

# Brisbin Road Corridor Access Study

Grundy County, Illinois



Prepared for  
Grundy County Highway Department



August 2012

# Contents

---

## *List of Figures and Tables, iii*

1. Introduction	1
2. What is Access Management?	3
Access Management Elements	3
3. Existing Traffic Conditions	6
Corridor Study Limits	6
Existing Traffic Volumes	9
Existing Roadway Conditions	10
Public Transportation	17
Existing Intersection Operations	17
4. Future Land Use and Traffic Conditions	20
Future Development and Traffic Generation	20
Future Roadway System	27
Distribution of Future Development Traffic	27
Assignment of Future Development Traffic	28
Year 2040 Projected Traffic Volumes	29
5. Recommended Roadway Design	33
Roadway Classification and Function	33
Cross-Section and Geometric Characteristics	34
Access Control and Traffic Signals	47
Intersection Geometrics and Traffic Control	48
Projected Intersection Operations	54
6. Project Funding Options	56
7. Conclusions	57
Appendix	

# List of Figures and Tables

---

## Figures

1. Corridor Study Limits	7
2. Aerial View of Corridor Study Area	8
3. Existing Traffic Volumes	11
4. Existing Typical Cross-Section	12
5. Existing Conditions (Brisbin Road: U.S. Route 6 to Whitman Road)	13
6. Existing Conditions (Brisbin Road: Whitman Road to Minooka Road)	14
7. Existing Conditions (Brisbin Road: Minooka Road to Sherrill Road)	15
8. Traffic Analysis Zones	22
9. Residential Growth to 2040	23
10. Retail Growth to 2040	24
11. Industrial Growth to 2040	25
12. Office Growth to 2040	26
13. Projected 2040 Traffic Volumes (Brisbin Road: North Road to Local Access F)	30
14. Projected 2040 Traffic Volumes (Brisbin Road: Local Access C to Local Access E)	31
15. Projected 2040 Traffic Volumes (Brisbin Road: Sherrill Road to Minooka Road)	32
16. Typical Cross-Section – Post Interchange Design (Brisbin Road: South Project Terminus)	35
17. Typical Cross-Section – Post Interchange Design (Brisbin Road: US 6 to South Project Terminus)	36
18. Recommended Typical Cross-Section – Ultimate Design (Brisbin Road: South of US 6)	37
19. Typical Cross-Section – Post Interchange Design (Brisbin Road: US 6 to I-80 Interchange)	39
20. Recommended Typical Cross-Section – Ultimate Design (Brisbin Road: US 6 to I-80 Interchange)	40
21. Typical Cross-Section – Post Interchange Design (Brisbin Road: North Project Terminus)	42
22. Recommended Typical Cross-Section – Interim Design (Near Term) (Brisbin Road: I-80 Interchange to Sherrill Road)	43
23. Recommended Typical Cross-Section – Interim Design (Mid Term) (Brisbin Road: I-80 Interchange to Sherrill Road)	44

24. Recommended Typical Cross-Section – Ultimate Design (Brisbin Road: I-80 Interchange to Sherrill Road)	45
25. Recommended Access Locations/Intersection Geometrics (Brisbin Road: U.S. Route 6 to Whitman Road)	49
26. Recommended Access Locations/Intersection Geometrics (Brisbin Road: Whitman Road to Minooka Road)	50
27. Recommended Access Locations/Intersection Geometrics (Brisbin Road: Minooka Road to Sherrill Road)	51

## **Tables**

1. Existing Daily (24-Hour) Traffic Volumes	9
2. Level of Service Criteria	18
3. Capacity Analysis Results – Existing Traffic Conditions	19
4. Directional Distribution of Future Study Area Traffic	28
5. Capacity Analysis Results – Projected 2040 Traffic Conditions	55

# 1.

## Introduction

The Grundy County Highway Department retained the services of Kenig, Lindgren, O'Hara, Aboona, Inc. (KLOA, Inc.) to develop a corridor access plan for Brisbin Road in unincorporated Grundy County, Illinois.

The study limits for Brisbin Road extend over a three-mile section from U.S. Route 6 on the south to the Grundy County-Kendall County line at Sherrill Road on the north, and envelops the future Brisbin Road interchange with Interstate 80, which is presently under construction and anticipated to be completed in Autumn 2012. This section of Brisbin Road is under the jurisdiction of the Grundy County Highway Department.

Brisbin Road is an important north-south County highway that connects U.S. Route 6 to the south with Kendall County Highway 5 and U.S. Route 52 to the north. Within the study area, Brisbin Road is presently a two-lane roadway with a rural cross-section (i.e., shoulders and drainage ditch).

The Village of Channahon planning area is located to the southeast of the future I-80/Brisbin Road interchange while the Village of Minooka planning area is located to the northeast of the interchange and the City of Morris planning area is located to the northwest and southwest of the interchange. Boundary agreements are in place amongst the three communities and Brisbin Road forms one of the boundaries of those agreements. The comprehensive plans of all three communities identify Brisbin Road as an arterial roadway and envision the corridor developing with highway-oriented commercial land uses, as well as some light industrial, office, research/business park, and low-density residential uses.

The opening of the I-80 interchange is likely to be the impetus for the development of the south end of the corridor. Prior to the Brisbin Road corridor becoming more developed, access and design guidelines are needed. As such, the purpose of this Corridor Access Study is to develop a roadway improvement plan that (1) accommodates the projected traffic levels generated by the new I-80 interchange and development growth that may occur along the corridor, (2) establishes future access points along the roadway, (3) defines the ultimate roadway cross-section, right-of-

way requirements, intersection geometrics and traffic controls, (4) achieves the County's functional and aesthetic vision of the roadway, and (5) attains consensus with the participating communities on an acceptable roadway design.

Access management elements have been incorporated into the plan to balance mobility and access, so as to maintain an efficient movement of traffic while enhancing safe and efficient access to and from abutting properties. Since the current roadway grid along Brisbin Road is incomplete and approximately spaced along the section lines at one-mile intervals, the plan includes the locations of future connector roadways that will improve local traffic circulation, provide alternate means of property access, and can be constructed, in part or in total, by private developers as a condition of approval at the time that a site plan is submitted to the governing agency for review.

## 2.

# What Is Access Management?

“Access management is the systematic control of the location, spacing, design, and operations of driveways, median openings, interchanges, and street connections to a roadway.”<sup>1</sup> Along busy commercial corridors, as Brisbin Road will eventually be, a well conceived access management plan serves to improve the efficient movement of traffic while enhancing the safe and efficient access to and from abutting properties. Some specific benefits of access management include:

- Safer and more efficient access to properties
- Fewer and less severe vehicle crashes
- Fewer vehicle/pedestrian conflicts
- Less traffic congestion
- Reduced travel delays
- Reduced fuel consumption and vehicle emissions
- Increased and preserved traffic capacity
- Enhanced corridor aesthetics

### Access Management Elements

There are many access management techniques that can be used to improve traffic flow and enhance safety along a corridor. The primary elements of this corridor access study include: well-spaced and coordinated traffic signals and full access intersections, location of future connector roadways, landscaped medians, and auxiliary lanes. The objective is to accommodate most, if not all, left-turn movements at the signalized intersections along the corridor.

---

<sup>1</sup> *Access Management Manual*, Transportation Research Board, Washington, D.C. 2003  
*Brisbin Road Corridor Access Study*  
*Grundy County, Illinois*

### Traffic Signal Spacing/Coordination and Connector Roads

The spacing of full access unsignalized intersection and signalized intersections can have a dramatic influence on the safe and efficient movement of traffic along a corridor. Management of signal spacing includes planning for the frequency of signals, as well as the uniformity of their spacing.

The Grundy County Highway Access Regulation Ordinance (GCHARO) does not include Brisbin Road in its highway access classification system as Brisbin Road was taken over by the County after the GCHARO was adopted in September 2004. Comparable County highways in Grundy County are classified as Access 3 roadways when defining access control standards. The minimum spacing of full access unsignalized intersections on Access 3 roadways is  $\frac{1}{4}$ -mile (1,320 feet) and the minimum spacing of signal-controlled intersections is  $\frac{1}{3}$ -mile (1,760 feet).

The Grundy County access standards are consistent with the standards of the adjoining counties of Kendall and LaSalle. However, these standards are more conservative than those of Will County and Kane County, where minimum spacing standards for signal-controlled intersections along suburban arterials and collectors are  $\frac{1}{4}$ -mile.

The future infill of connector roadways within the existing approximately one-mile roadway grid along Brisbin Road is likely to occur at the  $\frac{1}{2}$ -mile point to maintain a proportional roadway grid. The most efficient location of additional connector roads and property access drives would be mid-point between this future  $\frac{1}{2}$ -mile roadway grid, or at the  $\frac{1}{4}$ -mile points. A minimum signalized intersection spacing standard of  $\frac{1}{3}$ -mile is more appropriate in a rural, residential or other relatively low-density environment. Restricting signalized access to  $\frac{1}{3}$ -mile spacing in areas of denser traffic generators can lead to less efficient signal operation, poorer signal coordination, dual turn lanes and/or longer turn lane stacking requirements at intersections, higher vehicle delays, lower levels of service, and unsafe travel conditions on arterial or major collector roadways.

For these reasons, the minimum spacing standards for signal-controlled intersections along Brisbin Road is recommended to be  $\frac{1}{4}$ -mile, consistent with Grundy County's minimum spacing standards for full access unsignalized intersections along these roadways.

To maintain efficient traffic signal operations and traffic flow progression at this spacing standard, all future signals within the Brisbin Road corridor should be interconnected into a coordinated signal system.

### Landscaped Center Median

A landscaped center median can be a very effective access management tool because it separates directional traffic flow, limits the locations of left-turn movements, provides a refuge area for pedestrians crossing the roadway, and enhances community appearance. Left-turn movements adversely impact traffic flow and are far more likely to be involved in vehicular crashes than right-turn movements. The installation of a landscaped median has the effect of restricting driveway and minor cross-street turning movements to right-turn movements only. In addition, vehicular-pedestrian crash rates are typically less than one-half that on roadways with a two-way left-turn lane.

### Auxiliary Lanes

Deceleration lanes for left- and right-turns provide an effective way to limit the speed differential between turning vehicles and through vehicles. Left- and right-turn lanes are needed to maintain traffic progression on major signalized collector or arterial roadways. The GCHARO indicates that left-turn lanes “are mandatory for all major and minor use generators”, which would include intersections with significant collector and arterial roadways. The GCHARO further specifies that right-turn lanes “should be installed at an access on a County highway if the average daily two-way volume at the access is at least 1,000 vehicles and the average peak hour entering right-turn volume is at least 40 vehicles. Other factors such as the highway design speed, the number of highway approach lanes, composition of access traffic, and adjacent highway alignment should influence the need for a deceleration lane regardless of whether the volumes mentioned above are or are not met.”

### 3.

## Existing Traffic Conditions

Transportation conditions in the Brisbin Road corridor were inventoried to create a database for analyzing existing and projected future conditions. Three general components of existing conditions were considered, including:

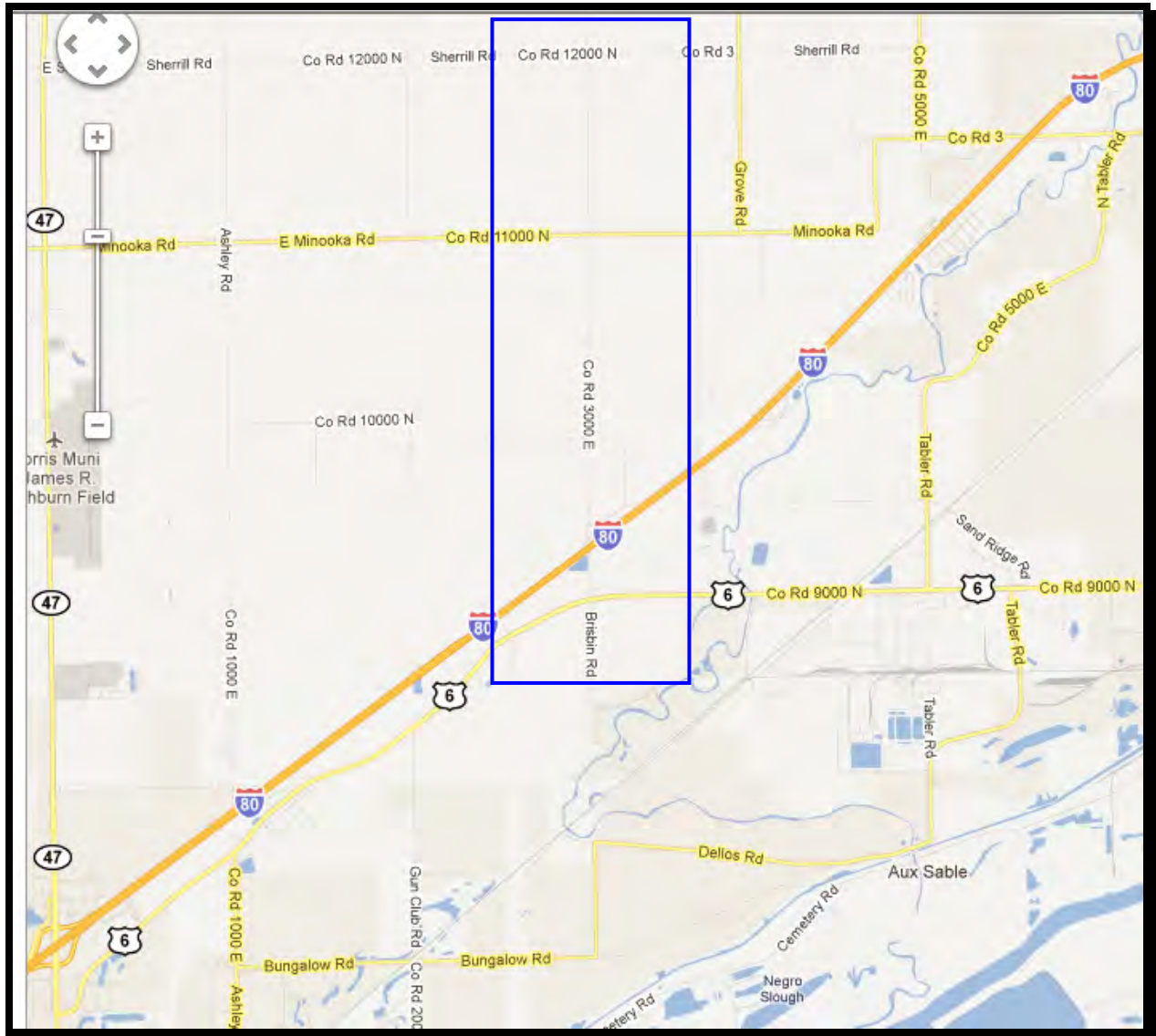
1. Characteristics of the roadways, including lane configuration, intersection traffic controls, and speed limits
2. Existing weekday traffic volumes
3. Intersection operations

### Corridor Study Limits

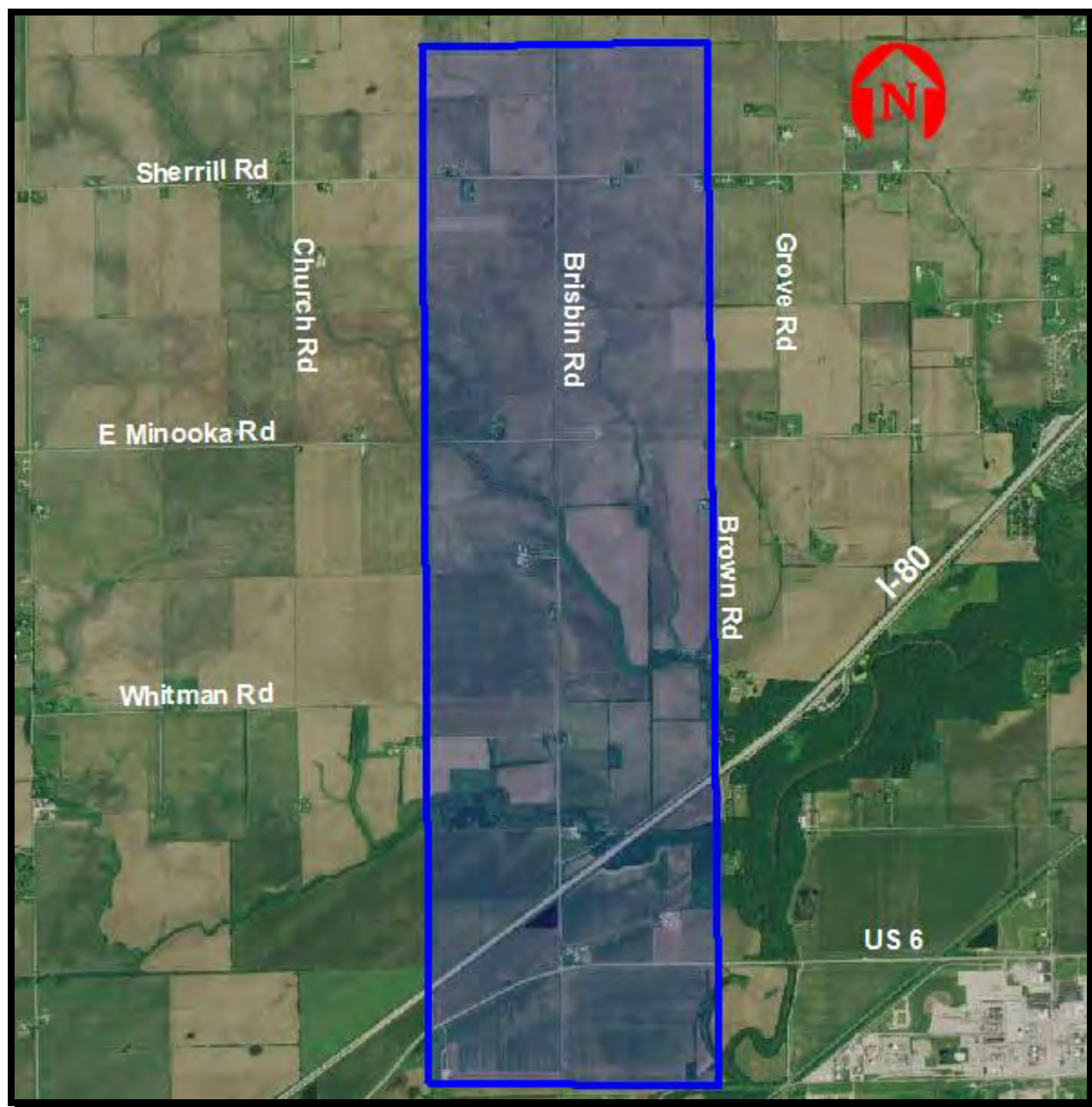
The study limits for the Brisbin Road corridor extend over a three-mile section from U.S. Route 6 on the south to Sherrill Road on the north. Five (5) intersections were evaluated and analyzed within the study limits, as follows:

1. Brisbin Road / Sherrill Road
2. Brisbin Road / Minooka Road
3. Brisbin Road / Private Drive
4. Brisbin Road / North Road
5. Brisbin Road / U.S. Route 6

Figure 1 shows the Brisbin Road corridor study area with respect to the surrounding roadway system. Figure 2 shows an aerial view of the corridor study area with the study intersections highlighted.



**Figure 1**  
**CORRIDOR STUDY LIMITS**



**Figure 2**  
**AERIAL VIEW OF CORRIDOR STUDY AREA**

## Existing Traffic Volumes

Traffic volume and vehicle classification data was collected or obtained by KLOA, Inc. as part of the corridor access study. The data was summarized on a 24-hour basis and for the weekday peak hours.

### Average Daily (24-Hour) Traffic Volumes

Average daily traffic volume and vehicle classification data for the study area roadways was obtained from the Illinois Department of Transportation (IDOT). The data was collected by IDOT in 2009 and 2010, prior to the commencement of construction on the I-80/Brisbin Road interchange.

The traffic count data indicates that Brisbin Road presently carries from approximately 175 vehicles per day (vpd) at the north end of the corridor to approximately 700 vpd at the south end of the corridor, as shown in Table 1. The Brisbin Road/U.S. Route 6 Intersection Design Study contained in the Combined Design Report for the I-80/Brisbin Road Interchange, prepared by Parsons Transportation Group in 2003, indicates that approximately 10 percent of the daily traffic on Brisbin Road is generated by single unit and multi-unit trucks.

Table 1  
EXISTING DAILY (24-HOUR) TRAFFIC VOLUMES

Section	Two-Way Traffic Volume			Percent Trucks (%)
	Passenger Vehicles	Trucks <sup>1</sup>	Total Vehicles	
Brisbin Road (South of Sherrill Road)	160	15	175	10.0
Brisbin Road (North of U.S. Route 6)	630	70	700	10.0
<sup>1</sup> Consists of single unit and multi-unit trucks (i.e., vehicles over 28 feet)				

### Peak Hour Intersection Traffic Volumes

Manual intersection turning-movement traffic counts were conducted at the Brisbin Road/Sherrill Road and Brisbin Road/Minooka Road intersections on Tuesday, September 20, 2011 during the weekday morning and afternoon commuter peak periods. From the traffic count data, the peak hours of traffic activity were determined to be 7:30-8:30 A.M. in the morning and 4:15-5:15 P.M. in the evening.

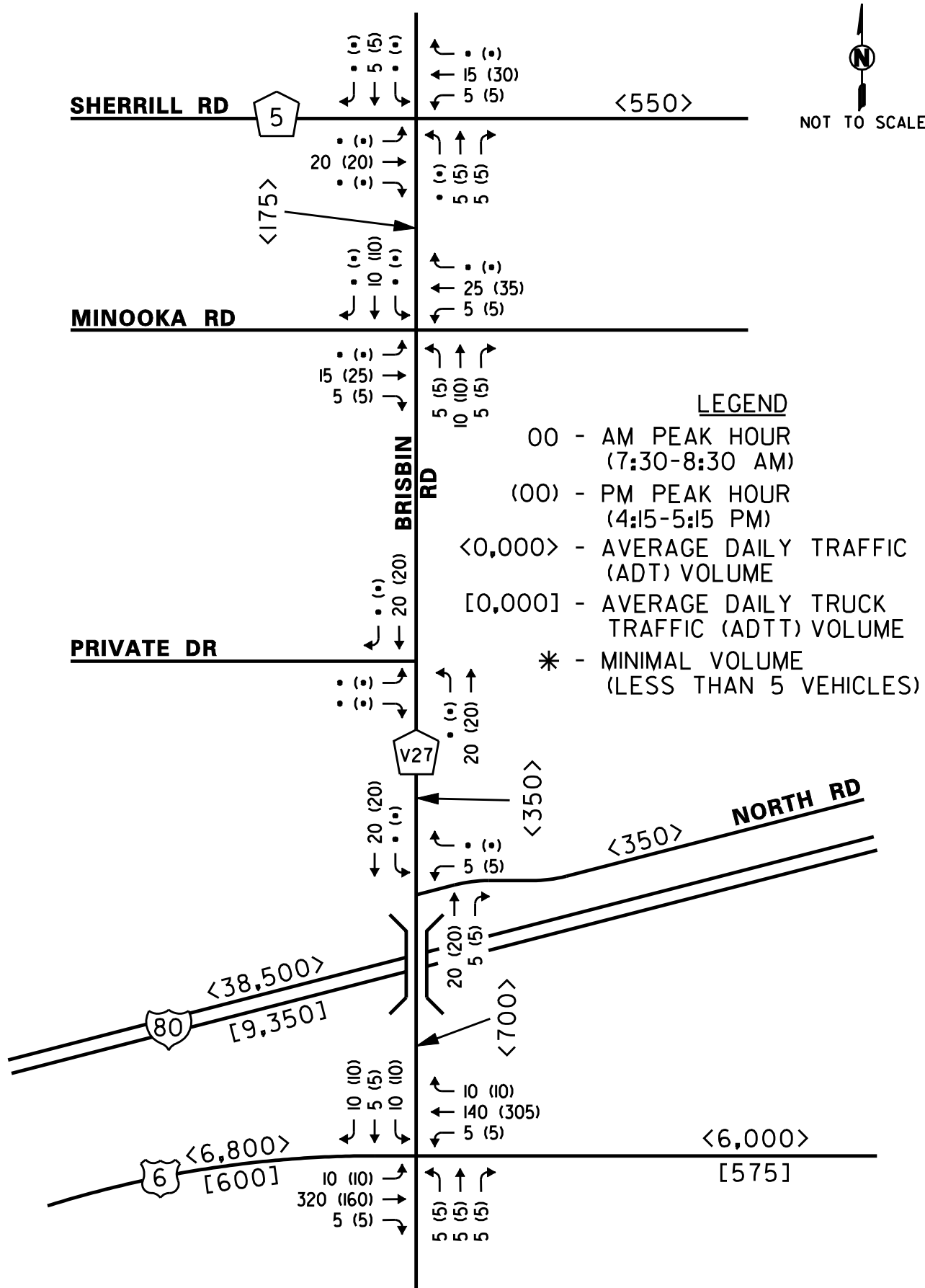
At the time of this study, the I-80/Brisbin Road interchange was under construction and Brisbin Road was closed between U.S. Route 6 and North Road. As such, peak hour traffic volumes for the Brisbin Road/U.S. Route 6 intersection were obtained from the 2003 Intersection Design Study. Peak hour traffic volumes at the Brisbin Road intersections with North Road and the private drive north of North Road were estimated based on an analysis of the traffic volumes at the other study area intersections.

The existing peak hour traffic volumes and 24-hour volumes are shown in Figure 3.

## **Existing Roadway Conditions**

KLOA, Inc. obtained the Phase II roadway design plans for the I-80/Brisbin Road interchange from the Grundy County Highway Department. KLOA then conducted an extensive field review of the corridor and the intersections in the study area to identify the physical and operational aspects of the roadway system. Figure 4 illustrates the existing typical cross-section of Brisbin Road. Presently, with the exception of the I-80 interchange area, Grundy County has a prescriptive easement for Brisbin Road with no recorded widths or public right-of-way as the private property lines extend to the centerline of the roadway. Brisbin Road is designed to rural standards with aggregate shoulders and open drainage swales. Figures 5 through 7 illustrate the existing property lines, right-of-way, lane geometrics, traffic controls, intersection spacing, and posted speed limits along Brisbin Road. The following paragraphs describe Brisbin Road and the key intersections in the corridor.

*Brisbin Road (County Highway V27)* is a two-lane, undivided, north-south roadway that extends from approximately 4,500 feet south of U.S. Route 6 to Walker Road approximately 12 miles to the north in Kendall County. The section of Brisbin Road under study (U.S. Route 6 to Sherrill Road) is under the jurisdiction of the Grundy County Highway Department (GCHD) and has a rural cross-section (i.e., shoulders and drainage ditch). Brisbin Road is functionally classified by IDOT as a collector road while the comprehensive plans of Morris, Minooka and Channahon all identify Brisbin Road as an arterial road. The Grundy County Highway Access Regulation Ordinance (GCHARO) does not include Brisbin Road in its highway access classification system as Brisbin Road was taken over by the County after the GCHARO was adopted in September 2004, however, comparable County highways in Grundy County are classified as Access 3 roadways when defining access control, intersection spacing and traffic control standards. Brisbin Road is also a Federal Aid Urban Route (FAU 401) between U.S. Route 6 and Minooka Road, making it part of the National Highway System (NHS) and eligible for federal-aid funds for resurfacing, reconstruction, traffic management, bicycle/ pedestrian, and operational improvement projects. There are no posted speed limits on Brisbin Road and the roadway was observed to operate within the Illinois statutory maximum speed limit of 55 mph.



PROJECT:

BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:

EXISTING TRAFFIC VOLUMES

PROJECT NO:

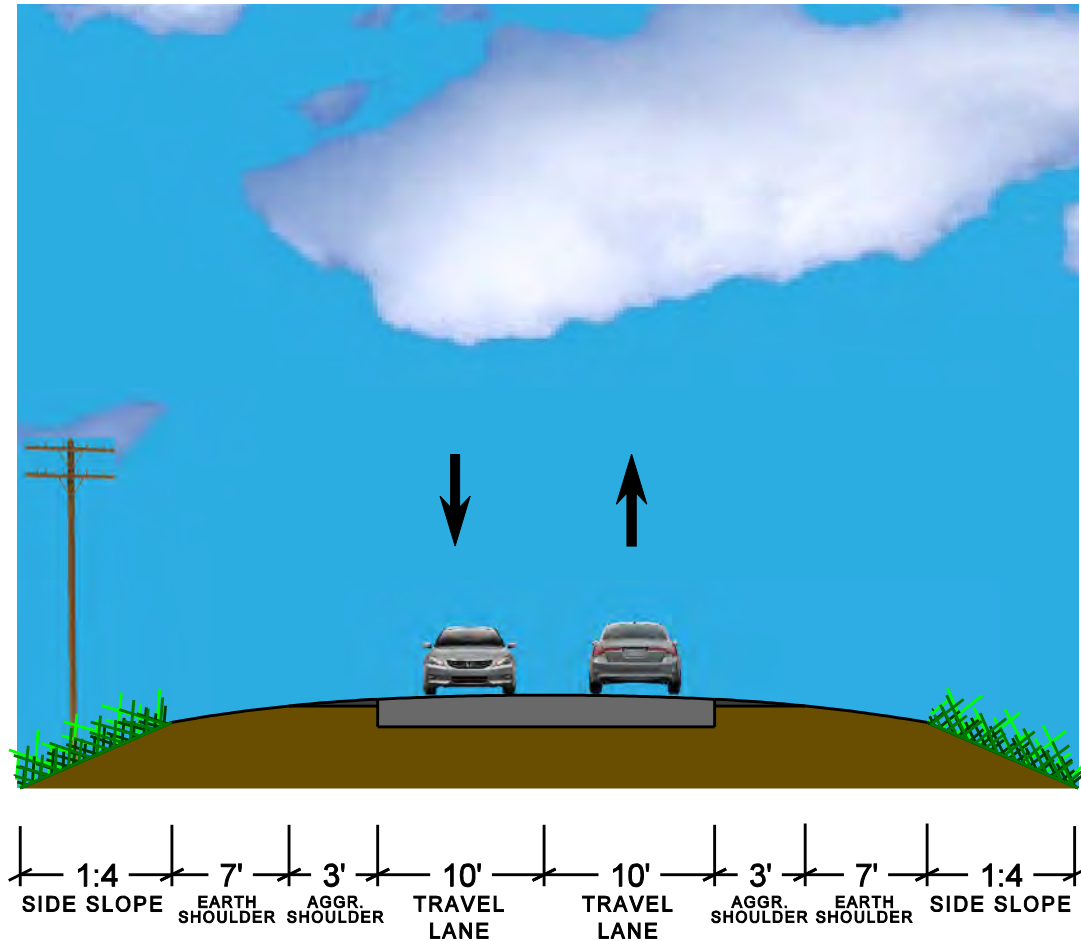
II-100

**KLOA**

FIGURE NO:

3

# Brisbin Road



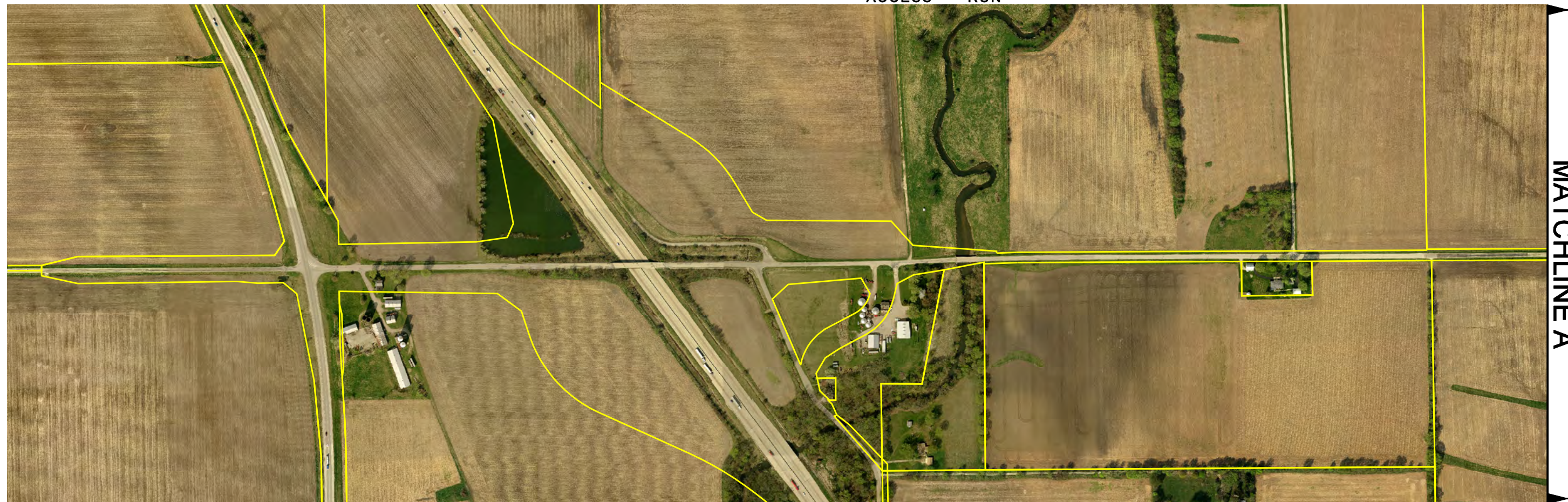
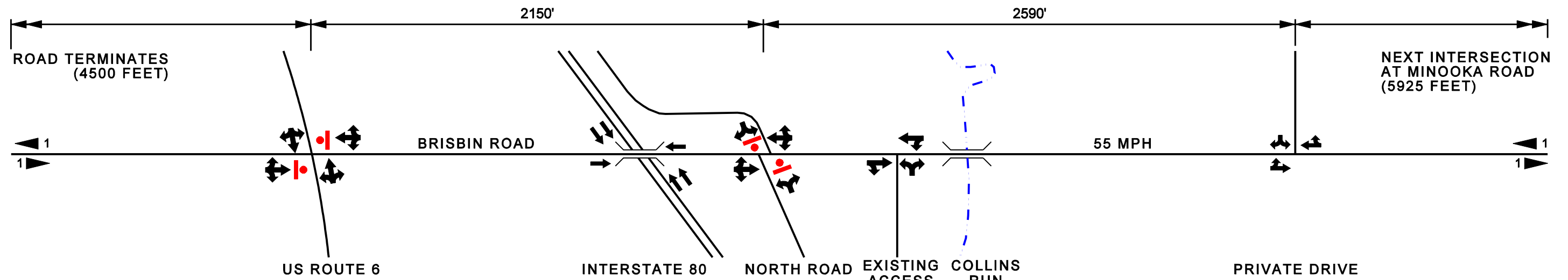
PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
EXISTING TYPICAL CROSS SECTION

