LOS							B	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh)	5.8
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	573	127	206
Demand Flow Rate (pc/h)	584	129	210
Vehicles Circulating (pc/h)	149	74	124
Vehicles Exiting (pc/h)	185	659	74
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	6.5	4.4	4.5
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	LTR
Right Turn Channelized				Yield		
Lane Utilization	0.469	0.531	1.000		0.529	0.471
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	274	310	124	5	111	99
Capacity, Entry Lane (pc/h)	1010	1018	1073	1049	1030	1036
Entry HV Adjustment Factor	0.983	0.980	0.980	0.980	0.984	0.978
Flow Rate, Entry (vph)	269	304	122	5	109	97
Capacity, Entry (vph)	993	997	1052	1029	1013	1013
Volume to Capacity Ratio	0.271	0.305	0.116	0.005	0.108	0.096
Control Delay (sec/veh)	6.3	6.7	4.4	3.5	4.5	4.4
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	1	1	0	0	0	0



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	31	33	20	60	154
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	37	39	24	72	184
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	379	32			63	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	379	32			63	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	96			95	
cM capacity (veh/h)	568	1035			1537	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	50	26	37	256
Volume Left	13	0	0	72
Volume Right	37	0	24	0
cSH	852	1700	1700	1537
Volume to Capacity	0.06	0.02	0.02	0.05
Queue Length 95th (ft)	5	0	0	4
Control Delay (s)	9.5	0.0	0.0	2.4
Lane LOS	A			A
Approach Delay (s)	9.5	0.0		2.4
Approach LOS	A			

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

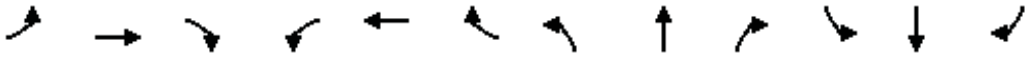
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	103	69	298	138	192	1239
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.94	0.94	0.90	0.90
Hourly flow rate (vph)	151	101	349	161	235	1514
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1575	174			510	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1575	174			510	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	88			78	
cM capacity (veh/h)	78	839			1051	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	252	174	174	161	235	757	757
Volume Left	151	0	0	0	235	0	0
Volume Right	101	0	0	161	0	0	0
cSH	123	1700	1700	1700	1051	1700	1700
Volume to Capacity	2.04	0.10	0.10	0.09	0.22	0.45	0.45
Queue Length 95th (ft)	517	0	0	0	21	0	0
Control Delay (s)	555.7	0.0	0.0	0.0	9.4	0.0	0.0
Lane LOS	F				A		
Approach Delay (s)	555.7	0.0			1.3		
Approach LOS	F						

Intersection Summary			
Average Delay	56.7		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	115	52	27	121	159	44	962	111	71	501	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	15	12	12	12	12	12	12
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1794	1770	1863	1742	1770	3539	1583	1770	3539	1583
Flt Permitted	0.66	1.00	1.00	0.66	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1231	1863	1794	1236	1863	1742	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.86	0.86	0.86	0.88	0.88	0.88	0.86	0.86	0.86	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	3	147	67	34	151	199	56	1230	142	85	599	7
RTOR Reduction (vph)	0	0	58	0	0	172	0	0	75	0	0	4
Lane Group Flow (vph)	3	147	9	34	151	27	56	1230	67	85	599	3
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)	8.1	8.1	8.1	8.1	8.1	8.1	4.7	28.7	28.7	4.6	28.6	28.6
Effective Green, g (s)	8.1	8.1	8.1	8.1	8.1	8.1	4.7	28.7	28.7	4.6	28.6	28.6
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.08	0.48	0.48	0.08	0.47	0.47
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6.0	6.0	1.2	6.0	6.0
Lane Grp Cap (vph)	165	250	241	166	250	234	138	1682	752	135	1676	750
v/s Ratio Prot		0.08			c0.08		0.03	c0.35		0.05	c0.17	
v/s Ratio Perm	0.00		0.01	0.03		0.02			0.04			0.00
v/c Ratio	0.02	0.59	0.04	0.20	0.60	0.11	0.41	0.73	0.09	0.63	0.36	0.00
Uniform Delay, d1	22.7	24.6	22.8	23.3	24.6	23.0	26.5	12.7	8.7	27.1	10.1	8.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	2.3	0.0	0.2	2.8	0.1	0.7	2.3	0.1	6.5	0.4	0.0
Delay (s)	22.7	26.9	22.8	23.5	27.4	23.1	27.2	15.1	8.8	33.5	10.4	8.4
Level of Service	C	C	C	C	C	C	C	B	A	C	B	A
Approach Delay (s)		25.5			24.8			14.9			13.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.4	Sum of lost time (s)	19.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	42	259	28	40	131	4	115	50	82	7	11	12
Peak Hour Factor	0.95	0.95	0.95	0.67	0.67	0.67	0.75	0.75	0.75	0.63	0.63	0.63
Hourly flow rate (vph)	49	300	32	66	215	7	169	73	120	12	19	21

