Appendix C

Crash Analysis & Regional Safety

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TECHNICAL MEMORANDUM # 2

DATE: August 2015
TO: Doug Mitchell
CC: Vijay Kunada, Neel-Schaffer, Inc.
FROM: JD Allen, AICP
RE: Monroe Urbanized Area Regional Safety

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*"**Disclaimer:** This document and the information contained herein is prepared solely for the purpose of identifying, evaluating and planning safety improvements on public roads which may be implemented utilizing federal aid highway funds; and is therefore exempt from discovery or admission into evidence pursuant to 23 U.S.C. 409."*

Introduction

Background

In recent years, on average, 32,900 fatalities occur on the roadways in the United States annually. Every crash, regardless of the severity, costs governments and taxpayers money and time in damages, emergency services, and delays. Despite the trend of reduced crashes over the last few years, crashes and roadway safety still need to be addressed. One of the goals of this plan is to improve travel safety by reducing the risk of crashes on the roadways.

Safety Management System (SMS)

Traffic safety programs are relatively uniform from state to state in their approach to making the highway system safer for their users. The typical traffic safety program combines several different features from a SMS, which all states were mandated to have under the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. Under ISTEA, the SMS was required to address:

- Coordinating and integrating safety features for the various modes of travel;
- Identifying hazardous locations, investigating them, and establishing countermeasures to increase safety;
- Early consideration for safety in all highway projects and programs;

- Identifying safety needs of special user groups (handicapped, elderly, etc.);
- Routinely maintaining and upgrading the safety features on the roadways; and
- Marketing safety programs to encourage community involvement.

The SMS mandate was later withdrawn due to the 1995 National Highway System Designation Act. However, Moving Ahead for Progress in the 21st Century Act (MAP-21) Section 1203 requires that each state and MPO have a planning process that addresses the safety performance measure to "achieve a significant reduction in traffic fatalities and serious injuries on all public roads." MAP-21 also retains the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) requirement that the planning process addresses the need to "increase the safety of the transportation system for motorized and non-motorized users." A traffic safety program involves several steps, and is relatively uniform throughout the United States. The typical traffic safety program includes:

- A crash record system;
- Identification of hazardous locations;
- Engineering studies;
- Selection of countermeasures;
- Prioritization of improvement projects;
- Planning and implementation of improvement projects; and
- Evaluation of the implemented projects.

The crash record system should contain data on individual crashes that occur in the area, as well as the following information:

- Time;
- Date;
- Weather condition;
- Pavement condition;
- Driver; and
- Roadway.

The primary source for this data is usually police reports from local jurisdictions. In order for this record system to be useful, the data has to be processed and available on a timely basis so that it can be analyzed.

The identification of hazardous locations is based on actual crashes that have occurred, and/or the potential of an area to have a high number of crashes. The severity of these crashes must also be considered in order to prioritize the locations and develop solutions for them. Once the hazardous locations have been identified, engineering studies can be conducted using the crash

record system data. An analysis can use crash frequency, crash rate, Equivalent Property Damage Only (EPDO) rates, and other methods. Supplemental data from police comments and citizen complaints can also be used in the analysis process in order to find the cause of the crashes.

Once the cause of the crashes has been determined, countermeasures are proposed and then evaluated. Improvement projects are then selected based on the benefits they provide compared to the cost to implement them. Sometimes, enforcement and education may be all that is necessary in order to reduce the number of crashes. Other times, multiple projects may be needed to mitigate a particular problem area.

Once the projects have been selected, they need to be prioritized based on their cost and benefits. Not all improvement projects will be able to be implemented due to funding limitations. After the projects have been selected and prioritized, a plan should be developed in order to implement the projects. An implementation plan will help ensure that resources and finances are available to complete the improvement projects in a timely manner. Implementation of the projects should occur as soon as possible to avoid cost increases and prevent potential crashes that may occur without the project in place.

Projects must be evaluated to determine whether they are effective or can be used to address similar problems in the future. This is typically done in a before-and-after analysis by observing the frequency and severity of the crashes several years before the implementation of the project, and then for several years after the project has been completed. Two issues can arise in this method of analysis. First, if enforcement and/or education change from before to after conditions, it can affect the number of crashes at that location. Second, “regression to the mean”, a statistical phenomenon that can make natural variation in repeated data look like real change, must be taken into account to ensure that change in crash patterns and/or frequency can be attributable to the safety projects. In order to correct these two issues, control sites should be established that are similar to the study locations but have not had any changes made to them.

The safety element of the Monroe MTP 2040 focuses on gathering and analyzing available crash data and then identifying hazardous locations. Due to the limited scope of this study, it does not identify location specific recommendations for the identified hazardous locations. However, potential countermeasures which could be used to mitigate various crash types have been included in conclusion of this technical memorandum.

Louisiana Strategic Highway Safety Plan

A Strategic Highway Safety Plan (SHSP) is a statewide-coordinated safety plan that is developed to reduce fatalities along state highways and all public roads.