PROJECT NO: II-100

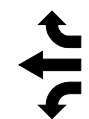


FIGURE NO: 4



MATCHLINE A

### LEGEND



INTERSECTION  
GEOMETRICS



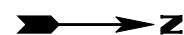
# NUMBER OF LANES



STOP SIGN



PROPERTY LINE



9575 West Higgins Road, Suite 400  
Rosemont, Illinois 60018  
P: (847) 518-9990 F: (847) 518-9987  
PROJECT # 11-100

DESIGNED - GJG  
DRAWN - GJG  
CHECKED - ER  
DATE - 8/27/2012

SCALE: 1" = 500'

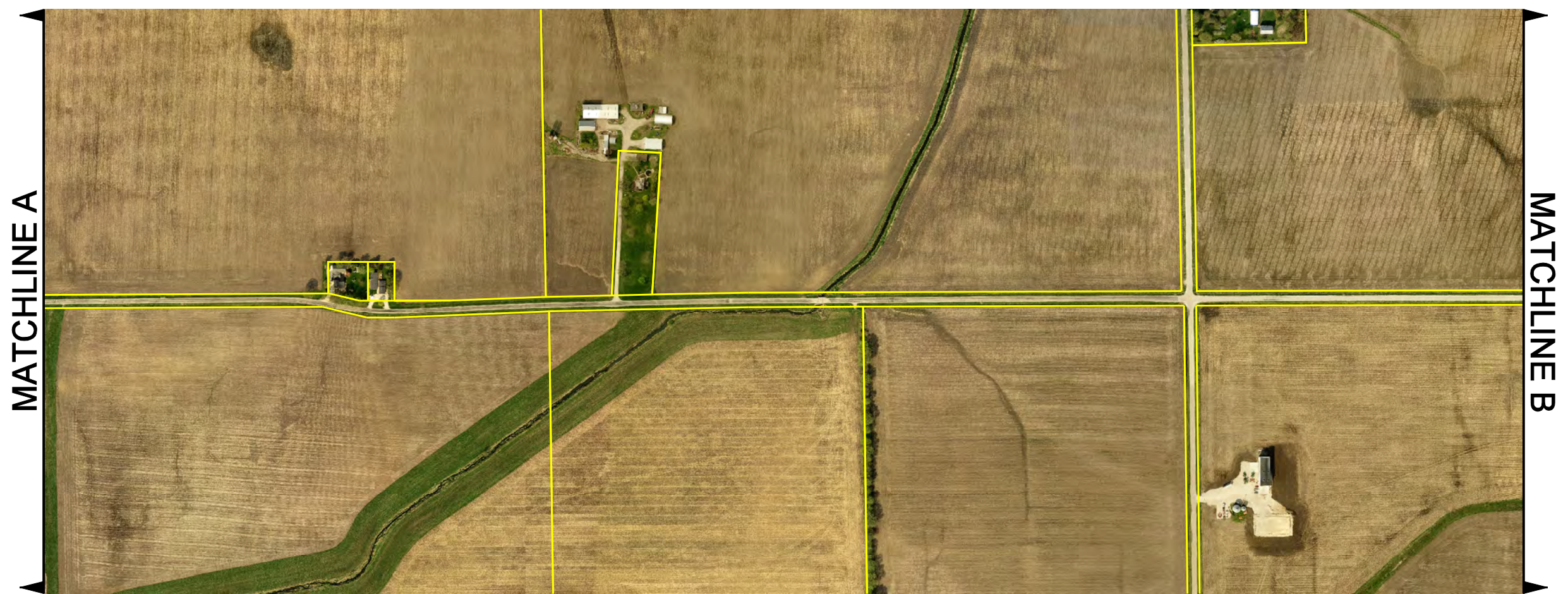
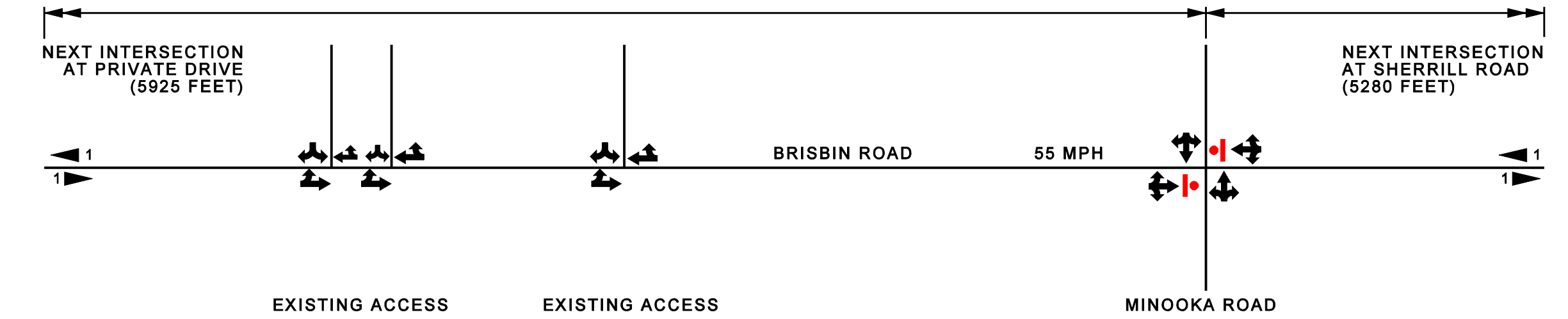


BRISBIN ROAD CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

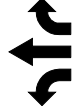



**EXISTING CONDITIONS**  
BRISBIN ROAD: US ROUTE 6 TO WHITMAN ROAD

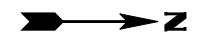
FIGURE NO.

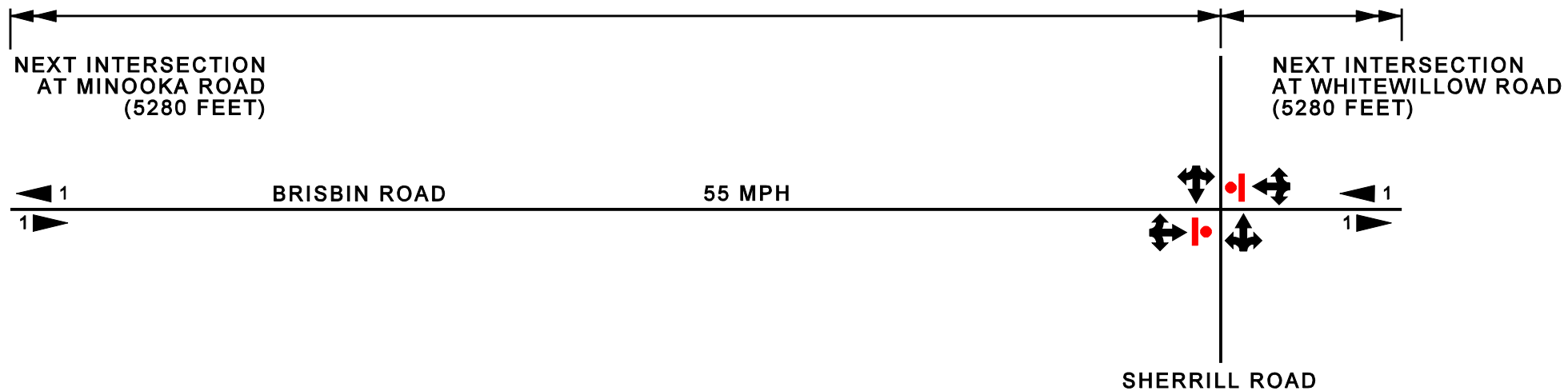
5



**LEGEND**

-  INTERSECTION GEOMETRICS
-  # NUMBER OF LANES
-  STOP SIGN
-  PROPERTY LINE





MATCHLINE B



# LEGEND



INTERSECTION  
GEOMETRICS



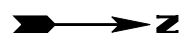
# NUMBER OF LANES



STOP SIGN

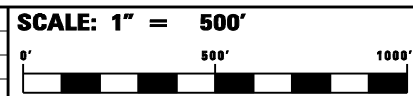


PROPERTY LINE



9575 West Higgins Road, Suite 400  
Rosemont, Illinois 60018  
P: (847) 518-9990 F: (847) 518-9987  
PROJECT # 11-100

DESIGNED	-	GJG
DRAWN	-	GJG
CHECKED	-	ER
DATE	-	8/27/2012



BRISBIN ROAD CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

**EXISTING CONDITIONS**  
BRISBIN ROAD: MINOOKA ROAD TO SHERRILL ROAD

FIGURE NO.

7

*U.S. Route 6* is a two-lane, undivided, east-west roadway that extends from IL Route 47 and the City of Morris on the west to I-55, the villages of Minooka and Channahon, and downtown Joliet on the east. U.S. Route 6 is under IDOT jurisdiction and has a rural cross-section. It is functionally classified by IDOT as a minor arterial roadway and an arterial roadway/major thoroughfare by the City of Morris and the villages of Minooka and Channahon. U.S. Route 6 is also a Federal Aid Urban Route (FAU 392) and is designated by IDOT as a Class II truck route. The intersection of U.S. Route 6 and Brisbin Road is under stop control on Brisbin Road. U.S. Route 6 carries approximately 6,000-6,800 vehicles per day and 575-600 trucks per day in the vicinity of Brisbin Road. The posted speed limit on U.S. Route 6 is 55 mph.

*Sherrill Road (County Highway C16)* is a two-lane, undivided, east-west roadway that extends from Lisbin Road in Saratoga Township on the west to O'Brien Road in Aux Sable Township on the east. Sherrill Road is under the jurisdiction of the GCHD from Lisbin Road to Ashley Road, and the Kendall County Highway Department (County Highway 5) from Ashley Road to O'Brien Road. Sherrill Road is classified as a local street by IDOT and a collector road by the City of Morris and Village of Channahon. Sherrill Road has a rural cross-section and carries approximately 500-550 vehicles per day. The intersection of Sherrill Road with Brisbin Road is under stop control on Brisbin Road. There are no posted speed limits on Sherrill Road in the vicinity of Brisbin Road and the roadway was observed to operate within the Illinois statutory maximum speed limit of 55 mph.

*Minooka Road* is a two-lane, undivided, east-west roadway that extends from E. 27<sup>th</sup> Road in LaSalle County on the west to Ridge Road in Minooka on the east where it continues east as Mondamin Street. Minooka Road has a rural cross-section and is under the jurisdiction of Saratoga Township to the west of Brisbin Road and Aux Sable Township from Brisbin Road east to O'Brien Road. From O'Brien Road east to Tabler Road, Minooka Road is under GCHD jurisdiction and designed County Highway C16. Minooka Road is classified by IDOT as a collector road. The City of Morris classifies Minooka Road as an arterial road to the west of Brisbin Road and a collector road to the east of Brisbin Road. Minooka Road is also a Federal Aid Urban Route (FAU 400). The intersection of Minooka Road with Brisbin Road is under stop control on Brisbin Road. Minooka Road carries approximately 300 vpd in the vicinity of Brisbin Road. There are no posted speed limits on Minooka Road in the vicinity of Brisbin Road and the roadway was observed to operate within the Illinois statutory maximum speed limit of 55 mph.

*Whitman Road* is a two-lane, undivided, east-west local roadway that extends from Ashley Road on the west to a point one mile east of Ashley Road. Whitman Road has a rural cross-section and is under the jurisdiction of Saratoga Township.

*North Road* is a two-lane, undivided, east-west local roadway that extends from Brisbin Road on the west to Brown Road on the east. North Road has a rural cross-section and is under the jurisdiction of Aux Sable Township. The intersection of North Road with Brisbin Road is under stop control on North Road.

*Interstate 80 (I-80)* is a limited access east-west expressway that spans the United States from New Jersey on the east to California on the west. Within Illinois, I-80 is under IDOT jurisdiction. In the vicinity of Brisbin Road, I-80 has two lanes in each direction and there are currently two full interchanges on I-80, one approximately six miles to the east at Ridge Road and the other approximately 3.75 miles to the west at IL Route 47. A new full interchange is presently under construction at Brisbin Road. I-80 is a Federal Aid Interstate Route (FAI 80) and is designated by IDOT as a Class I truck route. The posted speed limit on this section of I-80 is 65 mph.

## **Public Transportation**

There are presently no fixed-route transit services operating in the vicinity of Minooka, Channahon and Morris. The only public transportation currently available in the area is dial-a-ride transit service provided by the Grundy Transit System (GTS) on weekdays between 7:30 A.M. and 4:00 P.M.

## **Existing Intersection Operations**

To evaluate existing traffic operations in the Brisbin Road corridor during the peak weekday time periods, capacity analyses were conducted at all study intersections utilizing Synchro 6.0 computer software, which generally follows the methodologies outlined in the Transportation Research Board's *Highway Capacity Manual (HCM)*, 2000. This software allows for the analysis of multiple interconnected traffic signal systems as well as independent signalized or unsignalized intersections.

The ability of an intersection to accommodate traffic flow is expressed in terms of Level of Service, which is assigned a letter grade from A to F based on the average control delay experienced by vehicles passing through the intersection. Control delay is that portion of the total delay attributed to the traffic signal or stop sign control operation, and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Level of Service A is the highest grade (best traffic flow and least delay), Level of Service E represents saturated or at-capacity conditions, and Level of Service F is the lowest grade (oversaturated conditions, extensive delays). As indicated in the GCHARO, Level of Service C is the desired peak-hour service level for projected 20-year future traffic conditions.

For signal-controlled intersections, levels of service are calculated for lane groups, intersection approaches, and the intersection as a whole. For all-way stop controlled (AWSC) intersections, levels of service are calculated based on the weighted average of the delay on each of the approaches (the approach delay consists of the weighted average of the delay on each lane of the approach). For two-way stop controlled (TWSC) intersections, levels of service are only calculated for the approaches controlled by a stop sign (not for the intersection as a whole). Level of Service F at TWSC intersections occurs when there are not enough suitable gaps in the flow of traffic on the major (uncontrolled) street to allow minor-street traffic to safely enter the major street flow or cross the major street in a reasonable amount of time.

The *Highway Capacity Manual* definitions for levels of service and the corresponding control delay for signalized and unsignalized intersections are shown in Table 2. Table 3 summarizes the results of the capacity analyses for the existing weekday morning and afternoon peak-hour conditions, indicating the level service and delay for the critical minor street movement at all TWSC intersections. The capacity analysis worksheets are contained in the Appendix.

Table 2  
LEVEL OF SERVICE CRITERIA

<b>Signalized Intersections</b>		
Level of Service	Interpretation	Average Control Delay (seconds per vehicle)
A	Very short delay, with extremely favorable progression. Most vehicles arrive during the green phase and do not stop at all.	≤10
B	Good progression, with more vehicles stopping than for Level of Service A, causing higher levels of average delay.	>10-20
C	Light congestion, with individual cycle failures beginning to appear. Number of vehicles stopping is significant at this level.	>20-35
D	Congestion is more noticeable, with longer delays resulting from combinations of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines.	>35-55
E	Limit of acceptable delay. High delays result from poor progression, high cycle lengths, and high V/C ratios.	>55-80
F	Unacceptable delays occurring, with oversaturation.	>80.0
<b>Unsignalized Intersections</b>		
Level of Service		Average Control Delay (seconds per vehicle)
A		0-10
B		>10-15
C		>15-25
D		>25-35
E		>35-50
F		>50
Source: Highway Capacity Manual, 2000.		

Table 3  
CAPACITY ANALYSIS RESULTS – EXISTING TRAFFIC CONDITIONS

Intersection	Weekday AM Peak Hour		Weekday PM Peak Hour	
	LOS	Delay	LOS	Delay
Brisbin Road / Sherrill Road <sup>1</sup>	A	9.1	A	9.1
Brisbin Road / Minooka Road <sup>1</sup>	A	9.2	A	9.3
Brisbin Road / Private Drive <sup>1</sup>	A	8.6	A	8.6
Brisbin Road / North Road <sup>1</sup>	A	8.7	A	8.7
Brisbin Road / U.S. Route 6 <sup>1</sup>	B	12.2	B	12.3

Note: LOS = level of service    Delay = seconds/vehicle

<sup>1</sup> Unsignalized TWSC Intersection. LOS and delay representative of average of stop controlled approaches.

The results indicate that all study area intersections along the Brisbin Road corridor presently operate at very good levels of service under existing traffic controls. It should be noted that the capacity analysis for the intersections of Brisbin Road with U.S. Route 6 and North Road were based on traffic conditions prior to the commencement of construction of the new Brisbin Road interchange with I-80.

## 4.

# Future Land Use and Traffic Conditions

An assessment of future traffic conditions in the Brisbin Road corridor is an essential step in determining the ultimate design requirements for the roadway. The assessment was based on three key components: (1) the types and densities of land use anticipated to develop in the corridor, (2) the roadway system that will be developed to accommodate these land uses, and (3) the generation, distribution and assignment of the resulting traffic volumes from these land uses.

Based on a comparison of daily traffic volumes between that published by IDOT in 2009/2010 and that published by IDOT in 2001, Brisbin Road has experienced a modest but steady increase in volume of approximately 1.5-3.0 percent per year (14-27% total) during this time period. This trend may be reflective of the collector/arterial classification of Brisbin Road and development growth occurring along U.S. Route 6 and Minooka Road to the east (i.e., Minooka, Channahon) and west (i.e., Morris) of the study area.

As land is developed along Brisbin Road over the next 20 years or more, the traffic volumes on these roadways will increase. The aggregation of the traffic generated by these future developments with the existing traffic volumes comprise the projected traffic volumes utilized in this analysis. For the purpose of this study, a planning horizon of 28 years (i.e., Year 2040) was selected to coincide with the anticipated development of the developable land area in the corridor and for comparison to 2040 regional traffic projections developed by the Chicago Metropolitan Agency for Planning (CMAP). In actuality, full buildout of the developable land in the Brisbin Road corridor may not occur for many years beyond 2040.

## Future Development and Traffic Generation

Estimates of future development to the 2040 planning horizon were prepared by the City of Morris, Village of Minooka and Village of Channahon, in conjunction with KLOA, Inc., based on the future land uses contained in the comprehensive plans of the three communities as well as the Village of Channahon's West Side Sub-Area Plan.

First the number of developable acres by land-use type was estimated for the study area based on an analysis of aerial mapping of the study area, existing land uses, existing rights-of-way, and natural (undevelopable) features. Next development ratios were determined based on development trends in the three communities. The development ratios are in units per acre for residential developments and floor-area-ratios (FAR) for retail, industrial, and office/service developments. Development ratios range from 2 units per acre for residential uses and 0.2-0.35 FAR for retail, office/service and industrial uses. Next, development densities were estimated by multiplying the developable acreage by the development ratios.

The future development densities were then utilized to calculate weekday peak-hour traffic volumes that would be generated by these developments using trip generation equations published by the Institute of Transportation Engineers (ITE) in *Trip Generation*, 8<sup>th</sup> Edition, 2008. Average daily (24-hour) traffic volumes were also calculated by dividing the peak-hour volumes by a 12 percent peak-hour factor.

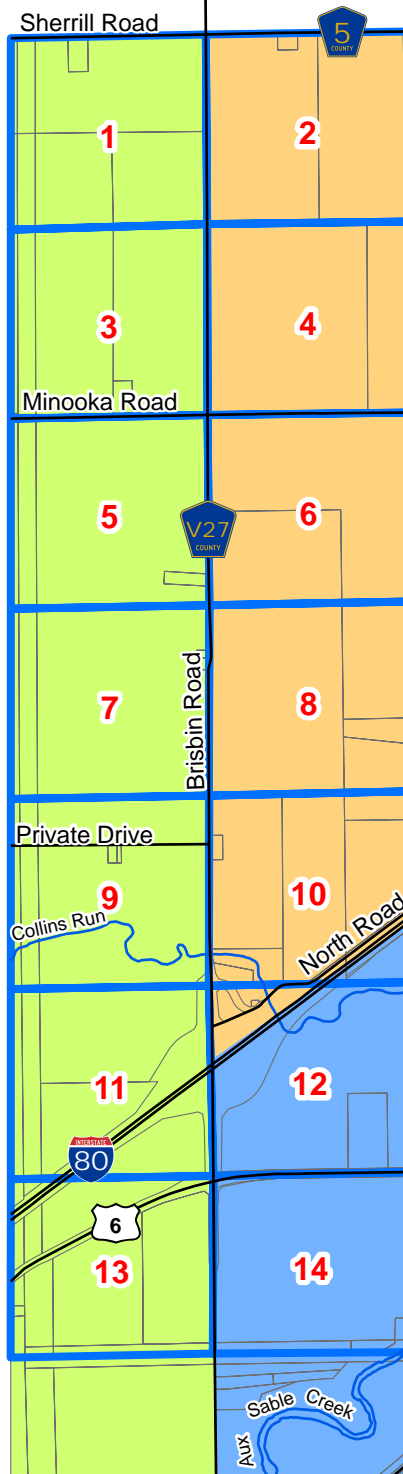
Due to the length of the Brisbin Road corridor (3 miles), the corridor was subdivided into 14 zones for traffic analysis purposes. Each zone has frontage on Brisbin Road, is equivalent in size (½-mile by ½-mile square), and is generally projected to contain parcels of similar land use. Figure 8 illustrates the boundaries of the traffic analysis zones (TAZs). A summary table of the future land-uses, developable acreage and ratios, projected development densities, and traffic generation for each of the TAZ's is in the Appendix.

Figure 9 illustrates where residential growth is anticipated to occur, the majority of which will occur along the east side of Brisbin Road between Sherrill Road and Minooka Road at the north end of the corridor. Approximately 540 dwelling units are projected to be built within the study area in the future.

Figure 10 illustrates where retail growth is anticipated to occur. Retail growth will occur in the form of neighborhood level centers, community level centers, and regional level centers. Regional retail growth will occur along Brisbin Road on the north and south sides of the new I-80 interchange and at the Brisbin Road/U.S. Route 6 intersection. Neighborhood and community level retail will tend to follow the residential development patterns and will cluster in the vicinity of the Brisbin Road/Minooka Road intersection and the Brisbin Road/Sherrill Road intersection. Approximately 4.8 million square feet of retail space is projected to develop in the future.

Figure 11 illustrates the anticipated industrial growth areas. The primary locations in which significant industrial development is expected is along the east and west sides of Brisbin Road to the north of the I-80 interchange. Approximately 11.4 million square feet of industrial space is projected to develop in this area in the future.

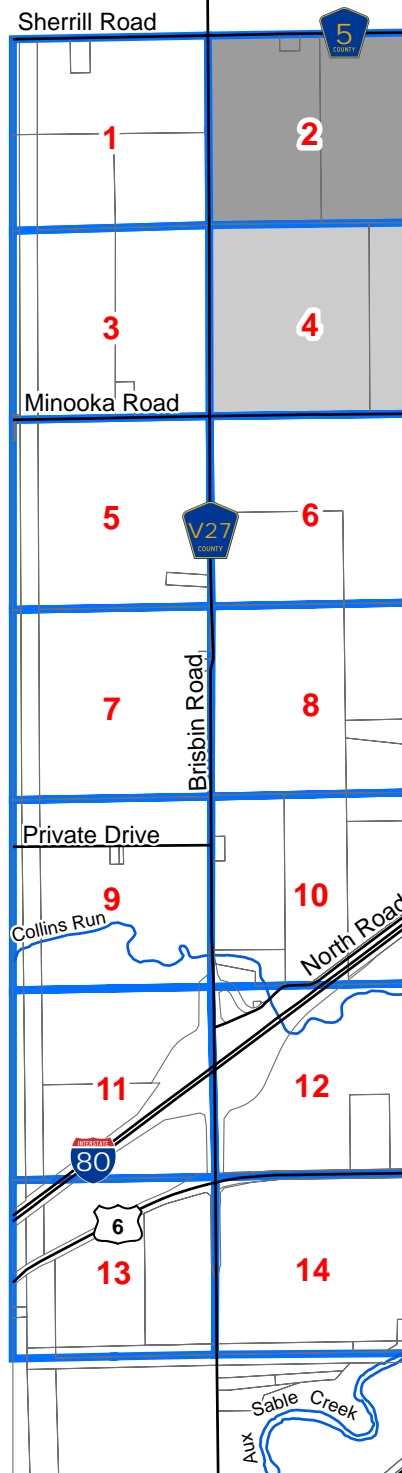
Growth in office/service uses will occur along both sides of Brisbin Road with the largest concentration occurring to the southeast of the I-80 interchange, as shown in Figure 12. In total, approximately 4.6 million square feet of office space is projected to develop in the future.



0 0.25 0.5 1 Miles

### Legend

- 8 Traffic Analysis Zone
- Street System
- Watercourse
- Morris Planning Area
- Minooka Planning Area
- Channahon Planning Area

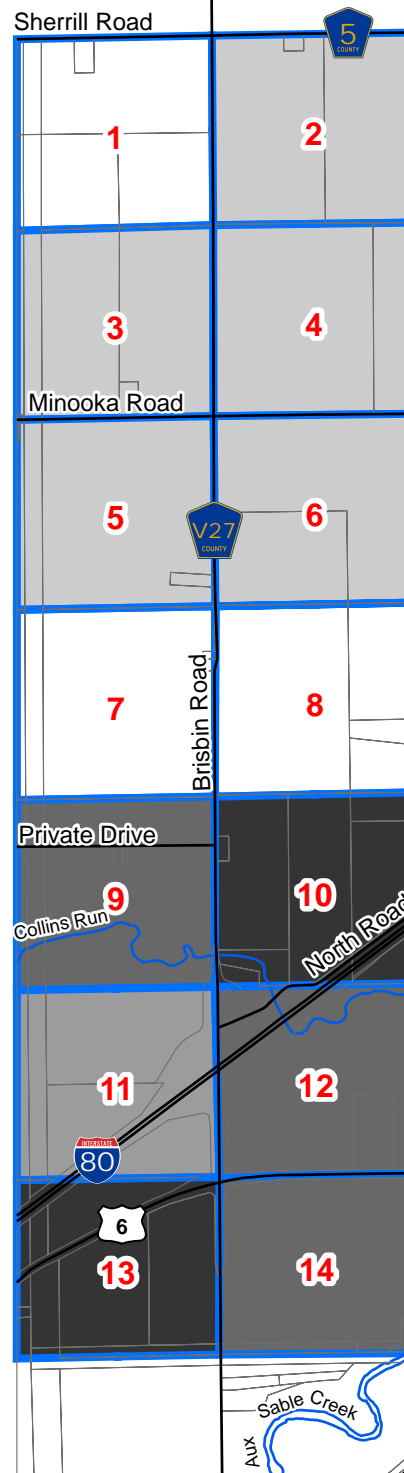


## Legend

- 8 Traffic Analysis Zone
- Street System
- ~ Watercourse
- No Significant Change
- < 200 New Units
- 200-400 Units
- 400-600 New Units
- > 600 New Units



0 0.25 0.5 1 Miles

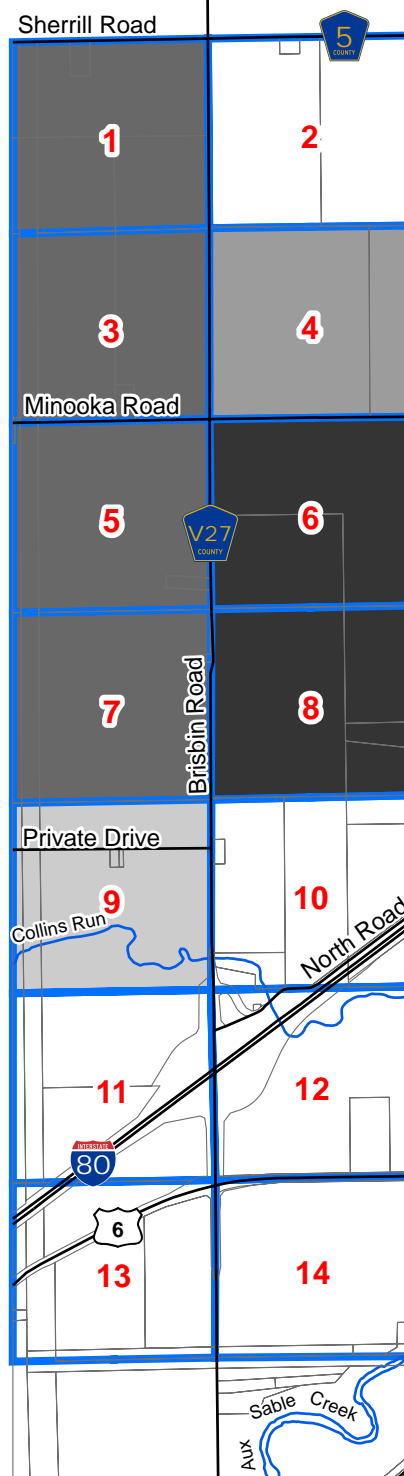


## Legend

- 8 Traffic Analysis Zone
- Street System
- ~ Watercourse
- No Significant Change
- < 250,000 SF
- 250,000-500,000 SF
- 500,000-1,000,000 SF
- > 1,000,000 SF



0 0.25 0.5 1 Miles

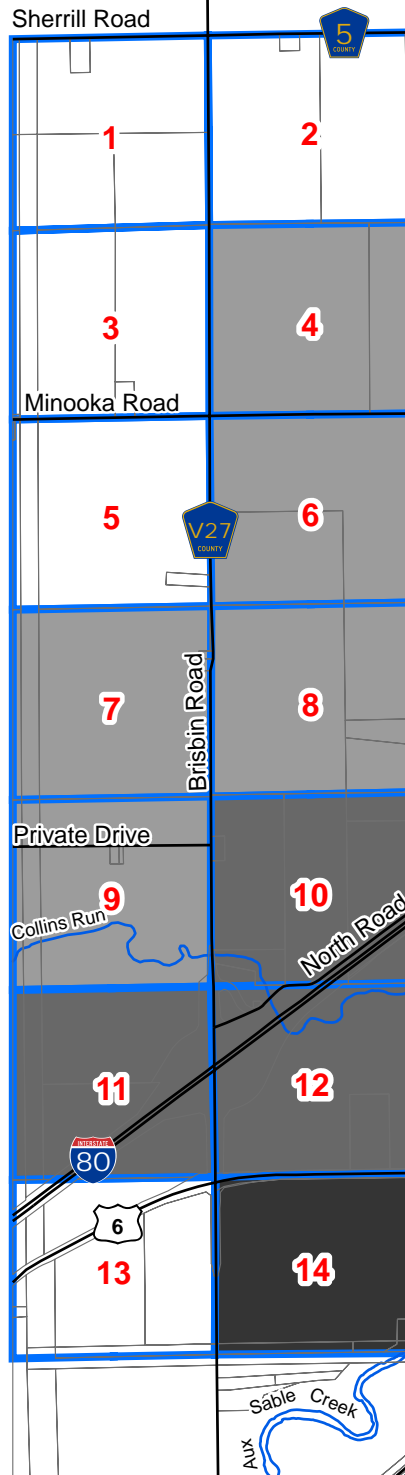


### Legend

- 8 Traffic Analysis Zone
- Street System
- ~ Watercourse
- No Significant Change
- < 500,000 SF
- 500,000-1,000,000 SF
- 1,000,000-2,000,000 SF
- > 2,000,000 SF



0 0.25 0.5 1 Miles



### Legend

- 8 Traffic Analysis Zone
- Street System
- ~ Watercourse
- No Significant Change
- < 250,000 SF
- 250,000-500,000 SF
- 500,000-1,000,000 SF
- > 1,000,000 SF



0 0.25 0.5 1 Miles

## **Future Roadway System**

The roadway system that will serve future development in the Brisbin Road corridor will be an improvement over the current system, both from the perspective of access to the regional roadway system as well as local circulation within the study area and environs.

Regionally, the Brisbin Road corridor will be directly connected to I-80 (eastbound and westbound) when construction of the full-diamond, I-80/Brisbin Road interchange is completed in Autumn 2012. Locally, access to the Brisbin Road corridor may be improved in the future with the extensions or realignments of existing roadways, as documented in the Morris and Channahon comprehensive plans. Potential roadway extensions include Brisbin Road south then west to Gun Club Road, Church Road south from Minooka Road to U. S. Route 6 (with a bridge over I-80), Whitman Road east to Brisbin Road, and North Road west to IL 47. North Road east of Brisbin Road will be realigned as part of the I-80/Brisbin Road interchange project.

## **Distribution of Future Development Traffic**

The distribution of traffic generated by future development within the traffic analysis zones was based on several factors. The first was existing traffic patterns on the roadways in the planning area. The second was home-to-work trip flow data from the 2000 U.S. Census, as tabulated by CMAP for the Census tracts that comprise the planning area (Tracts 1.02, 1.03, 2). The third was from an analysis of the distribution of existing and planned households in the study area based on the 2000 Census data and the development projections discussed above. Lastly, consideration was given to the potential development of new connections to existing regional roadway facilities (i.e., I-80/Brisbin Road interchange) and potential extensions of existing local roadways (e.g., Brisbin Road south to Gun Club Road).

Based on these factors, the directions from which future development traffic will approach and depart the study area were estimated. The directional distribution will vary by land use. Traffic generated by residential, industrial and office/service developments are more associated with the major travel corridors and regional roadway system. Traffic generated by retail developments will originate from the residential neighborhoods within the developments market area. The market areas for neighborhood and community scale retail centers will be smaller and draw more local traffic whereas the market area for regional scale retail centers will be larger and draw more traffic from I-80. To distinguish between the orientation of traffic from the various land uses, four (4) different directional distributions were developed to forecast future traffic volumes in the Brisbin Road corridor, as shown in Table 4.

Table 4

## DIRECTIONAL DISTRIBUTION OF FUTURE STUDY AREA TRAFFIC

Direction To/From	Percentage of Traffic			
	Residential	Industrial/ Office	Neighborhood/ Community Retail	Regional Retail
East on I-80	5%	10%	*	10%
West on I-80	5%	10%	*	10%
North via Brisbin Rd, Grove Rd, Church Rd	40%	20%	20%	20%
South via Brisbin Rd extended, Brown Rd, Gun Club Rd	*	5%	5%	10%
East via U.S. Route 6, Minooka Rd, Sherrill Rd	25%	30%	45%	25%
West via U.S. Route 6, Minooka Rd, Sherrill Rd, North Rd extended, Whitman Rd extended	<u>25%</u>	<u>25%</u>	<u>30%</u>	<u>25%</u>
Total	100%	100%	100%	100%

\* - Minimal

### Assignment of Future Development Traffic

The peak hour traffic generated by future development within the TAZ's was assigned to the roadway system based on the directional distributions shown in Table 4. The traffic assignment process was performed manually based on a modified gravity model methodology that considered all network roadway options and functional classifications.

