



In Association with



Canal Bridge Replacement- Improvements ICE Study

**Lafourche Parish
Louisiana**



Prepared for:



October 2024



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Executive Summary

This Intersection Control Evaluation (ICE) Study was initiated to evaluate an added southbound left turn lane at the intersection of LA 1 at LA 20 (Canal Boulevard). The primary goal of the study is to determine the effects of the added southbound left turn lane.



Figure ES-1: Study Area

The intersection of LA 1 at LA 20 (Canal Boulevard) is a four-legged divided signalized intersection. There is a large median that divides the northbound and southbound approaches. The southbound approach consists of one shared through/left turn lane and one shared through/right turn lane. The northbound approach consists of one left turn lane, one through lane, and one shared through/right turn lane. With this existing geometry, vehicles stacked in the inside southbound creating a sight obstruction for northbound left turners on permitted phasing. The westbound and eastbound approaches consist of one left turn lane and one shared through/right turn lane.

During the course of this study, several safety concerns were identified. A crash analysis shows clusters of left turn-f crashes on the northbound and southbound approaches due to the permitted signal phasing. The northbound left turns also have a sight issue due to southbound left turners obstructing their view of oncoming southbound through vehicles in the outside lane. The crash analysis also revealed a sideswipe (sd) crash issue on the southbound approach. The operations analysis indicates that the intersection of

LA 1 and LA 20 (Canal Boulevard) currently operates with acceptable delays during the AM, Noon, and PM peak periods.

The intersection of LA 1 at LA 20 (Canal Boulevard) was analyzed with proposed improvements. These improvements include the installation of a southbound left turn lane, increased clearance intervals, and modifying the protected-permitted phasing on the north and south approaches to protected only phasing. The alternative analyses for these proposed improvements indicate an increase in the delays for the study intersection due to increased clearance times and protected only northbound and southbound phasing.

Based on the results of the operations and safety analyses, the following improvements are recommended: install a southbound left turn lane, modify the north and south signal phasing to protected only phasing, and increase clearance times. However, it is DOTD District 02H's preference to keep the existing clearance intervals as well as the protected/permitted left turn phasing due to operational concerns. Furthermore, a 5-section left turn signal head is preferred (in lieu of a 4-section flashing yellow arrow signal head) by the district for consistency as the remainder of LA 20 (Canal Boulevard) has existing 5-section left turn signal heads. It should be noted that while full benefits from the proposed improvements as described in this report are not anticipated without protected only phasing and increased clearance intervals, some safety benefits will still be present with only the installation of a southbound left turn lane.

Introduction

The Intersection Control Evaluation (ICE) Study was initiated to evaluate an added southbound left turn lane at the intersection of LA 1 at LA 20 (Canal Boulevard). The primary goals of the study are to improve safety and delays at this intersection.

The process used to identify existing issues and develop improvements is described in this report as follows.

Chapter 1 – Data Collection – 8-hour turning movement counts were collected at the study intersection on Thursday, October 13, 2022. Based on this data, the AM, Noon, and PM peak hours were identified for use in the analysis. All detailed data is included in **Appendix B**.

Chapter 2 – Existing Analysis – Existing Analyses were performed in Synchro 12 Software comparing delays, v/c ratios, and queues at the intersection. In addition, an existing crash analysis was performed at this intersection. The detailed crash analysis can be found in **Appendix C** and the detailed existing operational analysis can be found in **Appendix D**.

Chapter 3 – Build Analysis – The intersection of LA 1 at LA 20 (Canal Boulevard) was analyzed with the new intersection geometry using Synchro 12 Software. The build analysis was compared to the existing analysis to evaluate the effectiveness of the proposed geometry. Detailed Build analyses can be found in **Appendix E**.

Chapter 1 – Data Collection

1.1 Introduction

Data collection was required to effectively study the intersection of LA 1 at LA 20 (Canal Boulevard). The data collected includes the following

- 1.2.1 Turning Movement Counts
- 1.2.2 Peak Period Observations
- 1.2.3 Geometric Field Review

The study area is the intersection of LA 1 at LA 20 (Canal Boulevard) in Thibodaux, LA. A study area map can be found in **Appendix B**.

1.2 Data Collection

1.2.1 Turning Movement Counts

The 8-hour turning movement counts were collected on Thursday, October 13, 2022 at the study intersection for the AM, Noon, and PM peak hours while schools were still in session and there were no holidays that would affect traffic patterns. Furthermore, queues were also collected at the study intersection. No demand queues were observed resulting in the demand volume equal to the raw turning movement counts. Also, pedestrians and bicycles were counted during the peak periods. The turning movement counts, queue counts, and pedestrian/bicycle counts can be found in **Appendix B**.

After interpreting the data, it was determined that the AM peak occurs between 7:30 am to 8:30 am, the Noon peak hour occurs between 12:00 pm to 1:00 pm, and the PM peak hour occurs between 4:30 pm to 5:30 pm. Detailed analysis performed to determine the peak hour can be found in **Appendix B**.

1.2.2 Peak Period Observations

Peak period observations occurred on Thursday, October 13, 2022 at the study intersection of LA 1 and LA 20 (Canal Boulevard) during the AM, Noon, and PM peak hour times. Some of the significant observations include:

- During the Noon and PM peak periods, the northbound queue from the upstream signalized intersection would extend past the intersection of LA 1 at LA 20 (Canal Blvd).
- Some vehicles attempting to perform a southbound left would stop in the middle of the intersection while waiting for a gap. There is currently no dedicated southbound left turn lane for vehicles to store.
- Southbound left traffic would cause vehicles to queue in the inside southbound lane, but would clear within one cycle. It was observed during the peak period observations that vehicles caught behind stopped vehicles in the inside southbound lane would merge into the outside lane to pass stopped vehicles.

1.2.3 Geometric Field Review

A geometric field check was conducted to document existing conditions at the study intersection. These existing conditions include:

- Lane Widths
- Median Widths
- Lane Assignments
- Posted Speeds
- Sight Distance

The geometric field check can be found in **Appendix B**.

Chapter 2 – Existing Analysis

2.1 Introduction

This traffic study was initiated for an Intersection Control Evaluation (ICE) Study to evaluate an added southbound left turn lane at the intersection of LA 1 at LA 20 (Canal Blvd) in Thibodaux, Louisiana in Lafourche Parish. The goal of this study is to study the effects of an added southbound left turn lane on safety and operations. Existing safety and operational analyses were performed for this intersection. This chapter outlines the results of the existing analyses.

2.2 Existing Intersection Analysis

The intersection of LA 1 at LA 20 (Canal Blvd) is a four-legged divided signalized intersection. LA 1 is a two-way two-lane undivided highway with a posted speed limit of 25 miles per hour on the westbound approach and 35 miles per hour on the eastbound approach. The eastbound and westbound approaches both consist of one shared through/right turn lane and one left turn lane. LA 20 (Canal Blvd) is a two-way four-lane divided highway with a posted speed limit of 35 miles per hour. The northbound approach consists of one shared through/right turn lane, one through lane, and one left turn lane. The southbound approach consists of one shared through/right turn lane and one shared through/left turn lane. Signal phases 1,3,5,7 all run protected/permissive phasing with 5-section signal heads.

Intersection analyses were performed using the “HCM 2000” module of the Synchro 12 software. The capacity analyses for this intersection during the AM, Noon, and PM analyses periods for existing conditions are presented in **Appendix D**.

The operational analyses indicate that under existing conditions, the intersection of LA 1 at LA 20 (Canal Blvd) currently operates with acceptable delays during the AM, Noon, and PM peak periods. The 95th percentile queues, observed max queues, and approach delays of this intersection are presented on aerial maps for AM, Noon, and PM peaks in **Appendix D**.

Crashes were pulled from the CARTS database for the latest three years of record (January 1, 2021 through December 31, 2023) at the intersection of LA 1 at LA 20 (Canal Blvd). The intersection of LA 1 at LA 20 (Canal Blvd) had fifty-five (55) observed crashes in 2021-2023. Of the fifty-five (55) crashes, the CARTS pattern recognition analysis flagged fifteen (15) left turn-f crashes and a cluster of eight (8) left turn-f crashes are shown on the collision diagram between southbound left turns and northbound throughs. Another cluster of six (6) left turn-f crashes occurred between northbound left turns and southbound throughs. These left turn-f crashes mostly occurred on the permitted left turn phase. CARTS pattern recognition analysis also flagged thirteen (13) right angle crashes as an area of concern. A cluster of four (4) right angle crashes between southbound through and westbound through were observed at this intersection. A cluster of six (6) side-swipes was also noted on the southbound approach. These crashes were caused by southbound through vehicles switching from the inside lane to the outside through lane to avoid waiting behind southbound left turners which block the through lane since there is currently no turn lane.

2.3 Summary of Findings

The Synchro results show that the intersection of LA 1 and LA 20 (Canal Blvd) currently has no operational deficiencies during the peak hours. The safety analysis noted areas of concern at this intersection. This included left turn-f crashes between southbound left and northbound through as well as between northbound left and southbound throughs. It should be noted that all left turn movements have a 5-section left turn signal head that operates the protected/permitted left turns. The majority of left turn crashes occurred on permitted phasing. In addition, the southbound approach has no dedicated left turn lane which causes drivers to attempt a lane change. The current left turns must stop in the left/through lane to wait to turn left.

