INFORMATION SHEET
IOWA DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING ASSISTANCE PROGRAM

CITY OF ADEL US HIGHWAY 169/6 CORRIDOR STUDY
June 7, 2017

1. Local Jurisdiction: City of Adel, IA

2. Reason TEAP Study Originated: The City of Adel was concerned with the safety and operations of the US Highway 169/6 corridor between 302nd Place and US Highway 6/Greene Street intersections. In addition, the City had concerns with safety and traffic operations with respect to an increase in traffic volumes associated with on-going land development projects adjacent to the study corridor, including the potential for turn lanes and a traffic signal system at the Middle/High School access intersection.

3. Scope of Services Provided: Performed field review and observation of existing conditions, reviewed vehicle count data, evaluated relevant crash history and traffic operations, evaluated traffic signal and intersection auxiliary lane warrants, examined intersection sight distances, and considered potential improvements.

4. The Consultant, HR Green, submitted a final report dated June 7, 2017 with the following recommendations:

Short Term Recommendations

- Place crosswalk and stop bar pavement markings across all legs of the US Highway 169/6 & US Highway 6/Greene Street intersection
- Update traffic signal heads at the US Highway 169/6 & US Highway 6/Greene Street intersection
- Relocate the City of Adel Gateway sign to a more southern location
- Continue speed enforcement efforts along US Highway 169/6 and consider adding vehicle actuated speed feedback signs

Long Term Recommendations

- Evaluate/update traffic signal timings at the intersection of US Highway 169/6 & US Highway 6/Greene Street.
- Consider reconstruction of US Highway 169/6 to include auxiliary turn lanes as warranted by future traffic demand
- Add luminaires to the intersections along US Highway 169/6 to enhance conspicuity

5. The order of magnitude construction cost opinions for recommended improvements:

   Short-Term:
   A. Stop bar pavement markings: $200 - $300 per approach
   B. Crosswalk pavement markings: $200 - $300 per approach
   C. Remove/relocate existing corridor signing: $200 - $300 per assembly
   D. Vehicle signal head addition/replacement: $750 - $1,000 per signal head
   E. Install dynamic speed display sign: $2,000 - $15,000 depending on sign

Long-Term:

A. Intersection Lighting (Further Study Necessary)
B. Traffic Signal Timing Evaluation (Further Study Necessary)
C. Widen US Highway 169/6 to include auxiliary turn lanes (Further Study Necessary)

6. Potential funding sources include the Urban-State Traffic Engineering Program (U-STEP), Surface Transportation Program (STP), and the Iowa Clean Air Attainment Program (ICAAP).

TRAFFIC ENGINEERING ASSISTANCE PROGRAM

FINAL

City of Adel, Iowa

US Highway 169/6 Corridor Study

Prepared for:

City of Adel, IA

In Cooperation With:
Iowa Department of Transportation &
U.S. Department of Transportation
Federal Highway Administration

June 7, 2017

HRGreen

Traffic Engineering Assistance Program

US Highway 169/6

Adel, Iowa

FINAL Report

June 2017

Prepared For:

City of Adel, Iowa

In Cooperation with:

Iowa Department of Transportation

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

6/7/2017

TYLER C. WILES, P.E. DATE

License Number: 20906

My license renewal date is DECEMBER 31, 2017.

Pages or sheets covered by this seal:

ENTIRE DOCUMENT

Prepared By:

HRGreen

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INTRODUCTION

Purpose and Study Objective

At the request of the Iowa Department of Transportation (DOT) and the City of Adel, Iowa, through the Iowa DOT Traffic Engineering Assistance Program (TEAP), this study evaluated traffic operations and safety along the US Highway 169/6 corridor, between the intersection with US Highway 6 (Greene Street) in the north and the intersection with 302nd Place to the south in Adel, Iowa. The study examined existing traffic patterns, traffic control, and lane use geometry along the corridor and study intersections. Recommendations for improvements and possible funding sources to implement the recommended improvements are contained within the report.

The City of Adel initiated the study to evaluate the safety of the US Highway 169/6 corridor south of the intersection of US Highway 169 & US Highway 6 within the city limits. Visibility and driver expectancy at the intersections along the corridor is perceived as an issue due to the vertical curves, speed limit transition, terrain and adjacent land use. Additional proposed development is expected within the area, further increasing traffic volumes and turning conflicts. US Highway 169/6 is a primary route for local commuters heading to/from the Des Moines metropolitan area.

BACKGROUND

Study Location

The City of Adel is located in Dallas County, approximately 25 miles west of Des Moines and 5 miles north of Interstate 80. In 2010, the population of Adel was approximately 3,680 people. The Adel Police Department is responsible for the local law enforcement. The location of Adel is shown in **Exhibit 1**.

Exhibit 1 – Location of Adel, IA

The US Highway 169/6 corridor study limits are between, and including, the intersections of US Highway 6 (Greene Street) to the north and the intersection of 302nd Place to the south. The study intersections are highlighted in **Exhibit 2** and include (from north to south):

- US Highway 169/6 & US Highway 6 (Greene Street)
- US Highway 169/6 & Adel/De Soto/Minburn Middle/High School
- US Highway 169/6 & Timberview Drive
- US Highway 169/6 & Bailey Grove Road
- US Highway 169/6 & Meadow Road
- US Highway 169/6 & 302nd Place

US Highway 169 is a primary highway that runs north/south through central Iowa. It is the primary access into the City of Adel from the junction with Interstate 80 to the south and accommodates a large proportion of the local commuter traffic between the City of Adel and the Des Moines metropolitan area.

US Highway 6 is a primary highway that predominantly runs east/west across the State of Iowa paralleling Interstate 80. The highway enters the study area from the south overlapping the US Highway 169 corridor until reaching the intersection of Greene Street where it continues east towards the outlying communities of the Des Moines metropolitan area.

Exhibit 2 – Project Study Area

In recent years, the City of Adel has experienced land development pushing southward along the US Highway 169/6 corridor. As land development expands, new roadway approaches have been introduced along the corridor and traffic demand has increased. Future planned residential and commercial developments will accelerate emerging traffic trends and local officials are concerned with the safety and operations of traffic along the US Highway 169/6 corridor.

As residential housing increases so does student attendance at the ADM Middle/High School located along US Highway 169/6. This facility houses both Middle and High School students, grades 6-12. At present, there are approximately 400 students attending ADM Middle School and 510 students attending ADM High School. The school has an 8:10 AM start time and a 3:35 PM end of day dismissal. There are approximately 450 students who drive themselves to school, approximately 360 arriving by bus, and the remaining students are dropped off by parents or walk to the school.

An intersection of notable concern, by the City, is the intersection of US Highway 169/6 & the ADM Middle/High School and Fareway Foods grocery store. This intersection has seen an increasing vehicle presence due to the rising student population at the ADM Middle/High School and the attraction of the only grocery store within a 10 mile radius. Anecdotal evidence suggests that many “near-miss” accidents have occurred here that may not be reflected in crash reports.

STUDY AREA FIELD REVIEW

Study Location Overview

A field review was conducted to gather information about the study area and six study intersections. Within the confines of the study area, US Highway 169/6 transitions from a typical urban roadway cross-section with curb and gutter to a rural two lane cross-section with granular shoulders. Residential, commercial, and agricultural land uses are present along US Highway 169/6. An overview of the intersections and roadway segments, along with findings from field reviews, is presented below traveling the corridor from north to south.

Study Intersection: US Highway 169/6 & US Highway 6/Greene Street

The intersection of US Highway 169/6 & US Highway 6/Greene Street consists of a four leg intersection with signalized traffic control. US Highway 6 has a four lane cross section with two approximately 11 foot lanes with a thru/left turn and thru/right turn lane on each approach. US Highway 169 has a three lane cross section with two approximately 11 foot lanes with a dedicated left turn lane and a thru/right turn lane on each approach. There exists curb and gutter and sidewalk at each quadrant of the intersection. The posted speed limit along US Highway 169 is 25 mph and the posted speed limit along US Highway 6 is 25 mph.

An aerial of the intersection is shown in **Exhibit 3**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 3 – US Highway 169 & US Highway 6 Intersection

Views to the north and south of the study intersection are provided in **Exhibit 4**.

Exhibit 4 – North and South of US Hwy 169 & US Hwy 6 Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

Views to the east and west of the study intersection are provided in **Exhibit 5**.

Exhibit 5 – East and West of US Hwy 169 & US Hwy 6 Intersection

US Highway 6 Looking West at Intersection

US Highway 6 Looking East at Intersection

From this intersection, US Highway 6 combines with US Highway 169 and continues south to an intersection with the Adel/De Soto/Minburn Middle/High School and Fareway Foods grocery store. The 3-lane cross section transitions from a typical urban roadway cross-section with curb and gutter to a rural two lane cross-section with granular shoulders.

Study Intersection: US Highway 169/6 & ADM Middle/High School

The intersection of US Highway 169/6 & the ADM Middle/High School and Fareway Foods grocery store is a four leg intersection with stop control on the minor legs. US Highway 169/6 has a three lane cross section with two approximately 11 foot lanes consisting of a dedicated left turn lane and thru/right turn lane on the southbound approach and three approximately 11 foot lanes consisting of a dedicated left turn lane, thru lane, and dedicated right turn lane on the northbound approach. Each access leg has a three lane cross section with two approximately 10 foot lanes consisting of a dedicated left turn lane and thru/right turn lane on the eastbound (Fareway Foods) approach and two approximately 10 foot lanes consisting of a dedicated right turn lane and thru/left turn lane on the westbound (ADM Middle/High School) approach. There are no curb and gutter or sidewalk at the intersection. The posted speed limit along US Highway 169/6 is 45 mph through the intersection. However, there are 35 mph (MUTCD, S5-1) school speed limit warning signs with flashing beacons located along US Highway 169/6 to the north and south of the intersection.

An aerial of the intersection is shown in **Exhibit 6**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 6 – US Highway 169/6 & ADM Middle/High School Intersection

Views to the north and south of the study intersection are provided in **Exhibit 7**.

Exhibit 7 – North and South of US Hwy 169 & ADM Middle/High School Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

Views to the east and west of the study intersection are provided in **Exhibit 8**.

Exhibit 8 – East and West of US Hwy 169 & ADM Middle/High School Intersection

ADM Middle/High School Access Looking West at Intersection

Fareway Foods Access Looking East at Intersection

From this intersection, US Highway 169/6 continues south to an intersection with Timberview Drive.

Study Intersection: US Highway 169/6 & Timberview Drive

The intersection of US Highway 169/6 & Timberview Drive is a three leg intersection with stop control on the minor leg. US Highway 169/6 has a two lane cross section with one approximately 12 foot lane providing for all movements on the northbound and southbound approaches. Timberview Drive has a two lane cross section with one approximately 12 foot lane providing for all movements on the westbound approach. There are curb and gutter along Timberview Drive ending at the curb radii but no sidewalk at the intersection. The posted speed limit along US Highway 169/6 is 55 mph through the intersection.

An aerial of the intersection is shown in **Exhibit 9**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 9 – US Highway 169/6 & Timberview Drive Intersection

Views to the north and south of the study intersection are provided in **Exhibit 10**.

Exhibit 10 – North and South of US Hwy 169 & Timberview Drive Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

From this intersection, US Highway 169/6 continues south to an intersection with Bailey Grove Road.

Study Intersection: US Highway 169/6 & Bailey Grove Road

The intersection of US Highway 169/6 & Bailey Grove Road is a three leg intersection with stop control on the minor leg. US Highway 169/6 has a two lane cross section with one approximately 12 foot lane providing for all movements on the northbound and southbound approaches. Bailey Grove Road has a two lane cross section with one approximately 12 foot lane providing for all movements on the eastbound approach. There are curb and gutter along Bailey Grove Road ending at the curb radii but no sidewalk at the intersection. The posted speed limit along US Highway 169/6 is 55 mph through the intersection.

An aerial of the intersection is shown in **Exhibit 11**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 11 – US Highway 169/6 & Bailey Grove Road Intersection

Views to the north and south of the study intersection are provided in **Exhibit 12**.

Exhibit 12 – North and South of US Hwy 169 & Bailey Grove Road Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

From this intersection, US Highway 169/6 continues south to an intersection with Meadow Road.

Study Intersection: US Highway 169/6 & Meadow Road

The intersection of US Highway 169/6 & Meadow Road is a three leg intersection with stop control on the minor leg. US Highway 169/6 has a two lane cross section with one approximately 12 foot lane providing for all movements on the northbound and southbound approaches. Meadow Road is a graveled surface road with an approximately 24 foot cross section. The posted speed limit along US Highway 169/6 is 55 mph through the intersection.

An aerial of the intersection is shown in **Exhibit 13**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 13 – US Highway 169/6 & Bailey Grove Road Intersection

Views to the north and south of the study intersection are provided in **Exhibit 15**.

Exhibit 14 – North and South of US Hwy 169 & Meadow Road Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

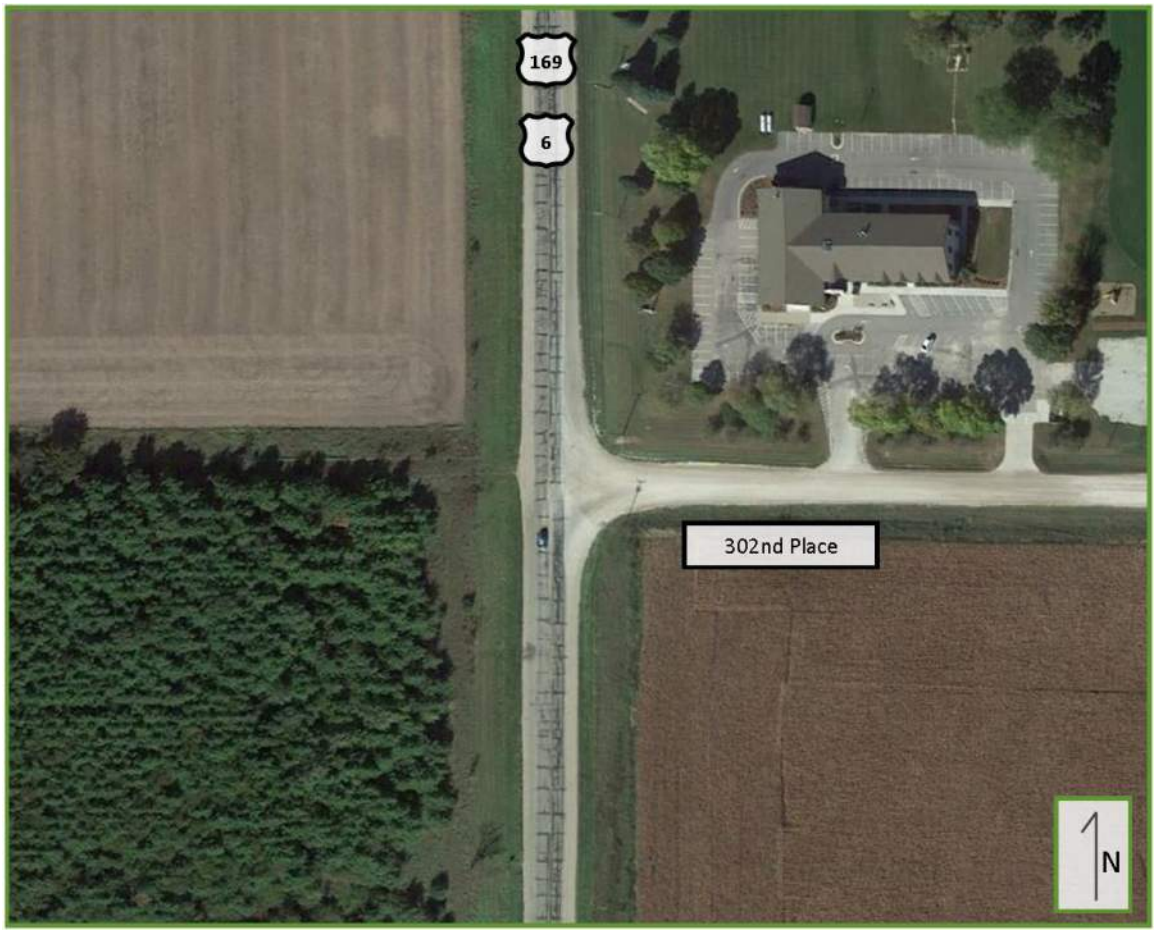
From this intersection, US Highway 169/6 continues south to an intersection with 302nd Place.

Study Intersection: US Highway 169/6 & 302nd Place

The intersection of US Highway 169/6 & 302nd Place is a three leg intersection with stop control on the minor leg. US Highway 169/6 has a two lane cross section with one approximately 12 foot lane providing for all movements on the northbound and southbound approaches. 302nd Place is a graveled surface road with an approximately 24 foot cross section. The posted speed limit along US Highway 169/6 is 55 mph through the intersection.

An aerial of the intersection is shown in **Exhibit 15**. Views of the intersection from each approach leg can be seen in the following **Exhibits**.

Exhibit 15 – US Highway 169/6 & 302nd Place Intersection



Views to the north and south of the study intersection are provided in **Exhibit 16**.

Exhibit 16 – North and South of US Hwy 169 & 302nd Place Intersection

US Highway 169 Looking South at Intersection

US Highway 169 Looking North at Intersection

There are several planned residential developments along US Highway 169/6 that, when completed, will add approximately 400 new residential single family homes to the area south of the ADM Middle/High School. The intersections of US Highway 169/6 with Timberview Drive, Bailey's Grove Drive, and Meadow Road will be extended, creating a four-legged intersection at each of these locations.

Intersection Sight Distance Review

Sight distance measurements were conducted for the study intersection of US Highway 169/6 & Timberview Drive after the field review determined a need for further evaluation. Specified areas, known as sight triangles, along the approach to an intersection should be clear of obstructions that might block the driver's view of potential conflicting vehicles. The dimensions of the sight triangles depend on the speeds of the intersection roadways and type of traffic control used at the intersection.

Ideally, the vertical profiles of the intersecting roadways will allow for the recommended sight distance for drivers on the intersection approaches. It is also preferred that obstructions such as buildings, parked cars, roadside structures, hedges, trees, walls, and the terrain itself do not exist within the sight triangle.

Sight distance triangles for each study intersection were derived from Section 9.5, Intersection Sight Distance, in the 2011 Edition of *A Policy on Geometric Design of Highways and Streets* from the American Association of State Highway and Transportation Officials (AASHTO).

The vertex of the sight triangles along the minor road were located approximately 14.5 ft. back from the edge of the major-road (US Highway 169/6) travel way. This position represents the typical position of the minor-road driver's eye location when a vehicle is stopped, based on AASHTO guidance.

The Timberview Drive intersection falls under Case B – Intersections with stop control on the minor road (Section 9.5.3 Intersection Control). Case B1 and B2 were analyzed to account for left turns and right turns from the minor road, respectively. Case B3, the crossing maneuver from the minor road, was omitted based on current 3-leg intersection geometry. The maximum US Highway 169/6 profile grade is 2.0 percent, thus an adjustment to calculate intersection sight distances was not necessary. **Table 1** summarizes AASHTO calculated intersection sight distance required from a minor

approach based on applicable US Highway 169/6 analysis design speeds within the study area.

Table 1 –Intersection Sight Distances Based on Design Speed

Design Speed	Left Turn (Case B1)		Right Turn (Case B2)	
	Passenger Car (ft.)	Single Unit Truck (ft.)	Passenger Car (ft.)	Single Unit Truck (ft.)
40	445	560	385	500
45	500	630	430	565
50	555	700	480	625
55	610	770	530	690
60	665	840	575	750
Time Gap	*7.5*	*9.5*	*6.5*	*8.5*

Condensed from AASHTO 2011 Edition of A Policy on Geometric Design of Highways and Streets Tables 9-6 through 9-8 and Equation 9-1.

The analysis design speeds used in the determination of sight distances at specific intersections were defined by the approaching US Highway 169/6 posted speed limit plus five (5) mph. If a speed transition occurs within a specific sight triangle, the highest posted speed limit plus five mph was utilized.

Table 2 summarizes the available study intersection sight distances for the minor road left and right turns onto US Highway 169/6 based on posted US Highway 169/6 speed limits and AASHTO minimum sight distances and the summary of AASHTO intersection sight distance presented in **Table 1**.

Table 2 – Timberview Drive Intersection Sight Distances

Minor Road Intersection and Orientation	Turn from Minor Approach	Approach Design Speed Used (mph)	Intersection Sight Distance			
			Passenger Cars (ft.)		Single Unit Trucks (ft.)	
			Available	Required	Available	Required
Timberview Drive Westbound	Left	**60**	>665	665	**680**	840
	Right	**60**	>575	575	>750	750

At the Timberview Drive approach, a distance over 750 feet (Combination Unit Truck, Right Turn [Case B2]) was documented looking to the south (along US Highway 169/6). Looking towards the north, a distance of approximately 680 feet (not meeting 840 feet – Combination Unit Truck, Left turn [Case B1]) was documented along US Highway 169/6. Although the clear roadside and absence of obstructions are beneficial to the turning motorist, the vertical curve north of the study intersection limits vehicle line of sight prior to a turning maneuver.

Exhibits 17 display approximate locations of sight triangles at each of the study intersections for passenger cars. Views from the minor road approach, to the left and right, are also provided.

Exhibit 17 – US Highway 169/6 & Timberview Drive Required Intersection Sight Triangles

Exhibit 18 – North and South of US Hwy 169 from Timberview Drive Intersection

Timberview Drive Approach Looking South from Intersection

Timberview Drive Approach Looking North from Intersection

Speed Study Review

The Iowa DOT conducted a speed study at two locations along US Highway 169/6 between September 23, 2014 and October 10, 2014. The two speed data collection locations and all posted speed limit signs within the study area are shown in **Exhibit 19**. There is a 35 mph (MUTCD, S5-1) school speed limit warning sign with flashing beacons located approximately 190 feet upstream of the intersection with ADM Middle/High School in the southbound direction and one located approximately 790 feet upstream of that intersection in the northbound direction.

An aerial map and output detail sheets for all speed data collection locations are provided in **Appendix A**.

The sample size at each location was between 200 and 250 vehicles, measuring the speed of both approaching and departing vehicles. Weather conditions over the collection days were similar: dry, sunny to overcast sky conditions, with temperatures ranging from the mid 40's to low 60's. Data was collected in late morning, typically between 10:00 AM and 12:00 PM.

Exhibit 19 – Speed Study Locations and Posted Speed Limit Overview

The 85th percentile speed, the speed at which 85 percent of free-flowing traffic is traveling at or below, was identified from the field measured speeds. The 10 mph pace is the 10 mph range of speeds containing the greatest number of observed speeds and is a measure of speed dispersion. Generally, a normal speed distribution contains

approximately 70 percent of the vehicles within the pace and the upper bound approximates the 85th percentile speed.

Measured 85th percentile speeds at the two locations within the study area were within five mph of the posted speed limit. The percent exceeding the posted speed limit ranged from 6.5 to 12.0 percent. The results are summarized in **Table 3**.

Table 3 – Speed Study Results Summary

Location	Site No.	Observed Range Min / Max	10 mph Pace	85th Percentile Speed	Posted Speed Limit	Percent Exceeding Posted Speed Limit
430 ft. South of Meadow Road	A1	44 / 68	52 - 61	60	**55**	6.5
325 ft. South of Timberview Drive	A2	38 / 62	47 - 56	56	**55**	12.0

CRASH HISTORY/INFORMATION

Iowa DOT Crash Mapping Analysis Tool

HR Green compiled and reviewed crash data within the study area. The crash data was compiled using the Crash Mapping Analysis Tool (CMAT) software distributed by the Iowa DOT. The crash data review includes the most recent five years of available crash data (2011-2015).

The following summarizes all crashes within the entirety of the study area, including and between the intersections of US Highway 169 & US Highway 6 to US Highway 169/6 & 302nd Place. Crash reports from CMAT for the study area are provided in **Appendix B**.

Study Area Overview

- 48 Total crashes
  - 6/48 = Possible/ Unknown Injury
  - 6/48 = Minor Injury
  - 1/48 = Major Injury
  - 35/48 = Property Damage Only (PDO)

- Major Causes
  - 11/48 = Animal crash
  - 8/48 = Followed too close
  - 4/48 = Driving too fast for conditions
  - 4/48 = Other improper action
  - 3/48 = Failure to yield making left turn
  - 3/48 = Ran off road
  - 2/48 = Failure to yield from stop sign
  - 2/48 = Failure to yield from driveway
  - 2/48 = Made improper turn
  - 2/48 = Operating vehicle in reckless/aggressive manner

  - 2/48 = Swerving/evasive action
  - 2/48 = Lost control
  - 1/48 = Ran stop sign
  - 1/48 = Unknown

- Manner of Crash
  - 16/48 = Rear end
  - 16/48 = Not reported
  - 8/48 = Broadside
  - 3/48 = Angle, oncoming left turn
  - 2/48 = Head on
  - 2/48 = Not reported
  - 1/48 = Sideswipe, same direction

- Time of Day
  - 27/48 = Crashes occurred between 2 PM and 6 PM
  - 14/48 = Crashes occurred on Friday

Study Area Intersections

The following summarizes the crash data for individual intersections within the study area with select crash characteristics. A radius of 150 ft. from the center of the intersection was used to identify intersection type crashes.

- US Highway 169 & US Highway 6 (Greene Street)
  - 10 Total crashes
    - 8/10 = Property Damage Only (PDO)
    - 2/10 = Possible Injury
      - 3 Possible Occupant Injury
  - Major Cause
    - 2/10 = Failure to yield making left turn
    - 2/10 = Failure to yield from driveway
    - 2/10 = Driving too fast for conditions
    - 1/10 = Made improper turn
    - 1/10 = Followed too close
    - 1/10 = Lost control
    - 1/10 = Other improper action
  - Manner of Crash
    - 4/10 = Rear-end
    - 3/10 = Angle, oncoming left turn
    - 2/10 = Broadside
    - 1/10 = Sideswipe, same direction
  - 6/10 = Crashes occurring between 2 PM and 4 PM

  - 0.33 Crashes/MEV compared to 1.0 Crashes/MEV Category Type Statewide Average, Category Type: Municipal Primary roadway with Municipal Primary roadway

- US Highway 169/6 & ADM Middle/High School
  - 2 Total crashes
    - 2/2 = Property Damage Only (PDO)
  - Major Cause
    - 1/2 = Followed too close
    - 1/2 = Other improper action
  - Manner of Crash
    - 2/2 = Rear-end

- US Highway 169/6 & Timberview Drive
  - 2 Total crashes
    - 1/2= Property Damage Only (PDO)
    - 1/2 = Minor Injury
      - 1 Minor Occupant Injury
      - 2 Possible Occupant Injury
      - 1 Unknown Occupant Injury
  - Major Cause
    - 1/2 = Animal
    - 1/2 = Operating vehicle in reckless/aggressive manner
  - Manner of Crash
    - 1/2 = Rear-end
    - 1/2 = Non-collision

- US Highway 169/6 & Bailey Grove Road
  - 2 Total crashes
    - 1/2= Property Damage Only (PDO)
    - 1/2 = Possible Injury
      - 1 Possible Occupant Injury
  - Major Cause
    - 1/2 = Animal
    - 1/2 = Followed too close
  - Manner of Crash
    - 1/2 = Rear-end
    - 1/2 = Not reported

- US Highway 169/6 & Meadow Road
  - 3 Total crashes
    - 1/3 = Property Damage Only (PDO)
    - 1/3 = Minor Injury

        - 1 Minor Occupant Injury
        - 1 Possible Occupant Injury
      - 1/3 = Major Injury
        - 1 Major Occupant Injury
  - Major Cause
    - 1/3 = Ran stop sign
    - 1/3 = Driving too fast for conditions
    - 1/3 = Operating vehicle in reckless/aggressive manner
  - Manner of Crash
    - 2/3 = Non-collision
    - 1/3 = Broadside

- US Highway 169/6 & 302nd Place
  - 6 Total crashes
    - 6/6 = Property Damage Only (PDO)
  - Major Cause
    - 2/6 = Animal
    - 2/6 = Followed too close
    - 1/6 = Swerving/evasive action
    - 1/6 = Other improper action
  - Manner of Crash
    - 3/6 = Rear-end
    - 2/6 = Non-collision
    - 1/6 = Not reported

From review of the CMAT data, the main cause of crashes within the study area was vehicular crashes with animals. The next most frequent crash cause was following too close, which occurred in eight of the forty-eight crashes along US Highway 169/6. Within the study intersection areas, the main cause of crashes was following too close. The next most frequent crash cause was failure to yield right of way.

The crash rates calculated above, that occurred over the five most recent years of available CMAT data, are below the statewide average for the study roadway traffic volumes and classification types.

City of Adel Crash Data

Additional crash information provided by the City of Adel was also reviewed. It was found to be consistent with the crash incidents included within the CMAT database. Crash reports from the City of Adel for the study intersections are provided in **Appendix B**.

TRAFFIC HISTORY/INFORMATION

The most recent (2012) and historical US Highway 169/6 annual average daily traffic (AADT) volumes were obtained from Iowa DOT traffic flow maps of Adel, Iowa. ADT

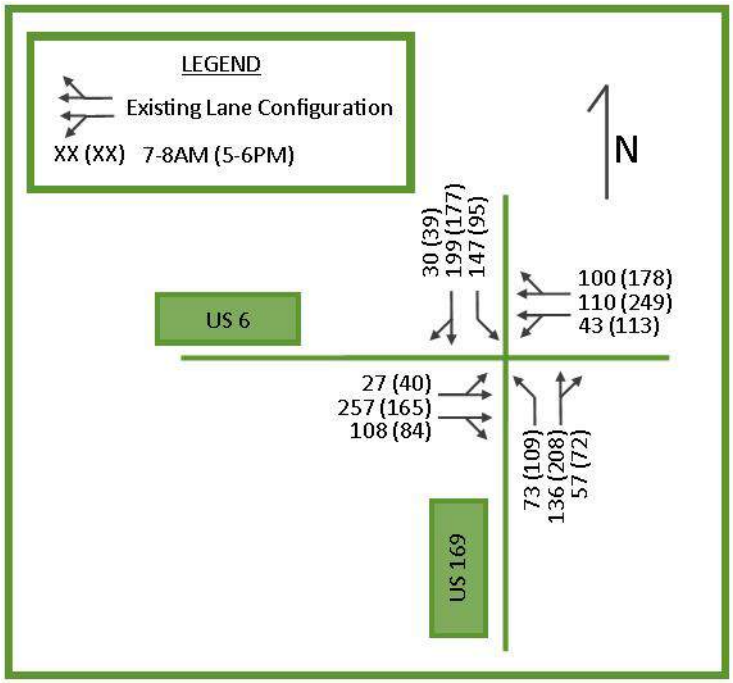
values for more recent years were calculated from the intersection turning movements counts conducted at the intersection of US Highway 169 & US Highway 6 and the intersection of US Highway 169/6 & Meadow Road. The 2004 to 2017 segment AADT volumes are shown below in **Table 4**. Count data from the Iowa DOT is provided in **Appendix C**.

Table 4 – US Highway 169/6 Annual Average Daily Traffic

Segment	2004	2008	2012	2016	2017	2004-2016/2017 Annual Growth Rate
US Highway 6 East of US 169 Junction	8,400	7,900	7,300	9,250	N/A	0.8%
US Highway 169/6 North of Meadow Road	4,610	4,690	4,940	N/A	6,285	2.4%

The Iowa DOT provided the most recent (2016) intersection turning movement counts for the intersection of US Highway 169 & US Highway 6. The AM and PM turning movement counts intersection are shown below in **Exhibit 20**.

Exhibit 20 – US Highway 169 & US Highway 6/Greene Street 2016 Intersection Turning Movement Counts (AM & PM)



The City of Adel in coordination with HR Green completed turning movement counts at the intersections of US Highway 169/6 & the ADM Middle/High School and US Highway 169/6 & Meadow Road on Wednesday, January 18, 2017. Turning movement collection periods were conducted over a 24 hour period. The counts included breakouts between the following:

- Turning movements by approach
- Composition of passenger vehicles and trucks
- Pedestrian crossings by approach

Count data from the City of Adel is provided in **Appendix D**. The AM and PM turning movement counts at each intersection are shown below in **Exhibit 21** and **22**.

Exhibit 21 – US Highway 169/6 & ADM Middle/High School 2017 Turning Movement Counts (AM, SCHOOL DISMISSAL, & PM)

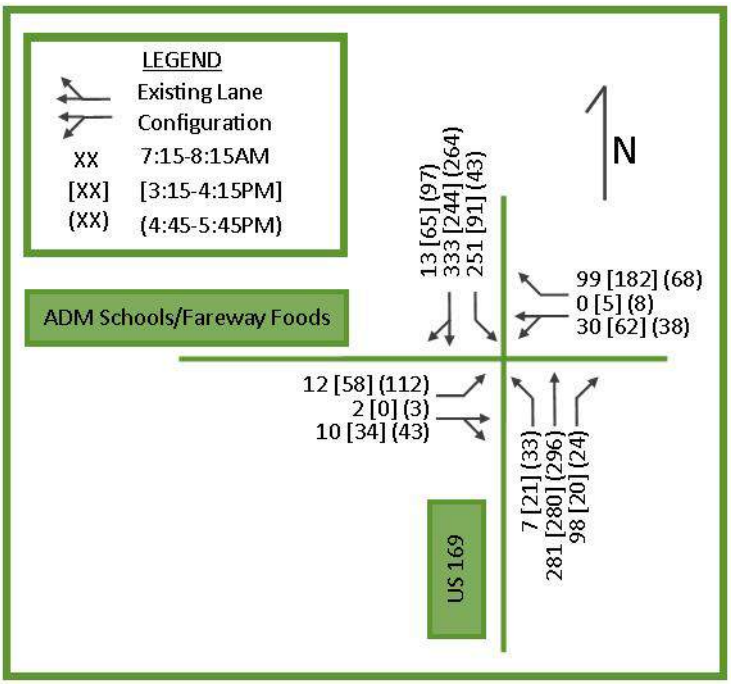
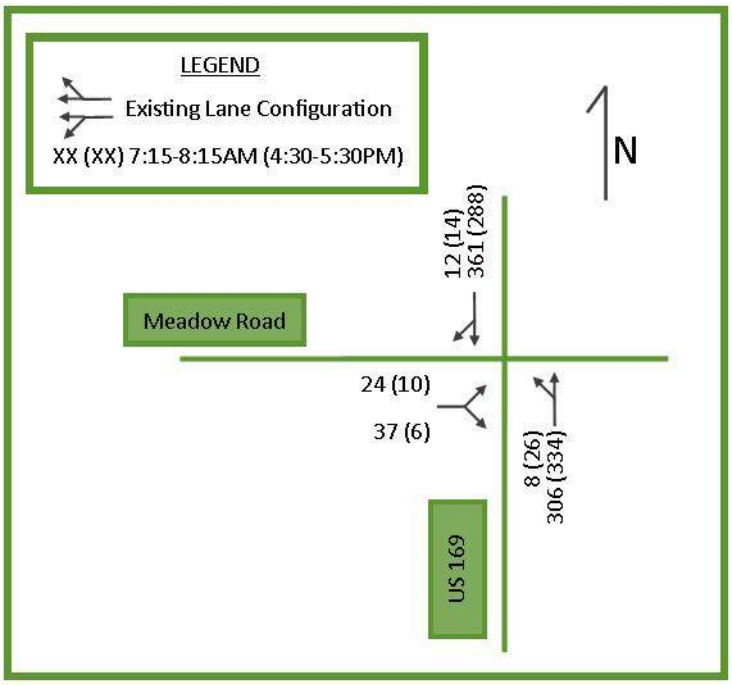


Exhibit 22 – US Highway 169/6 & Meadow Road 2017 Turning Movement Counts (AM & PM)



Traffic Projections

There are several planned residential developments along US Highway 169/6 that, when completed, will add approximately 400 new residential single family homes to the area. These residential housing projects are in various stages of planning, development, and construction. When completed, the intersections of Timberview Drive, Bailey's Grove Drive, and Meadow Road will be extended, creating a four-legged intersection at each of these locations.

The proposed residential developments include:

- Timberview West - planned for land west of US Highway 169/6 and providing access to US Highway 169/6 at the intersection with Timberview Drive. The land is planned to include approximately 155 residential lots.
- Bailey's Grove – planned for land west of US Highway 169/6 and providing access to Highway 169/6 from the intersection of Bailey's Grove Drive and from the intersection with Meadow Road. This is an extension of an existing residential development and will add approximately 44 residential lots to the site.
- Southbridge – planned for land east of US Highway 169/6 and providing access to US Highway 169/6 at the intersections with Bailey's Grove Drive, Meadow Road, and 302nd Place. The land is planned to include approximately 196 residential lots.

All development plans are considered preliminary and the proposed number of lots and access locations are not definite. The residential developments could potentially include additional access points or require modification of existing intersections along US Highway 169/6 to facilitate the increased traffic volumes generated by the new developments.

The proposed site location of the above mentioned residential developments can be seen in **Exhibit 23**.

Exhibit 23 – Proposed Residential Developments

The traffic volumes on the US Highway 169/6 corridor and the intersections related to the new residential developments were considered and additional average daily traffic volumes produced by the future residential development were estimated.

