Technical Memorandum 2 - Future Conditions

Highway 10 through Dilworth Corridor Study

Fargo Moorhead Metro COG, MnDOT, and the City of Dilworth

December 20, 2022

Dilworth
US 10 | Corridor Study

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1.0 Traffic Forecasts

When making infrastructure decisions, understanding future conditions, issues, and needs are important to ensure a fiscally responsible plan is in place in anticipation of future replacement and repairs. Therefore, year 2045 traffic forecasts were developed, with a goal of the identifying long-term corridor and intersection capacity needs within the study area. The following information provides an overview of the methodology, assumptions, and traffic forecasts.

Methodology & Assumptions

To develop year 2045 traffic forecasts, a multi-pronged approach was used. This process included a review of historical average daily traffic (ADT) volumes within the study area, traffic forecasts developed as part of the long-range transportation plan, and collaboration with MnDOT's forecasting group. Based on this approach, the project team agreed to use an annual growth rate of one-half (0.5) percent. This growth rate was applied to the existing peak hour and average daily traffic volumes to develop year 2045 base conditions.

Future year 2045 forecasts along the study corridor are expected to range from 10,000 to 19,100 vehicles per day. The higher volumes are located along the western limits of the study area, near 34th Street. The lower volumes are along the eastern limits of the study area, near 60th Street. Note that these forecasts do not include specific reductions and/or travel pattern shifts associated with the following improvements and/or developments:

- Paving 15th Avenue N (East of County Road 9)
- New BNSF Overpass at 14th Street
- Specific Development and/or Redevelopment within the Corridor

A summary of the traffic forecasts and hourly traffic volume profiles are shown in Figures 1 thru 3.

Table 1 ADT Volume Forecasts

Highway 10 Segment	Existing	2045
34th Street to 5th Street W	17,000	19,100
5th Street W to 7th Street E	13,400	15,000
7th Street E to Mn Highway 336	8,900	10,000

