



I-375 EXPANDED STUDY AREA ANALYSIS TECHNICAL MEMORANDUM

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1 Introduction

This memorandum is intended to document the traffic analysis process and recommendations of the expanded study area after the dynamic traffic assignment (DTA) modeling was completed.

The removal of the Gratiot Avenue Connector and conversion of I-375 from a freeway to a boulevard, along with other associated improvements, would result in vehicular rerouting that would be widely dispersed. However, there are some key corridors that may exhibit a more concentrated increase in volumes as a result. The intent of the expanded study area analysis is to identify alternate route corridors within the central business district (CBD) that may experience more traffic as a result of the conversion and analyze those locations using Synchro or Highway Capacity Software (HCS). The analysis results will confirm that the locations can support the increased volume or will provide recommendations for improvements if the volumes can't be supported. If large improvements are shown to be needed, additional assumptions in the dynamic traffic assignment model may be needed.

Per the I-375 Design Criteria, Level of Service (LOS) D is considered acceptable for the city grid, while LOS C is acceptable for the freeway and system ramps. The term "acceptable" in this document refers to these standards.

This analysis was conducted in the expanded study area to supplement Vissim modeling that was used for analysis of the primary study area, as documented in *I-375 Vissim Methods and Assumptions*.

2 Recommended Approach

The maps provided in Appendix A highlight any segments in green that may have an average increase of 200 vehicles per hour (vph) or more during the peak period as a result of the project. A baseline of 200 vph was chosen because it brings to light a subset of reroutes that are most likely to be taken. This 200 vph value was developed as 10% of the average saturation flow rate of the DTA model, which was approximately 2,000 vehicles per hour per lane (vphpl). Increases of fewer than 200 vph are unlikely to show significant changes in level of service. Note that some segments highlighted in green can be attributed to "modeling noise", which indicate unexplained volume increases that are unlikely to be directly related to the proposed changes. The study team analyzed all corridors within the study area to determine whether information presented was modeling noise or vehicular reroutes caused by the project.

The DTA model was also used to determine the corridors that could see delay of 10 seconds or more. Nearly all of these segments are contained within either the primary or expanded study area.

Based on the DTA modeling effort, the study team analyzed several intersections and freeway segments. The limits of the expanded study area are documented in the following sections.

2.1 HCS Analysis Recommendation

The following corridor was analyzed using HCS as part of the expanded study area analysis.

M-10 between Martin Luther King Blvd and Jefferson Avenue

The DTA model showed a potential increase in diverted traffic along M-10 in the Preferred Alternative in both the AM and PM conditions. The limits for the analysis included both northbound and southbound M-10 from Martin Luther King Blvd, north of I-75, and continue south until M-10 becomes Jefferson Avenue.

There are a total of 18 HCS segments that were analyzed in the northbound and southbound segments along M-10.

2.2 Synchro Analysis Recommendation

Signalized intersections were analyzed in the following corridors based on the DTA analysis:

1. Brush Street from I-75 to Jefferson Avenue
2. Mack Avenue from I-375 to St. Aubin Street
3. Randolph Street from Gratiot Avenue to Jefferson Avenue
4. Beaubien Street. from Gratiot Avenue to Jefferson Avenue
5. Congress Street from M-10 to Beaubien Street
6. Woodward Avenue from Montcalm Street to Gratiot Avenue

There are 34 signalized intersections that were analyzed within these corridors.

3 Data Collection

The following data was collected to conduct the analysis of the expanded study area.

3.1 Traffic Counts

Counts were collected from a variety of data sources.

Vehicle classification and turning movement counts were collected in October and November 2016 at the following locations:

- | | |
|------------------------------------|---|
| 1. Beaubien St. & Gratiot Ave. | 7. Jefferson Ave. & Griswold St. |
| 2. Congress St. & First St. | 8. Randolph St. & Cadillac Square North |
| 3. Congress St. & Griswold St. | 9. Randolph St. & Cadillac Square South |
| 4. Congress St. & Shelby St. | 10. Randolph St. & Congress St. |
| 5. Congress St. & Washington Blvd. | |
| 6. Gratiot Ave. & Brush St. | |

11. Randolph St. & Gratiot Ave.
12. Randolph St. & Lafayette Ave.

13. Randolph St. & Larned St.
14. Randolph St. & Monroe Ave.

Additional vehicle classification and turning movement counts were collected in September 2018 at the following locations:

- | | |
|----------------------------------|----------------------------------|
| 1. Beaubien St. & Congress St. | 9. Brush St. & Larned St. |
| 2. Beaubien St. & Fort St. | 10. Brush St. & Madison Ave. |
| 3. Beaubien St. & Lafayette Ave. | 11. Brush St. & Monroe Ave. |
| 4. Beaubien St. & Larned St. | 12. Brush St. & Montcalm St. |
| 5. Beaubien St. & Monroe Ave. | 13. Mack Ave. & Russell St. |
| 6. Brush St. & Adams St. | 14. Congress St. & Woodward Ave. |
| 7. Brush St. & Beacon St. | 15. Congress St. & Bates St. |
| 8. Brush St. & Congress St. | 16. Mack Ave. & St Aubin St. |

Additional vehicle classification and turning movement counts were collected in October 2018 at the following locations along Woodward Ave.:

1. Woodward Ave. & Montcalm St.
2. Woodward Ave. & Elizabeth St.
3. Woodward Ave. & Adams Ave.
4. Woodward Ave. & Park Ave.
5. Woodward Ave. & John R. St.
6. Woodward Ave. & Grand River Ave.
7. Woodward Ave. & Gratiot Ave.

Freeway and ramp counts, in 15-minute intervals, were taken on various dates in 2015 and 2016 on the freeway and the collector/distributor (C/D) road.

3.2 Signal Data

Existing signal timing data was collected from 2014 signal timing permits and a 2017 study. The study from 2017 included pre-developed Synchro models that were used in the analysis. The seven signalized intersections along the Woodward Avenue corridor were not included in the previous developed Synchro models. The signal timing permits were not utilized for the Woodward Avenue signal timings but were optimized based on existing and future traffic volumes. Not including the timing permits for Woodward Avenue was determined to be acceptable since the LOS comparisons for the corridor are against the No-Build and Build optimized signal timings and not the current signal timings. All pedestrian facilities at the traffic signals along Woodward Avenue were accounted for in the signal timings.

Signal data from 2014 was collected at the following locations:

- | | |
|------------------------------------|---------------------------------|
| 1. Congress St. & First St. | 4. Congress St. & Shelby St. |
| 2. Congress St. & Cass St. | 5. Congress St. & Griswold St. |
| 3. Congress St. & Washington Blvd. | 6. Congress St. & Woodward Ave. |

7. Congress St. & Bates St.
8. Brush St. & Larned St.
9. Brush St. & Congress St.
10. Brush St. & Monroe Ave.
11. Brush St. & Madison Ave.
12. Beaubien St. & Larned St.

13. Beaubien St. & Congress St.
14. Beaubien St. & Fort St.
15. Beaubien St. & Lafayette Ave.
16. Beaubien St. & Monroe Ave.
17. Mack & Russell St.
18. Mack & St Aubin St.

Data from 2017 was collected at the following locations:

1. Congress St. & First St.
2. Congress St. & Washington Blvd.
3. Congress St. & Shelby St.
4. Congress St. & Griswold St.
5. Congress St. & Woodward Ave.
6. Congress St. & Bates St.
7. Jefferson Ave. & Griswold St.
8. Randolph St. & Larned St.
9. Randolph St. & Congress St.
10. Randolph St. & Cadillac Square
11. Randolph St. & Lafayette Ave.
12. Randolph St. & Monroe Ave.
13. Randolph St. & Gratiot Ave.
14. Brush St. & Larned St.
15. Brush St. & Congress St.
16. Brush St. & Monroe Ave.
17. Brush St. & Gratiot Ave.
18. Brush St. & Madison Ave.
19. Beaubien St. & Larned St.
20. Beaubien St. & Congress St.
21. Beaubien St. & Gratiot Ave.

Where signal data was available from both the 2014 and 2017 sources, the 2017 sources took precedent.

4 Synchro Development Methodology

4.1 Develop Existing Models

An existing condition Synchro model was created to use as a baseline for the Future No-Build (FNB) and Preferred Alternative scenarios. Synchro files were obtained from MDOT and existing roadway geometry was verified. Signal timing permits were also obtained and the existing signal timings were entered into the Synchro model. The seven traffic signals along Woodward Avenue from Montcalm Street to Gratiot Avenue were added to the Synchro files obtained from MDOT due to Woodward Avenue being an alternate route under the Preferred Alternative. Once traffic counts were completed, volumes for the study area were inputted into AM and PM versions of the Synchro model.

4.2 Develop Future No-Build Models

The FNB used the same geometry as the existing condition but applied a growth factor to the volumes. The FNB scenario used a growth factor of 0.5% per year compounded from year 2017 to 2040. Signal timings were optimized to better suit these higher volumes.

4.3 Develop Future Preferred Alternative Models

The Preferred Alternative used proposed geometry and forecasted traffic volumes (see the *I-375 Traffic Forecasting Methodology Technical Memorandum* for further details). Similar to the FNB scenario, signal timings were optimized to suit the new volumes.

The main geometric changes implemented in the Synchro Preferred Alternative scenario were the conversion of select streets from one-way to two-way. The roads converted from one-way to two-way are as follows:

- Lafayette Avenue – one lane in each direction from Randolph Street to Beaubien Street
- Fort Street – one lane in each direction from Randolph Street to Brush Street
- Brush Street – one lane in each direction from Congress Street to Gratiot Avenue
- Beaubien Street – one lane each direction from Clinton Street to Madison Avenue

5 Synchro Results

Section 2 of this document identified a Synchro study area containing 34 signalized intersections. High-level results for these intersections can be found in Figure 1. Detailed results can be found in Table 5-1 through Table 5-6 summarizes the levels of service for the Woodward Avenue corridor for the existing conditions, Future No-Build, and Preferred Alternative. The delay breakdown by movement is included in Appendix B for the signalized intersections.

