SAFETY STUDY
DEL-36-10.59
PID 95625

E. William Street Improvements
Delaware County
August 2018

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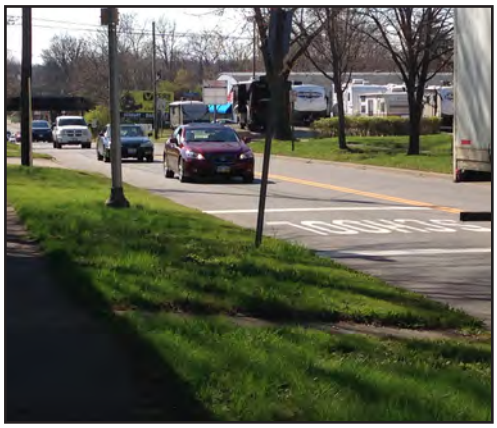
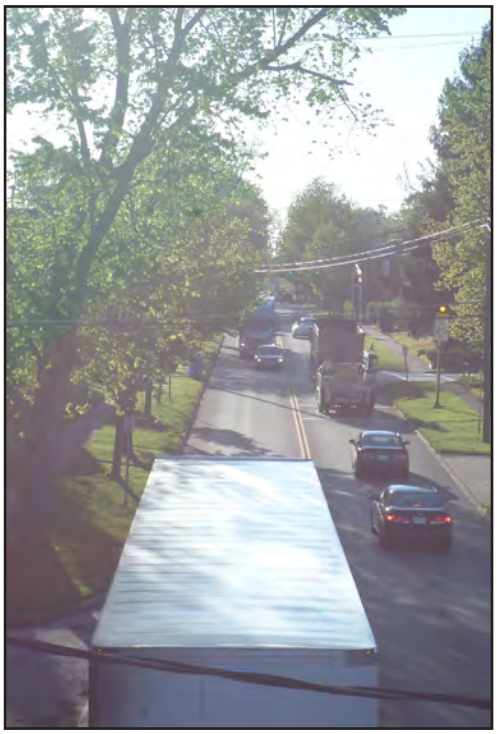
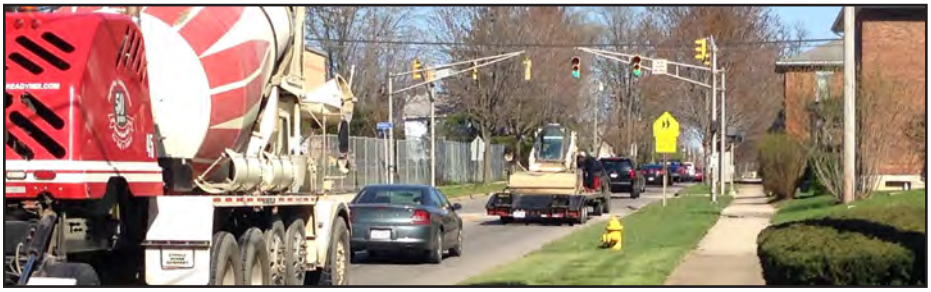
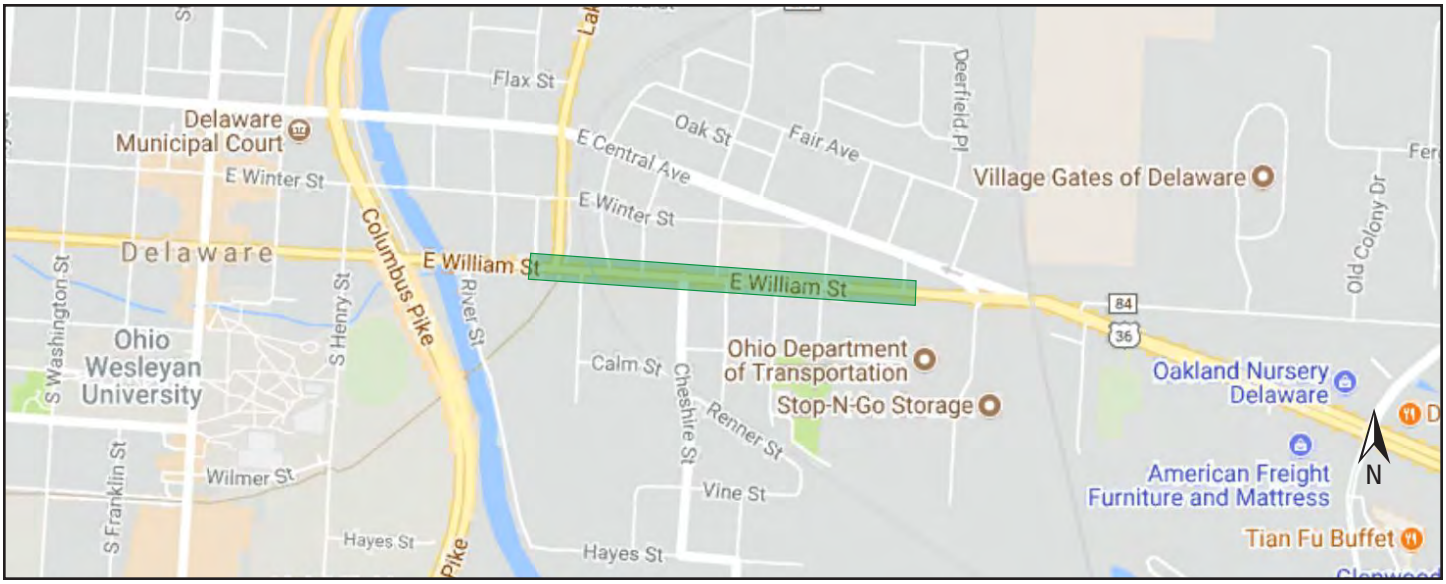






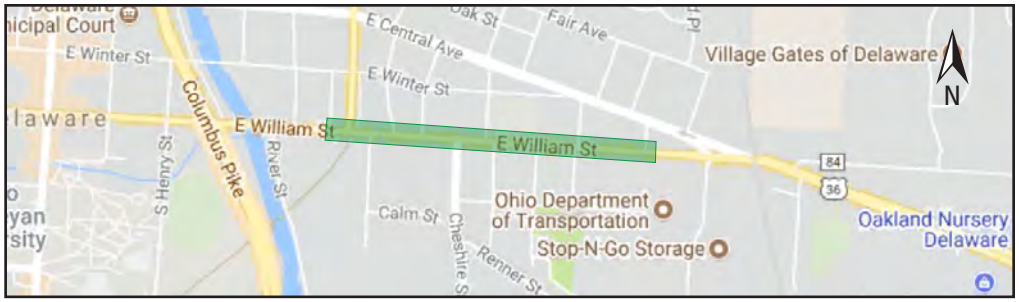


SAFETY APPLICATION SUMMARY
DEL-36-10.59 (PID 95625)

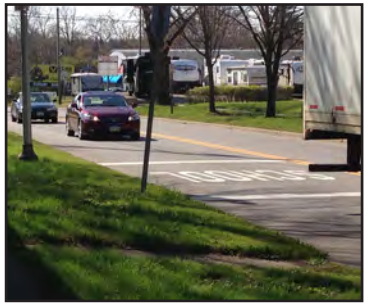
E. William Street Improvements
Delaware County
August 2018

EST 1808 CITY OF DELAWARE OHIO

Project Purpose
Address rear-end crashes caused by congestion in the corridor
71% rear-end collisions & 27% injury crashes



City Request $650,000
Represents *less* than the expected safety benefit

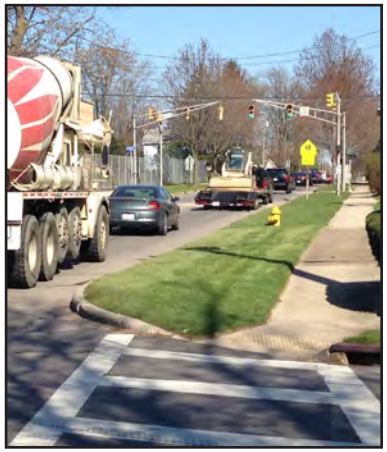


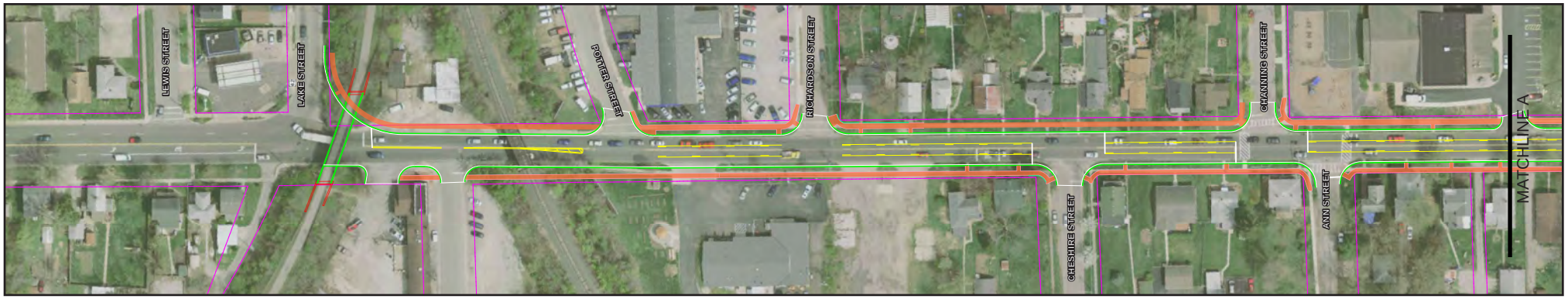
Recommended Improvements
- Widening of US 36 (E. William Street) to provide a center two-way left-turn lane between Lake Street & Foley Street
- Replacement of the pedestrian/bikeway bridge over E. William Street to accommodate a larger intersection at US 42 (Lake Street)
- Installation of a new traffic signal for the Cheshire Road intersection
- Removal of Ann Street from the existing Channing Street signal
- Upgraded highway lighting in the corridor

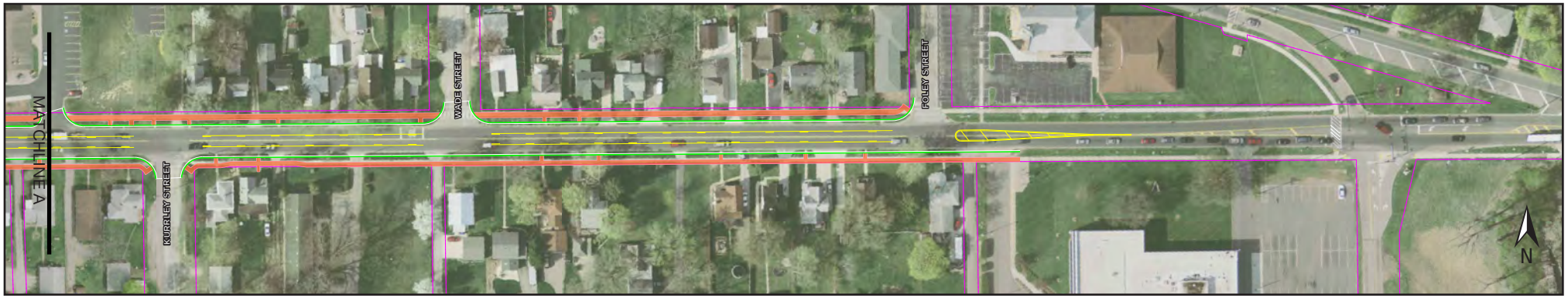
Schedule

Preliminary Engineering	completed
Final Engineering	completed
Right-of-Way Acquisition	2017 - 2018
Construction	2019

Project Phase	ODOT	MORPC	Local	ODOT Safety	Total
PE/FE	$1.00 mil	--	$0.01 mil	--	**$1.01 mil**
ROW	$0.39 mil	--	--	--	**$0.39 mil**
Construction	$2.55 mil	$0.80 mil	$0.25 mil	$0.65 mil	**$4.25 mil**
Total	**$3.94 mil**	**$0.80 mil**	**$0.26 mil**	**$0.65 mil**	**$5.65 mil**







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EXECUTIVE SUMMARY

A safety study has been performed for the East William Street (US 36) corridor, between Lake Street (US 42) and Foley Street, just west of the Central Avenue (SR 37) intersection – locally known as "The Point". The section of roadway serves nearly 15,000 vehicles on a two-lane corridor with no turn lanes. Congestion and long traffic queues are frequent occurrences on E. William Street (US 36) during peak hours, as traffic volumes exceed the capacity of a two-lane facility. Traffic is frequently blocked by vehicles attempting to turn left at one of the study area intersections or driveways. With daily traffic volumes expected to exceed 24,000 over the next two decades, the issues with congestion and rear-end crashes will continue to worsen.

The resulting queues have contributed to rear-end crashes in the corridor. In the most recent three-year period (2014-2016), the corridor experienced 58 crashes, with 41 rear-end collisions (71%). As the City of Delaware and surrounding Delaware County continue to grow, the congestion and safety concerns are expected to worsen. The functionality of East William Street as a safe and efficient corridor is critical to the economic health and growth of the City of Delaware and surrounding region.

A two-way left turn lane (TWLTL), along with other measures, is the recommended improvement for this study area. The two-way left turn lane will provide a safe refuge for left turning drivers to wait for gaps in opposing traffic, without obstructing trailing vehicles. The two-way left turn lane can be constructed with minimal right-of-way and limited disruption to adjacent property owners. Additional improvements are also included, such as:

- Modification of the Channing Street signal to remove an offset approach (Ann Street) from signal control (which accounts for the greatest safety benefit)
- Reconstruction of bikeway bridge over East William Street to provide wider clearance, allowing for improved turning radii at the Lake Street intersection
- New signal at Cheshire Street
- Upgraded lighting

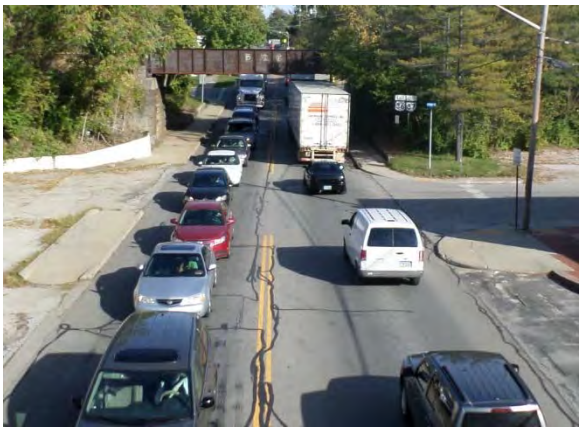
Construction of these improvements is scheduled to begin in 2019. Preliminary engineering and design has already been performed and right-of-way acquisition is in progress. The recommended improvements have a net present value safety benefit of $727,000. To implement the recommended improvements, ***a total of $650,000 in safety funds is being requested from ODOT, approximately 11.5% of the overall project cost of $5.64 million***. The funding amount being requested is <u>less</u> than the net present value safety benefit.

PURPOSE & NEED

A safety study has been performed for the E. William Street (US 36) corridor on the east side of the City of Delaware. The study area is between Lake Street (US 42) and the intersection of E. William Street (US 36) and E. Central Avenue (SR 37), commonly known as "The Point". This study area represents the two-lane section of US 36 between an adjacent four-lane section to the west of Lake Street and a four-lane divided section east of "The Point".

This existing two-lane section of E. William Street (US 36) serves nearly 15,000 vehicles daily, including nearly 1,500 trucks. It is a vital route for both commuter and freight traffic, as E. William Street (US 36) is located on a Statewide Freight Corridor, connecting US 23 and I-71.

Congestion and long traffic queues are frequent occurrences on E. William Street (US 36) during peak hours, as traffic volumes exceed the capacity of a two-lane facility. Traffic is frequently blocked by vehicles attempting to turn left at one of the study area intersections or driveways. The resulting queues have contributed to rear-end crashes in the corridor. With daily traffic volumes expected to exceed 24,000 over the next two decades, the issues with congestion and rear-end crashes will continue to worsen.



The purpose of this project is to maintain a safe and efficient route of travel by reducing congestion along E. William Street (US 36) for the immediate future. The needs of this project include improving safety and improving roadway capacity. The study area is shown in **Figure 1**.

Figure 1: Study Area Map

EXISTING CONDITIONS

E. William Street (US 36) is a major east-west arterial through the City of Delaware. This corridor serves to connect the western and central portions of Delaware with the eastern part of the City. The corridor also serves as a regional connection between US 23 and I-71. The most recently available ODOT 24-hour count, taken in 2015, shows a daily volume of 14,750 vehicles. Approximately 10% of daily vehicles are trucks.

Certified traffic was developed for the study area and was approved in 2014. The certified traffic estimates that the ADT will grow to 24,800 by 2037. The certified traffic can be found in **Appendix A**.

Corridor

The E. William Street (US 36) corridor traverses through a largely residential area, with single-family homes lining both sides of the street. Several small business and institutional land uses are also scattered throughout the corridor. An elementary school and church are located on the north side of the street. Cross streets are relatively minor roadways, with the exception of Lake Street (US 42) at the west edge of the study area.

The portion of East William Street (US 36) between Lake Street (US 42) and Foley Street has a single through lane in each direction. No turn lanes are present, even at intersections. The existing pavement width is generally 30' wide. Two overhead structures cross E. William Street (US 36) within the corridor limits – a CSX Railroad bridge and a former railroad bridge now functioning as a bike trail. These bridges have narrow clearances, resulting in a slightly narrower roadway width in these areas.

Intersections

Two signals exist in the study area. The E. William Street (US 36)/Lake Street (US 42) intersection is a signalized intersection with an eastbound left turn lane and no other turn lanes. The intersection is located immediately west of the CSX bridge. The bridge contributes to tight turning radii and sight distance issues at the intersection. Thus, no westbound or southbound right turns are allowed on red.

The second signal is located at Channing Street and Ann Street. These north-south streets are offset about 60' from each other; however these streets run on a common signal phase. The intersection is located adjacent to Conger Elementary School and has crosswalks and pedestrian signals.

The existing conditions diagram can be found as **Figure 2**.

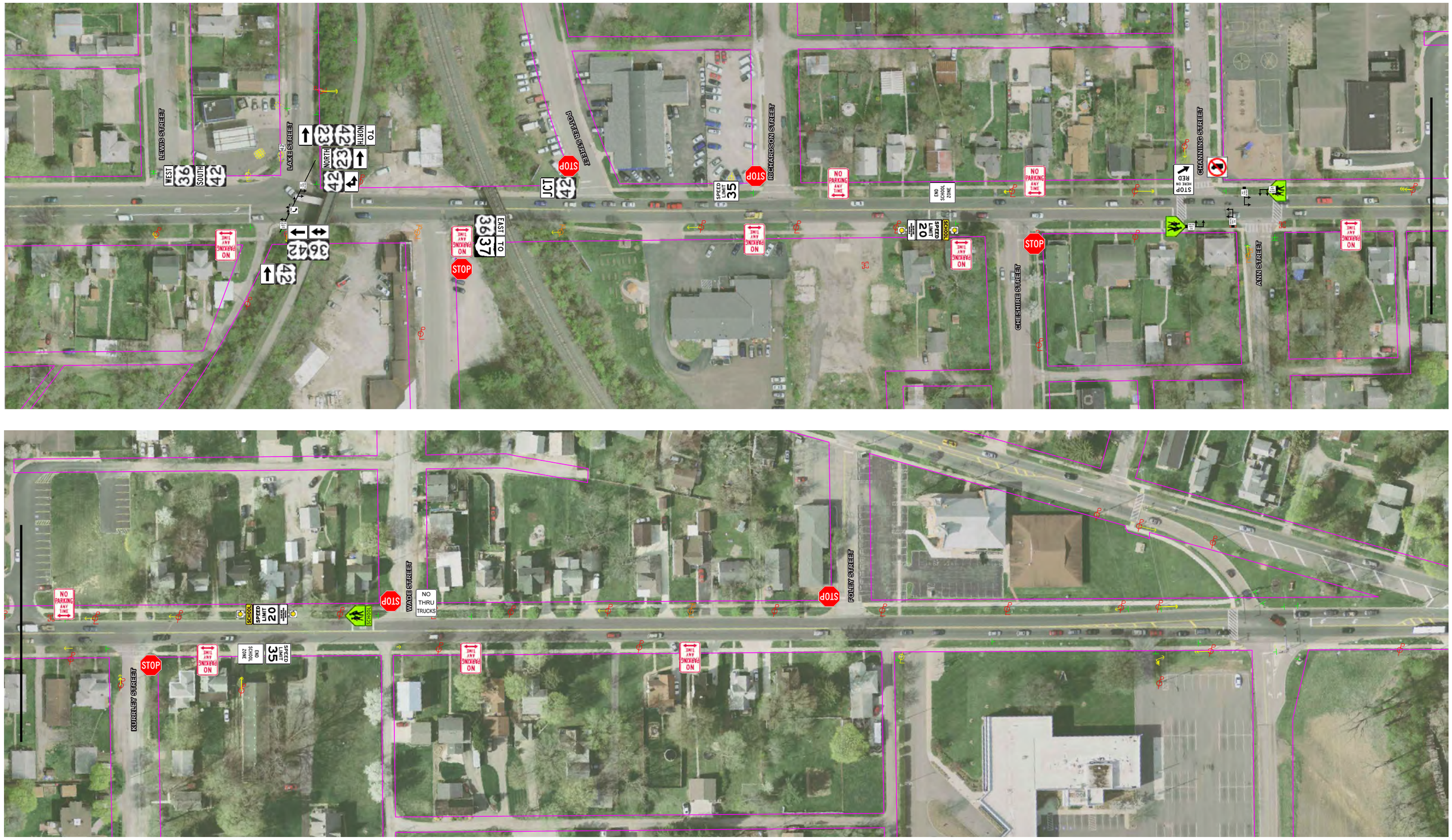


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FIGURE 2: EXISTING CONDITIONS DIAGRAM
E. William Street Improvements - Safety Study

PAST STUDIES

This corridor has been under study by the City of Delaware for several years. Initially this corridor was under study as part of the *Veterans Parkway Transportation Study* (PID 80824). However, the *Veterans Parkway Transportation Study* recommended that a short-term solution, focused on the E. William Street (US 36) corridor, be considered to correct safety deficiencies in the immediate future. A safety was performed in 2011 for the corridor. The City of Delaware initiated the DEL-36-10.59 project in December of 2013. The Feasibility Study was completed in 2015.

The City has been conducting studies of an adjacent roadway segment – the intersection of US 36 and SR 37, located just east of the study area. Commonly referred to as "The Point", this intersection has documented congestion and safety issues. A project has been established (DEL-36-11.03, PID 103626) and preliminary design is underway to address the issues at this adjacent location. This is currently the City's highest priority safety and congestion project. The City is allocating all additional funds to this project in order to ensure it is completed.

CRASH DATA

Crash reports from 2014-2016 were analyzed within the study area. Crash diagrams of the study area can be found as **Figure 4**. Crash data was obtained through the ODOT GCAT tool and the OH-1 reports were reviewed to determine causes and other details. The ODOT CAMTool was used to determine crash patterns and other highlights of the crash data. The crash data is summarized in **Figure 3**. A summary of the crash data within the study area from the CAMTool can be found in **Appendix B**.

A total of 58 crashes occurred in the study area, with 16 (27%) crashes involving injuries. The most commonly occurring crash type in the study area were rear-end collisions. These represented over 70% of the crashes. Fixed object crashes and sideswipe collisions were the second and third-most common crash type in the study area, with four and three of each type respectively.

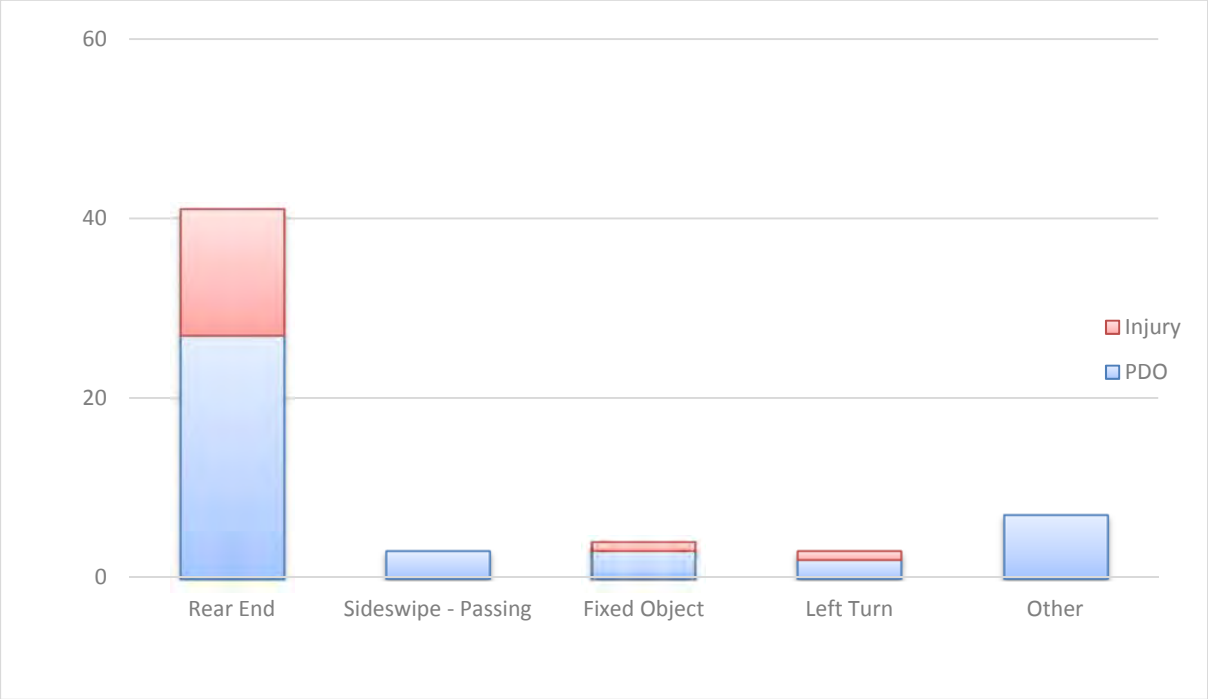

Figure 3: Crash Type Summary for the Study Area

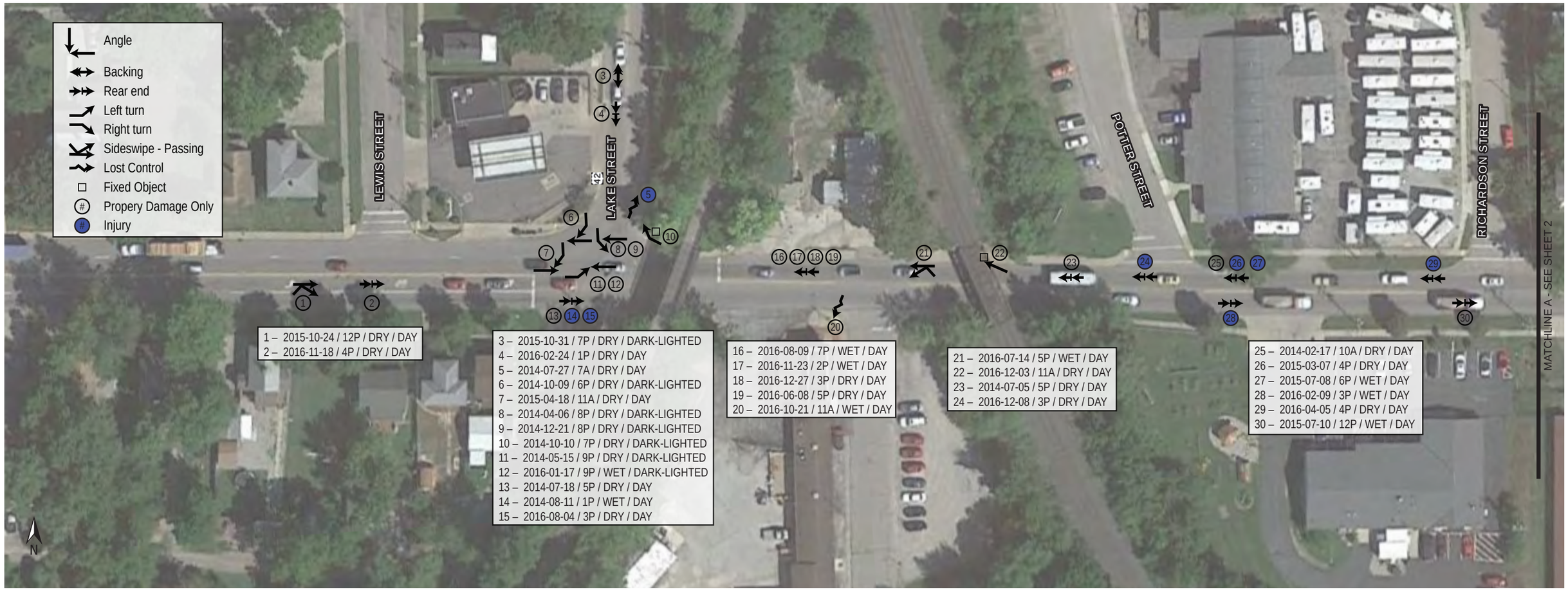

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FIGURE 4: CRASH DIAGRAM (1 OF 3)
E. William Street Improvements - Safety Study

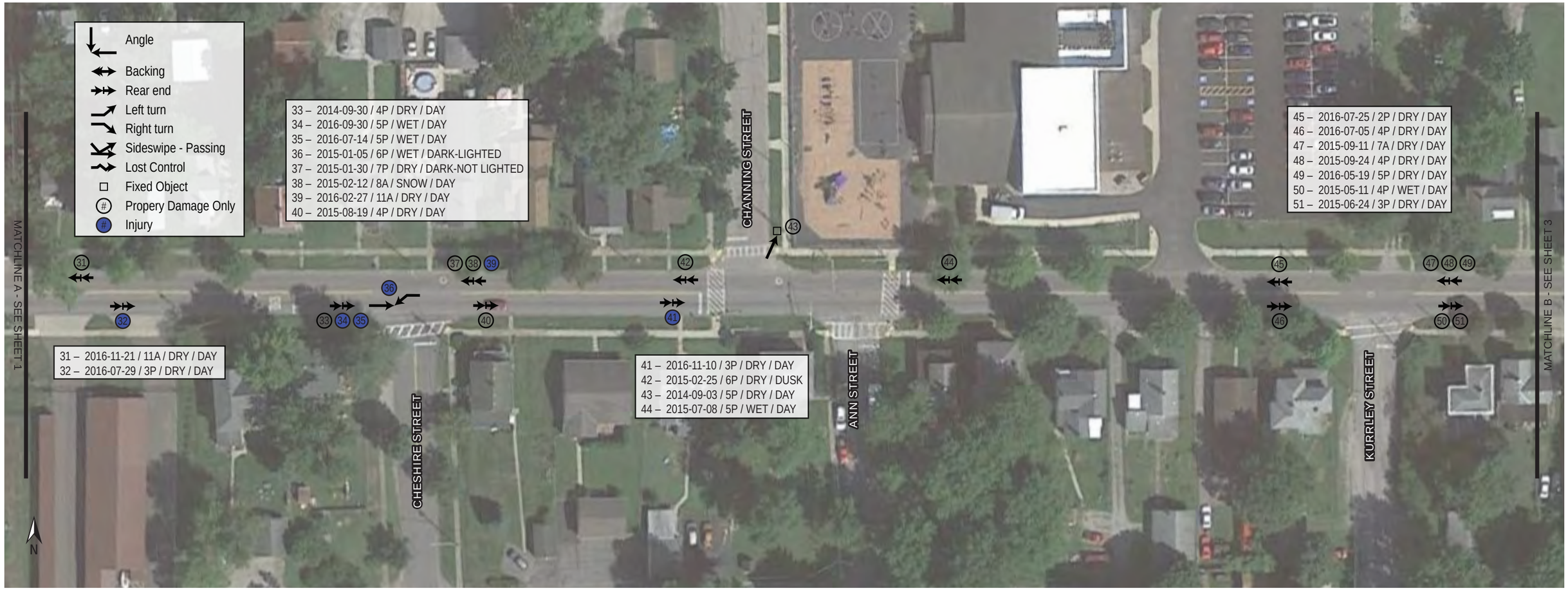

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FIGURE 4: CRASH DIAGRAM (2 OF 3)
E. William Street Improvements - Safety Study

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FIGURE 4: CRASH DIAGRAM (3 OF 3)
E. William Street Improvements - Safety Study

CRASH ANALYSES

Rear-end collisions comprise the majority of study area crashes. Rear-end collisions are typically attributed to congestion and lengthy queues, both of which are commonplace at this location during the peak hours. The overwhelming majority (78%) of rear-end collisions occur during peak hours – from 7:00-9:00 AM or 2:00-7:00 PM. This indicates that the collisions are more likely due to drivers being surprised by long queues, rather than rear-end collisions related to poor visibility or stopping sight distance.