To the extent possible, trip generation estimates for the planned residential housing developments were based on the Institute of Transportation Engineers' (ITE) publication, "Trip Generation: An ITE Information Report", 8th Edition. This publication provides trip generation estimates based on studies conducted across the nation for various land uses. Trip generation estimates for newly proposed developments were calculated using the weighted average trip generation rate.

Table 5 shows the ITE land use assumptions used to estimate the trips generated by the proposed residential developments.

Table 5 – ITE Land Uses Assumptions

Site Plan Land Use Description	ITE Code #	Independent Variable Assumption	Fitted Curve Equation	R^2
Single Family Detached Housing	210	*X* Dwelling Units	Ln(*T*)=0.92Ln(*X*)+2.72	0.95

For ITE land use code 210, the independent variable used for trip generation is the estimated number of dwelling units. The trip generation rate equation provides results in terms of the average weekday vehicle trip ends or the average 24-hour total of all vehicle trips counted to and from a study site from a Monday through Friday. The dataset used to formulate the trip generation rate had an average rate of 9.52 trips per dwelling unit, and a standard deviation of 3.70. Trip generation results are provided with a directional distribution of 50% entering and 50% exiting trips.

The analyses of the proposed residential developments are presented as full build-out. The trip generation estimates for the entire development, anticipated to utilize the US Highway 169/6 corridor, are shown in **Table 6**.

Table 6 – Residential Development Traffic Generation

ITE Code #	ITE Land Use Description	DAILY TRIPS			
		Dwelling Units	Total Trips	Entering Trips	Exiting Trips
Timberview West					
210	Single Family Detached Housing	116	1,204	602	602
Bailey's Grove Addition					
210	Single Family Detached Housing	44	493	247	247
Timberview Addition					
210	Single Family Detached Housing	19	228	114	114
Southbridge					
210	Single Family Detached Housing	43	483	242	242
210	Single Family Detached Housing	99	1,041	521	521
210	Single Family Detached Housing	54	596	298	298
	Development Totals =		***4,045***	***2,023***	***2,023***

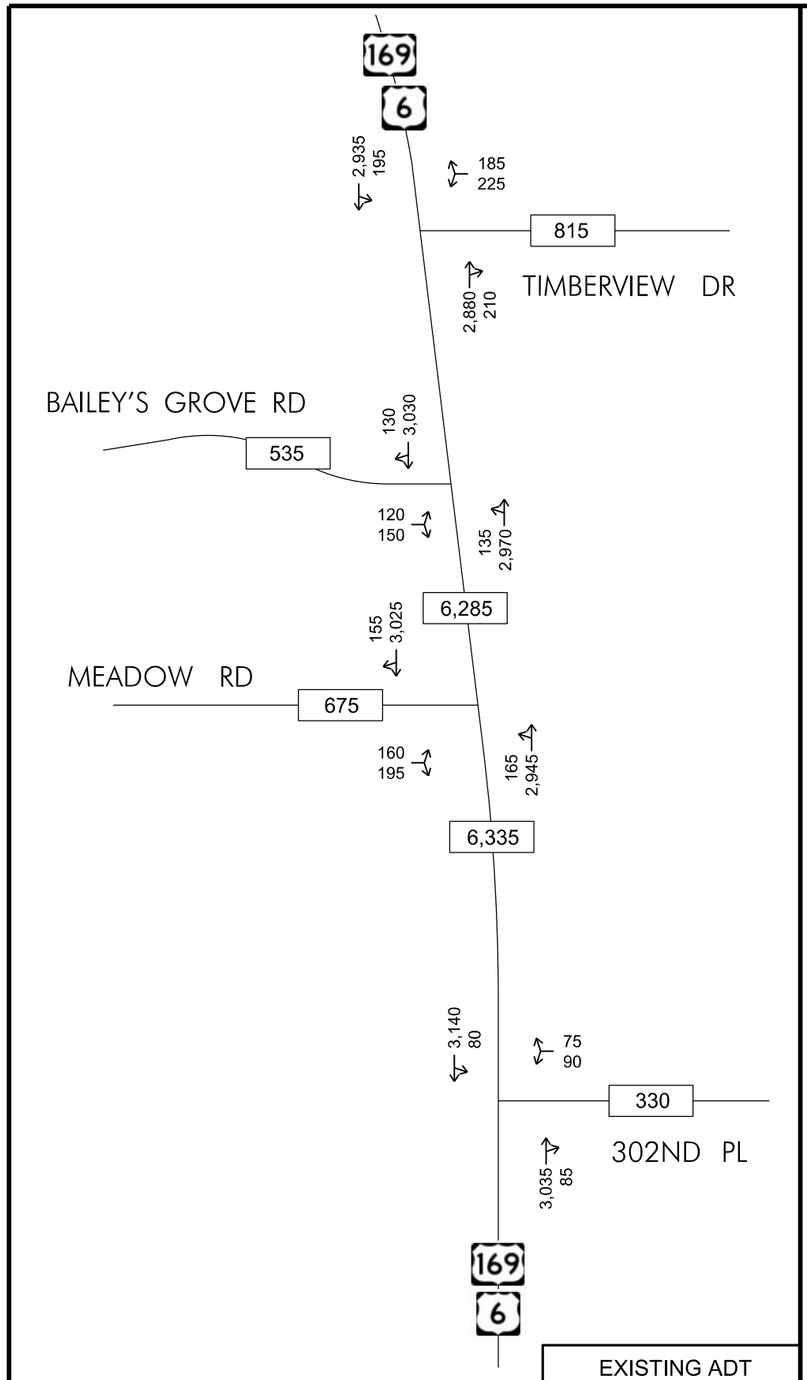
Trip Distribution is the process of assigning the anticipated trips generated by the new development to the roadway network. Several assumptions were needed to complete this task. The assumptions were based upon existing traffic trends as well as anticipated flow characteristics internal to the proposed development.

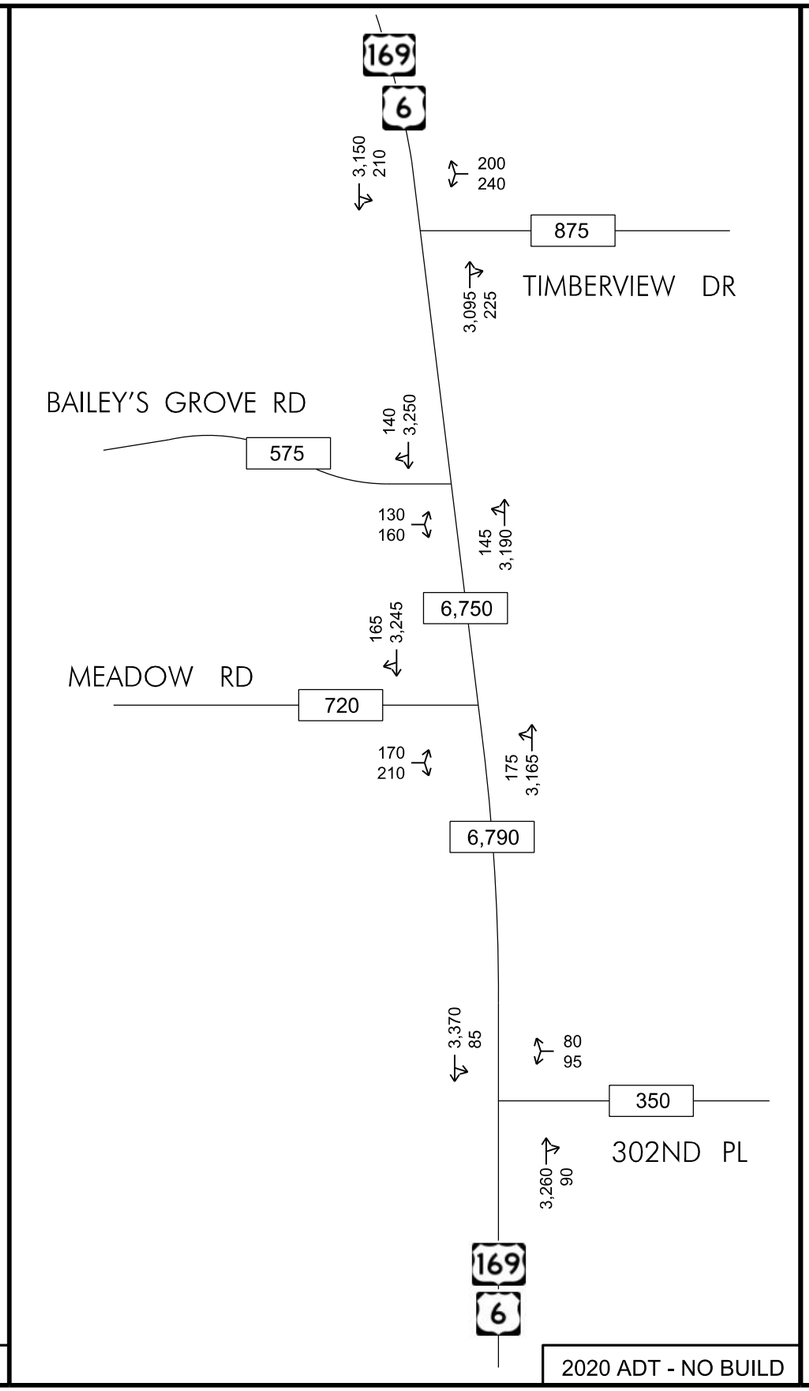
The distribution of the newly generated traffic was determined by constructing break lines separating the residential development housing lots into sections that filtered traffic flows to the nearest intersecting roadway with US Highway 169/6. Turning movements at the newly constructed intersection approaches were estimated by developing ratios

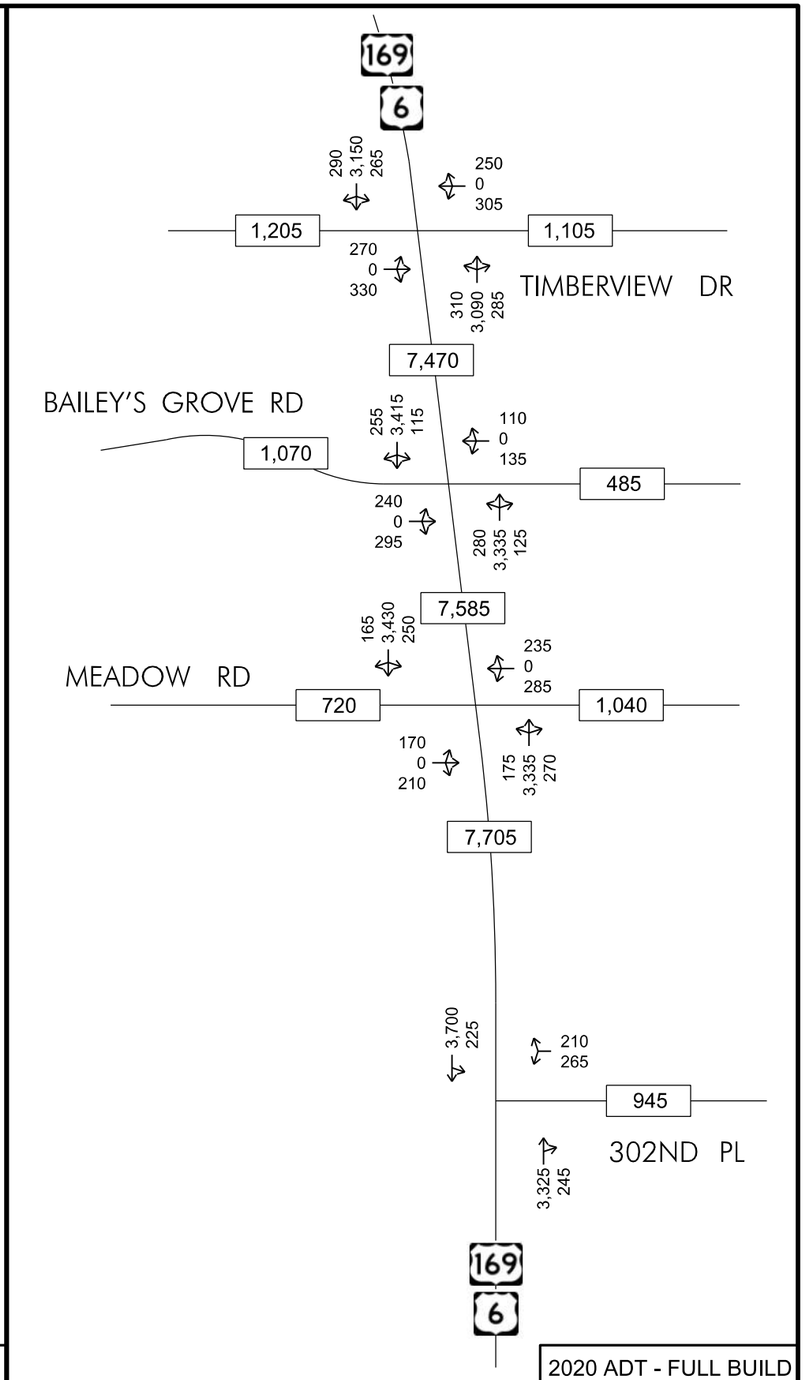
from existing intersection approaches and using these to produce reasonable approximations of turning traffic volumes.

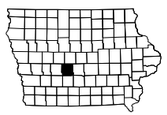
Traffic projections accounting for future 2020 traffic generated by the development of lands bordering the US Highway 169/6 corridor was used to estimate corridor intersection design needs. The Iowa DOT provides geometric design guidance for rural two-lane intersections within Chapter 6 of the Iowa DOT Design Manual. Procedures outlined in Chapter 6A-1 including auxiliary lane warrants were considered with the traffic demands presented by the full build-out development. The auxiliary lane warrant analysis can be seen in detail within the considered options section of this report.

Traffic flow volumes were balanced and smoothed between the intersections as required. The 2020 year average daily traffic trip distribution estimates for the corridor after full build-out of the developments are shown in **Exhibit 24**.









LEGEND

XX,XXX — AVERAGE DAILY TRAFFIC VOLUME (ADT)

X,XXX — ADT TURNING VOLUME

NORTH

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INTERSECTION GEOMETRIC ANALYSIS

The intersection of US Highway 169/6 & US Highway 6/Greene Street was replicated in Bentley MicroStation, to assess existing conditions and establish potential alternatives. As part of this assessment, AutoTURN (version 9.0) was used to graphically depict vehicle turning paths to better understand existing constraints and identify any potential conflict points. Standard vehicle sizes were utilized from the American Association of State Highway and Transportation Officials publication entitled, A Policy on Geometric Design of Highways and Streets, 2011 Edition (AASHTO 2011), commonly known as the 2011 AASHTO Green Book. AASHTO 2011 provides a variety of vehicles that traverse roadways throughout the United States, with specific vehicle characteristics such as width, length, turning angles, minimum centerline radius, among others, that can be used to assess vehicle turning path conflicts within intersections.

Per Iowa DOT design guidelines, an Interstate semitrailer truck (WB-67, AASHTO 2011) was used as the design vehicle at both intersections to represent the largest, permitted vehicle size on the route. A conventional school bus (S-Bus-36, AASHTO 2011) was also assessed, despite the vehicle's less-restrictive turning angle and overall turning path compared to a WB-67 truck.

Two types of turns were evaluated in AutoTURN for each movement, a corner path and an oversteer corner path. A corner path follows a typical turning movement from one roadway to another, ranging from a minimum turning radius allowed by the vehicle to a broad sweeping turn. An oversteer corner path is used for large vehicles that may need to encroach into an adjacent lane at the start and/or end of a turn, characterized by an entry offset into the turn or exit offset out of the turn. Actual turning maneuvers in the field, particularly on lower volume roadways where the opportunity presents itself, often utilize some sort of oversteer in the turning movement but will vary from driver to driver and turn to turn.

In the respective exhibits in which AutoTURN analysis was completed, the solid lines represent the vehicle envelope. The vehicle envelope is the outer point of a vehicle on either side as it completes the turn. Items located within this envelope, whether it is a queued vehicle, signal pole, or curb as examples, will be in conflict with the turning vehicle. A dashed line represents the centerline path of the front axle of the vehicle. In all instances, the turning angle and path represents a best case scenario, or a tight angle for the respective vehicle. It should be noted that factors in the field may not allow for this type of turn, including experience of the driver, positioning of the vehicle prior to making the turn, and non-recurring conflicts that may dictate a different turning path.

Study Intersection: US Highway 169/6 & US Highway 6/Green Street

The intersection of US Highway 169/6 & US Highway 6/Greene Street typically carries a high proportion of truck traffic due to the roadways designated as two primary highways and the direct access to the Interstate 80 road system south of the city. The current intersection geometry includes four lane cross sections on the eastbound/westbound approaches with dual shared thru/turn lanes, three lane cross sections on the northbound/southbound approaches with dedicated left turn lanes and shared thru/right turn lanes.

Existing turning paths of WB-67 trucks are shown in **Exhibit 25** and **26**, depicting any off-tracking and vehicle conflict difficulties the semitrailer trucks may experience when turning at the intersection. Existing turning paths of S-Bus-36 vehicles are shown in

Exhibit 27 and **28**, depicting any off-tracking and vehicle conflict difficulties the school busses may experience when turning at the intersection. The following section provides additional discussion regarding each of the turning movements.

Eastbound/Westbound US 6/Greene Street Truck Turning Paths

The WB-67 truck path needed to complete a right-turn from westbound US 6 to northbound US 169 encroaches into both the adjacent westbound travel lane and the southbound US 169 left turn lane, creating a conflict between the turning vehicle and any other vehicles in queue. This would require trucks to stop and wait for the southbound queue to reverse or proceed when the queue dissipates after receiving a green light. The other option, and likely done in conjunction with encroaching into opposing traffic, is to drive over the sidewalk/curb ramp creating safety concerns for pedestrians and maintenance issues for the sidewalk, adjacent driveway, and curb.

Similarly, the eastbound Greene Street to southbound US 169/6 movement requires a WB-67 truck to encroach into both the adjacent eastbound travel lane and the northbound US 169 left turn lane, creating a conflict between the turning vehicle and any other vehicles in queue. This would require trucks to stop and wait for the southbound queue to reverse or proceed when the queue dissipates after receiving a green light. The other option, and likely done in conjunction with encroaching into opposing traffic, is to drive over the sidewalk/curb ramp creating safety concerns for pedestrians and maintenance issues for the sidewalk, adjacent driveway, and curb.

As shown in **Exhibit 25**, the WB-67 oversteer corner path avoids off-tracking over the curb but encroaches into the opposing lanes. From field observations, it appears that trucks may be frequently off-tracking and some visible curb damage is evident.

The WB-67 truck path needed to complete left-turn movements from the eastbound/westbound approaches of US 6/Greene Street to US 169/6 are constrained to one receiving lane and could potentially encroach on the northbound/southbound US 169 left turn lane, creating a conflict between the turning vehicle and any other vehicles in queue. This would require trucks to stop and wait for the northbound/southbound queue to reverse or proceed when the queue dissipates after receiving a green light. The potential conflict with queued vehicles could be avoided if the truck swings wide by

shifting from the designated turn lane into the adjacent thru lane prior to beginning the turning movements, although this only substitutes one encroaching condition for another.

Northbound/Southbound US 169/6 Truck Turning Paths

The WB-67 truck path needed to complete a right-turn from northbound US 169/6 to eastbound US 6 encroaches into both the adjacent northbound travel lane and the westbound US 6 thru/left turn lane, creating a conflict between the turning vehicle and any other vehicles in queue. This would require trucks to stop and wait for the southbound queue to reverse or proceed when the queue dissipates after receiving a green light. The other option, and likely done in conjunction with encroaching into opposing traffic, is to drive over the sidewalk/curb ramp creating safety concerns for pedestrians and maintenance issues for the sidewalk, adjacent driveway, and curb.

Similarly, the southbound US 169 to westbound Greene Street movement requires a WB-67 truck to encroach into both the adjacent southbound travel lane and the eastbound Greene Street thru/left turn lane, creating a conflict between the turning vehicle and any other vehicles in queue. This would require trucks to stop and wait for the southbound queue to reverse or proceed when the queue dissipates after receiving a green light. The other option, and likely done in conjunction with encroaching into opposing traffic, is to drive over the sidewalk/curb ramp creating safety concerns for pedestrians and maintenance issues for the sidewalk, adjacent driveway, and curb

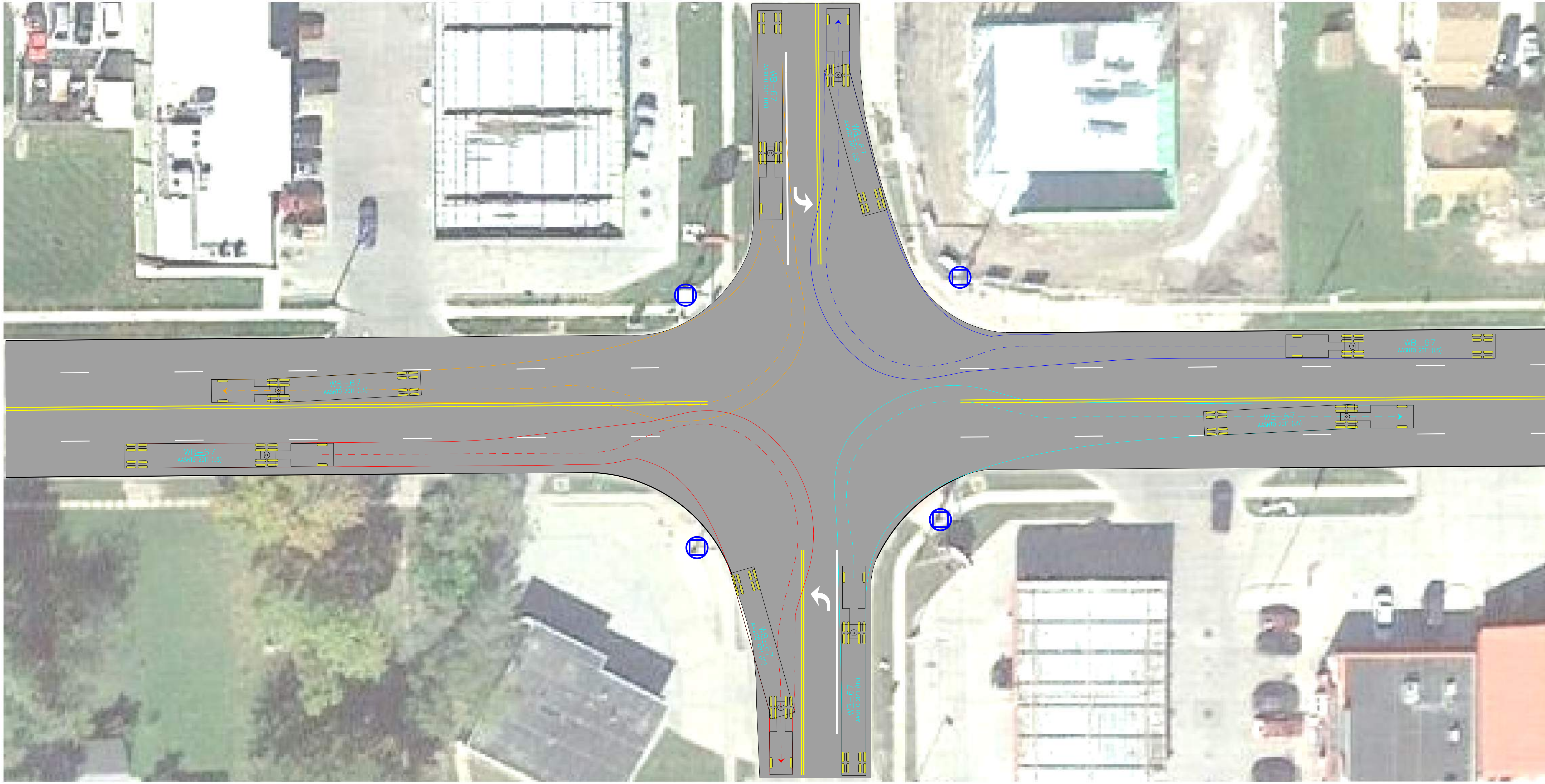
As shown in **Exhibit 25**, the WB-67 oversteer corner path avoids off-tracking over the curb but encroaches into the opposing lanes. From field observations, it appears that trucks may be frequently off-tracking and some visible curb damage is evident.

The WB-67 truck path needed to complete left-turn movements from the northbound/southbound approaches of US 169 to US 6/Greene Street can take advantage of the outer receiving lanes to widen the turning movement and reduce any potential intrusion into the eastbound/westbound opposing lanes of travel.

The desirable turning movement is one that does not encroach into opposing lanes, creating conflicts that lead to safety or operational issues. However, it is understood that

urban areas pose constraints and it is not always feasible to design an intersection that accommodates all WB-67 turning movements that do not encroach into an opposing lane. Therefore, the Iowa DOT Design Manual states that it is desirable that no encroachment into the opposing lane occur on a state highway to state highway or local road to state highway right-turn. For right-turns from a state highway to a low volume local road, trucks may encroach into the opposing lane on the receiving leg.

Through the development of geometric options at the intersection, the guidance and recommendations provided in the Iowa DOT Design will be used to provide the basis for conceptual intersection design. Within the considered options section in this report, the feasibility of converting the US Highway 6/Greene Street legs of the intersection of US Highway 169/6 & US Highway 6/Greene Street from a four lane to a three lane cross-section was examined.



LEGEND

EXISTING PAVEMENT MARKINGS	CORNER PATH ENVELOPE
EXISTING SIGNAL POLE	VEHICLE: WB-67
	CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

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EXISTING CONDITION

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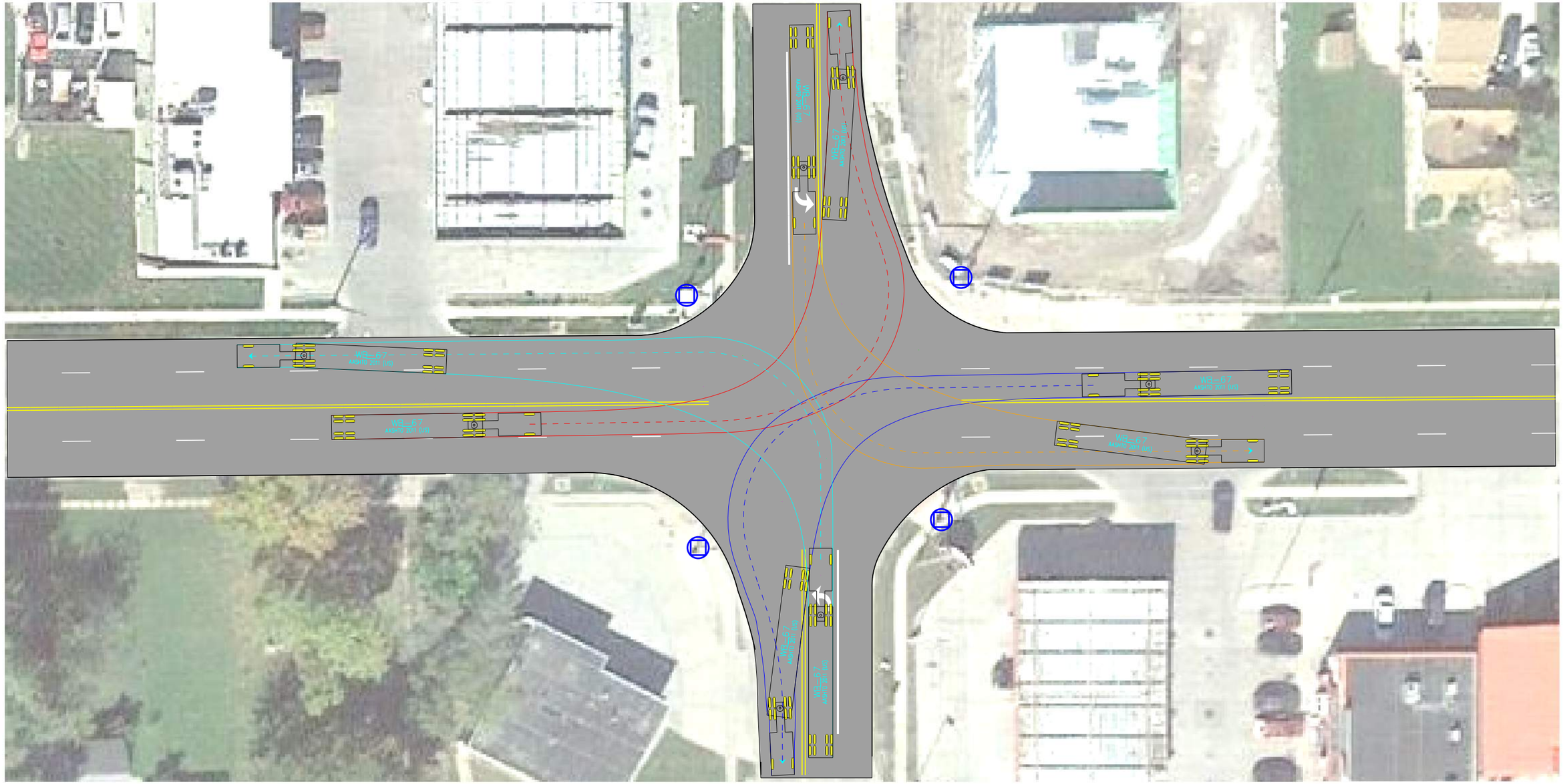

LEGEND

EXISTING PAVEMENT MARKINGS

EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: WB-67

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

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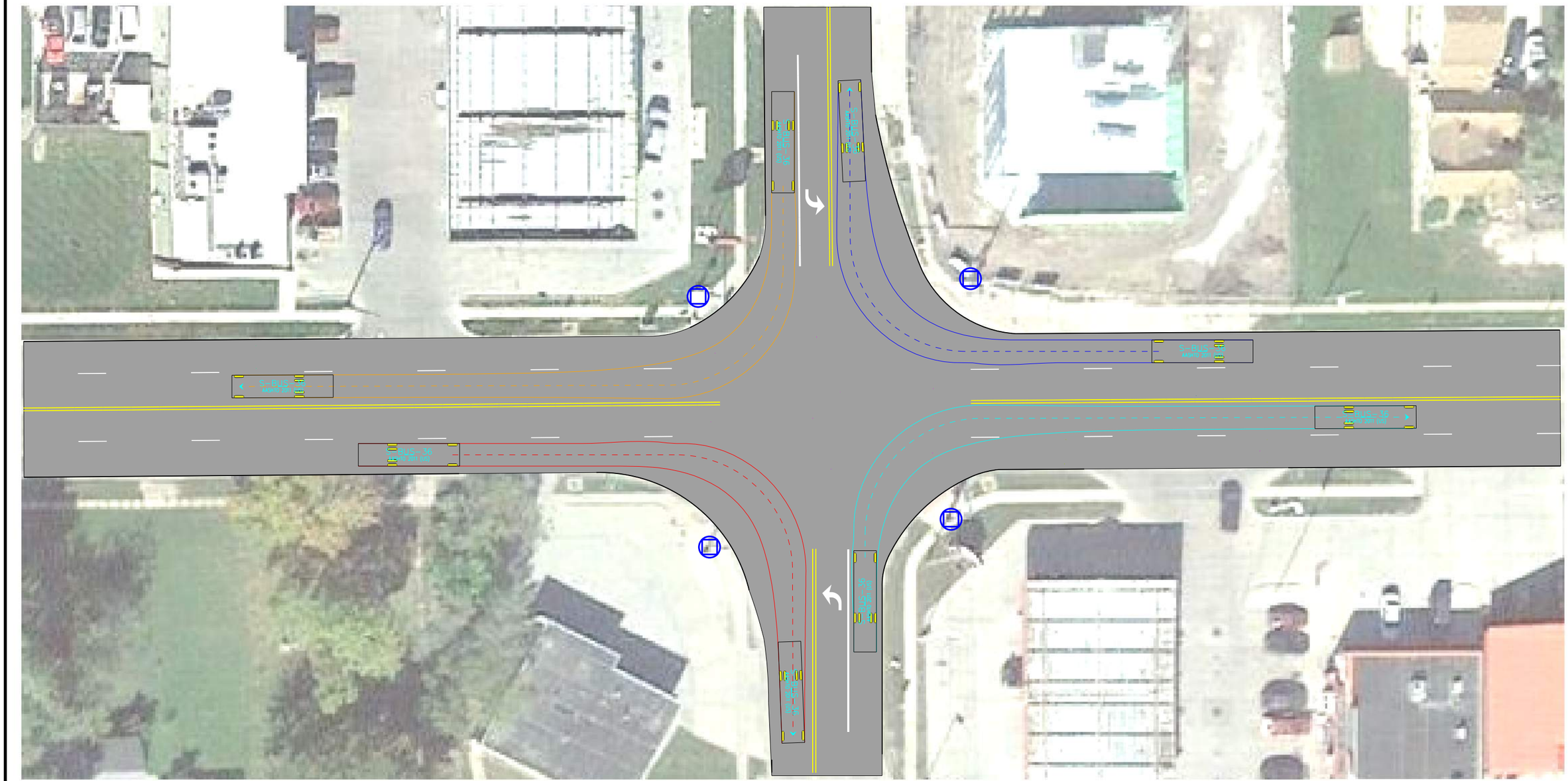

LEGEND

- EXISTING PAVEMENT MARKINGS
- EXISTING SIGNAL POLE
- CORNER PATH ENVELOPE
- VEHICLE: S-BUS-36
- CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

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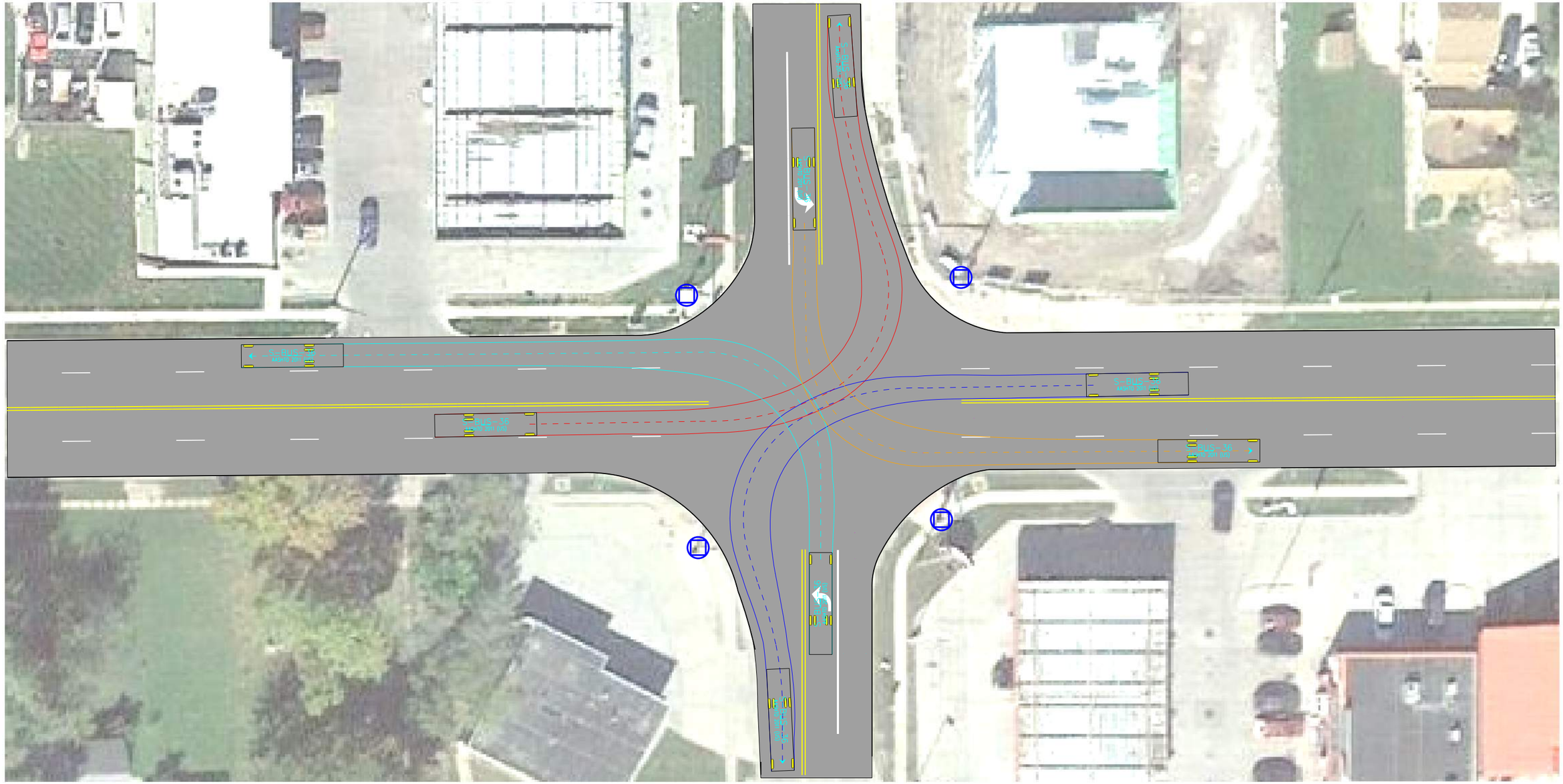

LEGEND

EXISTING PAVEMENT MARKINGS

EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: S-BUS-36

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

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INTERSECTION CAPACITY ANALYSIS

Level of service (LOS) at intersections is primarily a function of peak hour turning movement volumes, intersection lane configuration, and traffic control. For intersection analysis, the Highway Capacity Manual (HCM) defines LOS in terms of the average control delay at the intersection in seconds per vehicle. The results of an HCM analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative estimate of the operational efficiency or effectiveness of the corridor. Much like an academic report card, LOS A represents the best range of operating conditions (i.e., motorists experiencing little delay or congestion) and LOS F represents the worst (i.e., extreme delay or severe congestion).