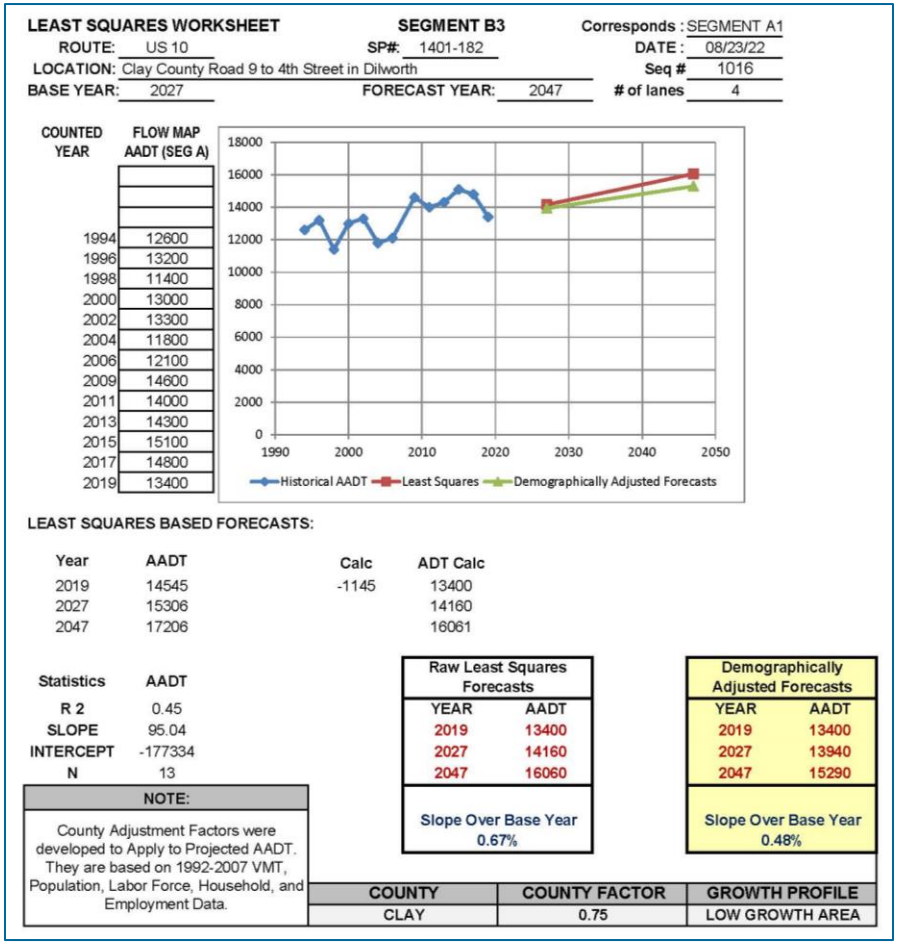

Figure 1 MnDOT Traffic Forecast Worksheet

Figure 2 2045 Hourly Traffic Volume Profiles - Westbound

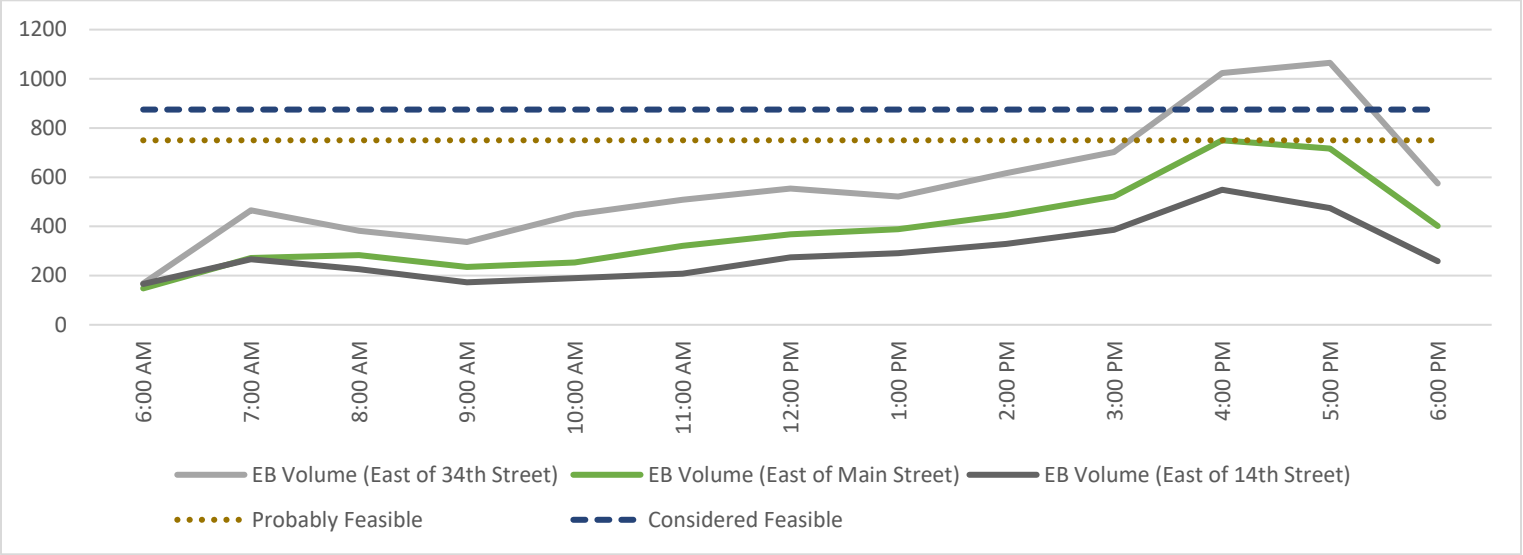

Figure 3 2045 Hourly Traffic Volume Profiles – Eastbound

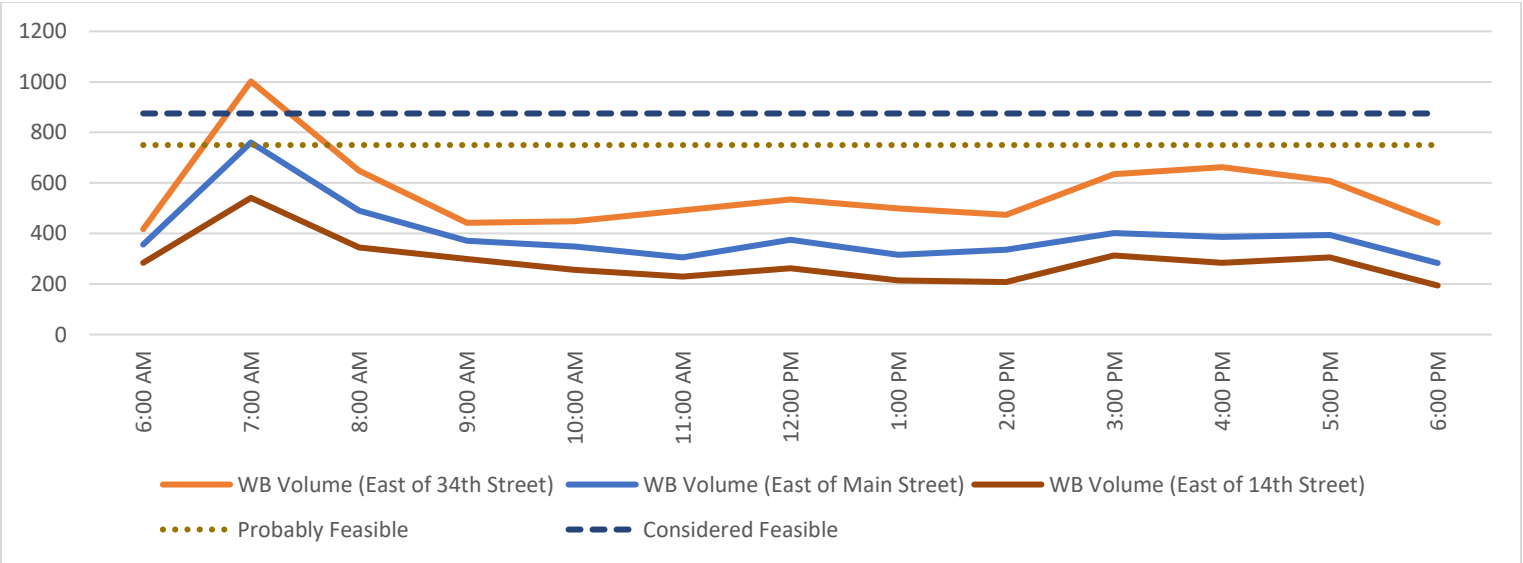

Figure 4 Year 2045 AM Peak Hour Volumes

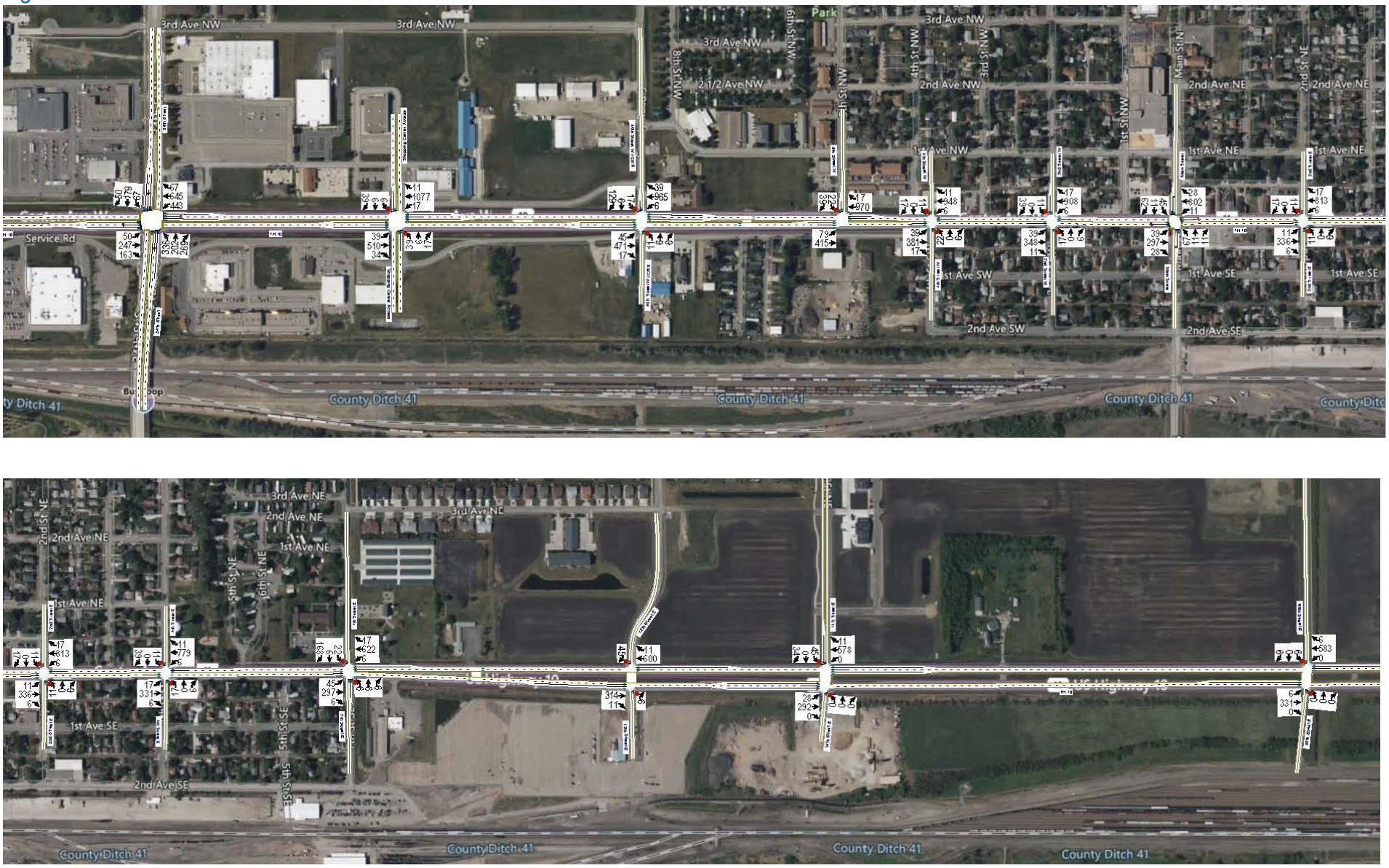

Figure 5 Year 2045 PM Peak Hour Volumes

2.0 Traffic Operations – 2045 Base Conditions

Corridor and Intersection Operations

Future year 2045 ADT volumes along Highway 10 are expected to range from approximately 10,000 to 19,100 vehicles per day. The corridor context also varies from a four-lane undivided facility to a four-lane divided arterial with turn lanes to a four-lane expressway. Typical planning level capacity thresholds by facility type are shown in **Table 2**.