Based on the crash data, 37% of the rear-end collisions are occurring westbound between Channing Street and Lake Street, indicating that either long queues or unexpected stops are occurring in this part of the corridor. There are several streets and driveways that vehicles may stop at to turn left, leading to rear-end collisions. Additionally, the Lake Street signal has tight turning radii that slows traffic down through the intersection, which aggravates the congestion and queuing – potentially contributing to rear-end collisions.

The ODOT Economic Crash Analysis Tool (ECAT) was utilized to analyze the existing conditions. The analysis indicates that the E. William Street (US 36) corridor experiences rear-end collisions at a higher frequency than peer locations.

PROPOSED ALTERNATIVES

Several alternatives have been analyzed to address the issues in the E. William Street (US 36) corridor. Below is a summary of the alternatives analyzed, some of which were included in the 2015 *Feasibility Study for the East William Street Improvements*.

No-Build

The No-Build alternative would forego any pavement widening or reconstruction, and would leave the existing bridges in place. Options for increasing driver safety and reducing crashes could include adjustment or updating of signals & signing, and driver education. However, as traffic volumes increase the safety and congestion problems will continue to worsen. Thus, the No-Build condition was not considered viable.

Five-Lane Section

Widening E. William Street (US 36) to a five lane section would reduce the congestion along the corridor, which would likely reduce the rear-end collisions related to congestion. Additionally, a two-way left turn lane would allow left-turning vehicles a place to wait for gaps, reducing the number of rear-end collisions due to unexpected stops. However, widening to five lanes on this section of E. William Street (US 36) would be extremely costly and disruptive to the area. Dozens of homes are located within close 20-30' of the existing curb. The existing 66' right-of-way is not nearly wide enough to accommodate a five-lane section. A five-lane section would require lengthening both the bikeway bridge and the CSX railroad bridge near Lake Street (US 42). Additionally, widening to five lanes would have limited incremental benefit compared to a three-lane widening until improvements at "The Point" intersection were undertaken. Therefore, a five-lane option was not considered further.

Three-Lane Section

The 2015 Feasibility study performed an analysis to determine if a two-way left turn lane (TWLTL) was justified based on the criteria outlined in the ODOT *Location and Design Manual*. The study area meets the traffic volume and length criteria. Based on ODOT's criteria, a TWLTL is justified if the ADT for a two-lane road is between 5,000 and 12,000. E. William Street has an ADT of approximately 15,000 today and is projected to increase to 24,000 vehicles by 2037. Additionally, the crash data suggests that a two-way left turn lane would benefit the corridor.

The 2015 Feasibility Study also looked at two alternatives for widening E. William Street to three lanes. One alternative would widen symmetrically along the centerline to provide three 12' lanes with 1' curb offsets. Another alternative would widen E. William Street to the north side of the corridor to provide three 12' lanes with 1' curb offsets. The 2015 Feasibility Study recommended to move forward with the symmetric widening alternative to construct a three-lane cross section. The two-way left turn lane will provide a safe refuge for left turning drivers to wait for gaps in opposing traffic, without obstructing trailing vehicles. The two-way left turn lane can be constructed with minimal right-of-way and limited disruption to adjacent property owners. The proposed alternative is shown as **Figure 5**.

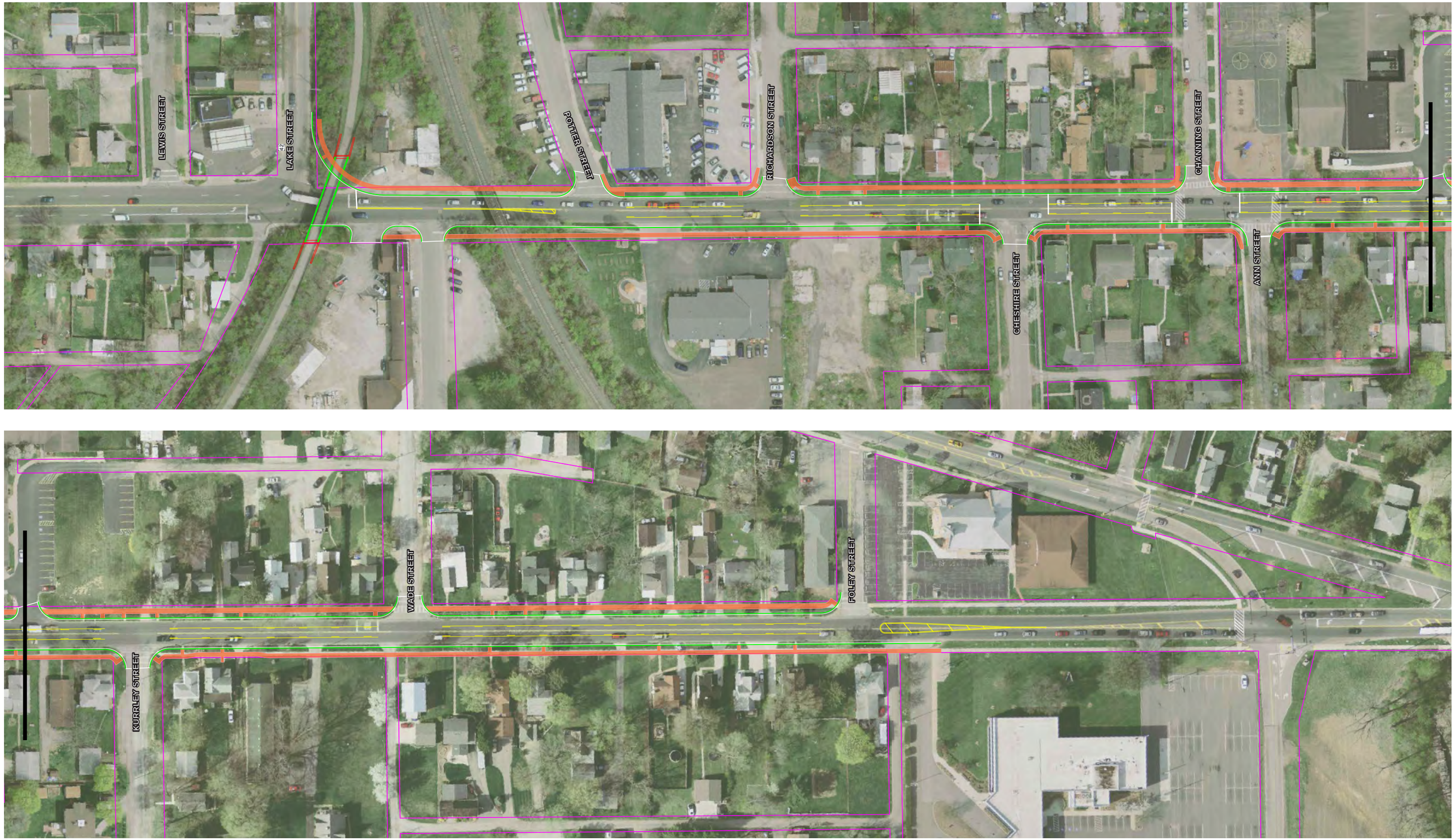

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FIGURE 5: RECOMMENDED ALTERNATIVE
E. William Street Improvements - Safety Study

A two-way left turn lane (TWLTL), along with other measures, is the recommended improvement for this study area. The recommended alternative includes:

- Modification of the Channing Street signal to remove an offset approach (Ann Street) from signal control
- Reconstruction of bikeway bridge over East William Street to provide wider clearance, allowing for improved turning radii at the Lake Street intersection
- New signal at Cheshire Street
- Upgraded lighting

Signal Warrant

The City of Delaware completed a signal warrant analysis for the E. William Street/Cheshire Street intersection. Traffic volumes are projected to meet a signal warrant by 2026. The signal warrant analysis can be found as **Appendix C**.

Capacity Analysis

The 2015 Feasibility Study performed capacity analyses using Highway Capacity Software (HCS). The 2014 certified traffic was used for turning movement volumes and both the Opening and Design Year were analyzed in the AM and PM Peaks. The HCS reports can be found in **Appendix D**. A summary of the delay and level-of-service can be found in **Table 1** below.

Table 1: Level-of-Service and Delay
(delay is in seconds per vehicle)

	Opening Year				Design Year			
	No-Build		Build		No-Build		Build	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Lake Street (US 42)	C 20.8	C 29.4	B 19.1	C 29.3	C 28.5	E 66.0	C 28.1	E 66.0
Cheshire Street	D 26.0	F 89.8	D 30.0	F 119.8	D 38.7	F 208.6	C 24.4	E 74.6
Channing Street/ Ann Street	B 19.3	C 25.7	B 17.7	C 25.6	C 22.9	C 32.4	C 21.3	C 32.1
Ann Street	--	--	B 13.5	C 17.0	--	--	C 18.9	D 28.2

Intersection of William Street at Cheshire Street is unsignalized in 2017 and signalized in 2037
In the No-Build condition, the William Street/Channing Street/Ann Street intersection is the existing condition.
In the Build condition, Ann Street is unsignalized.

PROPOSED COUNTERMEASURE EVALUATION

The ODOT Economic Crash Analysis Tool (ECAT) was utilized to determine the effect on the predicted crash rate the two-way left turn lane would have on the corridor, in addition to the signal at Cheshire Street. A summary of the ECAT is in **Table 2**. The net present value of the safety benefits is $727,000, which represents 13% of the estimated project cost of $5.64 million (which includes right-of-way and design engineering). Construction is scheduled to begin in February 2019. A copy of the cost estimate is provided in **Appendix E**. The ECAT results are provided in **Appendix F**.

Table 2: Summary of ECAT Analysis

Existing Conditions – Predicted Crashes	15.93
Existing Conditions – Expected Crashes	15.80
Existing Conditions – Potential for Improvement	0.13
Expected Crash Reduction/Year	1.22
20-Year Benefits	$727,421
Benefit-Cost Ratio	0.13

The ECAT analysis shows that the highest safety benefit occurs at the Channing Street/Ann Street intersection. ECAT shows that there is a potential benefit of 1.6 crashes per year. The removal of the Ann Street approach lowers the predicted crash rate by 3.3 crashes per year. The analysis also shows that the Cheshire Street intersection is predicted to experience an increase in crashes – by 2.5 crashes per year - due to the installation of the traffic signal.

RECOMMENDATIONS & PRIORIZATION

The purpose of this project is to maintain a safe and efficient route of travel by reducing congestion along East William Street for the immediate future. The following countermeasures are recommended to increase capacity of the section of E. William Street and increase safety in the corridor:

- Widening of US 36 (E. William Street) to provide a center two-way left-turn lane
- Replacement of the pedestrian/bikeway bridge over E. William Street to accommodate a larger intersection at US 42 (Lake Street)
- Installation of a new traffic signal for the Cheshire Road intersection
- Removal of Ann Street from the existing Channing Street signal
- Upgraded highway lighting through the corridor

Construction of these improvements is scheduled to begin in 2019, with final design being finished in June 2018 and right-of-way acquisition to finish in August of 2019. The recommended improvements have a new present value safety benefit of $727,000. To implement the safety improvements, a total of $650,000 in safety funds is being requested from ODOT, approximately 11.5% of the overall project cost of $5.64 million. The City is requesting an amount of safety funds less than the safety benefit value, and represents a small fraction of the overall project cost.

Appendix A

Certified Traffic

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INTER-OFFICE COMMUNICATION

TO: **Fay Taylor, District 6**

FROM: Becky Salak, Transportation Planner, Office of Statewide Planning and Research

SUBJECT: **DEL-36-10.59, PID 95625**

DATE: March 26, 2014

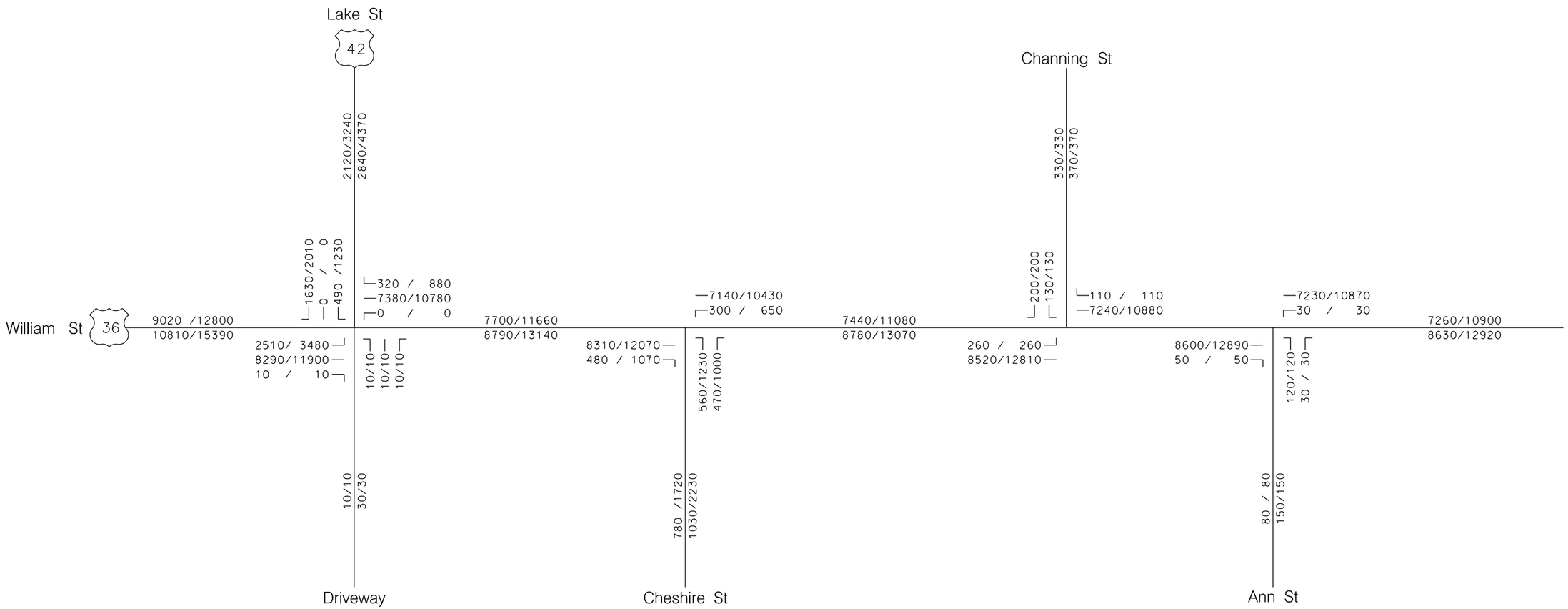
In reply to a request dated March 26, 2014 plates are attached showing 2017/2037 ADT, A.M. DHV and P.M. DHV turning movement volumes, and truck factors. 8th highest hour factors have been added below, as requested. Please use the following design designations:

	US-36 (William St)				US-42 (Lake St)	Cheshire St	Channing St	Ann St
	west of Lake	*east of Lake*	*west of Channing*	*east of Ann*	*north of US-36*	*south of US-36*	*north of US-36*	*south of US-36*
2017 ADT:	19,830	16,490	16,220	15,890	4,960	1,810	700	230
2037 ADT:	28,190	24,800	24,150	23,820	7,610	3,950	700	230
K:	0.10	0.10	0.10	0.10	0.11	0.10	0.13	0.17
2037 DHV:	2,850	2,470	2,410	2,400	800	400	90	40
D:	0.59	0.53	0.55	0.55	0.73	0.58	0.56	0.50
T24:	0.08	0.09	0.09	0.09	0.07	0.02	0.04	0.04
A.M. TD:	0.14	0.14	0.14	0.14	0.15	0.03	0.12	0.01
P.M. TD:	0.06	0.06	0.05	0.05	0.03	0.01	0.01	0.01
8th highest hour factor:	5.90%	5.90%	5.90%	5.90%	6.10%	5.80%	5.80%	5.80%

If you have any questions, please contact me at (614) 644-8195.

c: D. Bieberitz, DLZ – D. Carlin, D6 – M. Byram, OSPR – G. Giaimo, OSPR – File

DEL–36–10.59
PID 95625
PLATE 1 OF 4



DEL–36–10.59 PID 95625	
2017/2037 ADT	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
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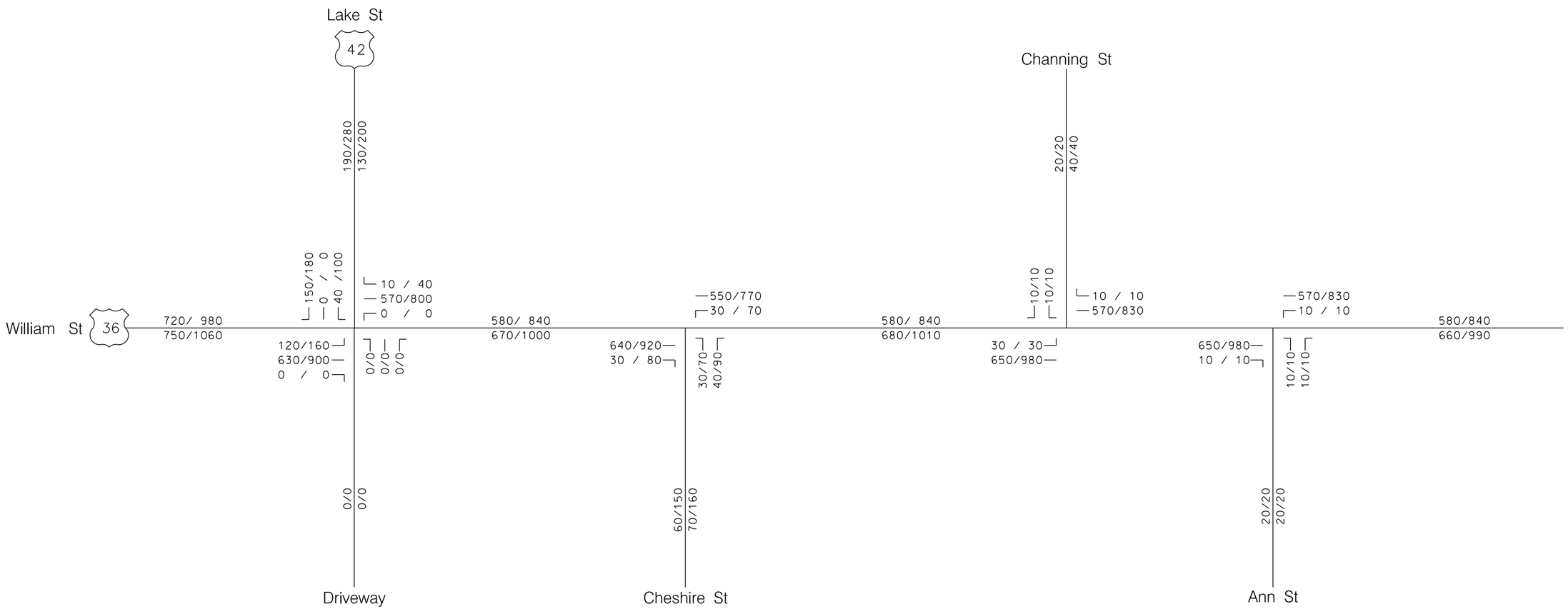
DEL–36–10.59
PID 95625
PLATE 2 OF 4



DEL–36–10.59 PID 95625	
2017/2037 A.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
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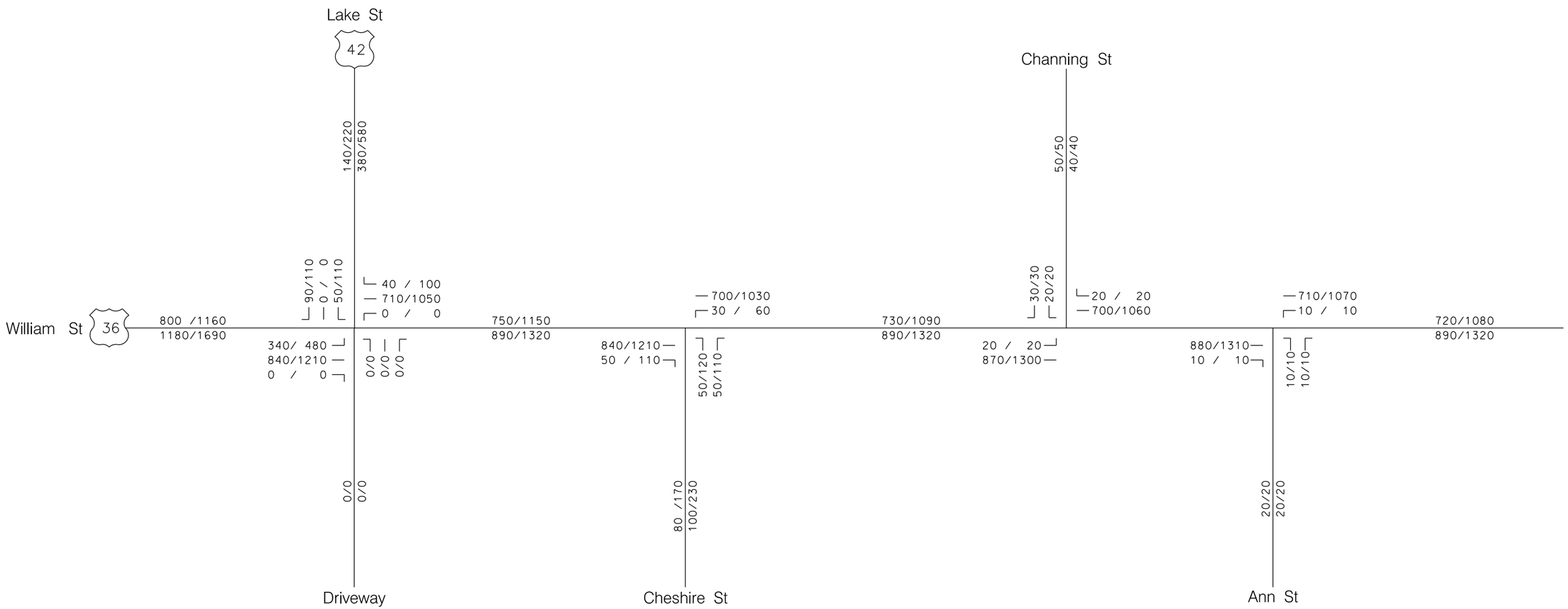
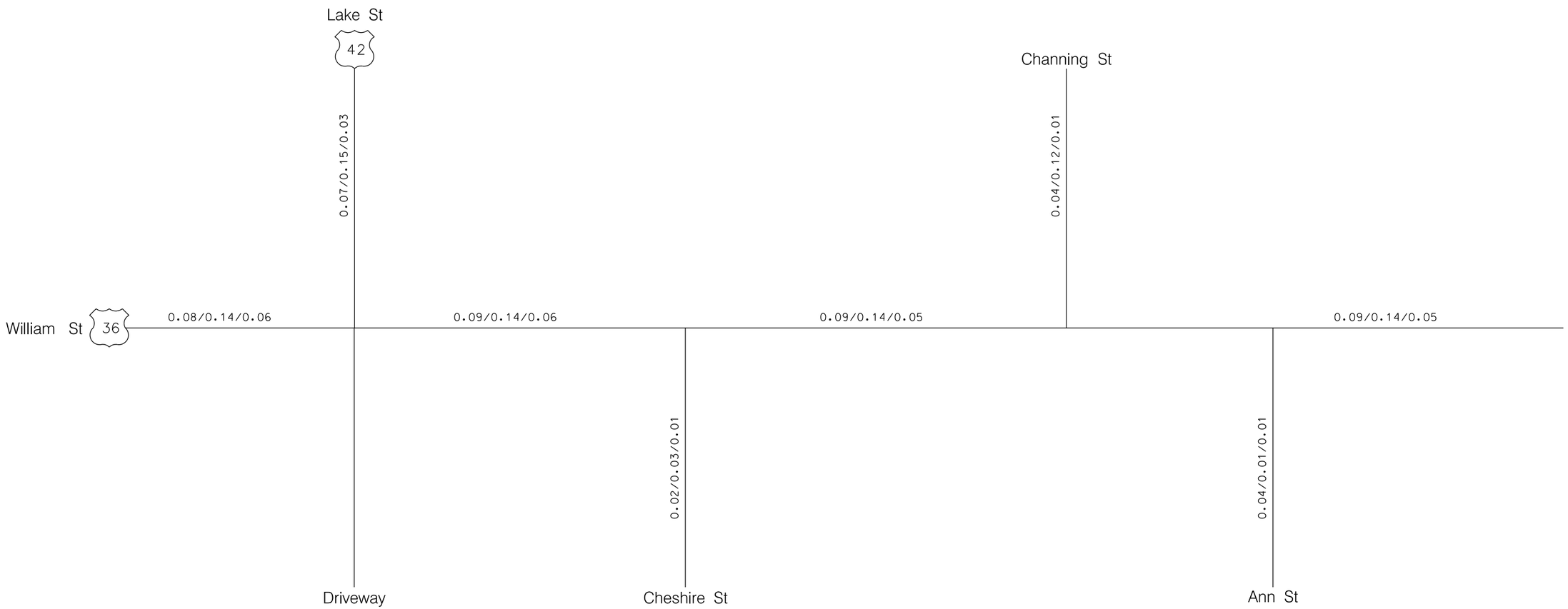
DEL–36–10.59
PID 95625
PLATE 3 OF 4



DEL–36–10.59 PID 95625	
2017/2037 P.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
JUNE 5, 2013	NOT TO SCALE

DEL-36-10.59
PID 95625
PLATE 4 OF 4



DEL-36-10.59 PID 95625	
TRUCK FACTORS: T24/A.M. TD/P.M. TD	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
JUNE 5, 2013	NOT TO SCALE

Appendix B

Crash Summary

ms consultants, inc.
engineers, architects, planners

DEL-36-10.59, PID 95625

	Number
Total	**58**

CRASH_SEVERITY	Number	%
Injury Crash	**16**	27.6%
Property Damage Crash	**42**	72.4%
Grand Total	**58**	**100.0%**

TRAFFIC_CRASH_YEAR	Number	%
2014	**15**	25.9%
2015	**19**	32.8%
2016	**24**	41.4%
Grand Total	**58**	**100.0%**

DAY_OF_WEEK	Number	%
Friday	**13**	22.4%
Thursday	**11**	19.0%
Wednesday	**9**	15.5%
Tuesday	**8**	13.8%
Saturday	**6**	10.3%
Monday	**6**	10.3%
Sunday	**5**	8.6%
Grand Total	**58**	**100.0%**

HOUR_OF_DAY	Number	%
00	**1**	1.7%
07	**3**	5.2%
08	**1**	1.7%
10	**1**	1.7%
11	**4**	6.9%
12	**3**	5.2%
13	**2**	3.4%
14	**3**	5.2%
15	**8**	13.8%
16	**9**	15.5%
17	**10**	17.2%
18	**5**	8.6%
19	**4**	6.9%
20	**2**	3.4%
21	**2**	3.4%
Grand Total	**58**	**100.0%**

TYPE_OF_CRASH	Number	%
Rear End	**41**	70.7%
Fixed Object	**4**	6.9%
Sideswipe - Passing	**3**	5.2%
Left Turn	**3**	5.2%
Angle	**2**	3.4%
Right Turn	**2**	3.4%
Backing	**1**	1.7%
Parked Vehicle	**1**	1.7%
Head On	**1**	1.7%
Grand Total	**58**	**100.0%**

DEL-36-10.59, PID 95625

WEATHER_CONDITION	Number	%
Clear	**27**	46.6%
Cloudy	**21**	36.2%
Rain	**8**	13.8%
Snow	**2**	3.4%
Grand Total	**58**	**100.0%**

ROAD_CONDITION	Number	%
Dry	**41**	70.7%
Wet	**15**	25.9%
Snow	**1**	1.7%
Ice	**1**	1.7%
Grand Total	**58**	**100.0%**

LIGHT_CONDITION	Number	%
Daylight	**46**	79.3%
Dark - Lighted Roadway	**10**	17.2%
Dusk	**1**	1.7%
Dark - Roadway Not Lighted	**1**	1.7%
Grand Total	**58**	**100.0%**

NUMBER_OF_VEHICLES	Number	%
1	**4**	6.9%
2	**43**	74.1%
3	**8**	13.8%
4	**3**	5.2%
Grand Total	**58**	**100.0%**

LOCATION	Number	%
Not An Intersection	**37**	63.8%
T-Intersection	**21**	36.2%
Grand Total	**58**	**100.0%**

CRASH_MONTH_NBR	Number	%
1	**3**	5.2%
2	**6**	10.3%
3	**1**	1.7%
4	**5**	8.6%
5	**3**	5.2%
6	**3**	5.2%
7	**11**	19.0%
8	**5**	8.6%
9	**5**	8.6%
10	**5**	8.6%
11	**5**	8.6%
12	**6**	10.3%
Grand Total	**58**	**100.0%**

ROAD_CONTOUR	Number	%
Straight Level	**45**	77.6%
Straight Grade	**13**	22.4%
Grand Total	**58**	**100.0%**

SPECIAL_AREA	Number	%
(blank)	**58**	100.0%
Grand Total	**58**	**100.0%**

ANIMAL_TYPE	Number	%
(blank)	**58**	100.0%
Grand Total	**58**	**100.0%**

DEL-36-10.59, PID 95625

ACTION1	Number	%
Straight Ahead	**41**	70.7%
Slowing Or Stopped In Traffic	**6**	10.3%
Making Left Turn	**6**	10.3%
Making Right Turn	**3**	5.2%
Leaving Traffic Lane	**1**	1.7%
Backing	**1**	1.7%
Grand Total	**58**	**100.0%**

CONTRIBUTING_FACTOR1	Number	%
Followed To Closely/ACDA	**35**	60.3%
Failure To Control	**9**	15.5%
Ran Red Light	**3**	5.2%
Failure To Yield	**3**	5.2%
Improper Turn	**2**	3.4%
Unknown	**2**	3.4%
Left Of Center	**1**	1.7%
Improper Backing	**1**	1.7%
Other Improper Action	**1**	1.7%
None-Motorist	**1**	1.7%
Grand Total	**58**	**100.0%**

	Number	%
Total	**58**	**100.0%**

TRAFFIC_CONTROL1	Number	%
Pavement Markings	**36**	62.1%
Traffic Signal	**16**	27.6%
No Controls	**2**	3.4%
School Zone	**1**	1.7%
Stop Sign	**1**	1.7%
Person (Flagger, Officer)	**1**	1.7%
Traffic Flashers	**1**	1.7%
Grand Total	**58**	**100.0%**

DRIVER_ALCOHOL1	Number	%
No	**57**	98.3%
Yes	**1**	1.7%
Grand Total	**58**	**100.0%**

DRIVER_DRUGS1	Number	%
No	**56**	96.6%
Yes	**2**	3.4%
Grand Total	**58**	**100.0%**

DEL-36-10.59, PID 95625

DIRECTION_FROM1	Number	%
East	**27**	46.6%
West	**23**	39.7%
North	**6**	10.3%
South	**1**	1.7%
Southwest	**1**	1.7%
Grand Total	**58**	**100.0%**

DIRECTION_TO1	Number	%
West	**27**	46.6%
East	**20**	34.5%
North	**5**	8.6%
South	**4**	6.9%
Unknown	**2**	3.4%
Grand Total	**58**	**100.0%**

POSTED_SPEED1	Number	%
35	**49**	84.5%
25	**7**	12.1%
20	**1**	1.7%
45	**1**	1.7%
Grand Total	**58**	**100.0%**

ESTIMATED_SPEED1	Number	%
5	**9**	15.5%
15	**9**	15.5%
25	**9**	15.5%
10	**8**	13.8%
35	**7**	12.1%
20	**6**	10.3%
30	**4**	6.9%
0	**3**	5.2%
3	**2**	3.4%
40	**1**	1.7%
Grand Total	**58**	**100.0%**

VEHICLE_TYPE1	Number	%
Sport Utility Vehicle	**11**	19.0%
Compact	**11**	19.0%
Mid Size	**10**	17.2%
Full Size	**6**	10.3%
Minivan	**4**	6.9%
Tractor/Semi-Trailer	**4**	6.9%
Pickup	**4**	6.9%
Single Unit Truck Or Van 2 Axle, 6 Tires	**3**	5.2%
Van	**2**	3.4%
Bus (16+ Seats, Inc Driver)	**1**	1.7%
Single Unit Truck; 3+ Axles	**1**	1.7%
Sub-Compact	**1**	1.7%
Grand Total	**58**	**100.0%**

VEHICLE_TYPE2	Number	%
Sport Utility Vehicle	**16**	27.6%
Mid Size	**11**	19.0%
Pickup	**6**	10.3%
Compact	**6**	10.3%
Full Size	**5**	8.6%
Minivan	**5**	8.6%
	4	6.9%
Van	**2**	3.4%
Single Unit Truck; 3+ Axles	**1**	1.7%
Tractor/Semi-Trailer	**1**	1.7%
Truck/Tractor (Bobtail)	**1**	1.7%
Grand Total	**58**	**100.0%**

DEL-36-10.59, PID 95625

ACTION2	Number	%
Slowing Or Stopped In Traffic	**43**	74.1%
Straight Ahead	**9**	15.5%
	4	6.9%
Parked	**1**	1.7%
Making Left Turn	**1**	1.7%
Grand Total	**58**	**100.0%**