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	381	281	7	242	120	52
Volume Left (vph)	49	66	0	169	0	12
Volume Right (vph)	32	0	7	0	120	21
Hadj (s)	0.01	0.15	-0.67	0.38	-0.67	-0.16
Departure Headway (s)	6.4	6.7	5.8	7.1	6.0	7.4
Degree Utilization, x	0.68	0.52	0.01	0.48	0.20	0.11
Capacity (veh/h)	545	517	579	476	559	409
Control Delay (s)	21.6	15.5	7.7	15.2	9.4	11.2
Approach Delay (s)	21.6	15.3		13.3		11.2
Approach LOS	C	C		B		B

Intersection Summary				
Delay	16.6			
HCM Level of Service	C			
Intersection Capacity Utilization	56.0%	ICU Level of Service		B
Analysis Period (min)	15			

Intersection	
Intersection Delay (sec/veh)	18.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	53	190	24	79	109	44	79	332	260	34	126	19
Peak Hour Factor	0.83	0.83	0.83	0.82	0.82	0.82	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	64	229	29	96	133	54	88	369	289	38	140	21
Number of Lanes	1	2	0	1	1	1	1	1	1	1	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	3	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	3	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	3	3
HCM Control Delay	14.3	14	22.7	13.1
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	0%	0%	100%	73%	0%	100%	0%	0%	100%
Volume Right (%)	0%	0%	100%	0%	0%	27%	0%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	79	332	260	53	127	87	79	109	44	34	84
Left Turning Volume	0	332	0	0	127	63	0	109	0	0	84
Through Volume	0	0	260	0	0	24	0	0	44	0	0
Right Turning Volume	79	0	0	53	0	0	79	0	0	34	0
Lane Flow Rate	88	369	289	64	153	105	96	133	54	38	93
Geometry Group	8	8	8	8	8	8	8	8	8	8	8
Degree of Utilization, X	0.192	0.755	0.535	0.155	0.349	0.235	0.236	0.307	0.114	0.094	0.22
Departure Headway, Hd	7.868	7.368	6.668	8.726	8.226	8.034	8.826	8.326	7.626	9	8.5
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	456	491	540	411	436	446	407	431	468	397	421
Service Time	5.622	5.122	4.422	6.492	5.992	5.799	6.594	6.094	5.394	6.773	6.273
HCM Lane V/C Ratio	0.193	0.752	0.535	0.156	0.351	0.235	0.236	0.309	0.115	0.096	0.221
HCM Control Delay	12.5	29.6	16.9	13.1	15.4	13.3	14.3	14.8	11.4	12.7	13.7
HCM Lane LOS	B	D	C	B	C	B	B	B	B	B	B
HCM 95th Percentile Queue	0.7	9.2	3.4	0.6	1.6	0.9	0.9	1.3	0.4	0.3	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	10	249	2	1	10	47	475	1	15	802	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95		1.00	0.91		1.00	0.91	
Frt	1.00	0.86			0.88		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3029			3094		1770	5084		1770	5066	
Flt Permitted	0.75	1.00			0.92		0.26	1.00		0.43	1.00	
Satd. Flow (perm)	1392	3029			2873		480	5084		797	5066	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	36	12	298	2	1	12	56	568	1	18	959	25
RTOR Reduction (vph)	0	50	0	0	10	0	0	1	0	0	6	0
Lane Group Flow (vph)	36	260	0	0	5	0	56	568	0	18	978	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.0	14.0			14.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)	14.0	14.0			14.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio	0.33	0.33			0.33		0.48	0.48		0.48	0.48	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	464	1010			958		229	2421		380	2412	
v/s Ratio Prot		c0.09						0.11			c0.19	
v/s Ratio Perm	0.03				0.00		0.12			0.02		
v/c Ratio	0.08	0.26			0.01		0.24	0.23		0.05	0.41	
Uniform Delay, d1	9.6	10.2			9.3		6.5	6.5		5.9	7.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.6			0.0		2.5	0.2		0.2	0.5	
Delay (s)	9.9	10.8			9.4		9.0	6.7		6.1	7.6	
Level of Service	A	B			A		A	A		A	A	
Approach Delay (s)		10.7			9.4			6.9			7.6	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	42.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	36	303	137	18	16	337	391	117	37	1127	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12	16	12	16	16	12	12
Total Lost time (s)	6.0	6.0		5.5	6.0		4.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.91	1.00	1.00	0.91	
Frt	1.00	0.87		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	2006	3065		1770	3287		3891	5085	1794	2006	5052	
Flt Permitted	0.73	1.00		0.23	1.00		0.12	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	1540	3065		437	3287		501	5085	1794	968	5052	