Table 2 Planning Level Capacity Thresholds

Facility Type	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
Primary/Principal Arterial (5-lane)	< 11,400	< 18,200	< 29,100	< 32,600	< 36,300	< 36,300
Primary/Principal Arterial (4-lane)	< 7,600	< 12,100	< 19,400	< 23,300	< 27,600	< 27,600
Primary/Principal Arterial (3-lane)	< 4,900	< 7,900	< 12,700	< 17,000	< 21,100	< 21,100
Primary/Principal Arterial (2-lane)	< 3,100	< 5,000	< 8,000	< 12,000	< 15,900	< 15,900

SOURCE: Mn/DOT and WSB & Associates

Based on this planning-level capacity approach, the US Highway 10 corridor is expected to continue to operate within the LOS A to LOS C range, depending on the segment. A summary of the planning-level capacity analysis by segment is shown in **Table 3**.

Table 3 Planning Level Capacity Analysis

Highway 10 Segment	Facility Type	ADT Volume		Planning-Level LOS	
		Existing	2045 Base	Existing	2045 Base
34th Street to 5th Street W	5-lane	17,900	19,100	LOS B	LOS C
5th Street W to 7th Street E	4-lane	13,400	15,000	LOS C	LOS C
7th Street E to Mn Highway 336	5-lane	9,000	10,000	LOS A	LOS A

Although the planning-level capacity can provide a good barometer of corridor operations, intersection operations often provide a clearer indication of corridor operations. Therefore, a detailed intersection capacity analysis was completed at the study intersections along Highway 10 to understand various performance metrics, including levels of services (LOS), queuing, and travel time. Future year 2045 intersection capacity was evaluated using Synchro/SimTraffic Software (version 11), which incorporates methods outlined in the Highway Capacity Manual, 6th Edition. Note that signal timing was assumed to be optimized, although no changes to phasing occurred.