CONTRIBUTING_FACTOR2	Number	%
None-Motorist	**52**	89.7%
	4	6.9%
Followed To Closely/ACDA	**1**	1.7%
Unknown	**1**	1.7%
Grand Total	**58**	**100.0%**

DIRECTION_FROM2	Number	%
East	**28**	48.3%
West	**22**	37.9%
	4	6.9%
North	**3**	5.2%
Unknown	**1**	1.7%
Grand Total	**58**	**100.0%**

DIRECTION_TO2	Number	%
West	**28**	48.3%
East	**23**	39.7%
	4	6.9%
South	**2**	3.4%
Unknown	**1**	1.7%
Grand Total	**58**	**100.0%**

DRIVER_ALCOHOL2	Number	%
(blank)	**58**	100.0%
Grand Total	**58**	**100.0%**

DRIVER_DRUGS2	Number	%
(blank)	**58**	100.0%
Grand Total	**58**	**100.0%**

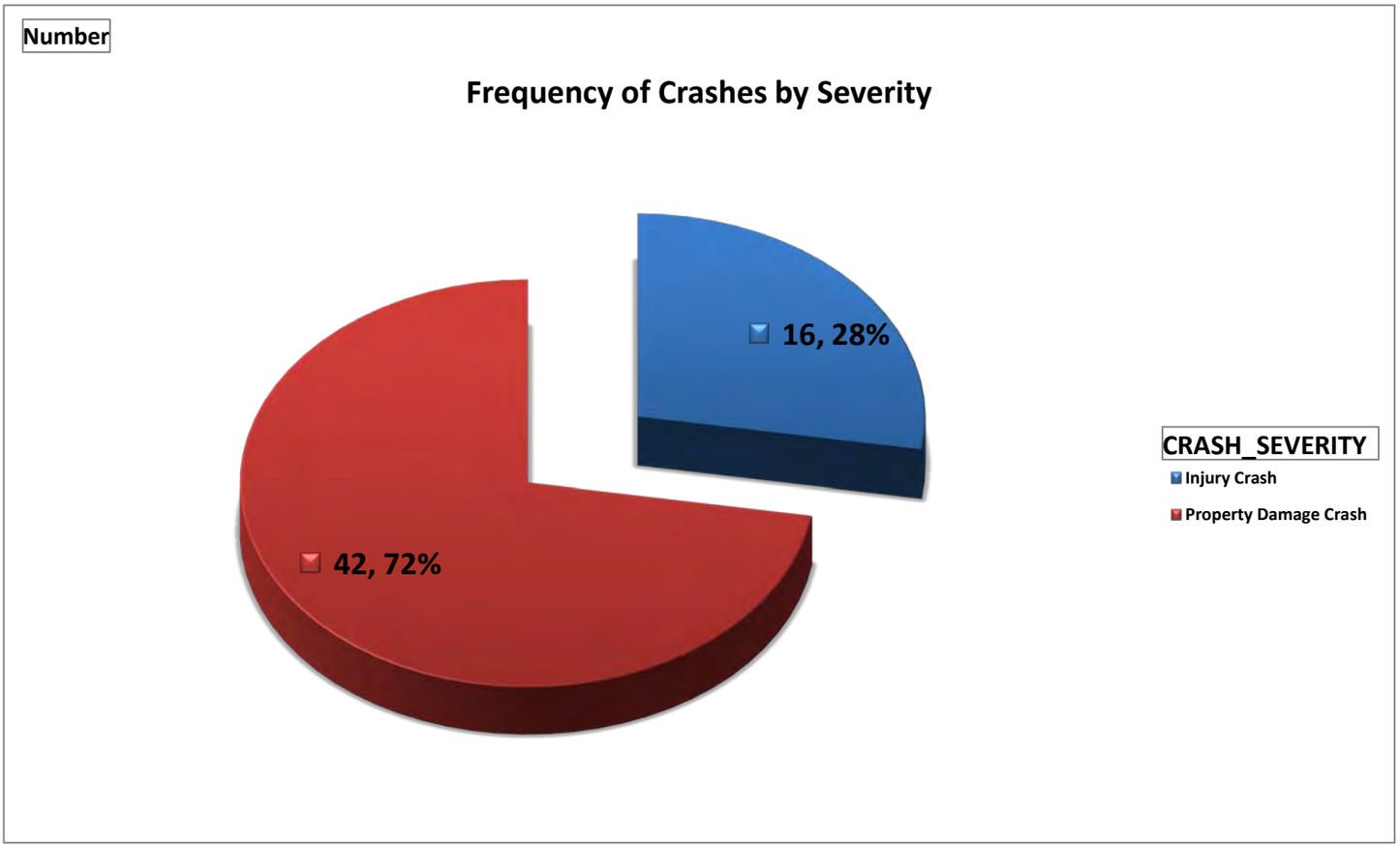
DEL-36-10.59, PID 95625

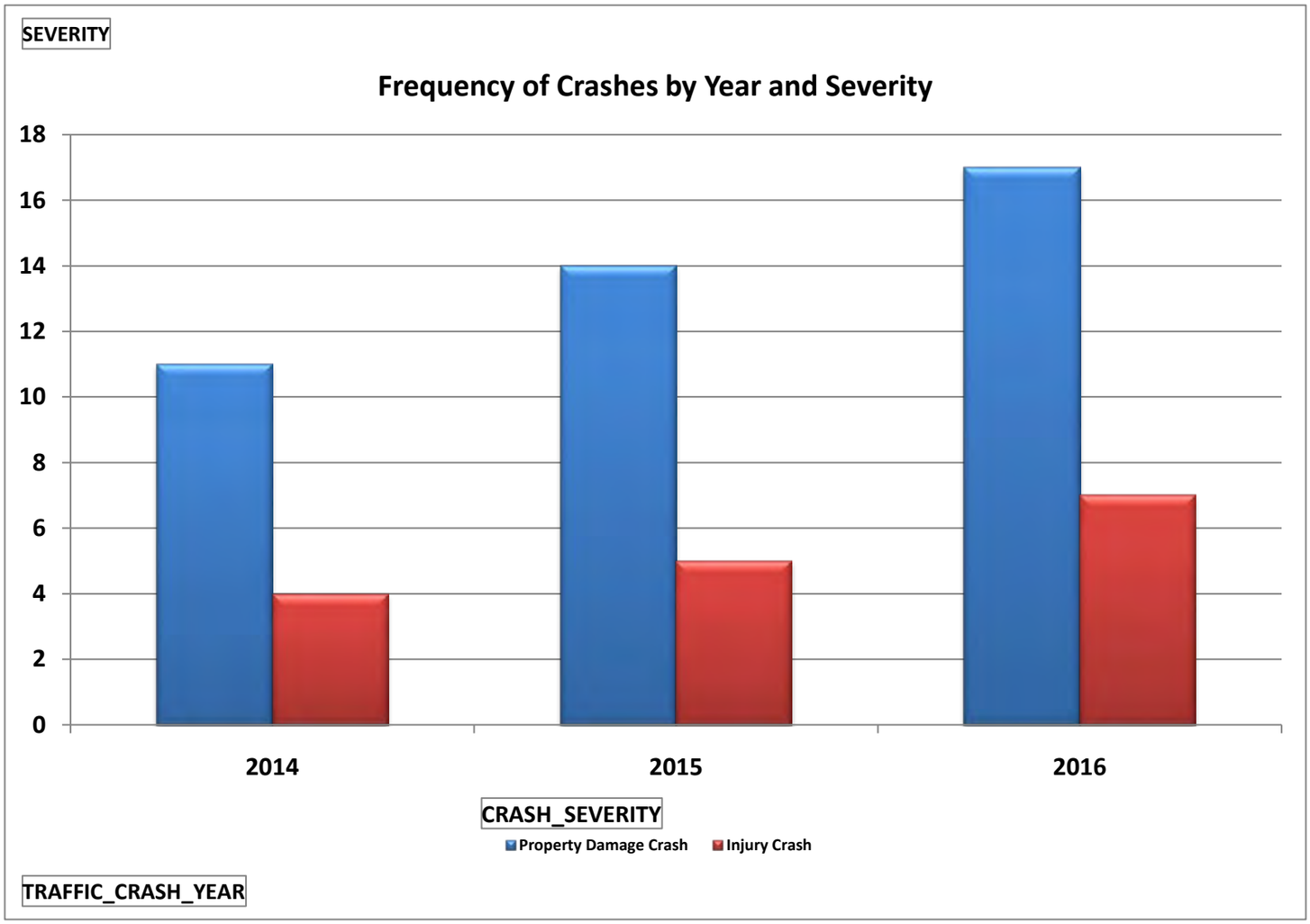
SEVERITY	CRASH_SEVERITY	
TRAFFIC_CRASH_YEAR	Property Damage Crash	Injury Crash
2014	11	4
2015	14	5
2016	17	7
Grand Total	**42**	**16**

TRAFFIC_CRASH_YEAR	Fatalities	Incapacitating Injuries
2014	0	1
2015	0	1
2016	0	0
Grand Total	**0**	**2**

TRAFFIC_CRASH_YEAR	INJ_TYPE2_SERIOUS_VISIBLE	INJ_TYPE3_MINOR_VISIBLE	INJ_TYPE4_NO_VISIBLE
2014	1	0	4
2015	1	0	6
2016	0	3	7
Grand Total	**2**	**3**	**17**

DEL-36-10.59, PID 95625





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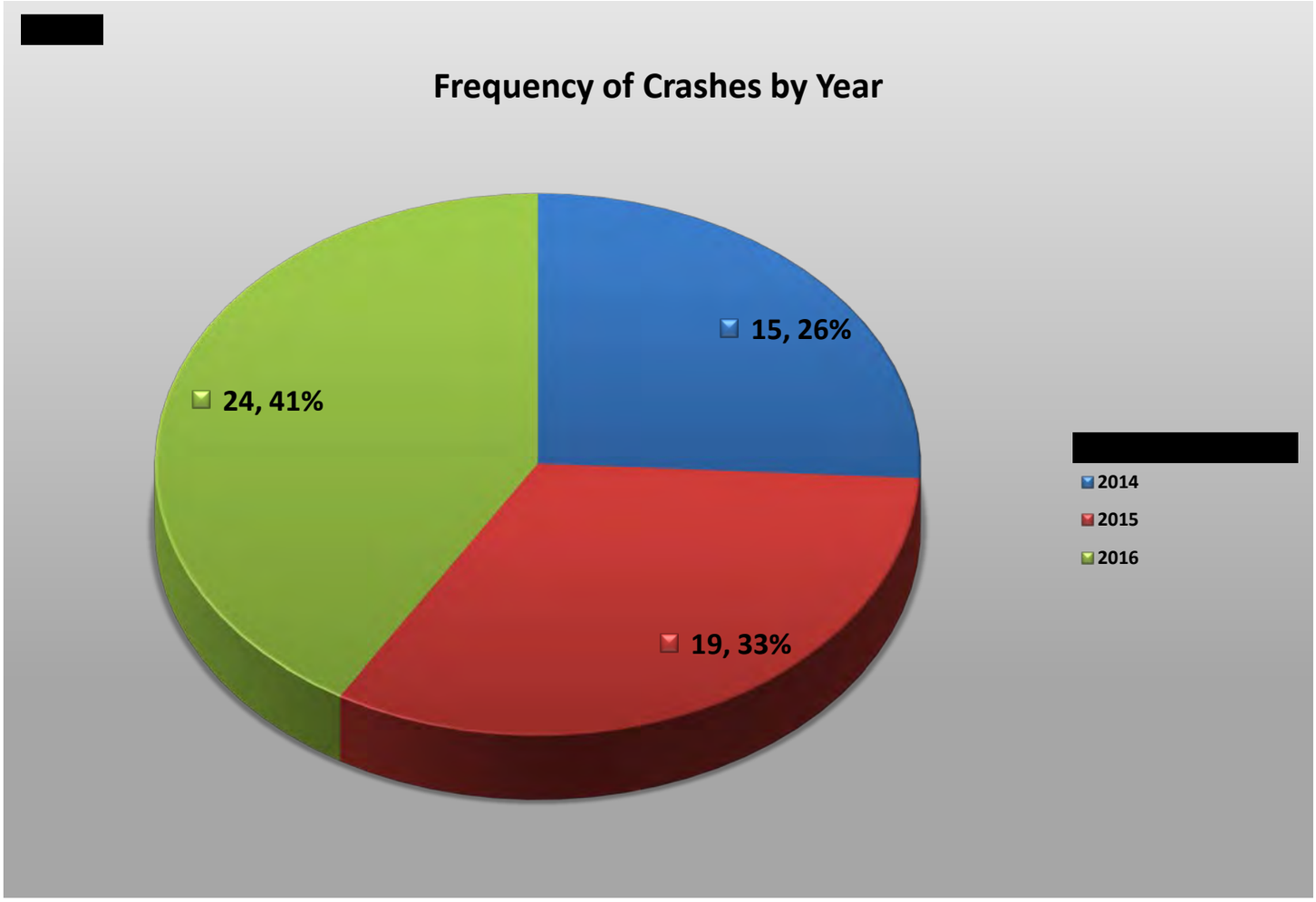

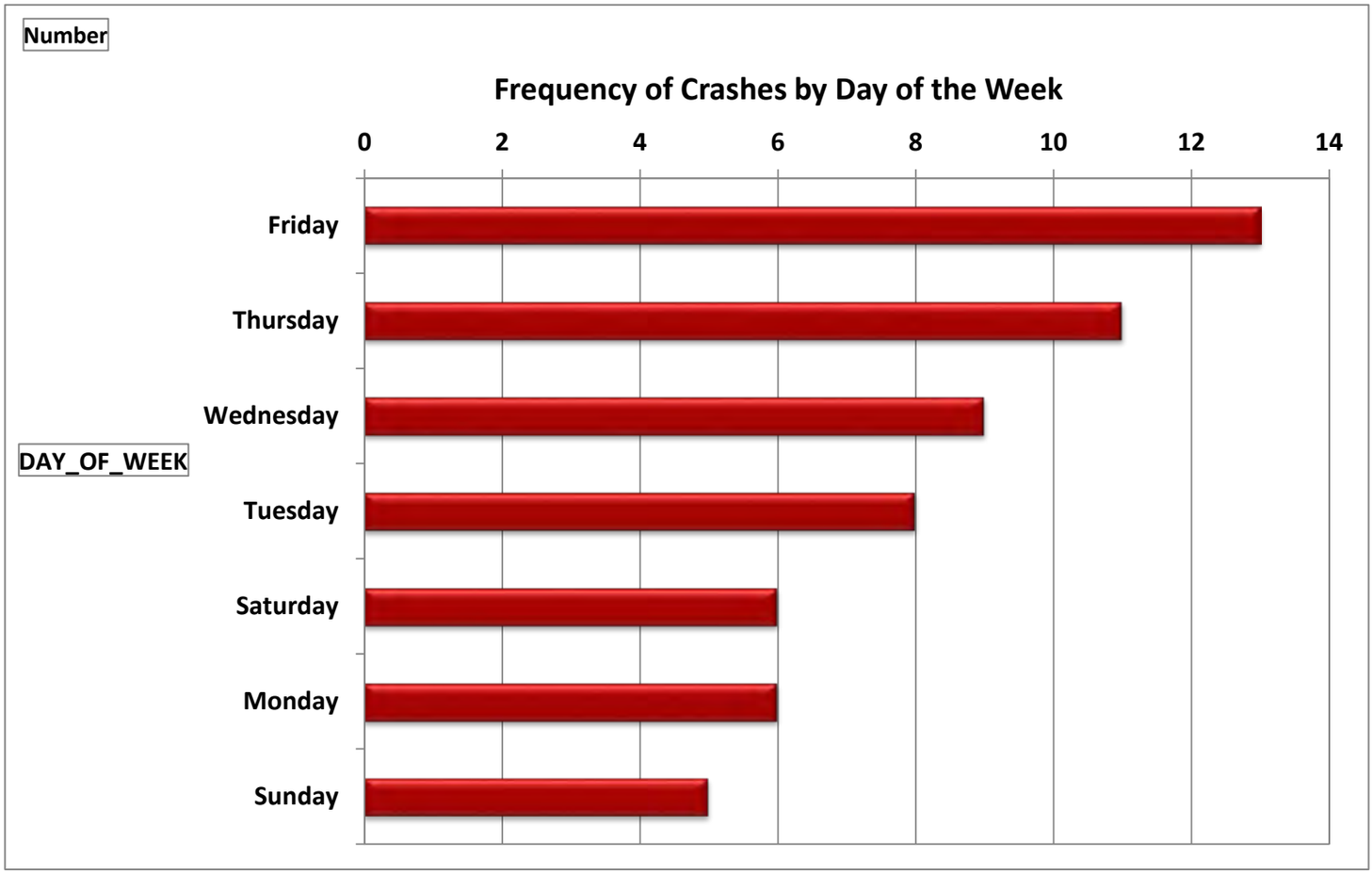

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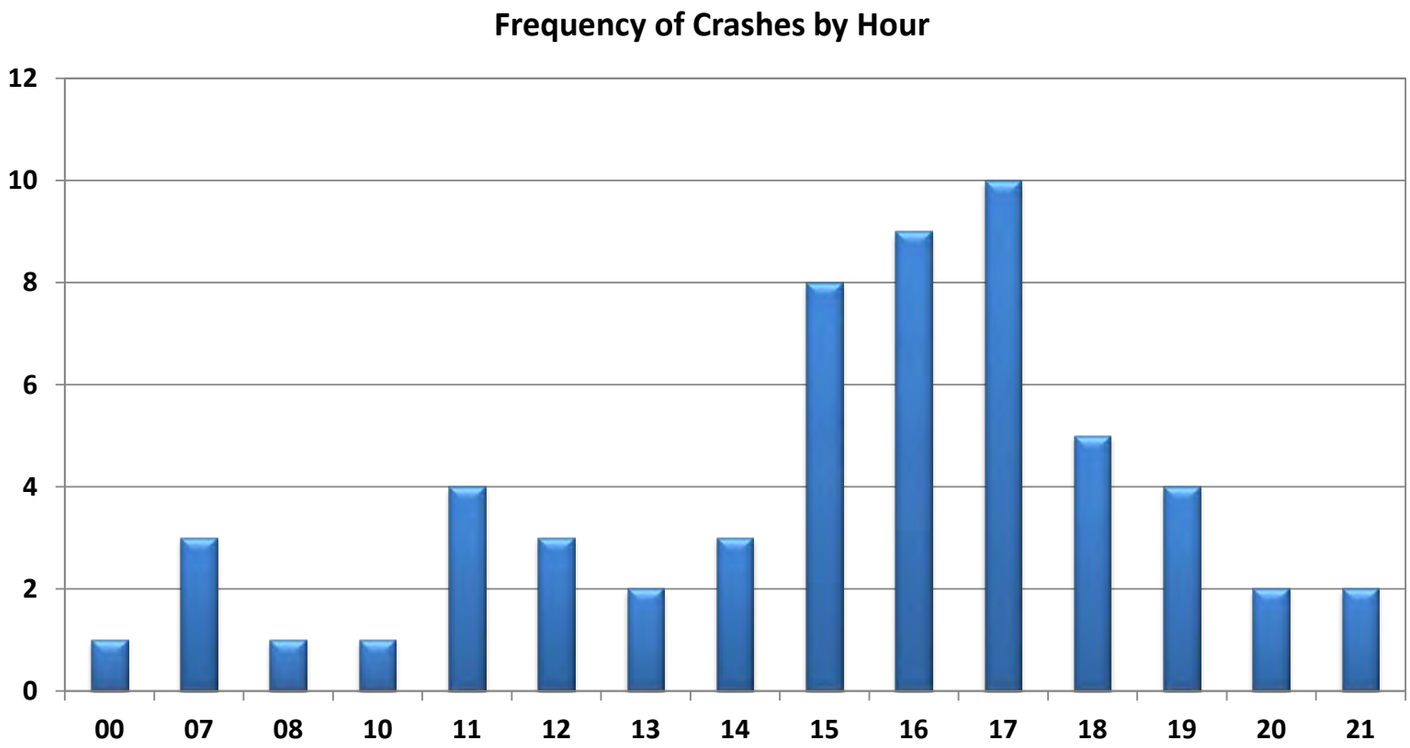

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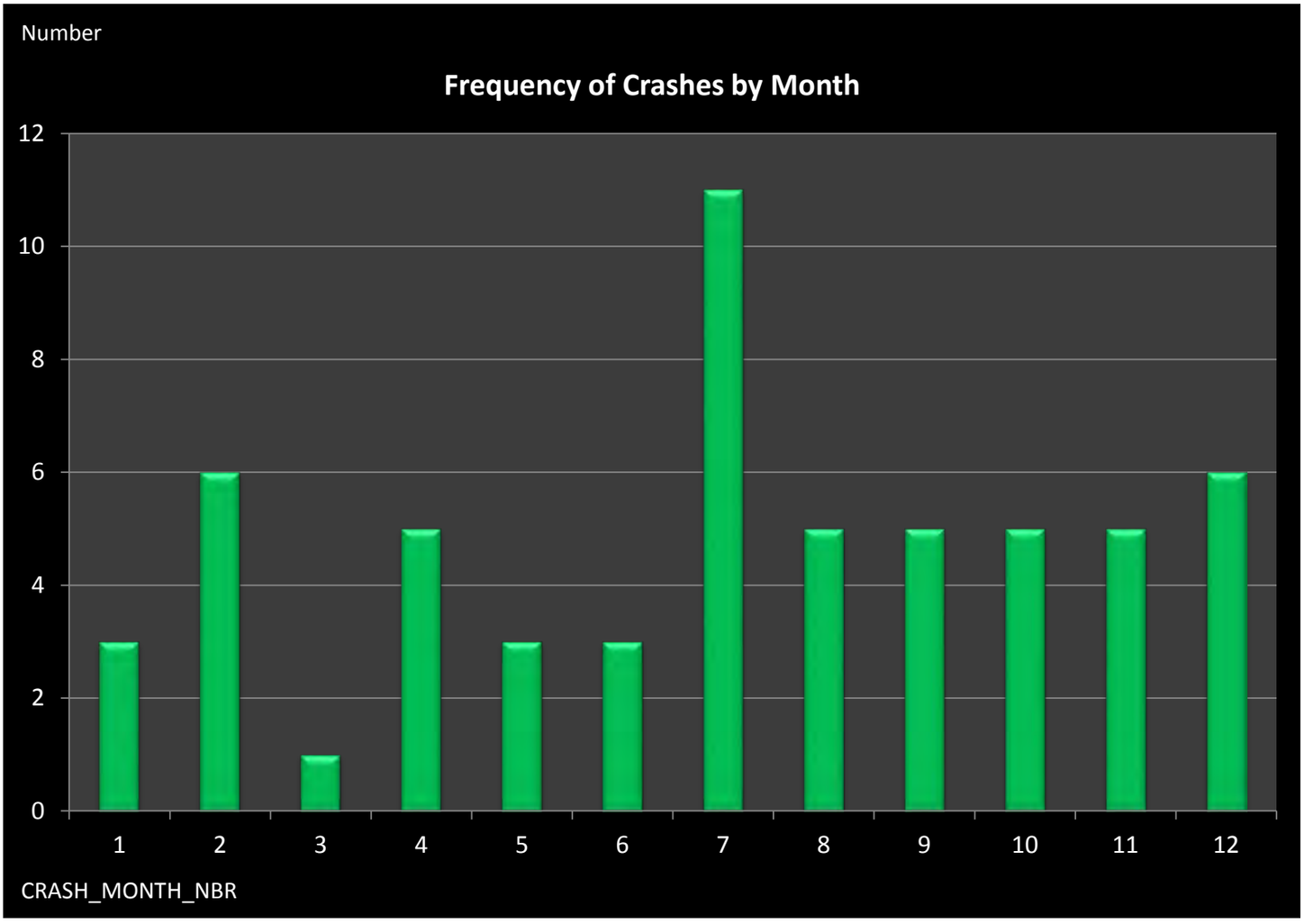

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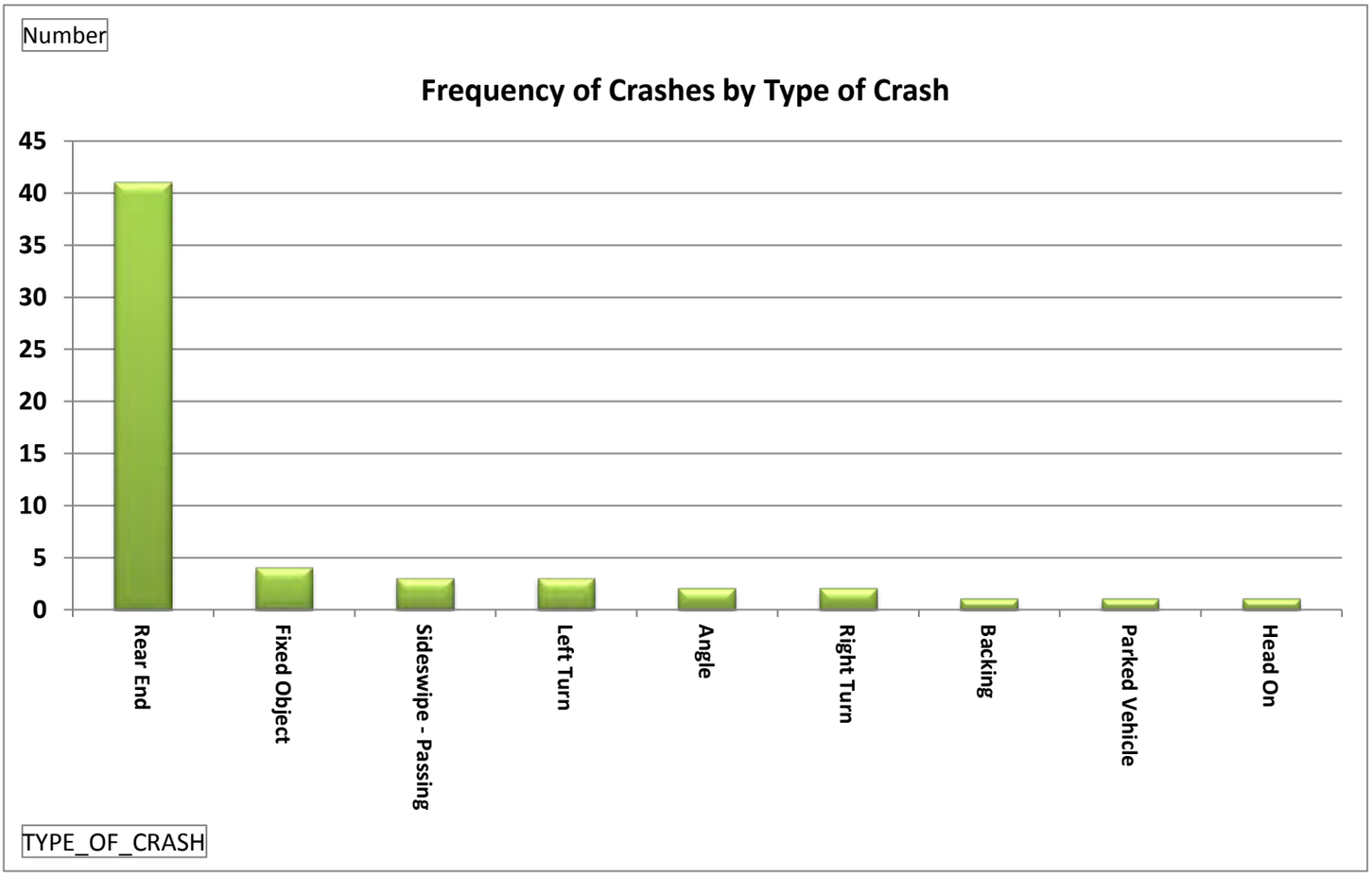

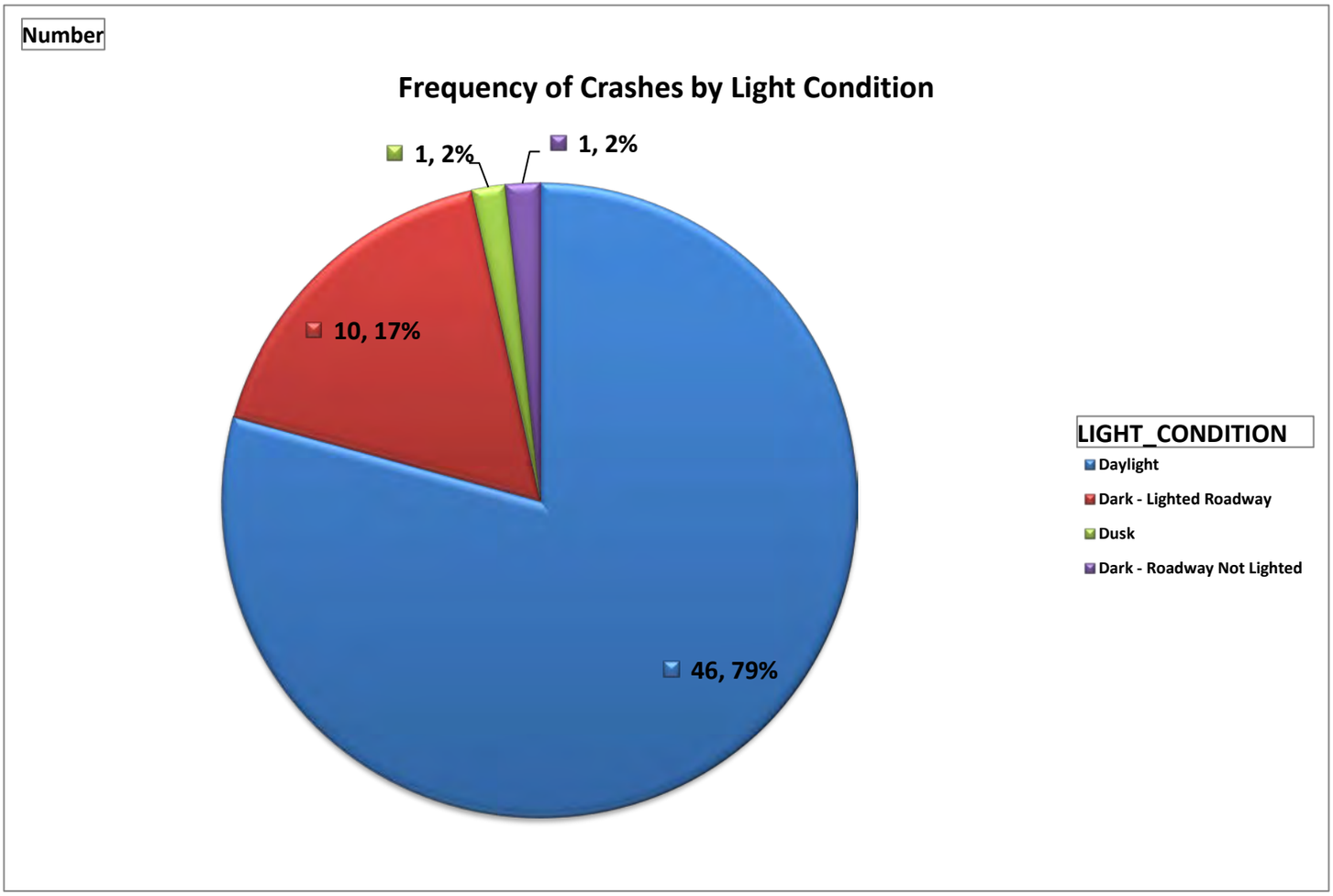

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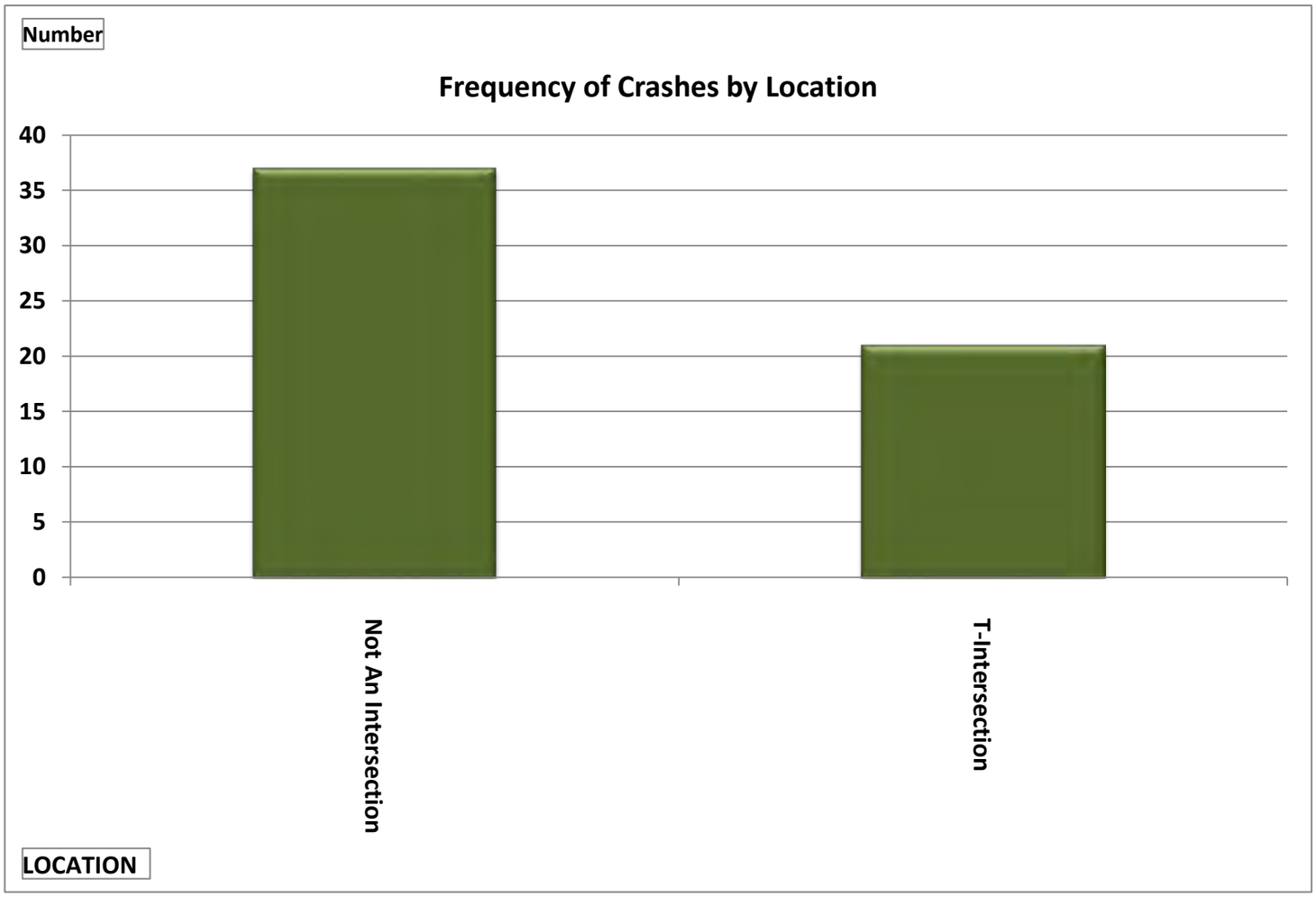