Peak-hour factor, PHF	0.68	0.68	0.68	0.93	0.93	0.93	0.86	0.86	0.86	0.81	0.81	0.81
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	189	58	490	162	21	19	431	500	150	50	1530	69
RTOR Reduction (vph)	0	175	0	0	12	0	0	0	77	0	5	0
Lane Group Flow (vph)	189	373	0	162	28	0	431	500	73	50	1594	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases		4		3	8		1	6			2	
Permitted Phases	4			8			6		6	2		
Actuated Green, G (s)	18.8	18.8		30.3	30.3		39.7	39.7	39.7	28.7	28.7	
Effective Green, g (s)	18.8	18.8		30.3	30.3		39.7	39.7	39.7	28.7	28.7	
Actuated g/C Ratio	0.23	0.23		0.37	0.37		0.48	0.48	0.48	0.35	0.35	
Clearance Time (s)	6.0	6.0		5.5	6.0		4.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.0	4.0		2.5	4.0		3.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)	353	703		259	1215		532	2462	869	339	1768	
v/s Ratio Prot		0.12		c0.05	0.01		c0.07	0.10			c0.32	
v/s Ratio Perm	0.12			c0.19			0.32		0.04	0.05		
v/c Ratio	0.54	0.91dr		0.63	0.02		0.81	0.20	0.08	0.15	0.90	
Uniform Delay, d1	27.8	27.7		19.0	16.4		16.8	12.1	11.4	18.3	25.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.0	1.0		4.0	0.0		9.1	0.1	0.1	0.3	7.0	
Delay (s)	29.8	28.7		23.0	16.4		25.8	12.2	11.4	18.5	32.3	
Level of Service	C	C		C	B		C	B	B	B	C	
Approach Delay (s)		29.0			21.7			17.5			31.8	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	26.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	82.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	312	312	237	76	80	46	180	360	93	16	63	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	12	15	12	12	11	11	13
Total Lost time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	0.88	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3416	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	3539	1794	1770	3539	2787	1947	3539	1583	1711	3416	
Peak-hour factor, PHF	0.89	0.89	0.89	0.79	0.79	0.79	0.81	0.81	0.81	0.76	0.76	0.76
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	386	386	293	106	111	64	244	489	126	23	91	1
RTOR Reduction (vph)	0	0	221	0	0	51	0	0	91	0	1	0
Lane Group Flow (vph)	386	386	72	106	111	13	244	489	35	23	91	0
Turn Type	Prot	NA	Perm	Prot	NA	Prot	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	6	3	8		7	4	
Permitted Phases			2						8			
Actuated Green, G (s)	8.3	16.3	16.3	5.2	13.2	13.2	9.3	18.1	18.1	2.0	10.8	
Effective Green, g (s)	8.3	16.3	16.3	5.2	13.2	13.2	9.3	18.1	18.1	2.0	10.8	
Actuated g/C Ratio	0.13	0.25	0.25	0.08	0.20	0.20	0.14	0.27	0.27	0.03	0.16	
Clearance Time (s)	6.0	6.5	6.5	6.0	6.5	6.5	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	1.5	3.0	3.0	1.5	3.0	3.0	1.5	1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	431	873	442	139	707	557	274	969	433	52	558	
v/s Ratio Prot	c0.11	c0.11		0.06	0.03	0.00	c0.13	c0.14		0.01	0.03	
v/s Ratio Perm			0.04						0.02			
v/c Ratio	0.90	0.44	0.16	0.76	0.16	0.02	0.89	0.50	0.08	0.44	0.16	
Uniform Delay, d1	28.5	21.1	19.5	29.8	21.9	21.3	27.9	20.2	17.8	31.5	23.8	
Progression Factor	1.00	1.00	1.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	20.1	0.4	0.2	19.7	0.1	0.0	27.5	0.2	0.0	2.2	0.1	
Delay (s)	48.6	21.4	20.0	49.5	22.0	21.3	55.4	20.4	17.8	33.7	23.8	
Level of Service	D	C	C	D	C	C	E	C	B	C	C	
Approach Delay (s)		30.9			32.2			30.0			25.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	18.5
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	69	339	1	22	407
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.90	0.90	0.88	0.88
Hourly flow rate (vph)	7	95	414	1	28	509
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	724	208			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	724	208			416	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	88			98	
cM capacity (veh/h)	352	798			1140	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	102	276	139	197	339
Volume Left	7	0	0	28	0
Volume Right	95	0	1	0	0
cSH	735	1700	1700	1140	1700
Volume to Capacity	0.14	0.16	0.08	0.02	0.20
Queue Length 95th (ft)	12	0	0	2	0
Control Delay (s)	10.7	0.0	0.0	1.3	0.0
Lane LOS	B			A	
Approach Delay (s)	10.7	0.0		0.5	
Approach LOS	B				