The State of Louisiana maintains a SHSP first enacted in accordance with SAFETEA-LU requirements. The original SHSP was developed in 2006 using the 4E's of traffic safety: engineering, enforcement, emergency response, and education. The purpose of the 2006 SHSP was to:

- Establish safety-related goals, objectives, and performance measures for high-priority emphasis areas identified in the plan;
- Address the issues at each of the jurisdictional levels;
- Identify current and future candidate safety strategies to reduce fatalities and injuries;
- Establish interagency coordination;
- Create a public outreach and education program for the SHSP; and
- Establish a process for evaluating progress towards the plan's goals and objectives, and updating the plan to reflect progress and changing needs.

The SHSP was updated in 2011 and includes all elements of the 2006 plan, with the addition of:

- Enhanced collaboration between agencies for updates and improvements to the plan;
- Alignment of safety goals with those of the state's other safety plans;
- A narrowed focus on the areas of greatest need;
- Inclusion of recent science-based research used to quantify the effectiveness of the engineering and behavioral safety countermeasures that are put into place;
- Increased stakeholder representation in the creation of the SHSP; and
- A new focus on countermeasure evaluation

The vision of the SHSP is to bring the number of fatalities on Louisiana roadways to zero by using the 4E's approach. The goal of the current SHSP is to reduce the number of highway fatalities by fifty percent by the year 2030. This same benchmark is used as the goal for each of the emphasis areas listed below. SHSP performance measures, tracked by the LADOTD with the OnTrack program, include countermeasures that are underway, completed, or awaiting implementation.

During the development of the current SHSP, four emphasis areas were identified for implementation of countermeasures based on data availability, improvement potential, and access to resources. The four emphasis areas are Alcohol Related Driving, Occupant Protection, Infrastructure and Operations, and Crashes Involving Young Drivers.

Strategies for reducing the fatal and injury crashes for each of these emphasis areas include:

- More efficient DWI/DUI arrest reports;
- Outreach and education;
- Marketing;
- Law Enforcement Liaisons at the Louisiana State Police Troop Commands;
- Checkpoints for alcohol and seat belts;
- "Buckle Up" signs;
- Newer, systematic improvements to infrastructure;
- A Roadway Departure Action Plan;
- Increased coordination with MPOs to include safety planning in the TIP; and
- An Underage Alcohol Purchase Prevention Program.

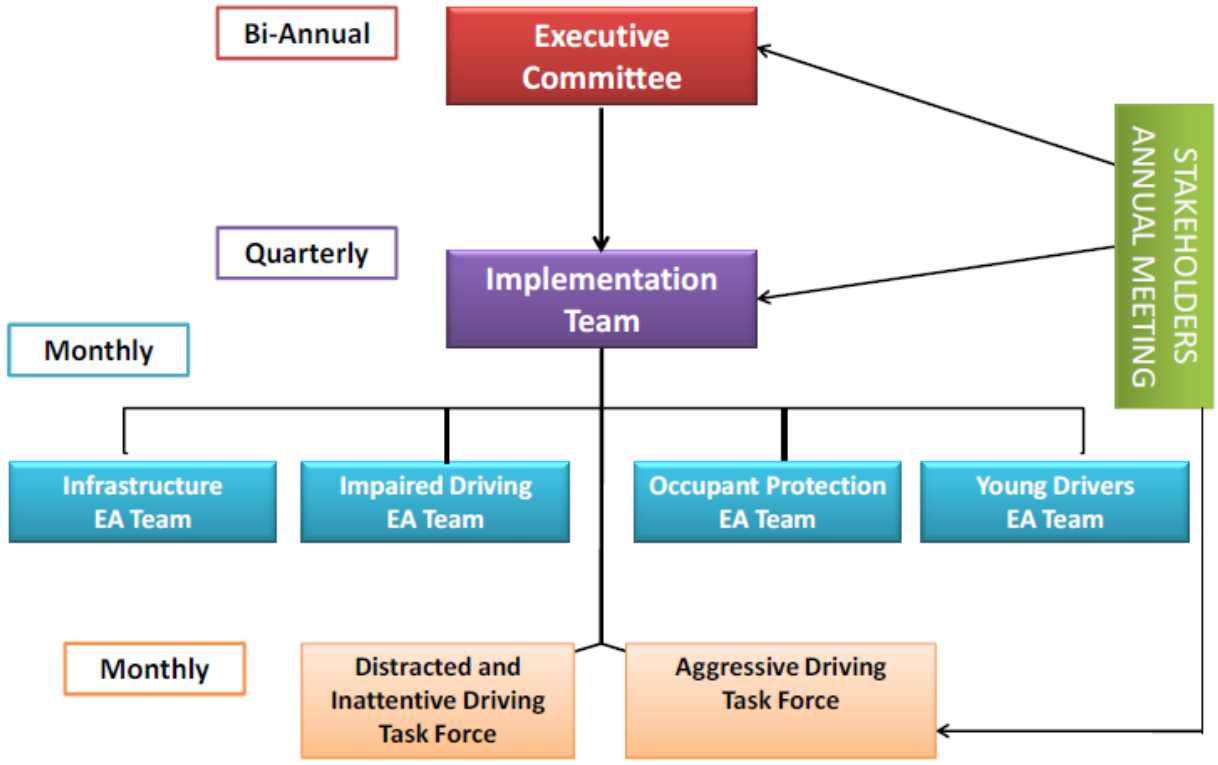
Figure 1 shows the planning process involved in the update of the SHSP. Figure 2 shows the structure that is used in the implementation of the SHSP by the various agencies that are involved in the plan.