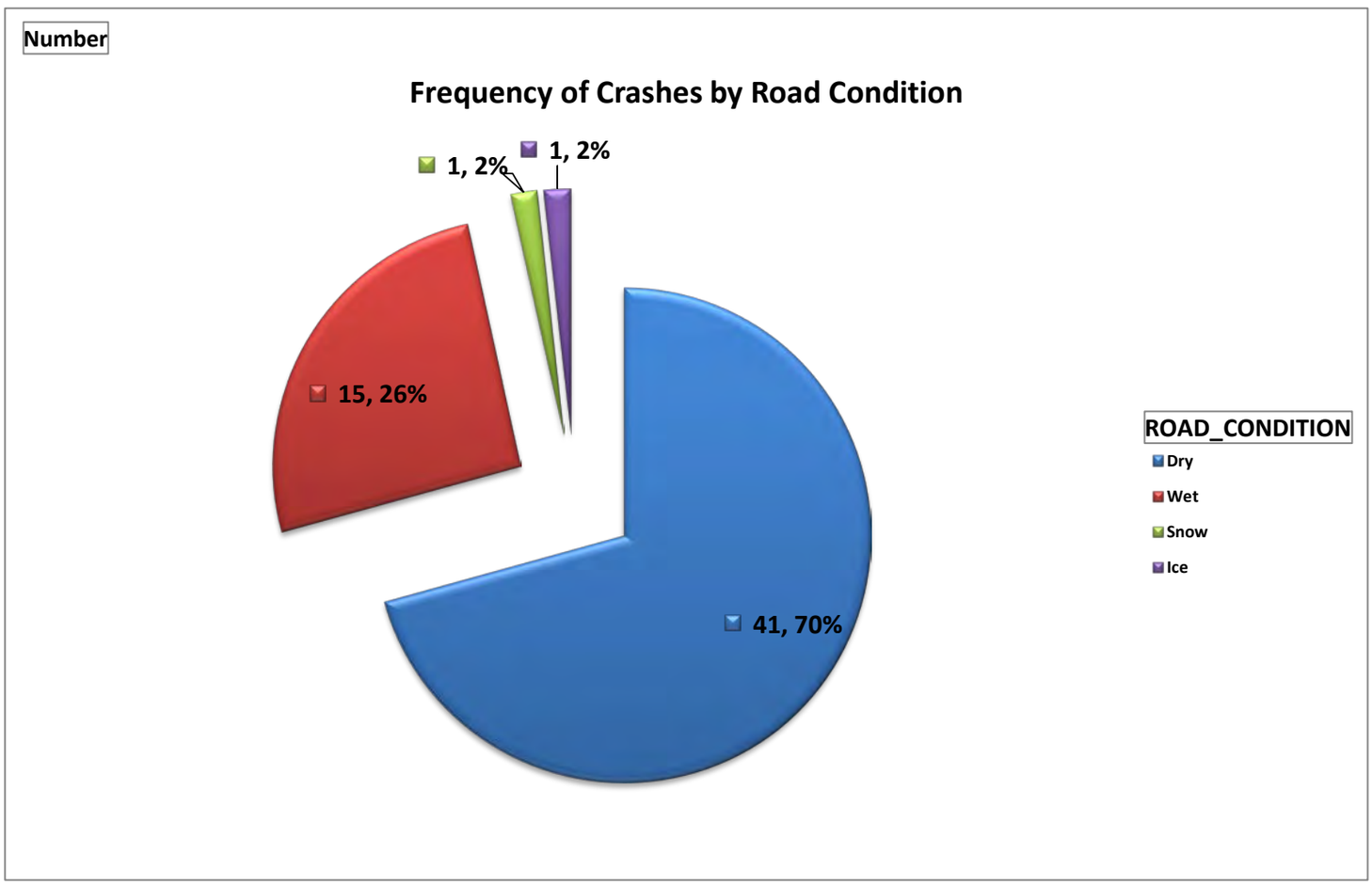

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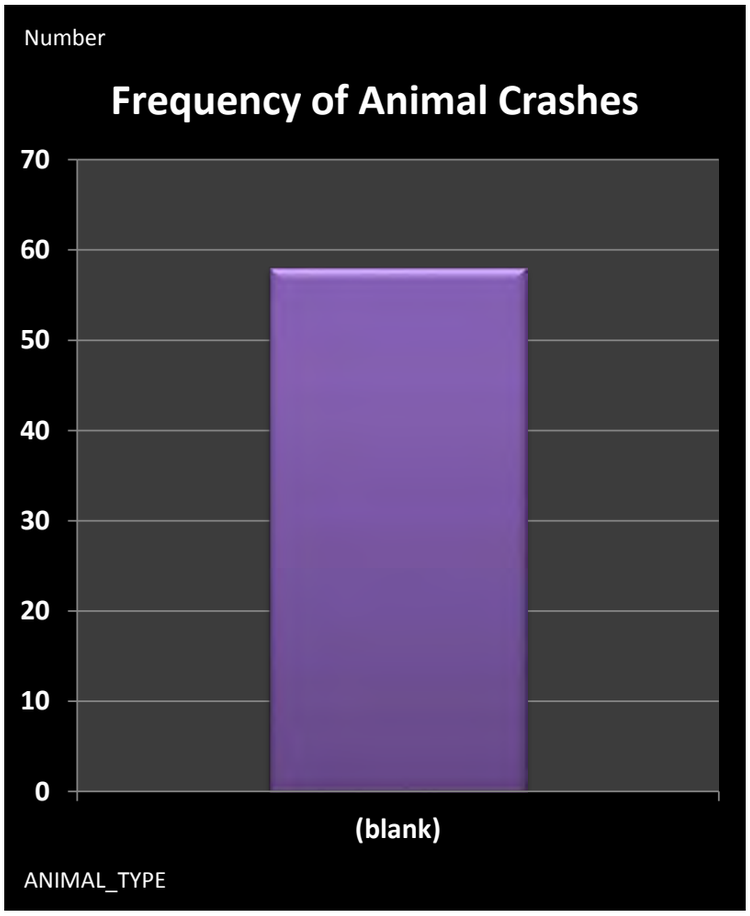

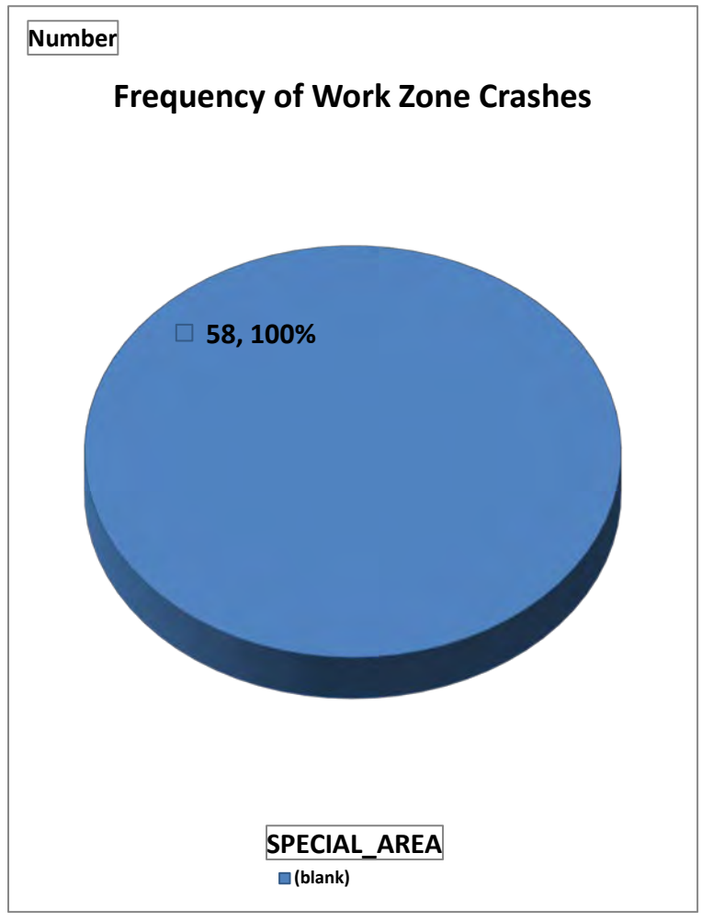

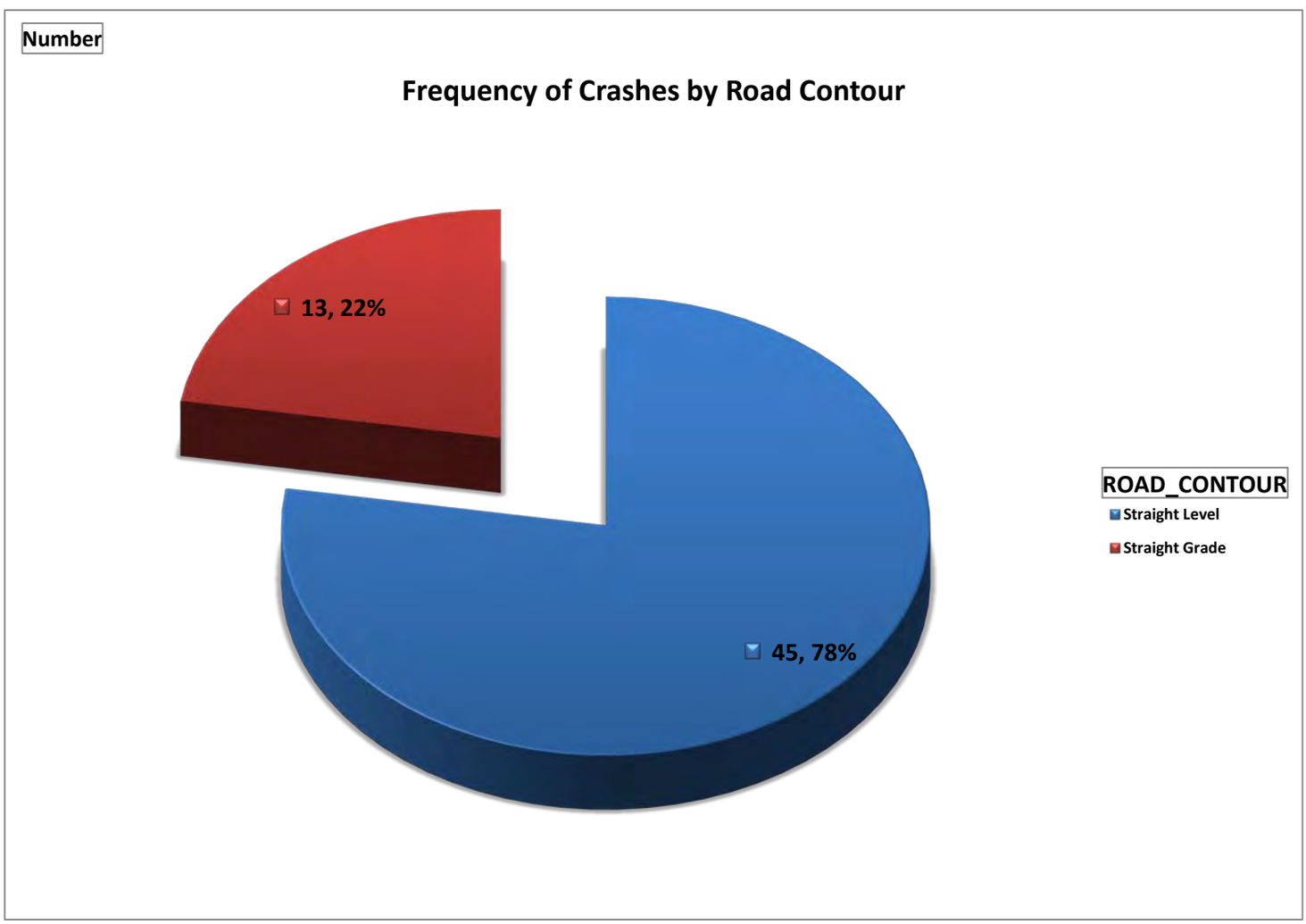

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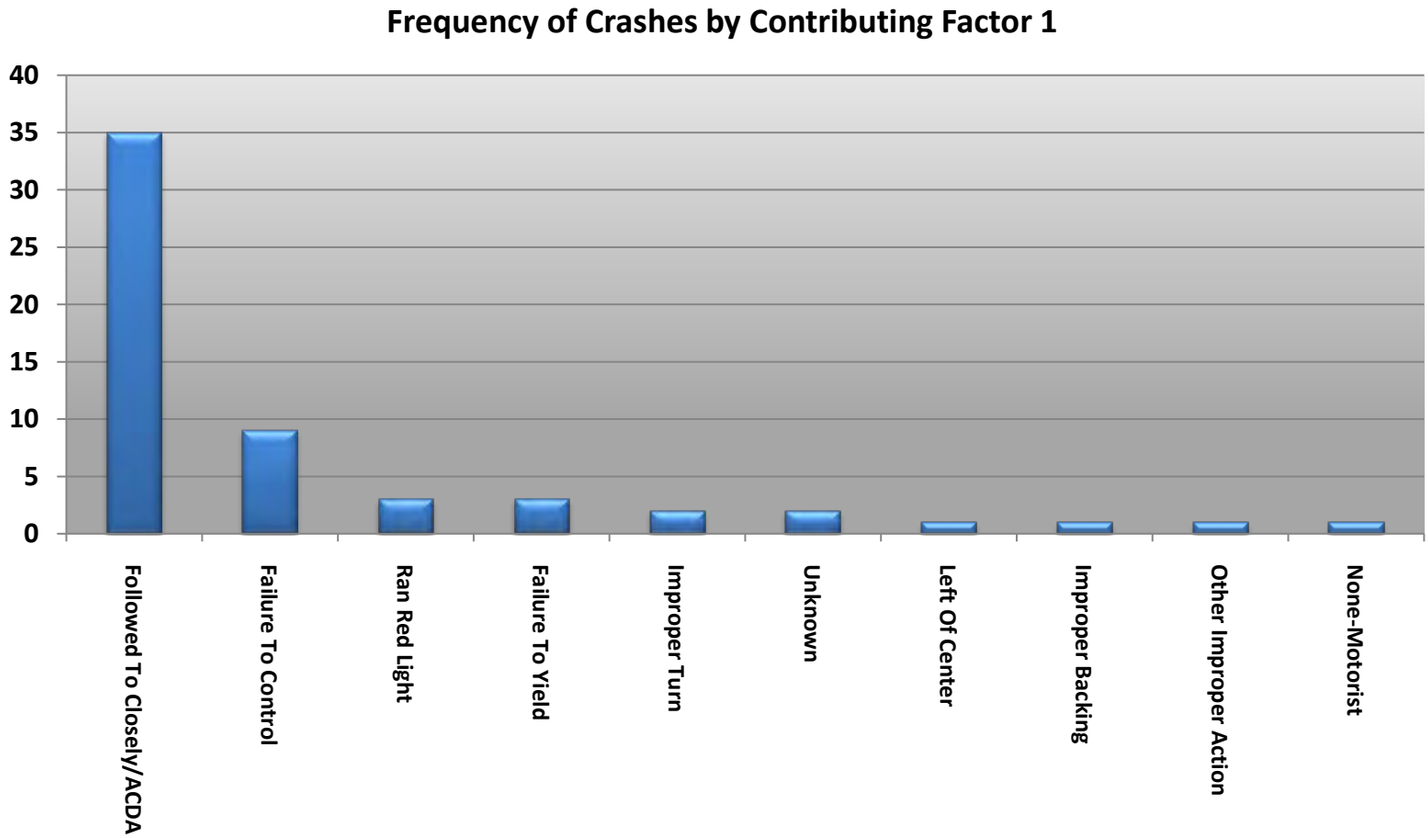

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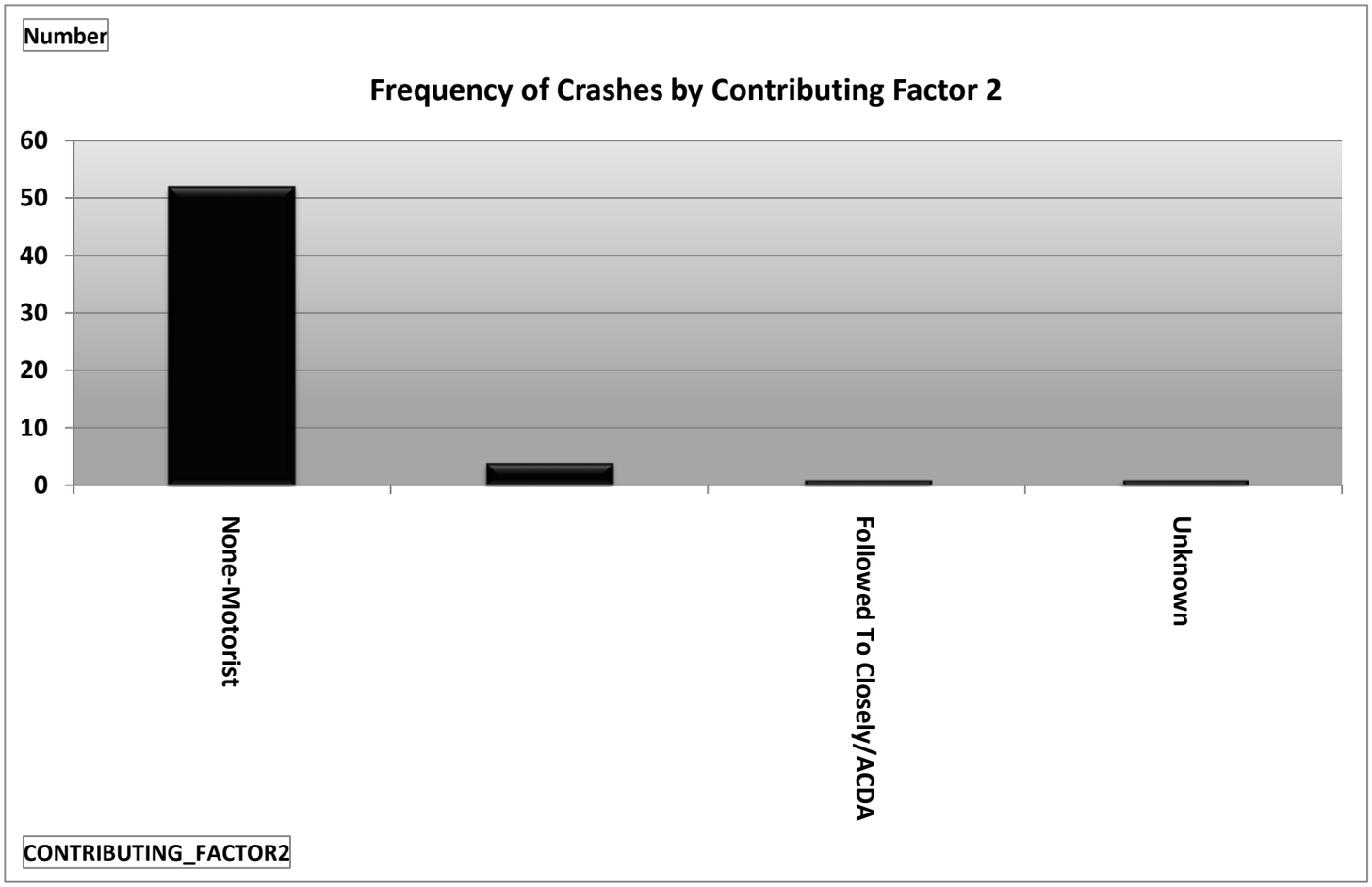

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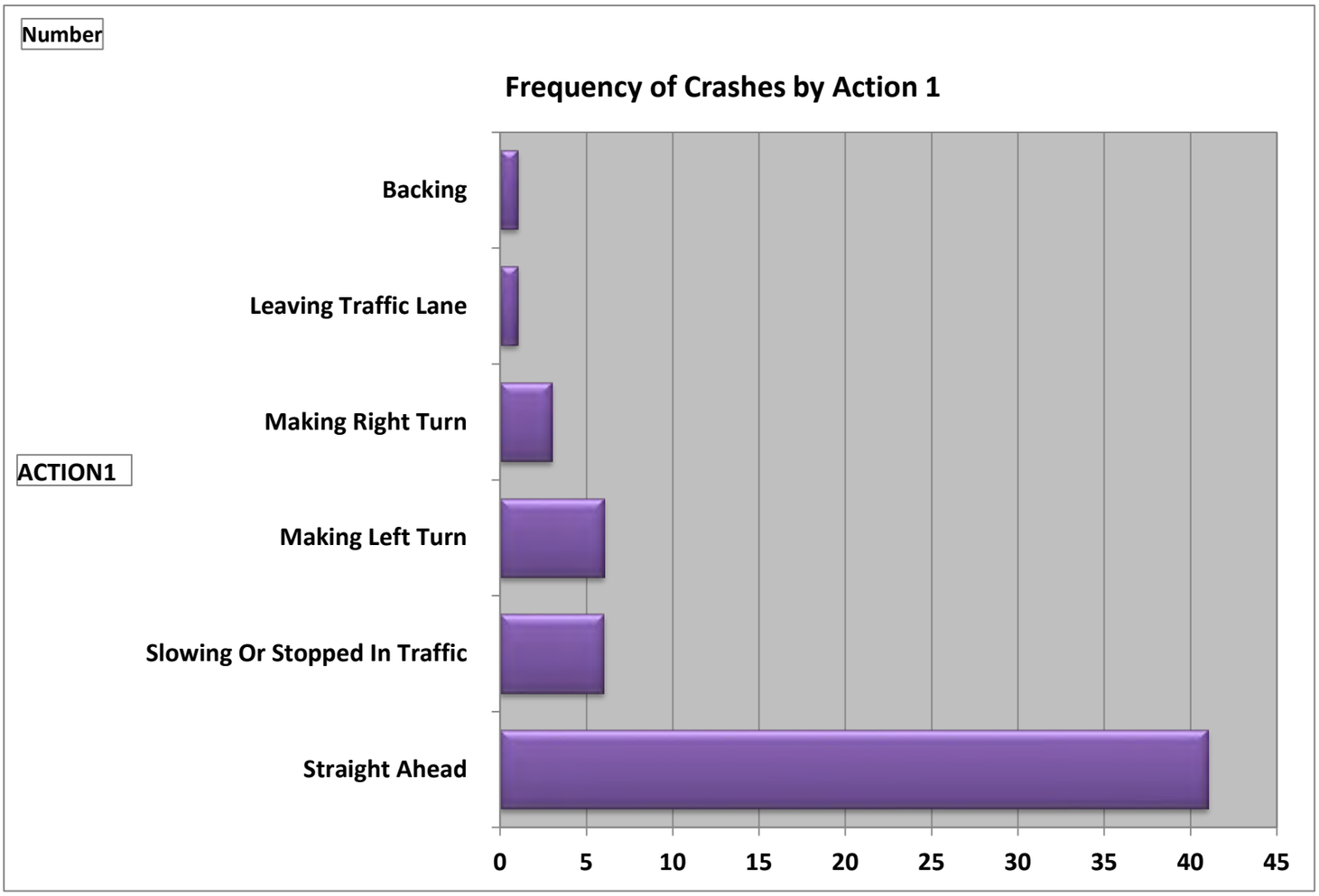