For future developments with Brisbin Road frontage, access was assumed from Brisbin Road as well as from the adjacent existing roadways and/or future east-west and north-south connector roads that may be developed in the future to support these developments. Consequently, only a portion of the traffic generated by these developments will travel on Brisbin Road. Traffic assignments were made for trips both originating in and destined to the study area and reflect the fact that a portion of the retail development traffic will be generated internal to the study area from existing and future residential subdivisions.

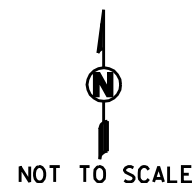
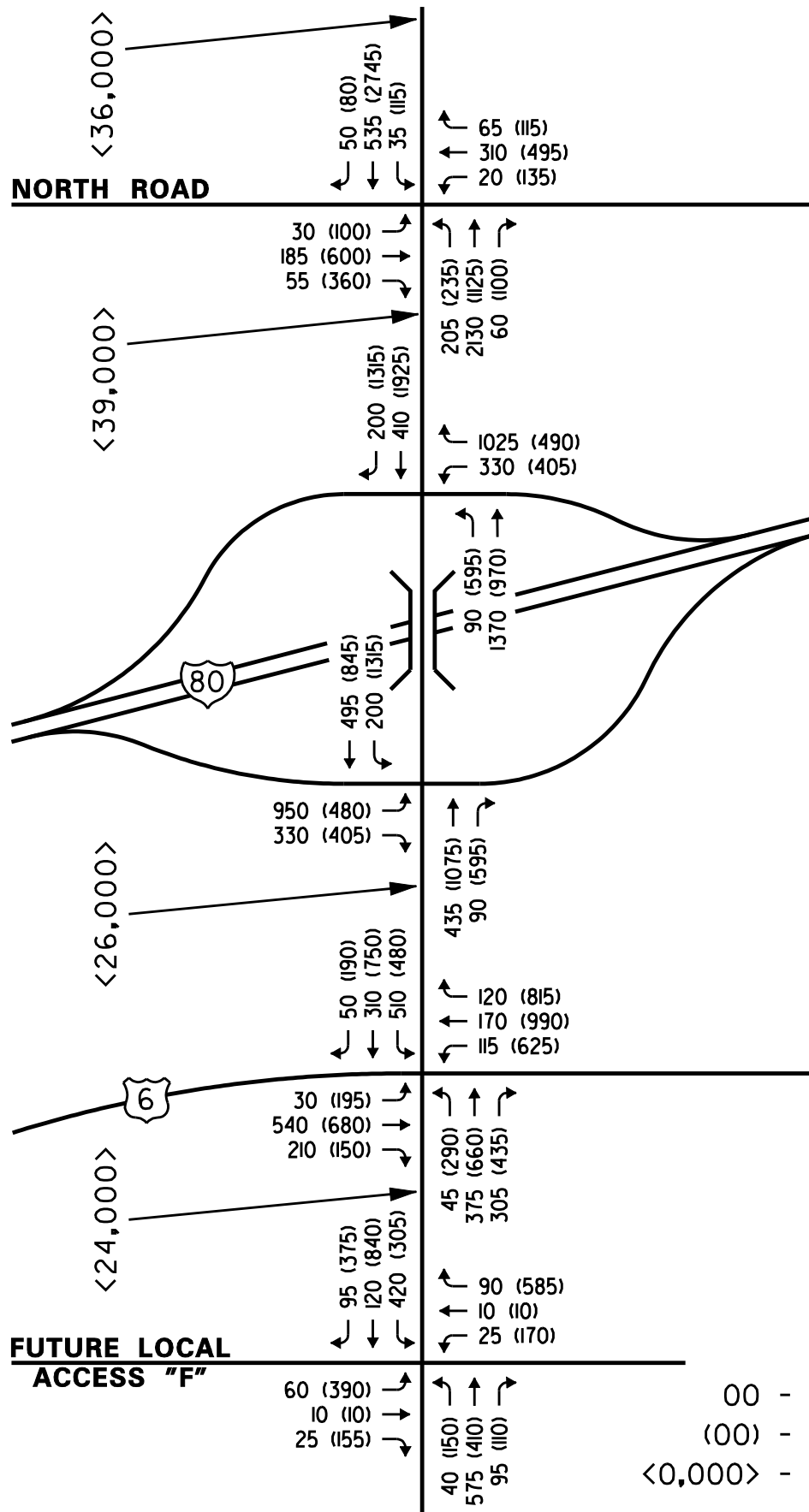
## **Year 2040 Projected Traffic Volumes**

The assignment of future development peak hour traffic was combined with the existing peak hour traffic volumes (Figure 3) to obtain the projected 2040 peak hour traffic volumes, which are shown in Figures 13-15 for the various sections of Brisbin Road. Projected 2040 daily (24-hour) traffic volumes were also calculated utilizing the peak hour factor and are also shown in Figures 13-15. To plan for the ultimate design of Brisbin Road, it was assumed that all planned development would be completed by 2040. The KLOA projections for Brisbin Road range from 24,000-39,000 vpd based on the land use data provided by the three communities.

To validate the 2040 traffic projections, KLOA requested 2040 average daily traffic (ADT) projections from CMAP, which are based on existing ADT data available from IDOT and from the April 2010 CMAP Regional Transportation Plan/Transportation Improvement Program Travel Demand Analysis. The regional travel model utilized in the transportation plan uses CMAP 2040 socioeconomic projections (provided by the local communities) and assumes the implementation of the 2040 Regional Transportation Plan for the Northeastern Illinois area.

The CMAP traffic projections indicate that traffic volumes on Brisbin Road will increase from the current volume of 175-700 vpd (see Table 1) to 500-8,000 vpd in 2040, reflecting an annual traffic growth rate of 6.6-37.2 percent over the next 28 years.

A comparison between the KLOA traffic projections and CMAP traffic projections indicates that the KLOA projections are substantially higher. This difference is attributed to the KLOA analysis assumption that full buildout of the Brisbin Road corridor will occur by 2040. In actuality, full buildout may not occur for several years beyond 2040.



PROJECT:

BRISBIN ROAD  
 CORRIDOR ACCESS STUDY  
 GRUNDY COUNTY, ILLINOIS

TITLE:

PROJECTED 2040 TRAFFIC VOLUMES  
 BRISBIN ROAD: NORTH ROAD TO  
 LOCAL ACCESS "F"

PROJECT NO:

11-100



FIGURE NO:

13



NOT TO SCALE

**FUTURE LOCAL  
ACCESS "C"**

**FUTURE MID-MILE  
COLLECTOR 2**

**FUTURE LOCAL  
ACCESS "D"**

**FUTURE  
WHITMAN RD**

**FUTURE LOCAL  
ACCESS "E"**

<26,000>

**LEGEND**  
00 - AM PEAK HOUR  
(00) - PM PEAK HOUR  
<0,000> - AVERAGE DAILY  
TRAFFIC (ADT)

PROJECT:

BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:

PROJECTED 2040 TRAFFIC VOLUMES  
BRISBIN ROAD: LOCAL ACCESS "C" TO  
LOCAL ACCESS "E"

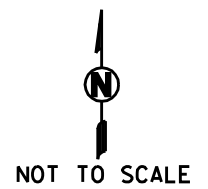
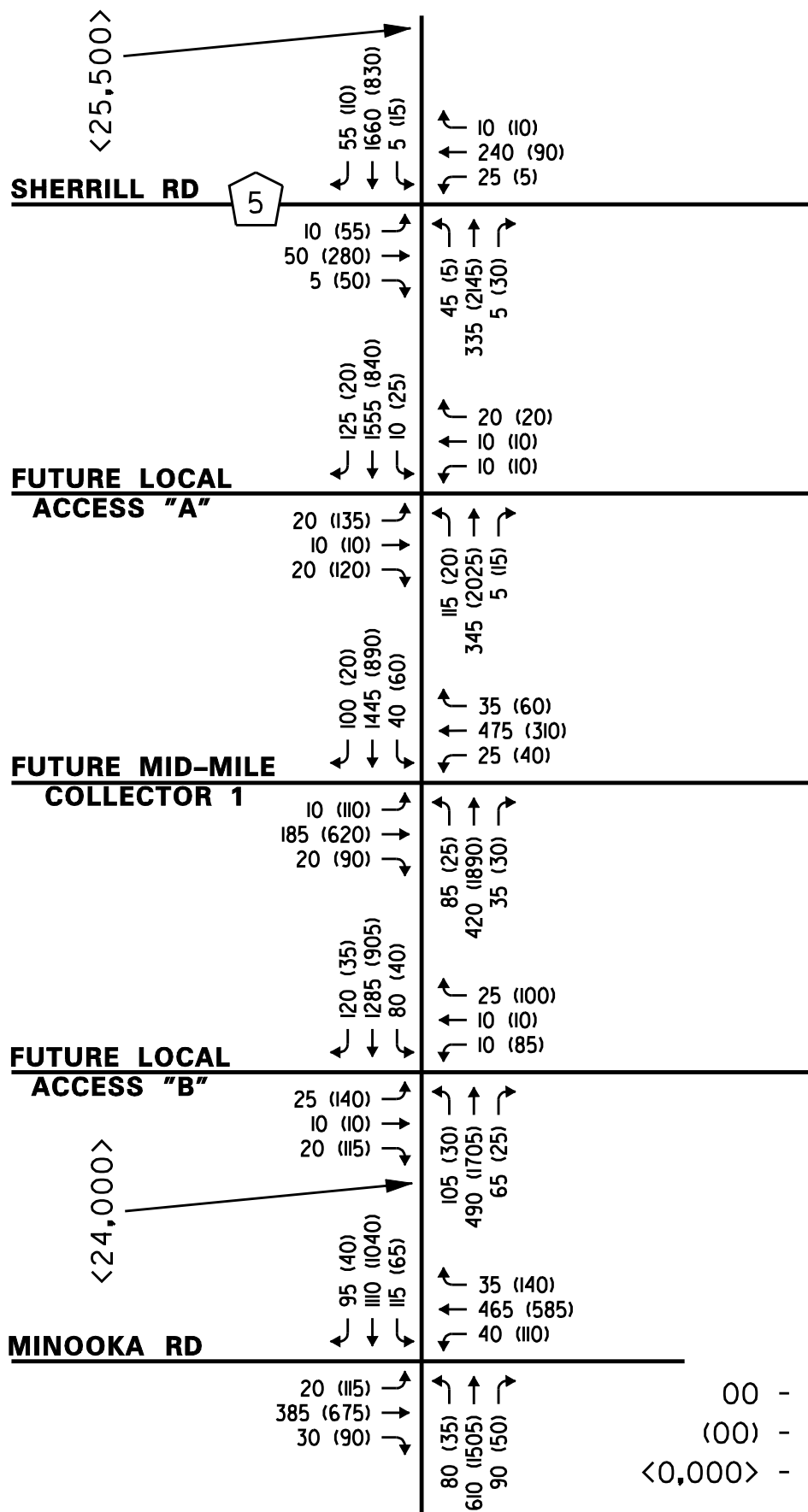
PROJECT NO:

11-100



FIGURE NO:

14



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
PROJECTED 2040 TRAFFIC VOLUMES  
BRISBIN ROAD: SHERRILL RD TO  
MINOOKA RD

PROJECT NO: 11-100



FIGURE NO: 15

## 5.

# Recommended Roadway Design

This chapter summarizes the recommended design of Brisbin Road within the corridor study area. The first step in this process is to understand the function that the roadway provides within the hierarchy of the Grundy County, City of Morris, Village of Minooka, and Village of Channahon roadway system. The next step is to develop a roadway design that sustains that function and operates at the desired level of service given the volume of traffic it may ultimately carry. Recommendations and/or policies developed in this chapter address the roadway cross-section, geometric characteristics (right-of-way requirements, number of lanes), access control, traffic signal spacing, intersection geometrics, traffic controls, and intersection operations.

### Roadway Classification and Function

Brisbin Road is functionally classified by IDOT as a collector road while the comprehensive plans of Morris, Minooka and Channahon all identify Brisbin Road as an arterial road. Arterial roadways and major collector roads serve a similar function to promote a high degree of mobility with limited direct land access. They serve as the primary routes through urbanized areas connecting residential, shopping, employment, and recreation activities at the community level via the minor collector and local roadway system.

As such, the recommended Brisbin Road cross-sections and geometric characteristics were developed to meet the following criteria:

1. To provide sufficient capacity to accommodate the projected 2040 traffic volumes safely and efficiently, particularly regarding turning movements at major intersections.
2. To provide adequate right-of-way to accommodate potential future capacity improvements (additional through lanes or turn lanes) beyond the 28-year planning period.
3. To control access to the facility while maintaining sufficient spacing between traffic signals and full-access intersections.
4. To minimize “side friction” by prohibiting parking or loading on Brisbin Road.

5. To achieve an urban design standard (i.e., curb and gutter, sidewalks) or a hybrid urban/rural design that can ultimately be converted to a full urban design in the future.
6. To develop an aesthetically-pleasing design that allows for streetscaping/landscaping opportunities within the median and parkways.
7. To encourage multimodal travel on separated off-street sidewalks and/or multi-use trails, which is a goal of the Grundy County 2020 Comprehensive Plan and is consistent with the comprehensive plans of Morris and Channahon that include an off-street path along the southern portion of Brisbin Road connecting to a path along Collins Run Creek.

## **Cross-Section and Geometric Characteristics**

### **South of U.S. Route 6**

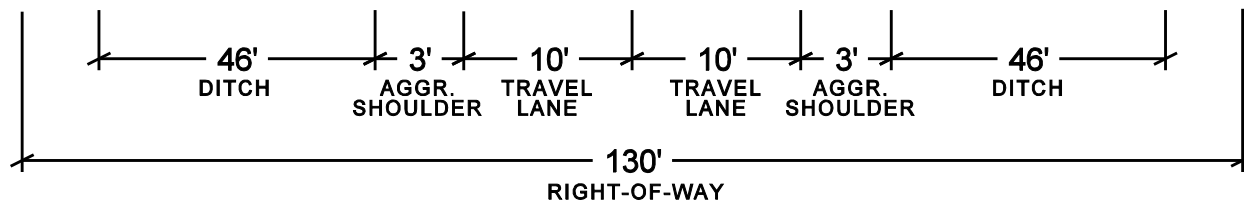
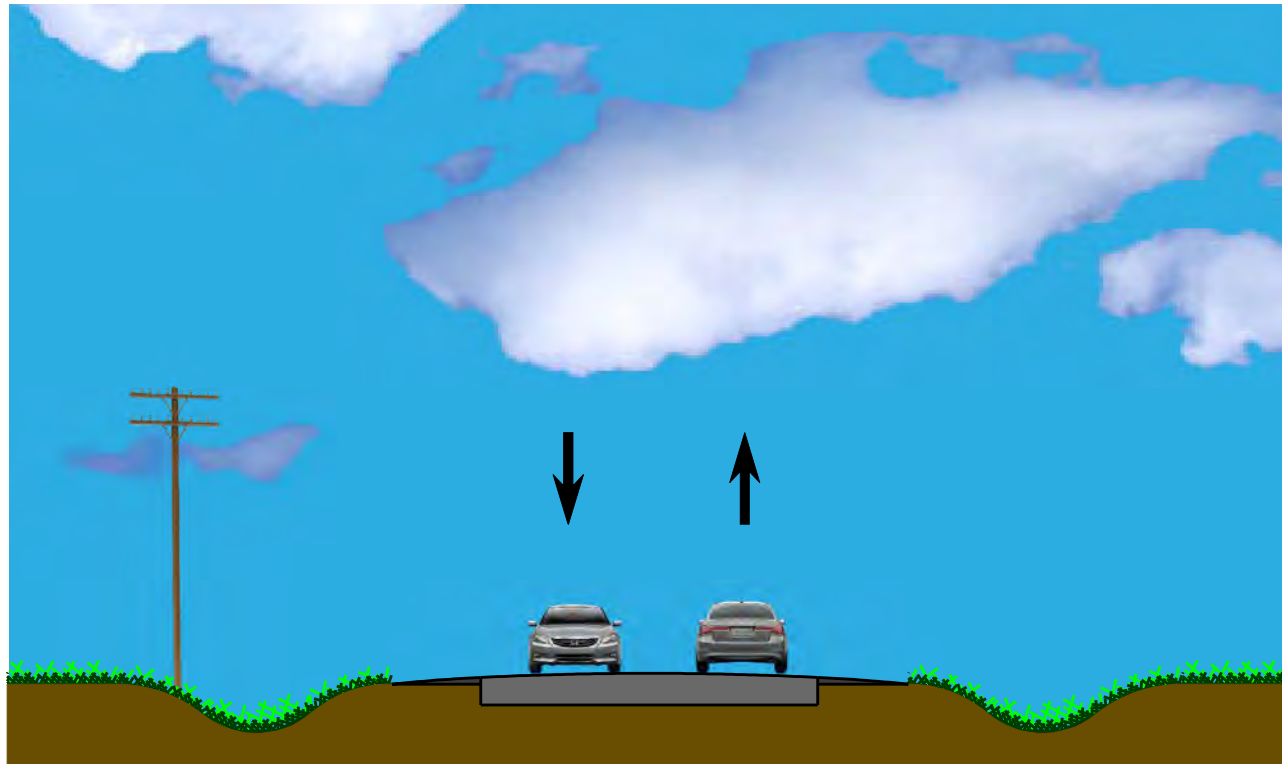
This section of Brisbin Road is presently adjoined by agricultural land on both sides. It is anticipated that this land will eventually develop with retail and office/service uses. The I-80/Brisbin Road interchange construction project includes improvements to Brisbin Road that extend south approximately 1,150 feet south of U.S. Route 6. Between the project's south terminus and U.S. Route 6, Brisbin Road will transition from a two-lane roadway with a rural cross-section (i.e., shoulder and ditch) within a 130-foot right-of-way to an urban cross-section (i.e., curb and gutter) that will widen to provide northbound left- and right-turn lanes within a 165-foot right-of-way. Figures 16 and 17 depict the Brisbin Road cross-sections upon completion of the interchange construction for the south project terminus and the south approach to U.S. Route 6, respectively.

An urban cross-section is ultimately desired for this section of Brisbin Road, which eventually will be under the jurisdiction of the City of Morris and Village of Channahon. The road capacity necessary to accommodate the projected 2040 traffic volumes can be developed within the 130-foot right-of-way that will be in place after the interchange construction is completed. As development occurs to the south of the interchange project limits, this 130-foot right-of-way (65 feet on each side) could be dedicated by the adjoining property owners to continue the desired cross-section further south. The recommended mid-block cross-section for the ultimate design of Brisbin Road south of U.S. Route 6 is shown in Figure 18 and described below:

- Two through lanes in both northbound and southbound directions. The inside lanes being 12-foot wide and outside lanes being 14-foot wide, consistent with the IDOT interchange design.
- Curb and gutter on both sides of the roadway.
- A raised 30-foot wide barrier median, landscaped with turf or shade trees and/or low-lying shrubs/flowers. The median would accommodate up to two 12-foot wide left-turn lanes at key intersections. The median would not be opened at right-in/right-out driveways.
- A 21.5-foot wide landscaped parkway on both sides of the road. The parkway would accommodate a 12-foot wide right-turn lane at key intersections.
- Sidewalk or multi-use trail within a 15-foot wide easement on both sides of the roadway.

# Brisbin Road

## South Project Terminus Post Interchange Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
TYPICAL CROSS SECTION

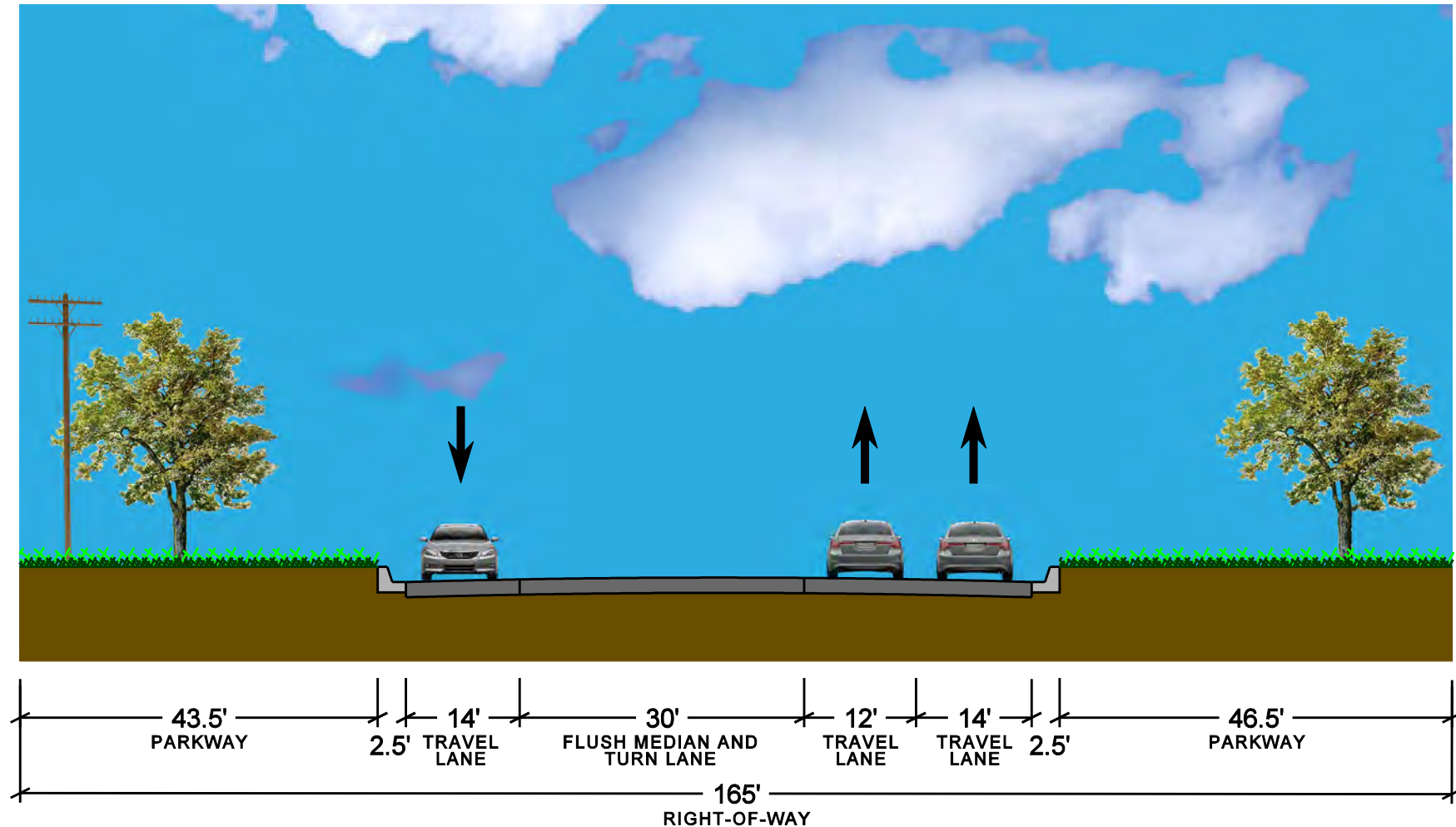
PROJECT NO: II-100



FIGURE NO: 16

# Brisbin Road

## US 6 to South Project Terminus Post Interchange Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
TYPICAL CROSS SECTION  
(VIEW LOOKING NORTH)

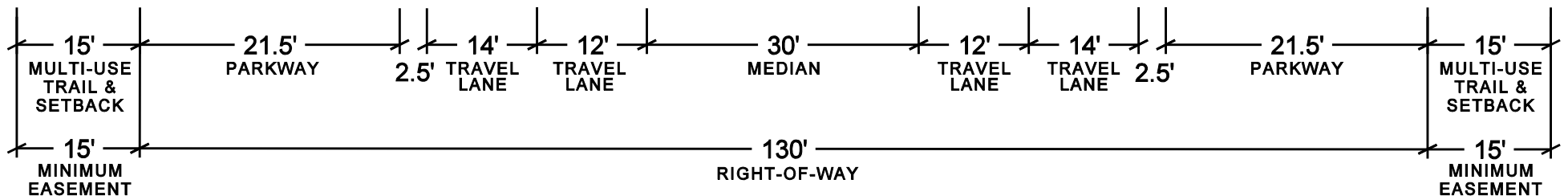
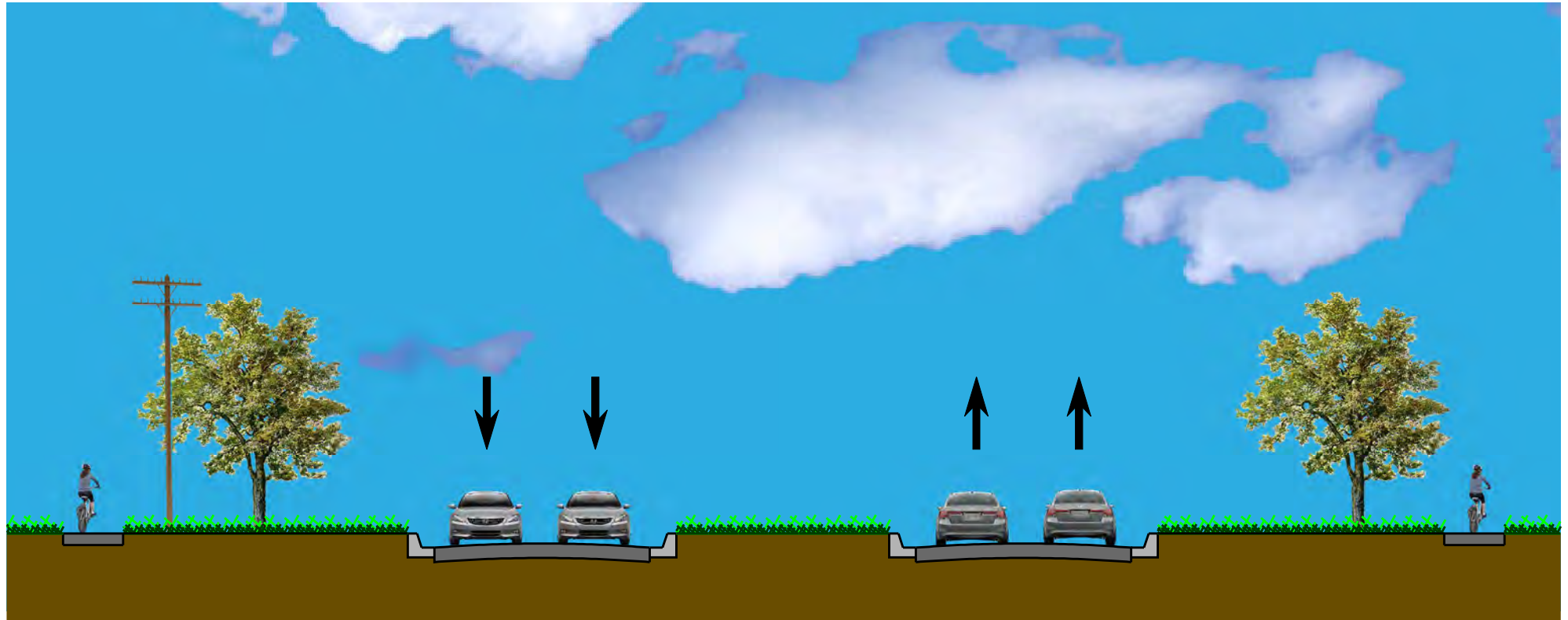
PROJECT NO: II-100



FIGURE NO: 17

# Brisbin Road

South of US 6  
Ultimate Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
RECOMMENDED TYPICAL CROSS SECTION

PROJECT NO: II-100



FIGURE NO: 18

## **U.S. Route 6 to I-80 Interchange**

This section of Brisbin Road is also presently adjoined by agricultural land on both sides of the roadway, which is also anticipated to develop with retail and office/service uses. The I-80/Brisbin Road interchange construction project includes the replacement of the existing bridge over I-80 with a wider bridge, the construction of eastbound and westbound entrance and exit ramps in a full diamond configuration, the realignment of North Road closer to Collins Run, and the widening of Brisbin Road between the bridge and U.S. Route 6. Within this section of Brisbin Road, a four-lane roadway with an urban design is being constructed with a concrete barrier median that varies in width from 22-30 feet and accommodates a single left-turn lane at the entrance ramps and dual left-turn lanes at U.S. Route 6, as shown in Figure 19. The right-of-way, which will be controlled by IDOT, will range from 210-250 feet.

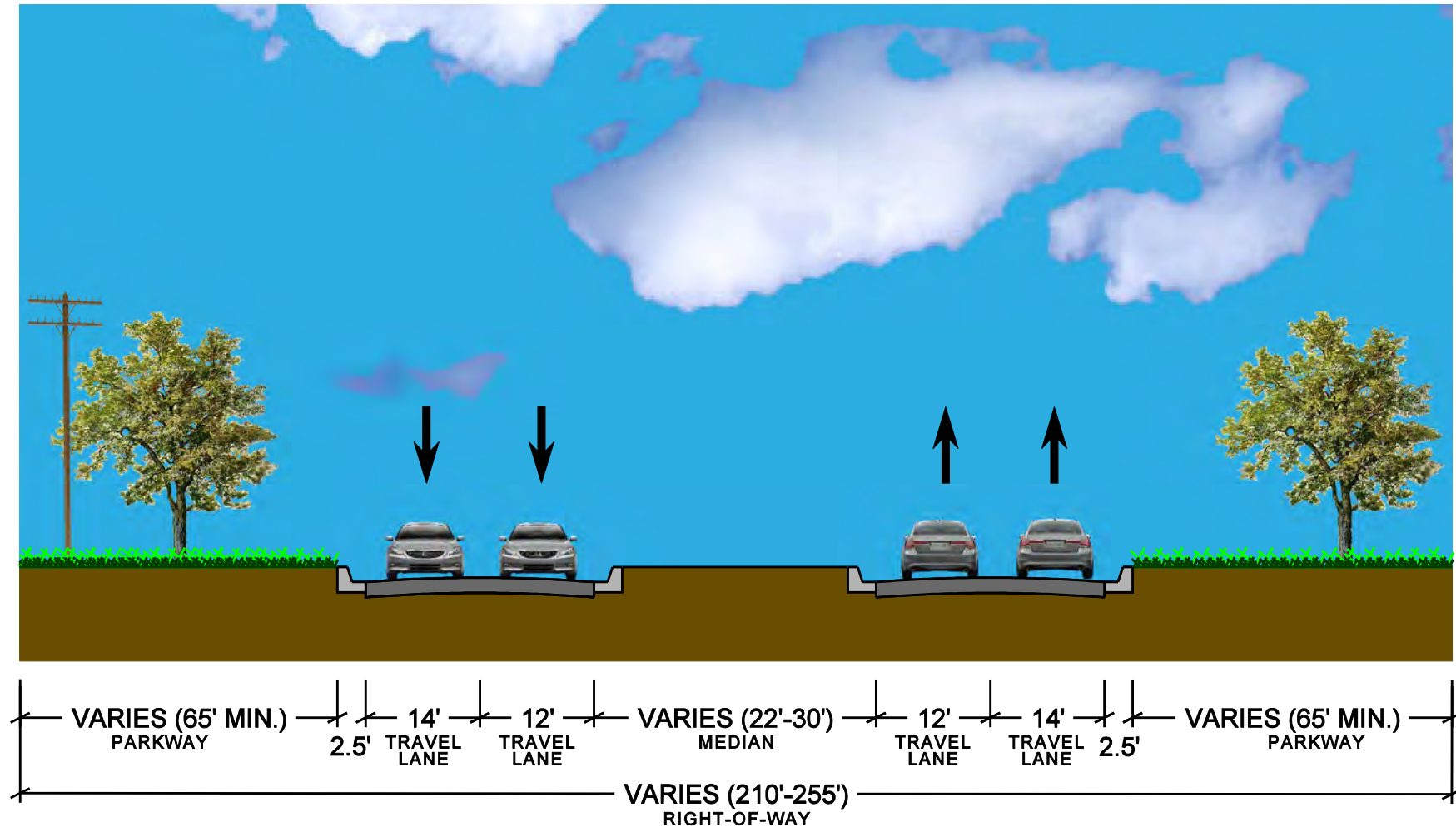
The projected 2040 traffic volumes will require expanded capacity on Brisbin Road to provide a six-lane roadway with dual left-turn lanes and single or dual right-turn lanes at all intersections, which can be accommodated within the 210-250 foot right-of-way. This expansion of road capacity will require a wider bridge deck over I-80 than is currently being constructed and will require additional lanes on the entrance and exit ramps (or possibly the reconfiguration of the ramps to provide free-flow movements). In addition, since the Brisbin Road bridge currently under construction does not provide accommodations for bicycles and pedestrians, any future widening of this bridge should be designed to accommodate bicycle and pedestrian movements in dedicated space protected from the vehicular lanes.

The recommended mid-block cross-section for the ultimate design of Brisbin Road between U.S. Route 6 and the I-80 interchange is shown in Figure 20 and is described below:

- Three through lanes in both the northbound and southbound directions. The two inside lanes being 12-feet wide and the outside lanes being 14-feet wide, consistent with the IDOT interchange design.
- Curb and gutter on both sides of the roadway.
- A raised 30-foot wide barrier median, which can be landscaped on the non-bridge sections and paved on the bridge section. The median would accommodate two 12-foot wide left-turn lanes at U.S. Route 6 and the I-80 ramps (unless the ramps are reconfigured).
- A variable-width landscaped parkway on the non-bridge sections of the roadway. The parkway would accommodate single or dual right-turn lanes at U.S. Route 6 and at the I-80 entrance ramps.
- Sidewalk or multi-use trail within the public right-of-way on both sides of the roadway.