Figure 1: Number of Intersections per LOS Category

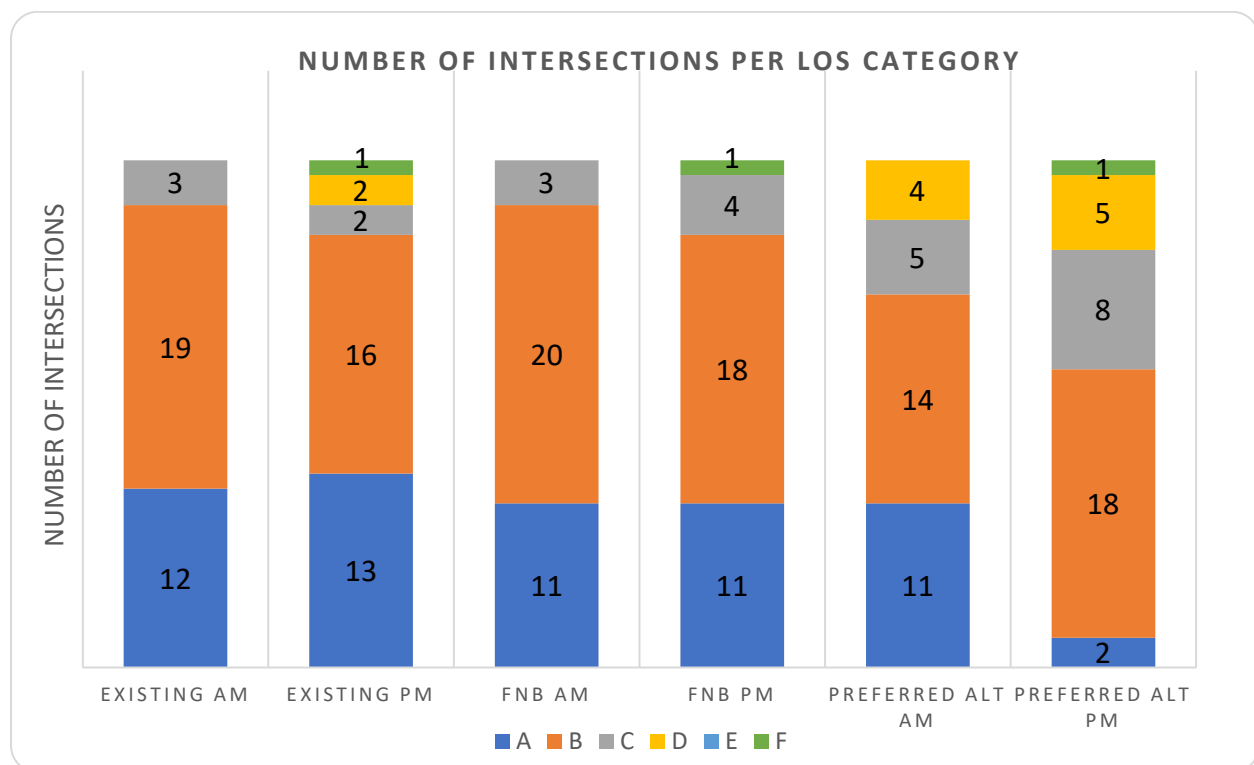


Figure 1 shows that the majority of the intersections across all scenarios would be LOS A-D. The AM and PM Preferred Alternative would have the majority of their intersections

with LOS A-D, but a few intersections may have a LOS E-F. This is partially due to forecasted increase in traffic volume and to the change in I-375 from a freeway to a surface street – there are more options for traffic to divert to other routes, increasing traffic at intersections in the nearby area.

Table 5-1 through Table 5-6 summarizes the levels of service for the Woodward Avenue corridor for the existing conditions, Future No-Build, and Preferred Alternative.

Table 5-6 detail the LOS for each intersection within each scenario. The tables are split by corridor.

5.1 Brush Street Corridor

Table 5-1: Brush Street Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Brush/Adams	A	A	A	A	A	B
Brush/Beacon	A	A	A	A	A	A
Brush/Congress	B	B	B	B	B	C
Brush/Larned	B	B	B	B	C	D
Brush/Madison	B	B	B	B	B	B
Brush/Monroe	B	B	B	B	B	B
Brush/Gratiot	B	B	B	B	D	C

All intersections along the Brush Street corridor have a LOS of D or greater for all scenarios except for the AM Preferred Alternative scenario at the Brush Street and Gratiot Avenue. The intersection is expected to be a LOS E in large part because of the traffic volume making a westbound left turn from Gratiot Avenue to Brush Street. The AM Preferred Alternative scenario shows 211 vehicles making the left turn and may cause operational issues at the intersection. The pavement markings and signage indicate left turns are not allowed. The operations at the intersection will improve to LOS D if a left turn lane with storage is constructed to provide protection for the westbound left turn from Gratiot Avenue to Brush Street. The build results assume the left turn storage lane on the westbound approach.

Currently, Congress Street between Brush Street and Beaubien Street is one-way and has a four-lane cross section, with two travel lanes and two parking lanes. When analyzing this configuration, the intersection of Brush St. & Congress St. operates at LOS F. In order to improve the PM Build scenario LOS of the Brush St./Congress St. intersection from LOS F to an acceptable level, it was assumed to turn one parking lane into a travel lane, creating three travel lanes and only one parking lane along Congress St. from Beaubien St. to Brush St. The changes to the westbound approach were incorporated into the Synchro model and the intersection results are reflected in Table

5-1. The traffic should be monitored in the future as traffic may utilize nearby routes and changing the parking lane into a westbound travel lane may not be necessary in the PM peak period.

5.2 Mack Avenue Corridor

Table 5-2 summarizes the levels of service for the Mack Avenue corridor for the existing conditions, Future No-Build, and Preferred Alternative. All intersections along Mack Avenue either have or are expected to have a LOS of D or better for all scenarios.

Table 5-2: Mack Avenue Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Mack/St. Aubin	B	B	B	B	D	D
Mack/Russell	A	A	B	A	B	B

While the intersection of Mack Avenue at St. Aubin Street is expected to have a LOS D in the AM and PM peak hour with the Preferred Alternative, the northbound approach is expected to have a LOS F in the AM peak hour, with a delay of 117.1 seconds. Currently, the northbound approach is one wide lane and the curb-to-curb width of the northbound approach is approximately 30 feet. Installing a dedicated left turn bay for the northbound left movement would improve the level of service for the northbound approach, however, there are bike lanes on the north leg of the intersection which may make installing a northbound left-turn lane infeasible. Also, a small storage lane for the westbound right turn at the intersection would improve operations based on the turning movement volume at the intersection. Volumes and delays at this intersection should be monitored during and after construction of the Preferred Alternative.

5.3 Randolph Street Corridor

Table 5-3 summarizes the levels of service for the Randolph Street corridor for the existing conditions, Future No-Build, and Preferred Alternative. All intersections along Randolph Street either have or are expected to have a LOS of D or better for all scenarios.

Table 5-3: Randolph Street Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Randolph/Larned	B	C	B	C	C	C
Randolph/Cadillac Square - S	C	C	C	C	C	D
Randolph/Lafayette	A	A	A	A	C	C
Randolph/Monroe	B	B	B	B	B	B
Randolph/Gratiot	C	D	C	C	D	D
Randolph/Cadillac Square - N	B	B	B	B	B	B

5.3.1 Randolph Street/Congress Street

Existing conditions show a four-lane cross section along Congress Street, with two travel lanes and two parking lanes between Brush Street and Randolph Street. In order to improve the LOS for the Randolph Street/Congress Street intersection in the Preferred Alternative, three of the four lanes may be needed as travel lanes in the PM peak hour between Brush Street and Randolph Street, keeping only one lane as a parking lane.

5.3.2 Randolph Street/Gratiot Avenue

The initial analysis indicated a LOS E in both the Preferred Alternative AM and PM scenarios at Randolph Street at Gratiot Avenue. The northbound left turn and westbound left turns operate poorly in the AM peak hour and the southbound left, westbound left, and eastbound thru operate poorly in the PM peak hour. The overall intersection LOS would be improved from a LOS E to a LOS D if the northbound left turn would be restricted, as it currently is signed, and the westbound thru lane on Gratiot Avenue is changed to a shared westbound left/thru lane. Following is a more detailed discussion of the intersection by movement.

Northbound Randolph Street Left Turn to Gratiot Avenue Westbound

The northbound left turn movement is expected to be a LOS F in the Future No-Build condition. The delay is increased from 90.5 seconds in the AM Future No-Build condition to 172 seconds in the AM Preferred Alternative condition and impacts approximately 185 vehicles. At this intersection, it was noted that 115 vehicles in the AM peak hour were making a left turn, despite the fact that the pavement markings and signs indicate left turns are not allowed. Additional green time is required on the northbound approach to accommodate the non-permitted movement and takes away green time from other approaches at the intersection.

Westbound Gratiot Avenue Left Turn to Randolph Street

The westbound left turning movement goes from LOS D in the No-Build to LOS F in the Preferred Alternative AM and PM scenario, exhibiting 107 seconds of delay in the AM Build and 114 seconds of delay in the PM Build. This is due to an increase in demand from 440 to 620 vehicles in the AM peak hour and from 200 to 460 vehicles in the PM

peak hour from No-Build to Build, respectively. As indicated earlier, changing the westbound thru lane to a shared westbound left/thru lane will reduce the westbound left delay to 63.6 seconds of delay in the AM Build and 75.2 seconds of delay in the PM Build. The changes to the westbound approach at Gratiot Avenue and Randolph Street implemented in the Build Synchro files and the results are reflected in Table 5-3.

Southbound Broadway Street Left Turn to Gratiot Avenue

The southbound left turning movement goes from a LOS D in the Future No-Build PM peak hour to a LOS F in the Preferred Alternative PM peak hour scenario, exhibiting 128 seconds of delay. The demand for this movement was slightly increased by 12 vehicles with the Preferred Alternative. However, signal timing adjustments were made to accommodate other movements which decreased the level of service for this movement.

Eastbound Gratiot Avenue

The eastbound approach contains all movements in one lane and is therefore considered by the full approach and not by turning movement. The approach goes from a LOS D in the Future No-Build PM peak hour to a LOS F in the Preferred Alternative PM peak hour scenario, exhibiting 120 seconds of delay. The demand for this movement was slightly increased by 16 vehicles with the Preferred Alternative. However, signal timing adjustments were made to accommodate other movements which decreased the level of service for this movement. The approach delay is decreased with the capacity improvements for the westbound left turn and restricting the northbound left movement.

5.3.3 Randolph Street/Cadillac Square South

While the intersection is a LOS D with the Preferred Alternative in the PM peak hour, the eastbound right turn movement experiences a LOS E with a delay of 56 seconds and the eastbound left turn movement experiences a LOS F with a delay of 90 seconds. However, this impacts 89 right turning vehicles and 70 left turning vehicles in the PM peak hour, respectively. Given the acceptable LOS for all other movements, and the low volume of impacted vehicles, no change is recommended at this location.

5.4 Beaubien Street Corridor

Table 5-4 summarizes the levels of service for the Beaubien Street corridor for the existing conditions, Future No-Build, and Preferred Alternative. All intersections along Beaubien Street either have or are expected to have a LOS of D or better for all scenarios.

Table 5-4: Beaubien Street Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Beaubien/Lafayette	A	A	A	A	B	B
Beaubien/Monroe	B	A	B	A	B	B
Beaubien/Congress	B	A	B	B	B	B
Beaubien/Larned	B	B	A	B	A	D
Beaubien/Gratiot	C	B	C	B	D	C
Beaubien/Fort	B	B	B	B	B	B

5.4.1 Beaubien Street/Gratiot Avenue

There is one intersection in the Preferred Alternative AM Peak Hour that exhibits a LOS F for the westbound left turn from Gratiot Avenue onto Beaubien Street. The LOS F movement can be attributed to the large increase in the westbound left turn volume from the No-Build to the Preferred Alternative. The westbound left turn volume in the No-Build AM peak hour is 224 vehicles and is expected to increase to 470 vehicles with the Preferred Alternative. A potential improvement at the intersection would be to add a protected left turn signal phase for this movement. There is already a left-turn lane for this approach, so adding a left-turn signal head would be a minimal expense and would provide better operations for the westbound left turn as well as the overall intersection.