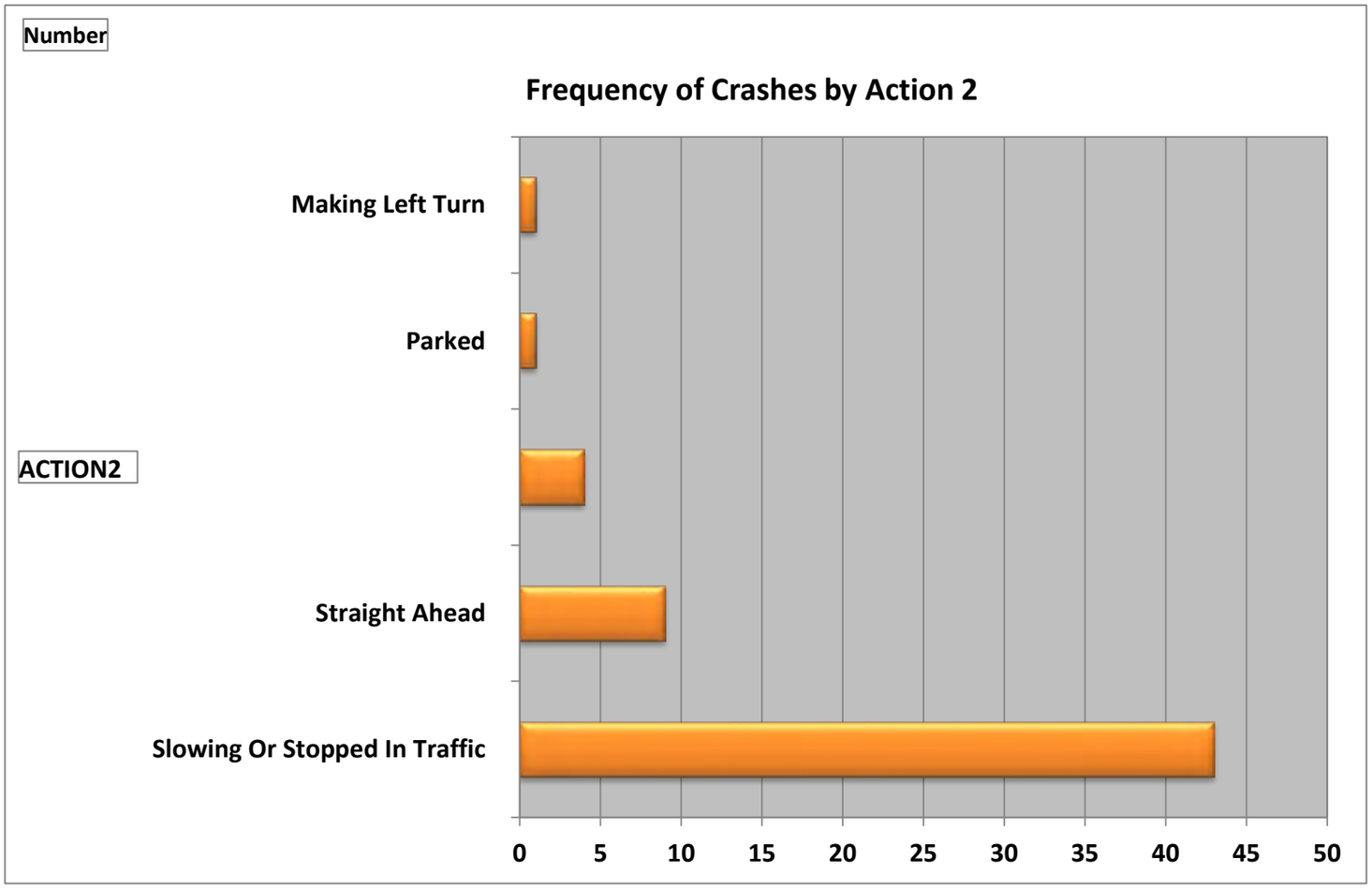

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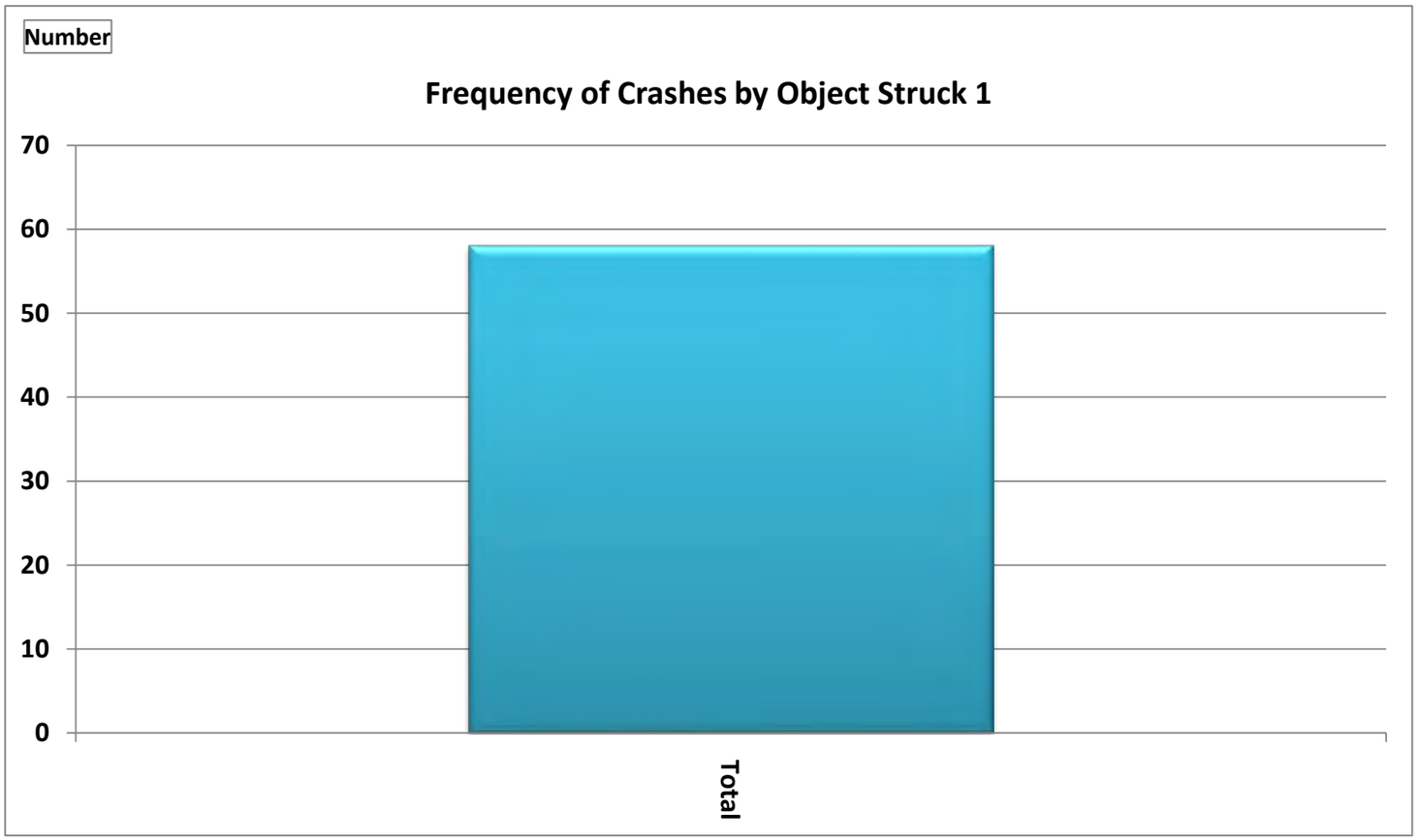
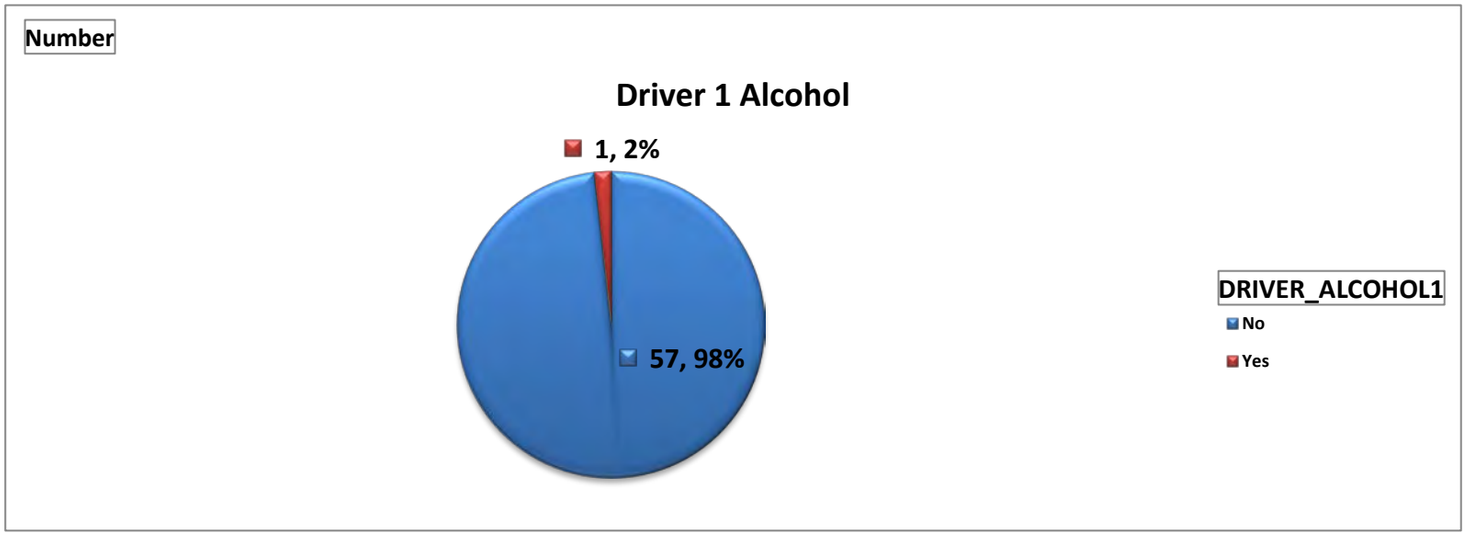
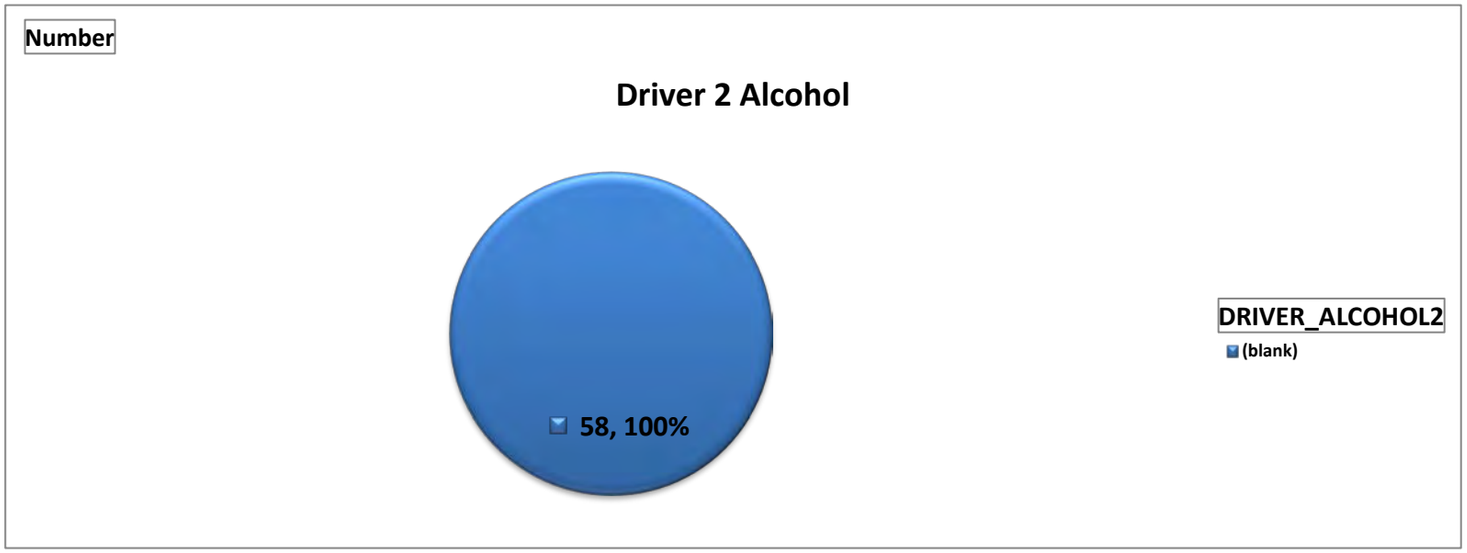






Appendix C

Signal Warrant Analysis

ms consultants, inc.
engineers, architects, planners

EST 1808

CITY OF DELAWARE OHIO

MEMORANDUM

TO: Matthew B. Weber, P.E.
FROM: Jessica Ormeroid, PE, PTOE
DATE: 11/21/2016 Updated 01/20/2017
RE: E. William Street (US36) & Cheshire Street

Below, please find my review of the existing and future conditions at the intersection of E. William Street (US36) and Cheshire Street with regard to a traffic signal warrant analysis as established by the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), 2012 Edition. Also, all vehicular volume and speed data to conduct the warrant analysis is attached to this memorandum.

OMUTCD Standard:

The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants found in the OMUTCD Part 4, Highway Traffic Signals:

- **Warrant 1, Eight-Hour Vehicular Volume**
- **Warrant 2, Four-Hour Vehicular Volume**
- **Warrant 3, Peak Hour**
- **Warrant 4, Pedestrian Volume**
- **Warrant 5, School Crossing**
- **Warrant 6, Coordinated Signal System**
- **Warrant 7, Crash Experience**
- **Warrant 8, Roadway Network**
- **Warrant 9, Intersection Near a Grade Crossing**

Summary of Results:

- **Existing & Future Traffic Volumes**: Existing 24-hour traffic counts and peak hour turning movement counts were collected on 8/22/16. Speed data was also collected 9/26/16-9/28/16 on E. William Street to determine the 85-percentile speed. Future traffic was formulated using a 2% growth rate compounded annually for both E. William Street and Cheshire Street out to 2026 and 2036. Also, given that the Ann Street signal will be removed with the E. William Street Widening project, it was assumed that the majority of the Ann Street traffic accessing E. William Street to travel westbound would utilize Cheshire Street if a signal was installed. This traffic was re-assigned to the Cheshire St approach.
- **85th-Percentile Speed:** Data was collected to determine that the 85th-percentile speed for E. William Street was 33 mph for an entire 24-hour period. This section of E. William Street is located within a School Zone, so Monday-Friday from 7:45AM-8:40AM, 11:00AM-12:45PM and 3:10PM-3:45PM, the speed limit from Wade Street to approximately 100-feet west of Cheshire Street is 20 mph. Also, during the hours of 4PM-6PM, E. William Street is congested causing the inability for traffic to "free flow" in turn causing low speeds. Also, given that there is not a center left turn lane, traffic is periodically stopped waiting for vehicles to obtain a gap in traffic to turn left. This also results in lower speeds throughout the day.
  When accounting for those three (3) factors and with the addition of the center turn lane with the E. William Street Widening project, it is safe to assume that the 85-percentile speed will be 5-6 mph higher.

This puts the overall 85-percentile speed close to 40 mph which enable the intersection to be evaluated using the 56% and 70% factor traffic volume thresholds outlined in Warrant 1 and Warrant 2.

- **Warrant 1, Eight-Hour Vehicular Volume**: The summary of Conditions A and B using existing traffic volumes on E. William Street and Cheshire Street are provided below for the 100%, 80% , 70% and 56% volume criteria.
    1. Condition A – Minimum Vehicular Volume 100%
        i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 0 hours of the day
    2. Condition B – Interruption of Continuous Traffic 100%
        i. Major Street (E. William Street) meets 13 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 2 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 2 hours of the day
    3. Condition A – Minimum Vehicular Volume 80%
        i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 0 hours of the day
    4. Condition B – Interruption of Continuous Traffic 80%
        i. Major Street (E. William Street) meets 14 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 4 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 4 hours of the day
    5. Condition A – Minimum Vehicular Volume 70%
        i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 0 hours of the day
    6. Condition B – Interruption of Continuous Traffic 70%
        i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 4 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 4 hours of the day
    7. Condition A – Minimum Vehicular Volume 56%
        i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 0 hours of the day
    8. Condition B – Interruption of Continuous Traffic 56%
        i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
        ii. Minor Street (Cheshire Street) meets 9 out of the 24 hours of the day
        iii. Warrant criteria is satisfied 9 hours of the day

The summary of Conditions A and B using future traffic volumes projected out to 2026 using a 2% growth rate on E. William Street and Cheshire Street are provided below for the 100%, 80%, 70% and 56% volume criteria.

1. Condition A – Minimum Vehicular Volume 100%
    i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
    ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
    iii. Warrant criteria is satisfied 0 hours of the day
2. Condition B – Interruption of Continuous Traffic 100%
    i. Major Street (E. William Street) meets 14 out of the 24 hours of the day
    ii. Minor Street (Cheshire Street) meets 4 out of the 24 hours of the day
    iii. Warrant criteria is satisfied 4 hours of the day
3. Condition A – Minimum Vehicular Volume 80%
    i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
    ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day

iii. Warrant criteria is satisfied 0 hours of the day

4. Condition B – Interruption of Continuous Traffic 80%
   i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 6 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 6 hours of the day
5. Condition A – Minimum Vehicular Volume 70%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 0 hours of the day
6. Condition B – Interruption of Continuous Traffic 70%
   i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 9 out of the 24 hours of the day
   iii. Warrant criteria is satisfied for 9 hours of the day
7. Condition A – Minimum Vehicular Volume 56%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 2 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 2 hours of the day
8. Condition B – Interruption of Continuous Traffic 56%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 11 out of the 24 hours of the day
   iii. Warrant criteria is satisfied for 11 hours of the day

The summary of Conditions A and B using future traffic volumes projected out to 2036 using a 2% growth rate on E. William Street and Cheshire Street are provided below for the 100%, 80%, 70% and 56% volume criteria.

1. Condition A – Minimum Vehicular Volume 100%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 0 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 0 hours of the day
2. Condition B – Interruption of Continuous Traffic 100%
   i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 4 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 4 hours of the day
3. Condition A – Minimum Vehicular Volume 80%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 1 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 1 hours of the day
4. Condition B – Interruption of Continuous Traffic 80%
   i. Major Street (E. William Street) meets 15 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 10 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 10 hours of the day
5. Condition A – Minimum Vehicular Volume 70%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 2 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 2 hours of the day
6. Condition B – Interruption of Continuous Traffic 70%
   i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 11 out of the 24 hours of the day
   iii. Warrant criteria is satisfied for 11 hours of the day
7. Condition A – Minimum Vehicular Volume 56%
   i. Major Street (E. William Street) meets 18 out of the 24 hours of the day
   ii. Minor Street (Cheshire Street) meets 4 out of the 24 hours of the day
   iii. Warrant criteria is satisfied 4 hours of the day

8. Condition B – Interruption of Continuous Traffic 56%
    i. Major Street (E. William Street) meets 17 out of the 24 hours of the day
    ii. Minor Street (Cheshire Street) meets 11 out of the 24 hours of the day
    iii. Warrant criteria is satisfied for 11 hours of the day

- **Warrant 2, Four-Hour Vehicular Volume**: The summary of findings with respect to Figures 4C-1 and 4C-2 using the existing and future traffic volumes on E. William Street and Cheshire Street are provided below.
    1. Figure 4C-1
        i. Existing Traffic Volumes: Warrant satisfied for 1 hour of the day
        ii. Future Traffic Volumes 2026 Horizon Year: Warrant satisfied for 3 hours of the day
        iii. Future Traffic Volumes 2036 Horizon Year: Warrant satisfied for 4 hours of the day
    2. Figure 4C-2
        i. Existing Traffic Volumes: Warrant satisfied for 1 hour of the day
        ii. Future Traffic Volumes 2026 Horizon year: Warrant satisfied for 6 hours of the day
        iii. Future Traffic Volumes 2036 Horizon Year: Warrant satisfied for 10 hours of the day

- **Warrant 3, Peak Hour**: The warrant does not apply to this intersection.
- **Warrant 4, Pedestrian Volume**: The pedestrian volumes crossing the E. William Street (major street), do not meet the requirements as established in Figures 4C-5 and 4C-7 unless it is assumed that the signal at US36-Channing Street and US36-Cheshire Street operate as one signalized intersection. The US36-Channing Street intersection does meet the pedestrian required volumes.
- **Warrant 5, School Crossing**: The minimum of 20 schoolchildren crossing during the highest crossing hour is not met. Please note though, this intersection is approximately 250-feet west of an Elementary School.
- **Warrant 6, Coordinated Signal System**: This warrant was not evaluated given that the resultant spacing of traffic control signals would not be 1,000-feet.
- **Warrant 7, Crash Experience**: There have been 11 accidents at this intersection since 2011, which consisted of four (4) in 2011, one (1) in 2013, one (1) in 2014, two (2) in 2015 and three (3) thus far in 2016. All 11 of the accidents were rear-end collisions and mainly as a result of congestion and lack of a center left turn lane.
- **Warrant 8, Roadway Network**: The warrant does not apply to this intersection.
- **Warrant 9, Intersection Near a Grade Crossing**: The warrant does not apply to this intersection given that the grade crossing on Cheshire Street is not close enough to the intersection in question to cause concern with vehicular traffic back-up. Also, the daily frequency of rail traffic is, at most, 1 per day.

Recommendations:

Based on the above summary of results and other known variables of this intersection and this area of the City, it is recommended that a traffic signal be installed at this intersection as part of the E. William Street Widening project for the following reasons:

1. Existing traffic volumes satisfy Warrant 1, Condition B 56% factor traffic volumes and are half way to satisfying Condition B for 80% & 70% factor traffic volume criteria.
2. Future traffic volumes satisfy Warrant 1, Condition B 70% factor traffic volumes and are half way to satisfying Warrant 1, Condition B 100% and 80% factor traffic volumes.
3. Existing traffic volumes satisfy Warrant 2, 70% factor traffic volumes.
4. Future traffic volumes more than satisfy Warrant 2, 70% factor traffic volumes and are ¾ of the way to satisfying Warrant 2, 100% factor traffic volumes.
5. Given the Ann Street Signal will be removed with the E. William Street Widening project, there will be no signalized access for vehicular traffic from the SE quadrant of the City (North St, Curve Rd, Armstrong Rd etc.) wanting to access westbound E. William Street or E. Central Avenue without going out of the way to the signalized access at US36/SR37-Mill Run Crossing or E. William Street-Henry Street. It is recommended that there be one signalized access point for this traffic to access between the Point and Lake Street (US42), given that during peak traffic times of the days, the safety

of this movement is jeopardized and the delay can be excessive at times waiting for a gap in traffic.

6. Public comment received during the public meeting held for the E. William Street Widening project emphasized the need for a traffic signal for traffic accessing westbound E. William Street from the SE quadrant of the City.
7. Consideration shall be given to putting this signal in flash operation during off-peak weekday hours and possibly on the weekends until it fully meets the Warrant 1, Condition A or B 100% traffic volume criteria.
8. It is recommended that signal at Cheshire Street be coordinated with the signal at Ann Street and Lake Street to allow for vehicular progression on E. William Street.

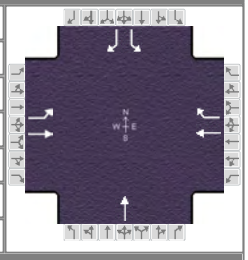
Appendix D

Capacity Analysis

ms consultants, inc.
engineers, architects, planners

HCS 2010 Signalized Intersection Results Summary

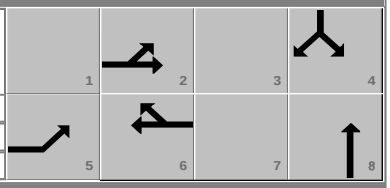
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 AM No Build - William Street & US 42.xus				
Project Description	2017 AM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	120	630			570	10		0		10		150

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	43.0	25.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	12.0	60.0		48.0		30.0		30.0
Change Period, (***Y+R$_c$***), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.3
Queue Clearance Time (***g$_s$***), s	5.4	26.4		29.8				10.6
Green Extension Time (***g$_e$***), s	0.0	2.8		2.6		0.0		0.3
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.00		0.08				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	130	685			620	11		0		11		163
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1587	1667			1667	1068		1900		1573		1400
Queue Service Time (***g$_s$***), s	3.4	24.4			27.8	0.5		0.0		0.5		8.6
Cycle Queue Clearance Time (***g$_c$***), s	3.4	24.4			27.8	0.5		0.0		0.5		8.6
Green Ratio (***g/C***)	0.58	0.61			0.48	0.48		0.28		0.28		0.28
Capacity (***c***), veh/h	324	1019			796	510		528		517		389
Volume-to-Capacity Ratio (***X***)	0.402	0.672			0.778	0.021		0.000		0.021		0.419
Available Capacity (***c$_a$***), veh/h	324	1019			796	510		528		517		389
Back of Queue (***Q***), veh/ln (50th percentile)	1.1	8.7			11.4	0.1		0.0		0.2		2.8
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (***d$_1$***), s/veh	14.8	11.6			19.5	12.4		0.0		23.6		26.6
Incremental Delay (***d$_2$***), s/veh	0.3	3.5			7.4	0.1		0.0		0.0		0.3
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	15.1	15.1			26.9	12.5		0.0		23.6		26.8
Level of Service (LOS)	B	B			C	B				C		C
Approach Delay, s/veh / LOS	15.1	B		26.7	C		0.0			26.6	C	
Intersection Delay, s/veh / LOS	20.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.4	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.8	A	1.5	A	0.5	A		F

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Cheshire*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*AM Peak Hour*		

Project Description *2017 AM No Build*

East/West Street: *William St* | North/South Street: *Cheshire*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*640*	*30*	*30*	*550*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*695*	*32*	*32*	*597*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*30*		*40*			
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*32*	*0*	*43*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*32*		*75*				
C (m) (veh/h)		*876*		*245*				
v/c		*0.04*		*0.31*				
95% queue length		*0.11*		*1.25*				
Control Delay (s/veh)		*9.3*		*26.0*				
LOS		*A*		*D*				
Approach Delay (s/veh)	--	--	*26.0*					
Approach LOS	--	--	*D*					

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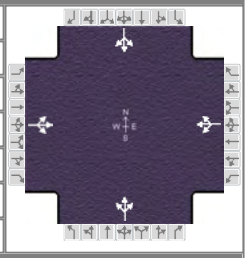
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

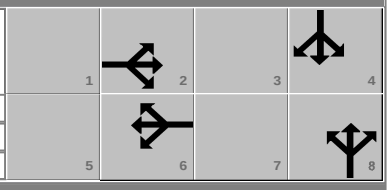
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 AM No Build - William Street & Channing.xus				
Project Description	2017 AM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	30	650	10	10	570	10	10	0	10	10	0	10

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	51.5	28.5	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		56.5		56.5		33.5		33.5
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		3.2		3.2
Queue Clearance Time (***g$_s$***), s		34.7		26.2		2.9		2.9
Green Extension Time (***g$_e$***), s		3.1		3.3		0.1		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.05		0.01		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (***v***), veh/h		750			641			22			22	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1610			1647			1365			1365	
Queue Service Time (***g$_s$***), s		8.5			0.0			0.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s		32.7			24.2			0.9			0.9	
Green Ratio (***g/C***)		0.57			0.57			0.32			0.32	
Capacity (***c***), veh/h		963			983			492			492	
Volume-to-Capacity Ratio (***X***)		0.779			0.652			0.044			0.044	
Available Capacity (***c$_a$***), veh/h		963			983			492			492	
Back of Queue (***Q***), veh/ln (50th percentile)		12.0			8.8			0.3			0.3	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh		15.1			13.4			21.3			21.3	
Incremental Delay (***d$_2$***), s/veh		6.2			3.4			0.0			0.0	
Initial Queue Delay (***d$_3$***), s/veh		0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh		21.3			16.8			21.3			21.3	
Level of Service (LOS)		C			B			C			C	
Approach Delay, s/veh / LOS	21.3	C		16.8	B		21.3	C		21.3	C	
Intersection Delay, s/veh / LOS	19.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	1.7	A	1.5	A	0.5	A	0.5	A

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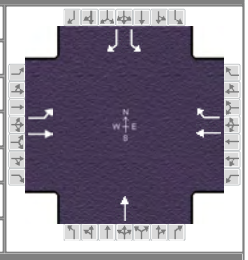
HCS 2010 Signalized Intersection Results Summary

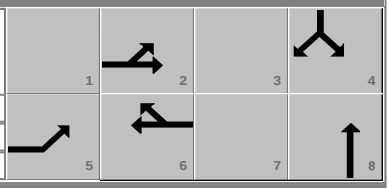
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 PM No Build - William Street & US 42.xus				
Project Description	2017 PM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	340	840			710	40		0		50		90

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	23.0	58.0	24.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	28.0	91.0		63.0		29.0		29.0
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.2
Queue Clearance Time (g_s), s	17.9	37.3		48.9				8.4
Green Extension Time (g_e), s	0.4	4.5		3.3		0.0		0.2
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	0.23	0.00		0.38				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	370	913			772	43		0		54		98
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1707	1792			1792	1149		1900		1757		1563
Queue Service Time (g_s), s	15.9	35.3			46.9	2.4		0.0		3.1		6.4
Cycle Queue Clearance Time (g_c), s	15.9	35.3			46.9	2.4		0.0		3.1		6.4
Green Ratio (***g/C***)	0.69	0.72			0.48	0.48		0.20		0.20		0.20
Capacity (***c***), veh/h	449	1285			866	555		380		411		313
Volume-to-Capacity Ratio (***X***)	0.823	0.711			0.891	0.078		0.000		0.132		0.313
Available Capacity (c_a), veh/h	449	1285			866	555		380		411		313
Back of Queue (***Q***), veh/ln (50th percentile)	11.5	13.0			22.3	0.7		0.0		1.3		0.0
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	29.9	9.8			28.1	16.6		0.0		39.6		41.0
Incremental Delay (d_2), s/veh	11.0	3.4			13.3	0.3		0.0		0.1		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	40.9	13.2			41.5	16.9		0.0		39.7		41.2
Level of Service (LOS)	D	B			D	B				D		D
Approach Delay, s/veh / LOS	21.2	C		40.1	D		0.0			40.6	D	
Intersection Delay, s/veh / LOS	29.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	2.6	B	1.8	A	0.5	A		F

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Cheshire*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*PM Peak Hour*		

Project Description *2017 PM No Build*

East/West Street: *William St* | North/South Street: *Cheshire*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*840*	*50*	*30*	*700*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*913*	*54*	*32*	*760*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*50*		*50*			
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*54*	*0*	*54*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*32*		*108*				
C (m) (veh/h)		*712*		*138*				
v/c		*0.04*		*0.78*				
95% queue length		*0.14*		*4.76*				
Control Delay (s/veh)		*10.3*		*89.8*				
LOS		*B*		*F*				
Approach Delay (s/veh)	--	--	*89.8*					
Approach LOS	--	--	*F*					

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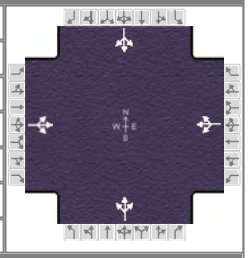
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

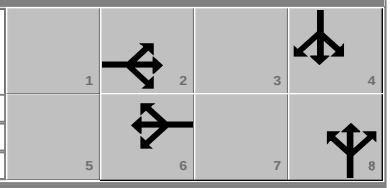
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 PM No Build - William Street & Channing.xus				
Project Description	2017 PM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	20	870	10	10	700	20	10	0	10	20	0	30

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	73.3	36.7	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		78.3		78.3		41.7		41.7
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		3.2		3.2
Queue Clearance Time (***g$_s$***), s		59.0		38.8		3.1		4.8
Green Extension Time (***g$_e$***), s		4.3		5.0		0.1		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.20		0.01		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (***v***), veh/h		978			793			22			54	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1771			1781			1498			1531	
Queue Service Time (***g$_s$***), s		20.2			0.0			0.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s		57.0			36.8			1.1			2.8	
Green Ratio (***g/C***)		0.61			0.61			0.31			0.31	
Capacity (***c***), veh/h		1112			1118			503			510	
Volume-to-Capacity Ratio (***X***)		0.879			0.710			0.043			0.107	
Available Capacity (***c$_a$***), veh/h		1112			1118			503			510	
Back of Queue (***Q***), veh/ln (50th percentile)		24.3			15.2			0.4			1.1	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh		20.0			16.2			29.3			29.9	
Incremental Delay (***d$_2$***), s/veh		10.0			3.8			0.0			0.0	
Initial Queue Delay (***d$_3$***), s/veh		0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh		29.9			20.1			29.3			29.9	
Level of Service (LOS)		C			C			C			C	
Approach Delay, s/veh / LOS	29.9	C		20.1	C		29.3	C		29.9	C	
Intersection Delay, s/veh / LOS	25.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	2.1	B	1.8	A	0.5	A	0.6	A

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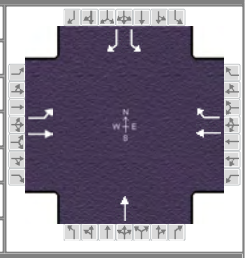
HCS 2010 Signalized Intersection Results Summary

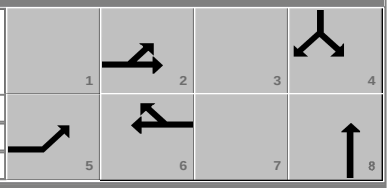
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM No Build - William Street & US 42.xus				
Project Description	2037 AM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	160	900			800	40		0		100		180

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	49.8	18.2	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	12.0	66.8		54.8		23.2		23.2
Change Period, (***Y+R$_c$***), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.2
Queue Clearance Time (***g$_s$***), s	5.8	42.1		45.9				13.7
Green Extension Time (***g$_e$***), s	0.0	4.8		2.1		0.0		0.3
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.12		0.89				0.37

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	174	978			870	43		0		109		196
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1587	1667			1667	1068		1900		1573		1400
Queue Service Time (***g$_s$***), s	3.8	40.1			43.9	1.7		0.0		5.3		11.7
Cycle Queue Clearance Time (***g$_c$***), s	3.8	40.1			43.9	1.7		0.0		5.3		11.7
Green Ratio (***g/C***)	0.65	0.69			0.55	0.55		0.20		0.20		0.20
Capacity (***c***), veh/h	241	1144			922	591		384		398		283
Volume-to-Capacity Ratio (***X***)	0.722	0.855			0.943	0.074		0.000		0.273		0.691
Available Capacity (***c$_a$***), veh/h	241	1144			922	591		384		398		283
Back of Queue (***Q***), veh/ln (50th percentile)	2.6	13.9			19.4	0.4		0.0		2.0		4.3
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (***d$_1$***), s/veh	20.3	10.7			18.8	9.4		0.0		30.8		33.3
Incremental Delay (***d$_2$***), s/veh	8.8	8.2			18.7	0.2		0.0		0.1		5.9
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	29.2	18.9			37.4	9.6		0.0		30.9		39.2
Level of Service (LOS)	C	B			D	A				C		D
Approach Delay, s/veh / LOS	20.5	C		36.1	D		0.0			36.2	D	
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.2	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	2.4	B	2.0	A	0.5	A		F

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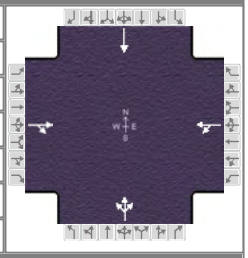
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

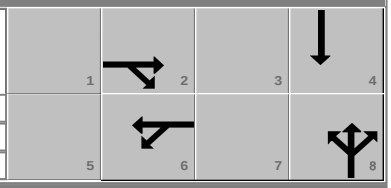
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Cheshire	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM No Build - William Street & Cheshire.xus				
Project Description	2037 AM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h		920	80	70	770		70	0	90		0	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	70.3	9.7	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		75.3		75.3		14.7		14.7
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.2		3.2		3.2		0.0
Queue Clearance Time (***g$_s$***), s		40.5		72.3		11.7		
Green Extension Time (***g$_e$***), s		6.9		0.0		0.0		0.0
Phase Call Probability		1.00		1.00		1.00		
Max Out Probability		0.07		1.00		1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3	8	18		4	
Adjusted Flow Rate (***v***), veh/h		1087			913			174			0	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1643			1031			1500			1845	
Queue Service Time (***g$_s$***), s		38.5			31.8			9.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s		38.5			70.3			9.7			0.0	
Green Ratio (***g/C***)		0.78			0.78			0.11			0.11	
Capacity (***c***), veh/h		1283			849			219			199	
Volume-to-Capacity Ratio (***X***)		0.847			1.076			0.794			0.000	
Available Capacity (***c$_a$***), veh/h		1283			849			219			199	
Back of Queue (***Q***), veh/ln (50th percentile)		9.4			20.2			5.3			0.0	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh		6.4			12.6			40.5			0.0	
Incremental Delay (***d$_2$***), s/veh		5.2			53.3			24.9			0.0	
Initial Queue Delay (***d$_3$***), s/veh		0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh		11.6			65.9			65.4			0.0	
Level of Service (LOS)		B			F			E				
Approach Delay, s/veh / LOS	11.6	B		65.9	E		65.4	E		0.0		
Intersection Delay, s/veh / LOS	38.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	2.3	B	2.0	A	0.8	A	0.5	A

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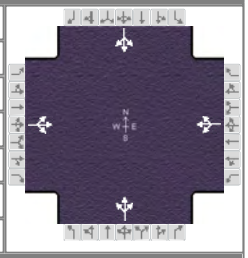
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

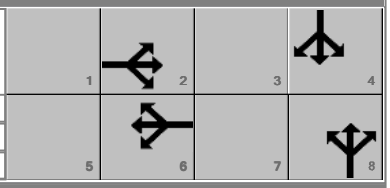
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM No Build - William Street & Channing.xus				
Project Description	2037 AM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	30	980	10	10	830	10	10	0	10	10	0	10

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	62.8	17.2	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		67.8		67.8		22.2		22.2
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		3.1		3.1		3.2		3.2
Queue Clearance Time (g_s), s		61.8		36.0		3.0		3.0
Green Extension Time (g_e), s		0.7		6.5		0.0		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		0.08		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		1109			924			22			22	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1611			1640			1374			1374	
Queue Service Time (g_s), s		25.8			0.0			0.0			0.0	
Cycle Queue Clearance Time (g_c), s		59.8			34.0			1.0			1.0	
Green Ratio (*g/C*)		0.70			0.70			0.19			0.19	
Capacity (*c*), veh/h		1165			1185			323			323	
Volume-to-Capacity Ratio (*X*)		0.952			0.780			0.067			0.067	
Available Capacity (c_a), veh/h		1165			1185			323			323	
Back of Queue (*Q*), veh/ln (50th percentile)		20.5			10.9			0.4			0.4	
Queue Storage Ratio (*RQ*) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		12.7			9.2			29.9			29.9	
Incremental Delay (d_2), s/veh		17.0			5.1			0.0			0.0	
Initial Queue Delay (d_3), s/veh		0.0			0.0			0.0			0.0	
Control Delay (*d*), s/veh		29.8			14.4			29.9			29.9	
Level of Service (LOS)		C			B			C			C	
Approach Delay, s/veh / LOS	29.8	C		14.4	B		29.9	C		29.9	C	
Intersection Delay, s/veh / LOS	22.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	2.3	B	2.0	B	0.5	A	0.5	A

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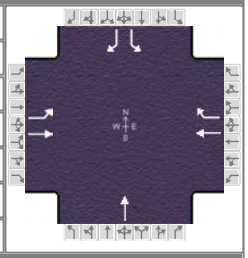
HCS 2010 Signalized Intersection Results Summary

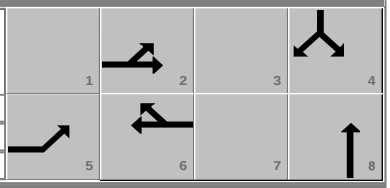
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM No Build - William Street & US 42.xus				
Project Description	2037 PM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	480	1210			1050	100		0		110		110