2.4 Recommendations based on Existing Analyses

Based on the existing analyses performed for the intersection of LA 1 at LA 20 (Canal Blvd), the following areas of concern and potential solutions were identified and documented in the following table.

Areas of Concern	Description	Potential Solution
Northbound left turn-f crash cluster	Mostly occur on permitted phasing.	• Protected-only phasing
Southbound left turn-f crash cluster	Mostly occur on permitted phasing	• Protected-only phasing
Southbound side-swipe crash cluster	Mostly occur due to through vehicles switching lanes to avoid waiting behind southbound lefts	• Install southbound left turn bay

Chapter 3 – Alternative Analysis

3.1 Introduction

This traffic study evaluates an added southbound left turn lane at the intersection of LA 1 at LA 20 (Canal Boulevard). The primary goals of this study are to improve safety and analyze the impacts of the build design on level of service and delays.

3.2 Build Intersection Operational Analysis

The intersection analyses were performed using Synchro 12 Software. Due to the existing safety issues found during the safety analysis, the northbound and southbound left turns were analyzed as protected only left turns. Additionally, clearance calculations were performed for the build geometry. The clearance calculations show that the existing clearances should be increased. The capacity analyses for this intersection during the AM, Noon, and PM peak periods for Existing and Build conditions are presented in **Table 3-1**. The build design layout is illustrated in **Figure 3-1**. Detailed Build Analysis as well as Analysis Results Maps (summaries of MOE results) can be found in **Appendix E**.



Figure 3-1: LA 1 at LA 20 (Canal Boulevard)

The build design consists of modifying the southbound approach to one exclusive left turn lane, one exclusive through lane, and one shared through/right turn lane. The existing geometry will be maintained on all other approaches.

Table 3-1 – LA 1 at LA 20 (Canal Boulevard)

Scenario	NB Left (Canal Blvd)			
	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)
<i>AM Peak</i>				
Existing	B	17.5	0.07	19
Proposed	F	86	0.63	38
<i>Noon Peak</i>				
Existing	C	20.1	0.14	33
Proposed	D	55	0.48	64
<i>PM Peak</i>				
Existing	B	19.9	0.08	21
Proposed	F	93	0.66	41

The results show that all movements with the exception of the northbound left are anticipated to operate with acceptable delays. The full results can be found in **Appendix E**. The results show an increase in delay for the northbound left turn movement. The increase in delay can be attributed to switching from protected only left turn movement to address areas of concern identified in **Chapter 2**. It should also be noted that with the added southbound left turn lane, 95th percentile queues are anticipated to decrease in all time periods analyzed.

During the existing safety analysis found in **Appendix C**, it was determined that during the study period of January 1, 2021 through December 31, 2023 there were fifty-five (55) crashes within the study area.

In Appendix E, the proposed geometry for build conditions for the intersection of LA 1 at LA 20 (Canal Boulevard) was utilized to determine if the crash issues determined in **Appendix C** would be mitigated by these improvements. This was done by utilizing crash modification factors.

In order to analyze the effects of the proposed geometry on safety, Crash Modification Factors (CMFs) were utilized. These CMFs were obtained from Crash Modification Factors Clearinghouse a searchable database. Several CMFs were considered in determining the anticipated safety improvements by the build scenario. A summary of the CMFs is shown in **Table 3-2**.

Table 3-2 – CMF Summary Table

CMF Name	CMF ID	CMF	Applies to:
Increase Total Change Interval	4219	0.92	All Crashes
Install left-turn lane (signal has left-turn phase)	1581	0.65	All Crashes
Protected/permissive to protected only left turn phasing	11159	0.745	All Crashes

As shown in the table, a CMF for Increase Total Change Interval, install left-turn lane (signal has left-turn

phase), and protected/permissive to protected only left turn phasing were utilized. Because these CMFs apply to all crash types, they can be multiplied together to make a single CMF for the proposed geometry. Further details on how these CMFs were determined can be found in **Appendix E**.

Using the calculated CMF, a reduction in crashes along with the anticipated total number of crashes after the proposed geometry and recommendations are implemented was determined. These numbers can be seen below in **Table 3-3**.

Table 3-3 – Crash Reduction Summary

Crash Code	Crash Type	Existing # of Crashes	CMF	Reduction Due to CMF	Expected # of Crashes
A	Non-Collision	0	0.45	0	0
B	Rear End	12	0.45	-7	5
C	Head On	0	0.45	0	0
D	Right Angle	13	0.45	-7	6
E	Left Turn-e	0	0.45	0	0
F	Left Turn-f	15	0.45	-8	7
G	Left Turn-g	1	0.45	-1	0
H	Right Turn-h	2	0.45	-1	1
I	Right Turn-i	1	0.45	-1	0
J	Side Swipe (sd)	9	0.45	-5	4
K	Side Swipe (od)	0	0.45	0	0
Z	Other	2	0.45	-1	1
Total		55		-31	24

As shown in the table above, of the fifty-five (55) crashes that occurred at the study intersection, thirty-one (31) of these crashes may have been corrected with the new geometry, the increased total change interval, and switching to protected only left turns. This would have resulted in a reduction of 56.4% for a total of twenty-four (24) total crashes.

While the protected only phasing and increased clearance times are recommended, it is DOTD District 02H's preference to keep the existing clearance intervals as well as the protected/permitted left turn phasing due to concerns of increased delays at the intersection. Furthermore, a 5-section left turn signal head is preferred by the district for consistency as the remainder of LA 20 (Canal Boulevard) has existing 5-section left turn signal heads. It should be noted that while the additional safety benefits from the protected only phasing and increased clearance intervals would not be present under these preferences, the safety benefits from the added southbound left turn lane will still be present.

3.3 Summary of Findings

The proposed intersection geometry change at the intersection of LA 1 at LA 20 (Canal Boulevard) presents safety and operational benefits. The addition of the southbound left turn lane on LA 20 (Canal Boulevard) shows an expected reduction in crashes. Additionally, adjusting the northbound and southbound phasing to be protected only and increasing the clearance intervals would decrease expected crashes further. These modifications (increasing the clearance interval and removing the permitted northbound and southbound left turn phase) are anticipated to introduce additional delays. Therefore, LADOTD District 02H prefers to maintain the protected/permitted phasing via a 5-section left turn signal head as well as maintain the existing clearance intervals.

Appendix A

Initial Data Collection

THIS APPENDIX IS NOT INCLUDED IN THE SCOPE

Appendix B

Final Data Collection

- I. Study Area
- II. Peak Period Counts
 - a. Raw Turning Movement Counts
 - b. Demand Queues
 - c. Peak Hour Determination
 - d. Pedestrian and Bicycle Counts
- III. Peak Period Observations
- IV. Geometric Field Check
- V. QAQC

Appendix B

I. Study Area

The study area for this project includes the intersection of LA 1 at LA 20 (Canal Blvd). The study area map can be seen in **Figure B-1**.



LEGEND

 STUDY AREA

FIGURE B-1
LA 1 AT LA 20 (CANAL BLVD)
STUDY AREA

LAFOURCHE PARISH



Appendix B

II. Peak Period Counts

a. Raw Turning Movement Counts

All peak period counts were collected on Thursday, October 13, 2022, by NSI personnel. These peak period counts were performed at the study intersection:

- LA 1 at LA 20 (Canal Blvd)

Turning movement counts with heavy vehicles for the study intersection were collected during the peak periods of 6:00 am to 9:00 am, 11:00 am to 1:00 pm, and 3:00 pm to 6:00 pm. This data is attached.

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Site Code : 17424
Start Date : 10/13/2022
Page No : 1