# Brisbin Road

## US 6 to I-80 Interchange Post Interchange Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
TYPICAL CROSS SECTION

PROJECT NO: II-100

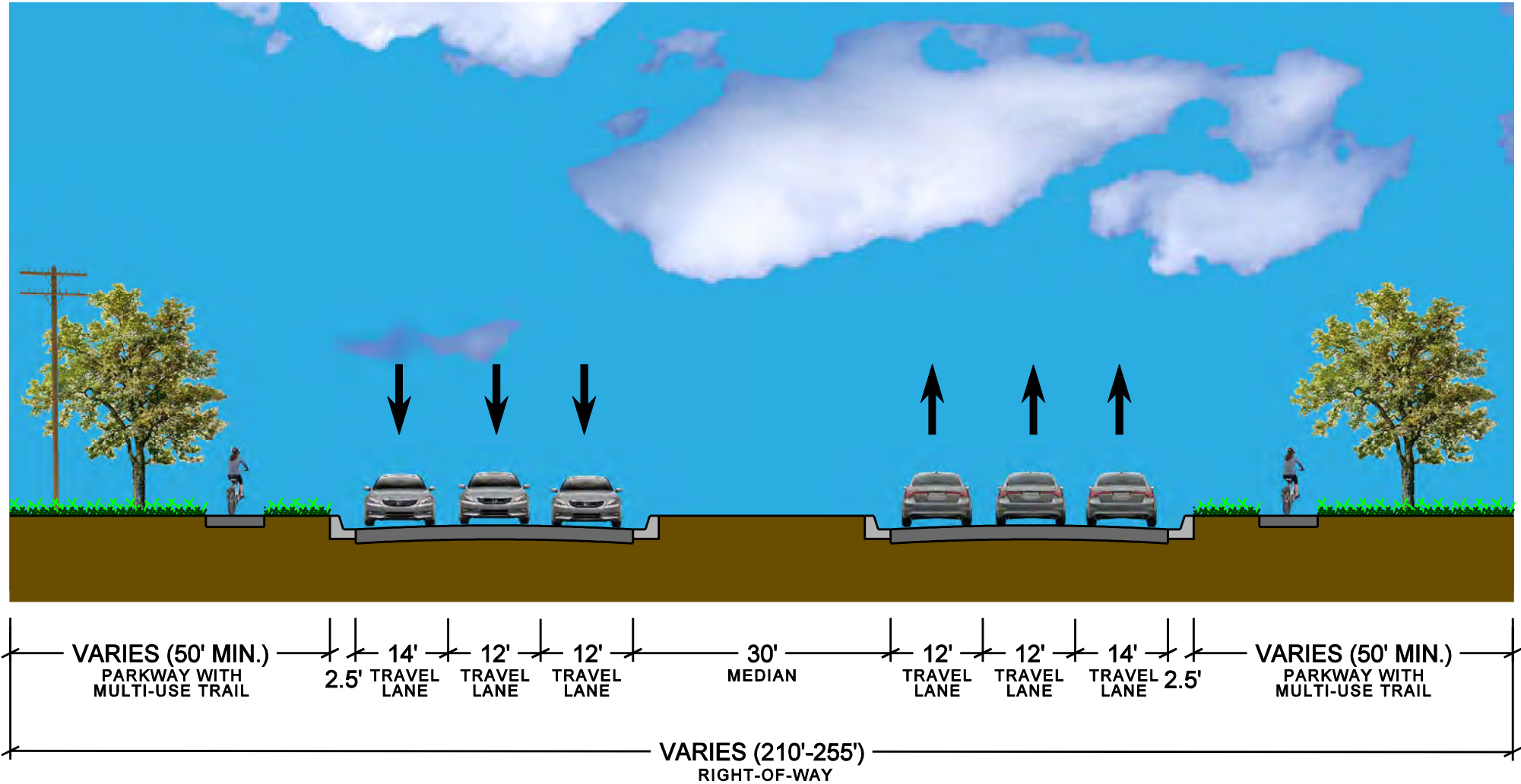


FIGURE NO: 19

# Brisbin Road

## US 6 to I-80 Interchange

### Ultimate Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
RECOMMENDED TYPICAL CROSS SECTION

PROJECT NO: II-100



FIGURE NO: 20

## **I-80 Interchange to Sherrill Road**

This section of Brisbin Road is presently adjoined by agricultural land on both sides of the roadway and is anticipated to eventually develop with industrial, retail, residential, and office/service uses. The north terminus of the I-80/Brisbin Road interchange construction project is located at the bridge over Collins Run. Between the I-80 interchange and this north terminus, Brisbin Road will transition from a four-lane divided roadway with an urban cross-section to a two-lane undivided roadway with a rural cross-section within a 100-foot right-of-way. Figure 21 depicts the Brisbin Road cross-section at the north project terminus upon completion of the interchange construction.

The road capacity necessary to accommodate the projected 2040 traffic volumes along the segment of Brisbin Road between the I-80 interchange and Sherrill Road will ultimately require a six-lane roadway with single or dual left-turn lanes and single right-turn lanes. The desired design for the six-lane facility is an urban cross-section with a raised barrier median and curb and gutter, which would match the ultimate design of Brisbin Road from the interchange south to U.S. Route 6. The ultimate road design would be built within a 170-foot right-of-way, which would be established through a roadway dedication easement of 85 feet of land on each side of the roadway as development occurs.

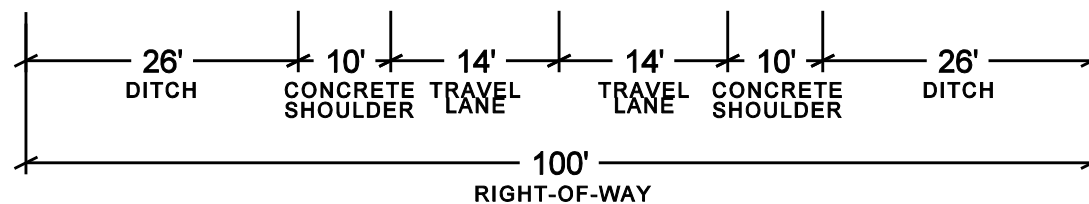
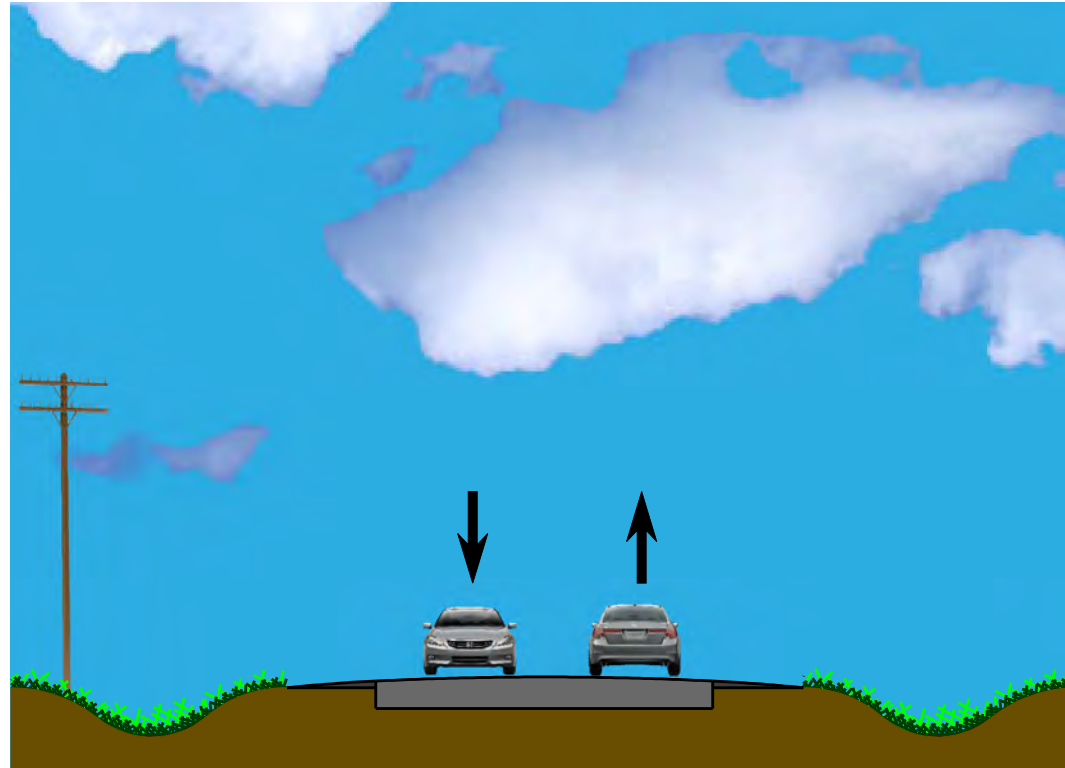
However, traffic conditions on Brisbin Road may not reach levels requiring a six-lane facility for many years, depending on the pace of development. Therefore, interim designs are recommended for Brisbin Road that would preserve sufficient right-of-way for the ultimate six-lane urban cross-section but only provide the road capacity to accommodate near-term (within the next 5 years) and mid-term (5-28 years) traffic volumes.

The near-term interim design would initially be implemented via the dedication of a 170-foot roadway easement to establish the public right-of-way and the construction of a rural two-lane cross-section with shoulder and ditch on both sides of the pavement. The roadway would be offset to one side of the centerline of the 170-foot right-of-way, thereby allowing a portion of the right-of-way to continue to be used by local land owners for agricultural purposes until the mid-term interim design is required. The mid-term interim design would have an urban-rural hybrid cross-section with an urban barrier median on the right-of-way centerline and a rural outside shoulder and ditch. The mid-term design would require the use of the entire 170-foot right-of-way and would utilize the outside shoulder and ditch from the near-term design, convert the two near-term travel lanes for one direction of travel, construct the median, and build the two additional travel lanes for the other direction of travel.

The recommended interim (near-term and mid-term) and ultimate mid-block designs for Brisbin Road between the I-80 interchange and Sherrill Road are shown in Figures 22, 23 and 24, respectively, and are described below:

# Brisbin Road

## North Project Terminus Post Interchange Design



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
TYPICAL CROSS SECTION

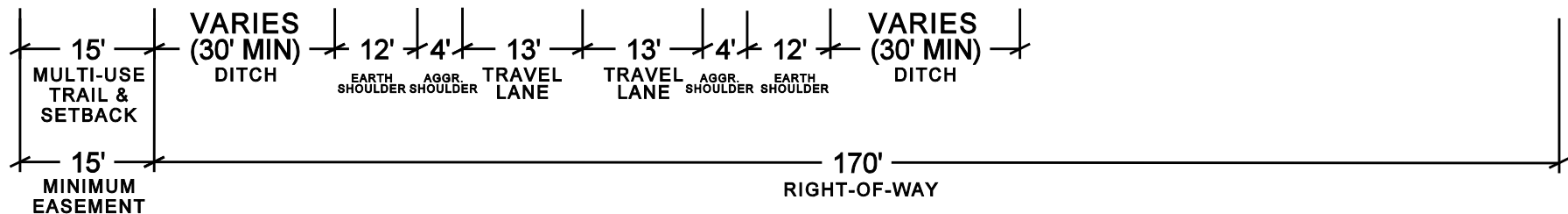
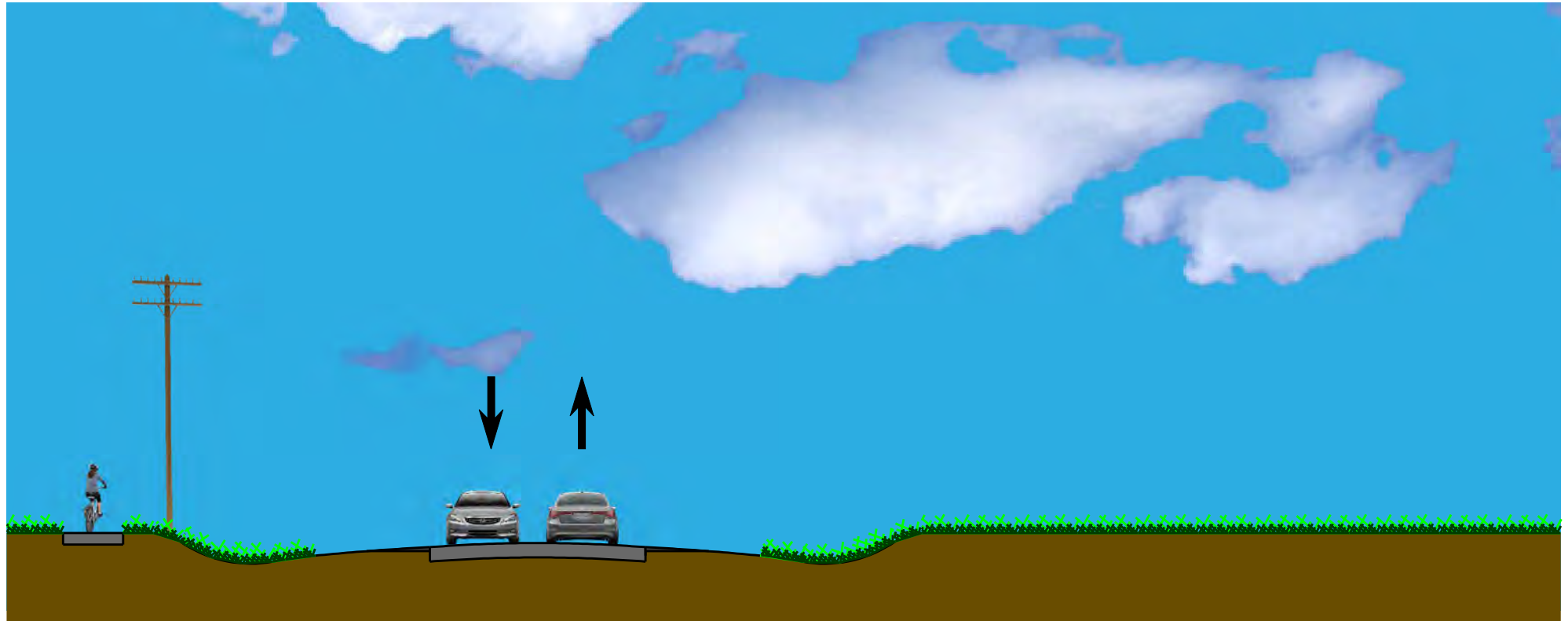
PROJECT NO: II-100



FIGURE NO: 21

# Brisbin Road

## I-80 Interchange to Sherrill Road Interim Design - Near Term



PROJECT:  
BRISBIN ROAD  
CORRIDOR ACCESS STUDY  
GRUNDY COUNTY, ILLINOIS

TITLE:  
RECOMMENDED TYPICAL CROSS SECTION

PROJECT NO: II-100

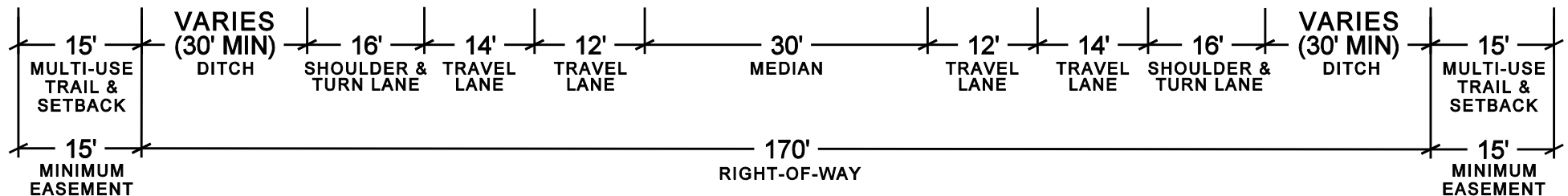
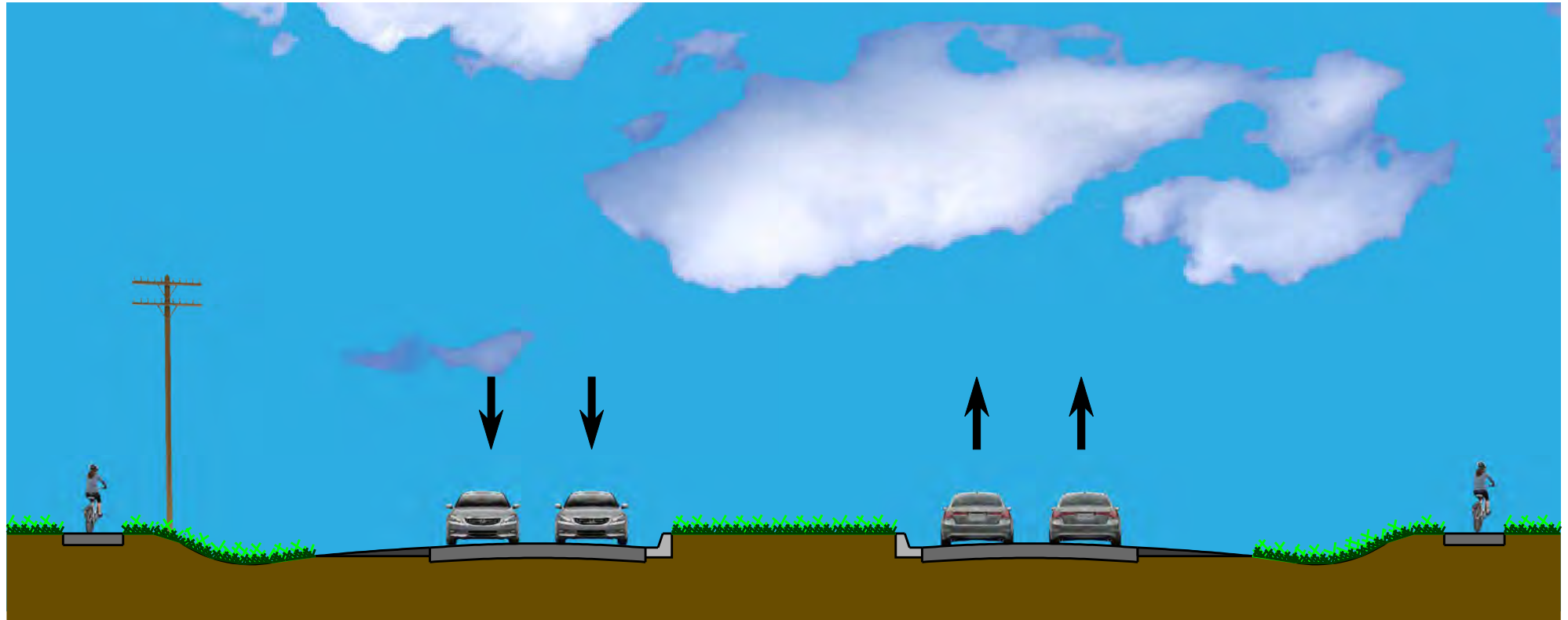


FIGURE NO: 22

# Brisbin Road

## I-80 Interchange to Sherrill Road

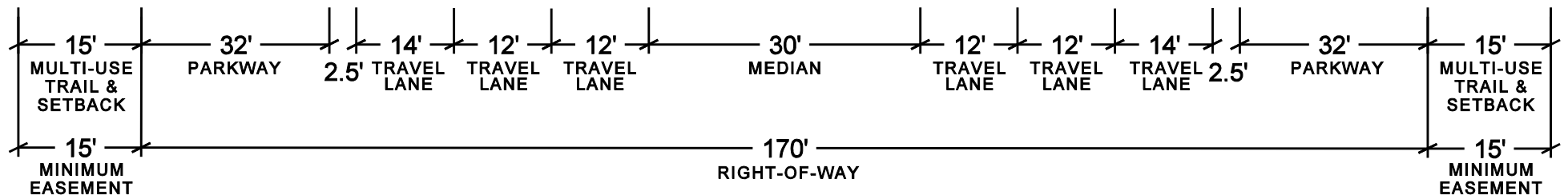
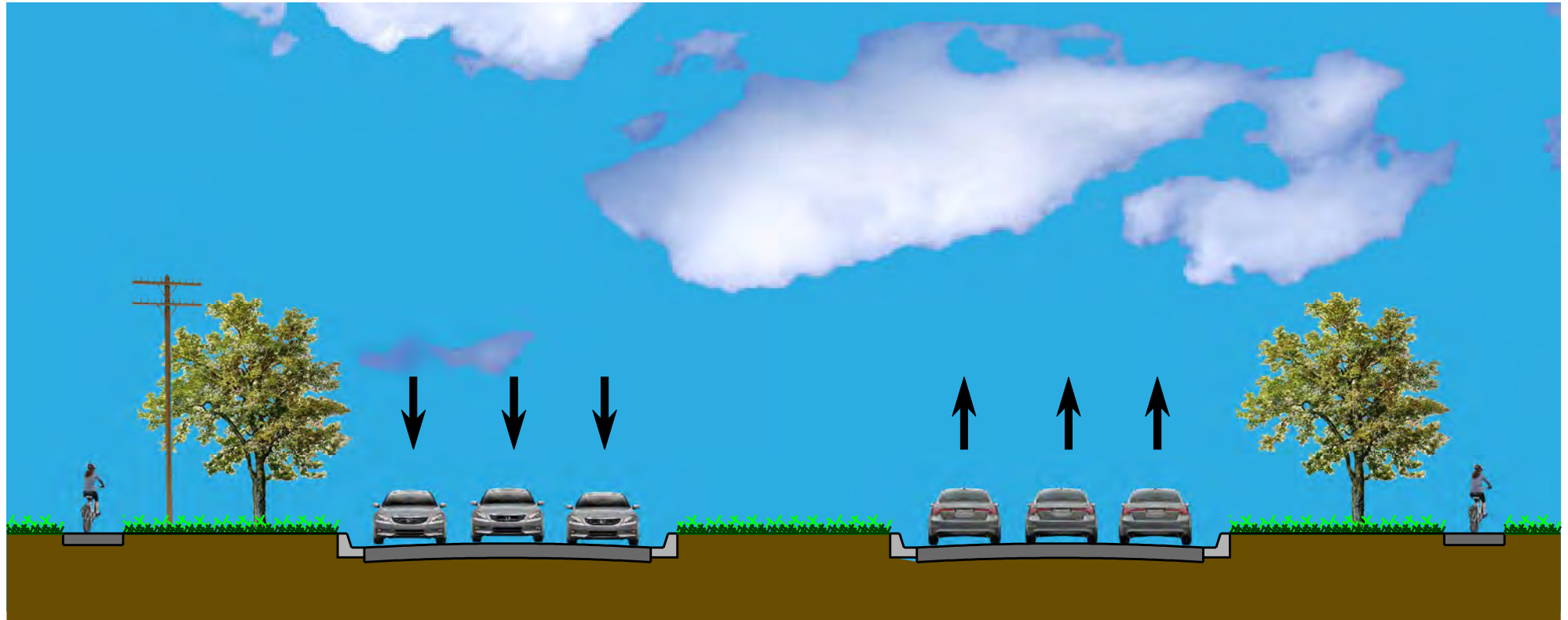
### Interim Design - Mid Term



PROJECT:  BRISBIN ROAD CORRIDOR ACCESS STUDY GRUNDY COUNTY, ILLINOIS	TITLE:  RECOMMENDED TYPICAL CROSS SECTION	PROJECT NO: II-100
		<b>KLOA</b>
		FIGURE NO: 23

# Brisbin Road

## I-80 Interchange to Sherrill Road Ultimate Design



PROJECT: BRISBIN ROAD CORRIDOR ACCESS STUDY GRUNDY COUNTY, ILLINOIS	TITLE:  RECOMMENDED TYPICAL CROSS SECTION	PROJECT NO: II-100
		<b>KLOA</b>
		FIGURE NO: 24

### Interim Design (Near-Term)

- One 13-foot wide through lane in both northbound and southbound directions, with the pavement centerline offset 28 feet to one side of the future 170-foot right-of-way centerline.
- A 16-foot shoulder (4-foot aggregate, 12-foot earth) accommodating a 12-foot wide right-turn lane at key intersections.
- A 30-foot wide (min.) drainage ditch
- Sidewalk or multi-use trail within a 15-foot wide easement on one side of the roadway.

### Interim Design (Mid-Term)

- Two through lanes in both northbound and southbound directions. The inside lane being 12-foot wide and the outside lane being 14-foot wide, consistent with the IDOT interchange design.
- A raised 30-foot wide barrier median on the 170-foot right-of-way centerline. The median can be turf or landscaped with shade trees and/or low-lying shrubs/flowers. The median would accommodate single or dual 12-foot wide left-turn lanes at key intersections and would not be opened at right-in/right-out driveways.
- A 16-foot paved shoulder accommodating a 12-foot wide right-turn lane at key intersections.
- A 30-foot wide (min.) drainage ditch
- Sidewalk or multi-use trail within a 15-foot wide easement on both sides of the roadway.

### Ultimate Design

- Three through lanes in both the northbound and southbound directions. The two inside lanes being 12-foot wide and the outside lane being 14-foot wide, consistent with the IDOT interchange design.
- Curb and gutter on both sides of the roadway
- A raised 30-foot wide barrier median, which can be turf or landscaped with shade trees and/or low-lying shrubs/flowers. The median would accommodate single or dual 12-foot wide left-turn lanes at key intersections. The median would not be opened at right-in/right-out driveways.
- A 32-foot wide landscaped parkway on both sides of the road. The parkway would accommodate a single 12-foot wide right-turn lane at key intersections.
- Sidewalk or multi-use trail within a 15-foot wide easement on both sides of the roadway.

## Access Control and Traffic Signals

As noted above and discussed in Chapter 2, access control standards should be established and adhered to in order to maximize roadway capacity, maintain traffic flow efficiency and enhance safety. The Grundy County Highway Access Regulation Ordinance (GCHARO) does not include Brisbin Road in its highway access classification system as jurisdiction of Brisbin Road was transferred to the County after the GCHARO was adopted in September 2004. However, comparable County highways in Grundy County are classified as Access 3 roadways when defining access control, intersection spacing and traffic control standards. Access 3 roadways are locally significant facilities where direct access to abutting land is controlled to maximize the through movement of traffic. The following access control standards are recommended for Brisbin Road:

- Access to Brisbin Road will be controlled by IDOT between U.S. Route 6 and North Road.
- Access to Brisbin Road between North Road and Sherrill Road will be controlled by the GCHD and should be limited as defined by the GCHARO Access 3 roadway guidelines. Currently, the minimum spacing of full access unsignalized intersections on Access 3 roadways is ¼-mile (1,320 feet) and the minimum spacing of signal-controlled intersections is 1/3-mile (1,760 feet). For reasons discussed in Chapter 2, the minimum spacing standards for signal-controlled intersections along Brisbin Road should be adjusted to ¼-mile, consistent with the spacing standard for suburban arterials and collectors in the urbanizing counties of Will and Kane.
- Access to Brisbin Road to the south of U.S. Route 6 will be controlled by the City of Morris and Village of Channahon and is encouraged to follow the Access 3 roadway guidelines.
- Restricted right-in/right-out (RIRO) access driveways should be spaced at a minimum of 500 feet with a desirable spacing of 1/8-mile (660 feet).
- As parcels are developed, consideration should be given to closing, relocating or consolidating existing driveways and/or limiting access at existing driveways to adhere to the minimum spacing guidelines.
- Access to adjoining parcels should be consolidated whenever possible.
- The raised barrier median should be extended across all RIRO driveways to reinforce the access restrictions by physically preventing left-turn entering and exiting movements.
- New full access driveways should be aligned opposite an existing full access driveway if it is reasonably close to meeting the minimum spacing requirements.
- The creation of offset intersections should be avoided.
- To promote development access flexibility, encourage a more uniform distribution of development traffic, and reduce traffic volumes on Brisbin Road, development access should also be provided from the adjoining cross streets.

- To maintain efficient traffic signal operations and traffic flow progression, all future signals within the corridor that are located within ½-mile of each other should be interconnected into a coordinated signal system.

Figures 25-27 illustrate the recommended future access locations along Brisbin Road.

## **Intersection Geometrics and Traffic Control**

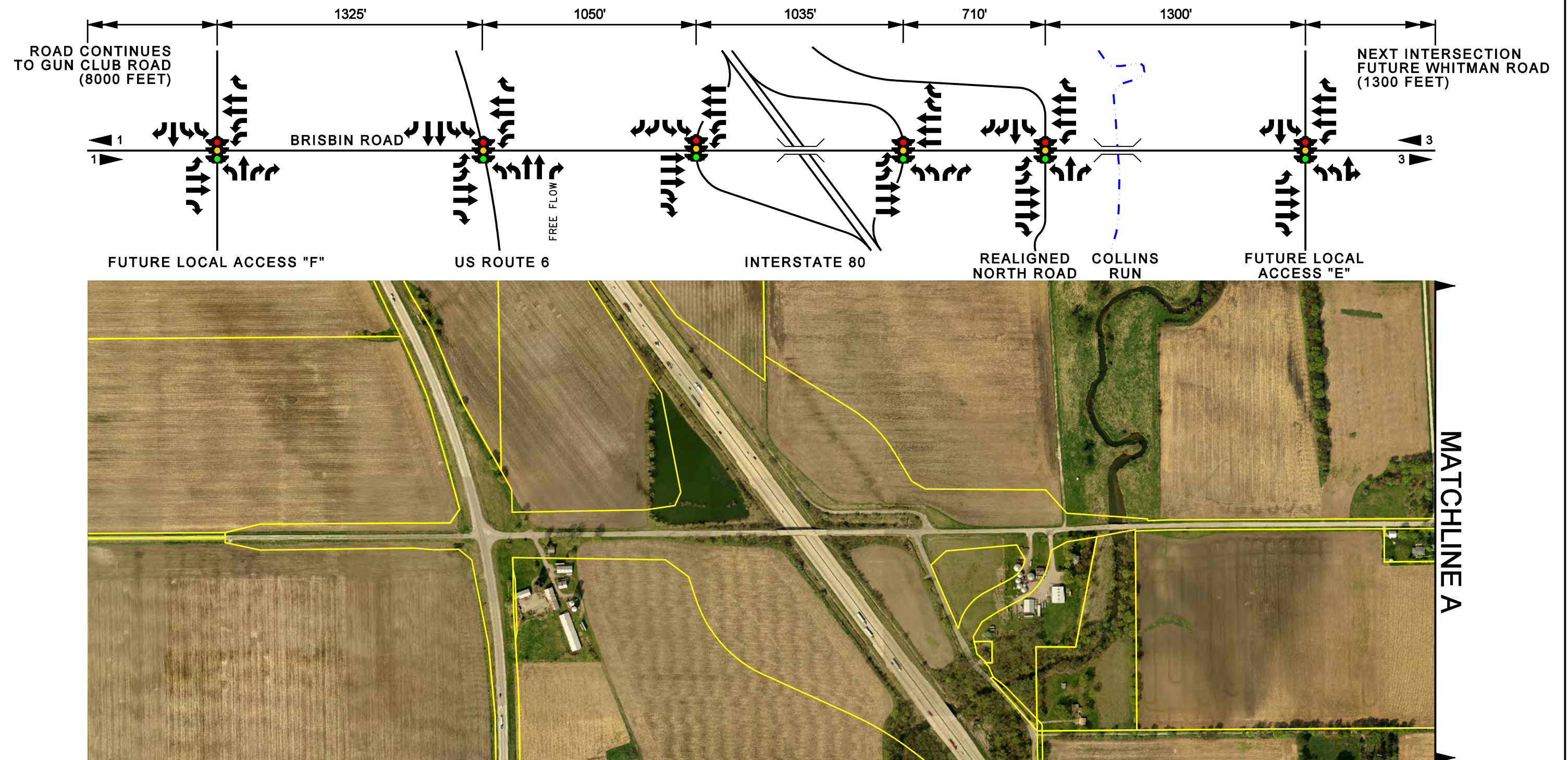
Figures 25-27 also illustrate the recommended geometrics for each intersection within the Brisbin Road corridor for the ultimate design condition. In addition to the four-lane to six-lane cross-sections, the key intersections will also require exclusive left- and right-turn lanes. It should be noted that the purpose of the corridor access study is to identify general geometric requirements for Brisbin Road to accommodate the projected 2040 traffic demands. The actual design of the intersections (i.e., need for dual turn lanes, length of turn lanes and tapers, intersection radii, signal equipment locations, etc.) will be determined when Phase I Intersection Design Studies (IDS) are prepared for the future signalized intersections or when Phase II engineering plans are developed. The following describes the recommended roadway improvements that will be required at each of the intersections in the corridor.

### **Brisbin Road with Future Intersections South of U.S. Route 6**

South of U.S. Route 6, new local access drives may develop at approximately ¼-mile spacing. At these future intersections, the recommended 130-foot right-of-way and ultimate four-lane urban design of Brisbin Road will accommodate a single or dual left-turn lanes, two through lanes, and a dedicated right-turn lane in each direction. The local access drives should provide separate left-turn, through and right-turn lanes, as needed based on the traffic volumes generated. These intersections are projected to ultimately require traffic signal control, which should be installed when traffic volumes reach threshold levels warranting the signal.