Figure 1: Planning Process to Update the Louisiana SHSP

Timeframe	Activity
July-November 2009	Conduct Data Analysis
Nov-09	Select SHSP Emphasis Areas
Nov-09	Draft update of the 2006 Louisiana SHSP Circulate for review by DOTD, LHSC, and LSP
Dec-09	Incorporate comments from DOTD, LHSC, and LSP and create revised Draft
16-Dec-09	Host Stakeholders Meeting to introduce the outline of the draft plan, gain feedback on emphasis areas, identify potential leadership, review research, and begin discussion of strategies and countermeasures
30-Dec-09	Develop revised Draft 2010 Louisiana SHSP Review Draft SHSP by stakeholder group
Mar-10	Host Transportation Safety Summit to introduce the SHSP, and build Regional Safety Coalitions which will develop safety action plans to align with the goals, emphasis areas, objectives, and strategies of the statewide SHSP Review Summit participant comments
Apr-10	Develop revised 2010 Louisiana SHSP
Jun-10	Convene Implementation Team to review revised SHSP, introduce management structure and roles and responsibilities
Jul-10	Begin monthly meetings of the Emphasis Area Teams and Task Forces to expand upon action plans and track implementation via OnTrack
Ongoing	Continue quarterly Implementation Team meetings, bi-annual Executive Committee meetings and annual Stakeholder meetings to further implementation and track progress

Source: Louisiana Strategic Highway Safety Plan

Figure 2: Louisiana SHSP Project Management Team



Source: Louisiana Strategic Highway Safety Plan

Study Area Crash Analysis

Crash records, corrected with LADOTD latitude and longitude data, from Ouachita Parish in the MPO study area from 2011 to 2013 were used in the crash analysis of the study area. The crash records included the time and location of the crash, severity of the crash, and crash location conditions. A total of 15,678 crashes occurred within the study area during that time period. Table 1 shows a breakdown of the crashes by year.

Table 1: Crashes by Year (2011-2013)

Crash Year	Crashes
2011	4,918
2012	5,340
2013	5,420
Total	**15,678**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Crash Trends

The first step in improving travel safety is determining the cause of the crashes. This study analyzed the time, surface conditions, lighting, severity, collision type, pedestrian, bicycle, vehicle type, and alcohol involvement factors to identify regional trends.

The first factor this study focused on was the time at which the crashes occurred, found in Table 2. Approximately 79 percent of the crashes occurred from 7 AM to 7 PM, when people are traveling to work, school, and other various activities. The largest number of crashes occurred between 3 PM and 6 PM, when traffic is likely to be the heaviest.

Table 2: Crashes by Time of Day (2011-2013)

Hour Beginning	Number of Crashes	Percentage
Midnight	212	1.4%
1:00 AM	146	0.9%
2:00 AM	168	1.1%
3:00 AM	114	0.7%
4:00 AM	113	0.7%
5:00 AM	120	0.8%
6:00 AM	242	1.5%
7:00 AM	924	5.9%
8:00 AM	626	4.0%
9:00 AM	617	3.9%
10:00 AM	742	4.7%
11:00 AM	947	6.0%
12:00 PM	1,117	7.1%
1:00 PM	1,111	7.1%
2:00 PM	1,152	7.3%
3:00 PM	1,401	8.9%
4:00 PM	1,310	8.4%
5:00 PM	1,452	9.3%
6:00 PM	949	6.1%
7:00 PM	602	3.8%
8:00 PM	526	3.4%
9:00 PM	470	3.0%
10:00 PM	338	2.2%
11:00 PM	256	1.6%
Unlisted	23	0.1%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Another factor considered was the surface conditions during the time of a crash. A breakdown of the surface conditions is shown in Table 3. Approximately 2,343 (about 14.94 percent) crashes occurred during wet pavement conditions. Nearly 13,201 crashes, approximately 84.2 percent occurred during dry conditions. Although wet roadway surface conditions could have been a factor in some instances, the majority of the crashes were unaffected by wet conditions.

Table 3: Crashes by Roadway Surface Conditions (2011-2013)

Roadway Surface Condition	Number of Crashes	Percentage
Dry	13,201	84.20%
Wet	2,343	14.94%
Snow/Slush	20	0.13%
Ice	79	0.50%
Contaminant	5	0.03%
Unknown	19	0.12%
Other	1	0.01%
Unlisted	10	0.06%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

The lighting conditions during the time of the crash were also taken into account in this analysis. Table 4 provides a breakdown of the crashes that occurred under various lighting conditions. Over 74 percent of the crashes occurred during daylight. About 10.4 percent of crashes occurred when it was dark outside with street lights, and about 12 percent of the crashes occurred at night with only a traffic signal or with no street lights.