Groups Printed- Passenger - Heavy Vehicle

	LA 20 (CANAL BLVD) Southbound					LA 1 Westbound				LA 20 (CANAL BLVD) Northbound					LA 1 Eastbound				
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	10	51	4	0	65	2	8	8	18	2	32	6	0	40	3	10	1	14	137
06:15 AM	13	79	4	0	96	4	12	6	22	0	35	2	0	37	4	31	1	36	191
06:30 AM	19	75	11	0	105	9	19	11	39	1	51	1	0	53	4	33	1	38	235
06:45 AM	17	118	12	0	147	6	18	13	37	1	62	7	0	70	0	42	2	44	298
Total	59	323	31	0	413	21	57	38	116	4	180	16	0	200	11	116	5	132	861
07:00 AM	28	125	2	0	155	6	25	8	39	2	69	13	0	84	8	51	4	63	341
07:15 AM	58	159	9	0	226	7	27	23	57	3	75	20	0	98	4	58	3	65	446
07:30 AM	62	199	14	1	276	13	34	18	65	3	105	16	0	124	6	69	4	79	544
07:45 AM	38	174	16	0	228	13	31	28	72	4	105	8	0	117	8	66	1	75	492
Total	186	657	41	1	885	39	117	77	233	12	354	57	0	423	26	244	12	282	1823
08:00 AM	30	112	15	0	157	19	44	11	74	5	86	7	0	98	6	46	3	55	384
08:15 AM	36	114	20	0	170	22	42	20	84	4	114	9	1	128	14	50	2	66	448
08:30 AM	38	127	14	0	179	10	30	25	65	8	84	11	0	103	11	56	2	69	416
08:45 AM	35	112	30	0	177	16	41	18	75	8	83	11	0	102	12	56	3	71	425
Total	139	465	79	0	683	67	157	74	298	25	367	38	1	431	43	208	10	261	1673
*** BREAK ***																			
11:00 AM	18	118	22	0	158	20	29	29	78	7	135	14	0	156	16	45	3	64	456
11:15 AM	21	151	20	0	192	12	24	26	62	5	144	15	0	164	24	35	6	65	483
11:30 AM	31	141	22	0	194	14	34	37	85	5	148	13	0	166	19	42	2	63	508
11:45 AM	33	127	26	0	186	12	42	28	82	4	109	16	0	129	34	40	2	76	473
Total	103	537	90	0	730	58	129	120	307	21	536	58	0	615	93	162	13	268	1920
12:00 PM	32	143	21	0	196	12	42	44	98	8	174	12	0	194	27	47	5	79	567
12:15 PM	27	133	28	0	188	17	50	27	94	9	133	13	0	155	31	34	3	68	505
12:30 PM	27	152	22	0	201	3	37	30	70	13	119	14	1	147	24	27	4	55	473
12:45 PM	27	157	37	0	221	15	43	27	85	7	134	11	0	152	20	39	4	63	521
Total	113	585	108	0	806	47	172	128	347	37	560	50	1	648	102	147	16	265	2066
*** BREAK ***																			
03:00 PM	22	152	18	0	192	14	50	47	111	14	156	13	0	183	11	29	4	44	530
03:15 PM	23	147	25	1	196	10	56	38	104	6	157	6	1	170	10	48	6	64	534
03:30 PM	16	153	35	0	204	9	53	36	98	4	164	16	0	184	20	44	3	67	553
03:45 PM	28	129	36	1	194	9	44	27	80	8	139	10	0	157	19	47	4	70	501
Total	89	581	114	2	786	42	203	148	393	32	616	45	1	694	60	168	17	245	2118
04:00 PM	34	156	29	0	219	13	30	35	78	2	143	13	0	158	23	55	3	81	536
04:15 PM	32	131	22	0	185	12	39	47	98	8	143	7	0	158	19	55	4	78	519
04:30 PM	25	159	28	0	212	13	46	30	89	8	151	12	1	172	42	65	2	109	582
04:45 PM	37	169	28	1	235	11	51	43	105	4	137	11	0	152	25	55	1	81	573
Total	128	615	107	1	851	49	166	155	370	22	574	43	1	640	109	230	10	349	2210
05:00 PM	34	180	23	0	237	11	44	32	87	3	157	14	0	174	25	62	5	92	590
05:15 PM	44	181	17	0	242	14	45	25	84	6	141	11	0	158	19	54	2	75	559
05:30 PM	32	171	18	0	221	9	38	33	80	4	116	10	0	130	18	54	3	75	506
05:45 PM	41	161	16	0	218	5	31	24	60	3	99	9	0	111	17	43	2	62	451
Total	151	693	74	0	918	39	158	114	311	16	513	44	0	573	79	213	12	304	2106
Grand Total	968	4456	644	4	6072	362	1159	854	2375	169	3700	351	4	4224	523	1488	95	2106	14777
Apprch %	15.9	73.4	10.6	0.1		15.2	48.8	36		4	87.6	8.3	0.1		24.8	70.7	4.5		
Total %	6.6	30.2	4.4	0	41.1	2.4	7.8	5.8	16.1	1.1	25	2.4	0	28.6	3.5	10.1	0.6	14.3	

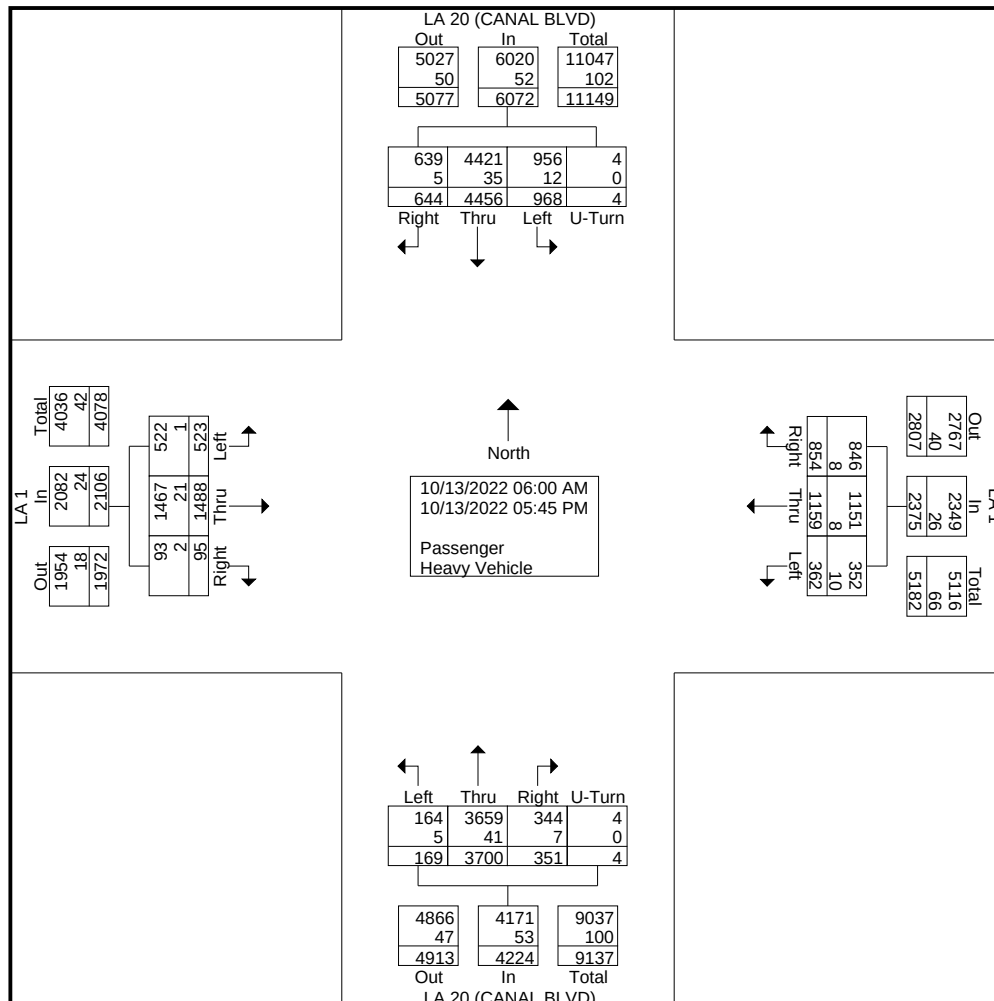
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Groups Printed- Passenger - Heavy Vehicle

	LA 20 (CANAL BLVD) Southbound					LA 1 Westbound				LA 20 (CANAL BLVD) Northbound					LA 1 Eastbound				
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Int. Total
Passenger	956	4421	639	4	6020	352	1151	846	2349	164	3659	344	4	4171	522	1467	93	2082	14622
% Passenger																			
Heavy Vehicle	12	35	5	0	52	10	8	8	26	5	41	7	0	53	1	21	2	24	155
% Heavy Vehicle	1.2	0.8	0.8	0	0.9	2.8	0.7	0.9	1.1	3	1.1	2	0	1.3	0.2	1.4	2.1	1.1	1