5.5 Congress Street Corridor

Table 5-5 summarizes the levels of service for the Congress Street corridor for the existing conditions, Future No-Build, and Preferred Alternative.

Table 5-5: Congress Street Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Congress/Bates	A	A	A	A	A	B
Congress/First	B	F	B	F	C	F
Congress/Griswold	B	B	B	B	B	B
Congress/Shelby	B	D	B	C	B	C
Congress/Washington	B	B	B	B	B	C
Congress/Woodward	A	A	A	A	A	B

In the AM peak hour, all intersections along the Congress Street corridor either have or are expected to have a LOS D or better in the Existing conditions, FNB, and the Preferred Alternative. There is one intersection in the PM peak hour in the future FNB and Preferred Alternative that is expected to have a LOS F. The following sections describe the

intersection analysis for those intersections that are expected to have poor LOS for either a movement or approach.

5.5.1 Congress Street/Shelby Street

Currently, Congress Street between Griswold Street and Washington Boulevard is one-way westbound and has a three-lane cross section, with one travel lane and two parking lanes. During the PM peak period, parking is supposed to be restricted in this section, however, this restriction is often ignored. In order to improve the LOS in the PM peak hour for Congress Street at Shelby Street, two of the three lanes would need to be travel lanes and the parking restriction needs to be enforced.

5.5.2 Congress Street/First Street

In the PM peak hour, Congress Street at First Street is a LOS F in the existing, FNB, and the Preferred Alternative. This can be attributed to the large westbound through volume utilizing the left most lane on Congress Street west of First Street. Even though there are two lanes, only the left most lane goes to northbound M-10. The demand for the westbound through movement is expected to grow from 975 vehicles to 1,340 vehicles in the PM peak as a result of the Preferred Alternative. The intersection delay will reduce significantly if the traffic signal is put into flash and the westbound approach is able to flow unimpeded through the intersection. The northbound and southbound approaches would receive a flashing red traffic signal basically converting the intersection into a two-way stop. The intersection delay in the Preferred Alternative in the PM peak hour would be reduced to 74.9 seconds. The improvements were not implemented into the Synchro models but could be implemented in the future to reduce the delay and congestion at the intersection.

5.6 Woodward Avenue Corridor

Table 5-6 summarizes the levels of service for the Woodward Avenue corridor for the existing conditions, Future No-Build, and Preferred Alternative.

Table 5-6: Woodward Avenue Corridor LOS

Intersection	Existing		Future No-Build		Preferred Alternative	
	AM	PM	AM	PM	AM	PM
Woodward/Montcalm	B	A	B	A	A	A
Woodward/Elizabeth	A	A	A	B	A	B
Woodward/Adams	A	B	A	B	A	C
Woodward/Park	A	A	B	A	A	B
Woodward/John R	A	B	A	B	A	B
Woodward/Grand River	B	B	B	B	A	B
Woodward/Gratiot	A	A	A	A	B	B

All intersections along the Woodward Avenue corridor either have or are expected to have a LOS D or better for the existing conditions, FNB, and Preferred Alternative. The signal timings implemented in Synchro accounted for the pedestrian phases and the appropriate clearance time based on the distance of the cross-walk. No additional improvements or modifications are recommended for this corridor.

6 HCS Development Methodology

While Synchro was utilized for the intersection analysis, the Highway Capacity Software (HCS) was utilized for the freeway analysis. Existing AM and PM peak hour HCS models were created to use as a baseline for the Future No-Build and Preferred Alternative scenarios. Traffic counts were obtained as discussed in Section 3. The Future No-Build and Preferred Alternative scenario used the same geometry as the existing conditions. The Future No-Build scenario used a growth factor of 0.5% per year compounded from year 2017 to 2040. The Preferred Alternative considered rerouting as a result of the I-375 project in the traffic forecasts, as documented in the I-375 Traffic Forecasting Methodology Technical Memorandum.

7 HCS Results

The HCS analysis was conducted on the study area shown in Figure 2. Results of the HCS analysis can be found in Table 7-1. The LOS and density results for the 18 segments along M-10 are provided in Appendix C.

Figure 2: HCS Segments

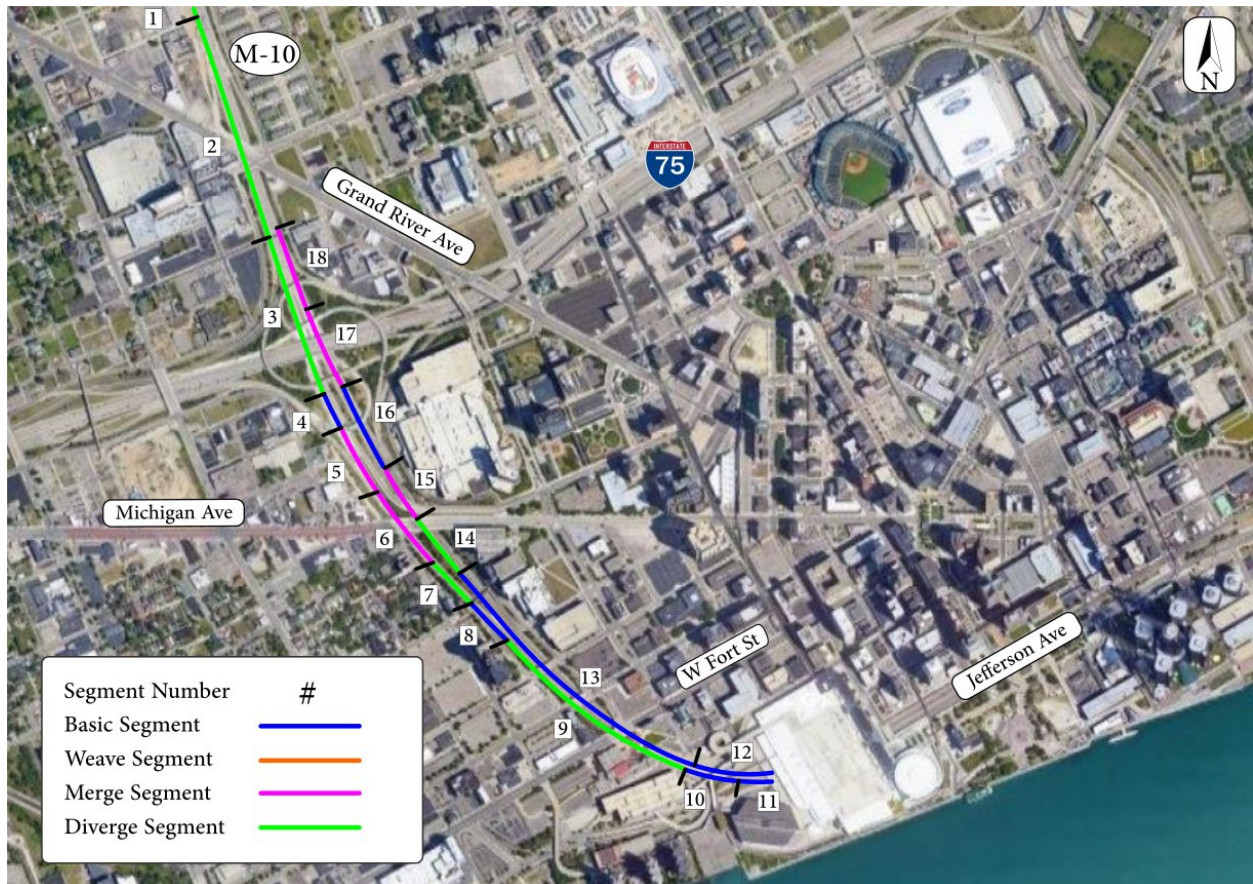


Table 7-1: M-10 Freeway Segment LOS Results

ID	Dir	Segment	LOS					
			AM			PM		
			Ex*	FNB	Preferred	Ex*	FNB	Preferred
1	SB	Forest On-ramp to Grand River Off-ramp	F	F	F	C	D	D
2	SB	Grand River Off-ramp to I-75 Off-ramp	F	F	F	C	C	C
3	SB	I-75 Off-ramp to SB I-75 On-ramp	D	D	D	B	B	B
4	SB	SB I-75 On-ramp merge	B	B	C	A	A	B
5	SB	SB I-75 On-ramp to NB I-75 On-ramp	B	C	C	B	B	B
6	SB	NB I-75 On-ramp merge	D	E	E	B	B	C
7	SB	NB I-75 On-ramp to Howard Off-ramp	D	E	E	B	B	C
8	SB	Howard Off-ramp to Abbott	C	C	C	A	A	B
9	SB	Abbott to WB Jefferson Off-ramp diverge	C	C	C	B	B	B
10	SB	WB Jefferson Off-ramp to Larned Off-ramp	B	C	C	A	A	B
11	SB	Larned Off-ramp to EB Jefferson	B	B	B	A	A	A
12	NB	WB Jefferson to Congress On-ramp	A	A	A	C	C	C
13	NB	Congress On-ramp to Abbott On-ramp	A	A	A	C	C	C
14	NB	Abbott On-ramp merge	A	A	B	D	D	E
15	NB	Abbot On-ramp to I-75 Off-ramp	A	A	B	F	F	F
16	NB	I-75 Off-ramp to NB I-75 On-ramp	A	A	A	B	B	C
17	NB	NB I-75 On-ramp merge	B	B	B	B	C	C
18	NB	NB I-75 On-ramp to SB I-75 On-ramp	B	C	C	C	C	C

*Ex = Existing Conditions

The notable volume increase that triggered an additional analysis was observed in both the AM and PM peak hours. Volumes increased by up to 725 vehicles in the PM peak hour. As the LOS results show, there is a sufficient amount of capacity in the PM peak hour to support this increase. In the PM peak hour, northbound M-10 at Abbott Street (#14), shows a change from a LOS D in the FNB while the Preferred Alternative is expected to have a LOS E. The density for the freeway segment increased from 33.8 to 37.4 passenger cars per mile per lane between the Future No-Build and the Preferred Alternative, respectively. The density results show a minor change in the freeway

operations and no recommendations are provided for the segment. The poor LOS segments in the AM and PM peak hours along M-10 are consistent between the Future No-Build and Preferred Alternative. No mitigation measures are recommended.