Table 4: Crashes by Roadway Lighting (2011-2013)

Lighting	Number of Crashes	Percentage
Daylight	11,698	74.6%
Dark, no lights	1,406	9.0%
Dark, street lights	1,626	10.4%
Dark, signal only	463	3.0%
Dusk	260	1.7%
Dawn	98	0.6%
Unknown	37	0.2%
Other	22	0.1%
Unlisted	68	0.4%
Total	**15,678**	**100.0%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Crash severity is also important to take into consideration. Crashes by severity are shown in Table 5. Of the 15,678 crashes that occurred between 2011 and 2013 within the study area, 48 crashes claimed lives and 5,065 crashes caused injuries. Only 1.3 percent of the total crashes resulted in a fatality or severe injury, while just over 67 percent of the crashes had no injuries reported.

Table 5: Crashes by Severity

Severity	Number of Crashes	Percentage
Fatal	48	0.3%
Severe	154	1.0%
Moderate	949	6.1%
Complaint	3,962	25.3%
No Injury	10,565	67.4%
Unlisted	0	0.0%
Total	**15,678**	**100.0%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Pedestrian crashes were also taken into consideration and are shown in Table 6. Within the study area between 2011 and 2013, 175 pedestrian crashes occurred, (approximately 1.1 percent of all crashes during the analysis period). Eight of these were fatal crashes, accounting for 16.7 percent of all fatal crashes in the study area.

Table 6: Pedestrian Crashes (2011-2013)

Pedestrian	Number of Crashes	Percentage
Pedestrian involved	175	1.1%
Pedestrian not involved	15,503	98.9%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

In addition, bicycle crashes were taken into consideration and are shown in Table 7. Within the study area, 54 bicycle crashes occurred between 2011 and 2013, accounting for 0.3 percent of all crashes, with one crash resulting in fatalities – a 1.8 percent share of fatal crashes in the study area.

Table 7: Bicycle Crashes (2011-2013)

Bicycle	Number of Crashes	Percentage
Bicycle involved	54	0.3%
Bicycle not involved	15,624	99.7%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Another factor considered was the vehicle type involved in the crash. A breakdown of this factor is shown in Table 8. The three highest vehicle types at fault, making up nearly 90.7 percent of the crashes in the study area, were passenger cars, light trucks, and sports utility vehicles. About three percent of the crashes in the study area involved a heavy vehicle, while passenger cars accounted for 47.7 percent of the total crashes in the study area.

Table 8: Crashes by Vehicle Type (2011-2013)

Vehicle Type	Number of Crashes	Percentage
Passenger Car	7,483	47.7%
Light Truck	3,610	23.0%
Van	535	3.4%
A, B, C or S (Vehicle) with Trailer	60	0.4%
Motorcycle	104	0.7%
Bicycle	54	0.3%
Off Road Vehicle	12	0.1%
Emergency Vehicle In Use	10	0.1%
School Bus	18	0.1%
Bus with Seats for 9-15 Occupants	7	0.0%
Bus with Seats for 16 or More occupants	13	0.1%
Single Unit Truck with 2 Axles	106	0.7%
Single Unit Truck with 3 or more Axles	43	0.3%
Truck/Trailer	39	0.2%
Truck/Tractor	79	0.5%
Tractor Semi-Trailer	163	1.0%
Truck Double	7	0.0%
SUV (Sport Utility Vehicle)	3,122	19.9%
Farm Equipment	4	0.0%
Motor Home	3	0.0%
Other	69	0.4%
Unlisted	137	0.9%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

The type of collisions is also an important factor in determining the cause of crashes. Table 9 shows the number of crashes by collision type that occurred between 2011 and 2013. The four highest collision types, making up about 77 percent of the crashes in the study area, were rear end collisions, right angle collisions, non-collision with motor vehicle (NCWMV), and sideswipe-same direction collisions. Rear-end crashes account for the majority of the collisions and were typically concentrated at or near signalized intersections. According to the crash data, right angle crashes were the second most common collision type followed by non-collision with motor vehicle crashes.

Table 9: Crashes by Collision Type (2011-2013)

Collision Type	Number of Crashes	Percentage
Non-collision with motor vehicle	2,330	14.9%
Rear end	5,690	36.3%
Head-on	220	1.4%
Right angle	2,587	16.5%
Left turn- angle	365	2.3%
Left turn- opposite direction	660	4.2%
Left turn- same direction	315	2.0%
Right turn- same direction	215	1.4%
Right turn- opposite direction	100	0.6%
Sideswipe- same direction	1,480	9.4%
Sideswipe- opposite direction	297	1.9%
Other	1,417	9.0%
Unlisted	2	0.0%
Total	**15,678**	**100.0%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

The last factor this study considered is whether alcohol was involved in these crashes. Alcohol is a factor in many crashes across the United States. Table 10 shows a breakdown of the alcohol involvement in crashes that occurred between 2011 and 2013. About four (4) percent of overall crashes in the study area involved alcohol. Of the 48 total fatal crashes with in the study area, seven (7) were fatal crashes related to alcohol involvement, resulting in a 14.6 percent share of total fatality crashes being alcohol related.