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	28.1	67.4	9.5	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	33.1	105.5		72.4		14.5		14.5
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.1		3.1		0.0		3.2
Queue Clearance Time (g_s), s	30.1	55.7		69.4				11.2
Green Extension Time (g_e), s	0.0	10.8		0.0		0.0		0.0
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.11		1.00				1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	522	1315			1141	109		0		120		120
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1707	1792			1792	1149		1900		1757		1563
Queue Service Time (g_s), s	28.1	53.7			67.4	5.5		0.0		8.1		9.2
Cycle Queue Clearance Time (g_c), s	28.1	53.7			67.4	5.5		0.0		8.1		9.2
Green Ratio (***g/C***)	0.81	0.84			0.56	0.56		0.08		0.08		0.08
Capacity (***c***), veh/h	460	1501			1007	645		150		199		124
Volume-to-Capacity Ratio (***X***)	1.135	0.876			1.134	0.168		0.000		0.601		0.966
Available Capacity (c_a), veh/h	460	1501			1007	645		150		199		124
Back of Queue (***Q***), veh/ln (50th percentile)	24.1	14.6			46.8	1.5		0.0		3.7		6.0
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	41.2	6.0			26.3	12.7		0.0		54.6		55.1
Incremental Delay (d_2), s/veh	84.4	7.5			72.7	0.6		0.0		3.5		69.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	125.6	13.4			99.0	13.3		0.0		58.1		124.8
Level of Service (LOS)	F	B			F	B				E		F
Approach Delay, s/veh / LOS	45.3	D		91.5	F		0.0			91.5	F	
Intersection Delay, s/veh / LOS	66.0						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	3.5	D	2.6	B	0.5	A		F

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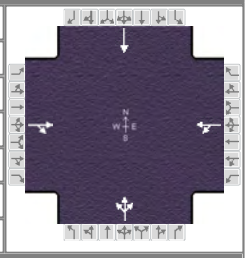
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

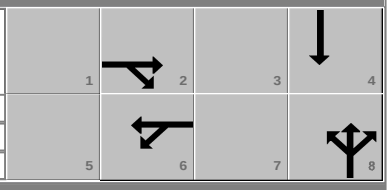
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Cheshire	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM No Build - William Street & Cheshire.xus				
Project Description	2037 PM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h		1210	110	60	1030		120	0	110		0	

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	101.8	8.2	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		106.8		106.8		13.2		13.2
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.2		3.2		3.2		0.0
Queue Clearance Time (***g$_s$***), s		80.8		103.8		10.2		
Green Extension Time (***g$_e$***), s		11.3		0.0		0.0		0.0
Phase Call Probability		1.00		1.00		1.00		
Max Out Probability		0.48		1.00		1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3	8	18		4	
Adjusted Flow Rate (***v***), veh/h		1435			1185			250			0	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1766			737			1502			1881	
Queue Service Time (***g$_s$***), s		78.8			23.0			8.2			0.0	
Cycle Queue Clearance Time (***g$_c$***), s		78.8			101.8			8.2			0.0	
Green Ratio (***g/C***)		0.85			0.85			0.07			0.07	
Capacity (***c***), veh/h		1498			657			148			129	
Volume-to-Capacity Ratio (***X***)		0.958			1.804			1.686			0.000	
Available Capacity (***c$_a$***), veh/h		1498			657			148			129	
Back of Queue (***Q***), veh/ln (50th percentile)		21.2			75.2			18.3			0.0	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh		7.4			27.4			57.2			0.0	
Incremental Delay (***d$_2$***), s/veh		15.1			367.7			336.2			0.0	
Initial Queue Delay (***d$_3$***), s/veh		0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh		22.5			395.1			393.3			0.0	
Level of Service (LOS)		C			F			F				
Approach Delay, s/veh / LOS	22.5	C		395.1	F		393.3	F		0.0		
Intersection Delay, s/veh / LOS	208.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	2.9	C	2.4	B	0.9	A	0.5	A

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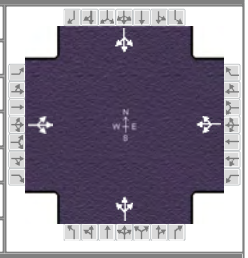
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

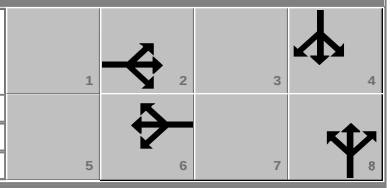
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM No Build - William Street & Channing.xus				
Project Description	2037 PM No Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	20	1300	10	10	1050	20	10	0	10	20	0	30

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	93.2	16.8	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		98.2		98.2		21.8		21.8
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		3.2		3.2
Queue Clearance Time (***g$_s$***), s		95.2		52.0		3.3		5.5
Green Extension Time (***g$_e$***), s		0.0		13.6		0.1		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		0.17		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (***v***), veh/h		1446			1174			22			54	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1768			1756			1521			1548	
Queue Service Time (***g$_s$***), s		43.2			0.0			0.0			0.5	
Cycle Queue Clearance Time (***g$_c$***), s		93.2			50.0			1.3			3.5	
Green Ratio (***g/C***)		0.78			0.78			0.14			0.14	
Capacity (***c***), veh/h		1404			1394			258			259	
Volume-to-Capacity Ratio (***X***)		1.030			0.842			0.084			0.210	
Available Capacity (***c$_a$***), veh/h		1404			1394			258			259	
Back of Queue (***Q***), veh/ln (50th percentile)		40.8			17.1			0.6			1.4	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh		13.9			8.6			44.9			45.8	
Incremental Delay (***d$_2$***), s/veh		32.1			6.3			0.1			0.1	
Initial Queue Delay (***d$_3$***), s/veh		0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh		46.0			14.9			45.0			46.0	
Level of Service (LOS)		F			B			D			D	
Approach Delay, s/veh / LOS	46.0	D		14.9	B		45.0	D		46.0	D	
Intersection Delay, s/veh / LOS	32.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	2.9	C	2.4	B	0.5	A	0.6	A

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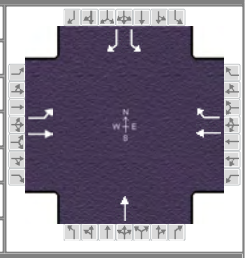
HCS 2010 Signalized Intersection Results Summary

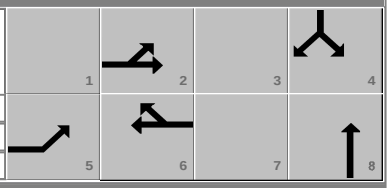
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 AM Build - William Street & US 42.xus				
Project Description	2017 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	120	630			570	10		0		40		150

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	37.9	20.1	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	12.0	54.9		42.9		25.1		25.1
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.3
Queue Clearance Time (g_s), s	5.0	23.0		26.9				9.9
Green Extension Time (g_e), s	0.0	2.8		2.4		0.0		0.3
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.00		0.14				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	130	685			620	11		0		43		163
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1587	1667			1667	1502		1900		1573		1400
Queue Service Time (g_s), s	3.0	21.0			24.9	0.3		0.0		1.7		7.9
Cycle Queue Clearance Time (g_c), s	3.0	21.0			24.9	0.3		0.0		1.7		7.9
Green Ratio (***g/C***)	0.59	0.62			0.47	0.47		0.25		0.25		0.25
Capacity (***c***), veh/h	345	1040			790	711		477		485		352
Volume-to-Capacity Ratio (***X***)	0.378	0.659			0.785	0.015		0.000		0.090		0.463
Available Capacity (c_a), veh/h	345	1040			790	711		477		485		352
Back of Queue (***Q***), veh/ln (50th percentile)	0.9	7.0			10.2	0.1		0.0		0.6		2.5
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	13.0	9.6			17.6	11.2		0.0		23.1		25.4
Incremental Delay (d_2), s/veh	0.3	3.3			7.7	0.0		0.0		0.0		0.4
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	13.2	12.9			25.3	11.2		0.0		23.1		25.7
Level of Service (LOS)	B	B			C	B				C		C
Approach Delay, s/veh / LOS	12.9	B		25.1	C		0.0			25.2	C	
Intersection Delay, s/veh / LOS	19.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.4	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	1.8	A	1.5	A	0.5	A		F

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Cheshire*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*AM Peak Hour*		

Project Description *2017 AM Build*

East/West Street: *William St* | North/South Street: *Cheshire*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*640*	*30*	*30*	*550*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*695*	*32*	*32*	*597*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*40*		*40*			
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*43*	*0*	*43*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*32*		*86*				
C (m) (veh/h)		*876*		*228*				
v/c		*0.04*		*0.38*				
95% queue length		*0.11*		*1.66*				
Control Delay (s/veh)		*9.3*		*30.0*				
LOS		*A*		*D*				
Approach Delay (s/veh)	--	--	*30.0*					
Approach LOS	--	--	*D*					

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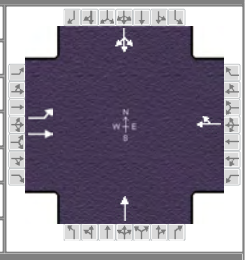
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

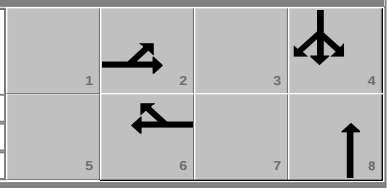
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 AM Build - William Street & Channing.xus				
Project Description	2017 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	30	650			570	10		0		10	0	10

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	45.0	25.0	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		50.0		50.0		30.0		30.0
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		0.0		3.2
Queue Clearance Time (***g$_s$***), s		27.8		23.4				2.8
Green Extension Time (***g$_e$***), s		3.0		3.1		0.0		0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.04		0.01				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7	4	14
Adjusted Flow Rate (***v***), veh/h	33	707			630			0			22	
Adjusted Saturation Flow Rate (***s***), veh/h/ln	709	1667			1662			1696			1373	
Queue Service Time (***g$_s$***), s	2.7	25.8			21.4			0.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s	24.1	25.8			21.4			0.0			0.8	
Green Ratio (***g/C***)	0.56	0.56			0.56			0.31			0.31	
Capacity (***c***), veh/h	299	938			935			530			497	
Volume-to-Capacity Ratio (***X***)	0.109	0.754			0.675			0.000			0.044	
Available Capacity (***c$_a$***), veh/h	299	938			935			530			497	
Back of Queue (***Q***), veh/ln (50th percentile)	0.5	9.6			7.7			0.0			0.3	
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh	20.8	13.3			12.3			0.0			19.2	
Incremental Delay (***d$_2$***), s/veh	0.7	5.6			3.9			0.0			0.0	
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh	21.6	18.9			16.2			0.0			19.2	
Level of Service (LOS)	C	B			B						B	
Approach Delay, s/veh / LOS	19.0	B		16.2	B		0.0			19.2	B	
Intersection Delay, s/veh / LOS	17.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	1.7	A	1.5	A	0.5	A	0.5	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Ann St*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*AM Peak Hour*		

Project Description *2017 AM Build*

East/West Street: *William St* | North/South Street: *Ann St*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*650*	*10*	*10*	*570*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*706*	*10*	*10*	*619*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*10*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*10*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*10*			*10*			
C (m) (veh/h)		*885*			*433*			
v/c		*0.01*			*0.02*			
95% queue length		*0.03*			*0.07*			
Control Delay (s/veh)		*9.1*			*13.5*			
LOS		*A*			*B*			
Approach Delay (s/veh)	--	--	*13.5*					
Approach LOS	--	--	*B*					

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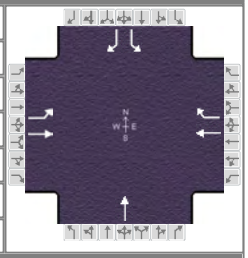
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

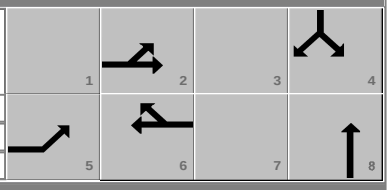
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 PM Build - William Street & US 42.xus				
Project Description	2017 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	340	840			710	40		0		50		90

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	23.0	58.0	24.0	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	28.0	91.0		63.0		29.0		29.0
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.2
Queue Clearance Time (g_s), s	17.9	37.3		48.9				8.4
Green Extension Time (g_e), s	0.4	4.4		3.2		0.0		0.2
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	0.23	0.00		0.37				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	370	913			772	43		0		54		98
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1707	1792			1792	1615		1900		1757		1563
Queue Service Time (g_s), s	15.9	35.3			46.9	1.7		0.0		3.1		6.4
Cycle Queue Clearance Time (g_c), s	15.9	35.3			46.9	1.7		0.0		3.1		6.4
Green Ratio (***g/C***)	0.69	0.72			0.48	0.48		0.20		0.20		0.20
Capacity (***c***), veh/h	449	1285			866	780		380		411		313
Volume-to-Capacity Ratio (***X***)	0.823	0.711			0.891	0.056		0.000		0.132		0.313
Available Capacity (c_a), veh/h	449	1285			866	780		380		411		313
Back of Queue (***Q***), veh/ln (50th percentile)	6.4	13.0			22.3	0.7		0.0		1.3		0.0
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	29.8	9.8			28.1	16.5		0.0		39.6		41.0
Incremental Delay (d_2), s/veh	11.0	3.4			13.3	0.1		0.0		0.1		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	40.9	13.2			41.5	16.6		0.0		39.7		41.2
Level of Service (LOS)	D	B			D	B				D		D
Approach Delay, s/veh / LOS	21.2	C		40.1	D		0.0			40.6	D	
Intersection Delay, s/veh / LOS	29.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	2.6	B	1.8	A	0.5	A		F

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Cheshire*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*PM Peak Hour*		

Project Description *2017 PM Build*

East/West Street: *William St* | North/South Street: *Cheshire*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*840*	*50*	*30*	*700*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*913*	*54*	*32*	*760*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*60*		*50*			
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*65*	*0*	*54*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*32*		*119*				
C (m) (veh/h)		*712*		*131*				
v/c		*0.04*		*0.91*				
95% queue length		*0.14*		*5.97*				
Control Delay (s/veh)		*10.3*		*119.8*				
LOS		*B*		*F*				
Approach Delay (s/veh)	--	--	*119.8*					
Approach LOS	--	--	*F*					

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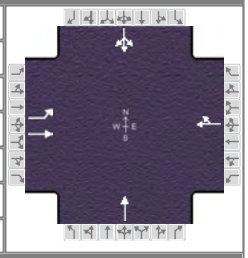
HCS 2010 Signalized Intersection Results Summary

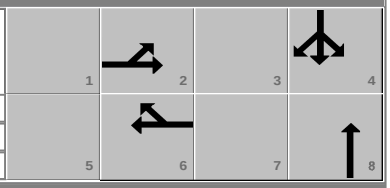
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 20, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2017	Analysis Period	1> 7:00
File Name	2017 PM Build - William Street & Channing.xus				
Project Description	2017 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	20	870			700	20		0		20	0	30

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	72.3	37.7	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		77.3		77.3		42.7		42.7
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		0.0		3.2
Queue Clearance Time (***g$_s$***), s		54.2		38.7				4.7
Green Extension Time (***g$_e$***), s		4.3		4.6		0.0		0.1
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.10		0.01				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7	4	14
Adjusted Flow Rate (***v***), veh/h	22	946			783			0			54	
Adjusted Saturation Flow Rate (***s***), veh/h/ln	695	1810			1801			1881			1536	
Queue Service Time (***g$_s$***), s	2.7	52.2			36.7			0.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s	39.4	52.2			36.7			0.0			2.7	
Green Ratio (***g/C***)	0.60	0.60			0.60			0.31			0.31	
Capacity (***c***), veh/h	266	1090			1085			591			525	
Volume-to-Capacity Ratio (***X***)	0.082	0.867			0.721			0.000			0.104	
Available Capacity (***c$_a$***), veh/h	266	1090			1085			591			525	
Back of Queue (***Q***), veh/ln (50th percentile)	0.5	22.9			15.3			0.0			1.1	
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh	30.6	19.9			16.8			0.0			29.2	
Incremental Delay (***d$_2$***), s/veh	0.6	9.3			4.2			0.0			0.0	
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh	31.2	29.2			20.9			0.0			29.2	
Level of Service (LOS)	C	C			C						C	
Approach Delay, s/veh / LOS	29.2	C		20.9	C		0.0			29.2	C	
Intersection Delay, s/veh / LOS	25.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	2.1	B	1.8	A	0.5	A	0.6	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Ann St*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2017*
Analysis Time Period	*PM Peak Hour*		

Project Description *2017 PM Build*

East/West Street: *William St* | North/South Street: *Ann St*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*880*	*10*	*10*	*710*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*956*	*10*	*10*	*771*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*10*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*10*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*10*			*10*			
C (m) (veh/h)		*713*			*311*			
v/c		*0.01*			*0.03*			
95% queue length		*0.04*			*0.10*			
Control Delay (s/veh)		*10.1*			*17.0*			
LOS		*B*			*C*			
Approach Delay (s/veh)	--	--	*17.0*					
Approach LOS	--	--	*C*					

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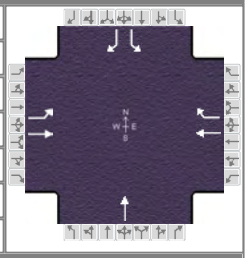
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

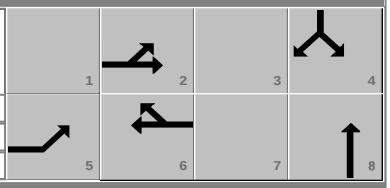
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM Build - William Street & US 42.xus				
Project Description	2037 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	160	900			800	40		0		100		180

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	43.5	14.5	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	12.0	60.5		48.5		19.5		19.5
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.2
Queue Clearance Time (g_s), s	5.4	36.8		41.8				12.6
Green Extension Time (g_e), s	0.0	4.8		1.0		0.0		0.1
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.12		1.00				1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	174	978			870	43		0		109		196
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1587	1667			1667	1502		1900		1573		1400
Queue Service Time (g_s), s	3.4	34.8			39.8	1.1		0.0		4.9		10.6
Cycle Queue Clearance Time (g_c), s	3.4	34.8			39.8	1.1		0.0		4.9		10.6
Green Ratio (***g/C***)	0.66	0.69			0.54	0.54		0.18		0.18		0.18
Capacity (***c***), veh/h	255	1156			906	816		344		375		254
Volume-to-Capacity Ratio (***X***)	0.682	0.846			0.960	0.053		0.000		0.290		0.771
Available Capacity (c_a), veh/h	255	1156			906	816		344		375		254
Back of Queue (***Q***), veh/ln (50th percentile)	2.1	11.2			18.2	0.3		0.0		1.8		4.3
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	18.0	9.1			17.4	8.6		0.0		28.8		31.2
Incremental Delay (d_2), s/veh	6.0	7.7			21.6	0.1		0.0		0.2		12.3
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	24.0	16.8			39.0	8.7		0.0		29.0		43.5
Level of Service (LOS)	C	B			D	A				C		D
Approach Delay, s/veh / LOS	17.9	B		37.5	D		0.0			38.3	D	
Intersection Delay, s/veh / LOS	28.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.2	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	2.4	B	2.0	A	0.5	A		F

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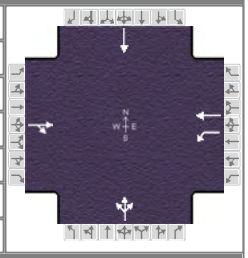
HCS 2010 Signalized Intersection Results Summary

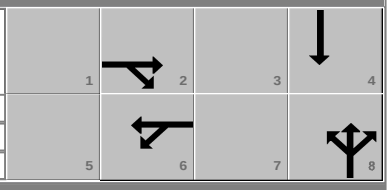
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Cheshire	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM Build - William Street & Cheshire.xus				
Project Description	2037 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h		920	80	70	760		80	0	90		0	

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	55.0	15.0	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		6.0		8.0		8.0
Phase Duration, s		60.0		60.0		20.0		20.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.2		3.2		3.2		0.0
Queue Clearance Time (g_s), s		50.9		57.0		10.9		
Green Extension Time (g_e), s		2.5		0.0		0.1		0.0
Phase Call Probability		1.00		1.00		1.00		
Max Out Probability		0.90		1.00		0.42		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3	8	18		4	
Adjusted Flow Rate (***v***), veh/h		1087		76	826			185			0	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1643		512	1667			1509			1845	
Queue Service Time (g_s), s		48.9		6.1	24.6			6.9			0.0	
Cycle Queue Clearance Time (g_c), s		48.9		55.0	24.6			8.9			0.0	
Green Ratio (***g/C***)		0.69		0.69	0.69			0.19			0.19	
Capacity (***c***), veh/h		1130		129	1146			349			346	
Volume-to-Capacity Ratio (***X***)		0.962		0.589	0.721			0.529			0.000	
Available Capacity (c_a), veh/h		1130		129	1146			349			346	
Back of Queue (***Q***), veh/ln (50th percentile)		18.3		2.1	7.5			3.2			0.0	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		11.5		38.4	7.7			29.9			0.0	
Incremental Delay (d_2), s/veh		19.1		18.2	3.9			0.8			0.0	
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	
Control Delay (***d***), s/veh		30.7		56.6	11.7			30.7			0.0	
Level of Service (LOS)		C		E	B			C				
Approach Delay, s/veh / LOS	30.7	C		15.5	B		30.7	C		0.0		
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.3	B	2.1	B
Bicycle LOS Score / LOS	2.3	B	2.0	A	0.8	A	0.5	A

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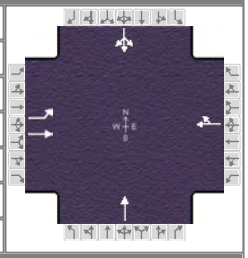
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

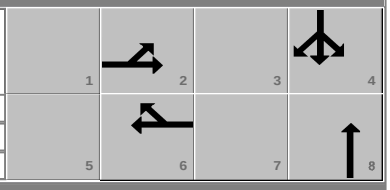
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 8, 2015	Area Type	Other
Jurisdiction		Time Period	AM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 AM Build - William Street & Channing.xus				
Project Description	2037 AM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	30	980			820	10		0		10	0	10

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	54.5	15.5	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		59.5		59.5		20.5		20.5
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		0.0		3.2
Queue Clearance Time (***g$_s$***), s		47.2		32.2				2.9
Green Extension Time (***g$_e$***), s		3.6		5.8		0.0		0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.61		0.11				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7	4	14
Adjusted Flow Rate (***v***), veh/h	33	1065			902			0			22	
Adjusted Saturation Flow Rate (***s***), veh/h/ln	550	1667			1663			1696			1383	
Queue Service Time (***g$_s$***), s	3.5	45.2			30.2			0.0			0.0	
Cycle Queue Clearance Time (***g$_c$***), s	33.7	45.2			30.2			0.0			0.9	
Green Ratio (***g/C***)	0.68	0.68			0.68			0.19			0.19	
Capacity (***c***), veh/h	257	1135			1133			329			335	
Volume-to-Capacity Ratio (***X***)	0.127	0.938			0.796			0.000			0.065	
Available Capacity (***c$_a$***), veh/h	257	1135			1133			329			335	
Back of Queue (***Q***), veh/ln (50th percentile)	0.5	16.6			9.7			0.0			0.3	
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh	20.6	11.3			8.9			0.0			26.4	
Incremental Delay (***d$_2$***), s/veh	1.0	15.5			5.8			0.0			0.0	
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh	21.7	26.7			14.7			0.0			26.4	
Level of Service (LOS)	C	C			B						C	
Approach Delay, s/veh / LOS	26.6	C		14.7	B		0.0			26.4	C	
Intersection Delay, s/veh / LOS	21.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	2.3	B	2.0	A	0.5	A	0.5	A

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From 2015 Feasibility Study by DLZ

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Ann St*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2037*
Analysis Time Period	*AM Peak Hour*		

Project Description *2037 AM Build*

East/West Street: *William St* | North/South Street: *Ann St*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*980*	*10*	*10*	*830*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*1065*	*10*	*10*	*902*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*10*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*10*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*10*			*10*			
C (m) (veh/h)		*649*			*269*			
v/c		*0.02*			*0.04*			
95% queue length		*0.05*			*0.12*			
Control Delay (s/veh)		*10.6*			*18.9*			
LOS		*B*			*C*			
Approach Delay (s/veh)	--	--	*18.9*					
Approach LOS	--	--	*C*					

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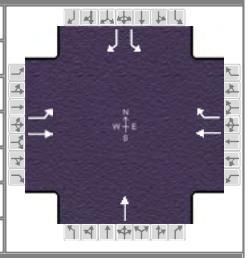
From 2015 Feasibility Study by DLZ

HCS 2010 Signalized Intersection Results Summary

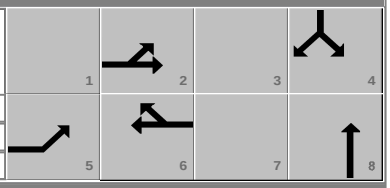
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & US 42	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM Build - William Street & US 42.xus				
Project Description	2037 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	480	1210			1050	100		0		110		110

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	28.1	67.4	9.5	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		7.3		8.0		5.0
Phase Duration, s	33.1	105.5		72.4		14.5		14.5
Change Period, ($Y+R_c$), s	5.0	5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s	3.1	3.0		3.0		0.0		3.2
Queue Clearance Time (g_s), s	30.1	55.7		69.4				11.2
Green Extension Time (g_e), s	0.0	10.7		0.0		0.0		0.0
Phase Call Probability	1.00	1.00		1.00				1.00
Max Out Probability	1.00	0.08		1.00				1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7		14
Adjusted Flow Rate (***v***), veh/h	522	1315			1141	109		0		120		120
Adjusted Saturation Flow Rate (***s***), veh/h/ln	1707	1792			1792	1615		1900		1757		1563
Queue Service Time (g_s), s	28.1	53.7			67.4	3.8		0.0		8.1		9.2
Cycle Queue Clearance Time (g_c), s	28.1	53.7			67.4	3.8		0.0		8.1		9.2
Green Ratio (***g/C***)	0.81	0.84			0.56	0.56		0.08		0.08		0.08
Capacity (***c***), veh/h	460	1501			1007	907		150		199		124
Volume-to-Capacity Ratio (***X***)	1.135	0.876			1.134	0.120		0.000		0.601		0.966
Available Capacity (c_a), veh/h	460	1501			1007	907		150		199		124
Back of Queue (***Q***), veh/ln (50th percentile)	24.1	14.6			46.8	1.4		0.0		3.7		6.0
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00	0.00		0.00		0.00		0.00
Uniform Delay (d_1), s/veh	41.2	6.0			26.3	12.4		0.0		54.6		55.1
Incremental Delay (d_2), s/veh	84.4	7.5			72.7	0.3		0.0		3.5		69.8
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Control Delay (***d***), s/veh	125.6	13.4			99.0	12.6		0.0		58.1		124.8
Level of Service (LOS)	F	B			F	B				E		F
Approach Delay, s/veh / LOS	45.3	D		91.5	F		0.0			91.5	F	
Intersection Delay, s/veh / LOS	66.0						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.3	A	2.3	B	2.3	B	2.3	B
Bicycle LOS Score / LOS	3.5	D	2.6	B	0.5	A		F

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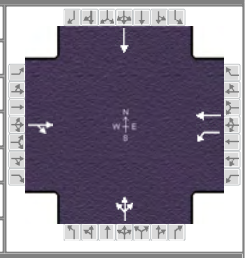
HCS 2010 Signalized Intersection Results Summary

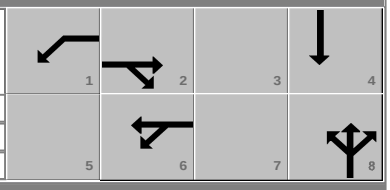
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Cheshire	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM Build - William Street & Cheshire.xus				
Project Description	2037 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h		1210	110	60	1020		130	0	110		0	

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	81.4	16.6	0.0	0.0	0.0
Yellow	3.5	3.5	3.5	0.0	0.0	0.0
Red	1.5	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		86.4	12.0	98.4		21.6		21.6
Change Period, ($Y+R_c$), s		5.0	5.0	5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.0	3.1	3.0		3.2		0.0
Queue Clearance Time (g_s), s		83.4	3.1	45.1		18.6		
Green Extension Time (g_e), s		0.0	0.0	12.1		0.0		0.0
Phase Call Probability		1.00	1.00	1.00		1.00		
Max Out Probability		1.00	0.32	0.08		1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3	8	18		4	
Adjusted Flow Rate (***v***), veh/h		1435		65	1109			261			0	
Adjusted Saturation Flow Rate (***s***), veh/h/ln		1766		1757	1792			1498			1881	
Queue Service Time (g_s), s		81.4		1.1	43.1			16.6			0.0	
Cycle Queue Clearance Time (g_c), s		81.4		1.1	43.1			16.6			0.0	
Green Ratio (***g/C***)		0.68		0.75	0.78			0.14			0.14	
Capacity (***c***), veh/h		1198		162	1395			254			260	
Volume-to-Capacity Ratio (***X***)		1.198		0.401	0.795			1.029			0.000	
Available Capacity (c_a), veh/h		1198		162	1395			254			260	
Back of Queue (***Q***), veh/ln (50th percentile)		60.8		1.3	14.3			12.2			0.0	
Queue Storage Ratio (***RQ***) (50th percentile)		0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		19.3		32.8	7.7			53.2			0.0	
Incremental Delay (d_2), s/veh		97.3		0.6	4.7			64.2			0.0	
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	
Control Delay (***d***), s/veh		116.6		33.4	12.5			117.5			0.0	
Level of Service (LOS)		F		C	B			F				
Approach Delay, s/veh / LOS	116.6	F		13.6	B		117.5	F		0.0		
Intersection Delay, s/veh / LOS	74.6						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.0	B	2.3	B	2.1	B
Bicycle LOS Score / LOS	2.9	C	2.4	B	0.9	A	0.5	A

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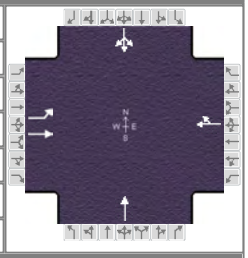
HCS 2010 Signalized Intersection Results Summary

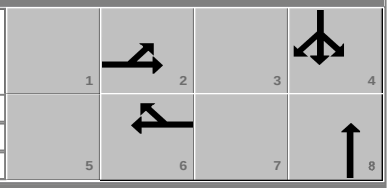
General Information				Intersection Information	
Agency	DLZ Ohio			Duration, h	0.25
Analyst	DKA	Analysis Date	Jan 9, 2015	Area Type	Other
Jurisdiction		Time Period	PM Peak Hour	PHF	0.92
Intersection	E. William St & Channing	Analysis Year	2037	Analysis Period	1> 7:00
File Name	2037 PM Build - William Street & Channing.xus				
Project Description	2037 PM Build				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (***v***), veh/h	20	1300			1050	20		0		20	0	30

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	91.5	18.5	0.0	0.0	0.0	0.0
Yellow	3.5	3.5	0.0	0.0	0.0	0.0
Red	1.5	1.5	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		8.0		8.0		8.0
Phase Duration, s		96.5		96.5		23.5		23.5
Change Period, (***Y+R$_c$***), s		5.0		5.0		5.0		5.0
Max Allow Headway (***MAH***), s		3.1		3.1		0.0		3.2
Queue Clearance Time (***g$_s$***), s		93.5		53.8				5.4
Green Extension Time (***g$_e$***), s		0.0		12.0		0.0		0.1
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		1.00		0.16				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16		8		7	4	14
Adjusted Flow Rate (***v***), veh/h	22	1413			1163			0			54	
Adjusted Saturation Flow Rate (***s***), veh/h/ln	486	1810			1803			1881			1550	
Queue Service Time (***g$_s$***), s	3.8	91.5			51.8			0.0			0.4	
Cycle Queue Clearance Time (***g$_c$***), s	55.5	91.5			51.8			0.0			3.4	
Green Ratio (***g/C***)	0.76	0.76			0.76			0.15			0.15	
Capacity (***c***), veh/h	221	1380			1375			290			281	
Volume-to-Capacity Ratio (***X***)	0.098	1.024			0.846			0.000			0.193	
Available Capacity (***c$_a$***), veh/h	221	1380			1375			290			281	
Back of Queue (***Q***), veh/ln (50th percentile)	0.5	39.6			18.2			0.0			1.4	
Queue Storage Ratio (***RQ***) (50th percentile)	0.00	0.00			0.00			0.00			0.00	
Uniform Delay (***d$_1$***), s/veh	28.1	14.3			9.5			0.0			44.3	
Incremental Delay (***d$_2$***), s/veh	0.9	30.5			6.6			0.0			0.1	
Initial Queue Delay (***d$_3$***), s/veh	0.0	0.0			0.0			0.0			0.0	
Control Delay (***d***), s/veh	29.0	44.8			16.1			0.0			44.5	
Level of Service (LOS)	C	F			B						D	
Approach Delay, s/veh / LOS	44.6	D		16.1	B		0.0			44.5	D	
Intersection Delay, s/veh / LOS	32.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	2.0	B	2.1	B	2.3	B
Bicycle LOS Score / LOS	2.9	C	2.4	B	0.5	A	0.6	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*David Addison*	Intersection	*William St & Ann St*
Agency/Co.	*DLZ Ohio*	Jurisdiction	
Date Performed	*1/20/2015*	Analysis Year	*2037*
Analysis Time Period	*PM Peak Hour*		