8 Recommendations

Recommendations made as a result of this analysis are separated into two categories. Geometric improvements that were more simplistic and helped achieve an intersection LOS D or better are referred to as “Intersection LOS Improvements” and were nearly all assumed as part of the analysis. Other improvements that benefitted individual movements at intersections where the intersection as a whole was LOS D or better are referred to as “Movement LOS Improvements”. These were often more complex and were not included in the analysis. This section summarizes the previously discussed improvements into one of those two categories. It should be noted that recommendations are based on future traffic volumes and the expected shifts in travel patterns based on the Preferred Alternative and the DTA models. Travel patterns may end up being different during and after construction of the Preferred Alternative. Some of these recommendations could be implemented on a “wait and see” condition to see if the traffic materializes. An additional traffic analysis could also be conducted immediately prior to construction or immediately after to evaluate conditions again.

8.1 Intersection LOS Improvements

Improvements that will improve all intersections to LOS D or better, and were assumed in the analysis:

- **Congress Street between Randolph Street and Beaubien Street** – one parking lane converted to a driving lane, changing the total number of driving lanes from two lanes to three lanes and leaving one parking lane.
- **Congress Street between Griswold Street and Washington Boulevard** – one parking lane converted to a driving lane, changing the total number of driving lanes from one lane to two lanes and leaving one parking lane on westbound Congress Street.
- **Mack Avenue at Russell Street** – Installed a dedicated left turn bay for the northbound left movement to improve the level of service for the northbound approach. Added a small storage lane for the eastbound right turn at the intersection to improve operations of the overall intersection.
- **Randolph Street at Gratiot Avenue** - Enforce the no northbound left turns from Randolph Street to Gratiot Avenue, as well as change the westbound thru lane to a shared westbound left/thru lane on Gratiot Avenue.
- **Brush Street at Gratiot Avenue** – Install a westbound left turn lane on Gratiot Avenue and provide a protective/permissive signal phase.

The one location that still may have a LOS F is at **Congress Street at First Street**. The intersection delay will reduce significantly if the traffic signal is put into flash and the westbound approach is able to flow unimpeded through the intersection. The northbound

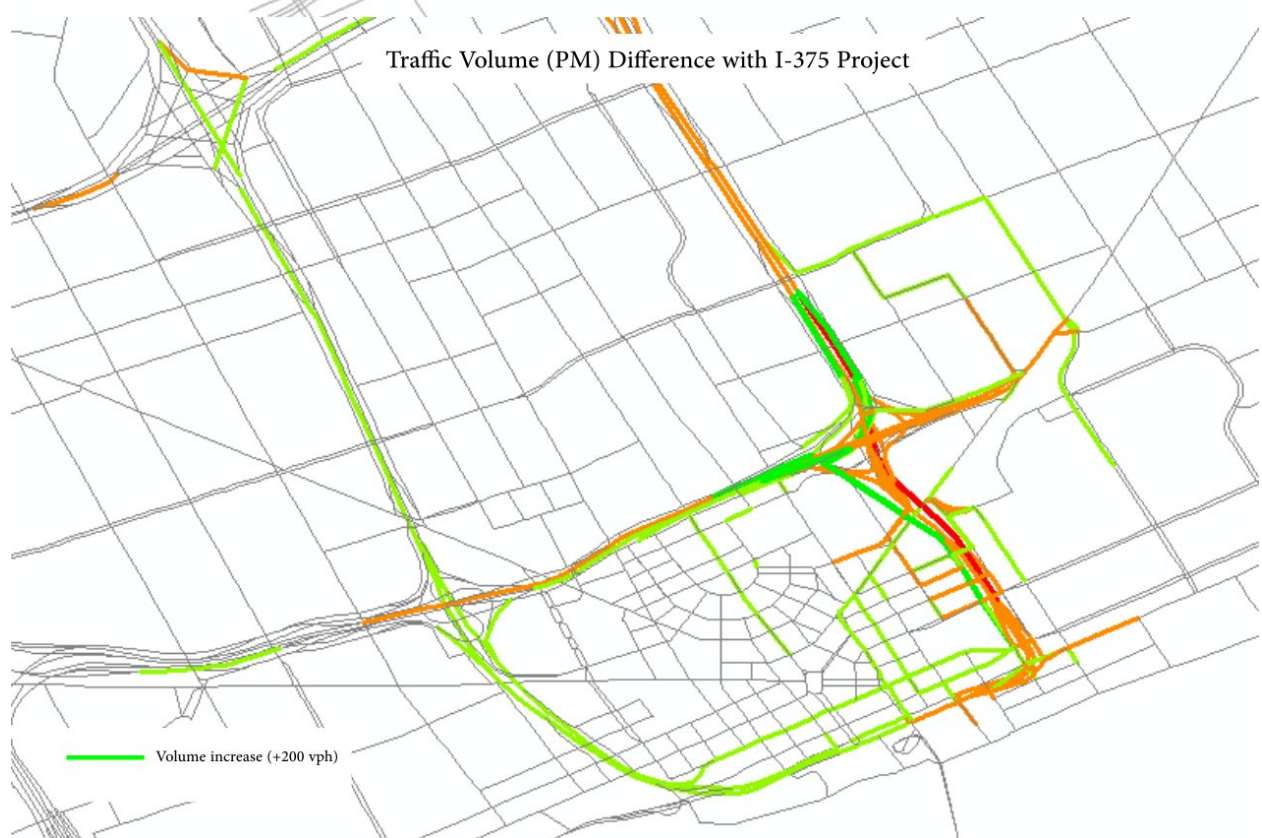
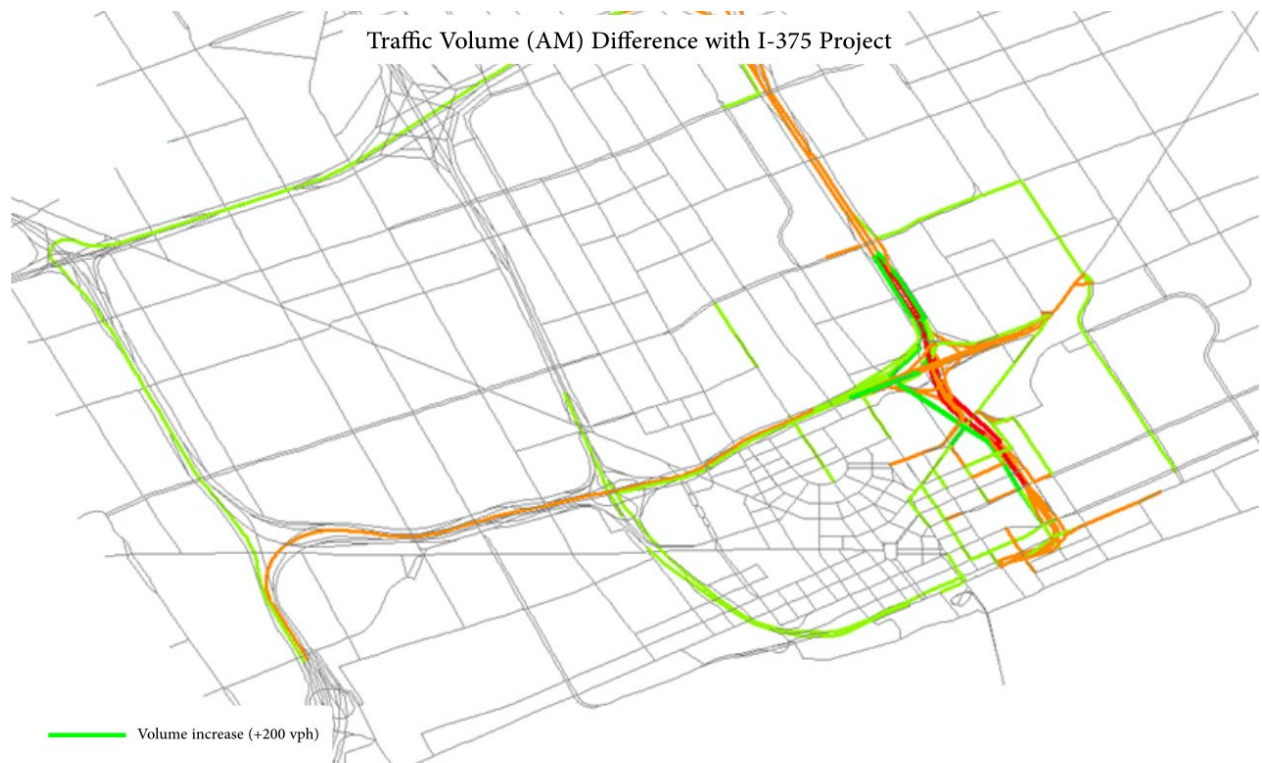
and southbound approaches would receive a flashing red traffic signal basically converting the intersection into a two-way stop. The intersection delay in the PM Build would be reduced to 74.9 seconds. The improvements were not implemented into the Synchro models but could be implemented in the future to reduce the delay and congestion at the intersection.

8.2 Movement LOS Improvements

The following improvements were **not** assumed for the analysis and may require additional analysis or consideration. Without these improvements, the intersections will all operate at LOS D or better, but there may be some individual movements that operate below LOS E or worse. The locations include:

- **Brush Street at Larned Street**
 - Restrict parking on southbound Brush Street to provide an additional travel lane.
- **Beaubien Street at Gratiot Avenue**
 - Add a southbound protected left turn signal phase for Gratiot Avenue if there are excessive delays.
- **Beaubien Street at Larned Street**
 - Add a southbound protected left turn signal phase for Beaubien Street at Larned Street if there are excessive delays.
- **Woodward Avenue at Adams Avenue**
 - The northbound left turn in the Preferred Alternative in the PM peak hour is a LOS E, with a volume of 334 vehicles. The northbound left turn is currently permissive but could be upgraded in the future to protected/permissive in order to improve the LOS of the northbound approach.