The future year 2045 intersection capacity analysis shown in **Table 4** indicates that all study intersections are expected to operate at an overall LOS D or better during the a.m. and p.m. peak hours. However, making a left-turn or crossing maneuvers from the side-street approaches along the corridor, particularly at the Frontage Road and County Road 9 during the peak hours, is expected to become more challenging. This is illustrated by the LOS F operations for these side-street approaches during the peak hours.

Table 4 Year 2045 Intersection Capacity Analysis

Highway 10 Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Existing	2045 Base	Existing	2045 Base
34th Street	SIGNAL	B (24 sec)	C (28 sec)	C (31 sec)	D (38 sec)
Frontage Road	SSS	A / E (47 sec)	A / F (88 sec)	B / F (155 sec)	D / F (>180 sec)
CR 9 / 40th Street W	SSS	A / E (37 sec)	A / F (54 sec)	A / F (98 sec)	A / F (>180 sec)
5th Street W	SSS	A / C (24 sec)	A / D (31 sec)	A / B (14 sec)	A / C (16 sec)
4th Street W	SSS	A / C (24 sec)	A / D (31 sec)	A / C (24 sec)	A / D (30 sec)
2nd Street W	SSS	A / C (22 sec)	A / D (27 sec)	A / C (23 sec)	A / D (28 sec)
Main Street	SIGNAL	A (7 sec)	A (7 sec)	A (6 sec)	A (6 sec)
2nd Street E	SSS	A / C (19 sec)	A / C (22 sec)	A / C (21 sec)	A / D (25 sec)
4th Street E	SSS	A / C (18 sec)	A / C (21 sec)	A / C (21 sec)	A / D (25 sec)
7th Street E	SSS	A / C (19 sec)	A / C (23 sec)	A / C (23 sec)	A / D (30 sec)
12th Street E	SSS	A / B (11 sec)	A / B (12 sec)	A / B (11 sec)	A / B (11 sec)
14th Street E	SSS	A / C (17 sec)	A / C (20 sec)	A / B (13 sec)	A / C (15 sec)
60th Street E	SSS	A / B (14 sec)	A / C (16 sec)	A / B (13 sec)	A / B (14 sec)

SSS – Side-Street-Stop

The busiest intersection along the corridor is expected to continue to be 34th Street, where there are several movements where queues extend through the full length of the available turn lane storage. During the a.m. peak hour, these queues occur in the westbound and northbound left-turn lanes, as well as the southbound direction. During the p.m. peak hour, eastbound thru movement and northbound left-turn queues are expected to extend approximately 400 feet, impacting adjacent travel lanes. The northbound left-turn lane is expected to extend beyond the existing turn lane storage approximately 15% of the p.m. peak hour. Northbound and southbound queues are also expected to continue to regularly extend beyond the adjacent Frontage Road access points along 34th Street, which are located approximately 150 feet and 100 feet to the north and south of Highway 10, respectively.

Corridor travel times and average arterial speed data was obtained from the calibrated SimTraffic modeling results. As shown in **Table 5**, average travel times through the 2.5 mile study corridor are expected to increase approximately five (5) to 15 seconds under future year 2045 conditions. The average travel speeds are expected to remain similar during the a.m. peak hour and decrease by an average of one (1) second during the p.m. peak hour.

Table 5 Corridor Travel Time and Average Speed

Highway 10 Direction	AM Peak Hour				PM Peak Hour			
	Travel Time		Arterial Speed		Travel Time		Arterial Speed	
	Existing	2045 Base	Existing	2045 Base	Existing	2045 Base	Existing	2045 Base
Westbound	4 min. 56 sec.	5 min. 00 sec.	38 mph	38 mph	4 min. 54 sec.	5 min. 02 sec.	38 mph	37 mph
Eastbound	5 min. 00 sec.	5 min. 04 sec.	33 mph	33 mph	5 min. 13 sec.	5 min. 25 sec.	32 mph	31 mph

3.0 Alternatives

3-Lane Facility

The analysis of a 3-lane facility assumes no changes to the 34th street intersection, the roadway would transition to a 3-lane section between 34th Street and the frontage road access, and a two-way center left-turn lane would be provided through the study area with no access control changes.