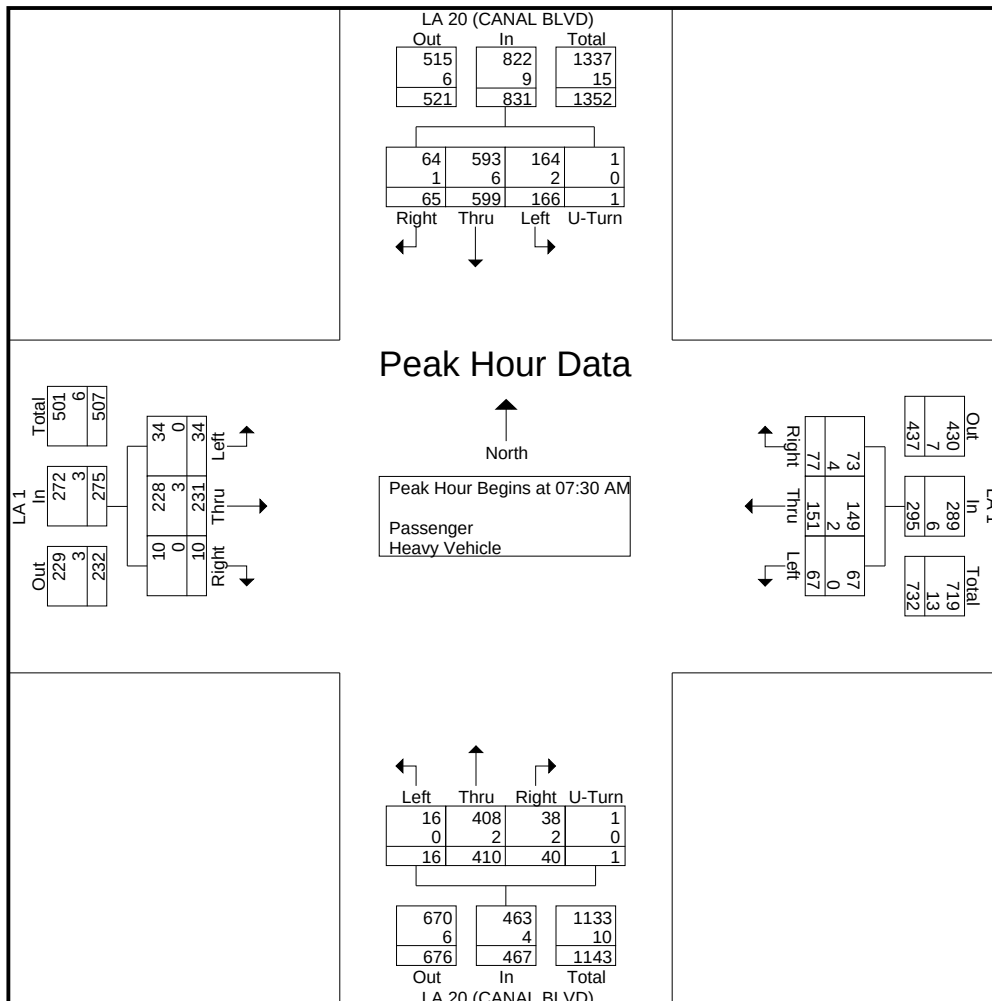


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	LA 20 (CANAL BLVD) Southbound					LA 1 Westbound				LA 20 (CANAL BLVD) Northbound					LA 1 Eastbound				
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 07:30 AM																			
07:30 AM	62	199	14	1	276	13	34	18	65	3	105	16	0	124	6	69	4	79	544
07:45 AM	38	174	16	0	228	13	31	28	72	4	105	8	0	117	8	66	1	75	492
08:00 AM	30	112	15	0	157	19	44	11	74	5	86	7	0	98	6	46	3	55	384
08:15 AM	36	114	20	0	170	22	42	20	84	4	114	9	1	128	14	50	2	66	448
Total Volume	166	599	65	1	831	67	151	77	295	16	410	40	1	467	34	231	10	275	1868
% App. Total	20	72.1	7.8	0.1		22.7	51.2	26.1		3.4	87.8	8.6	0.2		12.4	84	3.6		
PHF	.669	.753	.813	.250	.753	.761	.858	.688	.878	.800	.899	.625	.250	.912	.607	.837	.625	.870	.858
Passenger	164	593	64	1	822	67	149	73	289	16	408	38	1	463	34	228	10	272	1846
% Passenger	98.8	99.0	98.5	100	98.9	100	98.7	94.8	98.0	100	99.5	95.0	100	99.1	100	98.7	100	98.9	98.8
Heavy Vehicle	2	6	1	0	9	0	2	4	6	0	2	2	0	4	0	3	0	3	22
% Heavy Vehicle	1.2	1.0	1.5	0	1.1	0	1.3	5.2	2.0	0	0.5	5.0	0	0.9	0	1.3	0	1.1	1.2

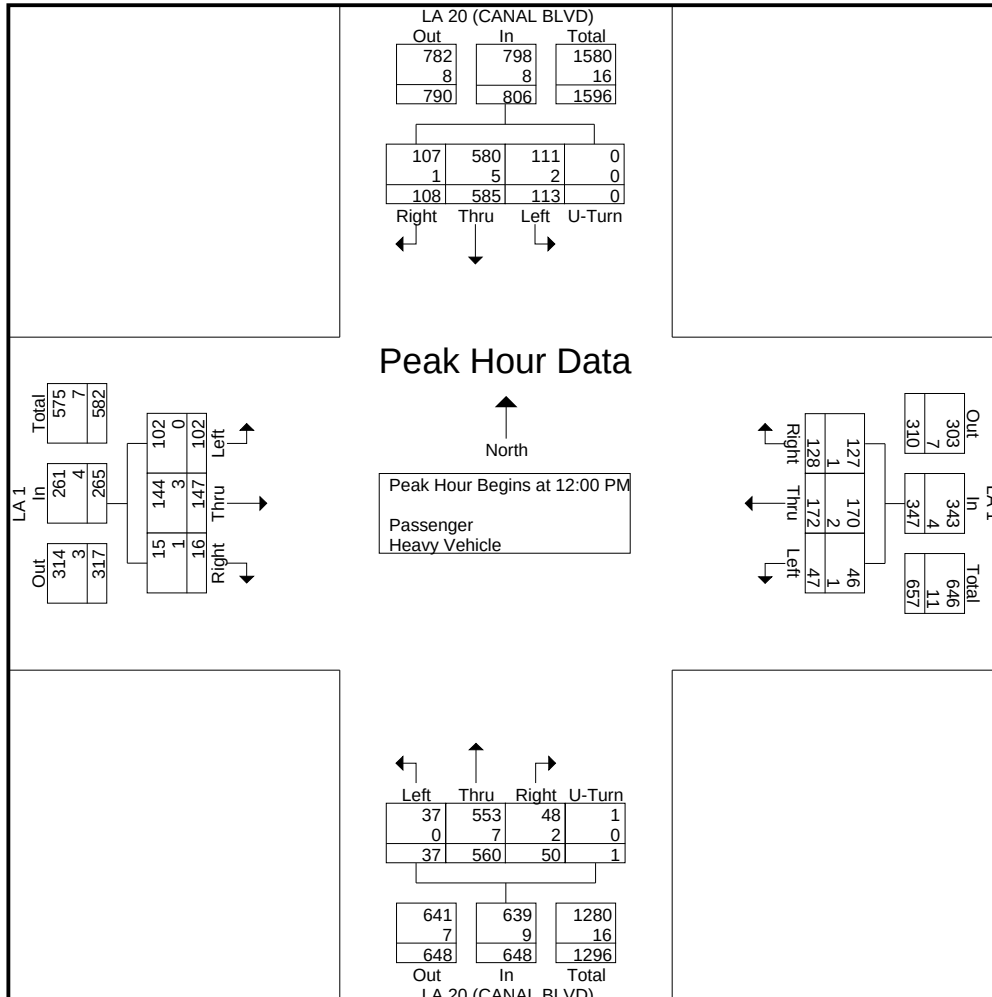


Neel-Schaffer

10000 Perkins Rowe, Suite G360
Baton Rouge, LA, 70810
Solutions You Can Build Upon

File Name : LA 20 @ LA 1
Site Code : 17424
Start Date : 10/13/2022
Page No : 4

	LA 20 (CANAL BLVD) Southbound					LA 1 Westbound				LA 20 (CANAL BLVD) Northbound					LA 1 Eastbound				
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 10:45 AM to 12:45 PM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 12:00 PM																			
12:00 PM	32	143	21	0	196	12	42	44	98	8	174	12	0	194	27	47	5	79	567
12:15 PM	27	133	28	0	188	17	50	27	94	9	133	13	0	155	31	34	3	68	505
12:30 PM	27	152	22	0	201	3	37	30	70	13	119	14	1	147	24	27	4	55	473
12:45 PM	27	157	37	0	221	15	43	27	85	7	134	11	0	152	20	39	4	63	521
Total Volume	113	585	108	0	806	47	172	128	347	37	560	50	1	648	102	147	16	265	2066
% App. Total	14	72.6	13.4	0		13.5	49.6	36.9		5.7	86.4	7.7	0.2		38.5	55.5	6		
PHF	.883	.932	.730	.000	.912	.691	.860	.727	.885	.712	.805	.893	.250	.835	.823	.782	.800	.839	.911
Passenger	111	580	107	0	798	46	170	127	343	37	553	48	1	639	102	144	15	261	2041
% Passenger	98.2	99.1	99.1	0	99.0	97.9	98.8	99.2	98.8	100	98.8	96.0	100	98.6	100	98.0	93.8	98.5	98.8
Heavy Vehicle	2	5	1	0	8	1	2	1	4	0	7	2	0	9	0	3	1	4	25
% Heavy Vehicle	1.8	0.9	0.9	0	1.0	2.1	1.2	0.8	1.2	0	1.3	4.0	0	1.4	0	2.0	6.3	1.5	1.2



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Baton Rouge, LA, 70810
Solutions You Can Build Upon