Appendix A – TDM Volume Maps



Appendix B – Synchro Analysis Results

I-375 Expanded Study Area - Synchro Results

Intersection	AM Peak Hour - Existing		PM Peak Hour - Existing		AM Peak Hour - No Build		PM Peak Hour - No Build		AM Peak Hour - Build		PM Peak Hour - Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1st & Congress	B	16.5	F	344	B	15.2	F	314.6	C	23.5	F	487.8
Washington & Congress	B	16.1	B	13.5	B	18.6	B	14.9	B	19.8	C	25.1
Shelby & Congress	B	15	D	37.8	B	16.5	C	27	B	14.9	C	22.7
Griswold & Congress	B	11.3	B	10.4	B	11.5	B	10.8	B	11.7	B	12.7
Woodward & Congress	A	9.3	A	8.1	A	9.2	A	8.4	A	9.3	B	11
Bates & Congress	A	5.5	A	7.9	A	5.6	A	8.5	A	5.3	B	12.7
Randolph & Gratiot	C	28.5	D	50.6	C	33.6	C	31	D	53.4	D	48.6
Randolph & Monroe	B	11.6	B	14.1	B	11.2	B	14.5	B	13.3	B	15.7
Randolph & Lafayette	A	7.9	A	8	A	8.9	A	7.9	C	22	C	24.2
Randolph & Cadillac Sq - N	B	12.1	B	11.9	B	11.6	B	12.5	B	18.9	B	19.9
Randolph & Cadillac Sq - S	C	23.9	C	24.9	C	27.4	C	25.6	C	32.5	D	47.9
Randolph & Larned	B	19.8	C	20.8	B	19.5	C	21.4	C	22.4	C	26.2
Brush & Adams	A	7.6	A	7.7	A	7.6	A	7.9	A	9.9	B	11.1
Brush & Beacon	A	6.1	A	6.8	A	6.2	A	6.9	A	8.2	A	8.2
Brush & Madison	B	11.8	B	15.9	B	11.9	B	15.4	B	12.4	B	15.9
Brush & Gratiot	B	10.7	B	14.6	B	11.6	B	14.8	D	49.5	C	33.5
Brush & Monroe	B	13.7	B	14	B	14.3	B	14.4	B	11.6	B	14.3
Brush & Congress	B	13.8	B	11.1	B	13.9	B	11.6	B	12.8	C	34.7
Brush & Larned	B	15.6	B	11.5	B	16.5	B	12.4	C	23.1	D	47.9
Beaubien & Gratiot	C	24.1	B	17.1	C	25.7	B	17.4	D	36.2	C	23.5
Beaubien & Monroe	B	11.7	A	8.3	B	15	A	8.8	B	13.6	B	14.7
Beaubien & Lafayette	A	9.8	A	6.1	A	10	A	6.4	B	13.1	B	12
Beaubien & Fort	B	14.4	B	14.7	B	14.5	B	14.1	B	12.5	B	16.9
Beaubien & Congress	B	10.1	A	10	B	12.2	B	11	B	11.6	B	15.4
Beaubien & Larned	B	10.3	B	12.3	A	9.8	B	13.3	A	9.4	D	53.4
Mack & Russell	A	8.8	A	8.5	B	13.3	A	9.5	B	15.5	B	14.9
Mack & St. Aubin	B	16.3	B	13.4	B	20	B	15.4	D	54.3	D	39.2
Woodward & Montcalm	B	10.2	A	6.4	B	10.3	A	6.5	A	9.2	A	6.8
Woodward & Elizabeth St	A	6.7	A	9.9	A	6.5	B	10.1	A	4.1	B	11.7
Woodward & Adams Ave	A	7.2	B	13.7	A	7.1	B	14.5	A	9.2	C	23.4
Woodward & Park Ave	A	9.8	A	8.5	B	11.1	A	8.6	A	8	B	11.6
Woodward & John R St.	A	4.5	B	11.5	A	4.8	B	12.1	A	3.8	B	17.3
Woodward & Grand River Ave	B	11.8	B	14.5	B	12.9	B	14.9	A	10	B	17.1
Woodward & Gratiot Ave	A	9.8	A	6.1	A	10	A	6.4	B	13.1	B	12

Build Synchro Analysis (AM & PM) - I-375 Expanded Study Area																					
Intersection	Traffic Control	Peak Hour		Level of Service per Movement by Approach																Intersection Delay	Intersection LOS
				Eastbound				Westbound				Northbound				Southbound					
				U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT		
Congress & 1st Street	Signalized	AM	Lanes	-	-	-	-	-	<1	1>	0	-	<1	-	-	-	-	1>	0>	-	
			Volume	-	-	-	-	-	95	285	181	-	4	-	-	-	-	20	36	-	
			Delay	-	-	-	-	-	9.5	24.8	-	-	16	-	-	-	-	34.2	-	-	
			LOS	-	-	-	-	-	A	C	-	-	B	-	-	-	-	C	-	-	
			95th Queue	-	-	-	-	-	m43	247	-	-	6	-	-	-	-	52	-	-	
Congress & Washington	Signalized	AM	Approach LOS	-	-	-	-	-	C	-	-	-	-	B	-	-	-	C	-	-	
			Lanes	-	-	-	-	-	1	1340	66	-	79	22	-	-	0	410	-	-	
			Volume	-	-	-	-	-	10	490.6	-	-	20.6	16.4	-	-	597.1	-	-		
			Delay	-	-	-	-	-	A	F	-	-	C	B	-	-	F	-	-		
			LOS	-	-	-	-	-	A	C	-	-	B	-	-	-	C	-	-		
Congress & Shelby	Signalized	PM	95th Queue	-	-	-	-	-	m43	247	-	-	55	22	-	-	#539	-	-		
			Approach LOS	-	-	-	-	-	F	-	-	-	B	-	-	-	F	-	-		
			Lanes	-	-	-	-	-	0	<3>	0	-	1	2	-	-	2>	0	-		
			Volume	-	-	-	-	-	31	275	62	-	398	358	-	-	220	67	-		
			Delay	-	-	-	-	-	14.7	-	-	-	32.3	11	-	-	20.4	-	-		
Congress & Griswold	Signalized	AM	LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	C	-	-		
			95th Queue	-	-	-	-	-	61	-	-	-	#256	74	-	-	80	-	-		
			Approach LOS	-	-	-	-	-	C	-	-	-	B	-	-	-	C	-	-		
			Lanes	-	-	-	-	-	0	<2>	0	-	0	<1	-	-	1>	0	-		
			Volume	-	-	-	-	-	1	310	30	-	57	66	-	-	80	30	-		
Congress & Woodward	Signalized	AM	Delay	-	-	-	-	-	10.9	-	-	-	22.8	-	-	-	17.4	-	-		
			LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	B	-	-		
			95th Queue	-	-	-	-	-	74	-	-	-	85	-	-	-	58	-	-		
			Approach LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	0	<3>	0	-	0	3	-	-	3>	0	-		
Congress & Bates	Signalized	PM	Volume	-	-	-	-	-	16	895	48	-	56	33	-	-	51	23	-		
			Delay	-	-	-	-	-	23.6	-	-	-	20.3	-	-	15.9	-	-			
			LOS	-	-	-	-	-	C	-	-	-	C	-	-	B	-	-			
			95th Queue	-	-	-	-	-	74	-	-	-	55	-	-	45	-	-			
			Approach LOS	-	-	-	-	-	C	-	-	-	B	-	-	-	C	-	-		
Congress & Griswold	Signalized	AM	Lanes	-	-	-	-	-	0	<2>	1	-	0	<2>	-	-	2>	0	-		
			Volume	-	-	-	-	-	42	248	95	-	46	223	-	-	248	70	-		
			Delay	-	-	-	-	-	11.3	3.5	-	-	15.3	-	-	11.7	-	-			
			LOS	-	-	-	-	-	B	A	-	-	B	-	-	B	-	-			
			95th Queue	-	-	-	-	-	52	12	-	-	73	-	-	71	-	-			
Congress & Woodward	Signalized	PM	Approach LOS	-	-	-	-	-	A	-	-	-	B	-	-	-	A	-	-		
			Lanes	-	-	-	-	-	20	838	222	-	57	168	-	-	373	84	-		
			Volume	-	-	-	-	-	12.7	2.5	-	-	15.8	-	-	16.2	-	-			
			Delay	-	-	-	-	-	8	A	-	-	66	-	-	B	-	-			
			LOS	-	-	-	-	-	B	A	-	-	B	-	-	B	-	-			
Congress & Bates	Signalized	AM	95th Queue	-	-	-	-	-	52	12	-	-	66	-	-	120	-	-			
			Approach LOS	-	-	-	-	-	B	-	-	-	B	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	0	<3>	0	-	1	3	-	-	3>	0	-		
			Volume	-	-	-	-	-	22	269	50	-	39	180	-	-	234	78	-		
			Delay	-	-	-	-	-	7.8	-	-	-	15.9	11.6	-	-	8.8	-	-		
Congress & Woodward	Signalized	PM	LOS	-	-	-	-	-	A	-	-	-	B	-	-	-	A	-	-		
			95th Queue	-	-	-	-	-	21	-	-	-	27	29	-	-	38	-	-		
			Approach LOS	-	-	-	-	-	A	-	-	-	B	-	-	-	A	-	-		
			Lanes	-	-	-	-	-	0	<2>	0	-	1	3	-	-	3>	0	-		
			Volume	-	-	-	-	-	50	1017	132	-	54	116	-	-	192	52	-		
Congress & Bates	Signalized	AM	Delay	-	-	-	-	-	10.8	-	-	-	14	11.4	-	-	11	-	-		
			LOS	-	-	-	-	-	B	-	-	-	B	-	-	B	-	-			
			95th Queue	-	-	-	-	-	21	-	-	-	35	20	-	-	36	-	-		
			Approach LOS	-	-	-	-	-	B	-	-	-	B	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	3>	0	-	-	-	-	-	-	-	1	-	-	
Congress & Woodward	Signalized	PM	Volume	-	-	-	-	-	280	74	-	-	-	-	-	-	92	-	-		
			Delay	-	-	-	-	-	6.7	-	-	-	-	-	-	-	0.6	-	-		
			LOS	-	-	-	-	-	A	-	-	-	-	-	-	-	A	-	-		
			95th Queue	-	-	-	-	-	36	-	-	-	-	-	-	-	-	-	-		
			Approach LOS	-	-	-	-	-	A	-	-	-	-	-	-	-	A	-	-		
Congress & Bates	Signalized	AM	Lanes	-	-	-	-	-	1086	128	-	-	-	-	-	-	300	-	-		
			Volume	-	-	-	-	-	12.4	-	-	-	-	-	-	-	16.4	-	-		
			Delay	-	-	-	-	-	B	-	-	-	-	-	-	-	B	-	-		
			LOS	-	-	-	-	-	36	-	-	-	-	-	-	-	0	-	-		
			Approach LOS	-	-	-	-	-	B	-	-	-	-	-	-	-	B	-	-		
Congress & Woodward	Signalized	PM	Lanes	-	-	-	-	-	1	2>	1	-	0	<2>	1	-	0	<2>	1		
			Volume	-	-	-	-	-	118	61	49	-	51	296	35	-	68	591	280		
			Delay	-	-	-	-	-	38.1	25	11.4	-	9.3	3.2	-	-	13.9	3.4	-		
			LOS	-	-	-	-	-	D	C	B	-	A	A	-	-	B	A	-		
			95th Queue	-	-	-	-	-	124	39	15	-	83	10	-	-	165	-	-		
Congress & Woodward	Signalized	AM	Approach LOS	-	-	-	-	-	C	-	-	-	A	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	205	87	31	-	129	579	58	-	41	386	157		
			Volume	-	-	-	-	-	45.1	32	11.7	-	13.1	3.6	-	-	10	2.3	-		
			Delay	-	-	-	-	-	D	C	B	-	B	A	-	-	B	A	-		
			LOS	-	-	-	-	-	D	C	B	-	181	20	-	-	100	-	-		
Congress & Woodward	Signalized	PM	95th Queue	-	-	-	-	-	124	39	15	-	-	-	-	-	-	-	-		
			Approach LOS	-	-	-	-	-	D	-	-	-	B	-	-	-	A	-	-		
			Lanes	-	-	-	-	-	0	<1>	0	-	0	<2>	0	-	<2>	0	-		
			Volume	-	-	-	-	-	37	106	122	-	8	281	51	-	441	89	-		
			Delay	-	-	-	-	-	47.3	-	-	-	11.8	-	-	-	14.8	-	-		
Congress & Woodward	Signalized	AM	LOS	-	-	-	-	-	D	D	-	-	8.8	-	-	B	-	-			
			95th Queue	-	-	-	-	-	#265	-	-	-	88	-	-	140	-	-			
			Approach LOS	-	-	-	-	-	D	-	-	-	B	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	75	90	152	-	13	561	1	-	370	83	-		
			Volume	-	-	-	-	-	54.8	-	-	-	15.6	-	-	-	12.5	-	-		
Congress & Woodward	Signalized	PM	Delay	-	-	-	-	-	D	-	-	-	B	-	-	B	-	-			
			LOS	-	-	-	-	-	#265	-	-	-	167	-	-	120	-	-			
			95th Queue	-	-	-	-	-	D	-	-	-	B	-	-	-	C	-	-		
			Approach LOS	-	-	-	-	-	D	-	-	-	B	-	-	-	C	-	-		
			Lanes	-	-	-	-	-	1	2>	1	-	<1	2	-	-	2	1	-		
Congress & Woodward	Signalized	AM	Volume	-	-	-	-	-	82	457	-	-	82	457	-	-	264	25	-		
			Delay	-	-	-	-	-	73.8	7.2	-	-	73.8	7.2	-	-	23.2	6.9	-		
			LOS	-	-	-	-	-	E	A	-	-	E	A	-	-	C	A	-		
			96th Queue	-	-	-	-	-	m74	m41	-	-	m74	m41	-	-	102	-	-		
			Approach LOS	-	-	-	-	-	-	-	-	-	B	-	-	-	C	-	-		
Congress & Woodward	Signalized	PM	Lanes	-	-	-	-	-	76	639	-	-	76	639	-	-	325	22	-		
			Volume	-	-	-	-	-	117.5	5.3	-	-	117.5	5.3	-	-	21.4	7.9	-		
			Delay	-	-	-	-	-	F	A	-	-	F	A	-	-	C	A	-		
			LOS	-	-	-	-	-	m43	-	-	-	m43	-	-	-	117	-	-		
			96th Queue	-	-	-	-	-	m43	-	-	-	m43	-	-	-	-	-	-		
Congress & Woodward	Signalized	AM	Approach LOS	-	-	-	-	-	-	-	-	-	B	-	-	-	C	-	-		
			Lanes	-	-	-	-	-	0	<3>	0	-	1	2	-	-	2>	0	-		
			Volume	-	-	-	-	-	31	275	62	-	398	358	-	-	220	67	-		
			Delay	-	-	-	-	-	14.7	-	-	-	32.3	11	-	-	20.4	-	-		
			LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	C	-	-		
Congress & Woodward	Signalized	PM	95th Queue	-	-	-	-	-	61	-	-	-	91	47	-	-	136	-	-		
			Approach LOS	-	-	-	-	-	C	-	-	-	B	-	-	-	C	-	-		
			Lanes	-	-	-	-	-	0	<2>	0	-	0	<1	-	-	1>	0	-		
			Volume	-	-	-	-	-	1	310	30	-	57	66	-	-	80	30	-		
			Delay	-	-	-	-	-	10.9	-	-	-	22.8	-	-	-	17.4	-	-		
Congress & Woodward	Signalized	AM	LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	B	-	-		
			95th Queue	-	-	-	-	-	74	-	-	-	85	-	-	-	58	-	-		
			Approach LOS	-	-	-	-	-	B	-	-	-	C	-	-	-	B	-	-		
			Lanes	-	-	-	-	-	0	<3>	0	-	1	2	-	-	2>	0	-		
			Volume	-	-	-	-	-	31	275	62	-	398	358	-	-	220	67	-		
Congress & Woodward																					