Table 7 defines the control delay range corresponding to each LOS for signalized intersection locations. LOS E is considered to be at capacity and, typically, LOS D is considered acceptable operations in urban environments.

Table 8 defines the control delay range corresponding to each LOS for un-signalized intersection locations. For un-signalized intersections, the worst-case stop-controlled LOS is reported. For instance, if an intersection experienced LOS D on one approach and LOS B on another, the LOS D would be reported for the intersection.

Table 7 – Level of Service vs. Control Delay (Signalized Intersections)

Level Of Service	Delay / Vehicle (s)
A	0 – 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

Table 8 – Level of Service vs. Control Delay (Un-signalized Intersections)

Level Of Service	Delay / Vehicle (s)
A	< 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Traffic models for the study area were created using Synchro 8 software. The Highway Capacity Manual (HCM 2010) reporting function of Synchro was used to obtain the average delay and corresponding Level-of-Service for each intersection movement. Further information for each analysis condition is contained below. Intersection reports from the Synchro software are available in **Appendix E**.

The results of the current intersection capacity analysis are documented in **Table 9**.

Table 9 – Existing Conditions Capacity Analysis

Peak Hour	Measure of Effectiveness	EB	WB	NB	SB	Overall
US Highway 169 & US Highway 6 / Greene Street (Signalized)						
AM	Delay (sec)	10.6	9.9	6.0	6.5	8.3
	Level of Service	B	A	A	A	A
PM	Delay (sec)	9.2	10.7	8.2	7.9	9.2
	Level of Service	A	B	A	A	A
US Highway 169/6 & ADM High School (TWSC)						
AM	Delay (sec)	28.3	18.6	-	-	28.3
	Level of Service	D	C	-	-	D
PM	Delay (sec)	27.5	15.5	-	-	27.5
	Level of Service	D	C	-	-	D

Based on the intersection turning movement counts presented in the previous section, the study intersection minor road (US Highway 6/Greene Street) approaches typically operate at LOS B or better in the AM and PM peak hours. The study intersection major road (US Highway 169) approaches typically operate at LOS A during both the AM and PM peak hours. The intersection control delay was calculated at 8.3 and 9.2 seconds per vehicle during the AM and PM peak hours, respectively.

The intersection of US Highway 169/6 & the ADM High School/Fareway Foods was shown to operate at LOS D during both the AM and PM peak hours. The intersection control delay was calculated at 28.3 and 27.5 seconds per vehicle during the AM and PM peak hours, respectively. The eastbound and westbound movements are stop controlled and the Level-of-Service for two-way stop control intersections are defined by the highest approach delay experienced on either of the controlled legs. LOS D is generally considered an acceptable operational metric in urban applications.

An exploratory analysis was conducted to determine the effect of signalizing the US Highway 169/6 & the ADM High School/Fareway Foods intersection. The existing intersection geometry was used with the addition of a semi-actuated traffic control signal.

The results of the traffic signal intersection capacity analysis are documented in **Table 10**.

Table 10 – Signalized Conditions Capacity Analysis

Peak Hour	Measure of Effectiveness	EB	WB	NB	SB	Overall
US Highway 169/6 & ADM High School (Signalized)						
AM	Delay (sec)	11.6	14.3	8.2	3.8	6.6
	Level of Service	B	B	A	A	A
PM	Delay (sec)	10.7	9.7	8.1	4.6	7.3
	Level of Service	B	A	A	A	A

The results of the capacity analysis showed that the study intersection minor road (ADM High School/Fareway Foods) approaches typically operate at LOS B or better in the AM and PM peak hours. The study intersection major road (US Highway 169/6) approaches typically operate at LOS A during both the AM and PM peak hours. The intersection

control delay was calculated at 6.6 and 7.3 seconds per vehicle during the AM and PM peak hours, respectively.

Traffic Signal Warrant Evaluation

Traffic signal warrant criteria were evaluated at the US Highway 169/6 & ADM Middle/High School and Fareway Foods access intersection according to the *Manual on Uniform Traffic Control Devices (MUTCD)*, 2009 Edition. Traffic data utilized for the analysis included the 2017 intersection turning movement counts collected by the City of Adel. Procedures to reduce a proportion of right-turn traffic from the minor street were followed prior to applying traffic signal warrants.

The analyses indicated that a traffic signal is not currently warranted by any of the nine MUTCD warrants at the US Highway 169/6 & ADM Middle/High School and Fareway Foods access intersection. The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic signal.

Table 11 below summarizes the results of the traffic signal warrant evaluation.

Table 11 – MUTCD Traffic Signal Warrant Analysis

Traffic Signal Warrant	Satisfied?
Warrant 1 (Eight Hour Vehicular Volume)	NO
Warrant 2 (Four Hour Vehicular Volume)	NO
Warrant 3 (Peak Hour Vehicular Volume)	NO
Warrant 4 (Pedestrian Volume)	NO
Warrant 5 (School Crossing)	NO
Warrant 6 (Coordinated Signal System)	NO
Warrant 7 (Crash Experience)	NO
Warrant 8 (Roadway Network)	NO
Warrant 9 (Intersection near RR Crossing	NO

Additional details of the traffic signal warrant evaluation can be found within **Appendix F**. Specific warrant notes include:

- Warrant 1 (Eight Hour Vehicle): Warrant 1 volume criteria establish a minimum required volume over eight hours within a 24-hour period. 2017 turning movement counts provided by the City of Adel include twenty-four hours of traffic data. None of the twenty-four recorded hours meet volume thresholds of Warrant 1, Condition A volume criteria. Three of the twenty-four recorded hours meet volume thresholds of Warrant 1, Condition B volume criteria. Therefore, the data of the collected hours does not satisfy the eight hours required to satisfy Warrant 1 volume criteria for either Condition A or Condition B. Due to the City of Adel having a population of less than 10,000 and the major street speed limit exceeding 40 mph, the 70 percent factor of required traffic levels was used.
- Warrant 2 (Four Hour Vehicle): Warrant 2 volume criteria establish a minimum required volume over four hours within a 24-hour period. 2017 turning movement counts provided by the City of Adel include twenty-four hours of traffic data. Two of the twenty-four recorded hours meet volume thresholds of Warrant 2 volume criteria. Therefore, the data of the collected hours confirms that traffic volumes do not satisfy Warrant 2 volume criteria. Due to the City of Adel having a

population of less than 10,000 and the major street speed limit exceeding 40 mph, the 70 percent factor of required traffic levels was used.

- Warrant 3 (Peak Hour Vehicle): The 2017 City of Adel turning movement counts did not satisfy Warrant 3, under condition 3B during the 4:45-5:45 PM peak hour. Due to the City of Adel having a population of less than 10,000 and the major street speed limit exceeding 40 mph, the 70 percent factor of required traffic levels was used.
- Warrant 4 (Pedestrian Volume): Pedestrian volumes were not provided for the intersection. The intersection does not have an adjacent sidewalk, curb ramp, or other pedestrian accommodations.
- Warrant 5 (School Crossing): Pedestrian volumes were not provided for the intersection. The ADM Middle/High School is located on the east side of US Highway 169/6 with access provided at the east leg of the intersection. However, this warrant requires a minimum of 20 schoolchildren during the highest crossing hour. It is assumed that the pedestrian volume would not satisfy this warrant.
- Warrant 6 (Coordinated Signal System): The intersection is not within a coordinated signal system.
- Warrant 7 (Crash Experience): Two reported crashes have occurred at the intersection in the previous five years. A total of two crashes in five years do not satisfy Warrant 7 crash criteria.
- Warrant 8 (Roadway Network): Roadway network requirements do not necessitate a traffic signal at this intersection.
- Warrant 9 (Intersection near a Grade Crossing): The intersection is not located near a railroad grade crossing.

At this time, a traffic signal is not recommended at the US Highway 169/6 & ADM Middle/High School and Fareway Foods access intersection due to the existing traffic volume data not satisfying any of the MUTCD traffic signal warrants.

As shown in the warrant analysis and capacity analysis, the traffic volumes do not show a need based on the 8-hour or 4-hour volume warrant or delay calculations in the capacity analysis. Furthermore, the crash history does not indicate an existing safety issue at the intersection that would be susceptible to correction by a traffic control device, as there have only been two reported crashes in the previous five years, not meeting the criteria of five crashes within the last twelve months.

It is recommended that the City of Adel monitor the intersection under future traffic demand and reevaluate the future implementation of a traffic signal at this intersection. As shown in the signal warrant analysis in **Appendix F**, Warrant 2 is nearly met with two of the four hours currently meeting minimum volume warrants. With the future residential developments in the south, it is anticipated that this warrant may possibly be met as traffic volumes increase through the corridor.

CONSIDERED OPTIONS

The following section explores options that were considered and may be of interest for improving the safety and operational efficiency along the US Highway 169/6 corridor. The proceeding mentioned options are not recommendations, but rather items that may have associated benefits as well as potential disadvantages. The proceeding mentioned options are arranged in no particular order. Final recommendations for the study corridor can be found within the Recommended Improvements section of this report.

US Highway 169/6 & US Highway 6/Greene Street Intersection Modifications

The intersection of US Highway 169 & US Highway 6/Greene Street has been identified by local City Administration as an intersection of focus for this study due to the increase in traffic demand and subsequent congestion that the intersection has experienced in recent years. Alternatives to traffic control and lane use for this intersection have been considered and potential options can be seen below.

4 Lane to 3 Lane Roadway Conversion

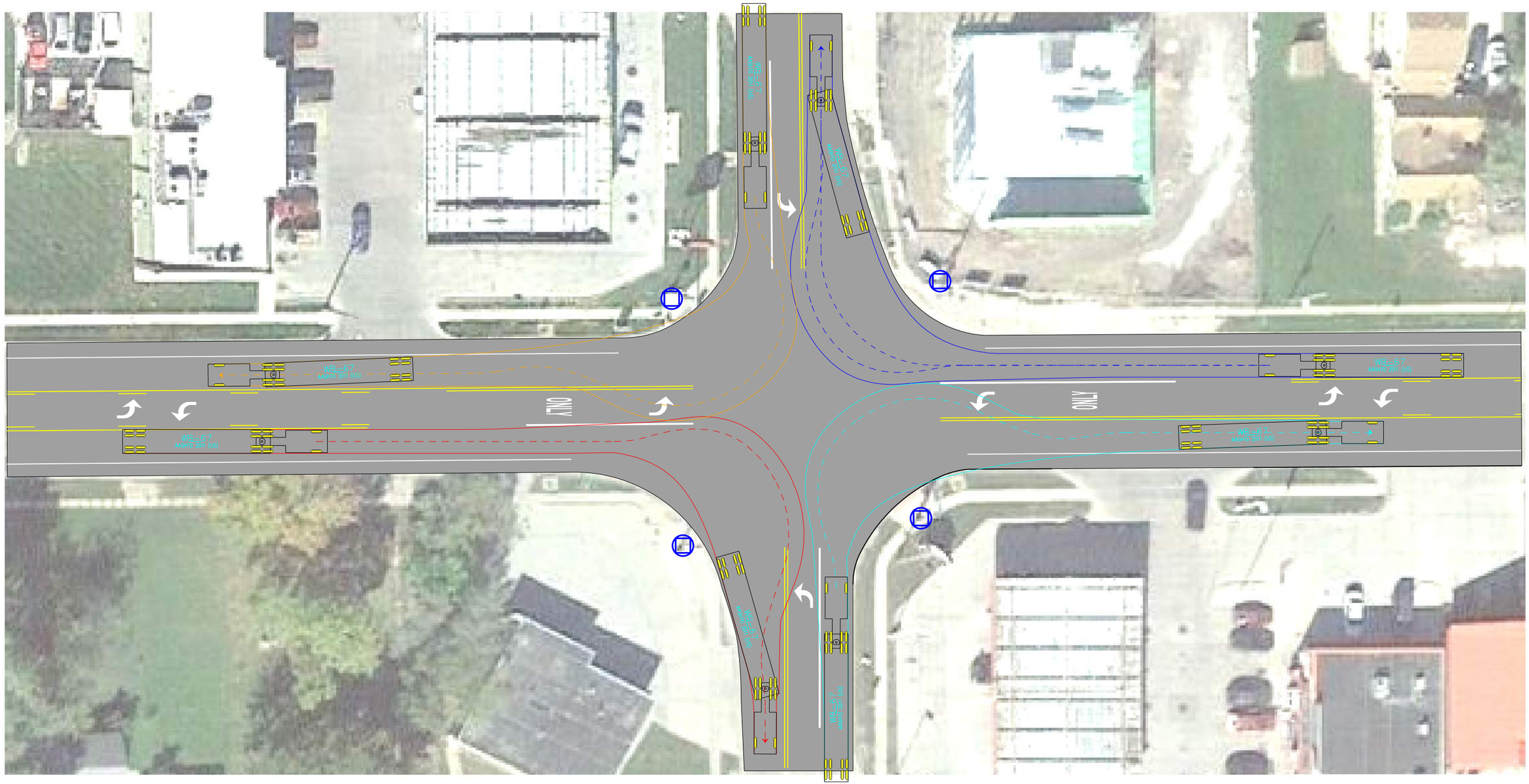
The intersection of US Highway 169/6 & US Highway 6/Greene Street typically carries a high volume of truck traffic due to the roadways designated as two primary highways and the direct access to the Interstate 80 road system south of the city. The current intersection geometry includes four lane cross sections on the eastbound/westbound approaches with dual shared thru/turn lanes, three lane cross sections on the northbound/southbound approaches with dedicated left turn lanes and shared thru/right turn lanes.

Analysis of the turning movements at the intersection of US Highway 169/6 & US Highway 6/Greene Street was conducted using intersection geometry that modified the four lane cross sections on the eastbound/westbound approaches to a three lane cross section including thru/right turn lanes and a two-way left turn lane. The northbound/southbound approaches of US 169/6 remained a three lane cross section with dedicated left turn lanes and shared thru/right turn lanes.

In the respective exhibits in which AutoTURN analysis was completed, the solid lines represent the vehicle envelope. The vehicle envelope is the outer point of a vehicle on either side as it completes the turn. Items located within this envelope, whether it is a queued vehicle, signal pole, or curb as examples, will be in conflict with the turning vehicle. A dashed line represents the centerline path of the front axle of the vehicle. In all instances, the turning angle and path represents a best case scenario, or a tight angle for the respective vehicle. It should be noted that factors in the field may not allow for this type of turn, including experience of the driver, positioning of the vehicle prior to making the turn, and non-recurring conflicts that may dictate a different turning path.

Examination of vehicle turning paths showed that the WB-67 semitrailer truck required extensive off-tracking and encroachment into adjacent and opposing vehicle lanes while completing both right-turn and left-turn movements at the intersection. The S-Bus-36 conventional school bus was proven able to negotiate the turning movements with no apparent conflicts. Due to the inability of a WB-67 design vehicle to complete turning movements while maintaining the appropriate lane position, the conversion of the approach legs of this intersection to a three lane cross section, without reconstructing the curb radii, has been determined unfeasible.

The turning paths of WB-67 trucks are shown in **Exhibit 29** and **30**, depicting any off-tracking and vehicle conflict difficulties the semitrailer trucks may experience when turning at the intersection. The turning paths of S-Bus-36 vehicles are shown in **Exhibit 31** and **32**, depicting any off-tracking and vehicle conflict difficulties the school busses may experience when turning at the intersection.



LEGEND

EXISTING PAVEMENT MARKINGS

EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: WB-67

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

NORTH

NOT TO SCALE

4 LANE TO 3 LANE CONDITION

HRGreen

IOWA DOT

TRAFFIC OPERATIONS & SAFETY STUDY
TRAFFIC DATA
US HWY 169 CORRIDOR
DALLAS COUNTY, IOWA

MARCH 2017

EXHIBIT 29

PAGE 42

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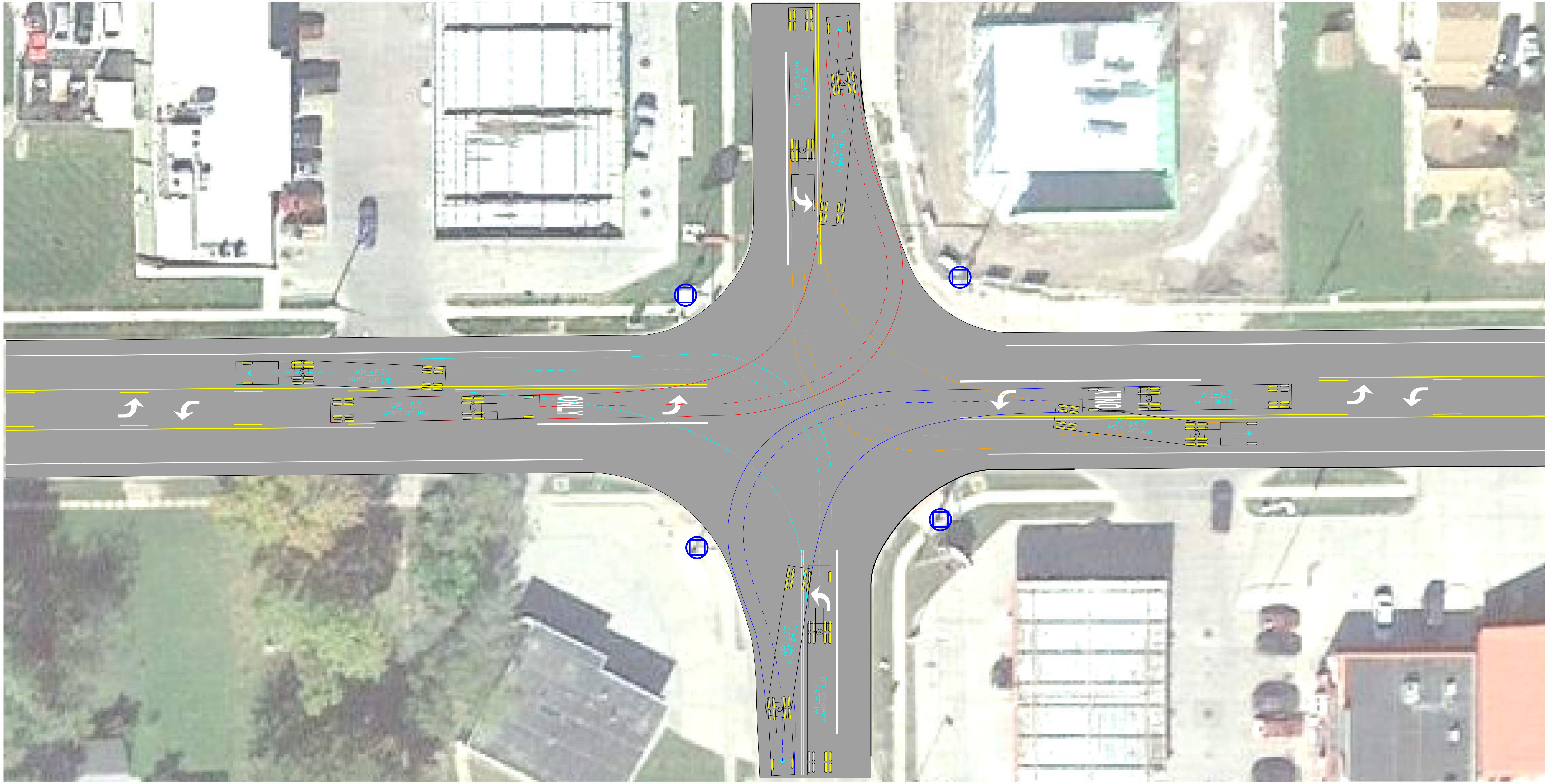


LEGEND

EXISTING PAVEMENT MARKINGS

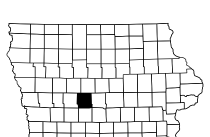
EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: WB-67

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.



NORTH

NOT TO SCALE

4 LANE TO 3 LANE CONDITION

HRGreen

IOWADOT

TRAFFIC OPERATIONS & SAFETY STUDY
TRAFFIC DATA
US HWY 169 CORRIDOR
DALLAS COUNTY, IOWA

MARCH 2017

EXHIBIT 30

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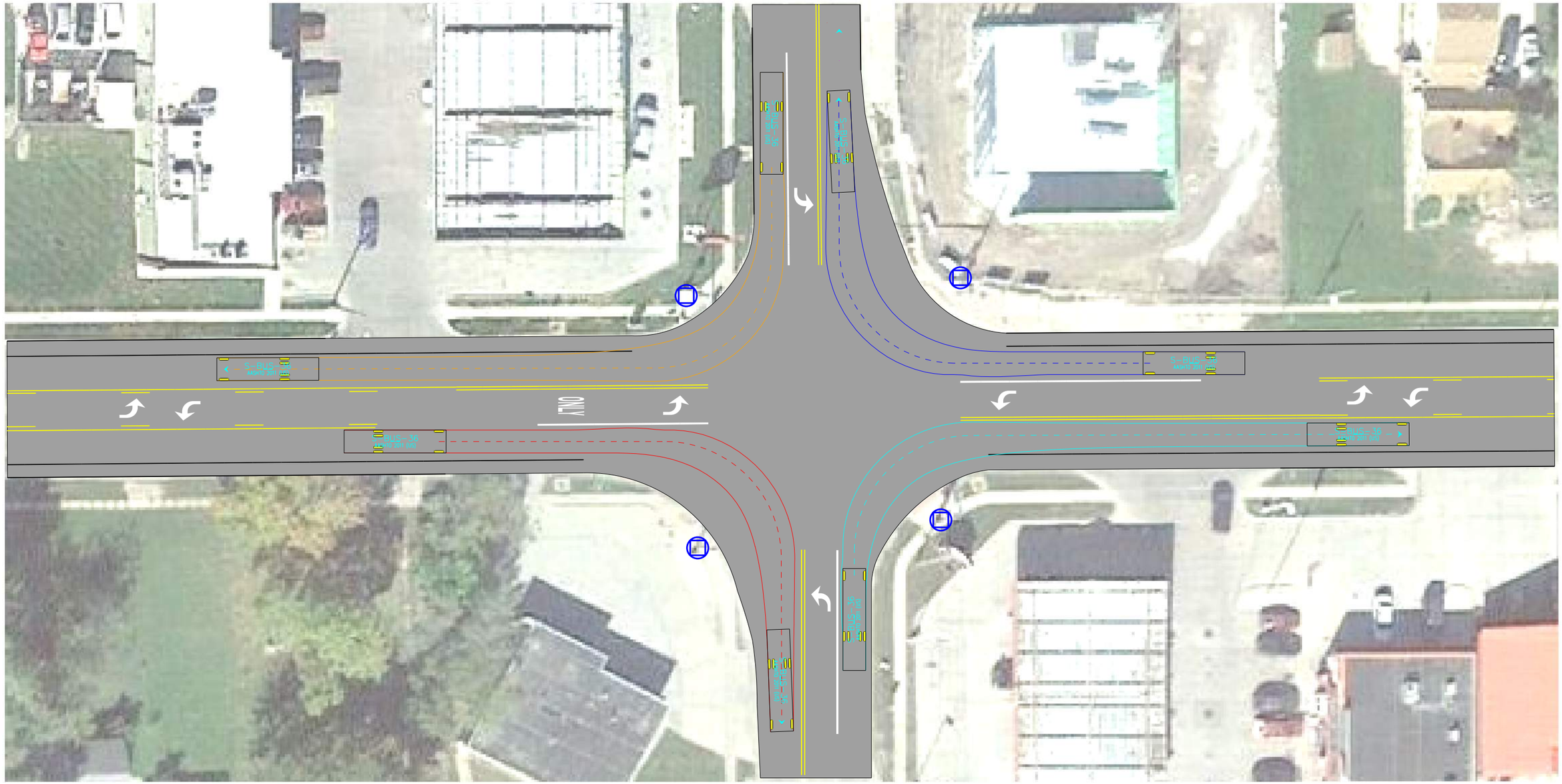

LEGEND

EXISTING PAVEMENT MARKINGS

EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: S-BUS-36

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

NORTH

NOT TO SCALE

4 LANE TO 3 LANE CONDITION

HRGreen

IOWA DOT

TRAFFIC OPERATIONS & SAFETY STUDY
TRAFFIC DATA
US HWY 169 CORRIDOR
DALLAS COUNTY, IOWA

MARCH 2017

EXHIBIT 31

PAGE 44

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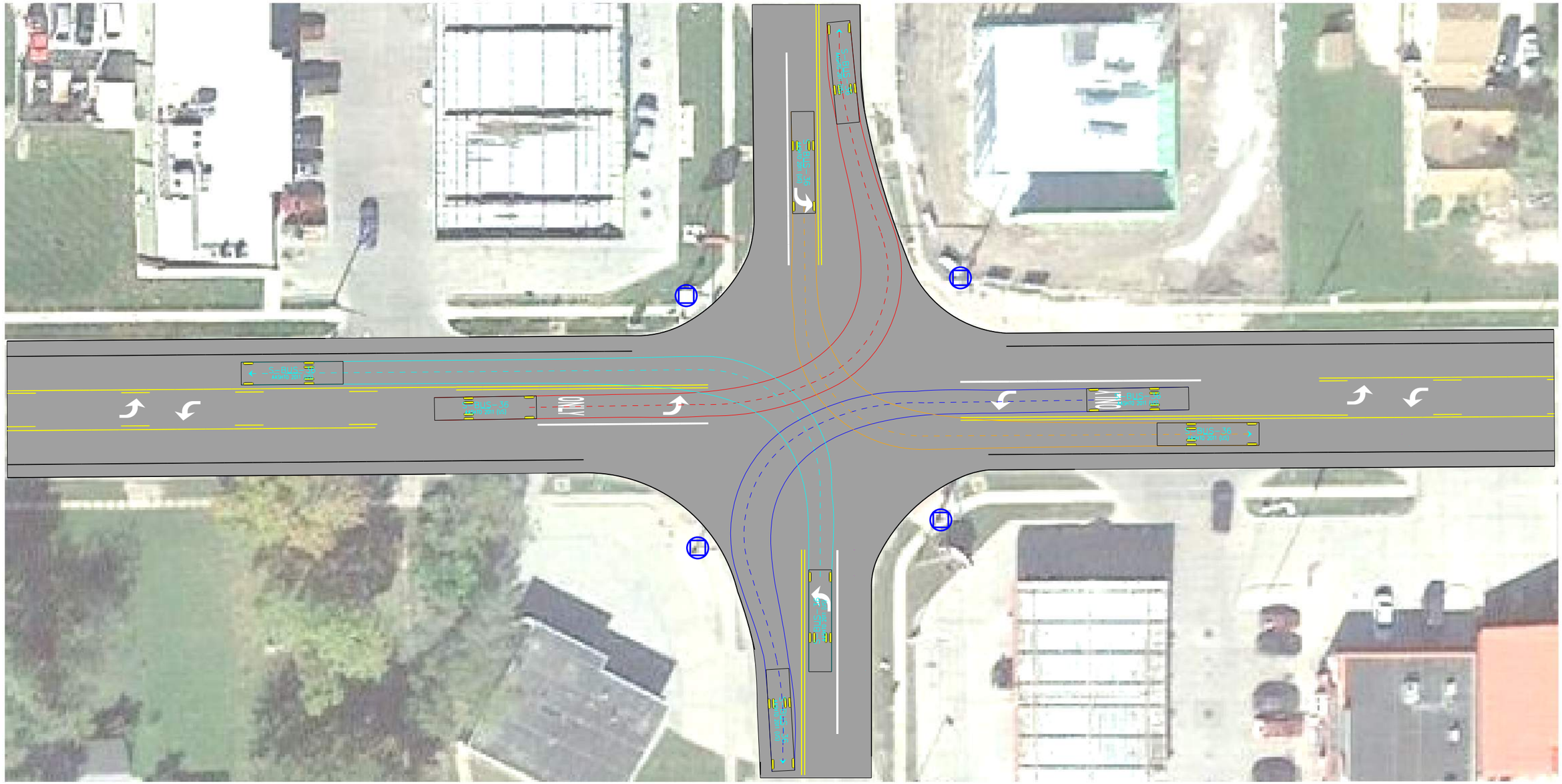

LEGEND

EXISTING PAVEMENT MARKINGS

EXISTING SIGNAL POLE

CORNER PATH ENVELOPE

VEHICLE: S-BUS-36

CENTERLINE RADIUS: 41 FT

EXISTING INFRASTRUCTURE NOTES:
ROADWAY ALIGNMENT, PAVEMENT FEATURES, AND PAVEMENT MARKINGS ARE APPROXIMATE, BASED ON AVAILABLE AS-BUILT PLANS, FIELD OBSERVATION, AND AERIAL PHOTOGRAPHY. THESE FEATURES MAY NOT REFLECT ACTUAL CONDITIONS AND LOCATIONS AS A SURVEY WAS NOT COMPLETED FOR THIS STUDY.

NORTH

NOT TO SCALE

4 LANE TO 3 LANE CONDITION

HRGreen

IOWA DOT

TRAFFIC OPERATIONS & SAFETY STUDY
TRAFFIC DATA
US HWY 169 CORRIDOR
DALLAS COUNTY, IOWA

MARCH 2017

EXHIBIT 32

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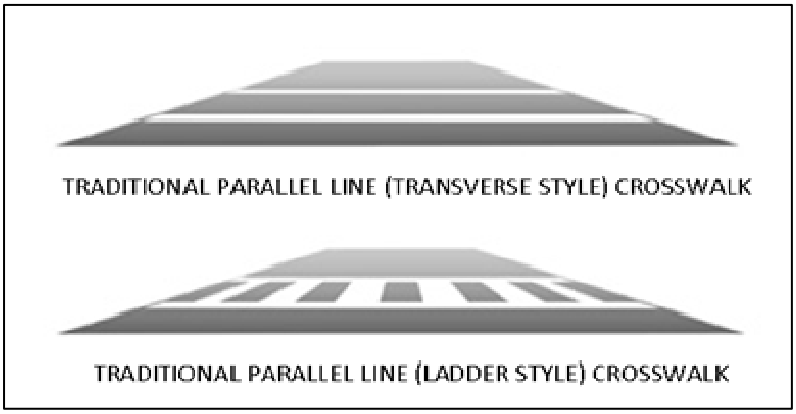
Crosswalk/Stop Bar Pavement Markings

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths across approaches of intersections. In conjunction with signs and other measures, crosswalk markings assist to alert drivers of a designated crossing point across a roadway.

As part of the existing Iowa Code five year agreement between the Iowa DOT and Iowa cities, cities are responsible for all transverse pavement markings within the corporate limits. Exposure to environmental conditions and traffic as well as normal aging will cause pavement markings to deteriorate and fade over time. It is recommended that the City assure that the pavement markings are part of the City pavement marking painting program. Higher grade pavement markings as well as tape marking products (requiring grooving of pavement) could also be explored. These products have higher initial cost, however are expected to last longer.



If implemented, it is recommended that the City of Adel adopt the use of ladder style crosswalks at this intersection to increase visibility. Further, the layout can accommodate typical vehicle wheel paths between the longitudinal markings which will decrease maintenance upkeep. The design recommendations from the MUTCD states that when crosswalk lines are used, they shall consist of solid white lines and not be less than six inches in width and that the diagonal lines should be 12 inches wide and be orientated at a 45-degree angle to the crosswalk. It is recommended that the longitudinal lines should be 12 to 24 inches wide and separated by gaps of 12 to 60 inches. The gap between the longitudinal lines should not exceed 2.5 times the width of the longitudinal lines.

A study completed by Iowa State University in 2006[1] found that the parallel line style (international style or ladder style) of pavement markings provided a greater amount of remaining target value over time than the traditional parallel line (transverse style).

Traffic Signal Improvements/Maintenance

Failure to maintain traffic signal systems can result in traffic signal failure or malfunctions that can lead to increased motorist costs due to unnecessary stops and delays, increased maintenance costs from recurring repairs or replacement of faulty parts, and increased crashes and liability from negligent maintenance practices. The adverse consequences from improper maintenance of traffic signal systems can place a significant burden on agencies and potentially result in liability judgments.

[1] Neal Hawkins and Hillary Isebrands, 2006, Internal Staff Review for Six Selected Pedestrian Crossing Locations, Center for Transportation Research and Education, Iowa State University

Once funding becomes available, the traffic signal should be upgraded to current standards of practice. The list below contains items that should be included under further study of the existing traffic signal system.

- Vehicle Signal Heads – The following items should be studied further:
    - Use of LED signal heads to reduce energy consumption.
    - Evaluate the future needs/impacts of changing to a protected-permissive flashing yellow phase for the northbound and southbound approach left-turn movements rather than the current permissive phasing.
- Pedestrian Signal Heads - Use of symbol indications rather than letter wording to provide a clearer intent of the message and increase recognition. Also, use of a countdown display in order to inform pedestrians of the number of seconds remaining in the pedestrian change interval should be used.
- Signal Poles - Evaluate existing pole placements with respect to pedestrian push button access and lateral sidewalk accessibility needs. Chapter 4E of the MUTCD should be used as reference.
- Cabinet Equipment - Evaluate existing cabinet components to determine replacement needs. The traffic signal controller may need to be replaced if flashing yellow left-turn signal heads are implemented.
- Detection Equipment – Evaluate current vehicle detection components in conjunction with other traffic system improvements to ensure compatibility.

The traffic signal systems at the study intersection should be inspected by a trained traffic signal technician with appropriate International Municipal Signal Association (IMSA) certification to evaluate the current signal system infrastructure status and to identify existing components in need of repair or replacement. As an example, the existing malfunction management unit (MMU) within the traffic signal controller cabinet may need tested, serviced and/or replaced.

With any potential traffic signal modification such as installation/relocation of a traffic signal pole/pedestrian pole, consideration should be given to Section 12A-2 of the Iowa DOT Design Manual regarding accessible sidewalk requirements. Section 12A-2 contains requirements based upon the *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (July 26th, 2011) (PROWAG).* The DOT Manual and PROWAG state that where elements are altered or added (traffic or pedestrian signal) to existing pedestrian facilities, however the pedestrian circulation path is not altered, the pedestrian circulation path is not required to be modified, however, elements that are added shall be made accessible to the maximum extent feasible.

It is prudent that the City implement an annual traffic signal maintenance plan to assure that the necessary funds/resources are programmed for the maintenance of all traffic signals within the City of Adel. As part of the maintenance plan, all existing traffic signals would be assessed to identify potential maintenance needs, such items to consider:

- Condition of signal heads
- Signal structure integrity
- Signal controller cabinet internal components
- Detection Equipment

Chapter 1 of the *Institute of Transportation Engineers (ITE) Traffic Signal Maintenance Handbook (2010)* provides guidance for municipalities desiring to develop an in-house traffic signal maintenance plan. The section includes a ten step process to develop a plan.

In addition, the current traffic signal timings at the US Highway 169/6 & US Highway 6/Greene Street intersection may benefit from a signal timing optimization/retiming review. Signal retiming is a process that optimizes the operation of signalized intersections through a variety of low-cost improvements, including the development and implementation of new signal timing parameters, phasing sequences, and improved control strategies. A signal timing evaluation considers total cycle length, including the minimum green, yellow, and all-red times of each phase. Signal retiming is considered one of the most cost effective ways to improve traffic flow along a corridor. Traffic signal retiming can significantly reduce delays and stops experienced by motorists, which can improve safety and reduce fuel consumption and emissions.

As part of the signal timing evaluation, special attention should be made to the yellow and all-red signal timings. Yellow times may have an impact on rear-end crashes and all-red times can have an impact on broadside crashes if the timing values are too low. In addition, the minimum green values should be verified as part of the signal timing evaluation.

Protected-permissive left-turn phasing operation represents the combination of the permissive and protected modes. Left-turning drivers have the right-of-way during the protected left-turn phase. They can also complete the turn “permissively” when the adjacent through movement receives its circular green indication. This mode provides for efficient left-turn movement service, often without causing a significant increase in delay to other movements. This mode also tends to provide relatively safer left-turning operations. The implementation of protected/permissive signal phasing requires vehicle detection for left-turn lanes.

Although there are no nationally established warrants mandated by the MUTCD, there are recognized academic resources that have formulated guidelines used for the consideration of left-turn phasing. NCHRP Report 457 entitled *Evaluating Intersection Improvements: An Engineering Study Guide* includes guidelines for providing left-turn phasing and determining whether the left-turn phase should operate as protected-plus-permitted or protected only. These guidelines account for collision frequency, intersection geometry, sight-distance, left-turn delay, and volume conditions.