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

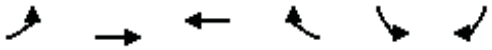
Intersection	
Intersection Delay (sec/veh):	1.8

Movement	SEL	SET	NWT	NWR	SWL	SWR
Volume (vph)	19	410	398	10	19	129
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	50			60	0	95
Median Width		11	11		14	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.90	0.90	0.86	0.86
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	26	569	442	11	22	150
Number of Lanes	1	2	2	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	453	0	0	0	780	221
Stage 1	0	0	0	0	442	0
Stage 2	0	0	0	0	338	0
Follow-up Headway	2.22	-	0	0	3.52	3.32
Pot Capacity-1 Maneuver	1105	-	-	-	332	782
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	694	-
Mov Capacity-1 Maneuver	1105	-	-	-	324	782
Mov Capacity-2 Maneuver	-	-	-	-	324	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	677.3	-

Approach	SE	NW	SW
HCM Control Delay (s)	0.4	0	11.496
HCM LOS	A	A	B

Lane	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (vph)					324	782
HCM Control Delay (s)	-	-	8.338	-	16.9	10.7
HCM Lane VC Ratio	0	-	0.024	-	0.068	0.192
HCM Lane LOS	-	-	A	-	C	B
HCM 95th Percentile Queue (veh)	0	-	0.073	-	0.218	0.706



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	30	81	317	210	348	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	97	379	228	378	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	607				493	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	607				493	190
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				23	93
cM capacity (veh/h)	967				488	820