Table 10: Alcohol Involvement in Crashes (2011-2013)

Alcohol	Number of Crashes	Percentage
Alcohol involved	601	3.8%
Alcohol not involved	15,077	96.2%
Total	**15,678**	**100.00%**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Crash Locations

There were about 5,900 intersection crashes in the study area over the three year analysis period. The total crashes at each intersection were computed by locating the crashes that occurred within 100 feet of that intersection. Table 11 shows the top 21 intersections with the highest crash frequency as well as the severity of the crashes. Table 12 shows the collision types that occurred at the top 21 intersections. Tables 13, 14, and 15 display the locations of the top intersections with rear end, non-collision with motor vehicle, and right angle crashes respectively, along with the intersection control at respective intersection.

Since the nature of this study is to only identify trends, this study did not attempt to analyze each location and corresponding crash records but merely relied on the data included in the crash databases provided by the Louisiana Highway Safety Commission.

Table 11: Top 21 Intersections with High Crash Frequency by Severity (2011-2013)

Rank	Location	Crashes	Fatal	Severe	Moderate	Complaint	No Injury
1	LA 617 (Thomas Rd) @ Glenwood Dr	118	0	1	3	27	87
2	US 80 (Louisville Ave) @ LA 840-6 (N 18th St)	115	0	1	3	31	80
3	LA 594 (Texas Ave) @ I-20 WB Ramps/18th St	103	0	1	7	35	60
4	US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	73	0	1	2	12	58
5	US 80 (Louisville Ave) @ Washington St/Lamy Ln	69	0	0	7	18	44
6	LA 617 (Thomas Rd) @ McMillan Rd	64	0	1	2	13	48
7	US 80 (Cypress St) @ LA 34	59	0	0	0	7	52
8	LA 34 SB (Stella St) @ LA 143 (N 7th St)	51	1	0	7	11	32
9	US 80 (Louisville Ave) @ US 165B/LA 15 (N 6th St)	48	0	0	1	16	31
10	US 80 (Cypress St) @ LA 143 (N 7th St)	48	0	0	1	9	38
11	LA 143 (N 7th St) @ LA 616 (Arkansas Rd)	47	0	1	2	7	37
12	LA 617 (Thomas Rd) @ Downing Pines Rd/Old Natchitoches Rd	47	0	0	1	9	37
13	US 80 (Cypress St) @ LA 617 (Warren Dr)	46	0	0	4	5	37
14	US 80 (Bridge St) @ Trenton St	45	0	0	2	7	36
15	US 80 (Cypress St) @ LA 3249 (Well Rd)/Wallace Dean Rd	45	0	0	0	10	35
16	US 80 (DeSiard St) @ University Ave/S College Ave	43	0	0	3	14	26
17	LA 594 (Millhaven Rd) @ Meadowlark Dr	42	2	0	5	19	16
18	LA 594 (Millhaven Rd) @ Garrett Rd	41	0	0	2	16	23
19	US 80 (DeSiard St) @ Kansas Ln	40	1	0	2	12	25
20	LA 594 (Millhaven Rd) @ Kansas Ln	40	0	1	1	6	32
21	LA 840-6 (N 18th St) @ Forsythe Ave	40	0	0	2	14	24
	Total	**1,224**	**4**	**7**	**57**	**298**	**858**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Table 12: Top 21 Intersections with High Crash Frequency by Collision Type (2011-2013)

Rank	Intersection	Crashes	NCWMV	Rear End	Head On	Right Angle	Left Turn-Angle	Left Turn-Opposite	Left Turn-Same	Right Turn-Angle	Right Turn-Opposite	Sideswipe-Same	Sideswipe-Opposite	Other	Unlisted
1	LA 617 (Thomas Rd) @ Glenwood Dr	118	1	51	1	23	4	7	2	7	0	21	0	1	0
2	US 80 (Louisville Ave) @ LA 840-6 (N 18th St)	115	0	67	0	8	3	7	2	1	1	15	0	11	0
3	LA 594 (Texas Ave) @ I-20 WB Ramps/18th St	103	0	62	2	13	0	16	0	0	0	3	0	7	0
4	US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	73	3	31	2	13	2	7	4	1	0	9	0	1	0
5	US 80 (Louisville Ave) @ Washington St/Lamy Ln	69	1	27	2	12	2	3	4	1	1	9	0	7	0
6	LA 617 (Thomas Rd) @ McMillan Rd	64	1	19	0	9	0	4	1	7	0	18	1	4	0
7	US 80 (Cypress St) @ LA 34	59	0	13	1	9	8	5	3	0	0	20	0	0	0
8	LA 34 SB (Stella St) @ LA 143 (N 7th St)	51	0	16	0	20	2	0	1	3	0	7	0	2	0
9	US 80 (Louisville Ave) @ US 165B/LA 15 (N 6th St)	48	5	16	0	7	5	5	2	0	0	7	0	1	0
10	US 80 (Cypress St) @ LA 143 (N 7th St)	48	1	28	0	9	0	3	0	0	0	4	0	3	0
11	LA 143 (N 7th St) @ LA 616 (Arkansas Rd)	47	2	16	0	16	2	7	0	0	0	3	0	1	0
12	LA 617 (Thomas Rd) @ Downing Pines Rd/Old Natchitoches Rd	47	1	29	1	10	1	0	0	0	0	2	1	2	0
13	US 80 (Cypress St) @ LA 617 (Warren Dr)	46	1	23	0	7	0	4	1	3	0	7	0	0	0
14	US 80 (Bridge St) @ Trenton St	45	1	28	0	9	1	1	0	0	0	4	0	1	0
15	US 80 (Cypress St) @ LA 3249 (Well Rd)/Wallace Dean Rd	45	3	27	1	3	2	3	3	1	0	1	1	0	0
16	US 80 (DeSiard St) @ University Ave/S College Ave	43	0	21	0	5	1	5	1	1	0	6	0	3	0
17	LA 594 (Millhaven Rd) @ Meadowlark Dr	42	19	11	0	5	0	0	1	0	1	1	0	4	0
18	LA 594 (Millhaven Rd) @ Garrett Rd	41	0	16	1	13	0	1	3	1	0	0	0	6	0
19	US 80 (DeSiard St) @ Kansas Ln	40	0	23	1	3	0	2	2	1	0	6	0	2	0
20	LA 594 (Millhaven Rd) @ Kansas Ln	40	1	22	0	2	0	6	0	0	0	5	0	4	0
21	LA 840-6 (N 18th St) @ Forsythe Ave	40	3	24	1	4	0	3	2	1	0	0	0	2	0
	Total	**1,224**	**43**	**570**	**13**	**200**	**33**	**89**	**32**	**28**	**3**	**148**	**3**	**62**	**0**