According to the NCHRP guidelines, providing protected left-turn phasing requires the fulfillment of at least one of the following criteria:

- 4 or more left-turn accidents per year or 6 left-turn collisions in a 2 year period,
- less than 5.5 seconds of sight distance for oncoming vehicles,
- 2 or more dedicated left-turn lanes,
- 4 or more opposing through lanes,

According to the NCHRP guidelines, providing protected-permitted left-turn phasing requires the fulfillment of at least one of the following criteria:

- Single lane opposing approach through lanes with greater than 50,000 vehicles as a product of the left-turn volume multiplied by the opposing through and right turn volume,

- Two or three lane opposing approach through lanes with greater than 100,000 vehicles as a product of the left-turn volume multiplied by the opposing through and right turn volume,
- Left-turn volume greater than 2 vehicles per cycle and left-turn delay greater than 2 vehicle hours and 35 seconds per vehicle.

The intersection US Highway 169/6 & US Highway 6/Greene Street does not meet the given criteria for the inclusion of protected or protected-permitted left turn phasing, at this time. For this reason, the evaluation concluded that implementing protected turn phases would be unnecessary.

US Highway 169/6 Corridor Modifications

The US Highway 169/6 corridor between the intersections of US Highway 169 & US Highway 6/Greene Street and US Highway 169/6 & 302nd Place was examined for potential safety and operational deficiencies. Visibility, driver expectancy, and vehicle turning movement conflicts at intersections along the corridor have been carefully considered and potential options to mitigate the identified traffic concerns can be seen below.

Corridor Signing Improvements

Through review of the US Highway 169/6 study corridor, there are several speed transitions located within the boundaries of the study area. Posted speed limit (MUTCD R2-1) signs regulate speeds from 55 mph at the southern limits of the study area to 45 mph near Timberview Drive, then 30 mph after the intersection with the ADM Middle/High School, and 25 mph as US Highway 169/6 nears the intersection with US Highway 6/Green Street. The location of the existing posted speed limit signs can be seen previously in **Exhibit 19**.

The Iowa DOT is responsible for postings of all regulatory speed limits based on a thorough engineering and traffic study. A 2014 speed limit study was conducted by Iowa DOT along US Highway 169/6 to verify whether the established speed limits should be lowered; the results showed that vehicles were in compliance with the 85th percentile range of speeds, at that time. However, additional analysis may warrant the modification of the regulatory speed limit zones based on the anticipated increased traffic volumes due to the planned residential housing developments. As the planned housing developments reach full build out, an additional speed study analysis for this corridor should be considered.

There are 35 mph (MUTCD, S5-1) school speed limit warning signs with flashing beacons located along US Highway 169/6 to the north and south of the intersection of US Highway 169/6 & the ADM Middle/High School and Fareway Foods grocery store. If a future speed study indicates that speeds should be reduced, then the school district speed limit should also be reviewed.

The Iowa DOT Traffic and Safety Manual, Section 2A-8 allows for the flexible location of non-critical guide signs and warning signs to allow for uniform spacing with priority given to existing regulatory sign locations. Uniform spacing increases the effectiveness of the signs and enhances the ability of motorists to view and understand the message conveyed before encountering another sign. According to the Iowa DOT, the recommended minimum longitudinal spacing of signs in a series is 300 feet for two lane

undivided roadways. However, in instances where speeds are reduced or space is limited, longitudinal sign spacing of five times the posted speed limit or as little as three times the posted speed limit is acceptable.

Consideration should be given to the relocation of the Adel City Limits Gateway Sign (I Series in 2009 MUTCD), from the current location near the intersection with Bailey's Grove Road to the beginning of the corporate limits boundary approximately 1,800 feet south near the intersection with 302nd Place. These signs have been shown to increase the motorist's recognition that they are entering an urbanized area. The urban setting promotes awareness of turning vehicles, higher traffic volumes, and pedestrians when compared to the rural setting.

Corridor Pavement Marking Improvements

Pavement markings guide road users while promoting safe and orderly movement within a highway system. Pavement markings are generally classified as longitudinal or transverse. Longitudinal markings run parallel to the roadway and guide the movement of vehicles by defining the safe limits of travel (i.e., centerline striping, edgeline striping, lane lines, etc.). Transverse markings generally run perpendicular to the lanes of travel and can be words, arrows, symbols, or limit lines that are used to communicate lane usage, or approach warnings (i.e., turn lane arrows, crosswalks, stop lines, PED X-ING, STOP AHEAD, BIKE LANE, etc.).

The application and maintenance of longitudinal pavement markings on all primary roadways are the responsibility of the Iowa DOT following standards outlined in Section 3B of the Iowa DOT Traffic and Safety Manual. The manual states that all centerline markings shall be continuous with the exception of single-lane bridges and intersection approaches. The manual also dictates that edgeline markings shall be continuous, with the exception of intersection approaches and in the presence of roadway segments with curb sections or parking located within cities.

If auxiliary turn lanes are implemented at intersections along US Highway 169/6 the pavement marking plan will need to be updated to accommodate the necessary changes.

Traffic Calming Measures

A 2007 report[2] developed by the Center for Transportation Research and Education (CTRE) at Iowa State University outlines and discusses gateway and low-cost traffic-calming treatments for major routes in small, rural communities. Several of the situations discussed in the report are directly applicable to locations throughout the US Highway 169/6 study area, where high speeds coming from a more rural setting approach a more developed area. The reduction in maximum speeds, variance, compliance to posted speed limits and increasing driver attentiveness are all objectives

[2] Hallmark, Shauna, Eric Peterson, Eric Fitzsimmons, Neal Hawkins, Jon Resler, and Tom Welch. 2007. Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities. Center for Transportation Research and Education. Iowa State University.

of traffic calming measures. An update to the 2007 report, Phase II[3], was published in April 2013.

For the US Highway 169/6 application, the following traffic calming measures were considered for potential implementation:

- Relocate Community Gateway Sign
- Dynamic Speed Displays and Vehicle Actuated Signs
- Enforcement

The objective in this application is to reduce speeds over the 85th percentile speed and decrease variance across the range of observed speeds. The applications are slightly different between the northbound and southbound directions of travel. In the northbound direction, speeds incrementally decrease from 55 mph to 45 mph to 30 mph and finally to 25 mph prior to US Highway 6/Greene Street. The inverse occurs in the southbound direction, increasing from 25 mph to 55 mph. Therefore, the objective in the northbound direction is to calm traffic down to the lower posted speed limit. In the southbound direction, the objective is to maintain speeds at the posted speed limit as the motorist heads southbound into a more rural area.

It is recommended that, if selected, a combination of traffic calming measures be utilized with continued speed enforcement. The careful selection of treatments that supplement the intended objectives is necessary to realize traffic calming benefits.

Dynamic Speed Displays and Vehicle Actuated Signs

Dynamic speed displays and vehicle actuated signs use radar to identify approaching vehicles' speed and dynamically present the speed back to the motorist. These signs can also be configured to be 'detected' by a driver's radar detector. The legend "YOUR SPEED XX MPH" or a similar legend should be displayed on the sign as recommended by the MUTCD. The dynamic feedback provided by these treatments can create the perception of motorists being monitored and foster an increased compliance to posted speed limits.

The dynamic speed display signs can be mounted on posts for a more permanent location or on moveable trailers to allow an agency to place the devices at different locations. MUTCD guidelines dictate that the changeable message signs should be a yellow legend on a black background or the reverse of this.

The purchase cost and maintenance of dynamic speed display signs is the responsibility of the City. Dynamic speed display signs must meet the requirements of the MUTCD.

The Center for Transportation Research and Education (CTRE) lists advantages to these devices as: not adversely affecting vehicle operations, not impacting emergency vehicles or drainage, portability, may be less expensive than enforcement over time, and they are available for immediate implementation. Some of the disadvantages include:

[3] Hallmark, Shauna, Skylar Knickerbocker, and Neal Hawkins. 2013. *Evaluation of Low Cost Traffic Calming for rural Communities, Phase II.* Center for Transportation Research and Education and Institute for Transportation. Iowa State University.

initial costs, maintenance, lost relevance if drivers perceive devices pose no threat of enforcement, and a single device is only effective in one direction.

Potential locations for the employment of dynamic speed display signs include any area where the posted speed limit transitions to a lower speed, or as a reminder within a posted speed zone where the frequency of speed limit offenders is high.

Based on the 2014 speed limit study conducted by the Iowa DOT, vehicles were in compliance with the 85th percentile range of speeds along the US Highway 169/6 corridor. There are no formal warrants for the implementation of dynamic speed display signs, although consideration should be given to the site crash history, speed compliance, and other geometric concerns when determining the appropriate treatment. After the planned residential developments reach full build-out, an additional speed study analysis for this corridor should be considered and the results of that study may necessitate additional measures in the treatment of vehicle speeds.

Speed Enforcement

Continued enforcement of the corridor is recommended to supplement any geometric and signing improvements and traffic calming measures. Compliance to posted speed limits can be greatly improved by implementing a policy of systematic enforcement.

Intersection Infrastructure Improvements

Several intersection improvement measures are available to address safety concerns at intersections within the study area. Examples include, but are not limited to, roadway and lighting infrastructure improvements tailored to individual intersections to meet unique and specific issues at each location.

Left and right turn lanes should be considered for installation at locations where conditions make it advantageous to remove turning vehicles from the through lanes. Multiple criteria are used to account for varying and unique conditions at each intersection, and include: turning vehicle volumes, opposing vehicle volumes, speed on through movement, and design vehicle.

A left-turn storage lane or right-turn deceleration lane reduces through-vehicle delay, queues, and slow speed conditions that impact safety at the intersection. Furthermore, the turning motorist does not feel a more urgent need to make a risky maneuver in order to alleviate the queue behind their vehicle. Disadvantages of adding left-turn or right-turn lanes include contributing to higher through vehicle speeds and increasing intersection size which decreases pedestrian safety and increases overall costs.

The most recent (2016) US Highway 169/6 annual average daily traffic (AADT) volumes were obtained from available Iowa DOT traffic counts of intersections within Adel, Iowa. ADT values for more recent years were calculated from the intersection turning movements counts conducted at the intersections of US Highway 169 & US Highway 6 and the intersection of US Highway 169/6 & Meadow Road. Traffic projections were prepared, as outlined in the preceding sections, to account for future 2020 traffic generated by the development of lands bordering the US Highway 169/6 corridor.

The Iowa DOT provides geometric design guidance for rural two-lane intersections within Chapter 6 of the Iowa DOT Design Manual. It should be noted that the guidance recommends Section 6A-1 not be used for the following situations:

- Intersections on four-lane highways

- Urban intersections
- Intersections on transitional highways
- Signalized intersections

With consideration to the terrain and setting of the study intersections, a rural design may be applicable as much of the land to the south of the study area is designated as agricultural land and presently have no plans of being developed.

Figure 1 in section 6A-1 of the Iowa DOT Design Manual provides rural two-lane highway auxiliary lane warrants, provided in **Appendix G**. The Iowa DOT warrants are based on major-road approach ADT, differentiating between the turning and through movements. A correction factor is applied to ADT based on truck percentages of the major-road approach. 2020 estimated ADT were produced by utilizing the historical growth factors along US Highway 169/6. Based on these warrants for right and left turns, an evaluation utilizing the 2020 estimated ADTs with planned residential development traffic is provided below in **Table 12**.

Table 12 – Turn Lane Warrants

Intersection	US Highway 169 Direction of Travel	Turn Direction	Approach Volume	Turning Volume	Through Volume	Warranted?
Timberview Drive	Northbound	Right	3839	297	3542	Yes
		Left	3839	323	3516	Yes
	Southbound	Right	3742	293	3450	Yes
		Left	3742	268	3475	Yes
Bailey's Grove Road	Northbound	Right	3896	130	3766	Yes
		Left	3896	292	3604	Yes
	Southbound	Right	3823	258	3566	Yes
		Left	3823	116	3707	Yes
Meadow Road	Northbound	Right	3938	281	3656	Yes
		Left	3938	182	3755	Yes
	Southbound	Right	3884	167	3717	Yes
		Left	3884	253	3631	Yes
302nd Place	Northbound	Right	3719	255	3464	Yes
		Left	3719	0	3719	N/A
	Southbound	Right	3763	0	3763	N/A
		Left	3763	227	3535	Yes

From review of **Table 12** above, right and left turn lanes may be warranted under the estimated 2020 ADT's for each intersection along the US Highway 169/6 corridor.

Where a left-turn lane is warranted, the lane is designed to accommodate the required vehicle storage and does not account for deceleration from mainline design speeds. Where a right-turn lane is warranted, there are distinctions between a major and minor right-turn lane designs. A minor-right turn lane assumes deceleration from the design speed begins on mainline and the right-turn lanes only provides deceleration from 30 mph to the speed necessary to navigate the control radius of the intersection. A major right-turn lane provides for full deceleration from the design speed to a speed required to safely maneuver the control radius at the intersection, which is the shortest radius of the intersection.

Intersection lighting should be considered for installation at the study intersections as a safety improvement measure. Intersection lighting adds to the conspicuity and driver expectancy of intersection location, geometry, and signage at night. Rural intersection lighting also provides benefits in the daytime as the luminaire poles provide advance notification of a change in roadway conditions.

A safety impacts of street lighting study[4] completed by CTRE for the Minnesota Department of Transportation found that lighting of rural intersections in Minnesota reduced night crash frequency by 13 percent (statistically significant) and decreased the ratio of night to day crash rates by 36 percent after intersection lighting was installed at the study intersections. It was found that the expected night crash rate before lighting was installed at the study intersections was 59 percent higher than after the lighting was installed.

The City of Adel would be responsible for the installation and maintenance costs of additional roadway lighting.

[4] Isebrands, Hillary, Shauna Hallmark, Zach Hans, Tom McDonald (CTRE) and Howard Preston and Richard Storm (CH2MHill). 2006. Safety Impacts of Street Lighting at Isolated Rural Intersections – Part II. Center for Transportation Research and Education. Iowa State University.

RECOMMENDED IMPROVEMENTS

Through conversations with City of Adel, Iowa DOT staff and field review observations, three primary concerns within the study area were identified:

- Turning vehicles and driver expectancy on US Highway 169/6 intersection approaches
- Vehicle speeds along US Highway 169/6
- Pedestrian safety

In general, the three concerns are interrelated with issues typically contributing to one another at applicable locations. The setting and environment in which the US Highway 169/6 corridor sits lends itself to being perceived as a more rural setting, with numerous potential conflicts due to daily peak traffic volumes and turning movements from shared lanes. Additional development in the area will increase these conflicts as traffic demand grows within the corridor.

Below is a list of recommendations that should be considered in the short term and longer term. Both lists are arranged in order of priority and the list could potentially aid as an implementation prioritization approach plan. Short term recommendations are those that should be able to be implemented fairly quickly and inexpensively. Long term recommendations are those that may require additional prior consideration and planning as well as procurement of funding.

The implementation of the short term recommendations may alleviate the concern to the extent that the long term recommendation becomes unnecessary.

The following recommendations are anticipated to improve the overall safety of vehicles and pedestrians. Refer to the Considered Options section of the report for more detail of each recommendation.

Short Term Recommendations

- Place crosswalk and stop bar pavement markings across all legs of the US Highway 169/6 & US Highway 6/Greene Street intersection
- Update traffic signal heads at the US Highway 169/6 & US Highway 6/Greene Street intersection
- Relocate the City of Adel Gateway sign to a more southern location
- Continue speed enforcement efforts along US Highway 169/6 and consider adding vehicle actuated speed feedback signs

Long Term Recommendations

- Evaluate/update traffic signal timings at the intersection of US Highway 169/6 & US Highway 6/Greene Street.
- Consider reconstruction of US Highway 169/6 to include auxiliary turn lanes as warranted by future traffic demand
- Add luminaires to the intersections along US Highway 169/6 to enhance conspicuity

PLANNING LEVEL OPINION OF PROBABLE COSTS

An order of magnitude opinion of probable cost for the short and long term recommendations presented above is included below.

	Cost Estimate	Notes
SHORT TERM:		
Stop Bar Pavement Markings (Per Approach)	$200 - $300	Construction costs only
Crosswalk Pavement Markings (Per Approach)	$200 - $300	Construction costs only
Remove/Relocate Existing Corridor Signing (Per Sign)	$200 - $300	Construction costs only
Vehicle Signal Head Addition/Replacement (Per Signal Head)	$750 - $1,000	Construction costs only
Install Dynamic Speed Display Sign (Per Sign)		
Hard Powered	$2,000 - $2,500	Construction costs only
Solar Powered	$2,500 - $3,500	Construction costs only
Portable Unit (Trailer Mounted)	$5,000 - $15,000	Construction costs only
LONG TERM:		
Intersection Lighting	-	Further study necessary
Traffic Signal Timing Evaluation	-	Further study necessary
Widen US Highway 169/6 to Include Auxiliary Turn Lanes	-	Further study necessary

NOTES:
* This opinion represents approximate construction quantities only and does not provided a detailed list of expected project pay items. The opinion is to be used as a planning number only. Actual costs may vary, as detailed design plans are prepared.
* Cost do not include any permanent right-of-way and temporary construction easement costs.
* Costs represent current dollars as of report date.

POTENTIAL FUNDING SOURCES

Many funding sources may be available while pursuing funding for elements of the project recommendations.

U-STEP

Funding assistance may be available through the Iowa DOT Urban-State Traffic Engineering Program (U-STEP). U-STEP funding is used to solve traffic operation and safety problems on primary roads in Iowa cities. The city match for U-STEP funding is 45% and the city must engineer and administer the project. An engineering analysis of the problem area is required, and this TEAP study satisfies that requirement. Maximum funding is $200,000 for spot improvements and $400,000 for linear improvements. U-STEP program funding may be applicable for the street lighting and turn lane addition improvements. Funding request letters may be submitted to the District Engineer at any time throughout the year.

STP

Funding for roadway facility improvements by public entities with public road jurisdiction may be available through the “Surface Transportation Program” (STP). Eligible highway/street projects must be on the federal-aid system, which includes all federal functional class routes except local and rural minor collectors. US Highway 169/6 is classified as a principal arterial under the Dallas County region Iowa DOT Federal Functional Classification System Map (Revised – December 19, 2014). A minimum of 20 percent non-federal match is required (80 federal funding). The STP program does impose detailed project requirements which may involve additional effort than other funding sources; however potential funding amounts may be higher. This program could

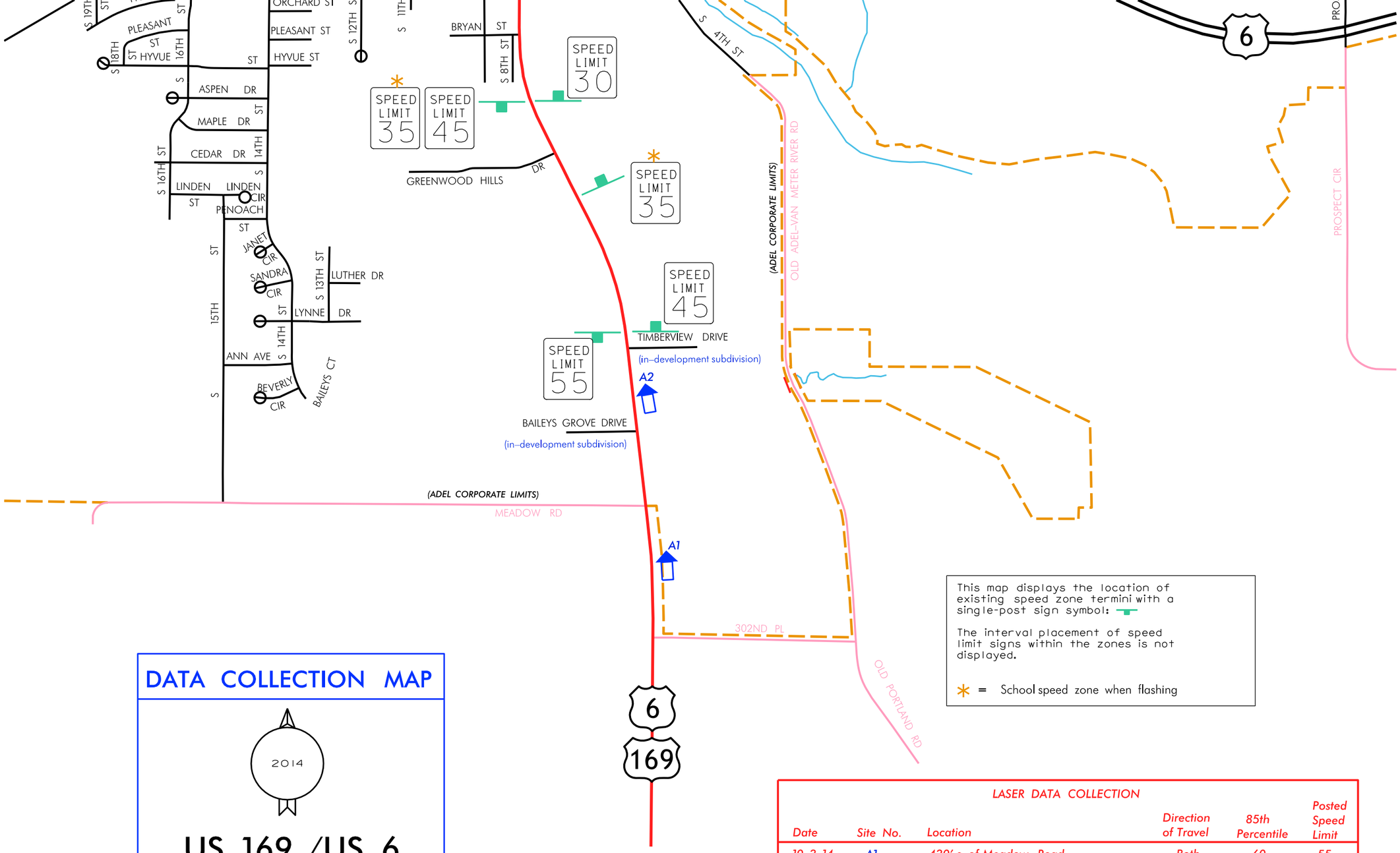
potentially aid in the construction of roadway improvements including turn lane additions along US Highway 169/6. Contact the Iowa DOT for additional information.

ICAAP

Funding may be available under the "Iowa Clean Air Attainment Program" (ICAAP) which funds highway/street projects which help maintain Iowa's clean air quality by reducing transportation-related emissions. Eligible highway/street projects must be on the federal-aid system, which includes all federal functional class routes except local and rural minor collectors. The application deadline for ICAAP funding is October 1st of each year. The average length of time for acceptance decision is four months. In order to qualify for funding, a local match of at least 20 percent is required and the project should fall within one of four categories. Eligible projects must reduce emissions via traffic flow improvements providing a direct benefit to air quality by addressing ozone, carbon monoxide, or particulate matter PM-2.5 or PM-10. Each of the preceding pollutants must be addressed, and a reduction calculation must be provided within the application.

Further information on potential funding sources is available on the Iowa DOT website at http://www.iowadot.gov/fundguid.htm, Information sheets on each of the programs mentioned are provided in **Appendix H** of this report.

Appendix A – Iowa DOT Speed Study



This map displays the location of existing speed zone termini with a single-post sign symbol: ⊢

The interval placement of speed limit signs within the zones is not displayed.

* = School speed zone when flashing

DATA COLLECTION MAP

2014

US 169 /US 6
Adel
Dallas County

NOT TO SCALE

LASER DATA COLLECTION

Date	Site No.	Location	Direction of Travel	85th Percentile	Posted Speed Limit
10–3–14	A1	430′ s. of Meadow Road	Both	60	55
9–23–14	A2	325′ s. of Timberview Drive	Both	56	55

SpeedStat Version 2.3 11/96

Project ID : A1
Street : US 169
Capture Zone : 430 FT SOUTH OF MEADOW ROAD

Direction(s) : BOTH FACING NORTH
Posted Speed Limit: 55
Types of Vehicles : ALL
Weather Conditions: 40S CLOUDY

****

Filter Settings

Date Range : 10/03/14 Through 10/03/14
Time Range : 10:02:00A Through 12:04:00P
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 44
Highest Recorded Speed : 68
Average Speed : 55.9
Vehicles Observed : 246

15th Percentile : 52
50th Percentile : 56
85th Percentile : 60
95th Percentile : 62

10 MPH Pace Speed : 52 Through 61
Percent In Pace Speed : 81.7
Percent Under Pace Speed : 11.8
Percent Over Pace Speed : 6.5

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	23	9.3	55.3
31	0	0.0	0.0	57	21	8.5	63.8
32	0	0.0	0.0	58	27	11.0	74.8
33	0	0.0	0.0	59	20	8.1	82.9
34	0	0.0	0.0	60	15	6.1	89.0
35	0	0.0	0.0	61	11	4.5	93.5
36	0	0.0	0.0	62	9	3.7	97.2
37	0	0.0	0.0	63	1	0.4	97.6
38	0	0.0	0.0	64	2	0.8	98.4
39	0	0.0	0.0	65	2	0.8	99.2
40	0	0.0	0.0	66	1	0.4	99.6
41	0	0.0	0.0	67	0	0.0	99.6
42	0	0.0	0.0	68	1	0.4	100.0
43	0	0.0	0.0	69	0	0.0	100.0
44	1	0.4	0.4	70	0	0.0	100.0
45	2	0.8	1.2	71	0	0.0	100.0
46	1	0.4	1.6	72	0	0.0	100.0
47	0	0.0	1.6	73	0	0.0	100.0
48	3	1.2	2.8	74	0	0.0	100.0
49	5	2.0	4.9	75	0	0.0	100.0
50	7	2.8	7.7	76	0	0.0	100.0
51	10	4.1	11.8	77	0	0.0	100.0
52	16	6.5	18.3	78	0	0.0	100.0
53	17	6.9	25.2	79	0	0.0	100.0
54	24	9.8	35.0	80	0	0.0	100.0
55	27	11.0	45.9				

SpeedStat Version 2.3 11/96

Project ID : A2
Street : US 169
Capture Zone : 325' SOUTH OF TIMBERVIEW DR

Direction(s) : BOTH FACING SOUTH
Posted Speed Limit: 55
Types of Vehicles : ALL
Weather Conditions: SUNNY 60S

****

Filter Settings

Date & Time : 09/23/14 (9:47am - 11:15am); 10/10/14 (10:45am - 11:18am)
Direction(s) : Approaching & Departing
Types of Vehicles : All Vehicles

****

Lowest Recorded Speed : 38
Highest Recorded Speed : 62
Average Speed : 50.8
Vehicles Observed : 200

15th Percentile : 45
50th Percentile : 51
85th Percentile : 56
95th Percentile : 58

10 MPH Pace Speed : 47 Through 56
Percent In Pace Speed : 68.5
Percent Under Pace Speed : 19.5
Percent Over Pace Speed : 12.0

****

SPEED	COUNT	PERCENT	CUM.%	SPEED	COUNT	PERCENT	CUM.%
30	0	0.0	0.0	56	12	6.0	88.0
31	0	0.0	0.0	57	11	5.5	93.5
32	0	0.0	0.0	58	5	2.5	96.0
33	0	0.0	0.0	59	4	2.0	98.0
34	0	0.0	0.0	60	2	1.0	99.0
35	0	0.0	0.0	61	1	0.5	99.5
36	0	0.0	0.0	62	1	0.5	100.0
37	0	0.0	0.0	63	0	0.0	100.0
38	2	1.0	1.0	64	0	0.0	100.0
39	0	0.0	1.0	65	0	0.0	100.0
40	2	1.0	2.0	66	0	0.0	100.0
41	0	0.0	2.0	67	0	0.0	100.0
42	4	2.0	4.0	68	0	0.0	100.0
43	2	1.0	5.0	69	0	0.0	100.0
44	8	4.0	9.0	70	0	0.0	100.0
45	12	6.0	15.0	71	0	0.0	100.0
46	9	4.5	19.5	72	0	0.0	100.0
47	11	5.5	25.0	73	0	0.0	100.0
48	12	6.0	31.0	74	0	0.0	100.0
49	15	7.5	38.5	75	0	0.0	100.0
50	14	7.0	45.5	76	0	0.0	100.0
51	22	11.0	56.5	77	0	0.0	100.0
52	17	8.5	65.0	78	0	0.0	100.0
53	13	6.5	71.5	79	0	0.0	100.0
54	7	3.5	75.0	80	0	0.0	100.0
55	14	7.0	82.0				

Appendix B – CMAT and City of Adel Crash Reports

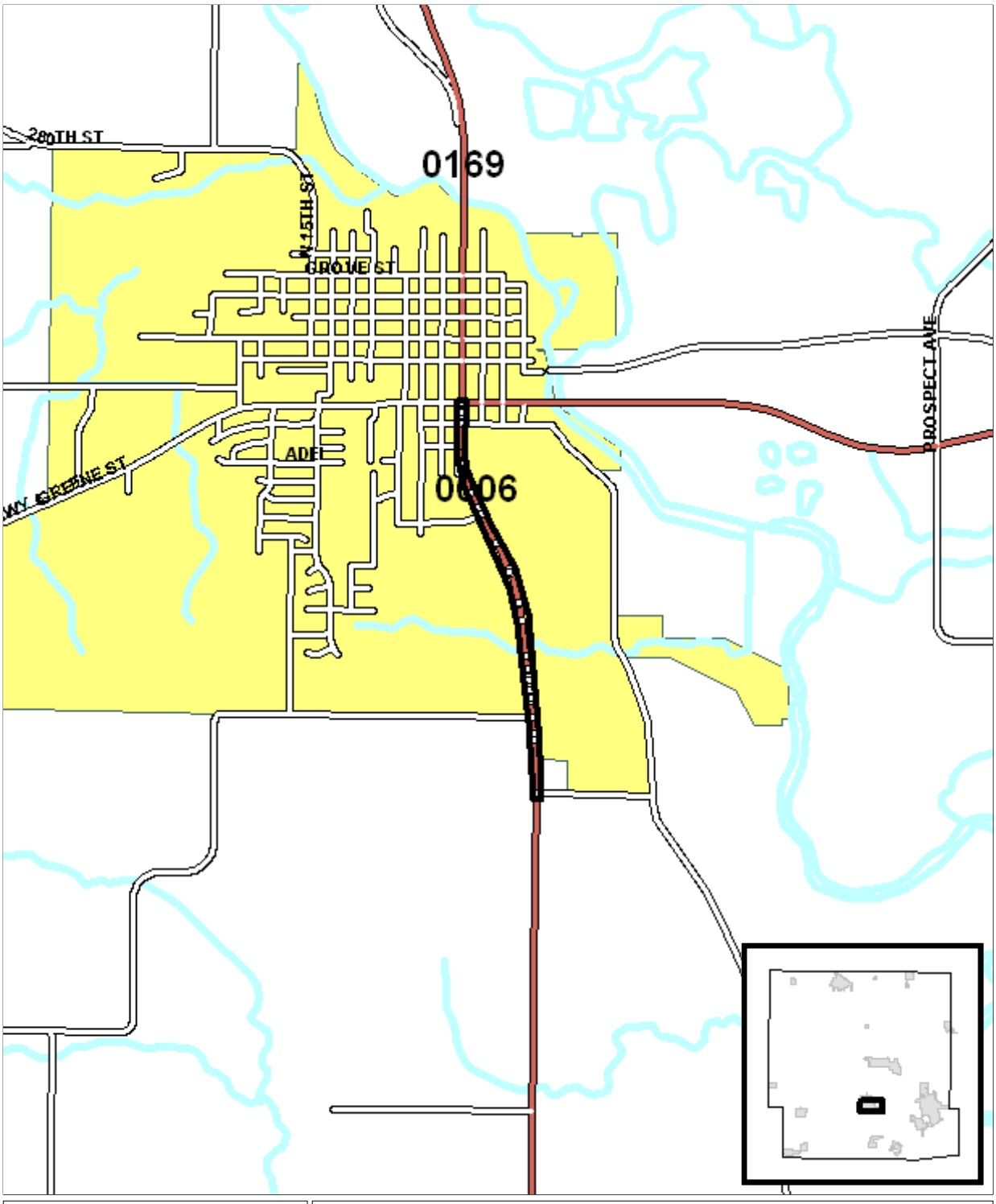
Iowa Department of Transportation

Location Map

US 169 Corridor

Incidents: 48

Report Version 1.1 Mar 2005



Analyst: CEC

Notes: Tylers computer CMAT

Iowa Department of Transportation

Driver and Time Summary

US 169 Corridor

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	2	-	-	-	-	2	4
MON	-	-	-	-	-	-	-	2	2	-	-	-	-	4	8
TUE	-	-	-	-	1	-	-	2	2	1	-	-	-	6	12
WED	-	-	-	2	1	1	1	2	2	1	1	-	-	11	23
THU	-	-	-	-	-	-	1	3	2	2	1	-	-	9	19
FRI	-	-	-	1	-	1	1	4	4	-	2	1	-	14	29
SAT	-	-	-	-	-	-	1	-	-	-	1	-	-	2	4
Tot.				3	2	2	4	13	14	4	5	1		48	
%				6	4	4	8	27	29	8	10	2			100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	2	1	-	3	4
15	-	2	-	2	2
16	5	3	-	8	10
17	3	1	-	4	5
18	3	1	-	4	5
19	-	-	-		
20	1	1	-	2	2
21 to 24	3	2	-	5	6
25 to 29	1	4	-	5	6
30 to 34	2	5	-	7	9
35 to 39	3	1	-	4	5
40 to 44	6	3	-	9	11
45 to 49	2	1	-	3	4
50 to 54	8	-	-	8	10
55 to 59	1	3	-	4	5
60 to 64	2	2	-	4	5
65 to 69	3	2	-	5	6
70 to 74	-	-	-		
75 to 79	1	2	-	3	4
80 to 84	-	1	-	1	1
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	1	-	-	1	1
Drivers	47	35	0	82	
%	57	43	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	48	100
Total Crashes	48	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment	2	2
Curb/Island/Raised Median	2	2
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc	2	2
Sign Post	2	2
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	74	90
Total Vehicles	82	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

Iowa Department of Transportation

Major Cause Summary

US 169 Corridor

Report Version 1.1 Jan 2005

Analysis Years: 2011 [5], 2012 [11], 2013 [7], 2014 [11], 2015 [14]

Crash Summary:

Fatal	-
Major Injury	1
Minor Injury	6
Possible/Unknown	6
PDO	35
Total Crashes	48

Injury Summary:

Fatal	-
Major Injury	1
Minor Injury	6
Possible	12
Unknown	1
Total Injuries	20

TOT Property Damage: $231,837

AVG Property Damage: $4,830

Surface Condition Summary:

Dry	35
Wet	4
Ice	4
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	1
Unknown	-
Not Reported	4
Total Crashes	48

Major Cause Summary:

11	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
1	Ran Stop Sign	2	Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
2	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign	3	Ran Off Road - Right
3	FTYROW: Making Left Turn		Ran Off Road - Straight
2	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position	2	Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
1	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
4	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
2	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
8	Followed Too Close	4	Other: Other Improper Action
	Disregarded Railroad Signal	1	Unknown
	Disregarded Warning Sign		Other: No Improper Action
2	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

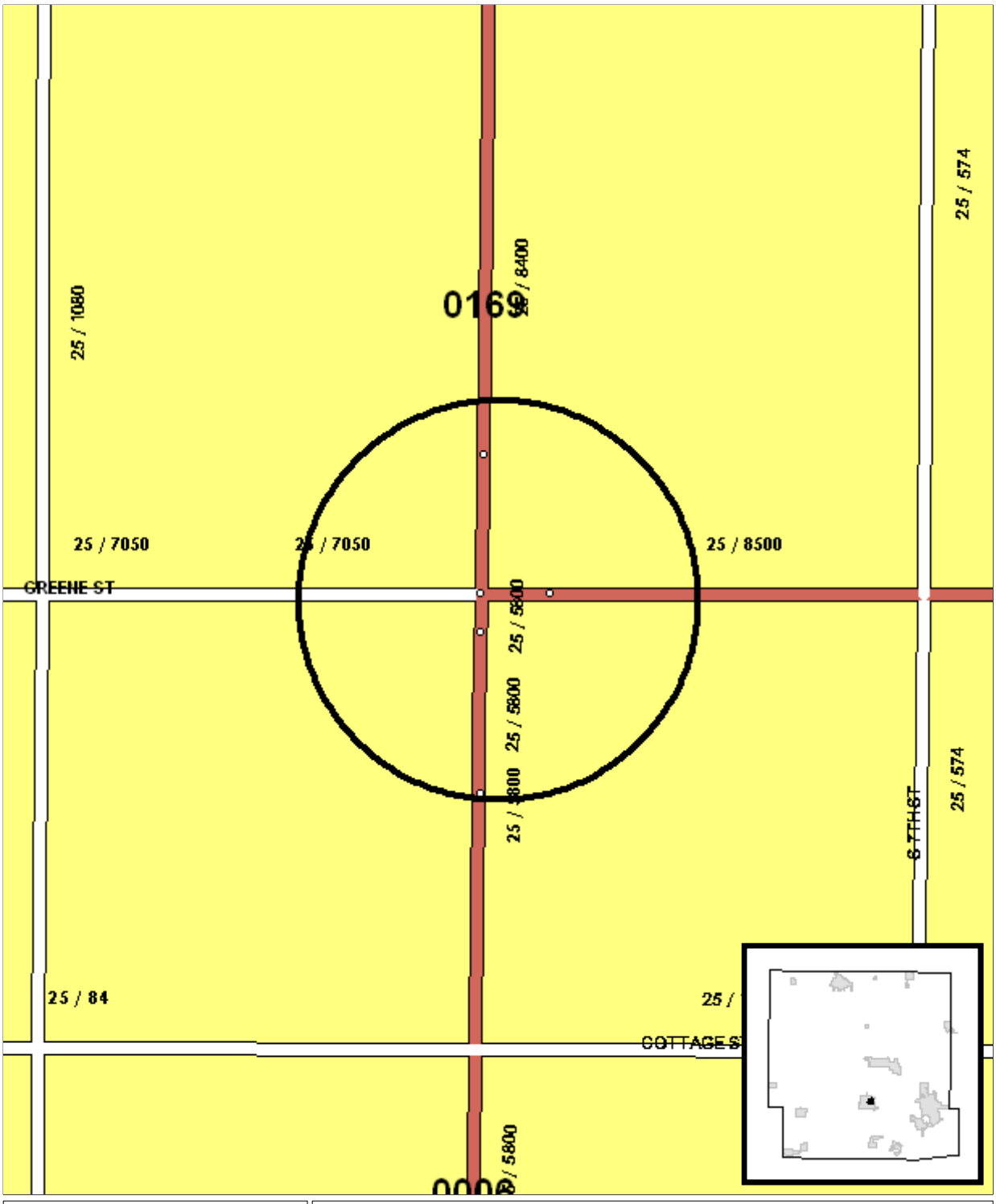
Iowa Department of Transportation

Location Map

US 169 & US 6/290th St

Incidents: 10

Report Version 1.1 Mar 2005



Analyst: C Cutler

Notes:

Iowa Department of Transportation

Driver and Time Summary

US 169 & US 6/290th St

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	1	-	-	-	-	1	10
MON	-	-	-	-	-	-	-	1	-	-	-	-	-	1	10
TUE	-	-	-	-	-	-	-	-	-	1	-	-	-	1	10
WED	-	-	-	-	-	-	-	1	-	-	-	-	-	1	10
THU	-	-	-	-	-	-	-	2	1	-	-	-	-	3	30
FRI	-	-	-	-	-	-	-	2	-	-	1	-	-	3	30
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.								6	2	1	1			10	
%								60	20	10	10				100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	2	-	-	2	10
15	-	2	-	2	10
16	-	-	-		
17	-	-	-		
18	-	-	-		
19	-	-	-		
20	1	-	-	1	5
21 to 24	-	-	-		
25 to 29	1	1	-	2	10
30 to 34	-	1	-	1	5
35 to 39	2	-	-	2	10
40 to 44	2	-	-	2	10
45 to 49	-	-	-		
50 to 54	2	1	-	3	15
55 to 59	-	1	-	1	5
60 to 64	-	-	-		
65 to 69	1	1	-	2	10
70 to 74	1	-	-	1	5
75 to 79	-	1	-	1	5
80 to 84	-	-	-		
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	-	-	-		
Drivers	12	8	0	20	
%	60	40	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	10	100
Total Crashes	10	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment		
Curb/Island/Raised Median	2	10
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc		
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	18	90
Total Vehicles	20	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

Iowa Department of Transportation

Major Cause Summary

US 169 & US 6/290th St

Report Version 1.1 Jan 2005

Analysis Years: 2011 [1], 2012 [1], 2013 [3], 2014 [2], 2015 [3]

Crash Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible/Unknown	2
PDO	8
Total Crashes	10

Injury Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible	3
Unknown	-
Total Injuries	3

TOT Property Damage: $51,700

AVG Property Damage: $5,170

Surface Condition Summary:

Dry	7
Wet	2
Ice	1
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	-
Total Crashes	10

Major Cause Summary:

	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
	Ran Stop Sign		Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign		Ran Off Road - Right
2	FTYROW: Making Left Turn		Ran Off Road - Straight
2	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position	1	Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
2	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
1	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
1	Followed Too Close	1	Other: Other Improper Action
	Disregarded Railroad Signal		Unknown
	Disregarded Warning Sign		Other: No Improper Action
	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

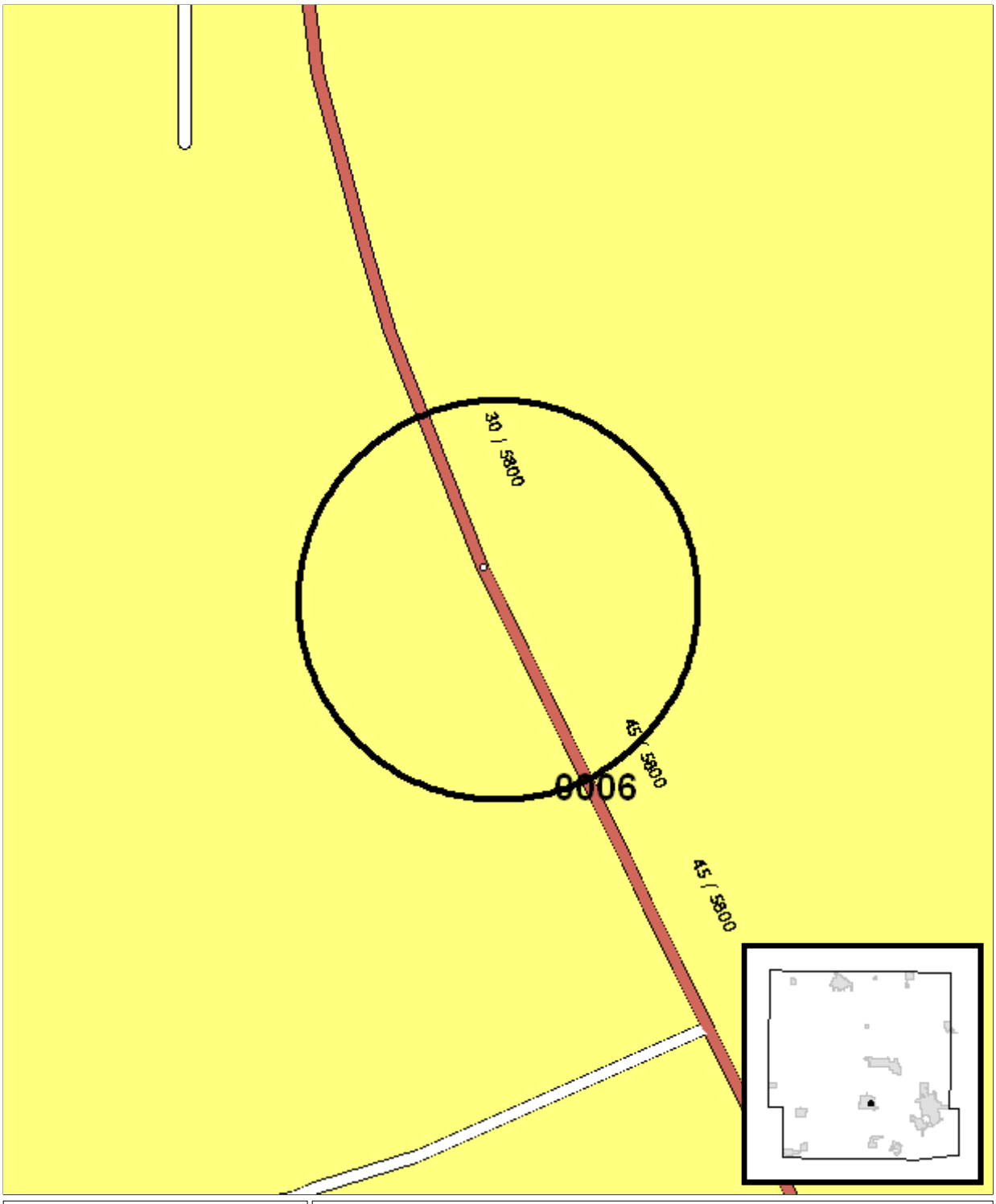
Iowa Department of Transportation

Location Map

US 169 & Adel DeSoto Middle School/ Fareway Access

Incidents: 2

Report Version 1.1 Mar 2005



Analyst: C Cutler

Notes:

Iowa Department of Transportation

Driver and Time Summary

US 169 & Adel DeSoto Middle School/ Fareway Access

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	-	-	-	-	-		
MON	-	-	-	-	-	-	-	-	-	-	-	-	-		
TUE	-	-	-	-	-	-	-	-	-	-	-	-	-		
WED	-	-	-	-	-	-	-	-	1	-	-	-	-	1	50
THU	-	-	-	-	-	-	1	-	-	-	-	-	-	1	50
FRI	-	-	-	-	-	-	-	-	-	-	-	-	-		
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.							1		1					2	
%							50		50						100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	-	-	-		
15	-	-	-		
16	-	-	-		
17	-	-	-		
18	1	-	-	1	20
19	-	-	-		
20	-	-	-		
21 to 24	-	-	-		
25 to 29	-	-	-		
30 to 34	-	-	-		
35 to 39	-	-	-		
40 to 44	1	1	-	2	40
45 to 49	-	1	-	1	20
50 to 54	-	-	-		
55 to 59	-	1	-	1	20
60 to 64	-	-	-		
65 to 69	-	-	-		
70 to 74	-	-	-		
75 to 79	-	-	-		
80 to 84	-	-	-		
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	-	-	-		
Drivers	2	3	0	5	
%	40	60	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	2	100
Total Crashes	2	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment		
Curb/Island/Raised Median		
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc		
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	5	100
Total Vehicles	5	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

Iowa Department of Transportation

Major Cause Summary

US 169 & Adel DeSoto Middle School/ Fareway Access

Report Version 1.1 Jan 2005

Analysis Years: 2014 [1], 2015 [1]

Crash Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible/Unknown	-
PDO	2
Total Crashes	2

Injury Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible	-
Unknown	-
Total Injuries	0

TOT Property Damage: $7,600

AVG Property Damage: $3,800

Surface Condition Summary:

Dry	2
Wet	-
Ice	-
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	-
Total Crashes	2

Major Cause Summary:

	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
	Ran Stop Sign		Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign		Ran Off Road - Right
	FTYROW: Making Left Turn		Ran Off Road - Straight
	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position		Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
1	Followed Too Close	1	Other: Other Improper Action
	Disregarded Railroad Signal		Unknown
	Disregarded Warning Sign		Other: No Improper Action
	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

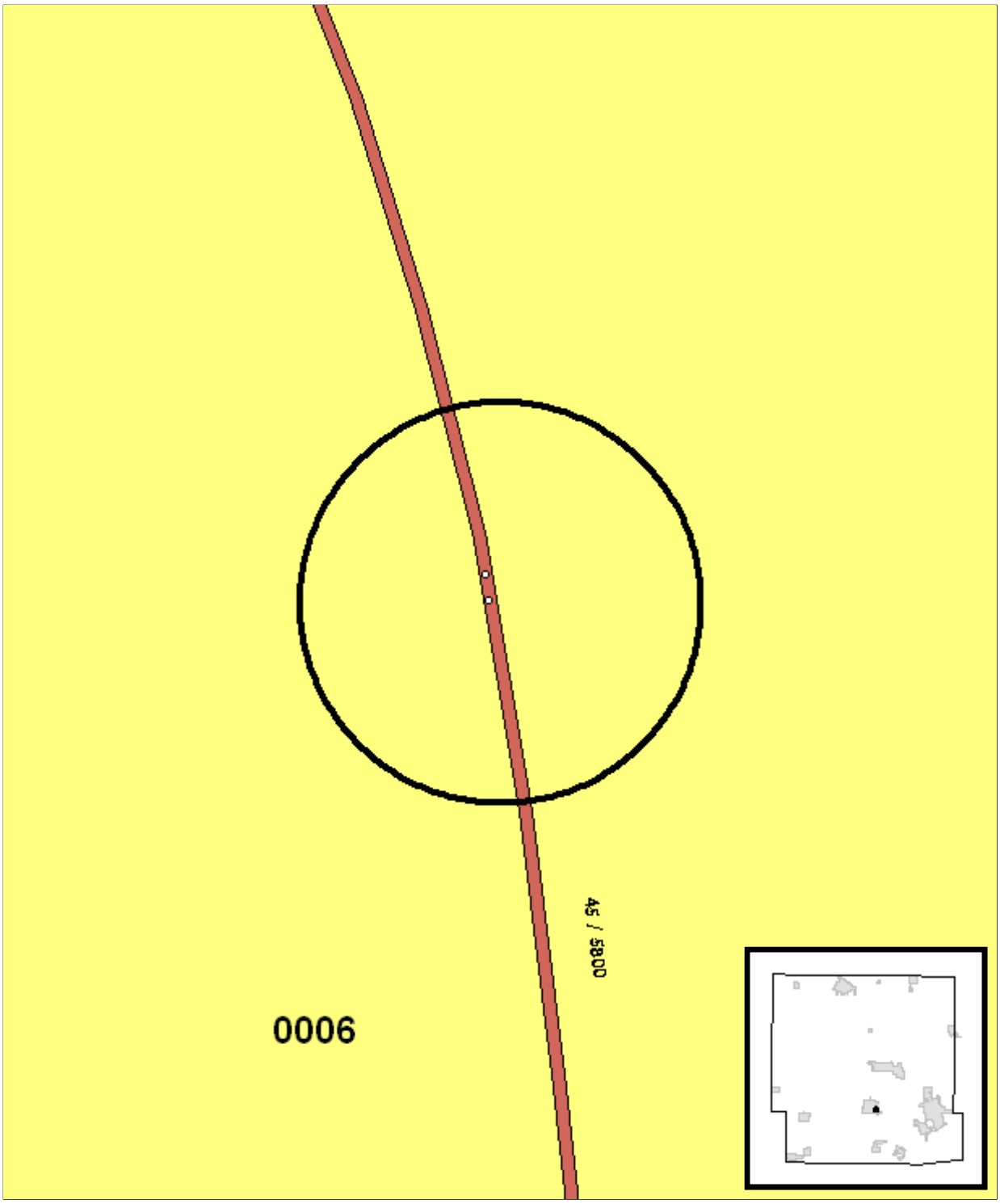
Iowa Department of Transportation

Location Map

US 169 & Timberview Drive

Incidents: 2

Report Version 1.1 Mar 2005



Analyst: CEC	**Notes:** Tylers computer CMAT

Iowa Department of Transportation

Driver and Time Summary

US 169 & Timberview Drive

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	-	-	-	-	-		
MON	-	-	-	-	-	-	-	-	-	-	-	-	-		
TUE	-	-	-	-	-	-	-	-	-	-	-	-	-		
WED	-	-	-	-	-	-	-	-	-	-	1	-	-	1	50
THU	-	-	-	-	-	-	-	-	-	-	-	-	-		
FRI	-	-	-	-	-	-	-	-	1	-	-	-	-	1	50
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.									1		1			2	
%									50		50				100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	-	1	-	1	25
15	-	-	-		
16	-	-	-		
17	-	-	-		
18	-	-	-		
19	-	-	-		
20	-	-	-		
21 to 24	-	-	-		
25 to 29	-	-	-		
30 to 34	-	-	-		
35 to 39	-	-	-		
40 to 44	-	-	-		
45 to 49	1	-	-	1	25
50 to 54	-	-	-		
55 to 59	-	-	-		
60 to 64	-	-	-		
65 to 69	-	-	-		
70 to 74	-	-	-		
75 to 79	1	-	-	1	25
80 to 84	-	1	-	1	25
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	-	-	-		
Drivers	2	2	0	4	
%	50	50	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	2	100
Total Crashes	2	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment		
Curb/Island/Raised Median		
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc		
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	4	100
Total Vehicles	4	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

Iowa Department of Transportation

Major Cause Summary

US 169 & Timberview Drive

Report Version 1.1 Jan 2005

Analysis Years: 2011 [1], 2015 [1]

Crash Summary:

Fatal	-
Major Injury	-
Minor Injury	1
Possible/Unknown	-
PDO	1
Total Crashes	2

Injury Summary:

Fatal	-
Major Injury	-
Minor Injury	1
Possible	2
Unknown	1
Total Injuries	4

TOT Property Damage: $10,500

AVG Property Damage: $5,250

Surface Condition Summary:

Dry	2
Wet	-
Ice	-
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	-
Total Crashes	2

Major Cause Summary:

1	Animal	Improper Backing
	Ran Traffic Signal	Illegally Parked/Unattended
	Ran Stop Sign	Swerving/Evasive Action
	Crossed Centerline	Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection	Downhill Runaway
	FTYROW: Making Right Turn on Red Signal	Equipment Failure
	FTYROW: From Stop Sign	Separation of Units
	FTYROW: From Yield Sign	Ran Off Road - Right
	FTYROW: Making Left Turn	Ran Off Road - Straight
	FTYROW: From Driveway	Ran Off Road - Left
	FTYROW: From Parked Position	Lost Control
	FTYROW: To Pedestrian	Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)	Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd	Inattentive/Distracted By: Fallen Object
	Driving Too Fast for Conditions	Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed	Other: Vision Obstructed
	Made Improper Turn	Oversized Load/ Oversized Vehicle
	Improper Lane Change	Cargo/Equipment Loss or Shift
	Followed Too Close	Other: Other Improper Action
	Disregarded Railroad Signal	Unknown
	Disregarded Warning Sign	Other: No Improper Action
1	Operating Vehicle in Reckless/Aggressive Manner	None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

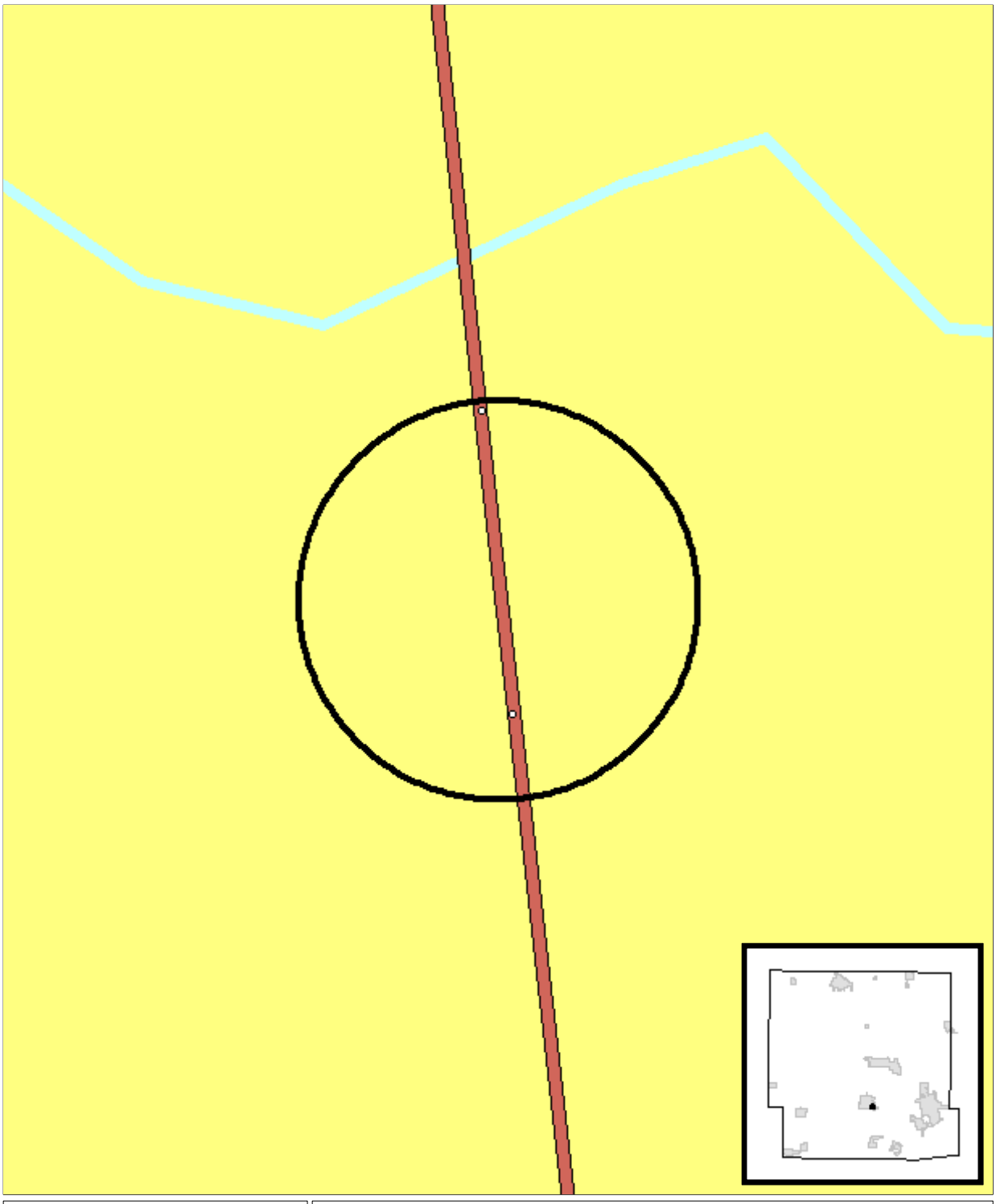
Iowa Department of Transportation

Location Map

US 169 & Bailey Grove Drive

Incidents: 2

Report Version 1.1 Mar 2005



Analyst: CEC

Notes: Tylers computer CMAT

Iowa Department of Transportation

Driver and Time Summary

US 169 & Bailey Grove Drive

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	-	-	-	-	-		
MON	-	-	-	-	-	-	-	-	-	-	-	-	-		
TUE	-	-	-	-	-	-	-	-	-	-	-	-	-		
WED	-	-	-	1	-	-	-	-	-	-	-	-	-	1	50
THU	-	-	-	-	-	-	-	-	-	-	-	-	-		
FRI	-	-	-	-	-	-	-	1	-	-	-	-	-	1	50
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.				1				1						2	
%				50				50							100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	-	-	-		
15	-	-	-		
16	-	-	-		
17	-	-	-		
18	-	-	-		
19	-	-	-		
20	-	-	-		
21 to 24	-	-	-		
25 to 29	-	-	-		
30 to 34	1	1	-	2	50
35 to 39	-	-	-		
40 to 44	-	-	-		
45 to 49	-	-	-		
50 to 54	1	-	-	1	25
55 to 59	-	-	-		
60 to 64	-	-	-		
65 to 69	1	-	-	1	25
70 to 74	-	-	-		
75 to 79	-	-	-		
80 to 84	-	-	-		
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	-	-	-		
Drivers	3	1	0	4	
%	75	25	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	2	100
Total Crashes	2	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment		
Curb/Island/Raised Median		
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc		
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	4	100
Total Vehicles	4	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

Iowa Department of Transportation

Major Cause Summary

US 169 & Bailey Grove Drive

Report Version 1.1 Jan 2005

Analysis Years: 2013 [2]

Crash Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible/Unknown	1
PDO	1
Total Crashes	2

Injury Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible	1
Unknown	-
Total Injuries	1

TOT Property Damage: $12,700

AVG Property Damage: $6,350

Surface Condition Summary:

Dry	1
Wet	-
Ice	-
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	1
Total Crashes	2

Major Cause Summary:

1	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
	Ran Stop Sign		Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign		Ran Off Road - Right
	FTYROW: Making Left Turn		Ran Off Road - Straight
	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position		Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
1	Followed Too Close		Other: Other Improper Action
	Disregarded Railroad Signal		Unknown
	Disregarded Warning Sign		Other: No Improper Action
	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: CEC

Notes: Tylers computer CMAT

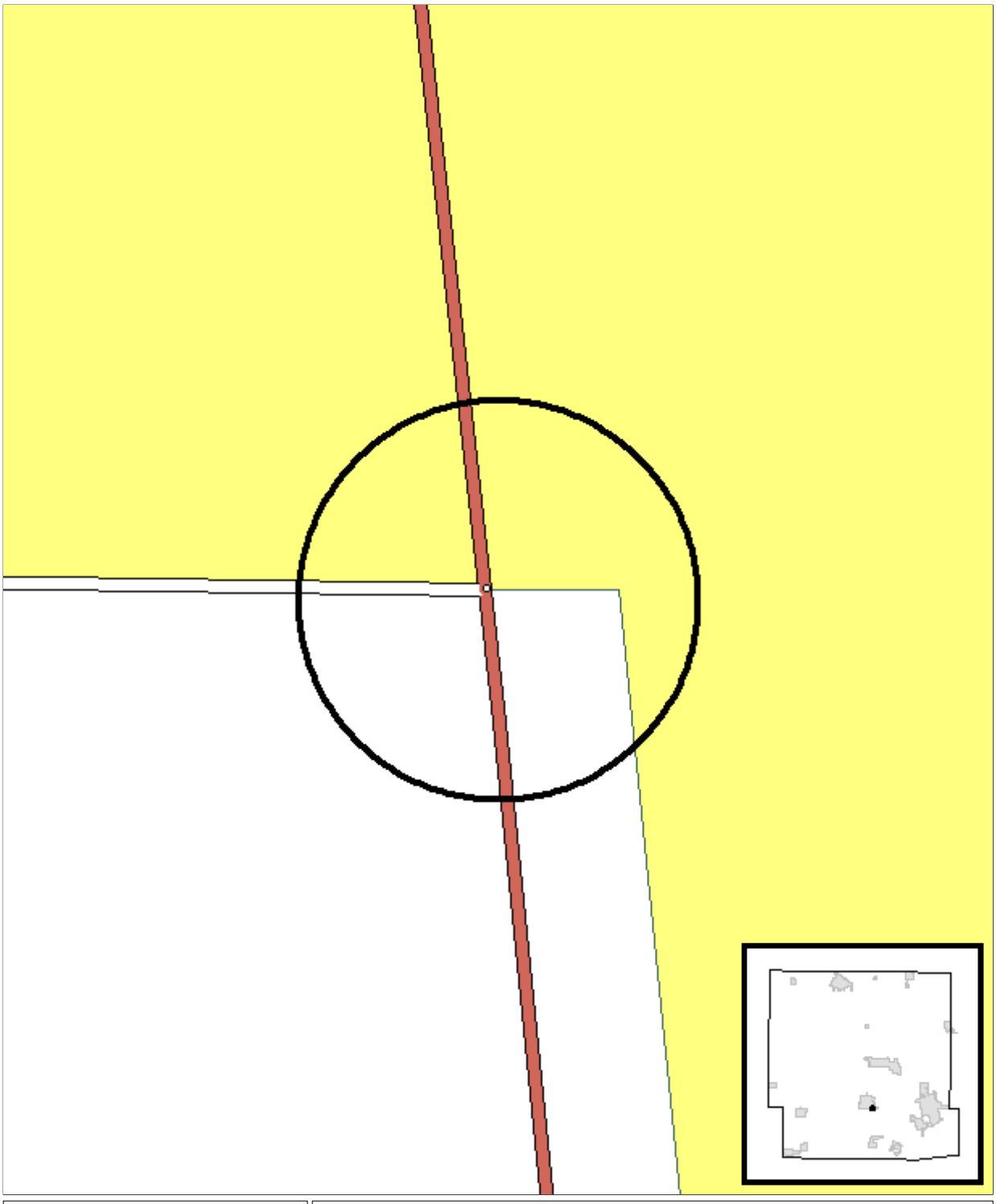
Iowa Department of Transportation

Location Map

US 169 & Meadow Rd

Incidents: 3

Report Version 1.1 Mar 2005



Analyst: C Cutler

Notes:

Iowa Department of Transportation

Driver and Time Summary

US 169 & Meadow Rd

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	-	-	-	-	-		
MON	-	-	-	-	-	-	-	-	-	-	-	-	-		
TUE	-	-	-	-	-	-	-	1	-	-	-	-	-	1	33
WED	-	-	-	-	-	1	1	-	-	-	-	-	-	2	67
THU	-	-	-	-	-	-	-	-	-	-	-	-	-		
FRI	-	-	-	-	-	-	-	-	-	-	-	-	-		
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.						1	1	1						3	
%						33	33	33							100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	-	-	-		
15	-	-	-		
16	1	-	-	1	25
17	-	-	-		
18	-	-	-		
19	-	-	-		
20	-	-	-		
21 to 24	-	-	-		
25 to 29	-	-	-		
30 to 34	-	1	-	1	25
35 to 39	-	-	-		
40 to 44	-	-	-		
45 to 49	-	-	-		
50 to 54	-	-	-		
55 to 59	-	-	-		
60 to 64	-	-	-		
65 to 69	-	1	-	1	25
70 to 74	-	-	-		
75 to 79	-	-	-		
80 to 84	-	-	-		
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	1	-	-	1	25
Drivers	2	2	0	4	
%	50	50	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	3	100
Total Crashes	3	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment	1	25
Curb/Island/Raised Median		
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc	1	25
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	2	50
Total Vehicles	4	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

Iowa Department of Transportation

Major Cause Summary

US 169 & Meadow Rd

Report Version 1.1 Jan 2005

Analysis Years: 2012 [1], 2015 [2]

Crash Summary:

Fatal	-
Major Injury	1
Minor Injury	1
Possible/Unknown	-
PDO	1
Total Crashes	3

Injury Summary:

Fatal	-
Major Injury	1
Minor Injury	1
Possible	1
Unknown	-
Total Injuries	3

TOT Property Damage: $24,050

AVG Property Damage: $8,017

Surface Condition Summary:

Dry	2
Wet	-
Ice	1
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	-
Total Crashes	3

Major Cause Summary:

	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
1	Ran Stop Sign		Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign		Ran Off Road - Right
	FTYROW: Making Left Turn		Ran Off Road - Straight
	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position		Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
1	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
	Followed Too Close		Other: Other Improper Action
	Disregarded Railroad Signal		Unknown
	Disregarded Warning Sign		Other: No Improper Action
1	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

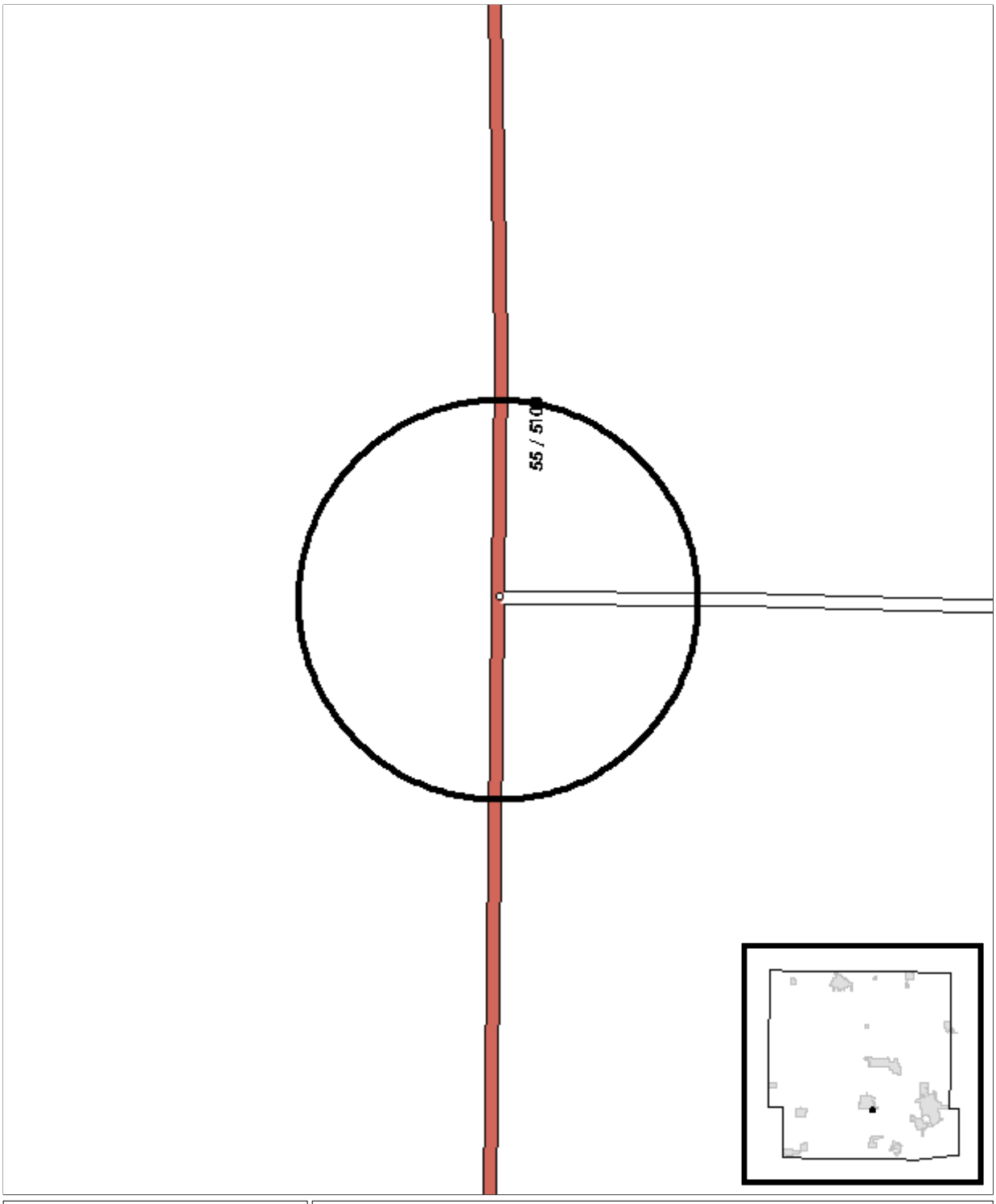
Iowa Department of Transportation

Location Map

US 169 & 302nd Pl

Incidents: 6

Report Version 1.1 Mar 2005



Analyst: C Cutler

Notes:

Iowa Department of Transportation

Driver and Time Summary

US 169 & 302nd Pl

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From / To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	NR	Total	%
SUN	-	-	-	-	-	-	-	-	-	-	-	-	-		
MON	-	-	-	-	-	-	-	-	-	-	-	-	-		
TUE	-	-	-	-	-	-	-	1	-	-	-	-	-	1	17
WED	-	-	-	-	-	-	-	-	-	-	-	-	-		
THU	-	-	-	-	-	-	-	-	-	1	-	-	-	1	17
FRI	-	-	-	-	-	-	-	1	2	-	-	1	-	4	67
SAT	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tot.								2	2	1		1		6	
%								33	33	17		17			100

Driver Age/Gender Summary:

Age	Male	Female	NR	Drivers	%
<14	-	-	-		
14	-	-	-		
15	-	-	-		
16	2	1	-	3	33
17	1	-	-	1	11
18	1	-	-	1	11
19	-	-	-		
20	-	1	-	1	11
21 to 24	-	-	-		
25 to 29	-	1	-	1	11
30 to 34	-	-	-		
35 to 39	-	-	-		
40 to 44	1	1	-	2	22
45 to 49	-	-	-		
50 to 54	-	-	-		
55 to 59	-	-	-		
60 to 64	-	-	-		
65 to 69	-	-	-		
70 to 74	-	-	-		
75 to 79	-	-	-		
80 to 84	-	-	-		
85 to 89	-	-	-		
90 to 94	-	-	-		
95 plus	-	-	-		
NR	-	-	-		
Drivers	5	4	0	9	
%	56	44	0		100

Drug/Alcohol Summary:

	Total	%
Drug		
Alcohol, Less than Statutory		
Alcohol, Statutory		
Drug/Alcohol, Less than Statutory		
Drug/Alcohol, Statutory		
Refused		
Under Influence of Alc/Drugs/Meds		
None Indicated	6	100
Total Crashes	6	100

Fixed Object Struck Summary:

	Vehs.	%
Bridge/Bridge rail/Overpass		
Underpass/Structure Support		
Culvert		
Ditch/Embankment		
Curb/Island/Raised Median		
Guardrail		
Concrete Barrier		
Tree		
Pole - Utility/Light/Etc	1	11
Sign Post		
Mailbox		
Impact Attenuator		
Other Fixed Object		
None	8	89
Total Vehicles	9	100

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

Iowa Department of Transportation

Major Cause Summary

US 169 & 302nd Pl

Report Version 1.1 Jan 2005

Analysis Years: 2012 [1], 2013 [1], 2014 [2], 2015 [2]

Crash Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible/Unknown	-
PDO	6
Total Crashes	6

Injury Summary:

Fatal	-
Major Injury	-
Minor Injury	-
Possible	-
Unknown	-
Total Injuries	0

TOT Property Damage: $26,700

AVG Property Damage: $4,450

Surface Condition Summary:

Dry	5
Wet	-
Ice	-
Snow	-
Slush	-
Sand/Dirt/Oil/Gravel	-
Water	-
Other	-
Unknown	-
Not Reported	1
Total Crashes	6

Major Cause Summary:

2	Animal		Improper Backing
	Ran Traffic Signal		Illegally Parked/Unattended
	Ran Stop Sign	1	Swerving/Evasive Action
	Crossed Centerline		Over-Correcting/Over-Steering
	FTYROW: At Uncontrolled Intersection		Downhill Runaway
	FTYROW: Making Right Turn on Red Signal		Equipment Failure
	FTYROW: From Stop Sign		Separation of Units
	FTYROW: From Yield Sign		Ran Off Road - Right
	FTYROW: Making Left Turn		Ran Off Road - Straight
	FTYROW: From Driveway		Ran Off Road - Left
	FTYROW: From Parked Position		Lost Control
	FTYROW: To Pedestrian		Inattentive/Distracted By: Passenger
	FTYROW: Other (explain in narrative)		Inattentive/Distracted By: Use of Phone or Other
	Traveling Wrong Way or on Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
	Driving Too Fast for Conditions		Inattentive/Distracted By: Fatigued/Asleep
	Exceeded Authorized Speed		Other: Vision Obstructed
	Made Improper Turn		Oversized Load/ Oversized Vehicle
	Improper Lane Change		Cargo/Equipment Loss or Shift
2	Followed Too Close	1	Other: Other Improper Action
	Disregarded Railroad Signal		Unknown
	Disregarded Warning Sign		Other: No Improper Action
	Operating Vehicle in Reckless/Aggressive Manner		None Indicated

Selection Filter:

((YEAR = 2011 or YEAR = 2012 or YEAR = 2013 or YEAR = 2014 or YEAR = 2015))

Analyst: C Cutler

Notes:

January through December 2011 - Accidents

Date	Ticket/Accident	Code/Reportable	Description	Address
3/30/2011	Accident	Non-Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
4/22/2011	Accident	Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
5/16/2011	Accident	Reportable	Property Damage	Nile Kinnick Dr. S. and Greene St.
6/13/2011	Accident	Non-Reportable	Property Damage	Nile Kinnick Dr. S. and Cottage St.
7/20/2011	Accident	Reportable	Car vs. Deer	1400 blk of Nile Kinnick Dr. S.
9/13/2011	Accident	Reportable	Property Damage	Nile Kinnick Dr. S. & Greenwood Hills Dr.
9/28/2011	Accident	Non-Reportable	Property Damage	Nile Kinnick Dr. S. & Cottage St.
10/26/2011	Accident	Reportable	Car vs. Deer	1500 blk of Nile Kinnick Dr. S.
11/14/2011	Accident	Reprotable	Agency Assist: 10-50 plus Car vs. Deer	27000 blk of N Ave.
11/15/2011	Accident	Reprotable	Car vs. Deer	1700 blk of Nile Kinnick Dr. S.