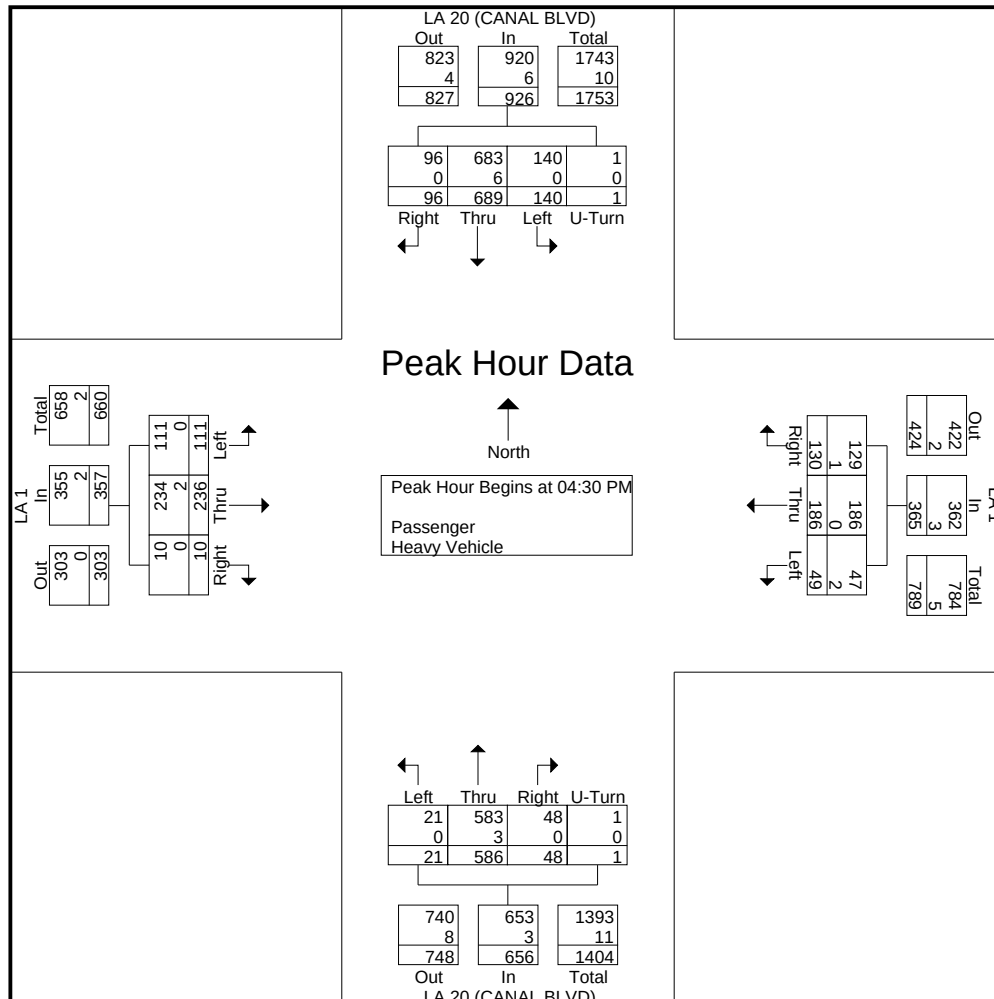
File Name : LA 20 @ LA 1
Site Code : 17424
Start Date : 10/13/2022
Page No : 5

	LA 20 (CANAL BLVD) Southbound					LA 1 Westbound				LA 20 (CANAL BLVD) Northbound					LA 1 Eastbound				
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM

04:30 PM	25	159	28	0	212	13	46	30	89	8	151	12	1	172	42	65	2	109	582
04:45 PM	37	169	28	1	235	11	51	43	105	4	137	11	0	152	25	55	1	81	573
05:00 PM	34	180	23	0	237	11	44	32	87	3	157	14	0	174	25	62	5	92	590
05:15 PM	44	181	17	0	242	14	45	25	84	6	141	11	0	158	19	54	2	75	559
Total Volume	140	689	96	1	926	49	186	130	365	21	586	48	1	656	111	236	10	357	2304
% App. Total	15.1	74.4	10.4	0.1		13.4	51	35.6		3.2	89.3	7.3	0.2		31.1	66.1	2.8		
PHF	.795	.952	.857	.250	.957	.875	.912	.756	.869	.656	.933	.857	.250	.943	.661	.908	.500	.819	.976
Passenger	140	683	96	1	920	47	186	129	362	21	583	48	1	653	111	234	10	355	2290
% Passenger	100	99.1	100	100	99.4	95.9	100	99.2	99.2	100	99.5	100	100	99.5	100	99.2	100	99.4	99.4
Heavy Vehicle	0	6	0	0	6	2	0	1	3	0	3	0	0	3	0	2	0	2	14
% Heavy Vehicle	0	0.9	0	0	0.6	4.1	0	0.8	0.8	0	0.5	0	0	0.5	0	0.8	0	0.6	0.6



Appendix B

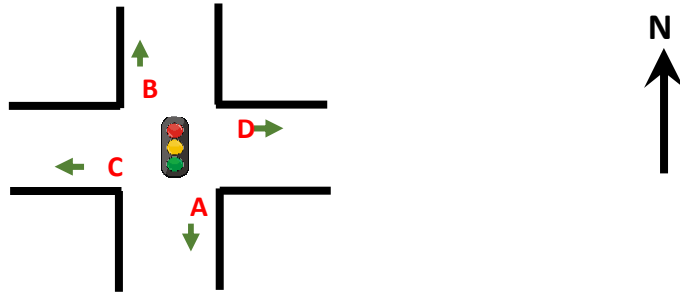
II. Peak Period Counts

b. Demand Queues

The number of vehicles not served at the end of each 15-minute turning movement count interval was noted as a queue count. These volumes were then added to the proper 15-minute period to calculate demand. These demand volumes were then used to determine the peak hours for the AM, Noon, and PM periods as shown in **Appendix B Section C**. This data is attached. It should be noted that no demand queues were noted. Therefore, the raw turning movement count volumes will be equal to the demand volumes.

15 MIN DEMAND QUEUE COUNT

Date: 10/13/2022
 N/S Street: LA 20 (Canal Blvd)
 E/W Street: LA 1



TIME	A [NB]			B [SB]		C [EB]		D [WB]	
AM PEAK									
	Left	Thru	Thru/Right	Left/Thru	Thru/Right	Left	Thru/Right	Left	Thru/Right
6:00 AM	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
MIDDAY PEAK									
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0
PM PEAK									
3:00 PM	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0

Appendix B

II. Peak Period Counts

c. Peak Hour Determination

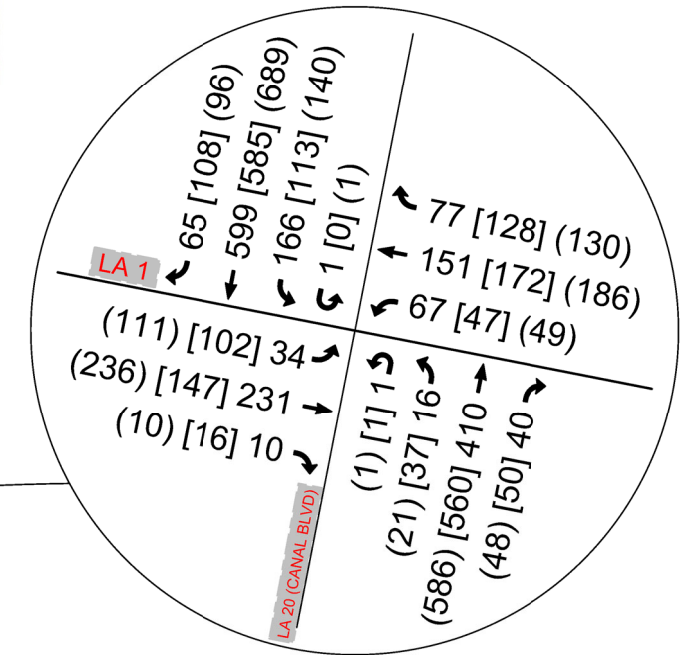
Based on the collected data, it was determined that the AM peak hour occurred between 7:30 am and 8:30 am, the Noon peak hour occurred between 12:00 pm and 1:00 pm, and the PM peak hour occurred between 4:30 pm and 5:30 pm. As mentioned in the previous section, due to the fact that no demand queues were observed, the peak hours for the demand volumes are equal to the raw turning movement count peak hours.

Appendix B

II. Peak Period Counts

d. Pedestrian and Bicycle Counts

During the peak periods, pedestrian and bicycle activity was also recorded. These counts are included in this section. Also, a figure depicting the final turning movement counts was developed for the study intersection and 15-minute count locations. The final turning movement counts can be seen in **Figure B-2** and the pedestrian and bicycle counts can be seen in **Figure B-3**.