Project Description *2037 PM Build*

East/West Street: *William St* | North/South Street: *Ann St*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*1310*	*10*	*10*	*1070*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*1423*	*10*	*10*	*1163*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*10*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*10*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*10*			*10*			
C (m) (veh/h)		*474*			*165*			
v/c		*0.02*			*0.06*			
95% queue length		*0.06*			*0.19*			
Control Delay (s/veh)		*12.8*			*28.2*			
LOS		*B*			*D*			
Approach Delay (s/veh)	--	--	*28.2*					
Approach LOS	--	--	*D*					

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From 2015 Feasibility Study by DLZ

Appendix E

Cost Estimate

ms consultants, inc.
engineers, architects, planners

Estimate DEL-36-10.59

Estimated Cost:$3,058,248.78

Contingency: 30.00%

Estimated Total: $3,975,723.41

PID 95625 Alternative 1

Base Date: 10/15/14

Spec Year: 13

Unit System: E

Work Type: ASPHALT

Highway Type: 448 ON 304

Urban/Rural Type: URBAN CLASS

Season: SPRING

County: DELAWARE

Latitude of Midpoint: 830325

Longitude of Midpoint: 401754

District: 06

Federal/State Project Number: E 130 (784)

Prepared by CEL on 10/10/14
Checked by DES

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
Group 0001: ROADWAY					
0005	201E11000 CLEARING AND GRUBBING	1.000	LS	$10,000.00000	$10,000.00
0006	202E23000 PAVEMENT REMOVED	673.000	SY	$11.08541	$7,460.48
0007	202E30000 WALK REMOVED	21,636.000	SF	$1.00020	$21,640.33
0008	202E32000 CURB REMOVED	6,052.000	FT	$2.70163	$16,350.26
0009	202E58100 CATCH BASIN REMOVED	43.000	EACH	$287.35932	$12,356.45
0010	204E10000 SUBGRADE COMPACTION	6,121.000	SY	$1.51816	$9,292.66
0011	608E49000 CURB RAMP	40.000	EACH	$364.15009	$14,566.00
0012	608E10000 4" CONCRETE WALK	33,616.000	SF	$4.18606	$140,718.59

Total for Group 0001:$232,384.77

Group 0002: EROSION CONTROL					
0013	832E30000 EROSION CONTROL	1.000	EACH	$50,000.00000	$50,000.00
0014	659E00100 SOIL ANALYSIS TEST	2.000	EACH	$54.44428	$108.89
0015	659E10000 SEEDING AND MULCHING	6,000.000	SY	$0.92848	$5,570.88
0016	659E14000 REPAIR SEEDING AND MULCHING	300.000	SY	$0.54990	$164.97
0017	659E15000 INTER-SEEDING	300.000	SY	$0.27604	$82.81
0018	659E20000 COMMERCIAL FERTILIZER	1.000	TON	$500.00000	$500.00
0019	659E31000 LIME	1.500	ACRE	$150.00000	$225.00
0020	659E35000	100.000	MGAL	$1.14787	$114.79

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
	WATER				
0021	832E15000 STORM WATER POLLUTION PREVENTION PLAN	1.000	LS	$5,000.00000	$5,000.00
0056	*BMP CONTINGINCY*	1.000		$100,000.00000	$100,000.00

Total for Group 0002:$161,767.34

Group 0003: DRAINAGE

0022	611E01500 6" CONDUIT, TYPE F	860.000	FT	$15.81740	$13,602.96
0023	611E05900 15" CONDUIT, TYPE B	430.000	FT	$58.50300	$25,156.29
0024	611E98150 CATCH BASIN, NO. 3	43.000	EACH	$2,625.94813	$112,915.77
0025	605E14000 6" BASE PIPE UNDERDRAINS	6,000.000	FT	$7.29066	$43,743.96

Total for Group 0003:$195,418.98

Group 0004: PAVEMENT

0026	252E01500 FULL DEPTH PAVEMENT SAWING	6,052.000	FT	$1.48896	$9,011.19
0027	407E10000 TACK COAT	170.000	GAL	$2.35294	$400.00
0028	407E14000 TACK COAT FOR INTERMEDIATE COURSE	107.000	GAL	$2.38764	$255.48
0029	408E10000 PRIME COAT	128.000	GAL	$4.76462	$609.87
0030	302E46000 ASPHALT CONCRETE BASE, PG64-22	370.000	CY	$142.05344	$52,559.77
0031	304E20000 AGGREGATE BASE	497.000	CY	$46.38479	$23,053.24
0032	448E46040 ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, PG64-28	92.000	CY	$209.99040	$19,319.12
0033	448E47010 ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG64-28	129.000	CY	$200.00000	$25,800.00

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0034	448E48020 ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG64-22 (DRIVEWAYS)	18.000	CY	$289.32144	$5,207.79
0035	452E10010 6" NON-REINFORCED CONCRETE PAVEMENT, CLASS QC1	220.000	SY	$51.35242	$11,297.53
0036	452E12010 8" NON-REINFORCED CONCRETE PAVEMENT, CLASS QC1	250.000	SY	$57.70277	$14,425.69
0037	609E26000 CURB, TYPE 6	5,675.000	FT	$13.08741	$74,271.05

Total for Group 0004:$236,210.73

Group 0005: TRAFFIC CONTROL

0038	644E00300 CENTER LINE	1.140	MILE	$5,210.00000	$5,939.40
0039	644E00400 CHANNELIZING LINE, 8"	300.000	FT	$1.55645	$466.93
0040	644E00500 STOP LINE	276.000	FT	$5.48783	$1,514.64
0041	644E00600 CROSSWALK LINE	1,224.000	FT	$2.53529	$3,103.19
0042	644E00700 TRANSVERSE/DIAGONAL LINE	150.000	FT	$5.14439	$771.66
0043	644E01100 SCHOOL SYMBOL MARKING, 72"	2.000	EACH	$487.62584	$975.25
0044	644E01300 LANE ARROW	10.000	EACH	$90.33262	$903.33
0045	632E90300 SIGNALIZATION, MISC.: William Street and Lake Street	1.000	LS	$140,000.00000	$140,000.00
0046	632E90300 SIGNALIZATION, MISC.: william Street and Channing Street	1.000	LS	$110,000.00000	$110,000.00

Total for Group 0005:$263,674.40

Group 0006: LIGHTING

0047	625E98200 LIGHTING, MISC.:	1.000	LS	$522,000.00000	$522,000.00

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension

Total for Group 0006:$522,000.00

Group 0007: LANDSCAPING

0048	661E99940 PLANTING, MISC.:	1.000	LS	$200,000.00000	$200,000.00

Total for Group 0007:$200,000.00

Group 0008: STRUCTURE

0055	530E00400 SPECIAL - STRUCTURE, MISC.: *ALTERNATIVE I - PREFABRICATED STEEL TRUSS*	1.000	EACH	$626,696.00000	$626,696.00

Total for Group 0008:$626,696.00

Group 0009: INCIDENTALS

0049	614E11000 MAINTAINING TRAFFIC	1.000	LS	$50,000.00000	$50,000.00
0050	619E16010 FIELD OFFICE, TYPE B	9.000	MNTH	$1,618.96615	$14,570.70
0051	622E41000 PORTABLE BARRIER, 32"	6,100.000	FT	$10.10185	$61,621.29
0052	623E10000 CONSTRUCTION LAYOUT STAKES	1.000	LS	$18,750.00000	$18,750.00
0053	624E10000 MOBILIZATION	1.000	LS	$55,000.00000	$55,000.00
0054		1.000		$420,154.57000	$420,154.57

Inflation at 12.3%

Total for Group 0009:$620,096.56

FY 2015-2019 Business Plan Inflation Calculator:

Not sure if you have the latest calculator? Click here.

Last Modified: 7/25/2014

Today's Date:
February 13, 2015

Please Enter Values in the Yellow Areas Only:

Estimation Start Date:
Less than or Equal to Today's Date
(mm/dd/yyyy)

2/13/2015
Start Date:

Enter Construction Mid-Point Date:
(cannot exceed 06/01/2025)
(mm/dd/yyyy)

5/10/2018
Construction Mid-Point Date:

Present-Day Estimated Cost:

$3,429,522.47
Estimated Dollar Amount:

Estimate Start Date to Construction Mid-Point Date: **39** **Months**

Inflation - Start to Mid-Point of Construction:

(compounded growth rate)

Inflated Dollar Amount:

Business Plan **12.3%** **$3,849,677.04**

Estimator's Name: CHALRIE LEWIS

County - Route - Section: U.S. 36

PID: 95625

Estimator's Notes:

From 2015 Feasbility Study by DLZ

Appendix F

ECAT Calculations

ms consultants, inc.
engineers, architects, planners

Project Information

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Existing**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
US36; 10.61-10.79	Urban & Suburban Arterial Segment		SDELUS00036**C	10.61	10.79	0.18		William Street - Lake to Cheshire
US36; 10.79-10.84	Urban & Suburban Arterial Segment		SDELUS00036**C	10.79	10.84	0.05		William Street - Cheshire to Channing
US36; 10.84-11.09	Urban & Suburban Arterial Segment		SDELUS00036**C	10.84	11.09	0.25		William Street - Ann to Foley
US36; 10.61	Urban & Suburban Arterial Intersection	Signalized	SDELUS00036**C	10.61		0.05	SDELUS0004	Lake Street
US36; 10.79	Urban & Suburban Arterial Intersection	Unsignalized	SDELUS00036**C	10.79		0.05	CDELCR0008	Cheshire Street
US36; 10.84	Urban & Suburban Arterial Intersection	Signalized	SDELUS00036**C	10.84		0.05	MDELMR0003	Channing Street-Ann Street

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2017	13,135	veh / day
Future ADT (FADT)	2037	18,000	veh / day
Annual Linear Growth Rate		0.02	

Project Elements Description Table

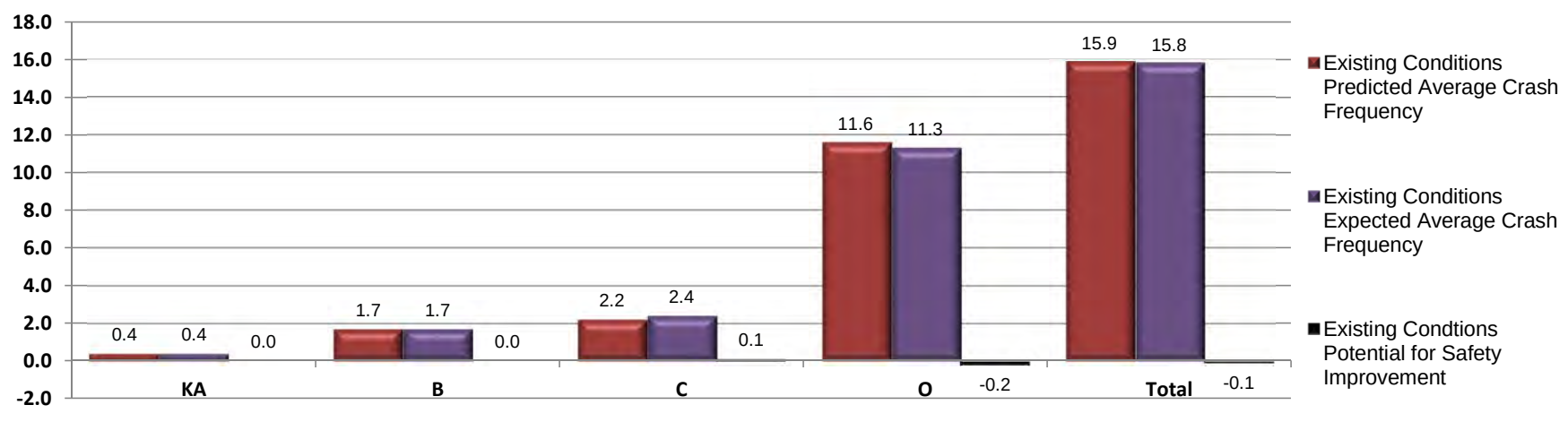
Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.4339	1.6971	2.2279	11.5681	15.9270
$N_{expected}$ - Existing Conditions	0.4321	1.6524	2.3740	11.3403	15.7988
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0018	-0.0447	0.1461	-0.2278	-0.1282

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	0.0401	0.0943	0.0859	0.442	0.6623
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0102	0.0245	0.0225	0.1183	0.1755
US36; 10.84-11.09	William Street - Ann to Foley	0.0555	0.1306	0.119	0.6131	0.9182
US36; 10.61	Lake Street	0.1269	0.5646	0.776	4.2819	5.7494
US36; 10.79	Cheshire Street	0.0397	0.1709	0.2424	1.232	1.685
US36; 10.84	Channing Street-Ann Street	0.1615	0.7122	0.9821	4.8808	6.7366

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	0.0399	0.1011	0.1046	0.5041	0.7497
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0104	0.0247	0.0225	0.1146	0.1722
US36; 10.84-11.09	William Street - Ann to Foley	0.0552	0.128	0.1437	1.3327	1.6596
US36; 10.61	Lake Street	0.1276	0.5582	0.8285	4.5629	6.0772
US36; 10.79	Cheshire Street	0.0395	0.167	0.2888	1.5055	2.0008
US36; 10.84	Channing Street-Ann Street	0.1595	0.6734	0.9859	3.3205	5.1393

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	-0.0002	0.0068	0.0187	0.0621	0.0874
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0002	0.0002	0	-0.0037	-0.0033
US36; 10.84-11.09	William Street - Ann to Foley	-0.0003	-0.0026	0.0247	0.7196	0.7414
US36; 10.61	Lake Street	0.0007	-0.0064	0.0525	0.281	0.3278
US36; 10.79	Cheshire Street	-0.0002	-0.0039	0.0464	0.2735	0.3158
US36; 10.84	Channing Street-Ann Street	-0.002	-0.0388	0.0038	-1.5603	-1.5973

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Expected Crash Frequency
Unknown	0.0828	0.0819	-0.0009	
Head On	0.1038	0.1055	**0.0017**	
Rear End	7.5522	7.7455	**0.1933**	
Backing	0.3705	0.3683	-0.0022	
Sideswipe - Meeting	0.3102	0.3053	-0.0049	
Sideswipe - Passing	1.7419	1.6369	-0.1050	
Angle	2.5529	2.2868	-0.2661	
Parked Vehicle	0.2922	0.2951	**0.0029**	
Pedestrian	0.1290	0.1276	-0.0014	
Animal	0.6624	0.5393	-0.1231	
Train	0.0029	0.0029	0.0000	
Pedalcycles	0.4250	0.3956	-0.0294	
Other Non-Vehicle	0.0007	0.0008	**0.0001**	
Fixed Object	0.7479	0.8072	**0.0593**	
Other Object	0.0296	0.0297	**0.0001**	
Overturning	0.0359	0.0355	-0.0004	
Other Non-Collision	0.0910	0.0902	-0.0008	
Left Turn	1.4592	1.4454	-0.0138	
Right Turn	0.0000	0.0000	0.0000	

Existing Conditions: General Information and Data for Urban And Suburban Roadway Segment

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.61 to 10.79
Date Performed	04/27/18	Common Name	William Street - Lake to Cheshire
Segment for Analysis	US36; 10.61-10.79	Analysis Year	2017

Input Data	Existing Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**2U**	--
Length of segment, L (mi)	0.18	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,600 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Not Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	3	--
Minor commercial driveways (number)	4	--
Major industrial / institutional driveways (number)	0	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	0	--
Minor residential driveways (number)	0	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.99	1.00	1.00	1.00	1.99

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-15.22	1.68	0.84	0.360	1.000	0.360	1.99	0.62	**0.444**
Fatal and Injury (FI)	-16.22	1.66	0.65	0.110	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.292	0.105	1.99	0.69	**0.145**
Property Damage Only (PDO)	-15.62	1.69	0.87	0.266	$(5)_{TOTAL}-(5)_{FI}$ 0.708	0.255	1.99	0.60	**0.304**

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.47	0.56	0.81	0.153	1.000	0.153	1.99	1.34	**0.406**
Fatal and Injury (FI)	-3.96	0.23	0.50	0.030	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.209	0.032	1.99	0.79	**0.050**
Property Damage Only (PDO)	-6.51	0.64	0.87	0.115	$(5)_{TOTAL}-(5)_{FI}$ 0.791	0.121	1.99	1.52	**0.365**

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	3	0.158	1.000	0.411	--
Minor commercial	4	0.050	1.000	0.173	
Major industrial/institutional	0	0.172	1.000	0.000	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	0	0.083	1.000	0.000	
Minor residential	0	0.016	1.000	0.000	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.584	0.81

Existing Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.584	1.000	0.584	1.99	0.20	0.232
Fatal and injury (FI)	--	0.037	0.021	1.99	0.22	0.009
Property damage only (PDO)	--	0.074	0.043	1.99	0.19	0.016

Existing Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.444	0.406	0.232	1.083	0.0022	6.07	0.014
Fatal and injury (FI)	--	--	--	--	--	6.07	0.014

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.444	0.406	0.232	1.083	0.0025	2.56	0.007
Fatal and injury (FI)	--	--	--	--	--	2.56	0.007

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: General Information and Data for Urban And Suburban Roadway Segment

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.79 to 10.84
Date Performed	04/27/18	Common Name	William Street - Cheshire to Channing
Segment for Analysis	US36; 10.79-10.84	Analysis Year	2017

Input Data	Existing Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**2U**	--
Length of segment, L (mi)	0.05	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,600 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Not Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	0	--
Minor commercial driveways (number)	0	--
Major industrial / institutional driveways (number)	0	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	0	--
Minor residential driveways (number)	0	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.99	1.00	1.00	1.00	1.99

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-15.22	1.68	0.84	0.100	1.000	0.100	1.99	0.62	**0.123**
Fatal and Injury (FI)	-16.22	1.66	0.65	0.030	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.292	0.029	1.99	0.69	**0.040**
Property Damage Only (PDO)	-15.62	1.69	0.87	0.074	$(5)_{TOTAL}-(5)_{FI}$ 0.708	0.071	1.99	0.60	**0.085**

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.47	0.56	0.81	0.042	1.000	0.042	1.99	1.34	**0.113**
Fatal and Injury (FI)	-3.96	0.23	0.50	0.008	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.209	0.009	1.99	0.79	**0.014**
Property Damage Only (PDO)	-6.51	0.64	0.87	0.032	$(5)_{TOTAL}-(5)_{FI}$ 0.791	0.034	1.99	1.52	**0.101**

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.158	1.000	0.000	--
Minor commercial	0	0.050	1.000	0.000	
Major industrial/institutional	0	0.172	1.000	0.000	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	0	0.083	1.000	0.000	
Minor residential	0	0.016	1.000	0.000	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.000	0.81

Existing Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.99	0.20	0.000
Fatal and injury (FI)	--	0.037	0.000	1.99	0.22	0.000
Property damage only (PDO)	--	0.074	0.000	1.99	0.19	0.000

Existing Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.123	0.113	0.000	0.236	0.0022	6.07	0.003
Fatal and injury (FI)	--	--	--	--	--	6.07	0.003

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.123	0.113	0.000	0.236	0.0025	2.56	0.002
Fatal and injury (FI)	--	--	--	--	--	2.56	0.002

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: General Information and Data for Urban And Suburban Roadway Segment

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.84 to 11.09
Date Performed	04/27/18	Common Name	William Street - Ann to Foley
Segment for Analysis	US36; 10.84-11.09	Analysis Year	2017

Input Data	Existing Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**2U**	--
Length of segment, L (mi)	0.25	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,600 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Not Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	1	--
Minor commercial driveways (number)	0	--
Major industrial / institutional driveways (number)	1	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	3	--
Minor residential driveways (number)	20	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.99	1.00	1.00	1.00	1.99

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-15.22	1.68	0.84	0.500	1.000	0.500	1.99	0.62	**0.617**
Fatal and Injury (FI)	-16.22	1.66	0.65	0.152	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.292	0.146	1.99	0.69	**0.201**
Property Damage Only (PDO)	-15.62	1.69	0.87	0.369	$(5)_{TOTAL}-(5)_{FI}$ 0.708	0.354	1.99	0.60	**0.423**

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total			0.81	0.212	1.000				
Fatal and Injury (FI)	-3.96	0.23	0.50	0.042	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.209	0.044	1.99	0.79	**0.069**
Property Damage Only (PDO)	-6.51	0.64	0.87	0.160	$(5)_{TOTAL}-(5)_{FI}$ 0.791	0.168	1.99	1.52	**0.507**

AADT (veh/day) is within range $AADT_{MAX}$ = 32,600 (veh/day)

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	1	0.158	1.000	0.137	--
Minor commercial	0	0.050	1.000	0.000	
Major industrial/institutional	1	0.172	1.000	0.149	
Minor industrial/institutional	0	0.023	1.000	0.000	
Major residential	3	0.083	1.000	0.216	
Minor residential	20	0.016	1.000	0.277	
Other	0	0.025	1.000	0.000	
Total	--	--	--	0.779	0.81

Existing Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment

(1)	(2)	(3)		(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.779	1.000		1.99	0.20	0.310
Fatal and injury (FI)	--	0.037		1.99	0.22	0.012
Property damage only (PDO)	--	0.074		1.99	0.19	0.022

Existing Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)			(8)

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.617	0.565	0.310	1.491	0.0022	6.07	0.020
Fatal and injury (FI)	--	--	--	--	--	6.07	0.020

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.617	0.565	0.310	1.491	0.0025	2.56	0.010
Fatal and injury (FI)	--	--	--	--	--	2.56	0.010

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoint	10.61
Date Performed	04/27/18	Common Name	Lake Street
Intersection	US36; 10.61	Analysis Year	2017
Signalized/Unsignalized	Signalized		

Input Data		Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)		3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ = 58,100 (veh/day)	17,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ = 16,400 (veh/day)	6,000	--
Intersection lighting (present/not present)		Not Present	Not Present
Calibration factor, C_i		Varies, See Below	1.00
Data for unsignalized intersections only:			
Number of major-road approaches with left-turn lanes			0
Number of major-road approaches with right-turn lanes			0
Data for signalized intersections only:			
Number of approaches with left-turn lanes		1	0
Number of approaches with right-turn lanes		0	0
Number of approaches with left-turn signal phasing		1	--
Type of left-turn signal phasing for Leg #1		Protected/Permissive	Permissive
Type of left-turn signal phasing for Leg #2		Permissive	--
Type of left-turn signal phasing for Leg #3		Not Applicable	--
Not Applicable		Not Applicable	--
Number of approaches with right-turn-on-red prohibited		1	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)		20	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		4	--
Number of bus stops within 300 m (1,000 ft) of the intersection		1 or 2	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		1 to 8	0
Locality:		State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.9300	0.9900	1.0000	0.9800	1.0000	1.0000	0.9023

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-12.13	1.11	0.26	0.33	2.571	1.000	2.571	0.90	2.25	5.220
Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.848	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.345	0.888	0.90	1.46	1.169
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.607	$(5)_{TOTAL}-(5)_{FI}$ 0.655	1.683	0.90	2.68	4.071

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.235	1.000	0.235	0.90	1.49	0.316
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.068	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.298	0.070	0.90	1.66	0.105
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.161	$(5)_{TOTAL}-(5)_{FI}$ 0.702	0.165	0.90	1.42	0.211

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.00	1.12	3.11

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.009	3.11	0.69	0.018
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.018

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.220	0.316	5.535	0.0079	4.00	0.175
Fatal and injury (FI)	--	--	--	--	4.00	0.175

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Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoint	10.79
Date Performed	04/27/18	Common Name	Cheshire Street
Intersection	US36; 10.79	Analysis Year	2017
Signalized/Unsignalized	Unsignalized		

Input Data				Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				3ST	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	45,700	(veh/day)	13,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	9,300	(veh/day)	5,000	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes				0	0
Number of major-road approaches with right-turn lanes				0	0
Data for signalized intersections only:					
Number of approaches with left-turn lanes					0
Number of approaches with right-turn lanes					0
Number of approaches with left-turn signal phasing					--
Type of left-turn signal phasing for Leg #1					Permissive
Type of left-turn signal phasing for Leg #2					--
Type of left-turn signal phasing for Leg #3					--
Not Applicable					--
Number of approaches with right-turn-on-red prohibited					0
Intersection red light cameras (present/not present)					Not Present
Sum of all pedestrian crossing volumes (PedVol)					--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})					--
Number of bus stops within 300 m (1,000 ft) of the intersection					0
Schools within 300 m (1,000 ft) of the intersection (present/not present)					Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection					0
Locality:				State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.0000	1.0000	1.0000	1.0000	0.9999	1.0000	0.9999

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-13.36	1.11	0.41	0.80	1.909	1.000	1.909	1.00	0.76	1.451
Fatal and Injury (FI)	-14.01	1.16	0.30	0.69	0.627	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.311	0.593	1.00	0.62	0.368
Property Damage Only (PDO)	-15.38	1.20	0.51	0.77	1.392	$(5)_{TOTAL}-(5)_{FI}$ 0.689	1.316	1.00	0.82	1.079

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-6.81	0.16	0.51	1.14	0.387	1.000	0.387	1.00	0.54	0.209
Fatal and Injury (FI)	--	--	--	--	0.120	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.307	0.119	1.00	0.47	0.056
Property Damage Only (PDO)	-8.36	0.25	0.55	1.29	0.271	$(5)_{TOTAL}-(5)_{FI}$ 0.693	0.268	1.00	0.57	0.153

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	1.451	0.209	1.660	0.010	1.11	0.019
Fatal and injury (FI)	--	--	--	--	1.11	0.019

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
--	--	--	--

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	--	--	--	--	--	--	--	--	--	--
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	--	--

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Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	1.451	0.209	1.660	0.0057	1.16	0.011
Fatal and injury (FI)	--	--	--	--	1.16	0.011

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Existing Conditions: General Information and Data for Urban And Suburban Arterial Intersection

General Information		Location Information	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoint	10.84
Date Performed	04/27/18	Common Name	Channing Street-Ann Street
Intersection	US36; 10.84	Analysis Year	2017
Signalized/Unsignalized	Signalized		

Input Data				Existing Conditions	HSM Base Conditions
Intersection type (3ST, 3SG, 4ST, 4SG)				4SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	67,700	(veh/day)	13,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	33,400	(veh/day)	3,000	--
Intersection lighting (present/not present)				Not Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				0	0
Number of approaches with right-turn lanes				0	0
Number of approaches with left-turn signal phasing				0	--
Type of left-turn signal phasing for Leg #1				Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Permissive	--
Type of left-turn signal phasing for Leg #3				Permissive	--
Type of left-turn signal phasing for Leg #4				Permissive	--
Number of approaches with right-turn-on-red prohibited				4	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				240	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				2	--
Number of bus stops within 300 m (1,000 ft) of the intersection				1 or 2	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Existing Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection

(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
1.0000	1.0000	1.0000	0.9224	1.0000	1.0000	0.9224

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Existing Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-10.99	1.07	0.23	0.39	2.684	1.000	2.684	0.92	2.48	6.139
Fatal and Injury (FI)	-13.14	1.18	0.22	0.33	0.818	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$	0.853	0.92	1.91	1.502
						0.318				
Property Damage Only (PDO)	-11.02	1.02	0.24	0.44	1.757	$(5)_{TOTAL}-(5)_{FI}$	1.831	0.92	2.75	4.645
						0.682				

Existing Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-10.21	0.68	0.27	0.36	0.201	1.000	0.201	0.92	1.70	0.314
Fatal and Injury (FI)	-9.25	0.43	0.29	0.09	0.058	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$	0.058	0.92	1.48	0.079
						0.288				
Property Damage Only (PDO)	-11.34	0.78	0.25	0.44	0.142	$(5)_{TOTAL}-(5)_{FI}$	0.143	0.92	1.79	0.236
						0.712				

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Existing Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.35	1.00	3.75

Existing Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-9.53	0.40	0.26	0.45	0.04	0.24	0.030	3.75	0.47	0.054
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.47	0.054

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Existing Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	6.139	0.314	6.454	0.0076	4.51	0.221
Fatal and injury (FI)	--	--	--	--	4.51	0.221

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Project Information

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition?	**Yes**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

If Yes, are you analyzing the existing or proposed conditions?	**Proposed**

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
US36; 10.61-10.79	Urban & Suburban Arterial Segment		SDELUS00036**C	10.61	10.79	0.18		William Street - Lake to Cheshire
US36; 10.79-10.84	Urban & Suburban Arterial Segment		SDELUS00036**C	10.79	10.84	0.05		William Street - Cheshire to Channing
US36; 10.84-11.09	Urban & Suburban Arterial Segment		SDELUS00036**C	10.84	11.09	0.25		William Street - Ann to Foley
US36; 10.61	Urban & Suburban Arterial Intersection	Signalized	SDELUS00036**C	10.61		0.05	SDELUS0004	Lake Street
US36; 10.79	Urban & Suburban Arterial Intersection	Signalized	SDELUS00036**C	10.79		0.05	CDELCR0008	Cheshire Street
US36; 10.84	Urban & Suburban Arterial Intersection	Signalized	SDELUS00036**C	10.84		0.05	MDELMR0003	Channing Street-Ann Street

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis

	Year	AADT	
Present ADT (PADT)	2017	13,135	veh / day
Future ADT (FADT)	2037	18,000	veh / day
Annual Linear Growth Rate		0.02	

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint *(Leave blank for Intersection)*	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

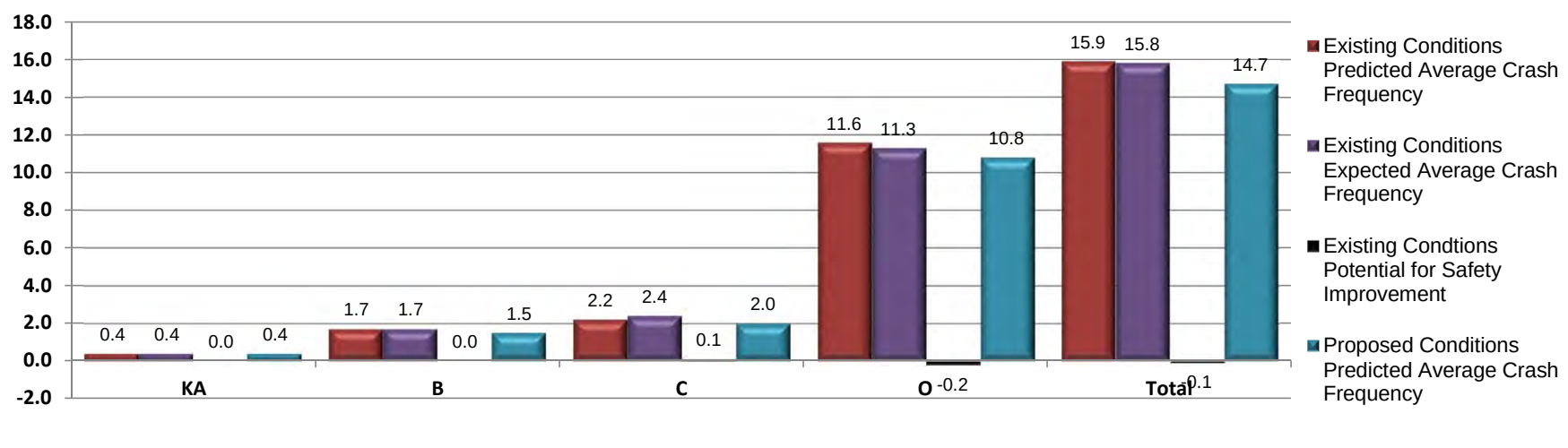
CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1						
CMF 2						
CMF 3						
CMF 4						
CMF 5						
CMF 6						
CMF 7						
CMF 8						
CMF 9						
CMF 10						

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.4339	1.6971	2.2279	11.5681	15.9270
$N_{expected}$ - Existing Conditions	0.4321	1.6524	2.3740	11.3403	15.7988
$N_{potential\ for\ improvement}$ - Existing Conditions	-0.0018	-0.0447	**0.1461**	-0.2278	-0.1282
$N_{predicted}$ - Proposed Conditions	0.3688	1.5311	2.0496	10.7547	14.7042

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	0.0401	0.0943	0.0859	0.442	0.6623
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0102	0.0245	0.0225	0.1183	0.1755
US36; 10.84-11.09	William Street - Ann to Foley	0.0555	0.1306	0.119	0.6131	0.9182
US36; 10.61	Lake Street	0.1269	0.5646	0.776	4.2819	5.7494
US36; 10.79	Cheshire Street	0.0397	0.1709	0.2424	1.232	1.685
US36; 10.84	Channing Street-Ann Street	0.1615	0.7122	0.9821	4.8808	6.7366