January through December 2012 - Accidents

Date	Ticket/Accident	Code/Reportable	Description	Address
1/19/2012	Accident	Non-Reportable	Car vs. Deer	1500 blk of Nile Kinnick Dr. S.
3/23/2012	Accident	Reportable	Property Damage	Nile Kinnick Dr. S. and Cottage St.
5/15/2012	Accident	Non-Reportable	Property Damage	Nile Kinnick Dr. S. and Greene St.
6/23/2012	Accident	Non-Reportable	Property Damage	Nile Kinnick Dr. S. and Greene St.
8/24/2012	Accident	Non-Reportable	Single Vehicle Property Damage	Nile Kinnick Dr. S. and Greene St.
9/6/2012	Accident	Non-Reportable	Property Damage	Nile Kinnick Dr. S. & Cottage St.
9/17/2012	Accident	Reportable	Property Damage	1300 blk of Nile Kinnick Dr. S.
10/21/2012	Accident	Reportable	Roll over Personal Injury	1300 blk of Nile Kinnick Dr. S.
11/16/2012	Accident	Reportable	Property Damage	800 blk of Nile Kinnick Dr. S.

January through December 2013 - Accidents

Date	Ticket/Accident	Code/Reportable	Description	Address
1/3/2013	Accident	Non-Reportable	Car vs. Deer	N Av. & 302nd St.
1/5/2013	Accident	Non-Reportable	Car vs. Deer	1300 blk of Nile Kinnick Dr. S.
1/10/2013	Accident	Reportable	Property Damage	Nile Kinnick Dr. S. and Greene St.
1/18/2013	Accident	Reportable	Personal Injury	Nile Kinnick Dr. S. and Greene St.
4/15/2013	Accident	Reportable	Car vs. deer	28000 blk of N Av.
11/1/2013	Accident	Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
12/4/2013	Accident	Non-Reportable	Car vs. Deer	1400 blk of Nile Kinnick Dr. S.
12/8/2013	Accident	Non-Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
12/20/2013	Accident	Reportable	Single Vehicle	600 blk of Nile Kinnick Dr. S.
12/27/2013	Accident	Reportable	Personal Injury	Nile Kinnick Dr. S. & Bailey's Grove Dr.

January through December 2014 - Accidents

Date	Ticket/Accident	Code/Reportable	Description	Address
2/21/2014	Accident	Reportable	Single Vehicle	1300 blk of Nile Kinnick Dr. S.
5/15/2014	Accident	Reportable	Property Damage	700 blk of Nile Kinnick Dr. S.
7/3/2014	Accident	Non-Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
7/6/2014	Accident	Non-Reportable	Hit & Run	400 blk of Nile Kinnick Dr. S.
9/12/2014	Accident	Reportable	Property Damage	800 blk of Nile Kinnick Dr. S.
9/19/2014	Accident	Non-Reportable	Car vs. deer	N Ave. and Bailey's Grove Dr.
10/1/2014	Accident	Non-Reprotable	Property Damage	Greene St. and Nile Kinnick Dr. S.
11/26/2014	Accident	Non-Reportable	Single Vehicle	800 blk of Nile Kinnick Dr. S.
12/23/2014	Accident	Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.

January through December 2015 - Accidents

Date	Ticket/Accident	Code/Reportable	Description	Address
1/29/2015	Accident	Non-Reportable	Property Damage	Cottage St. and Nile Kinnick Dr. S.
2/18/2015	Accident	Reportable	Property Damage	700 blk of Nile Kinnick Dr. S.
5/7/2015	Accident	Non-Reportable	Hit and Run	400 blk of Nile Kinnick Dr. S.
5/28/2015	Accident	Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.
6/16/2015	Accident	Reportable	Car vs. Turkey	30000 blk of N Ave.
8/7/2015	Accident	Reportable	Property Damage	1300 blk of Nile Kinnick Dr. S.
8/12/2015	Accident	Reportable	Personal Injury	N Ave. and Meadow Rd.
8/31/2015	Accident	Reportable	Personal Injury	Cottage St. and Nile Kinnick Dr. S.
9/3/2015	Accident	Reportable	Personal Injury	400 blk of Nile Kinnick Dr. S.
9/25/2015	Accident	Reportable	Personal Injury	N Ave. and Timberview Dr.
12/16/2015	Accident	Reportable	Property Damage	400 blk of Nile Kinnick Dr. S.

Appendix C – Iowa DOT Traffic Count Data

Iowa Department of Transportation

Turning Movement Traffic Count Summary

Annualized Daily Traffic For All Vehicles

Station Number:

25231725099

Count Date:

Monday, June 27, 2016

County:

Dallas

Location Description:

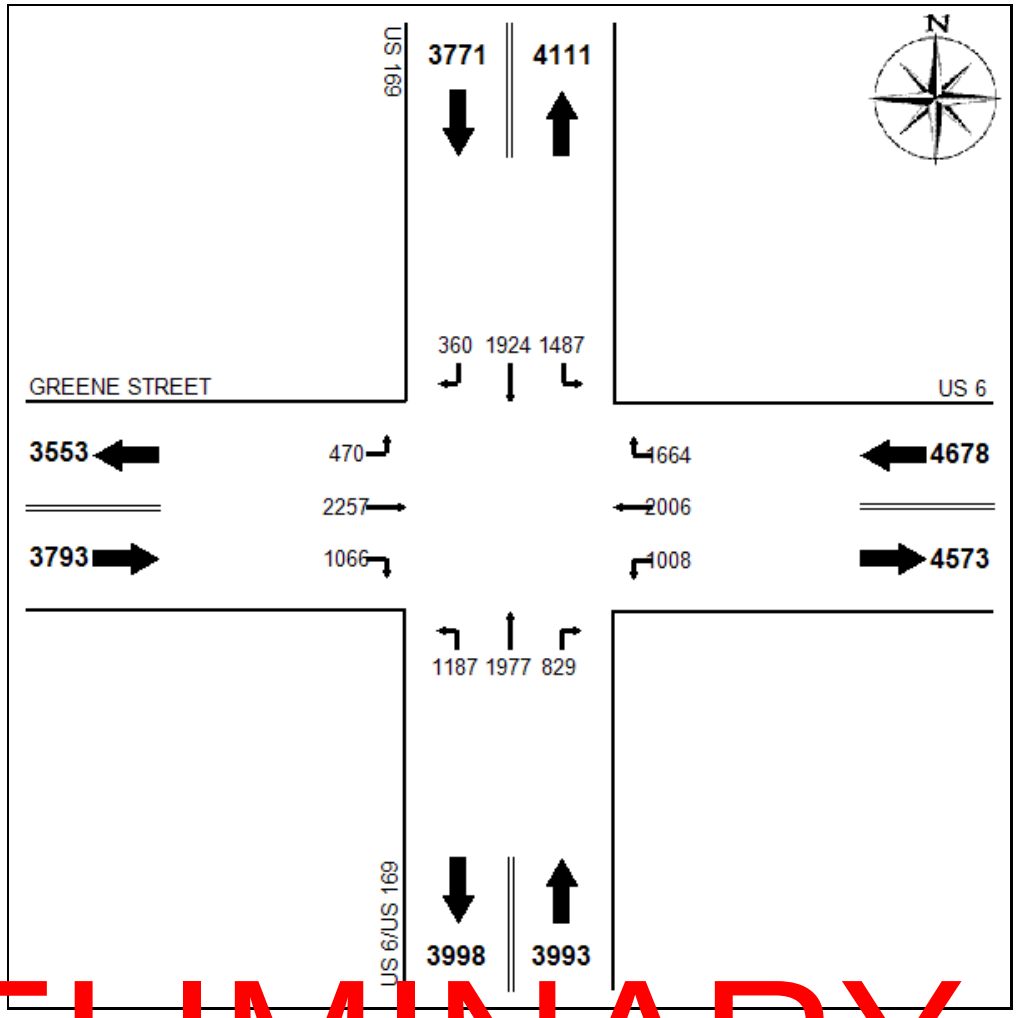
US 6 & US 169, GREENE ST

Volume Factor: 1.857

Pass Class Factor: 1.886

SU Class Factor: 1.592

Combo Class Factor: 1.558



Raw Data - All Vehicles

	N Leg			E Leg			S Leg			W Leg		
	L	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
07:00	147	199	30	43	110	100	73	136	57	27	257	108
08:00	109	92	18	49	91	98	74	130	54	31	189	79
11:00	105	143	23	76	117	119	89	149	56	41	158	85
12:00	118	134	40	101	140	121	109	152	65	49	168	83
15:00	113	143	26	64	147	116	84	143	69	40	135	61
16:00	106	144	18	94	219	155	96	142	76	25	141	69
17:00	95	177	39	113	249	178	109	208	72	40	165	84

Iowa Department of Transportation

Turning Movement Traffic Count Summary

Vehicle Type: Passenger Vehicles

Station Number:

25231725099

Count Date:

Monday, June 27, 2016

County:

Dallas

Location Description:

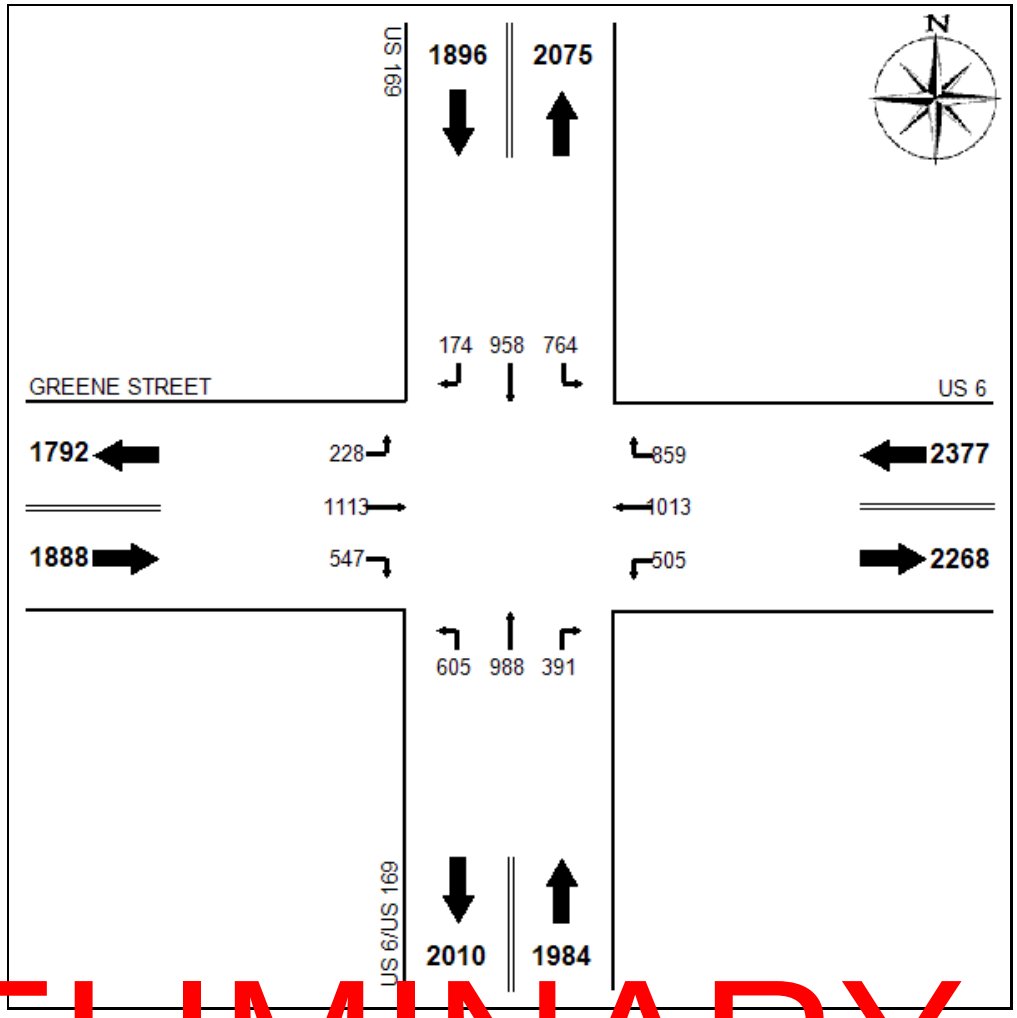
US 6 & US 169, GREENE ST

Volume Factor: N/A

Pass Class Factor: N/A

SU Class Factor: N/A

Combo Class Factor: N/A



Raw Data - Passenger Vehicles:

	N Leg			E Leg			S Leg			W Leg		
	L	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
07:00	143	185	28	40	102	98	69	124	55	27	244	105
08:00	106	77	13	40	76	90	70	117	49	23	169	74
11:00	98	130	19	69	113	112	81	135	42	35	142	79
12:00	114	122	35	94	129	116	103	140	54	47	147	78
15:00	108	135	24	58	133	113	80	133	55	36	126	60
16:00	102	137	16	91	215	153	93	139	66	21	126	68
17:00	93	172	39	113	245	177	109	200	70	39	159	83

Iowa Department of Transportation

Turning Movement Traffic Count Summary

Vehicle Type: Single-Unit Trucks

Station Number:

25231725099

Count Date:

Monday, June 27, 2016

County:

Dallas

Location Description:

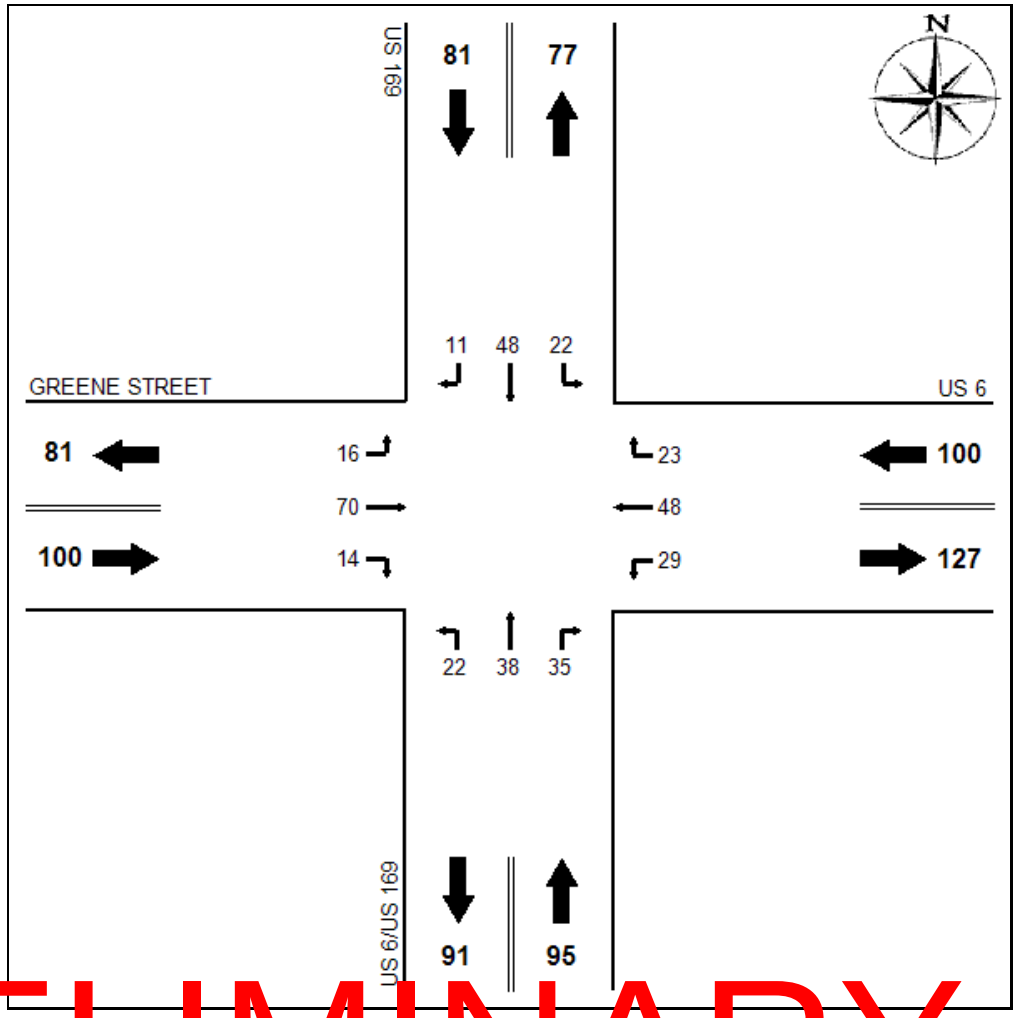
US 6 & US 169, GREENE ST

Volume Factor: N/A

Pass Class Factor: N/A

SU Class Factor: N/A

Combo Class Factor: N/A



Raw Data - Single-Unit Trucks:

	N Leg			E Leg			S Leg			W Leg		
	L	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
07:00	4	10	2	3	4	2	4	5	1	0	12	3
08:00	3	11	2	7	13	6	2	5	3	5	11	3
11:00	4	6	4	6	4	6	5	8	8	4	15	2
12:00	2	8	3	5	9	4	5	7	9	1	15	5
15:00	3	3	0	5	11	2	4	4	7	3	3	1
16:00	4	5	0	3	4	2	2	3	7	2	10	0
17:00	2	5	0	0	3	1	0	6	0	1	4	0

Iowa Department of Transportation

Turning Movement Traffic Count Summary

Vehicle Type: Combination Trucks

Station Number:

25231725099

Count Date:

Monday, June 27, 2016

County:

Dallas

Location Description:

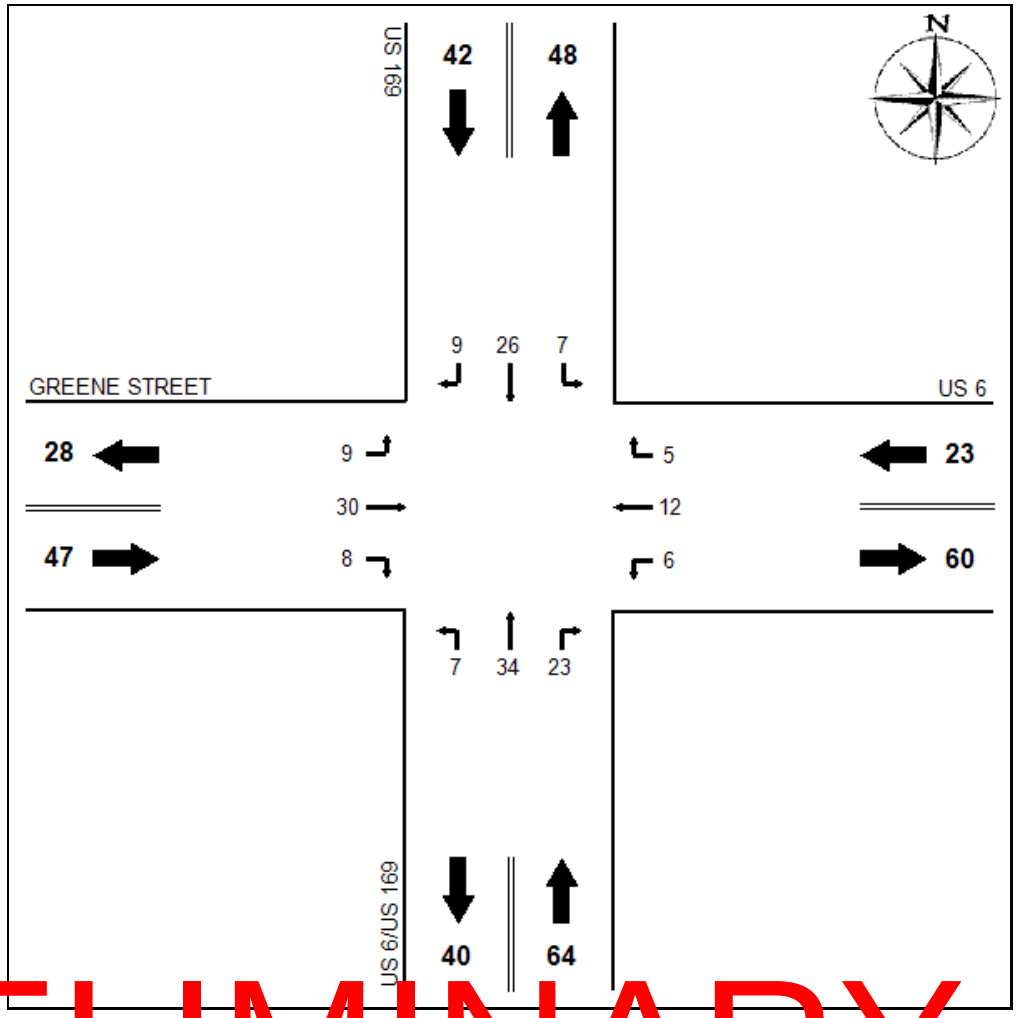
US 6 & US 169, GREENE ST

Volume Factor: N/A

Pass Class Factor: N/A

SU Class Factor: N/A

Combo Class Factor: N/A



Raw Data - Combination Trucks:

	N Leg			E Leg			S Leg			W Leg		
	L	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
07:00	0	4	0	0	4	0	0	7	1	0	1	0
08:00	0	4	3	2	2	2	2	8	2	3	9	2
11:00	3	7	0	1	0	1	3	6	6	2	1	4
12:00	2	4	2	2	2	1	1	5	2	1	6	0
15:00	2	5	2	1	3	1	0	6	7	1	6	0
16:00	0	2	2	0	0	0	1	0	3	2	5	1
17:00	0	0	0	0	1	0	0	2	2	0	2	1

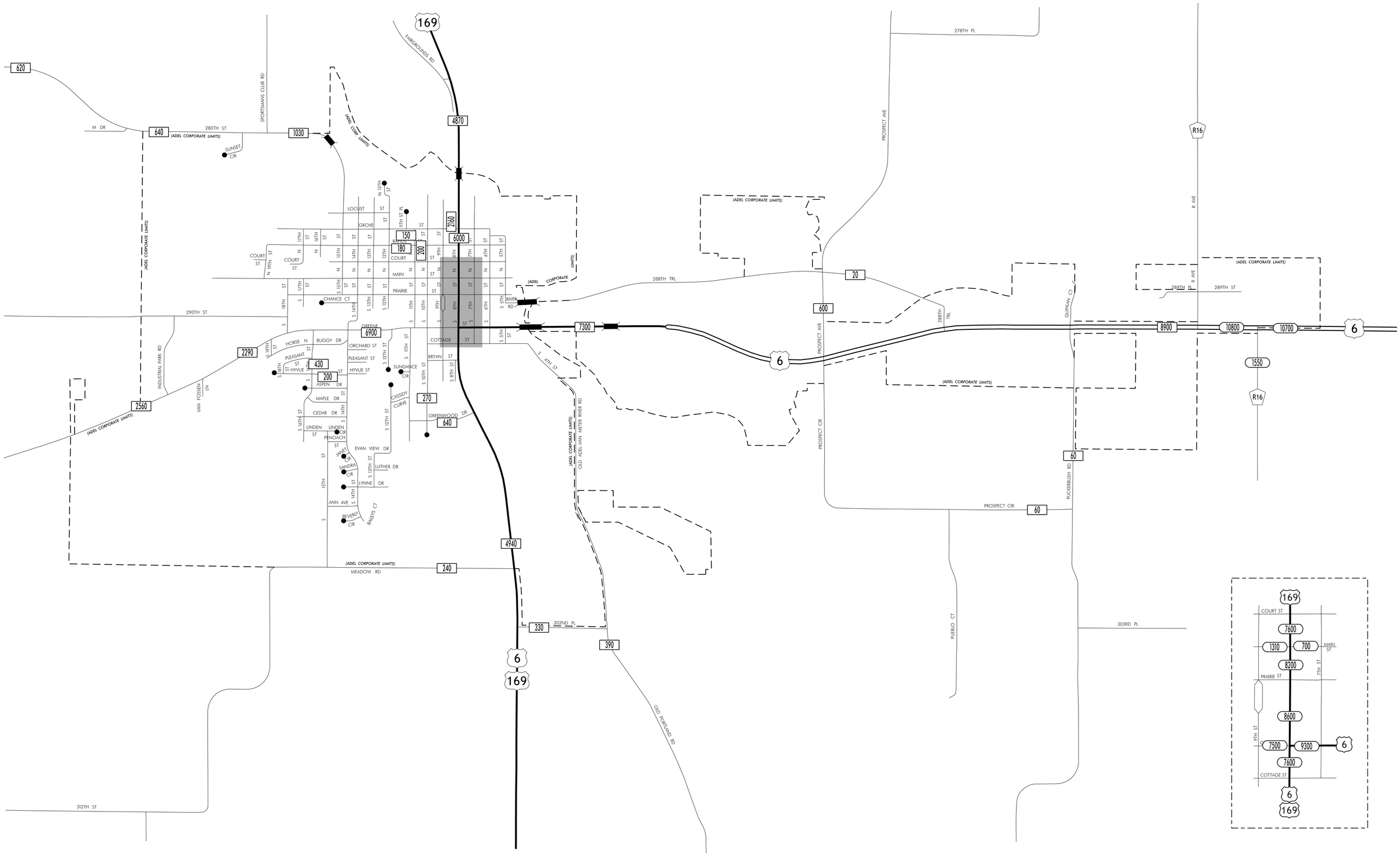
Iowa Department of Transportation

TRAFFIC FLOW MAP OF

ADEL

DALLAS COUNTY

2012 ANNUAL AVERAGE DAILY TRAFFIC



PREPARED BY

IOWA DEPARTMENT OF TRANSPORTATION

DIVISION OF PLANNING AND PROGRAMMING

OFFICE OF SYSTEM PLANNING

PHONE (515) 239–1289

LEGEND

RECORDER ONLY

MANUAL COUNT

Appendix D – Traffic Count Data Collected by Polk City

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and School
Site Code:
Start Date: 01/18/2017

Turning Movement Data

Start Time	US 169 Southbound					School Westbound					US 169 Northbound					Fareway Eastbound					
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
12:00 AM	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	7
12:15 AM	0	2	0	0	2	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	5
12:30 AM	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
12:45 AM	0	3	0	0	3	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	8
Hourly Total	0	12	0	0	12	0	0	1	0	1	0	12	0	0	12	0	0	0	0	0	25
1:00 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
1:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
1:30 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
1:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	7
2:00 AM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2:15 AM	0	5	0	0	5	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	6
2:30 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
2:45 AM	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5
Hourly Total	0	14	0	0	14	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	17
3:00 AM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
3:15 AM	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
3:30 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	5
3:45 AM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Hourly Total	0	10	1	0	11	0	0	0	0	0	0	5	0	0	5	1	0	0	0	1	17
4:00 AM	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
4:15 AM	0	5	0	0	5	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	7
4:30 AM	0	0	3	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
4:45 AM	1	4	3	0	8	0	0	0	0	0	2	7	0	0	9	1	0	1	0	2	19
Hourly Total	1	11	6	0	18	0	0	0	0	0	3	13	0	0	16	1	0	1	0	2	36
5:00 AM	0	11	1	0	12	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	16
5:15 AM	5	9	0	0	14	0	0	0	0	0	0	10	0	0	10	0	0	1	0	1	25
5:30 AM	6	8	2	0	16	0	0	0	0	0	0	12	2	0	14	0	0	0	0	0	30
5:45 AM	2	17	4	0	23	1	0	1	0	2	1	15	1	0	17	1	0	0	0	1	43
Hourly Total	13	45	7	0	65	1	0	1	0	2	2	40	3	0	45	1	0	1	0	2	114
6:00 AM	7	24	3	0	34	0	0	7	0	7	1	12	4	0	17	2	0	0	0	2	60
6:15 AM	5	55	0	0	60	3	0	0	0	3	1	29	3	0	33	0	0	0	0	0	96
6:30 AM	2	47	0	0	49	3	0	1	0	4	0	29	0	0	29	1	0	0	0	1	83
6:45 AM	2	60	3	0	65	2	0	6	0	8	0	38	0	0	38	1	0	0	0	1	112
Hourly Total	16	186	6	0	208	8	0	14	0	22	2	108	7	0	117	4	0	0	0	4	351
7:00 AM	14	87	1	0	102	5	0	7	0	12	0	48	5	0	53	2	0	0	0	2	169
7:15 AM	34	70	4	0	108	7	0	9	0	16	3	61	19	0	83	1	1	1	0	3	210
7:30 AM	51	82	3	0	136	6	0	25	0	31	0	65	28	0	93	2	1	1	0	4	264

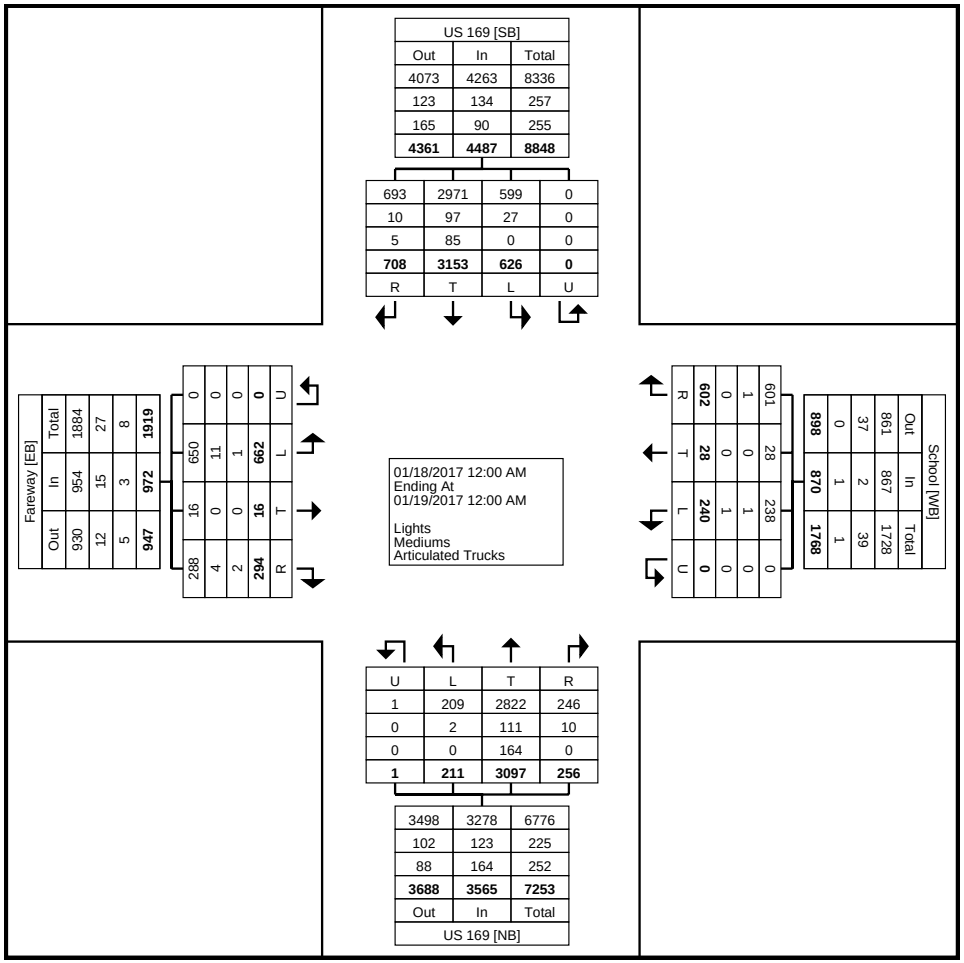
7:45 AM	81	85	2	0	168	7	0	32	0	39	2	82	45	0	129	5	0	3	0	8	344
Hourly Total	180	324	10	0	514	25	0	73	0	98	5	256	97	0	358	10	2	5	0	17	987
8:00 AM	85	96	4	0	185	10	0	33	0	43	2	73	6	0	81	4	0	5	0	9	318
8:15 AM	11	66	11	0	88	4	0	1	0	5	0	75	0	0	75	2	1	2	0	5	173
8:30 AM	2	50	7	0	59	2	0	5	0	7	2	43	0	0	45	9	0	4	0	13	124
8:45 AM	14	47	6	0	67	0	0	0	0	0	3	52	1	0	56	2	0	2	0	4	127
Hourly Total	112	259	28	0	399	16	0	39	0	55	7	243	7	0	257	17	1	13	0	31	742
9:00 AM	5	39	8	0	52	2	0	0	0	2	2	43	2	0	47	6	0	2	0	8	109
9:15 AM	2	42	9	0	53	0	0	1	0	1	3	40	0	0	43	6	0	4	0	10	107
9:30 AM	3	39	6	0	48	0	0	0	0	0	4	40	3	0	47	3	0	7	0	10	105
9:45 AM	4	26	7	0	37	4	0	6	0	10	2	37	4	0	43	5	0	5	0	10	100
Hourly Total	14	146	30	0	190	6	0	7	0	13	11	160	9	0	180	20	0	18	0	38	421
10:00 AM	2	40	9	0	51	1	0	3	0	4	1	43	3	0	47	5	0	0	0	5	107
10:15 AM	7	44	11	0	62	1	1	2	0	4	0	40	4	0	44	11	1	1	0	13	123
10:30 AM	2	34	10	0	46	1	0	4	0	5	2	45	0	0	47	6	0	4	0	10	108
10:45 AM	3	33	13	0	49	1	0	2	0	3	4	48	0	0	52	9	1	1	0	11	115
Hourly Total	14	151	43	0	208	4	1	11	0	16	7	176	7	0	190	31	2	6	0	39	453
11:00 AM	6	50	12	0	68	1	0	0	0	1	1	38	0	0	39	14	0	1	0	15	123
11:15 AM	3	37	14	0	54	3	2	18	0	23	3	54	1	0	58	11	0	6	0	17	152
11:30 AM	6	39	16	0	61	2	0	6	0	8	3	30	2	0	35	18	0	4	0	22	126
11:45 AM	8	42	10	0	60	0	0	16	0	16	4	44	1	0	49	11	1	4	0	16	141
Hourly Total	23	168	52	0	243	6	2	40	0	48	11	166	4	0	181	54	1	15	0	70	542
12:00 PM	4	55	20	0	79	4	0	9	0	13	2	49	1	0	52	15	0	1	0	16	160
12:15 PM	11	44	13	0	68	0	0	3	0	3	7	58	5	0	70	14	0	6	0	20	161
12:30 PM	5	44	8	0	57	1	0	9	0	10	1	44	3	0	48	14	0	4	0	18	133
12:45 PM	4	42	15	0	61	0	1	8	0	9	1	55	0	0	56	7	0	6	0	13	139
Hourly Total	24	185	56	0	265	5	1	29	0	35	11	206	9	0	226	50	0	17	0	67	593
1:00 PM	0	44	11	0	55	0	0	0	0	0	3	41	1	0	45	8	0	7	0	15	115
1:15 PM	5	46	12	0	63	1	0	4	0	5	2	56	3	0	61	12	0	3	0	15	144
1:30 PM	7	48	9	0	64	1	0	5	0	6	5	52	1	0	58	4	0	7	0	11	139
1:45 PM	3	26	18	0	47	5	0	1	0	6	5	42	2	0	49	14	0	4	0	18	120
Hourly Total	15	164	50	0	229	7	0	10	0	17	15	191	7	0	213	38	0	21	0	59	518
2:00 PM	3	41	7	0	51	1	1	4	0	6	1	48	2	1	52	14	0	2	0	16	125
2:15 PM	3	39	18	0	60	1	0	5	0	6	3	46	1	0	50	15	0	2	0	17	133
2:30 PM	1	44	12	0	57	1	1	13	0	15	4	47	3	0	54	15	0	5	0	20	146
2:45 PM	7	55	18	0	80	1	0	2	0	3	4	55	2	0	61	11	0	1	0	12	156
Hourly Total	14	179	55	0	248	4	2	24	0	30	12	196	8	1	217	55	0	10	0	65	560
3:00 PM	11	58	10	0	79	4	0	10	0	14	7	50	5	0	62	14	1	5	0	20	175
3:15 PM	18	53	14	0	85	26	0	90	0	116	3	69	10	0	82	14	0	6	0	20	303
3:30 PM	41	75	21	0	137	15	2	41	0	58	4	68	4	0	76	17	0	4	0	21	292
3:45 PM	22	67	16	0	105	15	3	37	0	55	7	60	4	0	71	15	0	12	0	27	258
Hourly Total	92	253	61	0	406	60	5	178	0	243	21	247	23	0	291	60	1	27	0	88	1028
4:00 PM	10	49	14	0	73	6	0	14	0	20	7	83	2	0	92	12	0	12	0	24	209
4:15 PM	7	77	15	0	99	8	0	13	0	21	7	56	7	0	70	17	0	14	0	31	221
4:30 PM	10	84	26	0	120	6	0	10	0	16	9	80	9	0	98	18	0	12	0	30	264
4:45 PM	14	72	26	0	112	7	2	17	0	26	9	75	9	0	93	22	1	8	0	31	262
Hourly Total	41	282	81	0	404	27	2	54	0	83	32	294	27	0	353	69	1	46	0	116	956
5:00 PM	5	65	22	0	92	14	0	25	0	39	6	72	3	0	81	30	0	11	0	41	253
5:15 PM	11	56	32	0	99	4	2	6	0	12	11	83	3	0	97	31	0	9	0	40	248
5:30 PM	13	71	17	0	101	13	4	20	0	37	7	66	9	0	82	29	2	15	0	46	266
5:45 PM	2	71	22	0	95	2	1	6	0	9	11	63	4	0	78	17	0	12	0	29	211
Hourly Total	31	263	93	0	387	33	7	57	0	97	35	284	19	0	338	107	2	47	0	156	978