Build Synchro Analysis (AM & PM) - I-375 Expanded Study Area																					
Intersection	Traffic Control	Peak Hour		Level of Service per Movement by Approach																Intersection Delay	Intersection LOS
				Eastbound				Westbound				Northbound				Southbound					
				U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT		
Randolph & Cadillac Sq - S	Signalized	AM	Lanes	1	-	2>	-	-	-	0	<3>	-	-	-	2	-	-	-	0	-	
			Volume	41	-	60	-	-	26	487	-	-	-	-	406	-	-	164	169	-	
			Delay	55.1	-	49.4	-	-	27.5	-	-	-	-	-	50.6	-	-	5.1	-	-	
		LOS	E	-	D	-	-	C	-	-	-	-	-	D	-	-	A	-	-		
		95th Queue	61	-	44	-	-	143	-	-	-	-	-	#245	-	-	16	-	-		
		Approach LOS	D				C				D				A						
PM	Volume	70	-	89	-	-	190	687	-	-	-	543	-	-	350	76	-	-			
	Delay	89.7	-	55.7	-	-	60	-	-	-	-	50.4	-	-	5.3	-	-				
	LOS	F	-	E	-	-	-	E	-	-	-	D	-	-	A	-	-				
95th Queue	61	-	44	-	-	143	-	-	-	-	181	-	-	23	-	-					
Approach LOS	E				E				D				A								
Randolph & Larned	Signalized	AM	Lanes	-	1	-	<3>	1	-	-	-	-	2>	0	-	-	0	-	1>	0	
			Volume	-	108	-	451	47	-	-	-	-	474	245	-	-	92	133	-		
			Delay	-	23.9	-	23.1	22.2	-	-	-	-	23.5	-	-	17.2	-	-			
		LOS	-	C	-	C	C	-	-	-	-	C	-	-	B	-	-				
		95th Queue	-	100	-	130	51	-	-	-	-	274	-	-	116	-	-				
		Approach LOS	C				-				C				B						
PM	Volume	-	165	-	543	259	-	-	-	-	431	80	-	-	52	490	-				
	Delay	-	26.6	-	26	36.5	-	-	-	-	20.8	-	-	28.8	-	-					
	LOS	-	C	-	C	D	-	-	-	-	C	-	-	C	-	-					
95th Queue	-	100	-	130	51	-	-	-	-	-	152	-	-	m243	-	-					
Approach LOS	C				-				C				C								
Brush & Adams	Signalized	AM	Lanes	-	1	-	-	1	-	-	-	-	1	1	-	-	-	1>	0		
			Volume	-	6	-	-	19	-	-	-	-	36	124	-	-	238	41	-		
			Delay	-	8.5	-	-	4.3	-	-	-	-	5.9	5.8	-	-	12.5	-	-		
		LOS	-	A	-	-	A	-	-	-	-	A	A	-	-	B	-	-			
		95th Queue	-	4	-	-	7	-	-	-	-	9	20	-	-	90	-	-			
		Approach LOS	A				-				A				B						
PM	Volume	-	2	-	-	8	-	-	-	-	54	352	-	-	95	11	-				
	Delay	-	8.5	-	-	5	-	-	-	-	7.7	12.6	-	-	8.7	-	-				
	LOS	-	A	-	-	A	-	-	-	-	A	B	-	-	A	-	-				
95th Queue	-	4	-	-	7	-	-	-	-	18	83	-	-	36	-	-					
Approach LOS	A				-				B				A								
Brush & Beacon	Signalized	AM	Lanes	-	-	-	-	-	-	-	1	-	1>	0	-	-	-	1	-		
			Volume	-	-	-	-	-	-	8	-	-	147	28	-	-	204	-			
			Delay	-	-	-	-	-	-	0	-	-	9.5	-	-	-	7.7	-			
		LOS	-	-	-	-	-	-	A	-	-	A	-	-	-	A	-				
		95th Queue	-	-	-	-	-	-	0	-	-	59	-	-	-	40	-				
		Approach LOS	-				A				A				A						
PM	Volume	-	-	-	-	-	-	19	-	-	184	8	-	-	94	-					
	Delay	-	-	-	-	-	-	0.1	-	-	10.7	-	-	-	5.5	-					
	LOS	-	-	-	-	-	-	A	-	-	B	-	-	A	-						
95th Queue	-	-	-	-	-	-	0	-	-	69	-	-	-	17	-						
Approach LOS	-				A				A				A								
Brush & Madison	Signalized	AM	Lanes	-	0	-	<2>	0	-	0	<2>	0	-	1	1>	0	-	1>	0		
			Volume	-	22	-	212	1	-	1	345	49	-	96	103	103	-	56	121	46	
			Delay	-	-	-	14	-	-	13.7	-	-	13.8	8.5	-	-	12.4	11.2	-		
		LOS	-	-	-	B	-	-	B	-	-	B	A	-	-	B	B	-			
		95th Queue	-	-	-	60	-	-	93	-	-	55	80	-	-	34	79	-			
		Approach LOS	B				B				A				B						
PM	Volume	-	31	-	562	1	-	1	195	18	-	122	160	271	-	64	21	59			
	Delay	-	17.3	-	B	-	-	12.5	-	-	14.3	17.4	-	-	18.5	4.9	-				
	LOS	-	B	-	-	-	-	B	-	-	B	B	-	-	B	A	-				
95th Queue	-	60	-	-	-	-	93	-	-	70	157	-	-	44	28	-					
Approach LOS	B				B				B				B								
Brush & Gratiot	Signalized	AM	Lanes	1	36	211	-	-	1	2	1	-	0	<1>	0	-	-	-	-		
			Volume	38.9	18.4	-	-	-	12.3	71.2	7.6	-	40	74	88	-	-	-	-		
			LOS	D	B	-	-	-	E	A	-	-	D	-	-	-	-	-	-		
		95th Queue	55	89	-	-	-	111	557	87	-	226	-	-	-	-	-	-			
		Approach LOS	C				E				D				C						
		PM	Volume	182	811	-	-	-	51	651	153	-	58	137	113	-	1	121	51		
Delay	52.4		39.2	-	-	-	19.6	3.5	-	-	54	-	-	-	19	19.4	-				
LOS	D		D	-	-	-	B	A	-	-	D	-	-	-	B	B	-				
95th Queue	55	89	-	-	-	557	87	-	-	#402	-	-	-	4	122	-					
Approach LOS	D				B				D				B								
Brush & Monroe	Signalized	AM	Lanes	-	0	-	<2>	0	-	-	-	-	1>	0	-	-	0	<1>	-		
			Volume	-	20	-	146	31	-	-	-	-	135	28	-	-	91	251	-		
			Delay	-	-	-	26.9	-	-	-	-	-	4	-	-	-	5.6	-	-		
		LOS	-	-	-	C	C	-	-	-	-	A	-	-	-	A	-	-			
		95th Queue	-	-	-	66	-	-	-	-	-	43	-	-	-	103	-	-			
		Approach LOS	C				-				A				A						
PM	Volume	-	57	-	223	1	-	-	-	-	309	186	-	-	1	241	-				
	Delay	-	-	-	29.8	-	-	-	-	-	9.6	-	-	-	5.7	-	-				
	LOS	-	-	-	C	-	-	-	-	-	A	-	-	-	A	-	-				
95th Queue	-	-	-	66	-	-	-	-	-	218	-	-	-	80	-	-					
Approach LOS	C				-				A				A								
Brush & Congress	Signalized	AM	Lanes	-	-	-	-	-	-	0	<3>	0	-	-	<1>	-	-	1>	0		
			Volume	-	-	-	-	-	-	67	613	42	-	111	195	-	-	241	41		
			Delay	-	-	-	-	-	-	14.5	-	-	12	-	-	-	8.6	-	-		
		LOS	-	-	-	-	-	-	B	-	-	B	-	-	-	A	-	-			
		95th Queue	-	-	-	-	-	-	66	-	-	147	-	-	-	102	-	-			
		Approach LOS	-				B				B				A						
PM	Volume	-	-	-	-	-	209	759	109	-	98	203	-	-	171	101	-				
	Delay	-	-	-	-	-	46.4	-	-	-	8.9	-	-	-	13.5	-	-				
	LOS	-	-	-	-	-	D	-	-	-	A	-	-	-	B	-	-				
95th Queue	-	-	-	-	-	66	-	-	-	m79	-	-	-	98	-	-					
Approach LOS	-				D				A				B								
Brush & Larned	Signalized	AM	Lanes	-	0	-	<3>	0	-	-	-	-	1>	0	-	-	0	<1>	-		
			Volume	-	89	-	445	41	-	-	-	-	257	169	-	-	126	152	-		
			Delay	-	22.8	-	-	-	-	-	-	-	13.1	-	-	-	37.3	-	-		
		LOS	-	C	-	C	-	-	-	-	-	B	-	-	-	D	-	-			
		95th Queue	-	-	-	122	-	-	-	-	-	189	-	-	-	124	-	-			
		Approach LOS	C				-				B				D						
PM	Volume	-	116	-	839	144	-	-	-	-	173	55	-	-	181	215	-				
	Delay	-	-	-	36.1	-	-	-	-	-	11.7	-	-	-	94.9	-	-				
	LOS	-	-	-	D	-	-	-	-	-	B	-	-	-	F	-	-				
95th Queue	-	-	-	122	-	-	-	-	-	105	-	-	-	m#337	-	-					
Approach LOS	D				-				B				F								
Beaubien & Gratiot	Signalized	AM	Lanes	1	195	-	-	-	1	2	1	-	1	1>	0	-	0	<2>	0		
			Volume	13	12.5	-	-	-	470	1449	341	-	41	21	61	-	37	64	362		
			LOS	B	B	-	-	-	67	35.1	12.3	-	31	10.3	-	-	36.9	-	-		
		95th Queue	8	57	-	-	-	#548	#729	179	-	56	49	-	-	150	-	-			
		Approach LOS	B				D				B				D						
		PM	Volume	-	844	-	-	-	95	708	-	-	41	101	201	-	157	84	79		
Delay	-		28	-	-	-	50.4	21.9	-	-	17.5	18	-	-	22.3	-	-				
LOS	-		C	-	-	-	D	C	-	-	B	B	-	-	C	-	-				
95th Queue	-	57	-	-	-	#548	#729	-	-	39	190	-	-	77	-	-					
Approach LOS	C				C				B				C								
Beaubien & Monroe	Signalized	AM	Lanes	-	0	-	2>	0	-	-	-	-	1>	0	-	-	0	<1>	-		
			Volume	-	51	-	106	74	-	-	-	-	61	1	-	-	90	264	-		
			Delay	-	-	-	9.3	-	-	-	-	-	6.3	-	-	-	17.8	-	-		
		LOS	-	A	-	A	-	-	-	-	-	A	-	-	-	B	-	-			
		95th Queue	-	-	-	55	-	-	-	-	-	17	-	-	-	194	-	-			
		Approach LOS	A				-				A				B						
PM	Volume	-	1	-	307	107	-	-	-	-	91	1	-	-	139	182	-				
	Delay	-	-	-	13.2	-	-	-	-	-	2.7	-	-	-	19.7	-	-				
	LOS	-	-	-	B	-	-	-	-	-	A	-	-	-	B	-	-				
95th Queue	-	-	-	55	-	-	-	-	-	4	-	-	-	176	-	-					
Approach LOS	B				-				A				B								