LEGEND

- STUDY INTERSECTION
- XX [XX] (XX) AM [NOON] (PM)

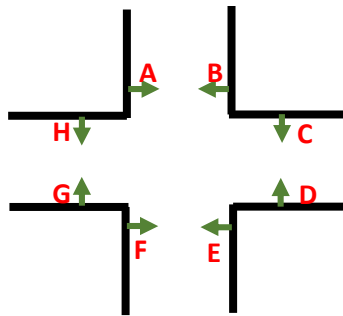
FIGURE B-2
LA 1 AT LA 20 (CANAL BLVD) - ICE STUDY
2022 EXISTING TURNING MOVEMENT VOLUMES

LAFOURCHE PARISH



PEDESTRIAN COUNT

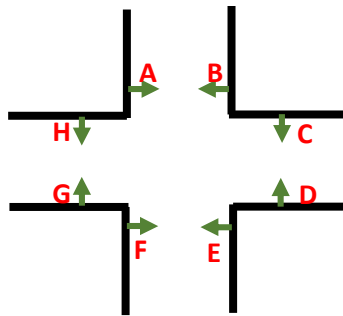
Date: 9/12/2023
 N/S Street: LA 20 (Canal Blvd)
 E/W Street: LA 1



	Southbound		Westbound		Northbound		Eastbound	
Start Time	A	B	C	D	E	F	G	H
AM PEAK								
6:00 AM								
6:15 AM								
6:30 AM								
6:45 AM								
7:00 AM								
7:15 AM								
7:30 AM							1	
7:45 AM								
8:00 AM								
8:15 AM								
8:30 AM								
8:45 AM					1			
MIDDAY PEAK								
11:00 AM								
11:15 AM								
11:30 AM								
11:45 AM								
12:00 PM								
12:15 PM								
12:30 PM								
12:45 PM								
PM PEAK								
3:00 PM					2			
3:15 PM								
3:30 PM								
3:45 PM								1
4:00 PM								1
4:15 PM								
4:30 PM					1			
4:45 PM								
5:00 PM								1
5:15 PM								
5:30 PM								
5:45 PM								

BIKE COUNT

Date: 9/12/2023
 N/S Street: LA 20 (Canal Blvd)
 E/W Street: LA 1



	Southbound		Westbound		Northbound		Eastbound	
Start Time	A	B	C	D	E	F	G	H
AM PEAK								
6:00 AM								
6:15 AM								
6:30 AM								
6:45 AM								
7:00 AM								
7:15 AM								
7:30 AM								
7:45 AM								
8:00 AM								
8:15 AM								
8:30 AM								
8:45 AM								
MIDDAY PEAK								
11:00 AM							1	
11:15 AM							1	
11:30 AM								
11:45 AM								
12:00 PM								
12:15 PM								1
12:30 PM								
12:45 PM								
PM PEAK								
3:00 PM								
3:15 PM								
3:30 PM								
3:45 PM								1
4:00 PM								
4:15 PM			1					
4:30 PM								
4:45 PM								
5:00 PM								
5:15 PM								
5:30 PM								
5:45 PM								

Appendix B

III. Peak Period Observations

Peak period observations for each intersection were performed on Thursday, October 13, 2022, by NSI personnel. Issues that were observed are illustrated on the attached as well as described below. Detailed observations for each intersection are attached.

- During the Noon and PM peak periods, the queue from the upstream signalized intersection would extend past the intersection of LA 1 at LA 20 (Canal Blvd).
- Some vehicles attempting to perform a southbound left would stop in the middle of the intersection while waiting for a gap. There is currently no dedicated southbound left turn lane for vehicles to store.
- Southbound left traffic would cause vehicles to queue in the inside southbound lane, but would clear within one cycle.

Peak Period Observations

Intersection: LA 1 at Canal Blvd

Date: Thursday, October 13, 2022

Weather Conditions: Clear Skies

Project site traffic observations at the intersection of LA 1 at Canal Blvd are summarized below. The observations were performed on Tuesday, September 12, 2023, from 6:00 am – 9:00 am, 11:00 am – 1:00 pm, and 3:00 pm – 6:00pm.

General Observations

- There are no pedestrian accommodations at this intersection.
- The striping and pavement are in fair condition.
- There is street lighting at the intersection.
- The posted speed limit for LA 1 westbound is 25 mph.
- The posted speed limit for LA 1 eastbound is 35 mph
- The posted speed limit for LA 20 (Canal Blvd) is 35 mph
- Vehicles exiting the bank sometimes have to wait for someone to let them out during the peak hours.
- During peak hours, vehicles attempting to make a SBL sometimes cause SBT traffic in the inside lane to either slow, stop, or merge into the outside lane.

AM Peak Period (6:00 am – 9:00 am)

- 6:00 am – Typical early morning traffic. No Issues.
- 6:15 am – Slight NB and SB traffic increase.
- 6:30 am – Steady NB traffic. No changes.
- 6:45 am – Steady traffic increase on all approaches.
- 7:00 am – 8-10 car queues in the NB lanes but everyone clears the cycle.
- 7:15 am – No changes.
- 7:16 am – SB car gets caught in yellow light trap.
- 7:20 am – Vehicle attempting a SBL causes a slow in SBT traffic while waiting to turn.

- 7:23 am – Vehicle attempting SBL causes vehicles to stop while waiting and causes multiple vehicles to catch the red light.
- 7:30 am – Steady traffic flow.
- 7:32 am – SBL vehicle causes large queue in inside lane.
- 7:41 am – Pedestrian walking NB crosses EB approach.
- 7:45 am – Heavy NB and SB traffic flow. There is consistent queueing in the inside lane due to Vehicles attempting a SBL.
- 7:49 am – SB left vehicle ran red light.
- 7:52 am – NB ambulance with lights.
- 7:57 am – A vehicle is observed pulling into and stopping in the middle of the intersection while waiting for a chance to make a SBL.
- 8:00 am – No changes. Construction worker observing something in the southeast quadrant.
- 8:15 am – No changes. Steady traffic.
- 8:18 am – Some vehicles observed going around stopped vehicles that were attempting to make a SBL.
- 8:30 am – SB Left ran red light. No changes.
- 8:31 am – A construction tractor is observed going SBT.
- 8:45 am – Decrease in NB and SB traffic flow.
- 8:58 am – Pedestrian crosses NB approach heading west.
- 9:00 am – No changes.

Noon Peak Period (11:00 am – 1:00 pm)

- 11:00 am – Construction work on the corner of the southeast quadrant is observed. Traffic volumes are light. Minimal queues.
- 11:09 am – Heavy vehicles present in all approaches.
- 11:13 am – Bicyclist crosses EB approach heading north.
- 11:15 am – NB and SB traffic has increased. Vehicles observed pulling into and stopping the middle of the intersection to make a SBL.
- 11:16 am – Bicyclist observed crossing the EB approach traveling NB.
- 11:21 am – SBL vehicles observed causing a slow in the inside southbound through/left lane.

- 11:28 am – The NB queue from the northern intersection reached the intersection but did not cross. Vehicle making SBL waited in the middle of the intersection and proceeded once the light turned red.
- 11:30 am – Increase in traffic from all approaches. Some minor queueing observed. All queues observed to make it through one cycle.
- 11:36 am – SBL vehicle caused a queue while waiting to turn.
- 11:37 am – Increase in SB volumes. Ped observed crossing NB approach heading EB.
- 11:45 am – No changes. Heavy NB and SB traffic.
- 12:00 pm – Volume is unchanged. Queues clear within one cycle. SBL vehicles consistently cause slowing.
- 12:14 pm – SBL vehicle runs red light after waiting through most of the cycle.
- 12:15 pm – All approach volumes have increased. All queues are served within one cycle.
- 12:25 pm – Bicyclist crosses EB approach heading south.
- 12:30 pm – No changes.
- 12:37 pm – Queue from northern light backed up past the intersection but cleared with one cycle.
- 12:43 pm – Queue passed intersection once more.
- 12:45 pm – Volumes have not changed. Queues are still served with one cycle.
- 1:00 pm – Volumes have decreased slightly. Queues are unchanged.

PM Peak Period (3:00 pm – 6:00 pm)

- 3:00 pm – Construction work still ongoing. Heavy NB traffic.
- 3:09 pm – NB traffic from upstream signal backs up to intersection. Two pedestrians walking together cross NB approach heading west.
- 3:12 pm – SBL vehicle causes large queue in inside SB lane while waiting to turn.
- 3:15 pm – Heavy traffic on all approaches.
- 3:20 pm – SB left runs red light.
- 3:30 pm – No changes. Slight increase in traffic. Construction work has stopped.
- 3:45 pm – Heavy SB and NB traffic. SB bicyclist crosses EB approach.
- 3:56 pm – SBL vehicle has to back up due to being too far into the intersection and getting caught by the red light. SB pedestrian cross EB approach.
- 4:00 pm – No changes.

- 4:10 pm – SB pedestrian crosses EB approach.
- 4:15 pm – No changes.
- 4:16 pm – SB bicyclist in the NB lanes crosses the WB approach.
- 4:30 pm – Very noticeable platoons of SB and NB traffic. 1 PED crosses NB and SB lanes going WB.
- 4:39 pm – Heavy NB traffic.
- 4:45 pm – Steady heavy traffic flow.
- 5:00 pm – No changes.
- 5:10 pm – Pedestrian heading south crosses EB approach.
- 5:15 pm – Slight decrease in NB traffic.
- 5:30 pm – Decrease in traffic on all approaches.
- 5:45 pm – No changes.
- 6:00 pm – No changes.

Appendix B

IV. Geometric Field Check

A geometric field check was conducted at the intersection of LA 1 at LA 20 (Canal Blvd). The geometric field check included the verification of lane widths, shoulder widths, median widths, and number of lanes. Detailed geometric field check maps are attached in **Figure B-4**.