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	0.0399	0.1011	0.1046	0.5041	0.7497
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0104	0.0247	0.0225	0.1146	0.1722
US36; 10.84-11.09	William Street - Ann to Foley	0.0552	0.128	0.1437	1.3327	1.6596
US36; 10.61	Lake Street	0.1276	0.5582	0.8285	4.5629	6.0772
US36; 10.79	Cheshire Street	0.0395	0.167	0.2888	1.5055	2.0008
US36; 10.84	Channing Street-Ann Street	0.1595	0.6734	0.9859	3.3205	5.1393

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	-0.0002	0.0068	0.0187	0.0621	0.0874
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0002	0.0002	0	-0.0037	-0.0033
US36; 10.84-11.09	William Street - Ann to Foley	-0.0003	-0.0026	0.0247	0.7196	0.7414
US36; 10.61	Lake Street	0.0007	-0.0064	0.0525	0.281	0.3278
US36; 10.79	Cheshire Street	-0.0002	-0.0039	0.0464	0.2735	0.3158
US36; 10.84	Channing Street-Ann Street	-0.002	-0.0388	0.0038	-1.5603	-1.5973

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
US36; 10.61-10.79	William Street - Lake to Cheshire	0.0181	0.0539	0.0605	0.3384	0.4709
US36; 10.79-10.84	William Street - Cheshire to Channing	0.0045	0.0133	0.015	0.0885	0.1213
US36; 10.84-11.09	William Street - Ann to Foley	0.025	0.0744	0.0835	0.4685	0.6514
US36; 10.61	Lake Street	0.1269	0.5646	0.776	4.2815	5.749
US36; 10.79	Cheshire Street	0.1048	0.4459	0.6016	3.0929	4.2452
US36; 10.84	Channing Street-Ann Street	0.0895	0.379	0.513	2.4849	3.4664

Summary by Crash Type

Crash Type	Existing			Proposed
	Predicted Crash Frequency	Expected Crash Frequency	PSI	Predicted Crash Frequency
Unknown	0.0828	0.0819	-0.0009	0.0165
Head On	0.1038	0.1055	0.0017	0.0920
Rear End	7.5522	7.7455	0.1933	7.0365
Backing	0.3705	0.3683	-0.0022	0.3488
Sideswipe - Meeting	0.3102	0.3053	-0.0049	0.2380
Sideswipe - Passing	1.7419	1.6369	-0.1050	1.6370
Angle	2.5529	2.2868	-0.2661	2.4216

Project Safety Performance Report

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Parked Vehicle	0.2922	0.2951	**0.0029**	0.2757
Pedestrian	0.1290	0.1276	-0.0014	0.1245
Animal	0.6624	0.5393	-0.1231	0.4073
Train	0.0029	0.0029	0.0000	0.0006
Pedalcycles	0.4250	0.3956	-0.0294	0.4181
Other Non-Vehicle	0.0007	0.0008	**0.0001**	0.0000
Fixed Object	0.7479	0.8072	**0.0593**	0.5854
Other Object	0.0296	0.0297	**0.0001**	0.0281
Overturning	0.0359	0.0355	-0.0004	0.0343
Other Non-Collision	0.0910	0.0902	-0.0008	0.0756
Left Turn	1.4592	1.4454	-0.0138	1.3715
Right Turn	0.0000	0.0000	0.0000	0.0000

Project Cost Estimate

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Engineering Design %	
Contingency %	

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
Construct TWLTL & signal at Cheshire Street	$4,150,000.00	$410,000.00	$1,085,000.00		**$5,645,000.00**		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
					$0.00		
Totals	**$4,150,000.00**	**$410,000.00**	**$1,085,000.00**	**$0.00**	**$5,645,000.00**	**$0.00**	**$0.00**

Inflation %	

Final Costruction Cost:	**$5,645,000.00**

*Final construction cost should match the Project Cost Estimate

Safety Benefit - Cost Analysis

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Construct TWLTL & signal at Cheshire Street	20	$5,645,000.00			$5,645,000.00	$5,645,000.00	-1.223	$727,421
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0

Safety Benefit - Cost Analysis

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Totals	**$5,645,000.00**	**$0.00**	**$0.00**	**$5,645,000.00**	**$5,645,000.00**	**-1.223**	**$727,421**

Safety Benefit - Cost Analysis

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Benefit - Cost Calculator

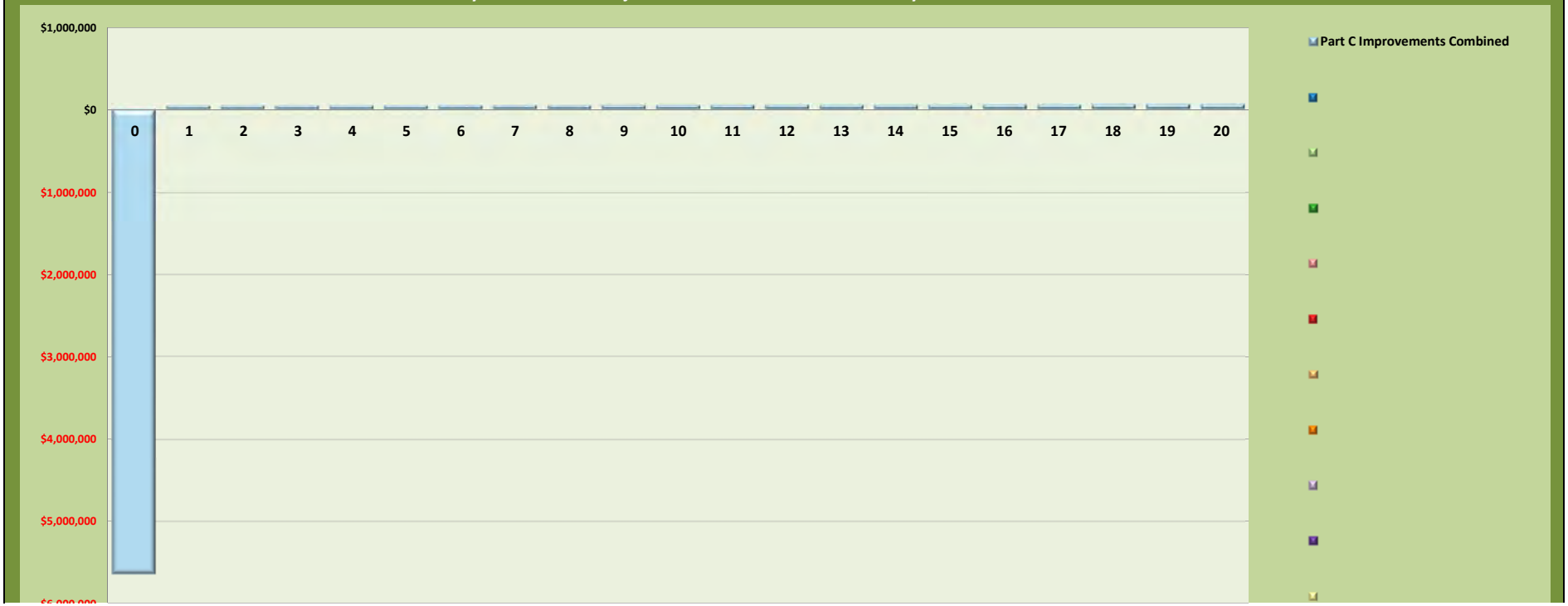
Net Present Value of Project	$5,645,000.00
Net Present Value of Safety Benefits	$727,420.51
Net Benefit	($4,917,579.49)
Benefit / Cost Ratio	0.13

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.065
Number of Injury Crashes	-0.409
Number of Total Crashes	-1.223

Comments:

Safety Benefits and Project Costs Combined Cash Flows By Countermeasure Per Year



Safety Benefit - Cost Analysis

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

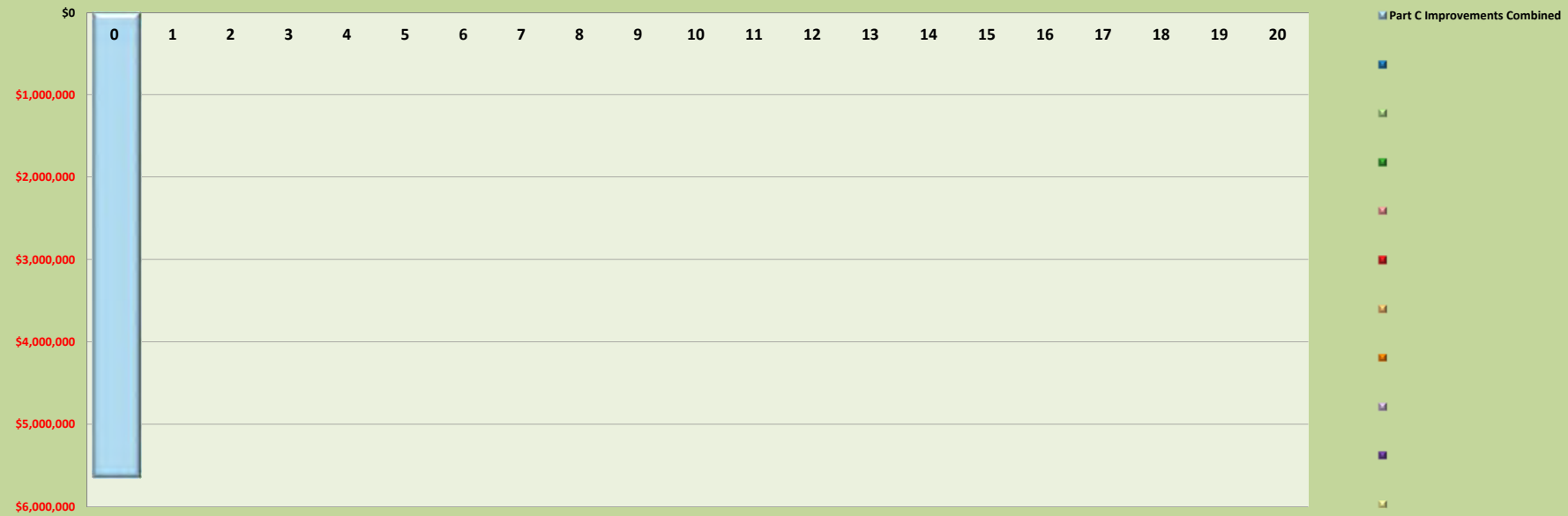
$8,000,000

Safety Benefit - Cost Analysis

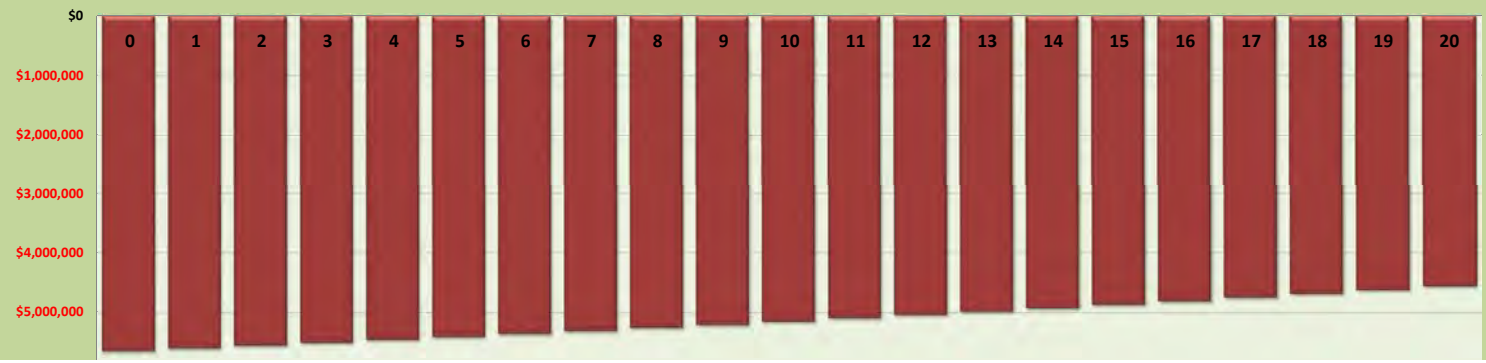
General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

Project Costs Only Cash Flows By Countermeasure Per Year



Return on Investment (Safety Benefits and Project Investments)



First year to observe a positive return on investiment: Unknown (Unknown years)

Percentage of Service Life to observe a continuous Positive Return on Investment: Unknown%

Safety Benefit - Cost Analysis

General Information

Project Name	William Street Upgrades	Contact Email	
Project Description	TWLTL & Signal at Cheshire	Contact Phone	
Reference Number		Date Performed	4/27/2018
Analyst	JRH	Analysis Year	2017
Agency/Company	ms consultants		

$6,000,000

Proposed Conditions: General Information and Data for Urban And Suburban Roadway Segment			
General Information		**Location Information**	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.61 to 10.79
Date Performed	04/27/18	Common Name	William Street - Lake to Cheshire
Segment for Analysis	US36; 10.61-10.79	Analysis Year	2017

Input Data	Proposed Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**3T**	--
Length of segment, L (mi)	0.18	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,900 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	3	--
Minor commercial driveways (number)	4	--
Major industrial / institutional driveways (number)	0	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	0	--
Minor residential driveways (number)	0	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.52	1.00	0.93	1.00	1.41

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Proposed Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-12.40	1.41	0.66	0.468	1.000	0.468	1.41	0.52	**0.345**
Fatal and Injury (FI)	-16.45	1.69	0.59	0.116	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.252	0.118	1.41	0.54	**0.090**
Property Damage Only (PDO)	-11.95	1.33	0.59	0.344	$(5)_{TOTAL}-(5)_{FI}$ 0.748	0.351	1.41	0.52	**0.258**

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.74	0.54	1.37	0.096	1.000	0.096	1.41	1.72	**0.235**
Fatal and Injury (FI)	-6.37	0.47	1.06	0.026	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.282	0.027	1.41	0.67	**0.026**
Property Damage Only (PDO)	-6.29	0.56	1.93	0.067	$(5)_{TOTAL}-(5)_{FI}$ 0.718	0.069	1.41	2.15	**0.210**

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15{,}000)^t$	from Table 12-7
Major commercial	3	0.102	1.000	0.265	--
Minor commercial	4	0.032	1.000	0.111	
Major industrial/institutional	0	0.110	1.000	0.000	
Minor industrial/institutional	0	0.015	1.000	0.000	
Major residential	0	0.053	1.000	0.000	
Minor residential	0	0.010	1.000	0.000	
Other	0	0.016	1.000	0.000	
Total	--	--	--	0.376	1.10

Proposed Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.376	1.000	0.376	1.41	0.35	0.186
Fatal and injury (FI)	--	0.061	0.023	1.41	0.40	0.013
Property damage only (PDO)	--	0.112	0.042	1.41	0.33	0.020

Proposed Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.345	0.235	0.186	0.766	0.0043	1.00	0.003
Fatal and injury (FI)	--	--	--	--	--	1.00	0.003

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.345	0.235	0.186	0.766	0.0043	1.00	0.003
Fatal and injury (FI)	--	--	--	--	--	1.00	0.003

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Proposed Conditions: General Information and Data for Urban And Suburban Roadway Segment			
General Information		**Location Information**	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.79 to 10.84
Date Performed	04/27/18	Common Name	William Street - Cheshire to Channing
Segment for Analysis	US36; 10.79-10.84	Analysis Year	2017

Input Data	Proposed Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**3T**	--
Length of segment, L (mi)	0.05	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,900 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	0	--
Minor commercial driveways (number)	0	--
Major industrial / institutional driveways (number)	0	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	0	--
Minor residential driveways (number)	0	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.52	1.00	0.93	1.00	1.41

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

Proposed Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-12.40	1.41	0.66	0.130	1.000	0.130	1.41	0.52	**0.096**
Fatal and Injury (FI)	-16.45	1.69	0.59	0.032	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.252	0.033	1.41	0.54	**0.025**
Property Damage Only (PDO)	-11.95	1.33	0.59	0.096	$(5)_{TOTAL}-(5)_{FI}$ 0.748	0.097	1.41	0.52	**0.072**

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.74	0.54	1.37	0.027	1.000	0.027	1.41	1.72	**0.065**
Fatal and Injury (FI)	-6.37	0.47	1.06	0.007	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.282	0.008	1.41	0.67	**0.007**
Property Damage Only (PDO)	-6.29	0.56	1.93	0.019	$(5)_{TOTAL}-(5)_{FI}$ 0.718	0.019	1.41	2.15	**0.058**

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	0	0.102	1.000	0.000	--
Minor commercial	0	0.032	1.000	0.000	
Major industrial/institutional	0	0.110	1.000	0.000	
Minor industrial/institutional	0	0.015	1.000	0.000	
Major residential	0	0.053	1.000	0.000	
Minor residential	0	0.010	1.000	0.000	
Other	0	0.016	1.000	0.000	
Total	--	--	--	0.000	1.10

Proposed Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.000	1.000	0.000	1.41	0.35	0.000
Fatal and injury (FI)	--	0.061	0.000	1.41	0.40	0.000
Property damage only (PDO)	--	0.112	0.000	1.41	0.33	0.000

Proposed Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

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Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.096	0.065	0.000	0.161	0.0043	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	1.00	0.001

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.096	0.065	0.000	0.161	0.0043	1.00	0.001
Fatal and injury (FI)	--	--	--	--	--	1.00	0.001

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Proposed Conditions: General Information and Data for Urban And Suburban Roadway Segment			
General Information		**Location Information**	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoints	10.84 to 11.09
Date Performed	04/27/18	Common Name	William Street - Ann to Foley
Segment for Analysis	US36; 10.84-11.09	Analysis Year	2017

Input Data	Proposed Conditions	HSM Base Conditions
Roadway type (2U, 3T, 4U, 4D, 5T)	**3T**	--
Length of segment, L (mi)	0.25	--
AADT (veh/day) is within range $AADT_{MAX}$ = 32,900 (veh/day)	13,000	--
Type of on-street parking (none/parallel/angle)	None	None
Proportion of curb length with on-street parking	0	--
Median width (ft) - for divided only	Not Present	15
Lighting (present / not present)	Present	Not Present
Auto speed enforcement (present / not present)	Not Present	Not Present
Major commercial driveways (number)	1	--
Minor commercial driveways (number)	0	--
Major industrial / institutional driveways (number)	1	--
Minor industrial / institutional driveways (number)	0	--
Major residential driveways (number)	3	--
Minor residential driveways (number)	20	--
Other driveways (number)	0	--
Speed Category	Posted Speed Greater than 30 mph	--
Roadside fixed object density (fixed objects / mi)	50	0
Offset to roadside fixed objects (ft) [If greater than 30 or Not Present, input 30]	5	30
Calibration Factor, Cr	Varies, See Below	1.00
Locality:	State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
CMF for On-Street Parking	CMF for Roadside Fixed Objects	CMF for Median Width	CMF for Lighting	CMF for Automated Speed Enforcement	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMF 5r*	*CMF comb*
from Equation 12-32	from Equation 12-33	from Table 12-22	from Equation 12-34	from Section 12.7.1	(1)*(2)*(3)*(4)*(5)
1.00	1.52	1.00	0.93	1.00	1.41

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Proposed Conditions: Multiple-Vehicle Nondriveway Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brmv}**	**Proportion of Total Crashes**	**Adjusted N_{brmv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brmv}**
	from Table 12-3		from Table 12-3	from Equation 12-10		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-12.40	1.41	0.66	0.651	1.000	0.651	1.41	0.52	**0.479**
Fatal and Injury (FI)	-16.45	1.69	0.59	0.161	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.252	0.164	1.41	0.54	**0.125**
Property Damage Only (PDO)	-11.95	1.33	0.59	0.478	$(5)_{TOTAL}-(5)_{FI}$ 0.748	0.487	1.41	0.52	**0.358**

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Roadway Segment									
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**		**Overdispersion Parameter, k**	**Initial N_{brsv}**	**Proportion of Total Crashes**	**Adjusted N_{brsv}**	**Combined CMFs**	**Calibration Factor, Cr**	**Predicted N_{brsv}**
	from Table 12-5		from Table 12-5	from Equation 12-13		$(4)_{TOTAL}$*(5)	(6) from Worksheet 1B		(6)*(7)*(8)
	a	b							
Total	-5.74	0.54	1.37	0.134	1.000	0.134	1.41	1.72	**0.326**
Fatal and Injury (FI)	-6.37	0.47	1.06	0.037	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.282	0.038	1.41	0.67	**0.036**
Property Damage Only (PDO)	-6.29	0.56	1.93	0.093	$(5)_{TOTAL}-(5)_{FI}$ 0.718	0.096	1.41	2.15	**0.292**

Multiple-Vehicle Driveway-Related Collisions By Driveway Type for Urban And Suburban Roadway Segment					
(1)	(2)	(3)	(4)	(5)	(6)
Driveway Type	**Number of driveways, n_j**	**Crashes per driveway per year, N_j**	**Coefficient for traffic adjustment, t**	**Initial N_{brdwy}**	**Overdispersion parameter, k**
		from Table 12-7	from Table 12-7	Equation 12-16 $n_j * N_j * (AADT/15,000)^t$	from Table 12-7
Major commercial	1	0.102	1.000	0.088	--
Minor commercial	0	0.032	1.000	0.000	
Major industrial/institutional	1	0.110	1.000	0.095	
Minor industrial/institutional	0	0.015	1.000	0.000	
Major residential	3	0.053	1.000	0.138	
Minor residential	20	0.010	1.000	0.173	
Other	0	0.016	1.000	0.000	
Total	--	--	--	0.495	1.10

Proposed Conditions: Multiple-Vehicle Crash Summary by Driveway Type for Urban And Suburban Roadway Segment						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Initial N_{brdwy}**	**Proportion of total crashes (f_{dwy})**	**Adjusted N_{brdwy}**	**Combined CMFs**	**Calibration factor, C_r**	**Predicted N_{brdwy}**
	$(5)_{TOTAL}$ from Worksheet 1G	from Table 12-7	$(2)_{TOTAL}$ * (3)	(6) from Worksheet 1B		(4)*(5)*(6)
Total	0.495	1.000	0.495	1.41	0.35	0.245
Fatal and injury (FI)	--	0.061	0.030	1.41	0.40	0.017
Property damage only (PDO)	--	0.112	0.056	1.41	0.33	0.026

Proposed Conditions: Vehicle-Pedestrian Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

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Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{pedr}	Calibration factor, C_r	Predicted N_{pedr}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-8		(5)*(6)*(7)
Total	0.479	0.326	0.245	1.050	0.0043	1.00	0.005
Fatal and injury (FI)	--	--	--	--	--	1.00	0.005

Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Roadway Segment							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crash Severity Level	Predicted N_{brmv}	Predicted N_{brsv}	Predicted N_{brdwy}	Predicted N_{br}	f_{biker}	Calibration factor, C_r	Predicted N_{biker}
	(9) from Worksheet 1C	(9) from Worksheet 1E	(7) from Worksheet 1H	(2)+(3)+(4)	from Table 12-9		(5)*(6)*(7)
Total	0.479	0.326	0.245	1.050	0.0043	1.00	0.005
Fatal and injury (FI)	--	--	--	--	--	1.00	0.005

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Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection			
General Information		**Location Information**	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoint	10.61
Date Performed	04/27/18	Common Name	Lake Street
Intersection	US36; 10.61	Analysis Year	2017
Signalized/Unsignalized	Signalized		

Input Data				**Proposed Conditions**	**HSM Base Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	17,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	6,000	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				1	0
Number of approaches with right-turn lanes				0	0
Number of approaches with left-turn signal phasing				1	--
Type of left-turn signal phasing for Leg #1				Protected/Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Permissive	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable				Not Applicable	--
Number of approaches with right-turn-on-red prohibited				1	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				20	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				4	--
Number of bus stops within 300 m (1,000 ft) of the intersection				1 or 2	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Not Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				1 to 8	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.9300	0.9900	1.0000	0.9800	0.9999	1.0000	0.9022

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Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-12.13	1.11	0.26	0.33	2.571	1.000	2.571	0.90	2.25	5.219
Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.848	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.345	0.888	0.90	1.46	1.169
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.607	$(5)_{TOTAL}-(5)_{FI}$ 0.655	1.683	0.90	2.68	4.070

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.235	1.000	0.235	0.90	1.49	0.316
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.068	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.298	0.070	0.90	1.66	0.105
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.161	$(5)_{TOTAL}-(5)_{FI}$ 0.702	0.165	0.90	1.42	0.211

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.00	1.12	3.11

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.009	3.11	0.69	0.018
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.018

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Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	5.219	0.316	5.535	0.0079	4.00	0.175
Fatal and injury (FI)	--	--	--	--	4.00	0.175

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Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection			
General Information		**Location Information**	
Analyst	JRH	Route	US36
Agency or Company	ms consultants	Logpoint	10.79
Date Performed	04/27/18	Common Name	Cheshire Street
Intersection	US36; 10.79	Analysis Year	2017
Signalized/Unsignalized	Signalized		

Input Data		**Proposed Conditions**	**HSM Base Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)		3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ = 58,100 (veh/day)	13,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ = 16,400 (veh/day)	5,000	--
Intersection lighting (present/not present)		Present	Not Present
Calibration factor, C_i		Varies, See Below	1.00
Data for unsignalized intersections only:			
Number of major-road approaches with left-turn lanes			0
Number of major-road approaches with right-turn lanes			0
Data for signalized intersections only:			
Number of approaches with left-turn lanes		1	0
Number of approaches with right-turn lanes		0	0
Number of approaches with left-turn signal phasing		0	--
Type of left-turn signal phasing for Leg #1		Permissive	Permissive
Type of left-turn signal phasing for Leg #2		Permissive	--
Type of left-turn signal phasing for Leg #3		Not Applicable	--
Not Applicable		Not Applicable	--
Number of approaches with right-turn-on-red prohibited		0	0
Intersection red light cameras (present/not present)		Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)		120	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})		3	--
Number of bus stops within 300 m (1,000 ft) of the intersection		1 or 2	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)		Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection		1 to 8	0
Locality:		State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.9300	1.0000	1.0000	1.0000	0.9999	1.0000	0.9299

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Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-12.13	1.11	0.26	0.33	1.821	1.000	1.821	0.93	2.25	3.809
Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.625	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.358	0.652	0.93	1.46	0.885
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	1.121	$(5)_{TOTAL}-(5)_{FI}$ 0.642	1.169	0.93	2.68	2.913

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.195	1.000	0.195	0.93	1.49	0.270
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.058	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.301	0.059	0.93	1.66	0.091
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.134	$(5)_{TOTAL}-(5)_{FI}$ 0.699	0.136	0.93	1.42	0.180

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.35	1.12	4.20

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.016	4.20	0.69	0.048
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.048

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Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	3.809	0.270	4.080	0.0079	4.00	0.129
Fatal and injury (FI)	--	--	--	--	4.00	0.129

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Proposed Conditions: General Information and Data for Urban And Suburban Arterial Intersection					
General Information		**Location Information**			
Analyst	JRH	Route	US36		
Agency or Company	ms consultants	Logpoint	10.84		
Date Performed	04/27/18	Common Name	Channing Street-Ann Street		
Intersection	US36; 10.84	Analysis Year	2017		
Signalized/Unsignalized	Signalized				
Input Data				**Proposed Conditions**	**HSM Base Conditions**
Intersection type (3ST, 3SG, 4ST, 4SG)				3SG	--
AADT $_{major}$ (veh/day) (total entering on major approaches)*	$AADT_{MAX}$ =	58,100	(veh/day)	13,000	--
AADT $_{minor}$ (veh/day) (total entering on minor approaches)*	$AADT_{MAX}$ =	16,400	(veh/day)	3,000	--
Intersection lighting (present/not present)				Present	Not Present
Calibration factor, C_i				Varies, See Below	1.00
Data for unsignalized intersections only:					
Number of major-road approaches with left-turn lanes					0
Number of major-road approaches with right-turn lanes					0
Data for signalized intersections only:					
Number of approaches with left-turn lanes				1	0
Number of approaches with right-turn lanes				0	0
Number of approaches with left-turn signal phasing				0	--
Type of left-turn signal phasing for Leg #1				Permissive	Permissive
Type of left-turn signal phasing for Leg #2				Permissive	--
Type of left-turn signal phasing for Leg #3				Not Applicable	--
Not Applicable				Not Applicable	--
Number of approaches with right-turn-on-red prohibited				3	0
Intersection red light cameras (present/not present)				Not Present	Not Present
Sum of all pedestrian crossing volumes (PedVol)				240	--
Maximum number of lanes crossed by a pedestrian (n_{lanesx})				3	--
Number of bus stops within 300 m (1,000 ft) of the intersection				1 or 2	0
Schools within 300 m (1,000 ft) of the intersection (present/not present)				Present	Not Present
Number of alcohol sales establishments within 300 m (1,000 ft) of the intersection				0	0
Locality:				State System	

Proposed Conditions: Crash Modification Factors (CMFs) for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
CMF for Left-Turn Lanes	CMF for Left-Turn Signal Phasing	CMF for Right-Turn Lanes	CMF for Right Turn on Red	CMF for Lighting	CMF for Red Light Cameras	Combined CMF
CMF 1i	*CMF 2i*	*CMF 3i*	*CMF 4i*	*CMF 5i*	*CMF 6i*	*CMF $_{COMB}$*
from Table 12-24	from Table 12-25	from Table 12-26	from Equation 12-35	from Equation 12-36	from Equation 12-37	(1)*(2)*(3)*(4)*(5)*(6)
0.9300	1.0000	1.0000	0.9412	0.9999	1.0000	0.8752

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Proposed Conditions: Multiple-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(6)*(7)*(8)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bimv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bimv}**
	from Table 12-10			from Table 12-10	from Equation 12-21		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		
	a	b	c							
Total	-12.13	1.11	0.26	0.33	1.594	1.000	1.594	0.88	2.25	3.139
Fatal and Injury (FI)	-11.58	1.02	0.17	0.30	0.573	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.373	0.595	0.88	1.46	0.761
Property Damage Only (PDO)	-13.24	1.14	0.30	0.36	0.962	$(5)_{TOTAL}-(5)_{FI}$ 0.627	0.999	0.88	2.68	2.343

Proposed Conditions: Single-Vehicle Crash Summary for Urban And Suburban Arterial Intersection										
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crash Severity Level	**SPF Coefficients**			**Overdispersion Parameter, k**	**Initial N_{bisv}**	**Proportion of Total Crashes**	**Adjusted N_{bimv}**	**Combined CMFs**	**Calibration Factor, C_i**	**Predicted N_{bisv}**
	from Table 12-12			from Table 12-12	from Eqn. 12-24; (FI) from Eqn. 12-24 or 12-27		$(4)_{TOTAL}$*(5)	(7) from Worksheet 2B		(6)*(7)*(8)
	a	b	c							
Total	-9.02	0.42	0.40	0.36	0.159	1.000	0.159	0.88	1.49	0.207
Fatal and Injury (FI)	-9.75	0.27	0.51	0.24	0.045	$(4)_{FI}/((4)_{FI}+(4)_{PDO})$ 0.282	0.045	0.88	1.66	0.065
Property Damage Only (PDO)	-9.08	0.45	0.33	0.53	0.114	$(5)_{TOTAL}-(5)_{FI}$ 0.718	0.114	0.88	1.42	0.142

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Stop-Controlled Intersections						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{pedi}**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-16		(4)*(5)*(6)
Total	--	--	--	--	--	--
Fatal and injury (FI)	--	--	--	--	--	--

Proposed Conditions: CMFs for Vehicle-Pedestrian Crash Summary for Urban And Suburban Arterial Signalized Intersections			
(1)	(2)	(3)	(4)
CMF for Bus Stops	CMF for Schools	CMF for Alcohol Sales Establishments	Combined CMF
CMF_{1p}	CMF_{2p}	CMF_{3p}	
from Table 12-28	from Table 12-29	from Table 12-30	(1)*(2)*(3)
2.78	1.35	1.00	3.75

Proposed Conditions: Vehicle-Pedestrian Crash Summary at Urban And Suburban Arterial Signalized Intersections										
(1)	(2)					(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**SPF Coefficients**					**Overdispersion Parameter, k**	**$N_{pedbase}$**	**Combined CMF**	**Calibration factor, C_i**	**Predicted N_{pedi}**
	from Table 12-14						from Equation 12-29	(4) from Worksheet 2H		(4)*(5)*(6)
	a	b	c	d	e					
Total	-6.60	0.05	0.24	0.41	0.09	0.52	0.019	3.75	0.69	0.050
Fatal and Injury (FI)	--	--	--	--	--	--	--	--	0.69	0.050
	--	--	--	--	--	--			0.69	0.050

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Proposed Conditions: Vehicle-Bicycle Crash Summary for Urban And Suburban Arterial Intersection						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crash Severity Level	**Predicted N_{bimv}**	**Predicted N_{bisv}**	**Predicted N_{bi}**	**f_{bikei}**	**Calibration factor, C_i**	**Predicted N_{bikei}**
	(9) from Worksheet 2C	(9) from Worksheet 2E	(2) + (3)	from Table 12-17		(4)*(5)*(6)
Total	3.139	0.207	3.347	0.0079	4.00	0.106
Fatal and injury (FI)	--	--	--	--	4.00	0.106

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