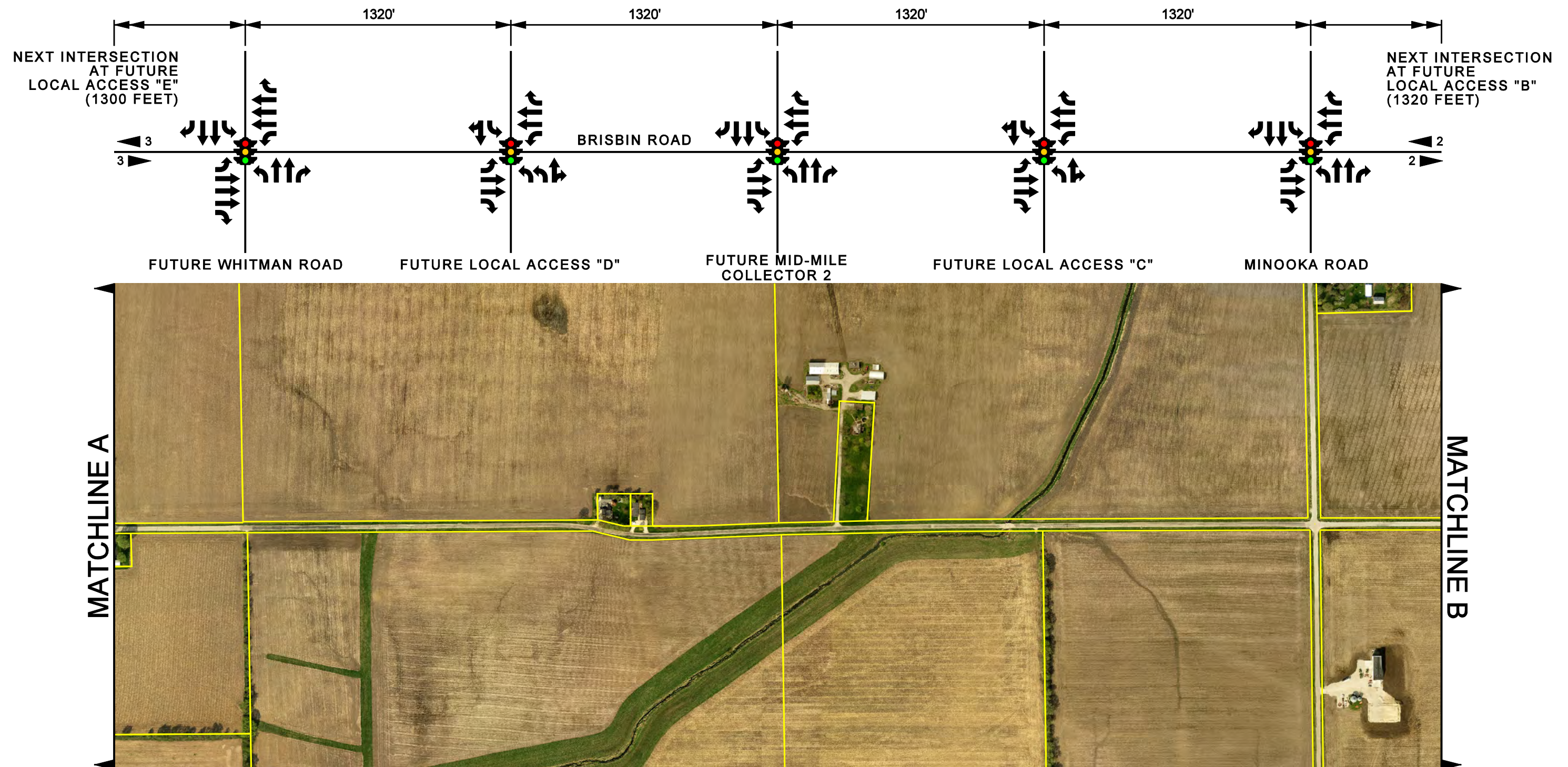
### **Brisbin Road with U.S. Route 6**

This intersection will be under traffic signal control upon completion of the interchange construction project. The cross-section of Brisbin Road at this intersection will ultimately require dual left-turn lanes, two through lanes and a dedicated right-turn lane in each direction. The ultimate design would maintain the urban cross-section and be accommodated within the right-of-way that will be in place when the interchange construction is completed (165 feet south of US 6; 255 feet north of US 6). As part of the interchange project, U.S. Route 6 will be widened to accommodate an ultimate cross-section of dual left-turn lanes, two through lanes, and a single right-turn lane, which will be sufficient to accommodate the projected 2040 traffic volumes, although the westbound right-turn lane may need to be redesigned for free-flow turning movements.

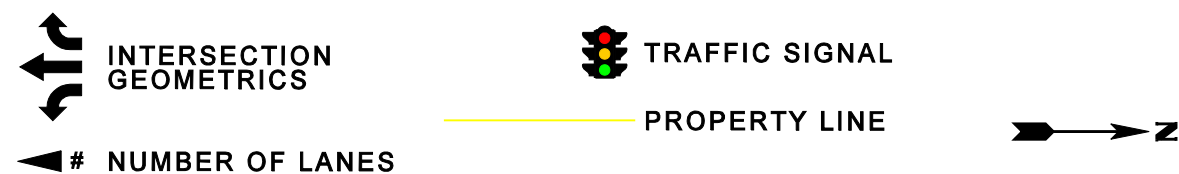


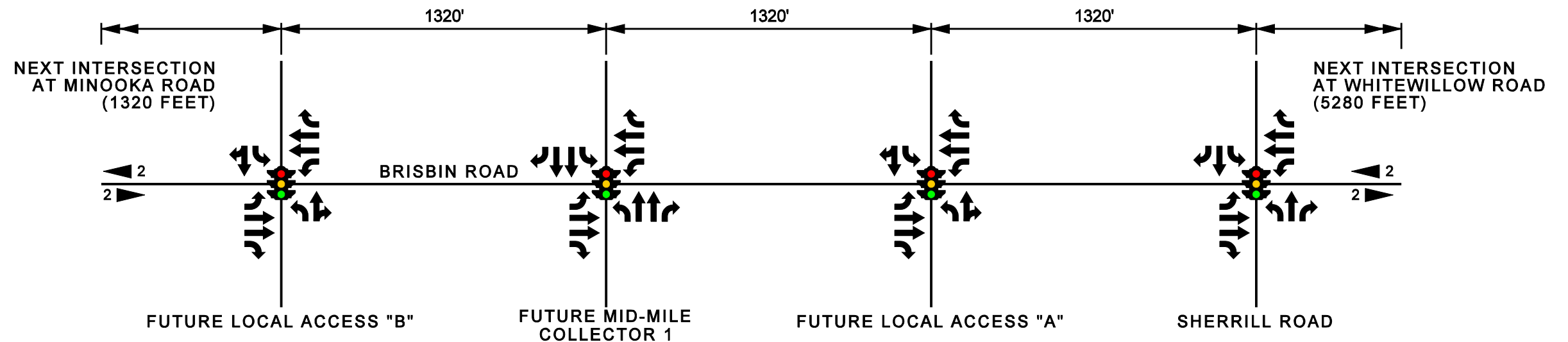
# LEGEND

- INTERSECTION GEOMETRICS
- TRAFFIC SIGNAL
- PROPERTY LINE
- # NUMBER OF LANES
- N





# LEGEND



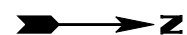


# LEGEND

 INTERSECTION GEOMETRICS  
 # NUMBER OF LANES

 TRAFFIC SIGNAL

 PROPERTY LINE



### **Brisbin Road with Future I-80 Ramps**

The future intersections of the I-80 ramps with Brisbin Road will be under traffic signal control upon completion of the interchange construction project. On Brisbin Road, the recommended ultimate six-lane urban design will accommodate three dedicated through lanes, dual left-turn lanes and dual right-turn lanes in each direction. This cross-section, however, will require the reconstruction and widening of the Brisbin Road bridge. The entrance ramps would be widened to accept the dual turn lanes before tapering down to the single merge lane. The exit ramps would be widened on the approach to Brisbin Road to provide dual left-turn lanes and dual right-turn lanes.

### **Brisbin Road with Realigned North Road**

This intersection will need to be under traffic signal control to accommodate the projected 2040 traffic volumes. The signal should be installed when traffic volumes reach threshold levels warranting the signal. At this intersection, the recommended ultimate six-lane urban design of Brisbin Road will accommodate single or dual left-turn lanes, three dedicated through lanes, and a dedicated right-turn lane in each direction. The widening would be accommodated within the recommended 170-foot right-of-way. North Road is recommended to be widened at this intersection to provide separate a left-turn lane, through lane, and single or dual right-turn lanes, which can be provided within the 120-foot right-of-way that will be in place upon completion of the interchange project.

### **Brisbin Road with Future Whitman Road**

This intersection will require signalization to accommodate the projected 2040 traffic volumes. The signal should be installed when traffic volumes reach the level that signal warrants are satisfied. The cross-section of Brisbin Road at this intersection will ultimately require single or dual left-turn lanes, three through lanes and a dedicated right-turn lane in each direction, which can be accommodated with an urban design within the recommended 170-foot right-of-way. The cross-section of the future Whitman Road at the intersection may require a dedicated left-turn lane, a single through lane and a dedicated right-turn lane in both directions.

### **Brisbin Road with Future Intersections between Whitman Road and Minooka Road**

The intersections of the new mid-mile collector road or local roads that may develop at approximately ¼-mile spacing between the future Whitman Road and Minooka Road are projected to eventually require traffic signal control, when volumes warrant, to accommodate the projected 2040 traffic volumes. The cross-section of Brisbin Road at these intersections may ultimately only require a single left-turn lane, two through lanes and a right-turn lane in each direction, which can be accommodated with an urban design within the recommended 170-foot right-of-way. However, if higher development densities are realized than projected in this report, the traffic volumes along this section of Brisbin Road could be higher as well. As such, it is recommended that the 30-foot median be maintained along this section of Brisbin Road to allow for the potential need to provide dual left-turn lanes at the signalized intersections. Preserving a

170-foot right-of-way along this section of Brisbin Road will also allow for the potential need to increase capacity along this section of the roadway to provide three through lanes in each direction. The cross-sections of the mid-mile collector and the local roads will likely require single or dual left-turn lanes, a single or dual through lanes, and a dedicated right-turn lane (or possibly a combination through/right-turn lane) in each direction.

### **Brisbin Road with Minooka Road**

The intersection of Brisbin Road with Minooka Road will require signalization to accommodate the projected 2040 traffic volumes. The signal should be installed when traffic volumes reach the level that signal warrants are satisfied. The cross-section of Brisbin Road at this intersection may ultimately only require a single left-turn lane, two through lanes and a dedicated right-turn lane in each direction, which can be accommodated with an urban design within the recommended 170-foot right-of-way. However, continuing the 30-foot median at this intersection and maintaining a 170-foot right-of-way will preserve the necessary space to increase intersection capacity in the future (i.e., dual left-turn lanes, third through lane) should traffic conditions marketably change due to higher development densities than projected within the corridor or to the north of the corridor. The cross-section of Minooka Road at the intersection may require single or dual left-turn lanes, two through lanes and a dedicated right-turn lane in each direction.

### **Brisbin Road with Future Intersections between Minooka Road and Sherrill Road**

The intersections of the new mid-mile collector road or local roads that may develop at approximately ¼-mile spacing between Minooka Road and Sherrill Road are projected to eventually require traffic signal control, when volumes warrant, to accommodate the projected 2040 traffic volumes. The cross-section of Brisbin Road at these intersections may ultimately only require a single left-turn lane, two through lanes and a right-turn lane in each direction, which can be accommodated with an urban design within the recommended 170-foot right-of-way. However, continuing the 30-foot median at this intersection and maintaining a 170-foot right-of-way will preserve the necessary space to increase intersection capacity in the future (i.e., dual left-turn lanes, third through lane) should traffic conditions marketably change due to higher development densities than projected within the corridor or to the north of the corridor. Preserving a 170-foot right-of-way along this section of Brisbin Road will also allow for the potential need to increase capacity along this section of the roadway to provide three through lanes in each direction. The cross-sections of the mid-mile collector and the local roads will likely require a single left-turn lane, through lane, and right-turn lane (or possibly a combination through/right-turn lane) in each direction.

### **Brisbin Road with Sherrill Road**

The intersection of Brisbin Road with Sherrill Road will require signalization to accommodate the projected 2040 traffic volumes. The signal should be installed when traffic volumes reach the level that signal warrants are satisfied. The cross-section of Brisbin Road at this intersection will ultimately require a single left-turn lane, two through lanes and a right-turn lane in each direction, which can be accommodated with an urban design within the recommended 170-foot

right-of-way. However, continuing the 30-foot median at this intersection and maintaining a 170-foot right-of-way will preserve the necessary space to increase intersection capacity in the future (i.e., dual left-turn lanes, third through lane) should traffic conditions marketably change due to higher development densities than projected within the corridor or to the north of the corridor. The cross-section of Sherrill Road will likely require a single left-turn lane, through lane, and right-turn lane in each direction.

## **Projected Intersection Operations**

Intersection capacity analyses were performed for the projected 2040 weekday peak hour traffic conditions. The recommended intersection geometrics for the major traffic signal controlled intersections were developed with the desire to maintain a Level of Service C or better for the overall intersection, per the GCHARO.

Table 5 summarizes the results of the capacity analyses for the projected 2040 weekday peak hour traffic conditions. The results shown in the table illustrate the average level of service and delay for all vehicles combined at each particular intersection. The capacity analysis worksheets are contained in the Appendix.

As the capacity analysis indicates, all intersection geometric design recommendations will be able to accommodate 2040 traffic levels at Level of Service C or better with the exception of the Brisbin Road intersections with future Whitman Road and U.S. Route 6 in the PM peak hour which are projected to operate at Level of Service D.

Queuing and the overall progression of traffic through the network can be managed efficiently through a system of signal interconnects that coordinate the signals along the corridor to create a platooning effect. It should be noted that the recommendations produced in this report are contingent upon the development of a continuous parallel collector road system with grid access via future and existing mid-mile collectors and local access roads that would divert some of the traffic burden away from Brisbin Road.

Table 5

## CAPACITY ANALYSIS RESULTS – PROJECTED 2040 TRAFFIC CONDITIONS

Intersection	Weekday AM Peak Hour		Weekday PM Peak Hour	
	LOS	Delay	LOS	Delay
Brisbin Road / Sherrill Road	C	22.3	B	19.8
Brisbin Road / Future Local Access “A”	A	7.0	A	7.9
Brisbin Road / Future Mid-Mile Collector 1	B	13.4	C	25.6
Brisbin Road / Future Local Access “B”	A	7.0	A	9.8
Brisbin Road / Minooka Road	B	15.2	C	27.8
Brisbin Road / Future Local Access “C”	A	9.2	B	10.8
Brisbin Road / Future Mid-Mile Collector 2	B	16.1	C	28.4
Brisbin Road / Future Local Access “D”	A	7.7	C	23.5
Brisbin Road / Future Whitman Road	B	16.8	D	39.3
Brisbin Road / Future Local Access “E”	A	8.1	C	21.4
Brisbin Road / Realigned North Road	B	18.6	C	31.8
Brisbin Road / I-80 Westbound Ramps	B	16.3	B	16.7
Brisbin Road / I-80 Eastbound Ramps	B	14.3	B	19.4
Brisbin Road / U.S. Route 6	C	24.8	D	39.3
Brisbin Road / Future Local Access “F”	B	16.2	C	25.0

Note: LOS = level of service    Delay = seconds/vehicle

## 6.

# Project Funding Options

The Illinois Road Improvement Impact Fee Law creates the authority for counties with a population over 400,000 and all home-rule municipalities to adopt and implement Road Improvement Impact Fee ordinances and resolutions designed to supplement other funding sources (i.e., Motor Fuel Taxes, Surface Transportation Program, Congestion Mitigation & Air Quality Program, Illinois Transportation Enhancement Program) so that the burden of paying for road improvements needed to accommodate new development can be allocated in a fair and equitable manner. These fees are levied or imposed by qualifying counties and municipalities as a condition to the issuance of a building permit or a certificate of occupancy and are pooled into an interest-bearing fund allowing for the corridor roadway improvements to be completed in a coordinated manner for efficiencies of scale and to minimize disruptions to the travelling public.

Presently DuPage County, Kane County and Lake County collect road impact fees to help fund roadway projects. Grundy County currently has a population of approximately 50,000 and does not presently meet the state statutes to impose road impact fees. However, as development growth occurs in the County and the residential population increases, the County will eventually be in a position to enact a Road Impact Fee Ordinance, which might be utilized for future improvements to Brisbin Road.

In the interim, Grundy County should work with the local municipalities that annex land along the Brisbin Road corridor (i.e., Morris, Minooka, Channahon) to insure that road impact fees or development impact fees are imposed on private development in the corridor (via annexation agreements, development agreements, etc.) to insure that funds are set aside to improve Brisbin Road in a coordinated manner when traffic conditions warrant such improvements. These fees can be used for engineering and construction of “add-capacity” projects, including lane additions, turning lanes at intersections, acquisition of land or real property for the expansion of the roadway, and relocation of existing utilities or drainage in advance of new road capacity. They can also be used for the design of new roadways, traffic signal interconnection, and bridge widening to accommodate new roadway capacity. Impact fee revenues must be encumbered for use within 5 years of payment.

## 7. Conclusions

This Corridor Access Study serves many functions in the evaluation of Brisbin Road, which will become the primary north-south travel corridor between IL Route 47 in Morris and Ridge Road in Minooka when the I-80/Brisbin Road interchange construction project is completed in 2012. Firstly, it serves to identify the ultimate right-of-way, roadway cross-section and intersection geometrics that will be required to accommodate projected traffic volumes over the next 28 years (Year 2040) or more when approximately 2,000 acres of land will potentially be developed with approximately 540 dwelling units and 20.8 million square feet of commercial and industrial space. Secondly, this study establishes guidelines pertaining to access control and traffic signal spacing with consideration given to the location of future land uses that may develop in the corridor. Lastly, this study identifies potential funding mechanisms that Grundy County can utilize to enact an equitable public-private cost-sharing arrangement with private developers so that the Brisbin Road improvements can be constructed in a coordinated manner for efficiencies of scale and to minimize disruptions to the travelling public.

The Corridor Access Study is intended to serve as a guide for future decisions affecting Brisbin Road. Key findings from the study follow below:

- At the time of this study, the Brisbin Road interchange with Interstate 80 was under construction and scheduled to be completed in Autumn 2012. As part of the interchange project, public right-of-way was secured by IDOT from approximately 1,150 feet south of U.S. Route 6 to the Collins Run bridge.
- Prior to the start of construction of the interchange project, all study area intersections along Brisbin Road operated at very good levels of service under stop sign controlled conditions.
- The traffic volumes on Brisbin Road presently range from 175-700 vehicles per day (vpd) and are projected to increase to 24,000-39,000 vpd upon completion of the interchange and buildout of the developable land in the corridor.

- To accommodate the projected 2040 traffic volumes at satisfactory levels of service, road capacity improvements will be required along Brisbin Road, which will require the dedication of sufficient public right-of-way. While the IDOT right-of-way between U.S. Route 6 and realigned North Road established as part of the interchange project will be sufficient to accommodate these capacity improvements, additional right-of-way will be required to the north of North Road and the south of U.S. Route 6.
- The ultimate design of Brisbin Road to the south of U.S. Route 6 is an urban four-lane cross-section with two travel lanes in each direction, a raised 30-foot wide barrier median accommodating single or dual left-turn lanes at intersections, curb and gutter on both sides of the roadway, and a 21.5-foot wide landscaped parkway accommodating right-turn lanes at key intersections. This design would be built within a 130-foot right-of-way, which is the right-of-way that will be in place for approximately 1,100 feet south of U.S. Route 6 after the I-80 interchange project is completed. As development occurs to the south of this point along Brisbin Road, the establishment of this 130-foot right-of-way will require the acquisition or dedication of 65 feet of land on each side of the roadway. A sidewalk or multi-use trail can be provided within a 15-foot wide easement on both sides of the roadway. This section of Brisbin Road will eventually be under the jurisdiction of the City of Morris and the Village of Channahon. As such, these communities will ultimately oversee the access controls and design requirements of the roadway.
- The ultimate design of Brisbin Road from U.S. Route 6 north to Sherrill Road is an urban six-lane cross-section with three travel lanes in each direction, a raised barrier median accommodating single or dual left-turn lanes at intersections, curb and gutter on both sides of the roadway, and a landscaped parkway accommodating right-turn lanes at key intersections. From U.S. Route 6 north to the I-80 interchange, the IDOT right-of-way (210-250 feet) is sufficient to accommodate the ultimate design. From the I-80 interchange north to Sherrill Road, this design would be built within a 170-foot right-of-way, which would be established through a roadway dedication easement of 85 feet of land on each side of the roadway as development occurs. A sidewalk or multi-use trail can be provided within a 15-foot wide private easement on both sides of the roadway, except within the IDOT right-of-way where the sidewalk/trail would be incorporated into the widened bridge structure within the public right-of-way.
- Considering that traffic levels on Brisbin Road may not require a six-lane facility for many years, interim designs are recommended the section of Brisbin Road between the I-80 interchange and Sherrill Road that would preserve sufficient right-of-way for the ultimate six-lane urban cross-section but only provide the road capacity to accommodate near-term (within 5 years) and mid-term (5-28 years) traffic volumes.
- The near-term interim design would initially be implemented via the dedication of a 170-foot roadway easement to establish the public right-of-way and the construction of a rural two-lane cross-section with shoulder and ditch on both sides of the pavement. The roadway would be offset to one side of the centerline of the 170-foot right-of-way, thereby allowing a

portion of the right-of-way to continue to be used by local land owners for agricultural purposes until the mid-term interim design is required.

- The mid-term interim design would have an urban-rural hybrid cross-section with an urban 30-foot barrier median on the right-of-way centerline that could ultimately accommodate dual left-turn lanes, a paved outside shoulder accommodating right-turn lanes at key intersections, and a drainage ditch. The mid-term design would require the use of the entire 170-foot right-of-way and would utilize the outside shoulder and ditch from the near-term design, convert the two near-term travel lanes for one direction of travel, construct the median, and build the two additional travel lanes for the other direction of travel.
- The public right-of-way needed along Brisbin Road should be dedicated as a contingency of development or acquired through other means to preserve the needed land area for the ultimate expansion of the roadway.
- Access control standards should be established for Brisbin Road to maximize road capacity and maintain traffic flow efficiency and safety. The following standards are recommended:
  - The minimum spacing between full access intersections, traffic-signal controlled or unsignalized, should be ¼-mile (1,320 feet) wherever possible.
  - Restricted right-in/right-out (RIRO) access driveways should be spaced at a minimum of 500 feet with a desirable spacing of 1/8-mile (660 feet).
  - As parcels are developed, existing driveways should be closed, relocated, consolidated or converted to RIRO to adhere to the minimum spacing standards.
  - Access to adjoining parcels should be consolidated whenever possible.
  - The raised barrier median should be extended across all RIRO driveways.
  - New full access driveways should be aligned opposite an existing full access driveway if it is reasonably close to meeting the minimum spacing requirements.
  - The creation of offset intersections should be avoided.
  - Development access should also be provided from the adjoining cross streets.
  - A parallel collector and local road system should be developed to distribute local traffic, serve new land uses, and divert some of the traffic burden away from Brisbin Road.
  - Future traffic signals located within ½-mile of each other should be interconnected into a coordinated signal system.
  - Left- and right-turn lanes should be provided at all full access intersections.
  - Parking should be prohibited at all times on the roadway.
  - Off-street pedestrian paths and/or multi-use trails should be provided within the corridor along both sides of the roadway.

- The actual design of the intersections (i.e., length of turn lanes and tapers, intersection radii, signal equipment locations, etc.) will be determined when Phase I Intersection Design Studies (IDS) are prepared for the future signalized intersections or when Phase II engineering plans are developed for the roadway.
- Funding for future capacity improvements to Brisbin Road should be borne, in part, by the developers of land that contributes significant volumes of traffic onto the roadway.
- Initially, Grundy County should work with the local municipalities that annex land along the Brisbin Road corridor (i.e., Morris, Minooka, Channahon) to insure that road impact fees or development impact fees are imposed on private development in the corridor (via annexation agreements, development agreements, etc.) to insure that funds are set aside to improve Brisbin Road in an equitable and coordinated manner when traffic conditions warrant such improvements. These fees would be used for engineering and construction of “add-capacity” projects, including lane additions, turning lanes, land acquisition, utility relocation, signal modifications/interconnect, and bridge widening.
- In addition, land developers along Brisbin Road should be required to dedicate the necessary right-of-way for the County to construct the ultimately roadway improvements described in this report.
- Eventually, as development growth occurs in Grundy County and the residential population reaches 400,000, the County should consider enacting a Road Improvement Impact Fee ordinance, which might be applied to future improvements of Brisbin Road.

# Appendix



# **Traffic Counts**



Morris, IL Weather: Warm and Sunny  
 Brisbin and Sherrill Rd  
 Tuesday September 20, 2011

09/22/11  
 16:31:48

URNS/TEAPAC[Ver 3.61.12] - 15-Minute Counts: All Vehicles - by Mvmt

Intersection # 1 brisbin/sherrill													
Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	
700	0	0	0	0	2	0	0	0	0	0	3	0	5
715	0	0	1	0	3	0	0	0	0	0	2	0	6
730	0	0	0	0	5	0	0	0	0	0	5	0	10
745	1	0	0	1	4	0	0	0	0	0	6	0	12
800	0	0	1	1	5	0	0	0	0	0	6	0	13
815	0	0	0	0	1	0	0	0	0	0	1	0	2
830	1	0	0	0	1	0	0	0	0	0	2	0	4
845	0	0	0	0	4	0	0	0	0	2	3	0	9
1600	0	0	0	0	4	0	1	1	0	0	3	0	9
1615	0	0	0	0	9	1	0	0	0	0	7	0	17
1630	0	1	0	1	8	0	0	0	0	1	1	0	12
1645	0	0	0	0	3	0	0	1	0	0	2	0	6
1700	0	0	0	0	9	0	0	0	0	0	8	0	17
1715	0	0	0	0	5	0	0	1	1	0	8	0	15
1730	0	0	0	0	4	0	0	0	0	0	1	0	5
1745	0	0	0	0	10	0	0	0	0	0	3	0	13
Total	2	1	2	3	77	1	1	3	1	3	61	0	155

URNS/TEAPAC[Ver 3.61.12] - 15-Minute Counts: All Vehicles - Totals

Intersection # 1 brisbin/sherrill									
Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	0	2	0	3	0	3	0	2	5
715	1	3	0	2	0	3	0	3	6
730	0	5	0	5	0	5	0	5	10
745	1	5	0	6	1	6	0	5	12
800	1	6	0	6	1	7	0	5	13
815	0	1	0	1	0	1	0	1	2
830	1	1	0	2	0	2	0	2	4
845	0	4	0	5	0	3	2	4	9
1600	0	4	2	3	1	4	0	4	9
1615	0	10	0	7	0	7	1	9	17
1630	1	9	0	2	1	1	2	8	12
1645	0	3	1	2	1	2	0	3	6
1700	0	9	0	8	0	8	0	9	17
1715	0	5	2	8	1	8	0	6	15
1730	0	4	0	1	0	1	0	4	5
1745	0	10	0	3	0	3	0	10	13
Total	5	81	5	64	6	64	5	80	155

Morris, IL Weather: Warm and Sunny  
 Brisbin and Sherrill Rd  
 Tuesday September 20, 2011

09/22/11  
 16:31:48

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: by Movement

Intersection # 1 brisbin/sherrill													
Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	
700	1	0	1	1	14	0	0	0	0	0	16	0	33
715	1	0	2	2	17	0	0	0	0	0	19	0	41
730	1	0	1	2	15	0	0	0	0	0	18	0	37
745	2	0	1	2	11	0	0	0	0	0	15	0	31
800	1	0	1	1	11	0	0	0	0	2	12	0	28
815	1	0	0	0	6	0	0	0	0	2	6	0	15*
830	1	0	0	0	5	0	0	0	0	2	5	0	13*
845	0	0	0	0	4	0	0	0	0	2	3	0	9*
1600	0	1	0	1	24	1	1	2	0	1	13	0	44
1615	0	1	0	1	29	1	0	1	0	1	18	0	52
1630	0	1	0	1	25	0	0	2	1	1	19	0	50
1645	0	0	0	0	21	0	0	2	1	0	19	0	43
1700	0	0	0	0	28	0	0	1	1	0	20	0	50
1715	0	0	0	0	19	0	0	1	1	0	12	0	33*
1730	0	0	0	0	14	0	0	0	0	0	4	0	18*
1745	0	0	0	0	10	0	0	0	0	0	3	0	13*

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: Appr/Exit Totals

Intersection # 1 brisbin/sherrill									
Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	2	15	0	16	1	17	0	15	33
715	3	19	0	19	2	21	0	18	41
730	2	17	0	18	2	19	0	16	37
745	3	13	0	15	2	16	0	13	31
800	2	12	0	14	1	13	2	12	28
815	1	6	0	8	0	6	2	7	15*
830	1	5	0	7	0	5	2	6	13*
845	0	4	0	5	0	3	2	4	9*
1600	1	26	3	14	3	14	3	24	44
1615	1	31	1	19	2	18	3	29	52
1630	1	26	3	20	3	19	2	26	50
1645	0	21	3	19	2	19	0	22	43
1700	0	28	2	20	1	20	0	29	50
1715	0	19	2	12	1	12	0	20	33*
1730	0	14	0	4	0	4	0	14	18*
1745	0	10	0	3	0	3	0	10	13*

Morris, IL Weather: Warm and Sunny  
Minooka and Brisbin Rd  
Tuesday September 20, 2011

09/22/11  
16:35:11

URNS/TEAPAC[Ver 3.61.12] - 15-Minute Counts: All Vehicles - by Mvmt

Intersection # 2 minooka/brisbin													
Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	
700	0	0	0	0	0	0	0	0	0	0	1	0	1
715	0	0	0	0	0	0	0	0	0	1	3	0	4
730	0	0	0	0	8	1	0	0	3	0	5	0	17
745	0	0	0	0	3	0	2	0	0	1	3	0	9
800	0	0	0	0	10	1	0	0	1	0	4	0	16
815	0	0	0	0	6	1	0	0	0	0	3	0	10
830	0	0	0	0	1	0	1	0	0	1	0	0	3
845	0	0	0	0	3	0	0	0	0	2	2	0	7
-----													
1600	0	0	0	2	4	1	0	0	2	1	10	0	20
1615	0	0	1	0	11	2	0	0	0	0	6	1	21
1630	1	1	0	0	4	0	1	0	1	0	10	1	19
1645	0	0	0	0	10	1	0	0	1	0	5	0	17
1700	0	0	0	0	12	0	0	0	1	0	6	0	19
1715	0	0	0	0	6	0	0	1	0	1	7	1	16
1730	0	0	0	0	13	0	0	0	0	1	7	0	21
1745	0	0	0	0	9	0	0	0	0	1	6	0	16
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
Total	1	1	1	2	100	7	4	1	9	9	78	3	216

URNS/TEAPAC[Ver 3.61.12] - 15-Minute Counts: All Vehicles - Totals

Intersection # 2 minooka/brisbin									
Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	0	0	0	1	0	1	0	0	1
715	0	0	0	4	0	3	1	0	4
730	0	9	3	5	0	5	1	11	17
745	0	3	2	4	0	5	1	3	9
800	0	11	1	4	0	4	1	11	16
815	0	7	0	3	0	3	1	6	10
830	0	1	1	1	0	1	1	1	3
845	0	3	0	4	0	2	2	3	7
-----									
1600	0	7	2	11	2	10	2	6	20
1615	1	13	0	7	1	7	2	11	21
1630	2	4	2	11	1	11	1	6	19
1645	0	11	1	5	0	5	1	11	17
1700	0	12	1	6	0	6	0	13	19
1715	0	6	1	9	2	7	1	6	16
1730	0	13	0	8	0	7	1	13	21
1745	0	9	0	7	0	6	1	9	16
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
Total	3	109	14	90	6	83	17	110	216

Morris, IL Weather: Warm and Sunny  
 Minooka and Brisbin Rd  
 Tuesday September 20, 2011

09/22/11  
 16:35:11

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: by Movement

Intersection # 2 minooka/brisbin													
Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	
700	0	0	0	0	11	1	2	0	3	2	12	0	31
715	0	0	0	0	21	2	2	0	4	2	15	0	46
730	0	0	0	0	27	3	2	0	4	1	15	0	52
745	0	0	0	0	20	2	3	0	1	2	10	0	38
800	0	0	0	0	20	2	1	0	1	3	9	0	36
815	0	0	0	0	10	1	1	0	0	3	5	0	20*
830	0	0	0	0	4	0	1	0	0	3	2	0	10*
845	0	0	0	0	3	0	0	0	0	2	2	0	7*
1600	1	1	1	2	29	4	1	0	4	1	31	2	77
1615	1	1	1	0	37	3	1	0	3	0	27	2	76
1630	1	1	0	0	32	1	1	1	3	1	28	2	71
1645	0	0	0	0	41	1	0	1	2	2	25	1	73
1700	0	0	0	0	40	0	0	1	1	3	26	1	72
1715	0	0	0	0	28	0	0	1	0	3	20	1	53*
1730	0	0	0	0	22	0	0	0	0	2	13	0	37*
1745	0	0	0	0	9	0	0	0	0	1	6	0	16*

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: Appr/Exit Totals

Intersection # 2 minooka/brisbin									
Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	0	12	5	14	0	14	3	14	31
715	0	23	6	17	0	17	4	25	46
730	0	30	6	16	0	17	4	31	52
745	0	22	4	12	0	13	4	21	38
800	0	22	2	12	0	10	5	21	36
815	0	11	1	8	0	6	4	10	20*
830	0	4	1	5	0	3	3	4	10*
845	0	3	0	4	0	2	2	3	7*
1600	3	35	5	34	4	33	6	34	77
1615	3	40	4	29	2	29	4	41	76
1630	2	33	5	31	3	29	3	36	71
1645	0	42	3	28	2	25	3	43	73
1700	0	40	2	30	2	26	3	41	72
1715	0	28	1	24	2	20	3	28	53*
1730	0	22	0	15	0	13	2	22	37*
1745	0	9	0	7	0	6	1	9	16*

# **Future Land Use & Trip Generation**



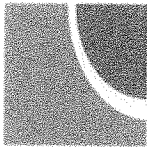
FUTURE LAND USE AND TRIP GENERATION

Zone #	Land Use	Developable Acres	Land Use Size					AM Peak Hour Trip Generation								PM Peak Hour Trip Generation									
			Residential		Industrial/Office/Retail/Other			Residential		Industrial		Office		Retail		Residential		Industrial		Office		Retail			
			(B) Units/Acre	(C) =(A)*(B) Total No. Units	(D) =(A)*43560/1000 Square Footage (,000 sf)	(E) Floor Area Ratio	(F) =(D)*(E) Floor Area (,000 sf)	(G) =(C)*.75*.25 Inbound Trips	(H) =(C)*.75*.75 Outbound Trips	(I) =(F)*.92*.88 Inbound Trips	(J) =(F)*.92*.12 Outbound Trips	(K) =(F)*1.5*.88 Inbound Trips	(L) =(F)*1.5*.12 Outbound Trips	(M) =XP((0.59*(LN(F)) Inbound Trips	(N) =XP((0.59*(LN(F)) Outbound Trips	(O) =(C)*.63 Inbound Trips	(P) =(C)*.37 Outbound Trips	(Q) =(F)*.97*.12 Inbound Trips	(R) =(F)*.97*.88 Outbound Trips	(S) =(F)*1.5*.17 Inbound Trips	(T) =(F)*1.5*.83 Outbound Trips	(U) =XP((0.67*(LN(F)) Inbound Trips	(V) =(C)*3.73*.51 Outbound Trips		
1	Residential Office Industrial Retail	120	3.0		5,227	0.25 0.35 0.2		1,830	1,481      202								213      1,562								
	SUBTOTAL	120							0      0      1,481      202      0      0      0      0	0      0      213      1,562      0      0      0      0															
2	Residential Office Industrial Retail	176 8	2.0	352		0.25 0.3 0.2			66      198	222      130															
	SUBTOTAL	184			348	0.2	70		66      198      0      0      0      0      76      49	222      130      0      0      0      0      245      255															
3	Residential Office Industrial Retail	110 10	3.0		4,792 436	0.25 0.35 0.2		1,677 87	1,358      185								195      1,432								
	SUBTOTAL	120							0      0      1,358      185      0      0      87      55	0      0      195      1,432      0      0      284      296															
4	Residential Office Industrial Retail	94 31 34 20	2.0	188	1,350 1,481 871	0.25 0.35 0.2	338 518 174	35      106	446      61								118      70								
	SUBTOTAL	179							35      106      420      57      446      61      130      83	118      70      60      442      86      420      452      471															
5	Residential Office Industrial Retail	98 12	3.0		4,269 523	0.25 0.35 0.2		1,494 105	1,210      165								174      1,275								
	SUBTOTAL	110							0      0      1,210      165      0      0      96      62	0      0      174      1,275      0      0      321      334															
6	Residential Office Industrial Retail	25 145 15	3.0		1,089 6,316 653	0.25 0.35 0.2	272 2,211 131		359      49								69      339								
	SUBTOTAL	185							0      0      1,790      244      359      49      110      70	0      0      257      1,887      69      339      373      388															
7	Residential Office Industrial Retail	40 80	3.0		1,742 3,485	0.25 0.35 0.2	436 1,220		575      78								111      542								
	SUBTOTAL	120							0      0      987      135      575      78      0      0	0      0      142      1,041      111      542      0      0															



# **CMAP Traffic Projections**





## Chicago Metropolitan Agency for Planning

233 South Wacker Drive  
Suite 800  
Chicago, Illinois 60606

312 454 0400  
[www.cmap.illinois.gov](http://www.cmap.illinois.gov)

June 24, 2011

Craig Cassem  
County Engineer  
Grundy County Highway Department  
245 North IL 47  
Morris, IL 60450

***Subject: Brisbin Road***  
Grundy County Highway Department

Dear Mr. Cassem:

In response to a request made on your behalf and dated June 14, 2011, we have developed year 2040 average daily traffic (ADT) projections for the subject location. These are in a table on the following page.