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Table 13: Top Intersections with High Rear End Crash Frequency (2011-2013)

Rank	Intersection	Number of Crashes	Intersection Control
1	US 80 (Louisville Ave) @ LA 840-6 (N 18th St)	67	Signal
2	LA 594 (Texas Ave) @ I-20 WB Ramps/18th St	62	Signal
3	LA 617 (Thomas Rd) @ Glenwood Dr	51	Signal
4	US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	31	Signal
5	LA 617 (Thomas Rd) @ Downing Pines Rd/Old Natchitoches Rd	29	Signal
6	US 80 (Bridge St) @ Trenton St	28	Signal
7	US 80 (Cypress St) @ LA 143 (N 7th St)	28	Signal
8	US 80 (Louisville Ave) @ Washington St/Lamy Ln	27	Signal
9	US 80 (Cypress St) @ LA 3249 (Well Rd)/Wallace Dean Rd	27	Signal
10	LA 840-6 (N 18th St) @ Forsythe Ave	24	Signal

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Table 14: Top Intersections with High NCWMV Frequency (2011-2013)

Rank	Intersection	Number of Crashes	Intersection Control
1	LA 594 (Millhaven Rd) @ Meadowlark Dr	19	Unsignalized
2	US 80 (Louisville Ave) @ US 165B/LA 15 (N 6th St)	5	Signal
3	LA 594 @ Rowland Rd	4	Unsignalized
4	I-20 WB Off Ramp @ US 165 SB (At Exit Itself)	4	Unsignalized
5	US 80 (DeSiard St) @ Gilbert St	3	Unsignalized
6	LA 3033 (Washington St) @ Lenwill Rd	3	Unsignalized
7	LA 840-6 (N 18th St) @ Forsythe Ave	3	Signal
8	DeSiard St @ 4th St/Catalpa St	3	Signal
9	LA 616 (Arkansas Rd) @ Forty Oaks Farm Rd	3	Signal
10	US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	3	Signal
11	US 80 (Cypress St) @ LA 3249 (Well Rd)/Wallace Dean Rd	3	Signal
12	LA 594 (Texas Ave) @ 10th St	3	Unsignalized

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Table 15: Top Intersections with High Right Angle Crash Frequency (2011-2013)

Rank	Intersection	Number of Crashes	Intersection Control
1	LA 617 (Thomas Rd) @ Glenwood Dr	23	Signal
2	LA 34 SB (Stella St) @ LA 143 (N 7th St)	20	Signal
3	LA 143 (N 7th St) @ LA 616 (Arkansas Rd)	16	Signal
4	US 80 (Louisville Ave) @ N 19th St	15	Unsignalized
5	US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	13	Signal
6	LA 594 (Millhaven Rd) @ Garrett Rd	13	Unsignalized
7	LA 594 (Texas Ave) @ S 8th St	13	Unsignalized
8	LA 594 (Texas Ave) @ I-20 WB Ramps/18th St	13	Signal
9	US 80 (Louisville Ave) @ Riverside Dr	13	Signal
10	Nutland Rd @ Hadley St	13	Unsignalized

SOURCE: Louisiana Highway Safety Commission, 2011-2013 Crash Records for Ouachita Parish

Crash Rates

Crash rates for the study area were based on the model network layer and base year volumes obtained from the Monroe MPO travel demand model. The length of each segment was calculated and the corresponding daily traffic volumes from the model were used in the crash rate equation. The equation that was used to calculate segment crash rates was:

$$Segment\ Crash\ Rate = \frac{N * 10^6}{365 * ADT * L}$$

Where: Segment Crash Rate = crashes per million vehicle miles travelled.

N = average annual crash frequency of the segment

ADT = average daily traffic of the segment

L = length of the segment in miles

Table 16 shows the ten segments with the highest crash frequencies in the study area, as well as their corresponding crash rates.