Build Synchro Analysis (AM & PM) - I-375 Expanded Study Area																				
Intersection	Traffic Control	Peak Hour		Level of Service per Movement by Approach												Intersection Delay	Intersection LOS			
				Eastbound				Westbound				Northbound						Southbound		
				U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	
Beaubien & Lafayette	Signalized	AM	Lanes	-	0	<1>	0	-	1	2>	0	-	0	<1>	1	122	-	69	198	73
			Volume	-	31	31	1	-	161	484	1	-	1	1	1	1	1	69	198	73
			Delay	-	-	11.4	-	-	13.4	12.9	-	-	-	14.5	6.3	-	-	12.6	-	-
			LOS	-	B	-	-	-	B	-	-	-	-	B	A	-	-	B	-	-
			95th Queue	-	-	37	-	-	85	104	-	-	-	-	m3	0	-	-	26.4	-
Beaubien & Fort	Signalized	PM	Approach LOS	-	-	B	-	-	B	-	-	-	-	A	-	-	-	C	-	
			Volume	-	71	11	21	-	128	325	21	-	1	1	565	-	123	125	65	
			Delay	-	-	10.4	-	-	13.8	11.8	-	-	-	9.5	7.3	-	-	20.7	-	
			LOS	-	-	B	-	-	B	-	-	-	-	A	C	-	-	C	-	
			95th Queue	-	-	37	-	-	85	104	-	-	-	m1	80	-	-	185	-	
Beaubien & Congress	Signalized	AM	Approach LOS	-	-	B	-	-	B	-	-	-	-	A	-	-	-	C	-	
			Lanes	-	2>	-	0	-	-	-	-	-	-	2>	-	-	2>	-	0	
			Volume	-	33	-	25	-	-	-	-	-	-	180	-	-	-	265	-	
			Delay	-	9.9	-	-	-	-	-	-	-	-	13.6	-	-	-	12.4	-	
			LOS	-	A	-	-	-	-	-	-	-	-	B	A	-	-	B	-	
Beaubien & Larned	Signalized	PM	95th Queue	-	31	-	-	-	-	-	-	-	50	-	-	-	54	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	-	B	-	-	-	A	-	
			Volume	-	209	-	166	-	-	-	-	-	365	-	-	-	340	-		
			Delay	-	21.7	-	-	-	-	-	-	-	13.2	-	-	-	15.6	-		
			LOS	-	C	-	-	-	-	-	-	-	-	B	-	-	B	-		
Beaubien & Mack	Signalized	AM	95th Queue	-	31	-	-	-	-	-	-	-	102	-	-	80	-			
			Approach LOS	-	-	C	-	-	-	-	-	-	-	B	-	-	-	B	-	
			Lanes	-	1	2	1	-	0	<4>	0	-	1	2	2	-	2>	-	0	
			Volume	-	52	491	38	-	56	618	46	-	68	189	-	-	179	86		
			Delay	-	8.2	9.8	2.6	-	-	-	-	-	10.7	9.7	-	-	3.6	-		
Beaubien & Congress	Signalized	PM	LOS	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-		
			95th Queue	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	A	-	-	-	-	-		
			Volume	-	99	674	215	-	99	674	215	-	167	136	-	-	232	242		
			Delay	-	-	16	-	-	15.5	-	-	-	24.4	9.6	-	-	8	-		
Beaubien & Larned	Signalized	AM	LOS	-	-	B	-	-	-	-	-	-	-	-	-	-	-			
			95th Queue	-	-	-	-	-	-	-	-	-	-	-	-	-	116	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	B	-	-	-	-	-		
			Volume	-	85	1073	29	-	85	1073	29	-	206	185	-	-	289	70		
			Delay	-	23.1	73.8	10.8	-	23.1	73.8	10.8	-	14	-	-	-	118.1	7.6		
Beaubien & Mack	Signalized	PM	LOS	-	C	B	-	-	-	-	-	-	-	-	-	-	-			
			95th Queue	-	m20	m84	m3	-	m20	m84	m3	-	108	-	-	F	10			
			Approach LOS	-	E	-	-	-	E	-	-	-	B	-	-	-	E	-		
			Lanes	-	0	3>	0	-	0	<3>	0	-	0	<3>	0	-	0	<1>	-	
			Volume	-	3	715	161	-	3	715	161	-	229	34	51	-	9	1		
Beaubien & Mack	Signalized	AM	Delay	-	-	10.8	-	-	-	18.2	-	-	17.9	-	-	18.6	-			
			LOS	-	-	B	-	-	-	B	-	-	-	-	-	B	-			
			95th Queue	-	-	108	-	-	-	242	-	-	32	-	-	-	5	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	B	-	-	-	B	-		
			Volume	-	3	903	212	-	3	903	212	-	393	11	128	-	12	3		
Beaubien & Mack	Signalized	PM	Delay	-	-	11.8	-	-	-	934	11	-	21.2	-	-	15.4	-			
			LOS	-	-	B	-	-	-	B	-	-	-	-	-	B	-			
			95th Queue	-	-	108	-	-	-	242	-	-	103	-	-	-	6	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	C	-	-	-	B	-		
			Volume	-	0	<1>	1	-	0	<1>	0	-	1	1>	0	-	0	<1>	-	
Beaubien & Mack	Signalized	AM	Delay	-	18	291	245	-	20	869	12	-	350	50	23	-	6	115	52	
			LOS	-	-	21.1	9.7	-	-	71.8	-	-	77	33.4	-	-	68.6	-		
			95th Queue	-	-	C	A	-	-	E	-	-	E	C	-	-	E	-		
			Approach LOS	-	-	B	-	-	-	E	-	-	E	-	-	-	E	-		
			Volume	-	22	669	67	-	22	669	67	-	543	8	-	310	51	20	18	48
Beaubien & Mack	Signalized	PM	Delay	-	-	36.9	6	-	-	44.8	-	-	50.3	25.5	-	-	28.6	-		
			LOS	-	-	D	A	-	-	D	-	-	D	C	-	-	C	-		
			95th Queue	-	-	227	70	-	-	#993	-	-	225	74	-	-	125	-		
			Approach LOS	-	-	C	-	-	-	D	-	-	D	-	-	-	C	-		
			Volume	-	0	<1>	0	-	0	<1>	0	-	-	3>	0	-	-	3>	0	
Beaubien & Mack	Signalized	AM	Delay	-	6	3	4	-	10	16	12	-	349	11	-	-	1034	51		
			LOS	-	-	14.2	-	-	-	14.5	-	-	-	6	-	-	10.1	-		
			95th Queue	-	-	B	-	-	-	B	-	-	-	32	-	-	B	-		
			Approach LOS	-	-	B	-	-	B	-	-	-	A	-	-	-	135	-		
			Volume	-	12	12	26	-	12	26	-	-	53	52	-	-	1281	7	-	
Beaubien & Mack	Signalized	PM	Delay	-	-	20.6	-	-	-	32.7	-	-	2.6	-	-	9.2	-			
			LOS	-	-	C	-	-	-	C	-	-	A	-	-	A	-			
			95th Queue	-	-	8	-	-	-	22	-	-	28	-	-	101	-			
			Approach LOS	-	-	C	-	-	-	C	-	-	A	-	-	-	A	-		
			Volume	-	0	<1>	0	-	0	<1>	0	-	3>	0	-	-	3>	0		
Beaubien & Mack	Signalized	AM	Delay	-	4	52	17	-	7	7	3	-	372	22	-	-	1042	15		
			LOS	-	-	14	-	-	-	12.9	-	-	-	4.5	-	-	2.7	-		
			95th Queue	-	-	B	-	-	-	B	-	-	-	A	-	-	A	-		
			Approach LOS	-	-	B	-	-	-	B	-	-	-	A	-	-	-	A	-	
			Volume	-	19	6	20	-	19	6	20	-	15	68	26	-	1187	53	-	
Beaubien & Mack	Signalized	PM	Delay	-	-	17.7	-	-	-	32.4	-	-	11	-	-	7.7	-			
			LOS	-	-	B	-	-	-	C	-	-	-	B	-	-	A	-		
			95th Queue	-	-	40	-	-	-	10	-	-	-	194	-	-	64	-		
			Approach LOS	-	-	B	-	-	-	C	-	-	-	B	-	-	-	A	-	
			Volume	-	0	<2	1	-	0	<3>	0	-	1	2	-	-	2	1		
Beaubien & Mack	Signalized	AM	Delay	-	76	292	54	-	-	-	-	-	241	75	-	313	663			
			LOS	-	-	21.7	6	-	-	-	-	-	7	-	-	7.4	0.9			
			95th Queue	-	-	C	A	-	-	-	-	-	-	-	-	A	A			
			Approach LOS	-	-	B	-	-	-	-	-	-	A	-	-	-	A	-		
			Volume	-	97	157	89	-	97	157	89	-	-	562	76	-	85	619		
Beaubien & Mack	Signalized	PM	Delay	-	-	32.7	5.7	-	-	-	-	10.6	-	-	6.6	5.7				
			LOS	-	-	C	A	-	-	-	-	B	-	-	A	A				
			95th Queue	-	-	105	14	-	-	-	-	-	8	-	-	m24	64			
			Approach LOS	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-		
			Volume	-	0	<2	1	-	0	<3>	0	-	0	2>	0	-	2>	0		
Beaubien & Mack	Signalized	AM	Delay	-	-	21.7	6	-	-	14.4	-	-	-	7.1	-	-	1.2			
			LOS	-	-	C	A	-	-	B	-	-	-	A	-	-	A			
			95th Queue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			Approach LOS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			Volume	-	89	157	92	-	89	157	92	-	749	70	-	-	382	111		
Beaubien & Mack	Signalized	PM	Delay	-	-	47.1	-	-	-	D	-	-	12.7	-	-	1.3				
			LOS	-	-	-	-	-	-	D	-	-	-	B	-	-	A			
			95th Queue	-	-	-	-	-	-	21	-	-	-	350	-	-	0	-		
			Approach LOS	-	-	-	-	-	-	D	-	-	-	B	-	-	A	-		
			Volume	-	0	<2>	0	-	0	<2>	0	-	0	2>	0	-	2>	0		
Beaubien & Mack	Signalized	AM	Delay	-	-	33	10	-	-	221	123	-	-	603	120					
			LOS	-	-	-	-	-	-	14.4	-	-	7.1	-	-	1.2				
			95th Queue	-	-	-	-	-	-	21	-	-	43	-	-	10	-			
			Approach LOS	-	-	-	-	-	-	-	-	-	A	-	-	-	-			
			Volume	-	89	157	92	-	89	157	92	-	749	70	-	-	382	111		
Beaubien & Mack	Signalized	PM	Delay	-	-	47.1	-	-	-	D	-	-	12.7	-	-	1.3				
			LOS	-	-	-	-	-	-	-	D	-	-	-	B	-	-	A		
			95th Queue	-	-	-	-	-	-	21	-	-	-	350	-	-	0	-		
			Approach LOS	-	-	-	-	-	-	D	-	-	-	B	-	-	A	-		
			Volume	-	0	<2>	0	-	0	<2>	0	-	0	2>	0	-	2>	0		
Beaubien & Mack	Signalized	AM	Delay	-	-	33	10	-	-	221	123	-	-	603	120					
			LOS	-	-	-	-	-	-	14.4	-	-	7.1	-	-	1.2				
			95th Queue	-	-	-	-	-	-	21	-	-	43	-	-	10	-			
			Approach LOS	-	-	-	-	-	-	-	-	-	A	-	-	-	-			
			Volume	-	89	157	92	-	89	157	92	-	749	70	-	-	382	111		
Beaubien & Mack	Signalized	PM	Delay	-	-	47.1	-	-	-	D	-	-	12.7	-	-	1.3				
			LOS	-	-	-	-	-	-	-	D	-	-	-	B	-	-	A		
			95th Queue	-	-	-	-	-	-	21	-	-	-	350	-	-	0	-		