Traffic projections are developed using existing ADT data provided in the request letter and the results from the most recent (April 2010) CMAP RTP/TIP Travel Demand Analysis. The regional travel model uses CMAP 2040 socioeconomic projections and assumes the implementation of the 2040 Regional Transportation Plan for the Northeastern Illinois area.

If you have any questions, please call Jose Rodriguez at (312) 386-8806.

Sincerely,

A handwritten signature in black ink that reads "Donald P. Kopec".

Donald P. Kopec  
Deputy Director for Planning and Programming

cc: Russell (KLOA)  
M:\proj1\ceb\forecasts\2011 Response\gr-01-11.docx

















Table: 2040 Projected ADTs, Brisbin Road Corridor

















<b>ROAD SEGMENT</b>	<b>2040 ADT</b>
Brisbin Road north of Minooka Road	500
Brisbin Rd between Minooka Rd and WB I-80 ramps	3,000
Brisbin Rd between EB I-80 ramps and US 6	8,000
I-80 east of Brisbin Rd	48,000
I-80 west of Brisbin Rd	52,000
Ramp, WB I-80 to Brisbin Rd	100
Ramp, Brisbin Rd to WB I-80	2,000
Ramp, Brisbin Rd to EB I-80	100
Ramp, EB I-80 to Brisbin Rd	2,000
US 6 east of Brisbin Rd	10,000
US 6 west of Brisbin Rd	5,000
Minooka Rd east of Brisbin Rd	500
Minooka Rd west of Brisbin Rd	500
Sherill Rd east of Brisbin Rd	2,000
Sherill Rd west of Brisbin Rd	2,000
Brown Rd between Minooka Rd and North Rd	200
Brown Rd between North Rd and Shady Oaks Rd	600
Brown Rd south of Shady Oaks Rd	100
Grove Rd between Sherill Rd and Minooka Rd	1,000
Church Rd between Sherill Rd and Minooka Rd	100
Gun Club Rd south of US 6	500

# **Capacity Analysis Worksheets**

## **Existing Traffic Conditions**



												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	20	1	5	15	1	1	5	5	1	5	1
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)	1	22	1	5	16	1	1	5	5	1	5	1
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	17			23			56	53	22	60	53	17
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	17			23			56	53	22	60	53	17
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	99	99	100	99	100
cM capacity (veh/h)	1600			1592			933	835	1055	923	835	1062
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	24	23	12	8								
Volume Left	1	5	1	1								
Volume Right	1	1	5	1								
cSH	1600	1592	932	874								
Volume to Capacity	0.00	0.00	0.01	0.01								
Queue Length 95th (ft)	0	0	1	1								
Control Delay (s)	0.3	1.7	8.9	9.2								
Lane LOS	A	A	A	A								
Approach Delay (s)	0.3	1.7	8.9	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization			13.3%		ICU Level of Service					A		
Analysis Period (min)			15									

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	15	5	5	25	1	5	10	5	1	10	1
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)	1	16	5	5	27	1	5	11	5	1	11	1
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	28			22			66	60	19	71	62	28
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			22			66	60	19	71	62	28
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	99	99	100	99	100
cM capacity (veh/h)	1585			1594			914	827	1059	904	825	1048
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	23	34	22	13								
Volume Left	1	5	5	1								
Volume Right	5	1	5	1								
cSH	1585	1594	898	846								
Volume to Capacity	0.00	0.00	0.02	0.02								
Queue Length 95th (ft)	0	0	2	1								
Control Delay (s)	0.4	1.2	9.1	9.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	0.4	1.2	9.1	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			13.3%		ICU Level of Service					A		
Analysis Period (min)			15									



















Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	1	1	20	20	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1	1	22	22	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46	22	23			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46	22	23			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	963	1055	1592			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	2	23	23			
Volume Left	1	1	0			
Volume Right	1	0	1			
cSH	1007	1592	1700			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	8.6	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		13.3%		ICU Level of Service		A
Analysis Period (min)		15				



















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	320	5	5	140	10	5	5	5	10	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	348	5	5	152	11	5	5	5	11	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	163			353			554	546	351	549	543	158
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	163			353			554	546	351	549	543	158
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	99	99	97	99	99
cM capacity (veh/h)	1416			1205			429	440	693	435	441	888
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	364	168	16	27								
Volume Left	11	5	5	11								
Volume Right	5	11	5	11								
cSH	1416	1205	496	548								
Volume to Capacity	0.01	0.00	0.03	0.05								
Queue Length 95th (ft)	1	0	3	4								
Control Delay (s)	0.3	0.3	12.5	11.9								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.3	0.3	12.5	11.9								
Approach LOS			B	B								
Intersection Summary												
Average Delay			1.2									
Intersection Capacity Utilization			31.3%		ICU Level of Service				A			
Analysis Period (min)			15									






Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	1	20	5	1	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1	22	5	1	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	48	24			27	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	48	24			27	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	960	1052			1587	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	7	27	23			
Volume Left	5	0	1			
Volume Right	1	5	0			
cSH	975	1700	1587			
Volume to Capacity	0.01	0.02	0.00			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.7	0.0	0.4			
Lane LOS	A		A			
Approach Delay (s)	8.7	0.0	0.4			
Approach LOS	A					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		13.3%		ICU Level of Service		A
Analysis Period (min)		15				

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	20	1	5	30	1	1	5	5	1	5	1
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)	1	22	1	5	33	1	1	5	5	1	5	1
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	34			23			72	69	22	77	69	33
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	34			23			72	69	22	77	69	33
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	99	99	100	99	100
cM capacity (veh/h)	1578			1592			910	818	1055	901	818	1040
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	24	39	12	8								
Volume Left	1	5	1	1								
Volume Right	1	1	5	1								
cSH	1578	1592	920	855								
Volume to Capacity	0.00	0.00	0.01	0.01								
Queue Length 95th (ft)	0	0	1	1								
Control Delay (s)	0.3	1.0	9.0	9.2								
Lane LOS	A	A	A	A								
Approach Delay (s)	0.3	1.0	9.0	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			13.6%		ICU Level of Service					A		
Analysis Period (min)			15									

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	25	5	5	35	1	5	10	5	1	10	1
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)	1	27	5	5	38	1	5	11	5	1	11	1
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	39			33			88	82	30	92	84	39
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	39			33			88	82	30	92	84	39
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	99	99	100	99	100
cM capacity (veh/h)	1571			1579			884	805	1045	875	803	1033
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	34	45	22	13								
Volume Left	1	5	5	1								
Volume Right	5	1	5	1								
cSH	1571	1579	875	824								
Volume to Capacity	0.00	0.00	0.02	0.02								
Queue Length 95th (ft)	0	0	2	1								
Control Delay (s)	0.2	0.9	9.2	9.4								
Lane LOS	A	A	A	A								
Approach Delay (s)	0.2	0.9	9.2	9.4								
Approach LOS			A	A								
Intersection Summary												
Average Delay			3.3									
Intersection Capacity Utilization		14.2%		ICU Level of Service					A			
Analysis Period (min)			15									



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	1	1	20	20	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1	1	22	22	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46	22	23			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46	22	23			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	963	1055	1592			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	2	23	23			
Volume Left	1	1	0			
Volume Right	1	0	1			
cSH	1007	1592	1700			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	8.6	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization	13.3%			ICU Level of Service	A	
Analysis Period (min)	15					



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	160	5	5	305	10	5	5	5	10	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	174	5	5	332	11	5	5	5	11	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	342			179			560	552	177	554	549	337
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	342			179			560	552	177	554	549	337
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	99	99	97	99	98
cM capacity (veh/h)	1217			1396			424	436	866	432	438	705
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	190	348	16	27								
Volume Left	11	5	5	11								
Volume Right	5	11	5	11								
cSH	1217	1396	517	513								
Volume to Capacity	0.01	0.00	0.03	0.05								
Queue Length 95th (ft)	1	0	2	4								
Control Delay (s)	0.5	0.2	12.2	12.4								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.2	12.2	12.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay			1.2									
Intersection Capacity Utilization		28.2%			ICU Level of Service				A			
Analysis Period (min)		15										



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	1	20	5	1	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1	22	5	1	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	48	24			27	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	48	24			27	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	960	1052			1587	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	7	27	23			
Volume Left	5	0	1			
Volume Right	1	5	0			
cSH	975	1700	1587			
Volume to Capacity	0.01	0.02	0.00			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.7	0.0	0.4			
Lane LOS	A		A			
Approach Delay (s)	8.7	0.0	0.4			
Approach LOS	A					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		13.3%		ICU Level of Service		A
Analysis Period (min)		15				

























# **Capacity Analysis Worksheets**

## **Projected 2040 Traffic Conditions**



## 4: Sherrill Road &amp; Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	265		265	265		265	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1961	1583	1770	1961	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.397			0.722			0.118			0.520		
Satd. Flow (perm)	740	1961	1583	1345	1961	1583	220	3725	1583	969	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			5			11			5			58
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		1533			1607			1320			1102	
Travel Time (s)		34.8			36.5			16.4			13.7	
Volume (vph)	10	50	5	25	240	10	45	335	5	5	1660	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	53	5	26	253	11	47	353	5	5	1747	58
Lane Group Flow (vph)	11	53	5	26	253	11	47	353	5	5	1747	58
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	38.0	10.0	10.0	38.0	10.0
Total Split (%)	12.5%	27.5%	12.5%	12.5%	27.5%	12.5%	12.5%	47.5%	12.5%	12.5%	47.5%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5	1.0	1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	20.0	17.8	27.6	19.6	16.2	25.8	48.7	46.3	55.5	47.6	44.2	53.2
Actuated g/C Ratio	0.25	0.22	0.34	0.24	0.20	0.32	0.61	0.58	0.69	0.60	0.55	0.66
v/c Ratio	0.04	0.12	0.01	0.07	0.64	0.02	0.19	0.16	0.00	0.01	0.85	0.05
Control Delay	17.8	24.7	11.0	18.6	36.6	9.5	13.6	3.5	1.6	8.2	25.1	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	24.7	11.0	18.6	36.6	9.5	13.6	3.5	1.6	8.2	25.1	2.7
LOS	B	C	B	B	D	A	B	A	A	A	C	A
Approach Delay		22.6			34.0			4.7			24.4	
Approach LOS		C			C			A			C	
Stops (vph)	8	39	3	18	212	5	23	79	0	3	1087	8
Fuel Used(gal)	0	1	0	1	6	0	1	5	0	0	40	1
CO Emissions (g/hr)	14	74	6	35	417	12	65	315	3	7	2815	39

#### 4: Sherrill Road & Brisbin Road

8/29/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	3	14	1	7	81	2	13	61	1	1	548	8
VOC Emissions (g/hr)	3	17	1	8	97	3	15	73	1	2	652	9
Dilemma Vehicles (#)	0	0	0	0	0	0	0	21	0	0	93	0
Queue Length 50th (ft)	4	18	0	9	114	0	1	4	0	1	~508	0
Queue Length 95th (ft)	14	50	7	25	186	10	42	34	0	6	#664	15
Internal Link Dist (ft)	1453			1527			1240			1022		
Turn Bay Length (ft)	265		265	265		265	265		265	265		265
Base Capacity (vph)	264	482	554	365	446	526	251	2156	1116	639	2058	1091
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.11	0.01	0.07	0.57	0.02	0.19	0.16	0.00	0.01	0.85	0.05

#### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 11 (14%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 22.3

Intersection LOS: C

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

























Queue shown is maximum after two cycles.

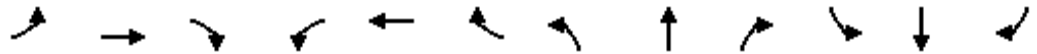
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

#### Splits and Phases: 4: Sherrill Road & Brisbin Road

	ø1		ø2		ø3		ø4
10 s		38 s		10 s		22 s	
	ø5		ø6		ø7		ø8
10 s		38 s		10 s		22 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.307			0.390			0.118			0.328		
Satd. Flow (perm)	572	3725	1583	726	3725	1583	220	3725	1583	611	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			32			32			95			100
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		739			617			1482			1320	
Travel Time (s)		16.8			14.0			18.4			16.4	
Volume (vph)	20	385	30	40	465	30	80	610	90	115	1110	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	405	32	42	489	32	84	642	95	121	1168	100
Lane Group Flow (vph)	21	405	32	42	489	32	84	642	95	121	1168	100
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	38.0	10.0	10.0	38.0	10.0
Total Split (%)	12.5%	27.5%	12.5%	12.5%	27.5%	12.5%	12.5%	47.5%	12.5%	12.5%	47.5%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	21.2	16.5	26.4	21.3	16.5	26.2	44.6	39.8	49.7	44.0	39.5	49.3
Actuated g/C Ratio	0.26	0.21	0.33	0.27	0.21	0.33	0.56	0.50	0.62	0.55	0.49	0.62
v/c Ratio	0.09	0.53	0.06	0.15	0.64	0.06	0.35	0.35	0.09	0.29	0.63	0.10
Control Delay	18.3	30.8	7.0	19.1	32.9	7.1	25.1	20.4	7.1	2.1	2.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	30.8	7.0	19.1	32.9	7.1	25.1	20.4	7.1	2.1	2.4	0.2
LOS	B	C	A	B	C	A	C	C	A	A	A	A
Approach Delay		28.5			30.4			19.3			2.2	
Approach LOS		C			C			B			A	
Stops (vph)	16	330	8	29	409	8	67	309	32	3	84	0
Fuel Used(gal)	0	6	0	1	8	0	2	14	2	1	11	1
CO Emissions (g/hr)	19	451	18	36	532	16	168	979	110	74	796	56



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	4	88	4	7	103	3	33	190	21	14	155	11
VOC Emissions (g/hr)	5	105	4	8	123	4	39	227	25	17	184	13
Dilemma Vehicles (#)	0	0	0	0	0	0	0	46	0	0	36	0
Queue Length 50th (ft)	7	93	0	14	116	0	17	12	1	3	14	1
Queue Length 95th (ft)	22	135	18	35	164	18	87	241	49	3	8	m0
Internal Link Dist (ft)		659			537			1402			1240	
Turn Bay Length (ft)	265		400	400		265	400		400	265		265
Base Capacity (vph)	242	838	547	272	838	547	241	1854	1022	425	1840	1018
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.48	0.06	0.15	0.58	0.06	0.35	0.35	0.09	0.28	0.63	0.10

**Intersection Summary**

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 77 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 15.2

Intersection LOS: B









Intersection Capacity Utilization 62.5%

























ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.













**Splits and Phases: 6: Minooka Road & Brisbin Road**

 ø1	 ø2	 ø3	 ø4
10 s	38 s	10 s	22 s
 ø5	 ø6	 ø7	 ø8
10 s	38 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	200		265	400		200	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	5353	1583	1770	5353	1583
Flt Permitted	0.327			0.327			0.950			0.950		
Satd. Flow (perm)	609	3725	1583	609	3725	1583	1770	5353	1583	1770	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53			42			176			74
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		484			484			974			1489	
Travel Time (s)		11.0			11.0			12.1			18.5	
Volume (vph)	40	445	50	55	445	40	180	1595	190	75	540	70
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	468	53	58	468	42	189	1679	200	79	568	74
Lane Group Flow (vph)	42	468	53	58	468	42	189	1679	200	79	568	74
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	20.0	10.0	22.0	12.0	20.0	36.0	10.0	12.0	28.0	10.0
Total Split (%)	12.5%	27.5%	25.0%	12.5%	27.5%	15.0%	25.0%	45.0%	12.5%	15.0%	35.0%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	22.2	16.3	32.9	23.0	18.2	29.7	12.6	36.3	46.2	7.5	29.2	39.1
Actuated g/C Ratio	0.28	0.20	0.41	0.29	0.23	0.37	0.16	0.45	0.58	0.09	0.36	0.49
v/c Ratio	0.17	0.62	0.08	0.22	0.55	0.07	0.68	0.69	0.20	0.48	0.29	0.09
Control Delay	19.4	32.6	4.0	20.2	30.5	5.9	56.4	4.7	0.5	38.5	19.6	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	32.6	4.0	20.2	30.5	5.9	56.4	4.7	0.5	38.5	19.6	11.3
LOS	B	C	A	C	C	A	E	A	A	D	B	B
Approach Delay		29.0			27.7			9.0			20.8	
Approach LOS		C			C			A			C	
Stops (vph)	30	389	8	38	382	10	159	446	1	52	466	60
Fuel Used(gal)	0	7	0	1	7	0	6	20	1	2	16	2
CO Emissions (g/hr)	33	474	19	45	458	18	429	1374	85	158	1112	135

# 9: Whitman Road & Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	6	92	4	9	89	3	83	267	16	31	216	26
VOC Emissions (g/hr)	8	110	4	10	106	4	99	319	20	37	258	31
Dilemma Vehicles (#)	0	0	0	0	0	0	0	98	0	0	4	0
Queue Length 50th (ft)	14	111	0	20	111	0	94	16	0	25	83	13
Queue Length 95th (ft)	35	156	18	44	156	19	145	35	0	59	147	54
Internal Link Dist (ft)		404			404			894			1409	
Turn Bay Length (ft)	200		265	400		200	400		400	265		265
Base Capacity (vph)	257	838	747	262	881	626	354	2426	990	180	1952	813
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.56	0.07	0.22	0.53	0.07	0.53	0.69	0.20	0.44	0.29	0.09

## Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 19 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 16.8









Intersection LOS: B

























Intersection Capacity Utilization 61.8%

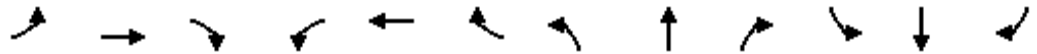
ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: Whitman Road & Brisbin Road

 ø1	 ø2	 ø3	 ø4
12 s	36 s	10 s	22 s
 ø5	 ø6	 ø7	 ø8
20 s	28 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	400		265	265		400	265		265	400		400
Storage Lanes	2		1	2		1	2		1	2		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frts			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3725	1583	3433	3725	1583	3433	3725	1583	3433	3725	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3725	1583	3433	3725	1583	3433	3725	1583	3433	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			221			126			36			53
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		1320			1878			1326			1049	
Travel Time (s)		30.0			42.7			16.4			13.0	
Volume (vph)	60	540	210	115	170	120	45	375	305	510	310	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	568	221	121	179	126	47	395	321	537	326	53
Lane Group Flow (vph)	63	568	221	121	179	126	47	395	321	537	326	53
Turn Type	Prot		pm+ov	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4			Free			2			6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	11.0	14.0	26.0	0.0	11.0	23.0	14.0	21.0	33.0	10.0
Total Split (%)	12.5%	27.5%	13.8%	17.5%	32.5%	0.0%	13.8%	28.8%	17.5%	26.3%	41.3%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5		1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min	None	None	C-Min	None
Act Effct Green (s)	6.4	18.5	28.9	8.1	22.0	80.0	6.4	21.3	33.3	16.2	31.0	41.5
Actuated g/C Ratio	0.08	0.23	0.36	0.10	0.28	1.00	0.08	0.27	0.42	0.20	0.39	0.52
v/c Ratio	0.23	0.66	0.31	0.35	0.17	0.08	0.17	0.40	0.47	0.77	0.23	0.06
Control Delay	36.5	31.9	3.9	35.9	22.8	0.1	45.4	19.8	13.0	43.1	19.0	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	31.9	3.9	35.9	22.8	0.1	45.4	19.8	13.0	43.1	19.0	3.8
LOS	D	C	A	D	C	A	D	B	B	D	B	A
Approach Delay		25.0			19.8			18.5			32.3	
Approach LOS		C			B			B			C	
Stops (vph)	54	472	23	105	125	0	41	271	217	493	183	7
Fuel Used(gal)	1	12	2	3	4	2	2	10	7	17	7	1
CO Emissions (g/hr)	95	816	172	217	277	123	109	678	517	1190	465	35



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	19	159	33	42	54	24	21	132	101	232	91	7
VOC Emissions (g/hr)	22	189	40	50	64	29	25	157	120	276	108	8
Dilemma Vehicles (#)	0	0	0	0	0	0	0	21	0	0	59	0
Queue Length 50th (ft)	15	131	0	29	35	0	11	93	116	143	55	0
Queue Length 95th (ft)	34	191	43	53	60	0	31	42	16	196	74	9
Internal Link Dist (ft)	1240				1798				1246		969	
Turn Bay Length (ft)	400			265	265			400	265			400
Base Capacity (vph)	280	893	724	429	1054	1583	300	1023	718	737	1465	848
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.64	0.31	0.28	0.17	0.08	0.16	0.39	0.45	0.73	0.22	0.06

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 16 (20%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 24.8

Intersection LOS: C

Intersection Capacity Utilization 57.6%

ICU Level of Service B



















Analysis Period (min) 15

Splits and Phases: 11: U.S. 6 &amp; Brisbin Road

ø1	ø2	ø3	ø4
21 s	23 s	14 s	22 s
ø5	ø6	ø7	ø8
11 s	33 s	10 s	26 s

## 14: WB I-80 Ramps &amp; Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	0		0	0		0	400		0	0		400
Storage Lanes	0		0	2		2	2		0	0		2
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)				50		50	50	50			50	50
Trailing Detector (ft)				0		0	0	0			0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	0.97	0.91	1.00	1.00	0.91	0.88
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	0	2787	3433	5353	0	0	5353	2787
Flt Permitted				0.950			0.950					
Satd. Flow (perm)	0	0	0	3433	0	2787	3433	5353	0	0	5353	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						9						211
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		402			422			1036			710	
Travel Time (s)		9.1			9.6			12.8			8.8	
Volume (vph)	0	0	0	330	0	1025	90	1370	0	0	410	200
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	347	0	1079	95	1442	0	0	432	211
Lane Group Flow (vph)	0	0	0	347	0	1079	95	1442	0	0	432	211
Turn Type			custom			custom	Prot					custom
Protected Phases							5	2			6	
Permitted Phases				8		8						3 6
Detector Phases				8		8	5	2			6	3 6
Minimum Initial (s)				4.0		4.0	4.0	4.0			4.0	
Minimum Split (s)				22.0		22.0	10.0	22.0			22.0	
Total Split (s)	0.0	0.0	0.0	46.0	0.0	46.0	11.0	34.0	0.0	0.0	23.0	69.0
Total Split (%)	0.0%	0.0%	0.0%	57.5%	0.0%	57.5%	13.8%	42.5%	0.0%	0.0%	28.8%	86.3%
Yellow Time (s)				4.5		4.5	3.0	4.5			4.5	
All-Red Time (s)				1.5		1.5	1.0	1.5			1.5	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Recall Mode				None		None	None	C-Max			C-Max	
Act Effct Green (s)				37.7		37.7	6.8	34.3			25.4	67.9
Actuated g/C Ratio				0.47		0.47	0.08	0.43			0.32	0.85
v/c Ratio				0.21		0.82	0.32	0.63			0.25	0.09
Control Delay				12.1		23.5	41.9	12.0			17.9	1.3
Queue Delay				0.0		0.0	0.0	0.0			0.0	0.0
Total Delay				12.1		23.5	41.9	12.0			17.9	1.3
LOS				B		C	D	B			B	A
Approach Delay								13.9			12.5	
Approach LOS								B			B	
Stops (vph)				177		822	77	818			277	50
Fuel Used(gal)				3		13	3	28			8	2
CO Emissions (g/hr)				201		897	195	1925			593	132



Lane Group	ø3
Lane Configurations	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	10.0
Total Split (s)	46.0
Total Split (%)	58%
Yellow Time (s)	4.5
All-Red Time (s)	1.5
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	

# 14: WB I-80 Ramps & Brisbin Road

8/29/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)				39		174	38	374			115	26
VOC Emissions (g/hr)				47		208	45	446			137	31
Dilemma Vehicles (#)				0		0	0	38			30	0
Queue Length 50th (ft)				47		240	22	100			9	0
Queue Length 95th (ft)				67		303	m34	198			87	0
Internal Link Dist (ft)		322			342			956			630	
Turn Bay Length (ft)							400					400
Base Capacity (vph)				1802		1467	304	2296			1702	2456
Starvation Cap Reductn				0		0	0	0			0	0
Spillback Cap Reductn				0		0	0	0			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.19		0.74	0.31	0.63			0.25	0.09

## Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 2 (3%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 16.3

Intersection LOS: B

Intersection Capacity Utilization 67.7%

ICU Level of Service C

























Analysis Period (min) 15













m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: WB I-80 Ramps & Brisbin Road

↑ ø2	↙ ø3
34 s	46 s
↖ ø5	↓ ø6
11 s	23 s
	↗ ø8
	46 s

Lane Group	ø3
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	300		150	150		300	150		150	400		400
Storage Lanes	2		1	1		2	1		1	2		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1961	1583	1770	1961	2787	1770	3725	1583	3433	3725	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1961	1583	1770	1961	2787	1770	3725	1583	3433	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			26			95			100			100
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		534			618			211			1326	
Travel Time (s)		12.1			14.0			2.6			16.4	
Volume (vph)	60	10	25	25	10	90	40	575	95	420	120	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	11	26	26	11	95	42	605	100	442	126	100
Lane Group Flow (vph)	63	11	26	26	11	95	42	605	100	442	126	100
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	11.0	23.0	11.0	11.0	23.0	21.0	11.0	25.0	11.0	21.0	35.0	11.0
Total Split (%)	13.8%	28.8%	13.8%	13.8%	28.8%	26.3%	13.8%	31.3%	13.8%	26.3%	43.8%	13.8%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	6.5	7.9	10.0	6.5	7.9	17.2	7.4	46.2	56.7	14.6	58.1	67.5
Actuated g/C Ratio	0.08	0.10	0.12	0.08	0.10	0.22	0.09	0.58	0.71	0.18	0.73	0.84
v/c Ratio	0.22	0.06	0.12	0.18	0.06	0.14	0.26	0.28	0.09	0.70	0.05	0.07
Control Delay	36.2	33.0	11.3	37.0	33.0	4.8	36.9	11.4	2.3	27.4	7.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	33.0	11.3	37.0	33.0	4.8	36.9	11.4	2.3	27.4	7.3	2.1
LOS	D	C	B	D	C	A	D	B	A	C	A	A
Approach Delay		29.4			13.5			11.6			19.8	
Approach LOS		C			B			B			B	
Stops (vph)	54	12	9	26	12	14	38	294	10	333	46	13
Fuel Used(gal)	1	0	0	0	0	1	1	8	0	12	2	1
CO Emissions (g/hr)	69	12	15	32	13	42	74	529	25	843	143	75

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	13	2	3	6	2	8	14	103	5	164	28	15
VOC Emissions (g/hr)	16	3	3	7	3	10	17	123	6	195	33	17
Dilemma Vehicles (#)	0	0	0	0	0	0	0	36	0	0	18	0
Queue Length 50th (ft)	15	5	0	12	5	0	20	72	0	74	10	0
Queue Length 95th (ft)	34	20	18	36	20	14	49	167	23	153	39	0
Internal Link Dist (ft)		454			538			131			1246	
Turn Bay Length (ft)	300		150	150		300	150		150	400		400
Base Capacity (vph)	300	466	230	155	466	774	175	2150	1160	756	2705	1340
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.02	0.11	0.17	0.02	0.12	0.24	0.28	0.09	0.58	0.05	0.07

**Intersection Summary**

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 5 (6%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 16.2

Intersection LOS: B

Intersection Capacity Utilization 45.5%

ICU Level of Service A




















Analysis Period (min) 15

Splits and Phases: 16: Access "F" &amp; Brisbin Road

 ø1	 ø2	 ø3	 ø4
21 s	25 s	11 s	23 s
 ø5	 ø6	 ø7	 ø8
11 s	35 s	11 s	23 s

## 19: EB I-80 Ramps &amp; Brisbin Road

8/29/2012


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	0		0	0		0	0		400	400		0
Storage Lanes	2		2	0		0	0		2	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50		50					50	50	50	50	
Trailing Detector (ft)	0		0					0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	0.88	1.00	1.00	1.00	1.00	0.91	0.88	0.97	0.91	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	0	2787	0	0	0	0	5353	2787	3433	5353	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	3433	0	2787	0	0	0	0	5353	2787	3433	5353	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			347						95			
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		405			451			1049			1036	
Travel Time (s)		9.2			10.3			13.0			12.8	
Volume (vph)	950	0	330	0	0	0	0	435	90	200	495	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1000	0	347	0	0	0	0	458	95	211	521	0
Lane Group Flow (vph)	1000	0	347	0	0	0	0	458	95	211	521	0
Turn Type	custom		custom						custom	Prot		
Protected Phases								2		1	6	
Permitted Phases	4		4						2 4			
Detector Phases	4		4					2	2 4	1	6	
Minimum Initial (s)	4.0		4.0					4.0		4.0	4.0	
Minimum Split (s)	22.0		22.0					22.0		10.0	22.0	
Total Split (s)	39.0	0.0	39.0	0.0	0.0	0.0	0.0	25.0	64.0	16.0	41.0	0.0
Total Split (%)	48.8%	0.0%	48.8%	0.0%	0.0%	0.0%	0.0%	31.3%	80.0%	20.0%	51.3%	0.0%
Yellow Time (s)	4.5		4.5					4.5		3.0	4.5	
All-Red Time (s)	1.5		1.5					1.5		1.0	1.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None		None					C-Max		None C-Max		
Act Effct Green (s)	30.9		30.9					26.6	61.5	10.5	41.1	
Actuated g/C Ratio	0.39		0.39					0.33	0.77	0.13	0.51	
v/c Ratio	0.76		0.27					0.26	0.04	0.47	0.19	
Control Delay	24.9		2.3					7.6	0.4	27.4	5.1	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.0	
Total Delay	24.9		2.3					7.6	0.4	27.4	5.1	
LOS	C		A					A	A	C	A	
Approach Delay								6.3			11.6	
Approach LOS								A			B	
Stops (vph)	772		25					205	6	177	257	
Fuel Used(gal)	12		1					7	1	6	9	
CO Emissions (g/hr)	845		93					515	50	400	597	

AM Peak Hour - Projected Traffic 11/10/2011 11-100, Brisbin Rd  
Kenig, Lindgren, O'Hara, Aboona, Inc

Synchro 6 Report

# 19: EB I-80 Ramps & Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	164		18					100	10	78	116	
VOC Emissions (g/hr)	196		22					119	12	93	138	
Dilemma Vehicles (#)	0		0					25	0	0	14	
Queue Length 50th (ft)	208		0					13	0	27	14	
Queue Length 95th (ft)	262		24					28	0	43	21	
Internal Link Dist (ft)		325			371			969			956	
Turn Bay Length (ft)									400	400		
Base Capacity (vph)	1502		1415					1781	2303	515	2753	
Starvation Cap Reductn	0		0					0	0	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.67		0.25					0.26	0.04	0.41	0.19	

## Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 32 (40%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 14.3





Intersection LOS: B

Intersection Capacity Utilization 67.7%

ICU Level of Service C

























Analysis Period (min) 15

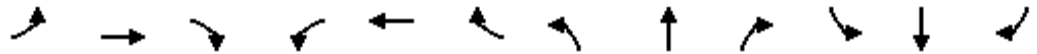
Splits and Phases: 19: EB I-80 Ramps & Brisbin Road

 ø1	 ø2	 ø4
16 s	25 s	39 s
 ø6		
41 s		

## 23: North Road &amp; Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		2	1		1	2		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.88	1.00	0.95	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	2787	1770	3725	1583	3433	5353	1583	1770	5353	1583
Flt Permitted	0.477			0.629			0.950			0.950		
Satd. Flow (perm)	889	3725	2787	1172	3725	1583	3433	5353	1583	1770	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			58			68			63			53
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		414			426			710			975	
Travel Time (s)		9.4			9.7			8.8			12.1	
Volume (vph)	30	185	55	20	310	65	205	2130	60	35	535	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	195	58	21	326	68	216	2242	63	37	563	53
Lane Group Flow (vph)	32	195	58	21	326	68	216	2242	63	37	563	53
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	13.0	10.0	22.0	10.0	13.0	38.0	10.0	10.0	35.0	10.0
Total Split (%)	12.5%	27.5%	16.3%	12.5%	27.5%	12.5%	16.3%	47.5%	12.5%	12.5%	43.8%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	18.8	14.1	27.7	18.7	14.0	24.7	9.7	41.2	51.0	6.7	36.4	46.2
Actuated g/C Ratio	0.24	0.18	0.35	0.23	0.18	0.31	0.12	0.52	0.64	0.08	0.46	0.58
v/c Ratio	0.12	0.30	0.06	0.07	0.50	0.13	0.52	0.81	0.06	0.25	0.23	0.06
Control Delay	20.0	29.3	4.9	19.2	32.2	5.6	37.1	15.4	1.8	32.2	18.0	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	29.3	4.9	19.2	32.2	5.6	37.1	15.4	1.8	32.2	18.0	5.7
LOS	B	C	A	B	C	A	D	B	A	C	B	A
Approach Delay		23.3			27.2			16.9			17.8	
Approach LOS		C			C			B			B	
Stops (vph)	23	152	10	16	267	12	187	1121	6	36	326	13
Fuel Used(gal)	0	3	0	0	5	0	6	37	0	1	11	1
CO Emissions (g/hr)	24	178	20	16	317	25	416	2592	28	78	792	42