6:00 PM	0	66	21	0	87	1	1	2	0	4	2	43	1	0	46	23	1	10	0	34	171
6:15 PM	3	73	15	0	91	1	0	3	0	4	1	60	1	0	62	15	0	7	0	22	179
6:30 PM	3	51	11	0	65	3	2	6	0	11	5	47	0	0	52	14	0	5	0	19	147
6:45 PM	4	36	14	0	54	7	1	6	0	14	4	31	9	0	44	12	1	4	0	17	129
Hourly Total	10	226	61	0	297	12	4	17	0	33	12	181	11	0	204	64	2	26	0	92	626
7:00 PM	2	15	10	0	27	2	1	4	0	7	1	26	3	0	30	8	0	5	0	13	77
7:15 PM	11	32	11	0	54	0	1	4	0	5	2	21	1	0	24	11	0	9	0	20	103
7:30 PM	2	44	6	0	52	6	0	4	0	10	3	34	1	0	38	10	1	2	0	13	113
7:45 PM	0	26	6	0	32	3	0	3	0	6	5	65	3	0	73	6	0	5	0	11	122
Hourly Total	15	117	33	0	165	11	2	15	0	28	11	146	8	0	165	35	1	21	0	57	415
8:00 PM	1	31	11	0	43	0	1	3	0	4	2	20	0	0	22	4	0	5	0	9	78
8:15 PM	2	18	9	0	29	2	1	3	0	6	2	14	2	0	18	10	1	5	0	16	69
8:30 PM	0	20	6	0	26	1	0	1	0	2	5	21	0	0	26	9	2	2	0	13	67
8:45 PM	2	7	7	0	16	1	0	2	0	3	3	17	0	0	20	10	0	3	0	13	52
Hourly Total	5	76	33	0	114	4	2	9	0	15	12	72	2	0	86	33	3	15	0	51	266
9:00 PM	2	22	0	0	24	3	0	15	0	18	1	9	1	0	11	3	0	1	0	4	57
9:15 PM	1	9	0	0	10	2	0	0	0	2	0	10	0	0	10	0	0	0	0	0	22
9:30 PM	0	7	2	0	9	4	0	5	0	9	1	14	4	0	19	7	0	4	0	11	48
9:45 PM	0	12	0	0	12	0	0	1	0	1	0	15	0	0	15	0	0	0	0	0	28
Hourly Total	3	50	2	0	55	9	0	21	0	30	2	48	5	0	55	10	0	5	0	15	155
10:00 PM	0	10	0	0	10	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	20
10:15 PM	1	4	0	0	5	1	0	1	0	2	0	7	2	0	9	1	0	0	0	1	17
10:30 PM	0	5	0	0	5	0	0	0	0	0	0	5	0	0	5	1	0	0	0	1	11
10:45 PM	0	4	0	0	4	1	0	1	0	2	0	5	0	0	5	0	0	0	0	0	11
Hourly Total	1	23	0	0	24	2	0	2	0	4	0	27	2	0	29	2	0	0	0	2	59
11:00 PM	1	3	0	0	4	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	6
11:15 PM	1	2	0	0	3	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	10
11:30 PM	0	2	0	0	2	0	0	0	0	0	0	5	1	0	6	0	0	0	0	0	8
11:45 PM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
Hourly Total	2	8	0	0	10	0	0	0	0	0	0	17	1	0	18	0	0	0	0	0	28
Grand Total	626	3153	708	0	4487	240	28	602	0	870	211	3097	256	1	3565	662	16	294	0	972	9894
Approach %	14.0	70.3	15.8	0.0	-	27.6	3.2	69.2	0.0	-	5.9	86.9	7.2	0.0	-	68.1	1.6	30.2	0.0	-	-
Total %	6.3	31.9	7.2	0.0	45.4	2.4	0.3	6.1	0.0	8.8	2.1	31.3	2.6	0.0	36.0	6.7	0.2	3.0	0.0	9.8	-
Lights	599	2971	693	0	4263	238	28	601	0	867	209	2822	246	1	3278	650	16	288	0	954	9362
% Lights	95.7	94.2	97.9	-	95.0	99.2	100.0	99.8	-	99.7	99.1	91.1	96.1	100.0	91.9	98.2	100.0	98.0	-	98.1	94.6
Mediums	27	97	10	0	134	1	0	1	0	2	2	111	10	0	123	11	0	4	0	15	274
% Mediums	4.3	3.1	1.4	-	3.0	0.4	0.0	0.2	-	0.2	0.9	3.6	3.9	0.0	3.5	1.7	0.0	1.4	-	1.5	2.8
Articulated Trucks	0	85	5	0	90	1	0	0	0	1	0	164	0	0	164	1	0	2	0	3	258
% Articulated Trucks	0.0	2.7	0.7	-	2.0	0.4	0.0	0.0	-	0.1	0.0	5.3	0.0	0.0	4.6	0.2	0.0	0.7	-	0.3	2.6

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and School
Site Code:
Start Date: 01/18/2017



Turning Movement Data Plot

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and School
Site Code:
Start Date: 01/18/2017

Turning Movement Peak Hour Data (7:15 AM)

Start Time	US 169 Southbound					School Westbound					US 169 Northbound					Fareway Eastbound					
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
7:15 AM	34	70	4	0	108	7	0	9	0	16	3	61	19	0	83	1	1	1	0	3	210
7:30 AM	51	82	3	0	136	6	0	25	0	31	0	65	28	0	93	2	1	1	0	4	264
7:45 AM	81	85	2	0	168	7	0	32	0	39	2	82	45	0	129	5	0	3	0	8	344
8:00 AM	85	96	4	0	185	10	0	33	0	43	2	73	6	0	81	4	0	5	0	9	318
Total	251	333	13	0	597	30	0	99	0	129	7	281	98	0	386	12	2	10	0	24	1136
Approach %	42.0	55.8	2.2	0.0	-	23.3	0.0	76.7	0.0	-	1.8	72.8	25.4	0.0	-	50.0	8.3	41.7	0.0	-	-
Total %	22.1	29.3	1.1	0.0	52.6	2.6	0.0	8.7	0.0	11.4	0.6	24.7	8.6	0.0	34.0	1.1	0.2	0.9	0.0	2.1	-
PHF	0.738	0.867	0.813	0.000	0.807	0.750	0.000	0.750	0.000	0.750	0.583	0.857	0.544	0.000	0.748	0.600	0.500	0.500	0.000	0.667	0.826
Lights	242	311	12	0	565	30	0	99	0	129	7	274	93	0	374	12	2	10	0	24	1092
% Lights	96.4	93.4	92.3	-	94.6	100.0	-	100.0	-	100.0	100.0	97.5	94.9	-	96.9	100.0	100.0	100.0	-	100.0	96.1
Mediums	9	16	0	0	25	0	0	0	0	0	0	2	5	0	7	0	0	0	0	0	32
% Mediums	3.6	4.8	0.0	-	4.2	0.0	-	0.0	-	0.0	0.0	0.7	5.1	-	1.8	0.0	0.0	0.0	-	0.0	2.8
Articulated Trucks	0	6	1	0	7	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	12
% Articulated Trucks	0.0	1.8	7.7	-	1.2	0.0	-	0.0	-	0.0	0.0	1.8	0.0	-	1.3	0.0	0.0	0.0	-	0.0	1.1

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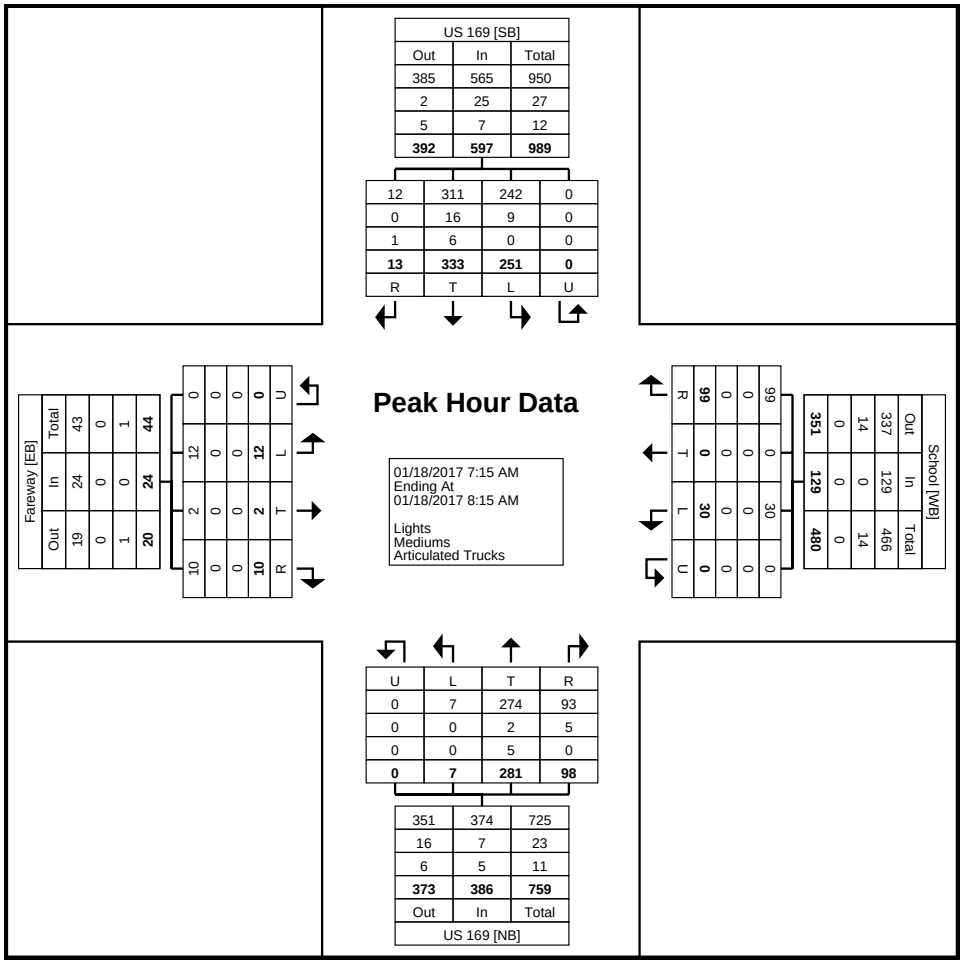

Turning Movement Peak Hour Data Plot (7:15 AM)

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and School
Site Code:
Start Date: 01/18/2017

Turning Movement Peak Hour Data (3:15 PM)

Start Time	US 169 Southbound					School Westbound					US 169 Northbound					Fareway Eastbound					
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
3:15 PM	18	53	14	0	85	26	0	90	0	116	3	69	10	0	82	14	0	6	0	20	303
3:30 PM	41	75	21	0	137	15	2	41	0	58	4	68	4	0	76	17	0	4	0	21	292
3:45 PM	22	67	16	0	105	15	3	37	0	55	7	60	4	0	71	15	0	12	0	27	258
4:00 PM	10	49	14	0	73	6	0	14	0	20	7	83	2	0	92	12	0	12	0	24	209
Total	91	244	65	0	400	62	5	182	0	249	21	280	20	0	321	58	0	34	0	92	1062
Approach %	22.8	61.0	16.3	0.0	-	24.9	2.0	73.1	0.0	-	6.5	87.2	6.2	0.0	-	63.0	0.0	37.0	0.0	-	-
Total %	8.6	23.0	6.1	0.0	37.7	5.8	0.5	17.1	0.0	23.4	2.0	26.4	1.9	0.0	30.2	5.5	0.0	3.2	0.0	8.7	-
PHF	0.555	0.813	0.774	0.000	0.730	0.596	0.417	0.506	0.000	0.537	0.750	0.843	0.500	0.000	0.872	0.853	0.000	0.708	0.000	0.852	0.876
Lights	79	237	65	0	381	62	5	182	0	249	21	254	19	0	294	58	0	33	0	91	1015
% Lights	86.8	97.1	100.0	-	95.3	100.0	100.0	100.0	-	100.0	100.0	90.7	95.0	-	91.6	100.0	-	97.1	-	98.9	95.6
Mediums	12	4	0	0	16	0	0	0	0	0	0	12	1	0	13	0	0	1	0	1	30
% Mediums	13.2	1.6	0.0	-	4.0	0.0	0.0	0.0	-	0.0	0.0	4.3	5.0	-	4.0	0.0	-	2.9	-	1.1	2.8
Articulated Trucks	0	3	0	0	3	0	0	0	0	0	0	14	0	0	14	0	0	0	0	0	17
% Articulated Trucks	0.0	1.2	0.0	-	0.8	0.0	0.0	0.0	-	0.0	0.0	5.0	0.0	-	4.4	0.0	-	0.0	-	0.0	1.6

McClure Engineering Company
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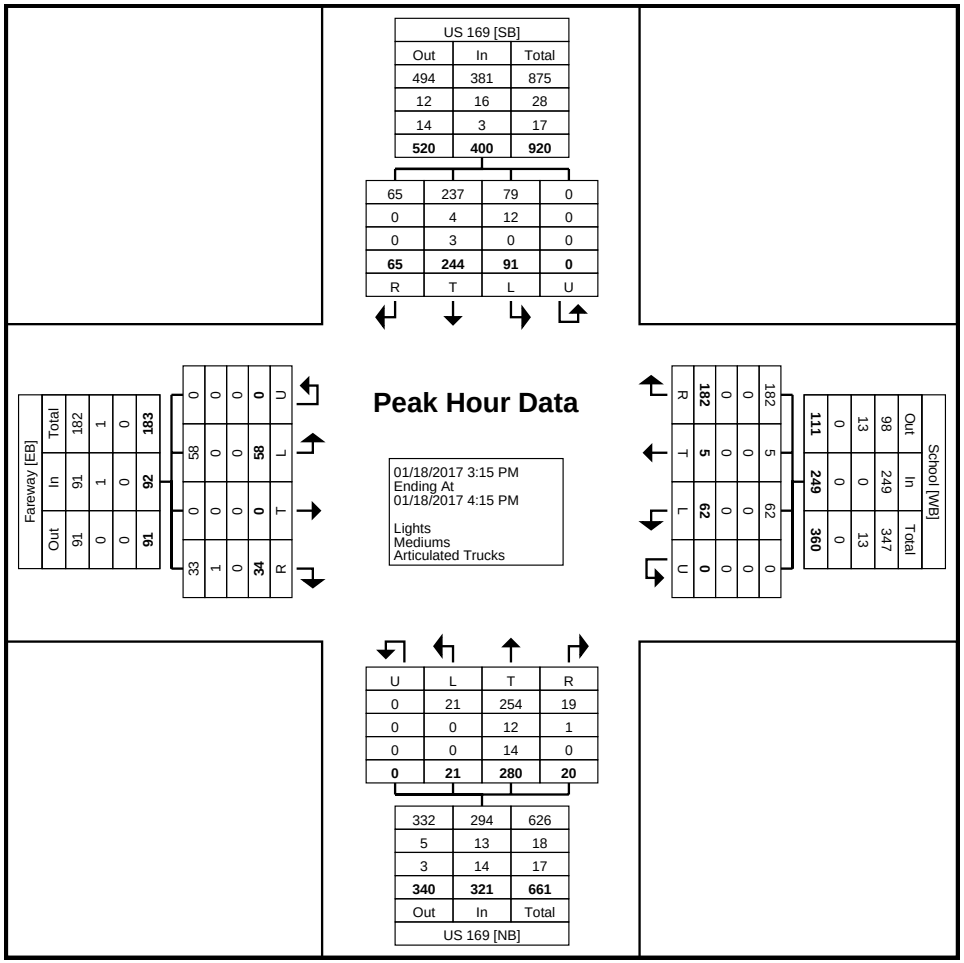
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and School
Site Code:
Start Date: 01/18/2017



Turning Movement Peak Hour Data Plot (3:15 PM)

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and Meadow Rd
Site Code:
Start Date: 01/18/2017

Turning Movement Data

Start Time	US 169 Southbound				US 169 Northbound				Meadow Rd Eastbound				
	Thru	Right	U-Turn	App. Total	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Int. Total
12:00 AM	3	0	0	3	0	3	0	3	0	0	0	0	6
12:15 AM	1	0	0	1	0	2	0	2	0	0	0	0	3
12:30 AM	2	0	0	2	0	1	0	1	0	0	0	0	3
12:45 AM	4	0	0	4	0	4	0	4	0	0	0	0	8
Hourly Total	10	0	0	10	0	10	0	10	0	0	0	0	20
1:00 AM	0	0	0	0	1	3	0	4	0	0	0	0	4
1:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 AM	0	0	0	0	0	2	0	2	0	0	0	0	2
1:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	1	5	0	6	0	0	0	0	6
2:00 AM	3	0	0	3	0	1	0	1	0	0	0	0	4
2:15 AM	4	0	0	4	1	1	0	2	0	0	0	0	6
2:30 AM	2	0	0	2	0	1	0	1	0	0	0	0	3
2:45 AM	4	0	0	4	0	1	0	1	0	0	0	0	5
Hourly Total	13	0	0	13	1	4	0	5	0	0	0	0	18
3:00 AM	3	0	0	3	1	0	0	1	0	0	0	0	4
3:15 AM	2	0	0	2	1	2	0	3	0	1	0	1	6
3:30 AM	1	0	0	1	0	2	0	2	0	0	0	0	3
3:45 AM	3	0	0	3	0	0	0	0	0	0	0	0	3
Hourly Total	9	0	0	9	2	4	0	6	0	1	0	1	16
4:00 AM	4	0	0	4	0	2	0	2	0	1	0	1	7
4:15 AM	5	0	0	5	0	2	0	2	0	1	0	1	8
4:30 AM	1	0	0	1	0	1	0	1	1	1	0	2	4
4:45 AM	5	0	0	5	0	3	0	3	0	1	0	1	9
Hourly Total	15	0	0	15	0	8	0	8	1	4	0	5	28
5:00 AM	8	0	0	8	0	2	0	2	0	3	0	3	13
5:15 AM	14	0	0	14	0	8	0	8	1	0	0	1	23
5:30 AM	10	0	0	10	0	12	0	12	0	0	0	0	22
5:45 AM	24	0	0	24	0	14	0	14	0	7	0	7	45
Hourly Total	56	0	0	56	0	36	0	36	1	10	0	11	103
6:00 AM	25	0	0	25	0	11	0	11	1	2	0	3	39
6:15 AM	54	0	0	54	1	22	0	23	2	7	0	9	86
6:30 AM	59	0	0	59	1	26	0	27	1	5	0	6	92
6:45 AM	63	1	0	64	1	28	0	29	1	7	0	8	101
Hourly Total	201	1	0	202	3	87	0	90	5	21	0	26	318
7:00 AM	91	1	0	92	2	48	0	50	2	10	0	12	154
7:15 AM	91	3	0	94	5	59	0	64	5	15	0	20	178
7:30 AM	85	0	0	85	2	66	0	68	9	7	0	16	169

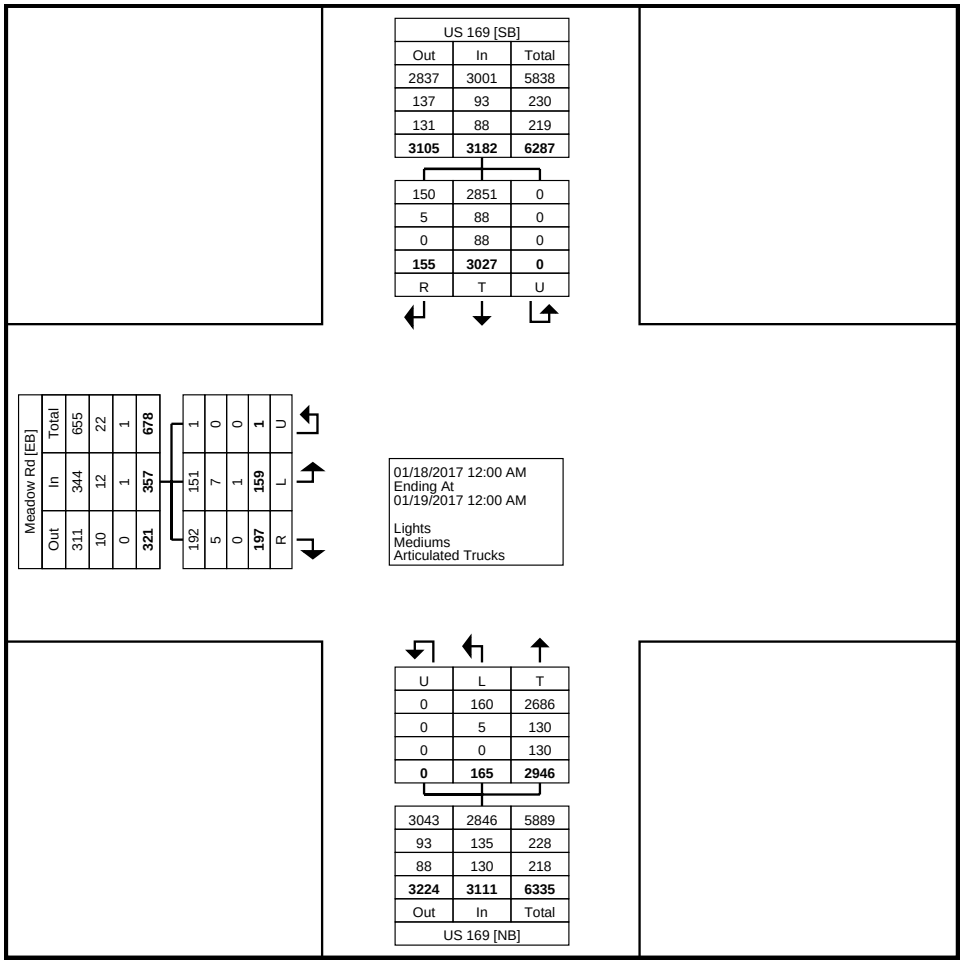
7:45 AM	85	2	0	87	0	94	0	94	8	8	0	16	197
Hourly Total	352	6	0	358	9	267	0	276	24	40	0	64	698
8:00 AM	100	7	0	107	1	87	0	88	2	7	0	9	204
8:15 AM	62	1	0	63	3	67	0	70	1	3	1	5	138
8:30 AM	58	1	0	59	1	40	0	41	0	2	0	2	102
8:45 AM	44	1	0	45	2	48	0	50	0	3	0	3	98
Hourly Total	264	10	0	274	7	242	0	249	3	15	1	19	542
9:00 AM	35	1	0	36	1	33	0	34	1	3	0	4	74
9:15 AM	40	0	0	40	1	36	0	37	1	3	0	4	81
9:30 AM	32	1	0	33	1	39	0	40	2	0	0	2	75
9:45 AM	23	4	0	27	6	35	0	41	0	1	0	1	69
Hourly Total	130	6	0	136	9	143	0	152	4	7	0	11	299
10:00 AM	32	0	0	32	0	29	0	29	3	1	0	4	65
10:15 AM	41	0	0	41	2	30	0	32	1	3	0	4	77
10:30 AM	30	2	0	32	2	38	0	40	1	2	0	3	75
10:45 AM	25	2	0	27	1	39	0	40	0	1	0	1	68
Hourly Total	128	4	0	132	5	136	0	141	5	7	0	12	285
11:00 AM	38	2	0	40	0	26	0	26	5	8	0	13	79
11:15 AM	25	3	0	28	3	40	0	43	1	4	0	5	76
11:30 AM	40	3	0	43	1	26	0	27	4	2	0	6	76
11:45 AM	34	3	0	37	1	40	0	41	2	1	0	3	81
Hourly Total	137	11	0	148	5	132	0	137	12	15	0	27	312
12:00 PM	46	2	0	48	2	39	0	41	3	4	0	7	96
12:15 PM	31	2	0	33	1	47	0	48	2	2	0	4	85
12:30 PM	27	1	0	28	1	34	0	35	2	1	0	3	66
12:45 PM	39	1	0	40	1	37	0	38	2	3	0	5	83
Hourly Total	143	6	0	149	5	157	0	162	9	10	0	19	330
1:00 PM	35	3	0	38	1	37	0	38	3	0	0	3	79
1:15 PM	41	2	0	43	2	48	0	50	1	2	0	3	96
1:30 PM	44	0	0	44	1	41	0	42	2	2	0	4	90
1:45 PM	24	0	0	24	3	39	0	42	2	2	0	4	70
Hourly Total	144	5	0	149	7	165	0	172	8	6	0	14	335
2:00 PM	36	0	0	36	3	40	0	43	1	0	0	1	80
2:15 PM	29	2	0	31	2	42	0	44	2	1	0	3	78
2:30 PM	32	5	0	37	1	40	0	41	1	0	0	1	79
2:45 PM	42	3	0	45	1	53	0	54	0	1	0	1	100
Hourly Total	139	10	0	149	7	175	0	182	4	2	0	6	337
3:00 PM	59	1	0	60	1	43	0	44	2	2	0	4	108
3:15 PM	55	4	0	59	2	68	0	70	2	1	0	3	132
3:30 PM	59	2	0	61	2	69	0	71	3	0	0	3	135
3:45 PM	80	5	0	85	2	54	0	56	2	2	0	4	145
Hourly Total	253	12	0	265	7	234	0	241	9	5	0	14	520
4:00 PM	56	2	0	58	4	82	0	86	1	1	0	2	146
4:15 PM	75	3	0	78	8	58	0	66	1	3	0	4	148
4:30 PM	82	2	0	84	6	81	0	87	3	2	0	5	176
4:45 PM	69	2	0	71	5	86	0	91	5	4	0	9	171
Hourly Total	282	9	0	291	23	307	0	330	10	10	0	20	641
5:00 PM	84	4	0	88	6	78	0	84	2	0	0	2	174
5:15 PM	53	6	0	59	9	89	0	98	0	0	0	0	157
5:30 PM	60	10	0	70	6	71	0	77	7	5	0	12	159
5:45 PM	63	9	0	72	6	63	0	69	3	3	0	6	147
Hourly Total	260	29	0	289	27	301	0	328	12	8	0	20	637

6:00 PM	53	4	0	57	4	43	0	47	4	4	0	8	112
6:15 PM	80	8	0	88	6	64	0	70	3	3	0	6	164
6:30 PM	54	9	0	63	5	47	0	52	7	2	0	9	124
6:45 PM	36	2	0	38	4	37	0	41	1	1	0	2	81
Hourly Total	223	23	0	246	19	191	0	210	15	10	0	25	481
7:00 PM	18	3	0	21	1	28	0	29	1	2	0	3	53
7:15 PM	23	4	0	27	2	27	0	29	1	2	0	3	59
7:30 PM	46	2	0	48	6	23	0	29	20	6	0	26	103
7:45 PM	25	4	0	29	1	82	0	83	3	3	0	6	118
Hourly Total	112	13	0	125	10	160	0	170	25	13	0	38	333
8:00 PM	28	3	0	31	4	24	0	28	2	1	0	3	62
8:15 PM	17	2	0	19	0	15	0	15	0	5	0	5	39
8:30 PM	19	2	0	21	2	19	0	21	8	2	0	10	52
8:45 PM	7	1	0	8	2	21	0	23	1	2	0	3	34
Hourly Total	71	8	0	79	8	79	0	87	11	10	0	21	187
9:00 PM	22	0	0	22	4	12	0	16	0	0	0	0	38
9:15 PM	12	1	0	13	3	9	0	12	0	2	0	2	27
9:30 PM	10	1	0	11	2	15	0	17	1	0	0	1	29
9:45 PM	10	0	0	10	0	14	0	14	0	0	0	0	24
Hourly Total	54	2	0	56	9	50	0	59	1	2	0	3	118
10:00 PM	11	0	0	11	0	14	0	14	0	0	0	0	25
10:15 PM	4	0	0	4	0	9	0	9	0	0	0	0	13
10:30 PM	6	0	0	6	0	6	0	6	0	0	0	0	12
10:45 PM	4	0	0	4	1	6	0	7	0	0	0	0	11
Hourly Total	25	0	0	25	1	35	0	36	0	0	0	0	61
11:00 PM	3	0	0	3	0	2	0	2	0	0	0	0	5
11:15 PM	1	0	0	1	0	7	0	7	0	0	0	0	8
11:30 PM	0	0	0	0	0	6	0	6	0	0	0	0	6
11:45 PM	2	0	0	2	0	3	0	3	0	1	0	1	6
Hourly Total	6	0	0	6	0	18	0	18	0	1	0	1	25
Grand Total	3027	155	0	3182	165	2946	0	3111	159	197	1	357	6650
Approach %	95.1	4.9	0.0	-	5.3	94.7	0.0	-	44.5	55.2	0.3	-	-
Total %	45.5	2.3	0.0	47.8	2.5	44.3	0.0	46.8	2.4	3.0	0.0	5.4	-
Lights	2851	150	0	3001	160	2686	0	2846	151	192	1	344	6191
% Lights	94.2	96.8	-	94.3	97.0	91.2	-	91.5	95.0	97.5	100.0	96.4	93.1
Mediums	88	5	0	93	5	130	0	135	7	5	0	12	240
% Mediums	2.9	3.2	-	2.9	3.0	4.4	-	4.3	4.4	2.5	0.0	3.4	3.6
Articulated Trucks	88	0	0	88	0	130	0	130	1	0	0	1	219
% Articulated Trucks	2.9	0.0	-	2.8	0.0	4.4	-	4.2	0.6	0.0	0.0	0.3	3.3

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and Meadow Rd
Site Code:
Start Date: 01/18/2017



Turning Movement Data Plot

McClure Engineering Company
1360 NW 121st Street

Clive, Iowa, United States 50325
515-964-1229 lvandenberg@mecresults.com

Count Name: US 169 and Meadow Rd
Site Code:
Start Date: 01/18/2017

Turning Movement Peak Hour Data (7:15 AM)

Start Time	US 169 Southbound				US 169 Northbound				Meadow Rd Eastbound				
	Thru	Right	U-Turn	App. Total	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Int. Total
7:15 AM	91	3	0	94	5	59	0	64	5	15	0	20	178
7:30 AM	85	0	0	85	2	66	0	68	9	7	0	16	169
7:45 AM	85	2	0	87	0	94	0	94	8	8	0	16	197
8:00 AM	100	7	0	107	1	87	0	88	2	7	0	9	204
Total	361	12	0	373	8	306	0	314	24	37	0	61	748
Approach %	96.8	3.2	0.0	-	2.5	97.5	0.0	-	39.3	60.7	0.0	-	-
Total %	48.3	1.6	0.0	49.9	1.1	40.9	0.0	42.0	3.2	4.9	0.0	8.2	-
PHF	0.903	0.429	0.000	0.871	0.400	0.814	0.000	0.835	0.667	0.617	0.000	0.763	0.917
Lights	342	11	0	353	7	299	0	306	24	35	0	59	718
% Lights	94.7	91.7	-	94.6	87.5	97.7	-	97.5	100.0	94.6	-	96.7	96.0
Mediums	13	1	0	14	1	5	0	6	0	2	0	2	22
% Mediums	3.6	8.3	-	3.8	12.5	1.6	-	1.9	0.0	5.4	-	3.3	2.9
Articulated Trucks	6	0	0	6	0	2	0	2	0	0	0	0	8
% Articulated Trucks	1.7	0.0	-	1.6	0.0	0.7	-	0.6	0.0	0.0	-	0.0	1.1

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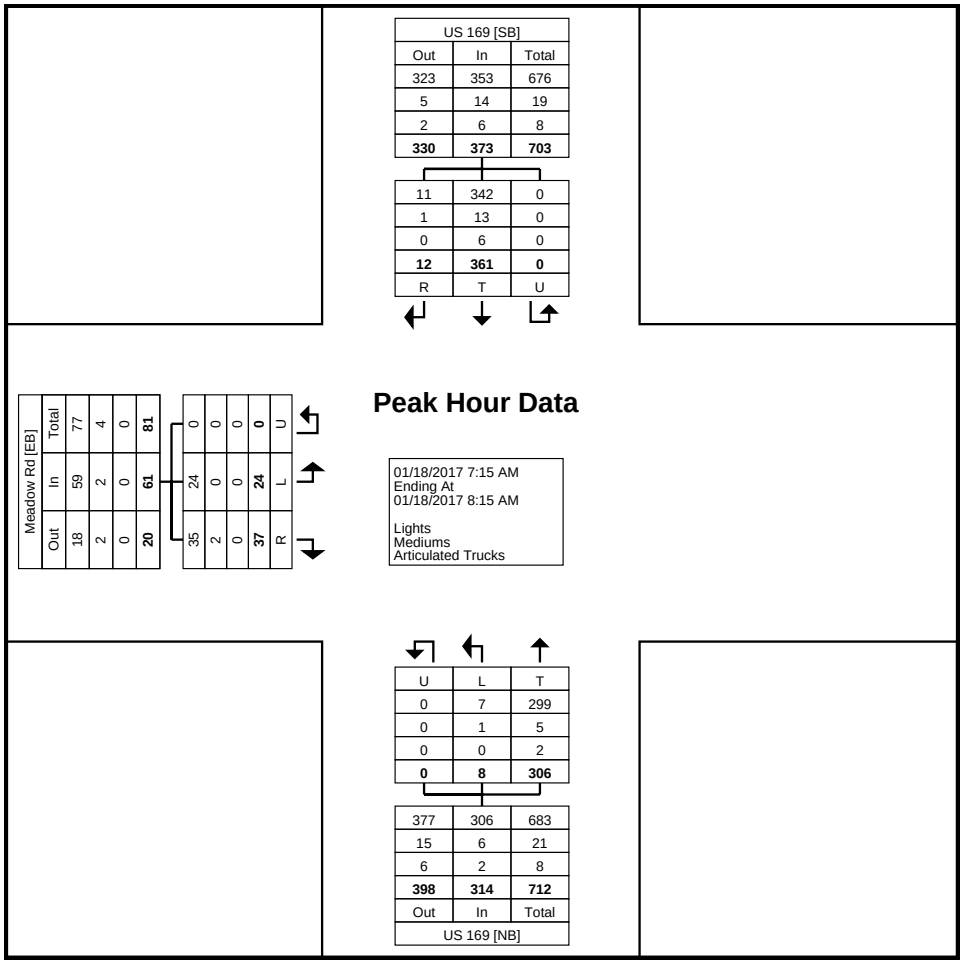

Turning Movement Peak Hour Data Plot (7:15 AM)

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Count Name: US 169 and Meadow Rd
Site Code:
Start Date: 01/18/2017

Turning Movement Peak Hour Data (4:30 PM)

Start Time	US 169 Southbound				US 169 Northbound				Meadow Rd Eastbound				
	Thru	Right	U-Turn	App. Total	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Int. Total
4:30 PM	82	2	0	84	6	81	0	87	3	2	0	5	176
4:45 PM	69	2	0	71	5	86	0	91	5	4	0	9	171
5:00 PM	84	4	0	88	6	78	0	84	2	0	0	2	174
5:15 PM	53	6	0	59	9	89	0	98	0	0	0	0	157
Total	288	14	0	302	26	334	0	360	10	6	0	16	678
Approach %	95.4	4.6	0.0	-	7.2	92.8	0.0	-	62.5	37.5	0.0	-	-
Total %	42.5	2.1	0.0	44.5	3.8	49.3	0.0	53.1	1.5	0.9	0.0	2.4	-
PHF	0.857	0.583	0.000	0.858	0.722	0.938	0.000	0.918	0.500	0.375	0.000	0.444	0.963
Lights	278	14	0	292	26	311	0	337	10	6	0	16	645
% Lights	96.5	100.0	-	96.7	100.0	93.1	-	93.6	100.0	100.0	-	100.0	95.1
Mediums	4	0	0	4	0	12	0	12	0	0	0	0	16
% Mediums	1.4	0.0	-	1.3	0.0	3.6	-	3.3	0.0	0.0	-	0.0	2.4
Articulated Trucks	6	0	0	6	0	11	0	11	0	0	0	0	17
% Articulated Trucks	2.1	0.0	-	2.0	0.0	3.3	-	3.1	0.0	0.0	-	0.0	2.5