FIGURE B-4
CANAL BRIDGE REPLACEMENT-IMPROVEMENTS
GEOMETRIC FIELD CHECK
LA 1 AT CANAL BLVD

TRAFFIC SIGNAL INVENTORY (v2.1)															TSI NO. 29-006			
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT															PAGE: 1 OF 4			
INTERSECTION: LA 20 (Canal Blvd) @ LA 1										CTRL SEC: 065-06		LOGMILE: 0						
CITY: Thibodaux					PARISH: Lafourche					LAT: 29.798935		LONG: -90.818033						
SIGNAL TYPE: Fully Actuated Controller					INTERCONNECT TYPE: GPS					REV. DATE:		INSTALL DATE:						
SIGNAL WARRANTS:			MAINTAINED BY: LA DOTD			CONT. MANUF: Cubic			SYS#:		Controller IP:							
TRAFFIC SIGNAL COORDINATION PLANS (PHASING MAY VARY FROM FREE OPERATION)																		
Phasing		$\Phi 2 + \Phi 6$			$\Phi 1 + \Phi 6$			$\Phi 3 + \Phi 7$			$\Phi 4 + \Phi 8$			$\Phi 2 + \Phi 5$			Pattern:	
																	254	
Int. Times		FREE OPERATION - SEE PAGE 4 FOR TIMING PARAMETERS															Ring Phases	
Ring 1	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	1-2 / 3-4	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Ring 2	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	5-6 / 7-8	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Action = Free		CYCLE LENGTH = Free			Sequence #: 3			Coord $\Phi 2$						Max: MAX INHIBIT				
Phasing		$\Phi 2 + \Phi 6$			$\Phi 1 + \Phi 6$			$\Phi 3 + \Phi 7$			$\Phi 4 + \Phi 8$			$\Phi 2 + \Phi 5$			Pattern/Split:	
Split		44 / 38			11 / 38			17 / 17			23 / 23			44 / 17			1	
Force Offs																	Offset =	
Yield Points																	89 sec	
Int. Times		39	4	1	6	4	1	12	4	1	18	4	1	12	4	1	Ring Phases	
Ring 1	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	1-2 / 3-4	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Ring 2	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	5-6 / 7-8	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Action = 1		CYCLE LENGTH = 95			Sequence #: 3			Coord Φ: $\Phi 2$						Max: MAX INHIBIT				
Phasing		$\Phi 2 + \Phi 6$			$\Phi 1 + \Phi 6$			$\Phi 3 + \Phi 7$			$\Phi 4 + \Phi 8$			$\Phi 2 + \Phi 5$			Pattern/Split:	
Split		49 / 43			11 / 43			15 / 15			35 / 35			49 / 17			2	
Force Offs																	Offset =	
Yield Points																	0 sec	
Int. Times		44	4	1	6	4	1	10	4	1	30	4	1	12	4	1	Ring Phases	
Ring 1	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	1-2 / 3-4	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Ring 2	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	5-6 / 7-8	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Action 2		CYCLE LENGTH = 110			Sequence #: 3			Coord Φ: $\Phi 2$						Max: MAX INHIBIT				
Phasing		$\Phi 2 + \Phi 6$			$\Phi 1 + \Phi 6$			$\Phi 3 + \Phi 7$			$\Phi 4 + \Phi 8$			$\Phi 2 + \Phi 5$			Pattern/Split:	
Split		43 / 42			11 / 42			14 / 14			22 / 22			43 / 12			3	
Force Offs																	Offset =	
Yield Points																	0 sec	
Int. Times		38	4	1	6	4	1	9	4	1	17	4	1	7	4	1	Ring Phases	
Ring 1	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	1-2 / 3-4	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Ring 2	Thru/OLP	G	Y	R	<G/G	<Y/Y	R	<G	<Y	R	G	Y	R	G	G	G	5-6 / 7-8	
	Turns	G	Y	R	G	Y	R	<G	<Y	R	G	Y	R	<G/G	<Y/G	G		
Action 3		CYCLE LENGTH = 90			Sequence #: 3			Coord Φ: $\Phi 2$						Max: MAX INHIBIT				
Action Table #		MON-TUES-WED-THURS-FRI										SATURDAY			SUNDAY			
Free		00:00-06:00 22:00-00:00										00:00-0600; 22:00-00:00			00:00-06:00; 22:00-00:00			
1																		
2		06:00-22:00										06:00-22:00			06:00-22:00			
3																		
MASTER/ LOCAL:					MASTER AT TSI #:					COORDINATED WITH TSI #'S:								

TRAFFIC SIGNAL INVENTORY (v2.1)

TSI NO. 29-006

PAGE: 2 OF 4

Intersection: LA 20 (Canal Blvd.) @ LA 1

Phase Timing Parameters

Phase Mode STD8	Force Off: Float	Phase #: Movement:	1	2	3	4	5	6	7	8
PARAMETER	RANGE (sec)									
MIN GREEN (MIN I)	0 - 99		5.0	20.0	5.0	5.0	5.0	20.0	5.0	5.0
GAP, EXTENSION	0 - 10		4.0	3.0	5.0	4.0	4.0	3.0	5.0	4.0
MAX GREEN I (MAX I)	0 - 255		10.0	40.0	10.0	30.0	10.0	40.0	10.0	30.0
MAX GREEN II (MAX II)	0 - 255		10.0	40.0	10.0	30.0	10.0	40.0	10.0	30.0
YELLOW CLEARANCE (YEL)	3 - 7		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
RED CLEARANCE (RED)	1 - 4		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
WALK (WALK)	0 - 100									
PED CLEARANCE (P CLR)	0 - 100									
ADDED INITIAL GREEN	0 - 10									
MAXIMUM INITIAL	0 - 255									
TIME BEFORE REDUCTION	0 - 255									
TIME TO REDUCE	0 - 255									
REDUCE BY	0 - 99									
MINIMUM GAP	0 - 10									
DYNAMIC MAX LIMIT	0 - 255									
DYNAMIC MAX STEP	0 - 25									
RECALL	MIN/MAX			MIN				MIN		
PEDESTRIAN CALL	ON/OFF									
LOCK CALLS	ON/OFF									

ADDITIONAL SIGNAL CONTROLLER SETTINGS

Dual Entry			X		X		X		X
Enable Simul Gap			X		X		X		X

Phase #	  	  	  	  	  	  	  			
1						1				
2	5					4				
3						6				
4	9					8				
5						4				
6	2,3					1				
7						8				
8	7					6				



30" x 36"
R10-12
S1(X4)

LA 1

EB1 Φ3

EB2 Φ8

D35

D40

SB2

SB1

Φ2

Φ5

Canal Blvd.

D34

D37

Φ1

Φ6

NB1

NB2

NB3

Φ3

Φ4

Φ7

Φ8

Φ9

Φ10

Φ11

Φ12

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Φ79

Φ80

Φ81

Φ82

Φ83

Φ84

LA 1

WB2 Φ4

WB1 Φ7

D36

D39

Canal Blvd.



BACKPLATES: YES ☒ NO ☐

INTERSECTION: Canal Blvd. @ LA 1

SKETCH OF INTERSECTION

NOT TO SCALE

TSI #: 29-006 PAGE 3 OF 4

● WOOD POLE	STOP LINE	② □ PEDESTAL MOUNT SIGNAL & NO.	▶ POWER SOURCE
○ METAL POLE	— PED CROSS WALK	② ← SIGNAL FACE & NO.	▨ VIDEO DETECTION ZONE
— MAST ARM	— SPAN WIRE SIGN & NO.	② ← SIGNAL FACE WITH ARROWS & NO.	— VIDEO DETECTION
— SPAN WIRE	③ GROUND MOUNT SIGN & NO.	② ← PEDESTRIAN SIGNAL & NO.	— WIRELESS INTERCONNECT
⊠ CONTROLLER	④ LOOP DETECTOR & NO.	② ← PED BUTTON & SIGN	○ UTILITY POLE
■ SIGNAL POWER PEDESTAL W/ DISCONNECT		□ PARALLEL PARKING	■ WIRELESS VDS
			— WIRELESS VDS RECIEVER

EXISTING SPEED LIMITS
LA 1 WESTBOUND 25 mph
LA 1 EASTBOUND 35 mph
Canal Blvd. 35 mph

SIGNAL FACES	2,3,5					1,4					
TOTALS	7,9					6,8					
DK = DARK R = RED Y = YELLOW G = GREEN ← = GREEN ARROW ← = YELLOW ARROW ← = STEADY YELLOW ARROW ← = FLASHING YELLOW ARROW WA = WALK DW = DON'T WALK FDW = FLASHING DON'T WALK 8" = 8" DIA. LENS 12" = 12" DIA. LENS OP = OPTICALLY PROGRAMED LENS	5					4					
	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	PED
	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)	(Y)	
	(G)	(G)	(G)	(G)	(G)	(G)	(G)	(G)	(G)	(G)	

TRAFFIC SIGNAL INVENTORY (v2.1)

TSI NO. 29-006

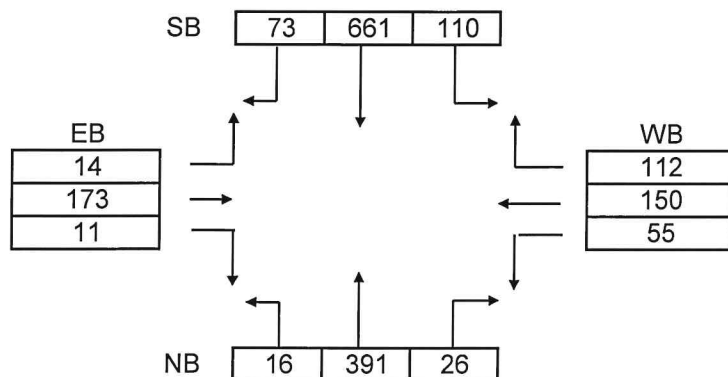
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