Table 16: Top 10 High Crash Frequency Segments and Crash Rates (2011-2013)

Segment	From	To	Total Crashes	Annual Crash Frequency	ADT	Length	Crash Rate*
I-20 WB	LA 617 Off Ramp	LA 617 On Ramp	245	82	30,872	0.41	17.75
I-20 EB	LA 617 Off Ramp	LA 617 On Ramp	72	24	29,200	0.73	3.08
US 80 (Cypress St)	LA 3249/Well Rd	Vernon Ln	70	23	16,145	0.11	35.48
I-20 EB	LA 546	LA 3249/Well Rd	59	20	28,298	2.82	0.69
US 80 (DeSiard St)	US 165 SB Ramps	US 165 NB Ramps	59	20	24,794	0.06	36.83
US 80 (Louisville Ave)	Washington St	Plaza Blvd	45	15	22,514	0.26	9.61
US 80 (Louisville Ave)	Newcombe St	0.16 Miles East of Newcombe St	41	14	21,977	0.16	10.91
US 165 SB	Renwick St	Louberta St	38	13	17,210	0.25	8.28
I-20 WB	LA 34 Off Ramp	LA 34 On Ramp	37	12	33,203	0.71	1.39
I-20 WB	LA 3249/Well Rd	LA 546	35	12	28,909	2.76	0.41

**: Crash Rate is expressed in crashes per million vehicle miles travelled*

The equation that was used to calculate intersection crash rates was:

$$Intersection\ Crash\ Rate = \frac{N * 10^6}{365 * ADT}$$

Where: Intersection Crash Rate = crashes per million vehicle miles travelled.

N = average annual crash frequency of the segment

ADT = average daily traffic of the segment

Table 17 shows the ten intersections with the highest crash rates in the study area.

Table 17: Top 10 High Crash Rate Intersections (2011-2013)

Location	Total Crashes	Annual Crash Frequency	ADT	Crash Rate*
LA 594 (Texas Ave) @ I-20 WB Ramps/18th St	103	34	20,665	4.55
LA 594 (Millhaven Rd) @ Garrett Rd	41	14	8,845	4.34
LA 617 (Thomas Rd) @ Glenwood Dr	118	39	27,565	3.88
LA 594 (Millhaven Rd) @ Meadowlark Dr	42	14	10,668	3.60
LA 617 (Thomas Rd) @ McMillan Rd	64	21	20,860	2.76
US 80 (Louisville Ave) @ LA 840-6 (N 18th St)	115	38	39,011	2.67
LA 840-6 (N 18th St) @ Forsythe Ave	40	13	13,686	2.60
US 80 (Cypress St) @ LA 617 (Thomas Rd)/Splane Dr	73	24	27,741	2.37
US 80 (Louisville Ave) @ Washington St/Lamy Ln	69	23	28,298	2.23
LA 594 (Millhaven Rd) @ Kansas Ln	40	13	16,435	2.17

**: Crash Rate is expressed in crashes per million vehicle miles travelled*

Conclusions and Recommendations

Within the study area, a total of 15,678 crashes occurred between 2011 and 2013. The majority of these crashes took place between the hours of 7 AM and 7 PM, with the most crashes occurring from 3 PM to 6 PM. These peak hour crashes are likely the result of intersections and/or roadways not being designed to operate efficiently when presented with large traffic volumes. Safety can likely be improved and collisions reduced by adjusting signal timing, implementing intersection improvements, and/or adding one or more lanes. Approximately 84 percent of crashes in the study area occurred during dry roadway surface conditions; therefore, roadway surface conditions do not play a major factor in the majority of crashes. About 75 percent of crashes occurred during the daylight, with about 22 percent of crashes occurring near a traffic signal or at locations with no street lights when it was dark. The crashes that occurred

under these conditions are likely the result of poor lighting and can be reduced by providing proper lighting at intersections.

Within the study area, there were 48 fatal crashes and 5,065 injury crashes between 2011 and 2013. About four (4) percent of the crashes that occurred in the study area involved alcohol, almost 15 percent of total fatal crashes were alcohol related. Hence, this study recommends promoting programs that aim to eliminate drunk driving.

The four highest collision types, making up nearly 77 percent of the crashes in the study area, were rear end collisions, right angle collisions, non-collision with motor vehicle (NCWMV), and side swipe same direction. Recommendations for reducing these types of crashes are outlined below.

Rear End Collisions

In the study area, rear end collisions account for the largest amount of crashes. These crashes can be attributed to a number of factors. One main cause of rear end accidents is driver inattentiveness. Other potential causes include large turning volumes, slippery pavement, inadequate roadway lighting, crossing pedestrians, poor visibility of a traffic signal, congestion, inadequate signal timing, and/or an unwarranted signal.

The crash data shows high concentrations of rear end crashes along US 80 (Cypress Street, Bridge Street, Louisville Avenue, and DeSiard Street). The crashes occur primarily at intersections. Correlating the crash data with field conditions and observation reveals that many of these rear-end crashes may be influenced by intersection geometry and traffic operations. Rear-end crash frequency may be reduced by adjusting the yellow clearance intervals in compliance with the *Institute of Transportation Engineers (ITE)* recommended clearance interval practices. The number of crashes may further be reduced by reconfiguring the travel and turning lanes. This can be accomplished in a variety of methods including converting the two-way frontage roads to one-way frontage roads, providing exclusive right-turn lanes, providing advanced warning signs, providing indirect left-turns, or by displacing left-turn movements.