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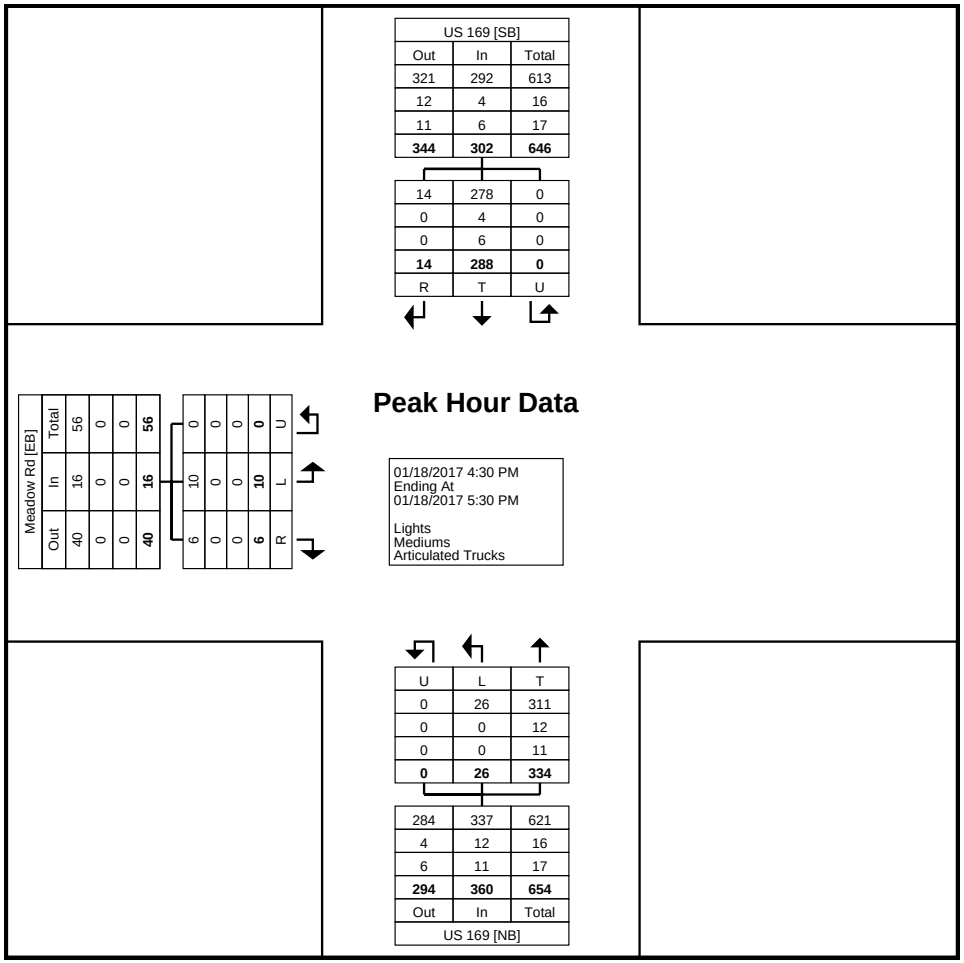


Turning Movement Peak Hour Data Plot (4:30 PM)

Appendix E – Synchro Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	257	108	43	110	100	73	136	57	147	199	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	190.0	182.5	190.0	190.0	180.9	190.0	179.2	176.7	190.0	184.5	177.6	190.0
Adj Flow Rate, veh/h	29	279	117	47	120	109	79	148	62	160	216	33
Adj No. of Lanes	0	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	5	5	5	7	7	7	6	9	9	3	7	7
Cap, veh/h	153	610	245	216	404	337	651	575	241	695	731	112
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	109	2246	903	266	1486	1239	1084	1184	496	1156	1505	230
Grp Volume(v), veh/h	230	0	195	150	0	126	79	0	210	160	0	249
Grp Sat Flow(s),veh/h/ln	1757	0	1501	1563	0	1428	1084	0	1680	1156	0	1735
Q Serve(g_s), s	0.0	0.0	3.6	0.0	0.0	2.3	1.6	0.0	2.4	3.1	0.0	2.8
Cycle Q Clear(g_c), s	3.5	0.0	3.6	3.6	0.0	2.3	4.4	0.0	2.4	5.5	0.0	2.8
Prop In Lane	0.13		0.60	0.31		0.87	1.00		0.30	1.00		0.13
Lane Grp Cap(c), veh/h	600	0	408	568	0	388	651	0	816	695	0	843
V/C Ratio(X)	0.38	0.00	0.48	0.26	0.00	0.32	0.12	0.00	0.26	0.23	0.00	0.30
Avail Cap(c_a), veh/h	962	0	729	871	0	693	651	0	816	695	0	843
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.0	0.0	10.0	9.5	0.0	9.6	6.4	0.0	5.0	6.6	0.0	5.1
Incr Delay (d2), s/veh	0.4	0.0	0.9	0.2	0.0	0.5	0.4	0.0	0.8	0.8	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	1.6	1.1	0.0	1.0	0.5	0.0	1.3	1.1	0.0	1.5
LnGrp Delay(d),s/veh	10.4	0.0	10.9	9.8	0.0	10.1	6.8	0.0	5.7	7.4	0.0	6.0
LnGrp LOS	B		B	A		B	A		A	A		A
Approach Vol, veh/h		425			276			289			409	
Approach Delay, s/veh		10.6			9.9			6.0			6.5	
Approach LOS		B			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		20.0		12.9		20.0		12.9
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		16.0		16.0		16.0		16.0
Max Q Clear Time (g_c+I1), s		6.4		5.6		7.5		5.6
Green Ext Time (p_c), s		2.8		3.4		2.6		3.4

Intersection Summary	
HCM 2010 Ctrl Delay	8.3
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	12	2	10	30	0	99	7	281	98
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	0	145	-	315
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	3	5
Mvmt Flow	13	2	11	33	0	108	8	305	107

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1236	1236	369	1242	1243	305	376	0	0
Stage 1	915	915	-	321	321	-	-	-	-
Stage 2	321	321	-	921	922	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	154	178	681	153	176	740	1194	-	-
Stage 1	329	354	-	695	655	-	-	-	-
Stage 2	695	655	-	327	352	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	109	138	681	123	136	740	1194	-	-
Mov Cap-2 Maneuver	109	138	-	123	136	-	-	-	-
Stage 1	327	276	-	690	651	-	-	-	-
Stage 2	590	651	-	249	275	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	28.3	18.6	0.1
HCM LOS	D	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1194	-	-	109	411	123	740	1244	-	-
HCM Lane V/C Ratio	0.006	-	-	0.12	0.032	0.265	0.145	0.219	-	-
HCM Control Delay (s)	8	-	-	42.5	14	44.5	10.7	8.7	-	-
HCM Lane LOS	A	-	-	E	B	E	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	1	0.5	0.8	-	-

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	251	333	13
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	250	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	92	92	92
Heavy Vehicles, %	4	7	8
Mvmt Flow	273	362	14

Major/Minor	Major2		
Conflicting Flow All	305	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.14	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.236	-	-
Pot Cap-1 Maneuver	1244	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1244	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	3.7
HCM LOS	

Minor Lane/Major Mvmt

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	165	84	113	249	178	109	208	72	95	177	39
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	190.0	184.5	190.0	190.0	187.7	190.0	190.0	183.1	190.0	186.3	185.4	190.0
Adj Flow Rate, veh/h	43	179	91	123	271	193	118	226	78	103	192	42
Adj No. of Lanes	0	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	2	2	2	0	4	4	2	3	3
Cap, veh/h	196	627	300	291	497	346	626	583	201	556	660	144
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.45	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	209	1908	914	455	1513	1053	1165	1303	450	1071	1475	323
Grp Volume(v), veh/h	162	0	151	308	0	279	118	0	304	103	0	234
Grp Sat Flow(s),veh/h/ln	1514	0	1517	1499	0	1522	1165	0	1752	1071	0	1797
Q Serve(g_s), s	0.1	0.0	2.7	3.4	0.0	5.4	2.6	0.0	4.1	2.5	0.0	3.0
Cycle Q Clear(g_c), s	5.5	0.0	2.7	6.1	0.0	5.4	5.5	0.0	4.1	6.7	0.0	3.0
Prop In Lane	0.27		0.60	0.40		0.69	1.00		0.26	1.00		0.18
Lane Grp Cap(c), veh/h	625	0	499	634	0	500	626	0	784	556	0	804
V/C Ratio(X)	0.26	0.00	0.30	0.49	0.00	0.56	0.19	0.00	0.39	0.19	0.00	0.29
Avail Cap(c_a), veh/h	798	0	679	809	0	681	626	0	784	556	0	804
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.8	0.0	8.9	10.0	0.0	9.9	8.0	0.0	6.6	8.8	0.0	6.3
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.6	0.0	1.0	0.7	0.0	1.4	0.7	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	1.1	2.6	0.0	2.4	0.9	0.0	2.3	0.9	0.0	1.6
LnGrp Delay(d),s/veh	9.1	0.0	9.3	10.6	0.0	10.8	8.7	0.0	8.0	9.6	0.0	7.2
LnGrp LOS	A		A	B		B	A		A	A		A
Approach Vol, veh/h		313			587			422			337	
Approach Delay, s/veh		9.2			10.7			8.2			7.9	
Approach LOS		A			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		20.0		15.8		20.0		15.8
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		16.0		16.0		16.0		16.0
Max Q Clear Time (g_c+I1), s		7.5		7.5		8.7		8.1
Green Ext Time (p_c), s		2.9		3.9		2.6		3.7

Intersection Summary	
HCM 2010 Ctrl Delay	9.2
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	112	3	43	38	8	68	33	296	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	0	145	-	315
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	0	0	0	0	0	0	5	0
Mvmt Flow	122	3	47	41	9	74	36	322	26

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	831	826	340	851	879	322	392	0	0
Stage 1	433	433	-	393	393	-	-	-	-
Stage 2	398	393	-	458	486	-	-	-	-
Critical Hdwy	7.11	6.5	6.2	7.1	6.5	6.2	4.1	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-
Follow-up Hdwy	3.509	4	3.3	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	290	310	707	282	288	724	1178	-	-
Stage 1	603	585	-	636	609	-	-	-	-
Stage 2	630	609	-	587	554	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	241	289	707	248	269	724	1178	-	-
Mov Cap-2 Maneuver	241	289	-	248	269	-	-	-	-
Stage 1	585	563	-	617	590	-	-	-	-
Stage 2	540	590	-	524	533	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	27.5	15.5	0.8
HCM LOS	D	C	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1178	-	-	241	646	251	724	1238	-	-
HCM Lane V/C Ratio	0.03	-	-	0.505	0.077	0.199	0.102	0.038	-	-
HCM Control Delay (s)	8.2	-	-	34.3	11	22.9	10.5	8	-	-
HCM Lane LOS	A	-	-	D	B	C	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.6	0.3	0.7	0.3	0.1	-	-

Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	43	264	97
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	250	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	92	92	92
Heavy Vehicles, %	2	4	1
Mvmt Flow	47	287	105

Major/Minor	Major2		
Conflicting Flow All	322	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1238	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1238	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0.9
HCM LOS	

Minor Lane/Major Mvmt

Appendix F – Traffic Signal Warrant Evaluation

Signal Warrant Analysis

Location: City of Adel, IA
Project # 40150015.05
Intersection: US Highway 169 & ADM School

COUNTY:	DALLAS	WARRANTS MET	0
PREPARED BY:	C CUTLER	WARRANTS NOT MET	9
DATE:	Apr-17	85th %ILE SPEED	45

WARRANTS					Meets
Warrant 1 - Eight Hour Vehicular Volume (See Page 3)					NO
Condition A	100%	N/A	70%	NO	
Condition B	100%	N/A	70%	NO	
Warrant 2 - Four Hour Vehicular Volume (See Page 2)					NO
70% of Warrant if 85th %ile >40 MPH or Pop. <10,000	100%	N/A	70%	NO	
Warrant 3 - Peak Hour (See Figures 4C-3 and 4C-4 on Page 2)					NO
70% of Warrant if 85th %ile >40 MPH or Pop. <10,000	100%	N/A	70%	NO	
Warrant 4 - Pedestrian Volume				N/A	NO
Warrant 5 - School Crossing				N/A	NO
Warrant 6 - Coordinated Signal System				N/A	N/A
Warrant 7 - Crash Experience				NO	NO
Warrant 8 - Roadway Network				N/A	N/A
Warrant 9 - Intersection Near Railroad Crossing				N/A	N/A

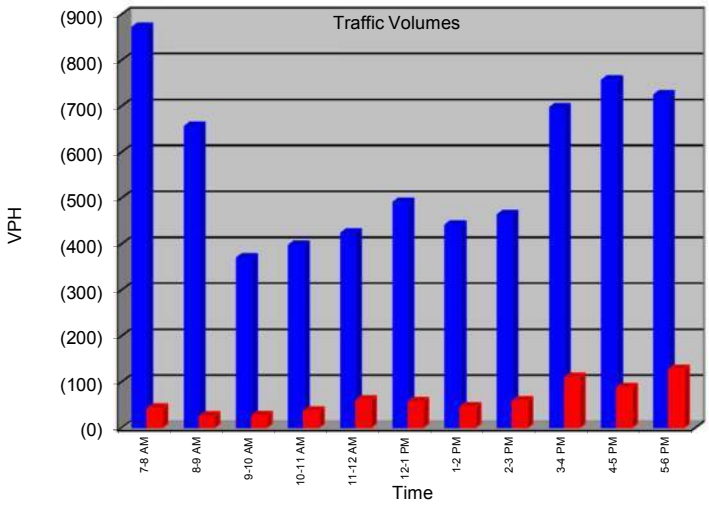
Signal Warrant Analysis

Location: City of Adel, IA
Project # 40150015.05
Intersection: US Highway 169 & ADM School

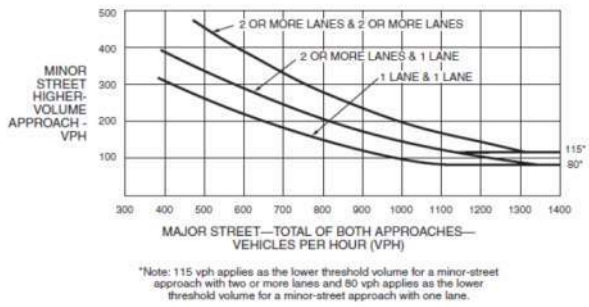
COUNTY	DALLAS	WARRANTS MET	0
PREPARED BY	C CUTLER	WARRANTS NOT MET	9
DATE	Apr-17	85th %ILE SPEED	45

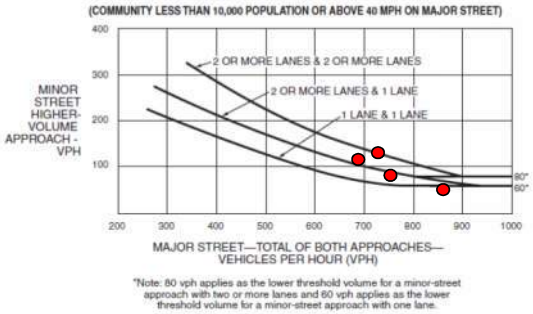
TRAFFIC VOLUMES

	Major Street			Minor Stree
Time	NB	SB	Total	Major App.
7-8 AM	358	514	(872)	43
8-9 AM	257	399	(656)	26
9-10 AM	180	190	(370)	27
10-11 AM	190	208	(398)	37
11-12 AM	181	243	(424)	61
12-1 PM	226	265	(491)	57
1-2 PM	213	229	(442)	46
2-3 PM	216	248	(464)	59
3-4 PM	291	406	(697)	110
4-5 PM	353	404	(757)	88
5-6 PM	338	387	(725)	128
6-7 PM	204	297	(501)	76
	3007	**3790**	**(6797)**	**758**

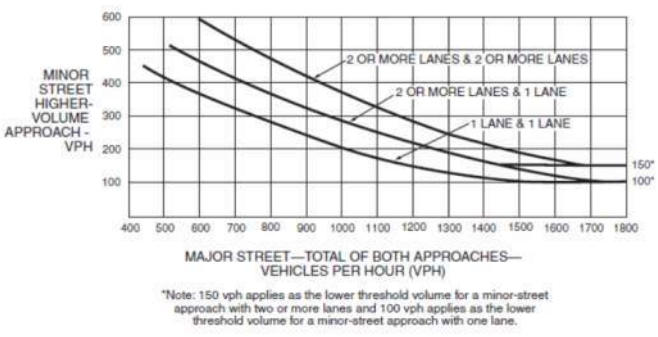


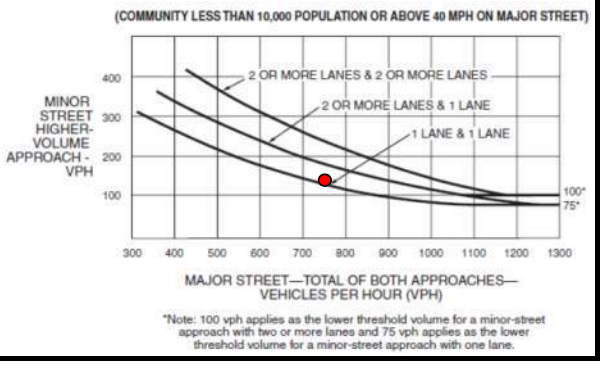
FOUR HOUR VOLUME WARRANT





PEAK HOUR VOLUME WARRANT





Signal Warrant Analysis

Location: City of Adel, IA
Project # 40150015.05
Intersection: US Highway 169 & ADM School

COUNTY	DALLAS	WARRANTS MET	0
PREPARED BY	C CUTLER	WARRANTS NOT MET	9
DATE	Apr-17	85th %ILE SPEED	45

WARRANT 1 - CONDITION A

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

WARRANT 1 - CONDITION B

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Signal Warrant Analysis

Location: City of Adel, IA
Project # 40150015.05
Intersection: US Highway 169 & ADM School

COUNTY	DALLAS	WARRANTS MET	0
PREPARED BY	C CUTLER	WARRANTS NOT MET	9
DATE	Apr-17	85th %ILE SPEED	45

NOTES

Turning movement counts collected by the City of Adel personnel on January 18, 2017 at the intersection of US Highway 169 & the ADM Middle/High School and Fareway Foods entrance were used for the traffic signal warrant analysis. Minor-street right turning traffic volumes were reduced following accepted Iowa DOT practices to account for RTOR movements.

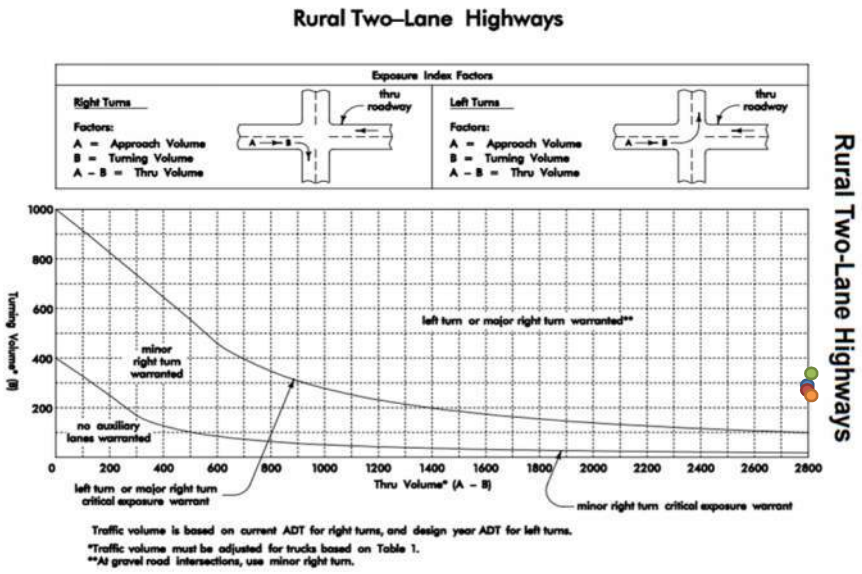
RECOMMENDATION

The analyses indicated that a traffic signal is not currently warranted by any of the nine MUTCD warrants.

Specific warrant notes include:
• Warrant 1 (Eight Hour Vehicle): The 2017 collected counts confirm that traffic volumes do not satisfy Warrant 1 volume criteria.
• Warrant 2 (Four Hour Vehicle): The 2017 collected counts confirm that traffic volumes do not satisfy Warrant 2 volume criteria.
• Warrant 3 (Peak Hour Vehicle): The 2017 collected counts confirm that traffic volumes do not satisfy Warrant 3 volume criteria.
• Warrant 4 (Pedestrian): Based on traffic volumes at this location, Warrant 4 would require at least 75 pedestrians per hour for four different hours or greater than 93 pedestrians in a peak hour. It is assumed that pedestrian volume counts would not satisfy Warrant 4 volume criteria.
• Warrant 5 (School Crossing): Warrant 5 would require at least 20 pedestrians per hour during the highest crossing hour. It is assumed that pedestrian volume counts would not satisfy Warrant 5 volume criteria.

Appendix G – Iowa DOT Design Manual – Horizontal Intersection Design: Rural Two-Lane, Auxiliary Lane Warrants (Figure 1, 6A-1)

US 169/6 & Timberview Drive



Traffic volume is based on current ADT for right turns, and design year ADT for left turns.

*Traffic volume must be adjusted for trucks based on Table 1.

**At gravel road intersections, use minor right turn.

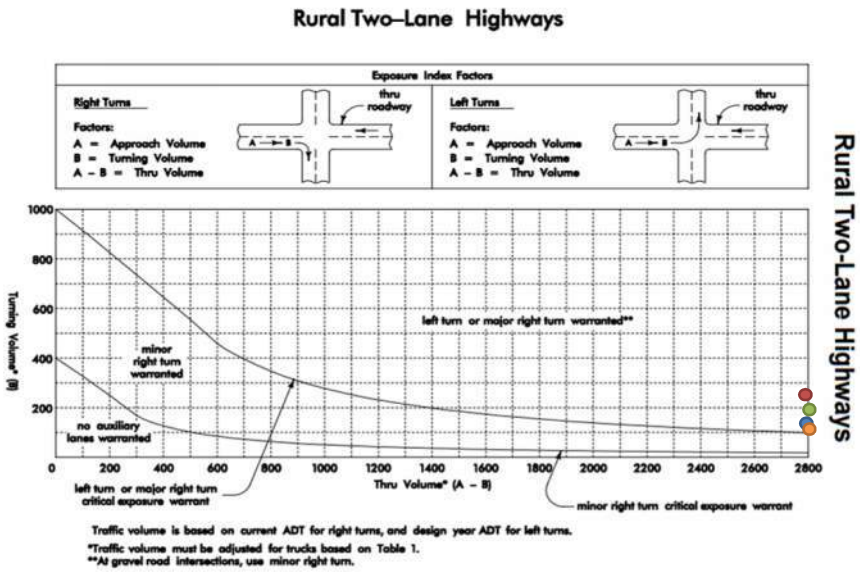
RIGHT TURNS (Existing Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3685	9	285	*0.96*	
		Adjusted ADT	**3838.5**		**296.9**		**3541.7**
	SB	ADT	3705	6	290	*0.99*	
		Adjusted ADT	**3742.4**		**292.9**		**3449.5**

LEFT TURNS (Design Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3685	9	310	*0.96*	
		Adjusted ADT	**3838.5**		**322.9**		**3515.6**
	SB	ADT	3705	6	265	*0.99*	
		Adjusted ADT	**3742.4**		**267.7**		**3474.7**

US 169/6 & Bailey's Grove Road



Traffic volume is based on current ADT for right turns, and design year ADT for left turns.

*Traffic volume must be adjusted for trucks based on Table 1.

**At gravel road intersections, use minor right turn.

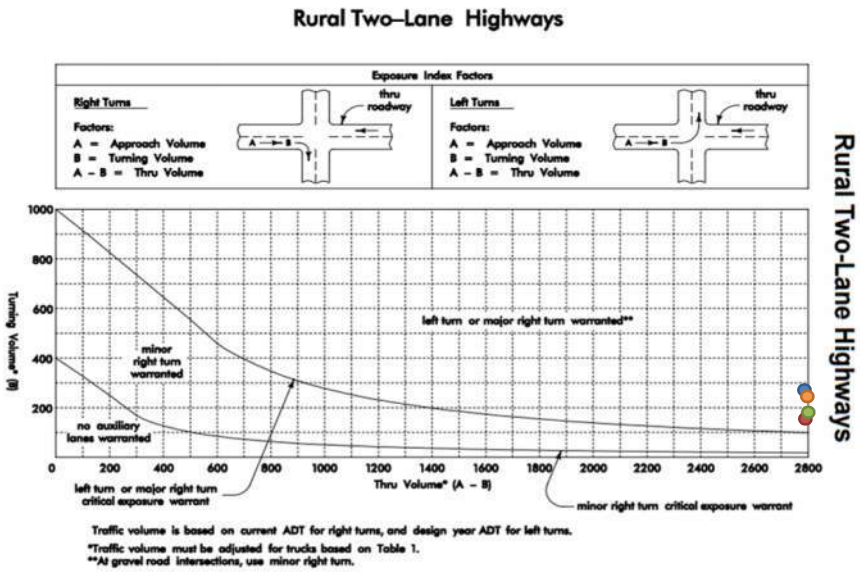
RIGHT TURNS (Existing Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3740	9	125	*0.96*	
		Adjusted ADT	**3895.8**		**130.2**		**3765.6**
	SB	ADT	3785	6	255	*0.99*	
		Adjusted ADT	**3823.2**		**257.6**		**3565.7**

LEFT TURNS (Design Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3740	9	280	*0.96*	
		Adjusted ADT	**3895.8**		**291.7**		**3604.2**
	SB	ADT	3785	6	115	*0.99*	
		Adjusted ADT	**3823.2**		**116.2**		**3707.1**

US 169/6 & Meadow Road



Traffic volume is based on current ADT for right turns, and design year ADT for left turns.

*Traffic volume must be adjusted for trucks based on Table 1.

**At gravel road intersections, use minor right turn.

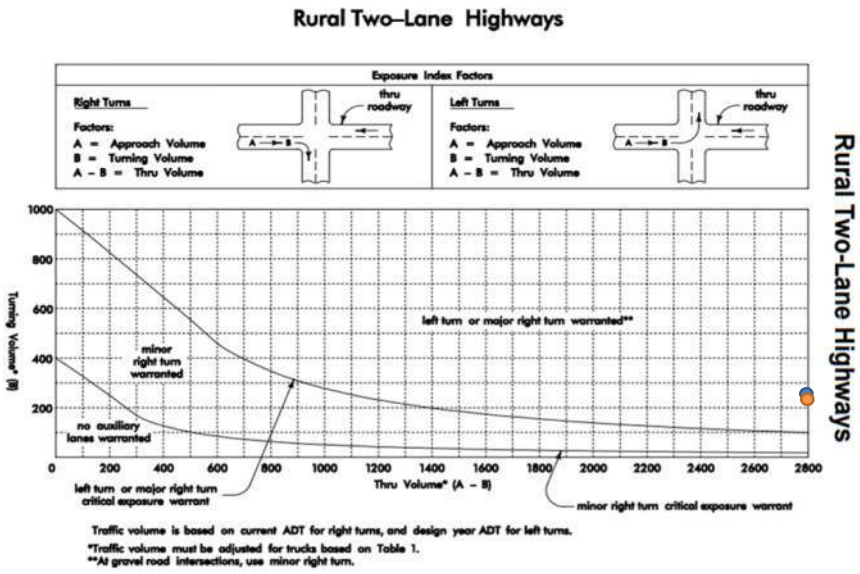
RIGHT TURNS (Existing Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3780	9	270	*0.96*	
		Adjusted ADT	**3937.5**		**281.3**		**3656.3**
	SB	ADT	3845	6	165	*0.99*	
		Adjusted ADT	**3883.8**		**166.7**		**3717.2**

LEFT TURNS (Design Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3780	9	175	*0.96*	
		Adjusted ADT	**3937.5**		**182.3**		**3755.2**
	SB	ADT	3845	6	250	*0.99*	
		Adjusted ADT	**3883.8**		**252.5**		**3631.3**

US 169/6 & 302nd Place



Traffic volume is based on current ADT for right turns, and design year ADT for left turns.

*Traffic volume must be adjusted for trucks based on Table 1.

**At gravel road intersections, use minor right turn.

RIGHT TURNS (Existing Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3570	9	245	*0.96*	
		Adjusted ADT	**3718.8**		**255.2**		**3463.5**
	SB	ADT	3725	6	0	*0.99*	
		Adjusted ADT	**3762.6**		**0.0**		**3762.6**

LEFT TURNS (Design Year ADT)

	Approach Direction	Values	Approach Volume (A)	Approach HV %	Turning Volume (B)	Correction Factor	Thru Volume (C)
Major Roadway	NB	ADT	3570	9	0	*0.96*	
		Adjusted ADT	**3718.8**		**0.0**		**3718.8**
	SB	ADT	3725	6	225	*0.99*	
		Adjusted ADT	**3762.6**		**227.3**		**3535.4**

Appendix H – Potential Funding Sources

Urban-State Traffic Engineering Program (U-STEP)

Intent of Program
Solve traffic operation and safety problems on primary roads in Iowa cities

Who is eligible to request funding?
Any Iowa city

Qualifications for funding

- The city must engineer and administer the project.
- Improvements must involve a municipal extension of a primary road. The two types of projects eligible are spot improvements and linear improvements (spot improvements are those limited to single locations; linear improvements are those which span two or more intersections).
- City match is 45 percent of the construction cost (55 percent state-funded).
- An engineering analysis of the problem area is required.
- Iowa Traffic Engineering Assistance Program can be used for analysis.

Type of submittal required
Letters of request with a sketch and cost estimate submitted by interested parties

Application amount minimum/maximum

- maximum of $200,000 per project for spot improvements
- maximum of $400,000 per project for linear improvements

Application deadline
Letters of request accepted all year

Special project requirements
DOT review of plans and specifications

Type of approval required
DOT staff approval and selection

Average length of time for acceptance decision
90 days

Send application/request to:
The appropriate DOT district engineer (see map and listing on page 77)

Surface Transportation Program

Intent of program
This federal program was established to:

- aid public road jurisdictions with funding for roads on federal-aid routes or bridges on any public road (for bridge projects see also "Highway Bridge Program" on page 23)
- provide funding for transit capital improvements (see also "STP - transit" on page 72); and
- provide funding for transportation planning activities.

Who is eligible to request funding?
Eligible entities are any public agencies with public road jurisdiction, public transit responsibilities or transportation planning responsibilities.

Qualifications for funding
Road projects
A minimum of 20 percent non-federal match is required (80 percent federal funding). Road projects must be on a federal-aid road, which includes all federal functional class routes except local and rural minor collectors.

Bridge projects
See page 23

Transit projects
See page 72

Type of submittal required
Application forms can be obtained from the appropriate Regional Planning Affiliation or Metropolitan Planning Organization (RPA/MPO).

Application amount – minimum/maximum
Varies according to RPA/MPO guidelines

Application deadline
RPAs/MPOs may have different deadlines for applications.

Special project requirements
Highway projects

- Project contracts must be let by the DOT.
- Federal Highway Administration (FHWA) must authorize work prior to contract letting.
- FHWA environmental concurrence is required.
- Right-of-way activities must comply with applicable federal and state laws.
- Plans and specifications must be prepared by an Iowa licensed professional engineer.
- If federal-aid dollars are used for a consulting engineer, the Federal-Aid Consultant Selection Process must be used.
- DOT design criteria for the appropriate road classification should be used.
- DOT approval of plans and specifications is required.
- Compliance with regulations regarding the following is required:
    - federal equal employment opportunity;
    - use of disadvantaged business enterprises;
    - Occupational Safety and Health Administration provisions; and
    - federal (Davis-Bacon) wage rates.

(continued on next page)

For projects on federal-aid routes, refer to Form FHWA 1273, "Required Contract Provisions, Federal-Aid Construction Contracts," for more information. Materials testing, construction inspection and final project acceptance must be done according to DOT procedures.

Transit projects (page 72)

- Capital improvements require adherence to approved transit procurement procedures and equipment specifications.
- Project candidates must be part of an approved five-year Capital Improvement Program.
- Federally funded projects must comply with requirements regarding:
  - civil rights protections;
  - use of disadvantaged business enterprises;
  - competitive procurement;
  - bus testing;
  - pre- and post-procurement audits; and
  - drug and alcohol testing.

Type of approval required

- Projects are selected through the process of adopting an RPA/MPO Transportation Improvement Program (TIP).
- The DOT reviews and compiles all RPA/MPO TIPs as part of the Statewide Transportation Improvement Program (STIP).
- The DOT adopts the STIP.
- Federal Highway Administration and Federal Transit Administration (FTA) give final approval of the STIP.
- FHWA must authorize highway/street/trail projects prior to proceeding with work on or advertisement of the project for receipt of bids.

Transit projects must be approved by FTA, either as part of a direct grant or a statewide grant.

Average length of time for acceptance decision
Nine months

Program's annual funding level
The annual amount available to RPAs/MPOs is approximately $75 million.

More information/applications
The appropriate RPA/MPO (see map and listing on page 81)

Iowa Clean Air Attainment Program (ICAAP)

Intent of program
This program funds highway/street, transit, bicycle/pedestrian, or freight projects or programs which help maintain Iowa's clean air quality by reducing transportation-related emissions. Eligible highway/street projects must be on the federal-aid system, which includes all federal functional class routes except local and rural minor collectors.

Who is eligible to request funding?
The state, a county or a city may sponsor an application or may co-sponsor for private, non-profit organizations and individuals. Transit systems may apply directly.

Qualifications for funding

- A local match of at least 20 percent is required.
- Eligible projects will fall into one of the following categories:
  - those which reduce emissions via traffic flow improvements and provide a direct benefit to air quality by addressing ozone, carbon monoxide, or particulate matter PM-2.5 or PM-10 (all of these pollutant emissions must be addressed, and a reduction calculation must be provided by the applicant for all types of projects listed);
  - those which reduce vehicle miles of travel;
  - those which reduce single-occupant vehicle trips; or
  - other transportation improvement projects to improve air quality or reduce congestion.

Net operating costs of new transit services are eligible for up to three years (at 80 percent federal/20 percent local participation).

Type of submittal required
Application forms must be submitted with emission reduction calculations and supporting documentation of congestion reduction and/or travel reduction assumptions. Applications are available from the DOT at www.iowadot.gov/forms/index.htm or at www.iowadot.gov/systems_planning/icaap.htm

Requested amount – minimum/maximum
Minimum $20,000 total project cost

Application deadline
October 1, statewide competitive application

Special project requirements - *Highway projects*

- Projects must be let by the DOT.
- Federal Highway Administration (FHWA) environmental concurrence is required.
- Right-of-way activities must comply with applicable federal and state laws.
- Plans and specifications must be prepared by an Iowa licensed professional engineer.
- If federal-aid dollars are used for a consulting engineer, the Federal-Aid Consultant Selection Process must be used.
- DOT design criteria should be used for the appropriate road classification.
- Approval by the DOT of plans and specifications is required.
- Compliance with regulations regarding the following is required:
  - federal equal employment opportunity;
  - use of disadvantaged business enterprises;
  - Occupational Safety and Health Administration provisions; and
  - federal (Davis-Bacon) wage rates.

(continued on next page)

For those projects on federal-aid routes, refer to FHWA form 1273, "Required Contract Provisions, Federal-Aid Construction Contracts," for more information. Materials testing, construction inspection and final project acceptance must be done according to DOT procedures.

Special Project Requirements - *Transit projects*

- Capital improvements require adherence to approved transit procurement procedures and equipment specifications.
- Project candidates must be part of an approved five-year Capital Improvement Program.
- Federally funded projects must comply with requirements regarding:
  - civil rights protections;
  - use of disadvantaged business enterprises;
  - competitive procurement;
  - bus testing;
  - pre- and post-procurement audits; and
  - drug and alcohol testing.

Type of approval required

- project evaluation committee/DOT staff recommendation, with Iowa Transportation Commission approval
- inclusion of selected projects in the Statewide Transportation Improvement Program
- Regional Planning Affiliations and Metropolitan Planning Organizations must also include selected projects in their respective Transportation Improvement Program
- FHWA and FTA final approval of the STIP
- authorization by FHWA of projects prior to proceeding with work or with advertisement of the project for receipt of bids

Transit projects must be approved by FTA as part of either a direct or a statewide grant.

Average length of time for acceptance decision
Four months

Program's annual funding level
Approximately $4.7 million

More information/applications
Iowa Department of Transportation
Office of Systems Planning
800 Lincoln Way
Ames, Iowa 50010
515-239-1681
www.iowadot.gov/systems_planning/icaap.htm