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	5	35	4	3	62	5	81	504	5	15	154	8
VOC Emissions (g/hr)	6	41	5	4	73	6	96	601	7	18	183	10
Dilemma Vehicles (#)	0	0	0	0	0	0	0	116	0	0	61	0
Queue Length 50th (ft)	11	45	0	7	78	0	53	217	1	19	75	1
Queue Length 95th (ft)	29	71	11	22	112	25	m78	#506	m3	50	105	0
Internal Link Dist (ft)		334			346			630			895	
Turn Bay Length (ft)	265		400	400		265	400		400	265		265
Base Capacity (vph)	276	838	1014	320	838	538	428	2757	1036	151	2433	940
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.23	0.06	0.07	0.39	0.13	0.50	0.81	0.06	0.25	0.23	0.06

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 69 (86%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 18.6

Intersection LOS: B

Intersection Capacity Utilization 67.2%

ICU Level of Service C

Analysis Period (min) 15
























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 23: North Road & Brisbin Road

ø1	ø2	ø3	ø4
10 s	38 s	10 s	22 s
ø5	ø6	ø7	ø8
13 s	35 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	150		0	400		0	400		400	265		265
Storage Lanes	1		1	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850		0.902				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1680	0	1770	5353	1583	1770	5353	1583
Flt Permitted	0.736			0.750			0.950			0.950		
Satd. Flow (perm)	1371	1863	1583	1397	1680	0	1770	5353	1583	1770	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			47		21				142			58
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		431			457			975			974	
Travel Time (s)		9.8			10.4			12.1			12.1	
Volume (vph)	15	10	45	45	10	20	160	1930	135	60	530	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	11	47	47	11	21	168	2032	142	63	558	58
Lane Group Flow (vph)	16	11	47	47	32	0	168	2032	142	63	558	58
Turn Type	pm+pt		pm+ov	pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases	4		4	8					2			6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	19.0	10.0	22.0	0.0	19.0	38.0	10.0	10.0	29.0	10.0
Total Split (%)	12.5%	27.5%	23.8%	12.5%	27.5%	0.0%	23.8%	47.5%	12.5%	12.5%	36.3%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	7.6	8.2	15.7	10.8	8.3		12.9	52.2	66.5	8.3	43.6	53.2
Actuated g/C Ratio	0.10	0.10	0.20	0.14	0.10		0.16	0.65	0.83	0.10	0.54	0.66
v/c Ratio	0.10	0.06	0.14	0.21	0.16		0.59	0.58	0.11	0.34	0.19	0.05
Control Delay	30.1	32.5	7.0	29.3	20.3		49.9	1.3	0.1	30.1	17.3	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.1	32.5	7.0	29.3	20.3		49.9	1.3	0.1	30.1	17.3	0.6
LOS	C	C	A	C	C		D	A	A	C	B	A
Approach Delay		15.7			25.6			4.7			17.0	
Approach LOS		B			C			A			B	
Stops (vph)	15	12	11	39	16		153	129	0	56	256	2
Fuel Used(gal)	0	0	0	1	0		5	15	1	2	10	0
CO Emissions (g/hr)	16	12	19	45	22		381	1035	58	124	691	27



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	3	2	4	9	4		74	201	11	24	135	5
VOC Emissions (g/hr)	4	3	4	10	5		88	240	14	29	160	6
Dilemma Vehicles (#)	0	0	0	0	0		0	17	0	0	126	0
Queue Length 50th (ft)	8	5	0	23	5		93	8	0	28	30	0
Queue Length 95th (ft)	21	20	19	44	30		m109	16	m0	72	115	0
Internal Link Dist (ft)		351			377			895			894	
Turn Bay Length (ft)	150			400			400		400	265		265
Base Capacity (vph)	168	419	401	231	394		346	3493	1328	186	2916	1080
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.03	0.12	0.20	0.08		0.49	0.58	0.11	0.34	0.19	0.05

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 9 (11%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 8.1

Intersection LOS: A









Intersection Capacity Utilization 57.9%
























ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 26: Access "E" & Brisbin Road

 ø1	 ø2	 ø3	 ø4
10 s	38 s	10 s	22 s
 ø5	 ø6	 ø7	 ø8
19 s	29 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		0	400		0	400		400	265		265
Storage Lanes	1		1	2		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.902				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1680	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.950			0.950			0.249			0.138		
Satd. Flow (perm)	1770	1863	1583	3433	1680	0	464	3725	1583	257	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			32		21				300			89
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		601			563			1489			1482	
Travel Time (s)		13.7			12.8			18.5			18.4	
Volume (vph)	15	10	30	40	10	20	195	1195	285	125	635	85
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	11	32	42	11	21	205	1258	300	132	668	89
Lane Group Flow (vph)	16	11	32	42	32	0	205	1258	300	132	668	89
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2	6		6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	15.0	10.0	22.0	0.0	15.0	37.0	10.0	11.0	33.0	10.0
Total Split (%)	12.5%	27.5%	18.8%	12.5%	27.5%	0.0%	18.8%	46.3%	12.5%	13.8%	41.3%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5		1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	5.9	8.2	9.7	8.8	8.3		54.1	47.1	60.0	58.6	49.4	59.3
Actuated g/C Ratio	0.07	0.10	0.12	0.11	0.10		0.68	0.59	0.75	0.73	0.62	0.74
v/c Ratio	0.12	0.06	0.14	0.11	0.16		0.48	0.57	0.24	0.36	0.29	0.07
Control Delay	36.9	32.5	10.5	32.3	20.3		14.1	5.4	1.4	19.1	8.2	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.9	32.5	10.5	32.3	20.3		14.1	5.4	1.4	19.1	8.2	0.2
LOS	D	C	B	C	C		B	A	A	B	A	A
Approach Delay		21.8			27.1			5.7			9.0	
Approach LOS		C			C			A			A	
Stops (vph)	16	12	10	37	16		78	528	49	80	178	0
Fuel Used(gal)	0	0	0	1	0		4	22	4	3	10	1
CO Emissions (g/hr)	19	13	18	45	24		269	1565	257	220	722	56



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	4	2	4	9	5		52	305	50	43	140	11
VOC Emissions (g/hr)	4	3	4	10	6		62	363	60	51	167	13
Dilemma Vehicles (#)	0	0	0	0	0		0	4	0	0	95	0
Queue Length 50th (ft)	8	5	0	10	5		9	4	0	39	34	0
Queue Length 95th (ft)	26	20	19	25	30		m70	425	m35	97	106	1
Internal Link Dist (ft)		521			483			1409			1402	
Turn Bay Length (ft)	265			400			400		400	265		265
Base Capacity (vph)	133	419	301	380	394		516	2195	1262	368	2301	1199
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.03	0.11	0.11	0.08		0.40	0.57	0.24	0.36	0.29	0.07

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 44 (55%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 7.7

Intersection LOS: A








Intersection Capacity Utilization 56.1%

























ICU Level of Service B

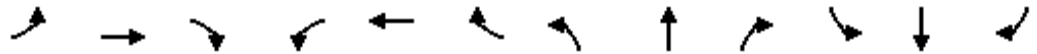
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: Access "D" &amp; Brisbin Road

 ø1	 ø2	 ø3	 ø4
11 s	37 s	10 s	22 s
 ø5	 ø6	 ø7	 ø8
15 s	33 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	400		265	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.301			0.235			0.284			0.140		
Satd. Flow (perm)	561	3725	1583	438	3725	1583	529	3725	1583	261	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			47			37			144			74
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		653			563			1482			1489	
Travel Time (s)		14.8			12.8			18.4			18.5	
Volume (vph)	30	540	45	50	470	35	125	910	195	120	735	70
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	568	47	53	495	37	132	958	205	126	774	74
Lane Group Flow (vph)	32	568	47	53	495	37	132	958	205	126	774	74
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	10.0	10.0	22.0	13.0	10.0	35.0	10.0	13.0	38.0	10.0
Total Split (%)	12.5%	27.5%	12.5%	12.5%	27.5%	16.3%	12.5%	43.8%	12.5%	16.3%	47.5%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	23.1	17.2	27.1	23.9	19.1	29.9	40.9	36.2	46.1	41.8	35.0	44.9
Actuated g/C Ratio	0.29	0.22	0.34	0.30	0.24	0.37	0.51	0.45	0.58	0.52	0.44	0.56
v/c Ratio	0.13	0.71	0.08	0.23	0.56	0.06	0.36	0.57	0.21	0.48	0.47	0.08
Control Delay	18.7	34.4	6.2	20.3	30.0	5.9	10.8	11.3	1.1	16.9	6.4	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	34.4	6.2	20.3	30.0	5.9	10.8	11.3	1.1	16.9	6.4	1.1
LOS	B	C	A	C	C	A	B	B	A	B	A	A
Approach Delay		31.6			27.6			9.7			7.4	
Approach LOS		C			C			A			A	
Stops (vph)	23	483	11	35	402	9	33	215	8	52	367	10
Fuel Used(gal)	0	9	0	1	7	0	2	15	2	3	15	1
CO Emissions (g/hr)	28	643	24	43	500	17	144	1023	142	176	1028	60



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	5	125	5	8	97	3	28	199	28	34	200	12
VOC Emissions (g/hr)	6	149	6	10	116	4	33	237	33	41	238	14
Dilemma Vehicles (#)	0	0	0	0	0	0	0	102	0	0	1	0
Queue Length 50th (ft)	10	137	0	18	116	0	7	29	1	11	56	1
Queue Length 95th (ft)	29	191	21	41	166	18	m62	163	0	42	75	3
Internal Link Dist (ft)		573			483			1402			1409	
Turn Bay Length (ft)	265		265	400		265	400		400	265		265
Base Capacity (vph)	253	838	569	231	895	658	364	1684	975	313	1630	923
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.68	0.08	0.23	0.55	0.06	0.36	0.57	0.21	0.40	0.47	0.08

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 44 (55%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 61.4%























ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 33: Collector "2" &amp; Brisbin Road

	ø1		ø2		ø3		ø4
13 s		35 s		10 s		22 s	
	ø5		ø6		ø7		ø8
10 s		38 s		10 s		22 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.911			0.895				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1697	0	1770	1667	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.733			0.740			0.199			0.160		
Satd. Flow (perm)	1365	1697	0	1378	1667	0	371	3725	1583	298	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			26				153			116
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		698			590			1489			1482	
Travel Time (s)		15.9			13.4			18.5			18.4	
Volume (vph)	20	10	15	15	10	25	95	735	145	175	895	110
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	11	16	16	11	26	100	774	153	184	942	116
Lane Group Flow (vph)	21	27	0	16	37	0	100	774	153	184	942	116
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	11.0	23.0	0.0	11.0	23.0	0.0	11.0	29.0	11.0	17.0	35.0	11.0
Total Split (%)	13.8%	28.8%	0.0%	13.8%	28.8%	0.0%	13.8%	36.3%	13.8%	21.3%	43.8%	13.8%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	9.3	8.5		9.7	8.4		55.0	47.6	57.5	59.1	51.2	60.6
Actuated g/C Ratio	0.12	0.11		0.12	0.10		0.69	0.60	0.72	0.74	0.64	0.76
v/c Ratio	0.11	0.14		0.08	0.19		0.26	0.35	0.13	0.48	0.40	0.09
Control Delay	27.0	21.3		26.2	19.0		6.3	16.1	9.0	20.0	1.4	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	21.3		26.2	19.0		6.3	16.1	9.0	20.0	1.4	0.1
LOS	C	C		C	B		A	B	A	C	A	A
Approach Delay		23.8			21.2			14.1			4.0	
Approach LOS		C			C			B			A	
Stops (vph)	19	16		14	18		44	621	94	126	37	0
Fuel Used(gal)	0	0		0	0		2	21	3	5	9	1
CO Emissions (g/hr)	23	24		16	28		128	1460	236	328	653	72



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	4	5		3	5		25	284	46	64	127	14
VOC Emissions (g/hr)	5	6		4	6		30	338	55	76	151	17
Dilemma Vehicles (#)	0	0		0	0		0	2	0	0	32	0
Queue Length 50th (ft)	10	5		8	5		2	106	7	31	8	0
Queue Length 95th (ft)	25	27		21	31		m44	280	103	m91	17	m0
Internal Link Dist (ft)		618			510			1409			1402	
Turn Bay Length (ft)	265			400			400		400	265		265
Base Capacity (vph)	223	415		223	416		401	2218	1203	467	2384	1257
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.07		0.07	0.09		0.25	0.35	0.13	0.39	0.40	0.09

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 24 (30%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 9.2

Intersection LOS: A



Intersection Capacity Utilization 46.8%























ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 36: Access "C" &amp; Brisbin Road

 ø1	 ø2	 ø3	 ø4
17 s	29 s	11 s	23 s
 ø5	 ø6	 ø7	 ø8
11 s	35 s	11 s	23 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		0	400		265	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.902			0.895				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1680	0	1770	1667	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.733			0.736			0.118			0.405		
Satd. Flow (perm)	1365	1680	0	1371	1667	0	220	3725	1583	754	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			26				68			126
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		807			661			1320			1319	
Travel Time (s)		18.3			15.0			16.4			16.4	
Volume (vph)	25	10	20	10	10	25	105	490	65	80	1285	120
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	11	21	11	11	26	111	516	68	84	1353	126
Lane Group Flow (vph)	26	32	0	11	37	0	111	516	68	84	1353	126
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	0.0	10.0	22.0	0.0	10.0	38.0	10.0	10.0	38.0	10.0
Total Split (%)	12.5%	27.5%	0.0%	12.5%	27.5%	0.0%	12.5%	47.5%	12.5%	12.5%	47.5%	12.5%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	9.2	8.4		9.2	8.4		62.0	56.0	63.7	56.1	52.5	60.2
Actuated g/C Ratio	0.12	0.10		0.12	0.10		0.78	0.70	0.80	0.70	0.66	0.75
v/c Ratio	0.14	0.16		0.06	0.19		0.32	0.20	0.05	0.14	0.55	0.10
Control Delay	27.8	20.1		25.5	19.0		16.7	17.5	3.9	0.8	2.1	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.8	20.1		25.5	19.0		16.7	17.5	3.9	0.8	2.1	0.1
LOS	C	C		C	B		B	B	A	A	A	A
Approach Delay		23.6			20.5			16.0			1.9	
Approach LOS		C			C			B			A	
Stops (vph)	23	16		10	18		44	350	14	2	61	0
Fuel Used(gal)	0	0		0	0		2	12	1	1	12	1
CO Emissions (g/hr)	30	28		11	29		143	863	60	50	869	70



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	6	5		2	6		28	168	12	10	169	14
VOC Emissions (g/hr)	7	6		3	7		33	200	14	12	201	16
Dilemma Vehicles (#)	0	0		0	0		0	62	0	0	60	0
Queue Length 50th (ft)	13	5		5	5		10	38	3	1	7	0
Queue Length 95th (ft)	29	29		16	31		104	184	8	m2	#18	m0
Internal Link Dist (ft)		727			581			1240			1239	
Turn Bay Length (ft)	265			400			400		265	265		265
Base Capacity (vph)	199	394		199	395		349	2608	1280	608	2444	1227
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.08		0.06	0.09		0.32	0.20	0.05	0.14	0.55	0.10

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 60 (75%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 7.0

Intersection LOS: A

Intersection Capacity Utilization 57.6%

ICU Level of Service B

Analysis Period (min) 15

























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 39: Access "B" & Brisbin Road

	ø1		ø2		ø3		ø4
10 s		38 s		10 s		22 s	
	ø5		ø6		ø7		ø8
10 s		38 s		10 s		22 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	265		265	265		265	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.296			0.629			0.118			0.455		
Satd. Flow (perm)	551	3725	1583	1172	3725	1583	220	3725	1583	848	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			21			37			37			105
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		827			693			1319			1311	
Travel Time (s)		18.8			15.8			16.4			16.3	
Volume (vph)	10	185	20	25	475	35	85	420	35	40	1445	100
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	195	21	26	500	37	89	442	37	42	1521	105
Lane Group Flow (vph)	11	195	21	26	500	37	89	442	37	42	1521	105
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	38.0	10.0	10.0	38.0	10.0
Total Split (%)	12.5%	27.5%	12.5%	12.5%	27.5%	12.5%	12.5%	47.5%	12.5%	12.5%	47.5%	12.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5	1.0	1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	21.5	18.3	28.3	21.2	16.9	26.4	45.8	42.1	51.4	44.3	39.8	48.8
Actuated g/C Ratio	0.27	0.23	0.35	0.26	0.21	0.33	0.57	0.53	0.64	0.55	0.50	0.61
v/c Ratio	0.05	0.23	0.04	0.07	0.64	0.07	0.37	0.23	0.04	0.08	0.82	0.10
Control Delay	17.9	25.8	7.8	18.2	32.5	6.6	25.3	6.2	0.4	0.8	8.7	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	25.8	7.8	18.2	32.5	6.6	25.3	6.2	0.4	0.8	8.7	0.4
LOS	B	C	A	B	C	A	C	A	A	A	A	A
Approach Delay		23.8			30.2			8.8			8.0	
Approach LOS		C			C			A			A	
Stops (vph)	8	144	7	18	416	9	56	92	0	2	426	2
Fuel Used(gal)	0	3	0	0	8	0	2	6	0	0	22	1
CO Emissions (g/hr)	10	207	14	23	560	20	153	402	21	26	1571	61



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	2	40	3	4	109	4	30	78	4	5	306	12
VOC Emissions (g/hr)	2	48	3	5	130	5	35	93	5	6	364	14
Dilemma Vehicles (#)	0	0	0	0	0	0	0	56	0	0	61	0
Queue Length 50th (ft)	4	42	0	9	118	0	11	20	1	1	13	1
Queue Length 95th (ft)	14	70	14	25	166	19	74	67	0	m1	#505	m0
Internal Link Dist (ft)		747			613			1239			1231	
Turn Bay Length (ft)	265		265	265		265	265		265	265		265
Base Capacity (vph)	243	899	575	363	848	557	243	1962	1045	542	1854	1025
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.22	0.04	0.07	0.59	0.07	0.37	0.23	0.04	0.08	0.82	0.10

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 44 (55%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 13.4

Intersection LOS: B

Intersection Capacity Utilization 71.8%

ICU Level of Service C

Analysis Period (min) 15























# 95th percentile volume exceeds capacity, queue may be longer.

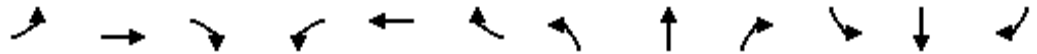
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 42: Collector 1 & Brisbin Road

ø1	ø2	ø3	ø4
10 s	38 s	10 s	22 s
ø5	ø6	ø7	ø8
10 s	38 s	10 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		0	265		0	265		265	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.902			0.902				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1680	0	1770	1680	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.736			0.736			0.118			0.512		
Satd. Flow (perm)	1371	1680	0	1371	1680	0	220	3725	1583	954	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			21				5			132
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		846			726			1311			1320	
Travel Time (s)		19.2			16.5			16.3			16.4	
Volume (vph)	20	10	20	10	10	20	115	345	5	10	1555	125
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	11	21	11	11	21	121	363	5	11	1637	132
Lane Group Flow (vph)	21	32	0	11	32	0	121	363	5	11	1637	132
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	0.0	10.0	22.0	0.0	10.0	38.0	10.0	10.0	38.0	10.0
Total Split (%)	12.5%	27.5%	0.0%	12.5%	27.5%	0.0%	12.5%	47.5%	12.5%	12.5%	47.5%	12.5%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	10.8	8.5		8.8	8.3		59.7	57.8	66.8	52.4	48.0	59.7
Actuated g/C Ratio	0.14	0.11		0.11	0.10		0.75	0.72	0.84	0.66	0.60	0.75
v/c Ratio	0.10	0.16		0.06	0.16		0.34	0.13	0.00	0.02	0.73	0.11
Control Delay	26.4	20.1		25.9	20.3		11.3	8.2	3.4	0.3	6.2	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	20.1		25.9	20.3		11.3	8.2	3.4	0.3	6.2	0.1
LOS	C	C		C	C		B	A	A	A	A	A
Approach Delay		22.6			21.7			8.9			5.7	
Approach LOS		C			C			A			A	
Stops (vph)	19	16		11	16		81	218	2	0	234	0
Fuel Used(gal)	0	0		0	0		3	7	0	0	19	1
CO Emissions (g/hr)	24	29		12	27		190	524	6	6	1350	73



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	5	6		2	5		37	102	1	1	263	14
VOC Emissions (g/hr)	6	7		3	6		44	121	1	1	313	17
Dilemma Vehicles (#)	0	0		0	0		0	57	0	0	46	0
Queue Length 50th (ft)	10	5		5	5		27	48	0	0	6	0
Queue Length 95th (ft)	25	29		16	30		88	119	m3	m0	#581	m0
Internal Link Dist (ft)		766			646			1231			1240	
Turn Bay Length (ft)	265			265			265		265	265		265
Base Capacity (vph)	221	394		198	394		353	2692	1343	690	2233	1215
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.08		0.06	0.08		0.34	0.13	0.00	0.02	0.73	0.11

### Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 28 (35%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 7.0

Intersection LOS: A

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15

























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.













### Splits and Phases: 45: Access "A" & Brisbin Road

	ø1		ø2		ø3		ø4
10 s		38 s		10 s		22 s	
	ø5		ø6		ø7		ø8
10 s		38 s		10 s		22 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	265		265	265		265	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1961	1583	1770	1961	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.652			0.222			0.265			0.062		
Satd. Flow (perm)	1215	1961	1583	414	1961	1583	494	3725	1583	115	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53			11			31			11
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		1533			1607			1320			1102	
Travel Time (s)		34.8			36.5			16.4			13.7	
Volume (vph)	55	280	50	5	90	10	5	2145	30	15	830	10
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	58	295	53	5	95	11	5	2258	32	16	874	11
Lane Group Flow (vph)	58	295	53	5	95	11	5	2258	32	16	874	11
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	68.0	10.0	10.0	68.0	10.0
Total Split (%)	9.1%	20.0%	9.1%	9.1%	20.0%	9.1%	9.1%	61.8%	9.1%	9.1%	61.8%	9.1%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5	1.0	1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	23.8	20.2	29.7	21.5	17.6	27.3	73.8	70.5	79.3	73.4	68.8	78.5
Actuated g/C Ratio	0.22	0.18	0.27	0.20	0.16	0.25	0.67	0.64	0.72	0.67	0.63	0.71
v/c Ratio	0.20	0.82	0.11	0.04	0.30	0.03	0.01	0.95	0.03	0.10	0.38	0.01
Control Delay	34.0	63.1	9.3	31.4	43.8	15.6	3.8	16.7	0.1	7.2	11.5	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.0	63.1	9.3	31.4	43.8	15.6	3.8	16.7	0.1	7.2	11.5	2.9
LOS	C	E	A	C	D	B	A	B	A	A	B	A
Approach Delay		51.9			40.5			16.5			11.3	
Approach LOS		D			D			B			B	
Stops (vph)	42	245	10	6	78	5	1	917	0	6	394	2
Fuel Used(gal)	1	8	1	0	2	0	0	42	0	0	15	0
CO Emissions (g/hr)	89	580	52	9	165	13	4	2955	18	17	1052	8

#### 4: Sherrill Road & Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	17	113	10	2	32	3	1	575	3	3	205	2
VOC Emissions (g/hr)	21	134	12	2	38	3	1	685	4	4	244	2
Dilemma Vehicles (#)	0	0	0	0	0	0	0	119	0	0	38	0
Queue Length 50th (ft)	32	204	0	3	60	0	0	~891	1	3	165	0
Queue Length 95th (ft)	66	#361	31	12	110	15	m1	#1033	m0	11	207	6
Internal Link Dist (ft)		1453			1527			1240			1022	
Turn Bay Length (ft)	265		265	265		265	265		265	265		265
Base Capacity (vph)	293	359	473	158	327	405	402	2386	1166	167	2329	1137
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.82	0.11	0.03	0.29	0.03	0.01	0.95	0.03	0.10	0.38	0.01

#### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 20 (18%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.









Queue shown is maximum after two cycles.

























# 95th percentile volume exceeds capacity, queue may be longer.













Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Sherrill Road & Brisbin Road

	ø1		ø2		ø3		ø4
10 s		68 s		10 s		22 s	
	ø5		ø6		ø7		ø8
10 s		68 s		10 s		22 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.205			0.148			0.153			0.074		
Satd. Flow (perm)	382	3725	1583	276	3725	1583	285	3725	1583	138	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			82			44			53			42
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		739			617			1482			1320	
Travel Time (s)		16.8			14.0			18.4			16.4	
Volume (vph)	115	675	90	110	585	140	35	1505	50	65	1040	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	121	711	95	116	616	147	37	1584	53	68	1095	42
Lane Group Flow (vph)	121	711	95	116	616	147	37	1584	53	68	1095	42
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	11.0	30.0	10.0	12.0	31.0	10.0	10.0	58.0	12.0	10.0	58.0	11.0
Total Split (%)	10.0%	27.3%	9.1%	10.9%	28.2%	9.1%	9.1%	52.7%	10.9%	9.1%	52.7%	10.0%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	32.2	25.2	35.1	33.9	26.1	36.0	60.9	55.0	66.8	61.0	55.1	66.1
Actuated g/C Ratio	0.29	0.23	0.32	0.31	0.24	0.33	0.55	0.50	0.61	0.55	0.50	0.60
v/c Ratio	0.60	0.83	0.17	0.61	0.70	0.27	0.16	0.85	0.05	0.41	0.59	0.04
Control Delay	39.9	49.9	8.3	39.9	43.0	19.9	6.3	15.6	0.3	27.7	25.9	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	49.9	8.3	39.9	43.0	19.9	6.3	15.6	0.3	27.7	25.9	3.2
LOS	D	D	A	D	D	B	A	B	A	C	C	A
Approach Delay		44.3			38.8			14.9			25.2	
Approach LOS		D			D			B			C	
Stops (vph)	86	622	19	79	520	70	7	938	1	42	754	9
Fuel Used(gal)	2	14	1	2	11	2	1	36	0	2	28	1
CO Emissions (g/hr)	145	991	54	130	756	114	35	2539	34	118	1970	37

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	28	193	11	25	147	22	7	494	7	23	383	7
VOC Emissions (g/hr)	34	230	13	30	175	26	8	588	8	27	457	9
Dilemma Vehicles (#)	0	0	0	0	0	0	0	39	0	0	118	0
Queue Length 50th (ft)	60	250	6	57	207	51	5	173	0	29	329	1
Queue Length 95th (ft)	#105	321	43	101	271	102	m10	163	m1	63	412	m9
Internal Link Dist (ft)		659			537			1402			1240	
Turn Bay Length (ft)	265		400	400		265	400		400	265		265
Base Capacity (vph)	200	880	563	194	914	549	239	1863	985	165	1865	968
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.81	0.17	0.60	0.67	0.27	0.15	0.85	0.05	0.41	0.59	0.04

**Intersection Summary**

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 92 (84%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.8

Intersection LOS: C

Intersection Capacity Utilization 80.3%

ICU Level of Service D








Analysis Period (min) 15

























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

**Splits and Phases: 6: Minooka Road & Brisbin Road**

 ø1	 ø2	 ø3	 ø4
10 s	58 s	12 s	30 s
 ø5	 ø6	 ø7	 ø8
10 s	58 s	11 s	31 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	200		265	400		200	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	5353	1583	1770	5353	1583
Flt Permitted	0.222			0.148			0.950			0.950		
Satd. Flow (perm)	414	3725	1583	276	3725	1583	1770	5353	1583	1770	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			25			89			128			59
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		484			484			974			1489	
Travel Time (s)		11.0			11.0			12.1			18.5	
Volume (vph)	110	720	295	280	715	100	170	835	145	70	1955	85
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	758	311	295	753	105	179	879	153	74	2058	89
Lane Group Flow (vph)	116	758	311	295	753	105	179	879	153	74	2058	89
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	27.0	16.0	19.0	36.0	14.0	16.0	50.0	19.0	14.0	48.0	10.0
Total Split (%)	9.1%	24.5%	14.5%	17.3%	32.7%	12.7%	14.5%	45.5%	17.3%	12.7%	43.6%	9.1%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	29.0	23.0	39.0	42.0	32.0	44.8	12.0	47.2	66.2	8.8	44.0	54.0
Actuated g/C Ratio	0.26	0.21	0.35	0.38	0.29	0.41	0.11	0.43	0.60	0.08	0.40	0.49
v/c Ratio	0.63	0.97	0.54	0.95	0.69	0.15	0.93	0.38	0.15	0.52	0.96	0.11
Control Delay	41.7	70.1	30.1	70.7	38.7	6.2	102.1	24.3	1.1	59.7	31.3	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	70.1	30.1	70.7	38.7	6.2	102.1	24.3	1.1	59.7	31.3	3.7
LOS	D	E	C	E	D	A	F	C	A	E	C	A
Approach Delay		56.8			43.9			32.9			31.1	
Approach LOS		E			D			C			C	
Stops (vph)	86	647	213	185	619	17	150	435	8	63	1734	21
Fuel Used(gal)	2	17	4	6	12	1	7	17	1	3	63	1
CO Emissions (g/hr)	127	1158	286	427	821	42	515	1214	75	187	4411	88



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	25	225	56	83	160	8	100	236	15	36	858	17
VOC Emissions (g/hr)	30	268	66	99	190	10	119	281	17	43	1022	20
Dilemma Vehicles (#)	0	0	0	0	0	0	0	82	0	0	57	0
Queue Length 50th (ft)	53	282	160	157	248	7	136	114	1	47	511	10
Queue Length 95th (ft)	#104	#407	249	#329	317	39 m#264	146	m6	m59	#623	m16	
Internal Link Dist (ft)		404			404			894			1409	
Turn Bay Length (ft)	200		265	400		200	400		400	265		265
Base Capacity (vph)	183	779	577	309	1084	714	193	2296	1003	161	2141	807
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.97	0.54	0.95	0.69	0.15	0.93	0.38	0.15	0.46	0.96	0.11

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 4 (4%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 39.3

Intersection LOS: D

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15

























# 95th percentile volume exceeds capacity, queue may be longer.

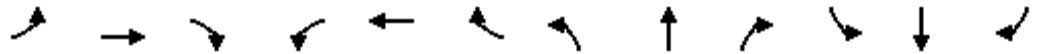
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 9: Whitman Road & Brisbin Road

ø1	ø2	ø3	ø4
14 s	50 s	19 s	27 s
ø5	ø6	ø7	ø8
16 s	48 s	10 s	36 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	400		265	265		400	265		265	400		400
Storage Lanes	2		1	2		1	2		1	2		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frnt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3725	1583	3433	3725	1583	3433	3725	1583	3433	3725	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3725	1583	3433	3725	1583	3433	3725	1583	3433	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			22			594			21			16
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		1320			1878			1326			1049	
Travel Time (s)		30.0			42.7			16.4			13.0	
Volume (vph)	390	680	150	625	990	815	290	660	435	480	750	190
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	411	716	158	658	1042	858	305	695	458	505	789	200
Lane Group Flow (vph)	411	716	158	658	1042	858	305	695	458	505	789	200
Turn Type	Prot		pm+ov	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4			Free			2			6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	20.0	31.0	16.0	28.0	39.0	0.0	16.0	28.0	28.0	23.0	35.0	20.0
Total Split (%)	18.2%	28.2%	14.5%	25.5%	35.5%	0.0%	14.5%	25.5%	25.5%	20.9%	31.8%	18.2%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5		1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min	None	None	C-Min	None
Act Effct Green (s)	15.6	27.0	42.7	23.3	34.7	110.0	11.7	25.2	52.5	18.5	32.0	51.6
Actuated g/C Ratio	0.14	0.25	0.39	0.21	0.32	1.00	0.11	0.23	0.48	0.17	0.29	0.47
v/c Ratio	0.84	0.78	0.25	0.91	0.89	0.54	0.83	0.81	0.60	0.88	0.73	0.27
Control Delay	62.7	45.9	20.7	59.5	46.3	1.3	62.2	41.8	20.6	57.2	34.4	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.7	45.9	20.7	59.5	46.3	1.3	62.2	41.8	20.6	57.2	34.4	14.1
LOS	E	D	C	E	D	A	E	D	C	E	C	B
Approach Delay		48.2			34.6			39.4			39.4	
Approach LOS		D			C			D			D	
Stops (vph)	362	621	84	576	894	0	248	592	313	429	682	108
Fuel Used(gal)	11	17	3	20	29	12	11	22	11	17	23	4
CO Emissions (g/hr)	768	1173	184	1391	2012	850	749	1549	789	1171	1601	267



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	149	228	36	271	391	165	146	301	154	228	311	52
VOC Emissions (g/hr)	178	272	43	322	466	197	174	359	183	271	371	62
Dilemma Vehicles (#)	0	0	0	0	0	0	0	27	0	0	18	0
Queue Length 50th (ft)	146	249	63	232	365	0	96	251	240	162	284	82
Queue Length 95th (ft)	#222	320	113	#329	#479	0 m#161	#349	321	#260	333	120	
Internal Link Dist (ft)		1240			1798			1246			969	
Turn Bay Length (ft)	400		265	265		400	265		265	400		400
Base Capacity (vph)	499	914	631	749	1185	1583	375	855	777	593	1084	757
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.78	0.25	0.88	0.88	0.54	0.81	0.81	0.59	0.85	0.73	0.26

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 82 (75%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 39.3

Intersection LOS: D

Intersection Capacity Utilization 81.5%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.



