In general, the recommendations for reducing rear end crashes include the following:

- Analyze turning volumes to determine if a right turn lane or left turn lane is warranted. Providing a turning lane separates the turning vehicles from the through vehicles, preventing through vehicles from rear ending turning vehicles. If a large right turn volume exists, increasing the corner radius for right turns is an option.
- Check the pavement conditions. Rear end collisions caused by slippery pavement can be reduced by lowering the speed limit with enforcement, providing overlay pavement,

adequate drainage, groove pavement, or with the addition of a "Slippery When Wet" sign.

- Ensure roadway lighting is sufficient for drivers to see the roadway and surroundings.
- Determine if there is a large amount of pedestrian traffic. Pedestrians crossing the roads may impede traffic and force drivers to stop suddenly. If crossing pedestrians are an issue, options include installing or improving crosswalk devices and providing pedestrian signal indications.
- Check the visibility of the traffic signals at all approaches. In order to provide better visibility of the traffic signal, options include installing or improving warning signs, overhead signal heads, installing 12" signal lenses, visors and back plates, or relocating/adding signal heads.
- Verify that the signal timing is adequate to serve the traffic volumes at the trouble intersections. Options include adjusting phase-change interval, providing a red-clearance interval, providing progression, and utilizing signal actuation with dilemma zone protection.
- Verify that a signal is warranted at the given intersection.

Right Angle Collisions

Right angle collisions were the second most prevalent collision type in the study area between 2011 and 2013. They can be caused by a number of factors, including restricted sight distance, excessive speed, inadequate roadway lighting, poor visibility of a traffic signal, inadequate signal timing, inadequate advance warning signs, running a red light, and large traffic volumes.

In general, the recommendations for reducing right angle collisions include the following:

- Verify that the sight distance at all intersection approaches is not restricted. Options to alleviate restricted sight distance include removing the sight obstruction and/or installing or improving warning signs.
- Conduct speed studies to determine whether speed was a contributing factor. In order to reduce crashes caused by excessive speeding, the speed limit can be lowered with enforcement, the phase change interval can be adjusted, or rumble strips can be installed.
- Ensure roadway lighting is sufficient for drivers to see roadway and surroundings.
- Check the visibility of the traffic signal at all approaches. To provide better visibility of the traffic signal, options include installing or improving warning signs, overhead signal heads, installing 12" signal lenses, visors, back plates, and/or relocating or adding signal heads.

- Verify that the signal timing is adequate to serve the traffic volumes. Options include adjusting phase change intervals, providing a red-clearance interval, providing progression, and/or utilizing signal actuation with dilemma zone protection.

Verify that the intersection is designed to handle the traffic volume. If the traffic volumes are too large for the intersection's capacity, options include adding a lane(s) and retiming the signal.

Non-Collision with Motor Vehicle

NCWMV crashes are the third most prevalent crash type in the study area. A number of factors could be the cause for NCWMV crashes, including speeding, pavement surface conditions, lighting and markings, roadway geometry, and signal timing.

In general, the recommendations for reducing NCWMV crashes include:

- Conduct speed studies to determine whether or not speed was a contributing factor.
- Ensure roadway lighting is sufficient for drivers to see the roadway and surroundings during dark hours.
- Ensure proper application of traffic control devices.
- Verify proper signal head alignments as well as condition of signal head indications (i.e. lens burn through, L.E.D. usage, etc.)
- Verify that pavement markings are visible during day and night hours.
- Verify that the roadway geometry can be safely maneuvered by drivers.
- Provide and/or increase the shoulder width.
- Relocate fixed objects that are close to travel lanes.
- Improve the visibility of fixed objects during night.

Other Collisions Types

Within the study area, a number of other collision types are prevalent, including left turn- angle, left turn-opposite, left turn-same, right turn-same, right turn-opposite, sideswipe-same, and sideswipe-opposite.

In general, the recommendations for increasing the safety and reducing the number of crashes at all the study intersections include the following:

- Determine if the speed limit is too high or if vehicles in the area are traveling over the speed limit. Reducing the speed can reduce the severity of crashes and make drivers more attentive to their surroundings.
- Verify the clearance intervals for all signalized intersection approaches and ensure that there is an all red clearance. For larger intersections, it is particularly important to have a

long enough clearance interval for vehicles to safely make it through the intersection before the light turns red.

- Check for proper intersection signage, especially if the roadway geometry may be confusing for the driver. Verify that all one-way streets are marked “One-Way” and “No Turn” signs are placed at appropriate locations.
- Verify that pavement markings are visible during day and night hours.
- Verify that the roadway geometry can be easily maneuvered by drivers.
- Evaluate left and right turning volumes to determine if a right turn and/or left turn lane is warranted.
- Ensure roadway lighting is sufficient for drivers to see roadway and surroundings.
- Check the visibility of the traffic signals from all approaches.
- Verify that lanes are marked properly and provide turning and through movement directions, as well as signage that indicates lane configurations. This will prevent cars from dangerously switching lanes at the last minute and reduces crash potential.