Build Synchro Analysis (AM & PM) - I-375 Expanded Study Area																				
Intersection	Traffic Control	Peak Hour		Level of Service per Movement by Approach												Intersection Delay	Intersection LOS			
				Eastbound				Westbound				Northbound						Southbound		
				U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	U-turn	LT	TH	RT	
Woodward & Grand River Ave	Signalized	AM	Lanes	-	-	<3>	0	-	-	-	-	-	-	-	0	-	0	0	<2>	-
			Volume	-	121	439	191	-	-	-	-	-	-	217	28	-	163	450	-	-
			Delay	-	18.5	-	-	-	-	-	-	-	-	5	-	-	-	2.2	-	-
			LOS	-	B	-	-	-	-	-	-	-	-	A	-	-	-	A	-	-
			95th Queue	-	128	-	-	-	-	-	-	-	-	27	-	-	-	11	-	-
			Approach LOS	B				-				A				A				
		PM	Volume	-	188	316	89	-	-	-	-	-	-	635	66	-	48	415	-	-
			Delay	-	-	32	-	-	-	-	-	-	-	11.9	-	-	-	7	-	-
			LOS	-	-	C	-	-	-	-	-	-	-	B	-	-	-	A	-	-
			95th Queue	-	-	128	-	-	-	-	-	-	-	140	-	-	-	75	-	-
Approach LOS	C				-				B				A							
Woodward & Gratiot Ave	Signalized	AM	Lanes	-	-	-	-	-	0	<3>	0	-	0	<2	-	-	-	2>	0	
			Volume	-	-	-	-	-	96	270	64	-	17	185	-	-	447	-	187	
			Delay	-	-	-	-	-	15.8	-	-	-	-	8.8	-	-	-	4.6	-	
			LOS	-	-	-	-	-	B	-	-	-	-	A	-	-	-	A	-	
			95th Queue	-	-	-	-	-	69	-	-	-	-	40	-	-	59	-	-	
			Approach LOS	-				B				A				A				
		PM	Volume	-	-	-	-	-	56	155	300	-	70	402	-	-	404	-	88	
			Delay	-	-	-	-	-	-	9	-	-	-	11.1	-	-	3.6	-	-	
			LOS	-	-	-	-	-	A	-	-	-	-	B	-	-	A	-	-	
			95th Queue	-	-	-	-	-	-	69	-	-	-	96	-	-	37	-	-	
Approach LOS	-				A				B				A							

Appendix C – HCS Analysis Results

I-375 Expanded Study Area - HCS Analysis

ID	Facility	Location	Analysis Type	AM						PM					
				EX AM		FNB AM		Build AM		EX PM		FNB PM		Build PM	
				LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density
1	M-10 SB	Grand River Ave	Ramp - Diverge	F	46.2	F	53.9	F	55.4	C	26.0	D	28.2	D	29.1
2	M-10 SB	I-75	Ramp - Diverge	F	42.8	F	46.1	F	47.9	C	22.5	C	24.6	C	25.4
3	M-10 SB	Bagley St.	Ramp - Diverge	D	29.4	D	32.0	D	33.4	B	15.5	B	16.9	B	19.4
4	M-10 SB	WB I-75 On - SB Bagley St. Off	Freeway Segment	B	15.4	B	17.2	C	18.5	A	8.0	A	9.0	B	11.1
5	M-10 SB	I-75	Ramp - Merge	B	19.3	C	21.1	C	21.9	B	11.2	B	12.1	B	14.2
6	M-10 SB	I-75	Ramp - Merge	D	32.5	E	35.8	E	37.1	B	15.4	B	16.7	C	20.6
7	M-10 SB	Howard St.	Ramp - Diverge	D	33.2	E	36.0	E	36.7	B	17.4	B	18.9	C	22.5
8	M-10 SB	SB Howard St. Off - Abbott St.	Freeway Segment	C	18.5	C	20.7	C	22.6	A	7.3	A	8.1	B	12.0
9	M-10 SB	Jefferson Ave.	Ramp - Diverge	C	24.0	C	26.1	C	27.7	B	12.1	B	13.1	B	17.4
10	M-10 SB	SB Jefferson Ave Off - EB Larned St. Off	Freeway Segment	B	17.9	C	19.9	C	21.9	A	6.5	A	7.3	B	11.2
11	M-10 SB	EB Larned St. Off - EB Jefferson Ave	Freeway Segment	B	13.7	B	15.3	B	17.9	A	4.7	A	5.3	A	10.2
12	M-10 NB	WB Jefferson Ave - WB Congress St. On	Freeway Segment	A	0.9	A	1.0	A	3.9	C	18.6	C	20.7	C	24.4
13	M-10 NB	WB Congress St. On - WB Abbott St. On	Freeway Segment	A	1.2	A	1.3	A	3.5	C	18.9	C	21.1	C	25.1
14	M-10 NB	Abbott St.	Ramp - Merge	A	8.8	A	9.4	B	11.7	D	30.7	D	33.8	E	37.4
15	M-10 NB	I-75	Ramp - Diverge	A	8.1	A	8.7	B	11.8	F	34.6	F	37.6	F	41.1
16	M-10 NB	I-75 Off - NB Bagley St. On	Freeway Segment	A	2.2	A	2.4	A	4.4	B	14.6	B	16.3	C	18.8
17	M-10 NB	Bagley St.	Ramp - Merge	B	11.2	B	12.4	B	13.8	B	19.3	C	21.4	C	23.3
18	M-10 NB	I-75	Ramp - Merge	B	19.9	C	21.9	C	22.2	C	22.2	C	24.4	C	25.6

Density - passenger cars per mile per lane