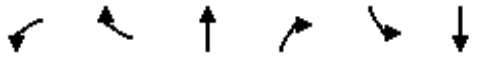
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1	SB 2
Volume Total	33	48	48	190	190	228	378	54
Volume Left	33	0	0	0	0	0	378	0
Volume Right	0	0	0	0	0	228	0	54
cSH	967	1700	1700	1700	1700	1700	488	820
Volume to Capacity	0.03	0.03	0.03	0.11	0.11	0.13	0.77	0.07
Queue Length 95th (ft)	3	0	0	0	0	0	172	5
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	0.0	33.4	9.7
Lane LOS	A						D	A
Approach Delay (s)	2.2			0.0			30.4	
Approach LOS							D	

Intersection Summary			
Average Delay	11.5		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay (sec/veh)	5.2
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	2	1	2
Conflicting Circle Lanes	2	2	2
Adjusted Approach Flow (vph)	242	463	75
Demand Flow Rate (pc/h)	247	472	76
Vehicles Circulating (pc/h)	21	87	311
Vehicles Exiting (pc/h)	366	181	87
Follow-Up Headway (s)	3.186	3.186	3.186
Ped Vol. Crossing Leg (#/hr)	0	0	0
Ped Capacity Adjustment	1.000	1.000	1.000
Approach Delay (sec/veh)	4.3	5.9	4.5
Approach LOS	A	A	A

Lane	Left	Right	Left	Bypass	Left	Right
Designated moves	LT	TR	T	R	L	LTR
Assumed Moves	LT	TR	T	R	L	TR
Right Turn Channelized				Yield		
Lane Utilization	0.470	0.530	1.000		0.276	0.724
Critical Headway (s)	4.293	4.113	4.113		4.293	4.113
Entry Flow Rate (pc/h)	116	131	311	161	21	55
Capacity, Entry Lane (pc/h)	1112	1113	1063	1036	895	909
Entry HV Adjustment Factor	0.980	0.979	0.980	0.980	1.000	0.982
Flow Rate, Entry (vph)	114	128	305	158	21	54
Capacity, Entry (vph)	1090	1090	1042	1015	895	892
Volume to Capacity Ratio	0.104	0.118	0.293	0.156	0.023	0.061
Control Delay (sec/veh)	4.2	4.3	6.3	5.0	4.2	4.6
Level of Service	A	A	A	A	A	A
95th-Percentile Queue (veh)	0	0	1	1	0	0



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	25	75	175	15	45	28
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	82	209	16	49	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	341	209			226	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	341	209			226	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	90			96	
cM capacity (veh/h)	632	831			1343	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	109	209	16	82
Volume Left	27	0	0	49
Volume Right	82	0	16	0
cSH	770	1700	1700	1343
Volume to Capacity	0.14	0.12	0.01	0.04
Queue Length 95th (ft)	12	0	0	3
Control Delay (s)	10.4	0.0	0.0	4.7
Lane LOS	B			A
Approach Delay (s)	10.4	0.0		4.7
Approach LOS	B			

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	176	106	1067	108	59	515
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.86	0.86	0.80	0.80	0.95	0.95
Hourly flow rate (vph)	225	136	1467	148	68	596
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1902	734			1616	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1902	734			1616	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	63			83	
cM capacity (veh/h)	50	363			400	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	361	734	734	148	68	298	298
Volume Left	225	0	0	0	68	0	0
Volume Right	136	0	0	148	0	0	0
cSH	75	1700	1700	1700	400	1700	1700
Volume to Capacity	4.84	0.43	0.43	0.09	0.17	0.18	0.18
Queue Length 95th (ft)	Err	0	0	0	15	0	0
Control Delay (s)	Err	0.0	0.0	0.0	15.9	0.0	0.0
Lane LOS	F				C		
Approach Delay (s)	Err	0.0			1.6		
Approach LOS	F						

Intersection Summary			
Average Delay	1366.1		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		