m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 11: U.S. 6 & Brisbin Road

ø1	ø2	ø3	ø4
23 s	28 s	28 s	31 s
ø5	ø6	ø7	ø8
16 s	35 s	20 s	39 s

## 14: WB I-80 Ramps &amp; Brisbin Road













8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	0		0	0		0	400		0	0		400
Storage Lanes	0		0	2		2	2		0	0		2
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)				50		50	50	50			50	50
Trailing Detector (ft)				0		0	0	0			0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	0.97	0.91	1.00	1.00	0.91	0.88
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	0	2787	3433	5353	0	0	5353	2787
Flt Permitted				0.950			0.950					
Satd. Flow (perm)	0	0	0	3433	0	2787	3433	5353	0	0	5353	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						282						39
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		402			422			1036			710	
Travel Time (s)		9.1			9.6			12.8			8.8	
Volume (vph)	0	0	0	405	0	490	595	970	0	0	1925	1315
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	426	0	516	626	1021	0	0	2026	1384
Lane Group Flow (vph)	0	0	0	426	0	516	626	1021	0	0	2026	1384
Turn Type			custom			custom	Prot					custom
Protected Phases							5	2			6	
Permitted Phases				8		8						3 6
Detector Phases				8		8	5	2			6	3 6
Minimum Initial (s)				4.0		4.0	4.0	4.0			4.0	
Minimum Split (s)				22.0		22.0	10.0	22.0			22.0	
Total Split (s)	0.0	0.0	0.0	29.0	0.0	29.0	28.0	81.0	0.0	0.0	53.0	82.0
Total Split (%)	0.0%	0.0%	0.0%	26.4%	0.0%	26.4%	25.5%	73.6%	0.0%	0.0%	48.2%	74.5%
Yellow Time (s)				4.5		4.5	3.0	4.5			4.5	
All-Red Time (s)				1.5		1.5	1.0	1.5			1.5	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Recall Mode				None		None	None	C-Max			C-Max	
Act Effct Green (s)				21.6		21.6	23.4	80.4			53.0	78.6
Actuated g/C Ratio				0.20		0.20	0.21	0.73			0.48	0.71
v/c Ratio				0.63		0.67	0.86	0.26			0.79	0.69
Control Delay				44.6		22.1	58.2	0.4			11.9	6.0
Queue Delay				0.0		0.0	0.0	0.0			0.0	0.2
Total Delay				44.6		22.1	58.2	0.4			11.9	6.2
LOS				D		C	E	A			B	A
Approach Delay								22.4			9.6	
Approach LOS								C			A	
Stops (vph)				359		207	517	50			1174	732
Fuel Used(gal)				7		5	21	7			35	21
CO Emissions (g/hr)				489		347	1437	515			2456	1476



Lane Group	ø3
Lane Configurations	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	10.0
Total Split (s)	29.0
Total Split (%)	26%
Yellow Time (s)	4.5
All-Red Time (s)	1.5
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)				95		67	280	100			478	287
VOC Emissions (g/hr)				113		80	333	119			569	342
Dilemma Vehicles (#)				0		0	0	0			40	0
Queue Length 50th (ft)				142		84	198	0			306	230
Queue Length 95th (ft)				188		144	m#257	2			m349	m328
Internal Link Dist (ft)		322			342			956			630	
Turn Bay Length (ft)							400					400
Base Capacity (vph)				780		851	758	3912			2580	2088
Starvation Cap Reductn				0		0	0	0			0	184
Spillback Cap Reductn				0		0	0	0			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.55		0.61	0.83	0.26			0.79	0.73

## Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 23 (21%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 16.7

Intersection LOS: B

Intersection Capacity Utilization 84.5%

### ICU Level of Service E

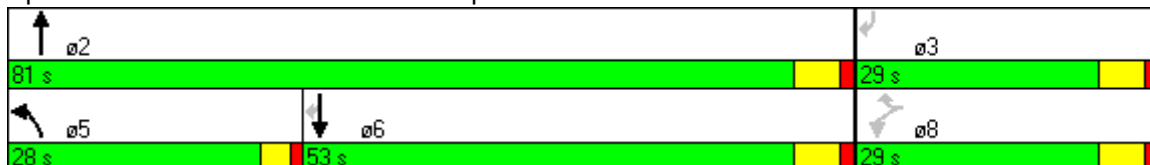
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: WB I-80 Ramps & Brisbin Road



Lane Group	ø3
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	300		150	150		300	150		150	400		400
Storage Lanes	2		1	1		2	1		1	2		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frts			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1961	1583	1770	1961	2787	1770	3725	1583	3433	3725	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1961	1583	1770	1961	2787	1770	3725	1583	3433	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			299			116			395
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		534			618			211			1326	
Travel Time (s)		12.1			14.0			2.6			16.4	
Volume (vph)	390	10	155	170	10	585	150	410	110	305	840	375
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	411	11	163	179	11	616	158	432	116	321	884	395
Lane Group Flow (vph)	411	11	163	179	11	616	158	432	116	321	884	395
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	24.0	23.0	22.0	23.0	22.0	20.0	22.0	44.0	23.0	20.0	42.0	24.0
Total Split (%)	21.8%	20.9%	20.0%	20.9%	20.0%	18.2%	20.0%	40.0%	20.9%	18.2%	38.2%	21.8%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	17.4	8.3	17.8	17.2	8.1	22.1	14.9	58.5	79.7	19.4	63.0	84.4
Actuated g/C Ratio	0.16	0.08	0.16	0.16	0.07	0.20	0.14	0.53	0.72	0.18	0.57	0.77
v/c Ratio	0.76	0.07	0.46	0.65	0.08	0.77	0.66	0.22	0.10	0.53	0.41	0.30
Control Delay	53.5	47.8	15.3	54.5	48.3	26.8	57.5	16.3	1.9	56.1	6.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.5	47.8	15.3	54.5	48.3	26.8	57.5	16.3	1.9	56.1	6.8	0.7
LOS	D	D	B	D	D	C	E	B	A	E	A	A
Approach Delay		42.7			33.2			23.2			15.2	
Approach LOS		D			C			C			B	
Stops (vph)	364	11	40	157	11	285	139	219	9	287	203	19
Fuel Used(gal)	8	0	1	4	0	8	5	6	0	11	12	4
CO Emissions (g/hr)	551	14	94	250	14	530	317	418	25	795	838	249



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	107	3	18	49	3	103	62	81	5	155	163	48
VOC Emissions (g/hr)	128	3	22	58	3	123	74	97	6	184	194	58
Dilemma Vehicles (#)	0	0	0	0	0	0	0	19	0	0	48	0
Queue Length 50th (ft)	143	7	27	119	7	125	108	79	0	124	38	0
Queue Length 95th (ft)	193	25	70	192	26	157	166	155	24	m130	m207	m26
Internal Link Dist (ft)		454			538			131			1246	
Turn Bay Length (ft)	300		150	150		300	150		150	400		400
Base Capacity (vph)	624	339	406	309	321	819	300	1982	1206	635	2133	1334
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.03	0.40	0.58	0.03	0.75	0.53	0.22	0.10	0.51	0.41	0.30

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 108 (98%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 58.2%

ICU Level of Service B

Analysis Period (min) 15




















m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 16: Access "F" & Brisbin Road

ø1	ø2	ø3	ø4
20 s	44 s	23 s	23 s
ø5	ø6	ø7	ø8
22 s	42 s	24 s	22 s


## 19: EB I-80 Ramps &amp; Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	0		0	0		0	0		400	400		0
Storage Lanes	2		2	0		0	0		2	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50		50					50	50	50	50	
Trailing Detector (ft)	0		0					0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	0.88	1.00	1.00	1.00	1.00	0.91	0.88	0.97	0.91	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	0	2787	0	0	0	0	5353	2787	3433	5353	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	3433	0	2787	0	0	0	0	5353	2787	3433	5353	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			405						30			
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		405			451			1049			1036	
Travel Time (s)		9.2			10.3			13.0			12.8	
Volume (vph)	480	0	405	0	0	0	0	1075	595	1315	845	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	505	0	426	0	0	0	0	1132	626	1384	889	0
Lane Group Flow (vph)	505	0	426	0	0	0	0	1132	626	1384	889	0
Turn Type	custom		custom						custom	Prot		
Protected Phases								2		1	6	
Permitted Phases	4		4						2 4			
Detector Phases	4		4					2	2 4	1	6	
Minimum Initial (s)	4.0		4.0					4.0		4.0	4.0	
Minimum Split (s)	22.0		22.0					22.0		10.0	22.0	
Total Split (s)	24.0	0.0	24.0	0.0	0.0	0.0	0.0	32.0	56.0	54.0	86.0	0.0
Total Split (%)	21.8%	0.0%	21.8%	0.0%	0.0%	0.0%	0.0%	29.1%	50.9%	49.1%	78.2%	0.0%
Yellow Time (s)	4.5		4.5					4.5		3.0	4.5	
All-Red Time (s)	1.5		1.5					1.5		1.0	1.5	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None		None					C-Max		None	C-Max	
Act Effct Green (s)	20.0		20.0					28.0	52.0	50.0	82.0	
Actuated g/C Ratio	0.18		0.18					0.25	0.47	0.45	0.75	
v/c Ratio	0.81		0.51					0.83	0.47	0.89	0.22	
Control Delay	54.5		7.3					26.6	7.7	19.9	3.6	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.0	
Total Delay	54.5		7.3					26.6	7.7	19.9	3.6	
LOS	D		A					C	A	B	A	
Approach Delay								19.9			13.6	
Approach LOS								B			B	
Stops (vph)	442		47					872	133	1061	168	
Fuel Used(gal)	9		2					29	7	34	9	
CO Emissions (g/hr)	649		149					2039	514	2354	649	

# 19: EB I-80 Ramps & Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	126		29					397	100	458	126	
VOC Emissions (g/hr)	150		35					473	119	546	150	
Dilemma Vehicles (#)	0		0					40	0	0	45	
Queue Length 50th (ft)	178		6					229	55	159	48	
Queue Length 95th (ft)	#252		53					282	m75	#192	59	
Internal Link Dist (ft)		325			371			969			956	
Turn Bay Length (ft)									400	400		
Base Capacity (vph)	624		838					1363	1333	1560	3990	
Starvation Cap Reductn	0		0					0	0	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.81		0.51					0.83	0.47	0.89	0.22	

## Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 19.4

Intersection LOS: B

Intersection Capacity Utilization 84.5%

ICU Level of Service E



Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

























m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: EB I-80 Ramps & Brisbin Road

 ø2	 ø1	 ø4
32 s	54 s	24 s
 ø6		
86 s		

## 23: North Road &amp; Brisbin Road

8/29/2012

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		2	1		1	2		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.88	1.00	0.95	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	2787	1770	3725	1583	3433	5353	1583	1770	5353	1583
Flt Permitted	0.211			0.211			0.950			0.950		
Satd. Flow (perm)	393	3725	2787	393	3725	1583	3433	5353	1583	1770	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			26			62			105			15
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		414			426			710			975	
Travel Time (s)		9.4			9.7			8.8			12.1	
Volume (vph)	100	600	360	135	495	115	235	1125	100	135	2745	80
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	632	379	142	521	121	247	1184	105	142	2889	84
Lane Group Flow (vph)	105	632	379	142	521	121	247	1184	105	142	2889	84
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	23.0	12.0	10.0	23.0	20.0	12.0	57.0	10.0	20.0	65.0	10.0
Total Split (%)	9.1%	20.9%	10.9%	9.1%	20.9%	18.2%	10.9%	51.8%	9.1%	18.2%	59.1%	9.1%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	25.0	19.0	31.0	25.0	19.0	36.3	8.0	55.7	65.7	13.3	61.0	71.0
Actuated g/C Ratio	0.23	0.17	0.28	0.23	0.17	0.33	0.07	0.51	0.60	0.12	0.55	0.65
v/c Ratio	0.64	0.98	0.47	0.87	0.81	0.21	0.99	0.44	0.11	0.66	0.97	0.08
Control Delay	51.7	77.5	32.6	78.9	54.8	14.0	114.8	9.9	2.1	61.4	17.7	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	77.5	32.6	78.9	54.8	14.0	114.8	9.9	2.1	61.4	17.7	2.0
LOS	D	E	C	E	D	B	F	A	A	E	B	A
Approach Delay		59.8			52.9			26.2			19.3	
Approach LOS		E			D			C			B	
Stops (vph)	79	538	271	103	456	40	209	510	15	131	1242	9
Fuel Used(gal)	2	14	5	3	10	1	10	17	1	5	50	1
CO Emissions (g/hr)	127	1005	353	223	677	65	729	1174	54	346	3491	48



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	25	195	69	43	132	13	142	228	10	67	679	9
VOC Emissions (g/hr)	29	233	82	52	157	15	169	272	13	80	809	11
Dilemma Vehicles (#)	0	0	0	0	0	0	0	10	0	0	168	0
Queue Length 50th (ft)	58	236	117	80	187	29	95	147	3	105	243	3
Queue Length 95th (ft)	#118	#356	168	#165	#263	70	#180	183	m10	m114	m#354	m8
Internal Link Dist (ft)		334			346			630			895	
Turn Bay Length (ft)	265		400	400		265	400		400	265		265
Base Capacity (vph)	164	643	804	164	643	601	250	2710	987	257	2968	1027
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.98	0.47	0.87	0.81	0.20	0.99	0.44	0.11	0.55	0.97	0.08

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 10 (9%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 31.8

Intersection LOS: C

Intersection Capacity Utilization 93.7%

ICU Level of Service F

Analysis Period (min) 15
























# 95th percentile volume exceeds capacity, queue may be longer.

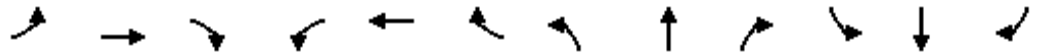
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: North Road &amp; Brisbin Road

ø1	ø2	ø3	ø4
20 s	57 s	10 s	23 s
ø5	ø6	ø7	ø8
12 s	65 s	10 s	23 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	150		0	400		0	400		400	265		265
Storage Lanes	1		1	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850		0.862				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1606	0	1770	5353	1583	1770	5353	1583
Flt Permitted	0.590			0.711			0.070			0.242		
Satd. Flow (perm)	1099	1863	1583	1324	1606	0	130	5353	1583	451	5353	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			17		121				221			68
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		431			457			975			974	
Travel Time (s)		9.8			10.4			12.1			12.1	
Volume (vph)	100	10	290	290	10	115	195	935	210	85	2380	65
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	11	305	305	11	121	205	984	221	89	2505	68
Lane Group Flow (vph)	105	11	305	305	132	0	205	984	221	89	2505	68
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases	4		4	8			2		2	6		6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	18.0	11.0	23.0	0.0	18.0	61.0	11.0	16.0	59.0	10.0
Total Split (%)	9.1%	20.0%	16.4%	10.0%	20.9%	0.0%	16.4%	55.5%	10.0%	14.5%	53.6%	9.1%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	9.6	9.8	18.9	27.6	18.2		73.8	65.3	93.9	61.7	55.2	65.2
Actuated g/C Ratio	0.09	0.09	0.17	0.25	0.17		0.67	0.59	0.85	0.56	0.50	0.59
v/c Ratio	0.79	0.07	1.06	0.71	0.36		0.67	0.31	0.16	0.27	0.93	0.07
Control Delay	83.5	44.0	111.7	48.1	11.8		53.5	4.1	0.3	3.9	12.1	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.5	44.0	111.7	48.1	11.8		53.5	4.1	0.3	3.9	12.1	0.1
LOS	F	D	F	D	B		D	A	A	A	B	A
Approach Delay		102.9			37.2			10.7			11.5	
Approach LOS		F			D			B			B	
Stops (vph)	90	11	219	247	26		215	145	1	12	619	0
Fuel Used(gal)	3	0	9	5	1		7	9	1	1	32	0
CO Emissions (g/hr)	177	13	614	366	62		512	647	93	57	2240	28



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	34	3	119	71	12		100	126	18	11	436	5
VOC Emissions (g/hr)	41	3	142	85	14		119	150	21	13	519	7
Dilemma Vehicles (#)	0	0	0	0	0		0	31	0	0	53	0
Queue Length 50th (ft)	~84	7	~281	192	7		116	41	0	10	156	0
Queue Length 95th (ft)	105	23	260	#370	60		#204	54	0	m10	m164	m0
Internal Link Dist (ft)		351			377			895			894	
Turn Bay Length (ft)	150			400			400		400	265		265
Base Capacity (vph)	133	305	287	439	378		304	3176	1384	420	2688	966
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.04	1.06	0.69	0.35		0.67	0.31	0.16	0.21	0.93	0.07

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 5 (5%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 21.4

Intersection LOS: C

Intersection Capacity Utilization 87.7%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.
























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 26: Access "E" & Brisbin Road

ø1	ø2	ø3	ø4
16 s	61 s	11 s	22 s
ø5	ø6	ø7	ø8
18 s	59 s	10 s	23 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		0	400		0	400		400	265		265
Storage Lanes	1		1	2		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.862				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1606	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.950			0.950			0.068			0.196		
Satd. Flow (perm)	1770	1863	1583	3433	1606	0	127	3725	1583	365	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			10		132				47			16
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		601			563			1489			1482	
Travel Time (s)		13.7			12.8			18.5			18.4	
Volume (vph)	90	10	200	290	10	125	30	970	45	20	1785	15
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	11	211	305	11	132	32	1021	47	21	1879	16
Lane Group Flow (vph)	95	11	211	305	143	0	32	1021	47	21	1879	16
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2	6		6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	13.0	22.0	10.0	15.0	24.0	0.0	10.0	63.0	15.0	10.0	63.0	13.0
Total Split (%)	11.8%	20.0%	9.1%	13.6%	21.8%	0.0%	9.1%	57.3%	13.6%	9.1%	57.3%	11.8%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5		1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	8.6	8.7	18.1	19.0	9.7		79.7	75.7	101.1	66.6	60.9	73.5
Actuated g/C Ratio	0.08	0.08	0.16	0.17	0.09		0.72	0.69	0.92	0.61	0.55	0.67
v/c Ratio	0.68	0.07	0.78	0.51	0.55		0.10	0.40	0.03	0.07	0.91	0.02
Control Delay	73.9	46.7	61.6	45.7	17.9		12.4	22.5	1.2	3.4	15.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.9	46.7	61.6	45.7	17.9		12.4	22.5	1.2	3.4	15.1	0.5
LOS	E	D	E	D	B		B	C	A	A	B	A
Approach Delay		64.7			36.8			21.3			14.8	
Approach LOS		E			D			C			B	
Stops (vph)	82	11	174	240	29		16	829	5	4	660	0
Fuel Used(gal)	2	0	4	5	1		1	29	1	0	34	0
CO Emissions (g/hr)	156	14	308	370	88		46	2026	37	19	2411	10



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	30	3	60	72	17		9	394	7	4	469	2
VOC Emissions (g/hr)	36	3	71	86	20		11	470	9	4	559	2
Dilemma Vehicles (#)	0	0	0	0	0		0	45	0	0	39	0
Queue Length 50th (ft)	66	7	138	98	7		11	303	0	2	158	0
Queue Length 95th (ft)	#141	25	199	#190	65		m31	439	m7	m4	#224	m0
Internal Link Dist (ft)		521			483			1409			1402	
Turn Bay Length (ft)	265			400			400		400	265		265
Base Capacity (vph)	145	305	269	594	400		313	2564	1459	299	2061	1068
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.04	0.78	0.51	0.36		0.10	0.40	0.03	0.07	0.91	0.01

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 68 (62%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 23.5

Intersection LOS: C

Intersection Capacity Utilization 77.5%

ICU Level of Service D

Analysis Period (min) 15

























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 30: Access "D" & Brisbin Road

ø1	ø2	ø3	ø4
10 s	63 s	15 s	22 s
ø5	ø6	ø7	ø8
10 s	63 s	13 s	24 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	400		265	400		400	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.213			0.154			0.083			0.110		
Satd. Flow (perm)	397	3725	1583	287	3725	1583	155	3725	1583	205	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76			123			58			53
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		653			563			1482			1489	
Travel Time (s)		14.8			12.8			18.4			18.5	
Volume (vph)	95	570	130	200	640	145	50	1080	55	60	1325	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	600	137	211	674	153	53	1137	58	63	1395	53
Lane Group Flow (vph)	100	600	137	211	674	153	53	1137	58	63	1395	53
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	16.0	26.0	10.0	22.0	32.0	10.0	10.0	52.0	22.0	10.0	52.0	16.0
Total Split (%)	14.5%	23.6%	9.1%	20.0%	29.1%	9.1%	9.1%	47.3%	20.0%	9.1%	47.3%	14.5%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0	1.0	1.5	1.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	32.1	22.7	32.5	41.0	27.7	37.7	56.7	50.9	69.3	57.1	51.1	64.5
Actuated g/C Ratio	0.29	0.21	0.30	0.37	0.25	0.34	0.52	0.46	0.63	0.52	0.46	0.59
v/c Ratio	0.43	0.78	0.26	0.70	0.72	0.25	0.32	0.66	0.06	0.33	0.81	0.06
Control Delay	28.3	49.4	15.2	37.4	42.4	8.0	21.9	10.1	0.4	18.5	32.2	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	49.4	15.2	37.4	42.4	8.0	21.9	10.1	0.4	18.5	32.2	10.2
LOS	C	D	B	D	D	A	C	B	A	B	C	B
Approach Delay		41.3			36.3			10.2			30.8	
Approach LOS		D			D			B			C	
Stops (vph)	66	519	46	139	569	28	22	347	1	38	1009	30
Fuel Used(gal)	1	11	1	3	11	1	1	19	1	1	40	1
CO Emissions (g/hr)	98	804	92	222	802	72	77	1315	38	105	2790	79



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	19	156	18	43	156	14	15	256	7	20	543	15
VOC Emissions (g/hr)	23	186	21	51	186	17	18	305	9	24	647	18
Dilemma Vehicles (#)	0	0	0	0	0	0	0	47	0	0	38	0
Queue Length 50th (ft)	44	205	30	100	221	14	7	85	0	28	408	10
Queue Length 95th (ft)	81	#282	81	164	294	59	m44	176	m1	m61	495	m26
Internal Link Dist (ft)		573			483			1402			1409	
Turn Bay Length (ft)	265		265	400		265	400		400	265		265
Base Capacity (vph)	275	785	524	350	974	625	168	1723	1068	193	1729	986
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.76	0.26	0.60	0.69	0.24	0.32	0.66	0.05	0.33	0.81	0.05

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 62 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 77.5%

ICU Level of Service D

Analysis Period (min) 15























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 33: Collector "2" & Brisbin Road

ø1	ø2	ø3	ø4
10 s	52 s	22 s	26 s
ø5	ø6	ø7	ø8
10 s	52 s	16 s	32 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		265	400		400	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.863			0.858				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1608	0	1770	1598	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.436			0.527			0.107			0.077		
Satd. Flow (perm)	812	1608	0	982	1598	0	199	3725	1583	143	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		116			205				32			42
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		698			590			1489			1482	
Travel Time (s)		15.9			13.4			18.5			18.4	
Volume (vph)	135	10	110	170	10	195	30	1260	30	45	1155	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	142	11	116	179	11	205	32	1326	32	47	1216	42
Lane Group Flow (vph)	142	127	0	179	216	0	32	1326	32	47	1216	42
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	16.0	24.0	0.0	18.0	26.0	0.0	12.0	56.0	18.0	12.0	56.0	16.0
Total Split (%)	14.5%	21.8%	0.0%	16.4%	23.6%	0.0%	10.9%	50.9%	16.4%	10.9%	50.9%	14.5%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	20.2	9.6		24.1	11.5		71.8	67.1	83.6	74.2	69.8	84.4
Actuated g/C Ratio	0.18	0.09		0.22	0.10		0.65	0.61	0.76	0.67	0.63	0.77
v/c Ratio	0.59	0.52		0.59	0.62		0.15	0.58	0.03	0.24	0.51	0.03
Control Delay	44.1	18.2		42.9	15.4		3.1	3.8	0.1	14.8	8.7	2.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.1	18.2		42.9	15.4		3.1	3.8	0.1	14.8	8.7	2.3
LOS	D	B		D	B		A	A	A	B	A	A
Approach Delay		31.9			27.8			3.7			8.7	
Approach LOS		C			C			A			A	
Stops (vph)	112	27		140	34		3	214	0	19	382	7
Fuel Used(gal)	3	1		3	2		0	17	0	1	20	1
CO Emissions (g/hr)	179	88		212	124		25	1178	20	64	1398	37



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	35	17		41	24		5	229	4	12	272	7
VOC Emissions (g/hr)	42	20		49	29		6	273	5	15	324	8
Dilemma Vehicles (#)	0	0		0	0		0	11	0	0	41	0
Queue Length 50th (ft)	84	7		108	7		2	41	0	7	143	1
Queue Length 95th (ft)	131	62		162	76		m4	234	m0	m27	189	m1
Internal Link Dist (ft)		618			510			1409			1402	
Turn Bay Length (ft)	265			400			400		400	265		265
Base Capacity (vph)	264	387		324	484		247	2271	1231	218	2365	1244
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.33		0.55	0.45		0.13	0.58	0.03	0.22	0.51	0.03

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 88 (80%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 10.8

Intersection LOS: B

Intersection Capacity Utilization 67.5%























ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 36: Access "C" & Brisbin Road

	ø1		ø2		ø3		ø4
12 s		56 s		18 s		24 s	
	ø5		ø6		ø7		ø8
12 s		56 s		16 s		26 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		400	400		0	400		265	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.862			0.864				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1606	0	1770	1609	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.563			0.590			0.233			0.063		
Satd. Flow (perm)	1049	1606	0	1099	1609	0	434	3725	1583	117	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		121			105				26			37
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		807			661			1320			1319	
Travel Time (s)		18.3			15.0			16.4			16.4	
Volume (vph)	140	10	115	85	10	100	30	1705	25	40	905	35
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	11	121	89	11	105	32	1795	26	42	953	37
Lane Group Flow (vph)	147	132	0	89	116	0	32	1795	26	42	953	37
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	11.0	23.0	0.0	10.0	22.0	0.0	10.0	67.0	10.0	10.0	67.0	11.0
Total Split (%)	10.0%	20.9%	0.0%	9.1%	20.0%	0.0%	9.1%	60.9%	9.1%	9.1%	60.9%	10.0%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	18.1	12.5		15.4	9.5		78.6	75.0	84.9	79.7	75.5	86.5
Actuated g/C Ratio	0.16	0.11		0.14	0.09		0.71	0.68	0.77	0.72	0.69	0.79
v/c Ratio	0.67	0.46		0.47	0.50		0.08	0.71	0.02	0.23	0.37	0.03
Control Delay	56.2	15.4		46.8	18.6		3.5	5.9	0.2	14.8	5.3	1.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	15.4		46.8	18.6		3.5	5.9	0.2	14.8	5.3	1.3
LOS	E	B		D	B		A	A	A	B	A	A
Approach Delay		36.9			30.9			5.8			5.5	
Approach LOS		D			C			A			A	
Stops (vph)	132	27		74	26		5	310	0	21	270	4
Fuel Used(gal)	3	1		2	1		0	22	0	1	14	0
CO Emissions (g/hr)	225	93		116	79		26	1543	15	59	947	26



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	44	18		23	15		5	300	3	11	184	5
VOC Emissions (g/hr)	52	22		27	18		6	358	3	14	219	6
Dilemma Vehicles (#)	0	0		0	0		0	89	0	0	27	0
Queue Length 50th (ft)	95	7		55	7		2	114	0	0	98	0
Queue Length 95th (ft)	149	63		97	60		m6	198	m0	38	112	m0
Internal Link Dist (ft)		727			581			1240			1239	
Turn Bay Length (ft)	265			400			400		265	265		265
Base Capacity (vph)	218	378		191	351		384	2540	1229	183	2557	1253
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.35		0.47	0.33		0.08	0.71	0.02	0.23	0.37	0.03

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 92 (84%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 9.8

Intersection LOS: A









Intersection Capacity Utilization 69.2%

























ICU Level of Service C













Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 39: Access "B" & Brisbin Road

 ø1	 ø2	 ø3	 ø4
10 s	67 s	10 s	23 s
 ø5	 ø6	 ø7	 ø8
10 s	67 s	11 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		265	265		265	265		265	265		265
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3725	1583	1770	3725	1583	1770	3725	1583	1770	3725	1583
Flt Permitted	0.372			0.211			0.236			0.065		
Satd. Flow (perm)	693	3725	1583	393	3725	1583	440	3725	1583	121	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			95			45			32			21
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		827			693			1319			1311	
Travel Time (s)		18.8			15.8			16.4			16.3	
Volume (vph)	110	620	90	40	310	60	25	1890	30	60	890	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	653	95	42	326	63	26	1989	32	63	937	21
Lane Group Flow (vph)	116	653	95	42	326	63	26	1989	32	63	937	21
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	7	4	5	3	8	1	5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	11.0	24.0	10.0	10.0	23.0	10.0	10.0	66.0	10.0	10.0	66.0	11.0
Total Split (%)	10.0%	21.8%	9.1%	9.1%	20.9%	9.1%	9.1%	60.0%	9.1%	9.1%	60.0%	10.0%
Yellow Time (s)	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5	1.0	0.0	1.5	1.0	1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	26.5	20.9	30.7	23.6	18.0	27.9	69.8	65.2	74.8	69.3	63.4	74.3
Actuated g/C Ratio	0.24	0.19	0.28	0.21	0.16	0.25	0.63	0.59	0.68	0.63	0.58	0.68
v/c Ratio	0.49	0.92	0.19	0.27	0.54	0.15	0.07	0.90	0.03	0.38	0.44	0.02
Control Delay	39.8	63.8	7.2	34.6	45.5	14.1	4.0	13.7	0.2	25.0	20.0	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.8	63.8	7.2	34.6	45.5	14.1	4.0	13.7	0.2	25.0	20.0	2.2
LOS	D	E	A	C	D	B	A	B	A	C	C	A
Approach Delay		54.4			39.8			13.4			20.0	
Approach LOS		D			D			B			B	
Stops (vph)	88	550	14	30	277	19	4	692	0	40	499	2
Fuel Used(gal)	2	15	1	1	6	1	0	34	0	2	20	0
CO Emissions (g/hr)	146	1055	55	46	425	42	21	2371	18	108	1418	15

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	28	205	11	9	83	8	4	461	3	21	276	3
VOC Emissions (g/hr)	34	244	13	11	98	10	5	549	4	25	329	3
Dilemma Vehicles (#)	0	0	0	0	0	0	0	100	0	0	117	0
Queue Length 50th (ft)	64	243	0	22	111	10	2	222	0	27	195	0
Queue Length 95th (ft)	113	#360	39	50	157	43	m4	#849	m0	m57	255	m5
Internal Link Dist (ft)		747			613			1239			1231	
Turn Bay Length (ft)	265		265	265		265	265		265	265		265
Base Capacity (vph)	236	709	514	160	643	436	353	2207	1092	166	2147	1077
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.92	0.18	0.26	0.51	0.14	0.07	0.90	0.03	0.38	0.44	0.02

**Intersection Summary**

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 106 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 25.6

Intersection LOS: C

Intersection Capacity Utilization 79.5%

ICU Level of Service D





Analysis Period (min) 15























# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: Collector 1 &amp; Brisbin Road

	ø1		ø2		ø3		ø4
10 s		66 s		10 s		24 s	
	ø5		ø6		ø7		ø8
10 s		66 s		11 s		23 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	2000	1900
Storage Length (ft)	265		0	265		0	265		265	265		265
Storage Lanes	1		0	1		0	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
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		0.862			0.902				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1606	0	1770	1680	0	1770	3725	1583	1770	3725	1583
Flt Permitted	0.736			0.536			0.261			0.062		
Satd. Flow (perm)	1371	1606	0	998	1680	0	486	3725	1583	115	3725	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		126			21				16			21
Headway 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
Link Speed (mph)		30			30			55			55	
Link Distance (ft)		846			726			1311			1320	
Travel Time (s)		19.2			16.5			16.3			16.4	
Volume (vph)	135	10	120	10	10	20	20	2025	15	25	840	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	142	11	126	11	11	21	21	2132	16	26	884	21
Lane Group Flow (vph)	142	137	0	11	32	0	21	2132	16	26	884	21
Turn Type	pm+pt			pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4			8			2		2	6		6
Detector Phases	7	4		3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0		10.0	22.0		10.0	22.0	10.0	10.0	22.0	10.0
Total Split (s)	10.0	22.0	0.0	10.0	22.0	0.0	10.0	68.0	10.0	10.0	68.0	10.0
Total Split (%)	9.1%	20.0%	0.0%	9.1%	20.0%	0.0%	9.1%	61.8%	9.1%	9.1%	61.8%	9.1%
Yellow Time (s)	3.0	4.5		3.0	4.5		3.0	4.5	3.0	3.0	4.5	3.0
All-Red Time (s)	0.0	1.5		0.0	1.5		1.0	1.5	0.0	1.0	1.5	0.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Act Effct Green (s)	13.4	9.8		11.6	9.5		83.7	80.4	89.5	85.2	82.6	94.8
Actuated g/C Ratio	0.12	0.09		0.11	0.09		0.76	0.73	0.81	0.77	0.75	0.86
v/c Ratio	0.74	0.53		0.08	0.20		0.05	0.78	0.01	0.15	0.32	0.02
Control Delay	66.5	17.8		37.2	26.6		1.6	4.2	0.0	9.8	5.0	1.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.5	17.8		37.2	26.6		1.6	4.2	0.0	9.8	5.0	1.2
LOS	E	B		D	C		A	A	A	A	A	A
Approach Delay		42.6			29.3			4.2			5.1	
Approach LOS		D			C			A			A	
Stops (vph)	136	28		9	15		2	197	0	11	187	1
Fuel Used(gal)	3	1		0	0		0	22	0	0	11	0
CO Emissions (g/hr)	242	104		13	29		15	1553	9	32	794	13



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	47	20		2	6		3	302	2	6	155	3
VOC Emissions (g/hr)	56	24		3	7		3	360	2	8	184	3
Dilemma Vehicles (#)	0	0		0	0		0	76	0	0	37	0
Queue Length 50th (ft)	92	7		7	7		1	66	0	4	84	0
Queue Length 95th (ft)	146	64		22	36		m2	#104	m0	19	114	m3
Internal Link Dist (ft)		766			646			1231			1240	
Turn Bay Length (ft)	265			265			265		265	265		265
Base Capacity (vph)	191	368		156	292		441	2721	1303	182	2798	1367
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.37		0.07	0.11		0.05	0.78	0.01	0.14	0.32	0.02

### Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 9 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 7.9

Intersection LOS: A

Intersection Capacity Utilization 74.0%

ICU Level of Service D




Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### Splits and Phases: 45: Access "A" & Brisbin Road

 ø1	 ø2	 ø3	 ø4
10 s	68 s	10 s	22 s
 ø5	 ø6	 ø7	 ø8
10 s	68 s	10 s	22 s