In this scenario, the intersections at the frontage road access, and at CR 9 operate poorly. The side-streets west of Main Street are the most impacted (i.e., difficult to turn left onto Highway 10). Most of the issues are in the NB direction where a higher volume of left turning vehicles experience significant delay trying to enter Highway 10.

4-Lane Facility (Base)

The analysis of a future 4-lane facility is the same as the base conditions. The assumption is that no changes would be made at 34th Street and any access or intersection control changes that might apply to a 3-lane facility would also affect a 4-lane facility in a similar fashion.

Table 6 Year 2045 Intersection Capacity Analysis Comparison

Highway 10 Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		2045 4-Lane (Base)	2045 3-Lane	2045 4-Lane (Base)	2045 3-Lane
34th Street	SIGNAL	C (28 sec)	C (29 sec)	D (38 sec)	D (36 sec)
Frontage Road	SSS	A / F (88 sec)	C / F (>180 sec)	D / F (>180 sec)	F / F (>180 sec)
CR 9 / 40th Street W	SSS	A / F (54 sec)	A / F (>180 sec)	A / F (>180 sec)	B / F (>180 sec)
5th Street W	SSS	A / D (31 sec)	A / E (40 sec)	A / C (16 sec)	A / C (24 sec)
4th Street W	SSS	A / D (31 sec)	A / F (72 sec)	A / D (30 sec)	A / E (40 sec)
2nd Street W	SSS	A / D (27 sec)	A / F (61 sec)	A / D (28 sec)	A / E (38 sec)
Main Street	SIGNAL	A (7 sec)	B (11 sec)	A (6 sec)	A (9 sec)
2nd Street E	SSS	A / C (22 sec)	A / D (32 sec)	A / D (25 sec)	A / D (32 sec)
4th Street E	SSS	A / C (21 sec)	A / E (38 sec)	A / D (25 sec)	A / D (31 sec)
7th Street E	SSS	A / C (23 sec)	A / D (34 sec)	A / D (30 sec)	A / E (35 sec)
12th Street E	SSS	A / B (12 sec)	A / C (15 sec)	A / B (11 sec)	A / B (14 sec)
14th Street E	SSS	A / C (20 sec)	A / C (23 sec)	A / C (15 sec)	A / C (19 sec)
60th Street E	SSS	A / C (16 sec)	A / C (19 sec)	A / B (14 sec)	A / C (18 sec)

SSS – Side-Street-Stop

Operational Needs / Considerations

With any alternative, there are general corridor needs to consider. Primary and secondary access points should be identified to guide decisions regarding control of public access points. Management of private access points should also be a priority along the corridor, especially to properties with multiple access points or redundant access points on side-streets or alleys. Medians can be considered for access control as well as streetscaping/landscaping and streetlighting.

Transition areas will need to be identified between a 3-lane and 4-lane facility. The operational analysis at the frontage road intersection and at CR 9 indicates those intersections would not function well as a purely 3-lane configuration with no change to intersection control. Because CR 9 is a primary intersection it provides an opportunity for a transition either through a traffic signal (if warranted), roundabout, or other control method. Likewise, a transition from 3-lanes back to 4-lanes could occur at 7th Street E, 14th Street E, or 60th Street at the western edge of Dilworth without a discernable change to the Level of Service.

Following are additional observations and potential improvements at the study intersections:

- 34th Street would benefit from dual northbound left turn lanes, as well as access management north and south of Highway 10.
- The Frontage Road intersection could be considered for access control method to limit northbound and southbound left turns. This would improve the Level of Service and reduce the potential for vehicle crashes involving left turns.
- The south approach at CR 9 could be realigned or relocated if a traffic signal, roundabout, or other control method is implemented.
- The south approach at 4th Street W should be realigned to eliminate the offset from the north approach, or it should be eliminated.
- The 14th Street East intersection should be designed with consideration of a potential future BNSF overpass south of Highway 10.
- Left-turn lanes should have a zero or positive offset at all intersections.