PAGE: 4 OF 4

Intesection:

LA 20 (Canal Blvd.) @ LA 1

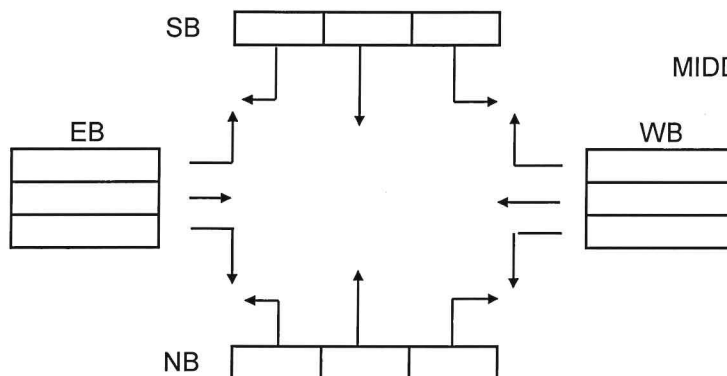
TRAFFIC VOLUMES - VPH



AM PEAK HOUR: 7:15 AM to 8:15 AM

Count Date: 2014 Existing

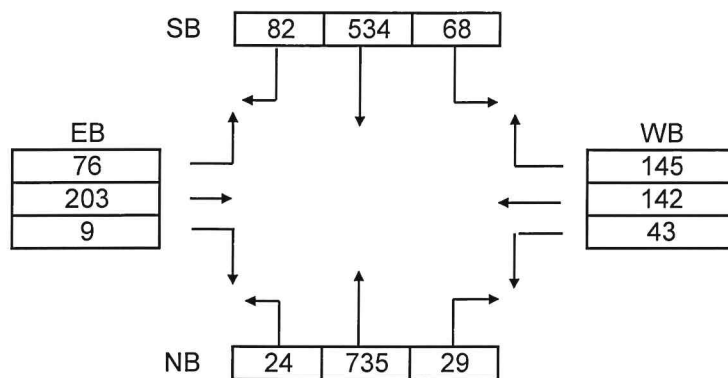
PHF: _____



MIDDAY PEAK HOUR: _____ to _____

Count Date: _____

PHF: _____



PM PEAK HOUR: 5:00 PM to 6:00 PM

Count Date: 2014 Existing

PHF: _____

Detector #	Delay(s)	Phase	Equipment	Lane #	Size	Type
D33		Φ1	Vid - Naztec	NB1	1-6x50	Stopbar
D34		Φ2	Vid - Naztec	SB2	1-6x50	Stopbar
D35		Φ3	Vid - Naztec	EB1	1-6x50	Stopbar
D36		Φ4	Vid - Naztec	WB2	1-6x50	Stopbar
D37		Φ5	Vid - Naztec	SB1	1-6x50	Stopbar
D38		Φ6	Vid - Naztec	NB2, NB3	1-6x50	Stopbar
D39		Φ7	Vid - Naztec	WB1	1-6x50	Stopbar
D40		Φ8	Vid - Naztec	EB2	1-6x50	Stopbar

IP Addresses

Appendix B

V. QAQC

Final Data Collection QA/QC Checklist

✓	Data Collection	Comments
✓	Classifications on hourly counts have been compared to TMC data to confirm vehicle classifications along the corridor	
✓	Unbalanced raw data map has been checked for reasonableness along the corridor	
	Total demand and 48 hour counts were compared and discrepancies noted	n/a - there were no demand volumes
✓	Any sink/source locations have been explained and justified	study area consists of a single intersection
	Trip Generation calculations meet ITE	n/a
	Growth rate has been checked for reasonableness (maps and/or calculations)	n/a
✓	Peak Hour Observations have been performed for entire peak hours per location	
	Travel time runs meet 95th confidence level	n/a

Notes:

Engineer: Britton Overby Date given to Quality Checker: 10/11/24

Quality Checker: Jonathan Duhe Date check completed: 10/21/24

Appendix C

Existing Safety Analysis

- I. Existing Safety Analysis Summary
- II. Crash Queries
- III. Crash Report Documentation
- IV. Collision Diagrams
- V. CARTS Analysis
- VI. QAQC

I. Existing Safety Analysis Summary

Duplantis Design Group, LLC retained the services of Neel-Schaffer, Inc. to prepare an interchange control evaluation study to evaluate capacity, safety, and access management improvements for the LA 1 at LA 20 (Canal Blvd) bridge replacement. As part of the existing safety analysis, crashes were pulled from the CARTS database for the last three years of record (January 1, 2021 through December 31, 2023) at the study intersection. All crashes pulled for the 2021-2023 years were reviewed and analyzed. Pedestrian and bicycle crashes were also pulled and reviewed for the 2019-2023 years. The study area illustrated in **Figure C-1** encompasses the intersection to be evaluated.

Included in this appendix are the following sections:

- I. Existing Safety Analysis Summary**
- II. Crash Queries**
- III. Crash Report Documentation**
- IV. Collision Diagrams**
- V. CARTS Analysis**
- VI. QAQC**

Based on the results of the existing safety analysis, the following was noted:

The intersection of LA 1 at LA 20 (Canal Blvd) had fifty-five (55) observed crashes in 2021-2023. Of the fifty-five (55) crashes, the CARTS pattern recognition analysis flagged fifteen (15) left turn-f crashes and a cluster of eight (8) left turn-f crashes are shown on the collision diagram between southbound left turns and northbound throughs. Another cluster of six (6) left turn-f crashes occurred between northbound left turns and southbound throughs. These left turn-f crashes mostly occurred on the permitted left turn phase. CARTS pattern recognition analysis also flagged thirteen (13) right angle crashes as an area of concern. A cluster of four (4) right angle crashes between southbound through and westbound through were observed at this intersection. A cluster of six (6) side-swipes was also noted on the southbound approach. These crashes were caused by southbound through vehicles switching from the inside lane to the outside through lane to avoid waiting behind southbound left turners which block the through lane since there is currently no turn lane.

As shown in the collision diagram, several right angle and left turn crashes are experienced at this intersection. It should be noted that all left turn approaches have a 5-section left turn signal head that operates the protected/permitted left turns. In addition, the southbound approach has no dedicated left turn lane which causes drivers to attempt a lane change. The current left turns must stop in the left/through lane to wait to turn left.

Pedestrian and Bicycle Crashes

Pedestrian and bicycle crashes were pulled in the study area between January 1, 2019 and December 31, 2023. There were no pedestrian or bicycle crashes listed in the CARTS database.



MAP DATA © GOOGLE EARTH

LA 1 AT LA 20 (CANAL BLVD)
SAFETY ANALYSIS MAP
FIGURE C-1
LAFOURCHE PARISH

Appendix C

II. Crash Queries

2021-2023 Raw Crash Data

Crashes were pulled from the CARTS database for the years 2021-2023 (January 1, 2021 through December 31, 2023) at the study intersection of LA 1 at LA 20 (Canal Blvd).

Intersection crashes are crashes which occur at the intersection or within the determined radius. These crashes could be due to traffic, lane changes, etc. For safety studies, intersection limits are defined based on maximum queues or posted speed limits.

Intersection Radii

The intersection radii that was utilized to collect crash reports were dependent on the typical weekday queues for each intersection or a standard radius based the posted speed limit in the vicinity of the intersection. The standard radius for a posted speed limit of 45 mph is 175 feet. However, observed queues were found to exceed this distance. Therefore, the radius used to pull crash data was increased to 250 feet at this intersection.

2021-2023 Raw Crash Data

The raw data results of the crash query before review are summarized in **Table C-1**.

Table C-1: Raw 2021-2023 Intersection Crashes

Intersection		Vehicle	Pedestrian	Bicycle	Total
1	LA 1 at LA 20 (Canal Blvd)	67	0	0	67

There were no pedestrian or bicycle crashes listed in the CARTS database at the intersection of LA 1 at LA 20 (Canal Blvd) between January 1, 2019 and December 31, 2023.

Year	Severity	Manner of Collision	Intersection	Roadway Condition	Lighting	Surface Condition	Roadway Departure	Weather	Lat	Long
2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.799291	-90.817875
2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NO	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798725	-90.817996
2022	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79886	-90.817966
2022	102-(B) SUSPECTED MINOR INJURY	102-ANGLE - LEFT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.798846	-90.817969
2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	301-DARK - STREET LIGHTS AT INTERSECTION ONLY	000-DRY	FALSE	000-CLEAR	29.79883	-90.817973
2022	104-(O) PROPERTY DAMAGE ONLY	102-ANGLE - LEFT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798921	-90.817953
2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.799338	-90.818028
2022	104-(O) PROPERTY DAMAGE ONLY	102-ANGLE - LEFT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798937	-90.818108
2022	104-(O) PROPERTY DAMAGE ONLY	100-ANGLE - LEFT OVERTAKE	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798859	-90.818124
2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798887	-90.818118
2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798942	-90.818107
2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.799146	-90.818066
2022	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.79894	-90.818107
2022	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798924	-90.81811
2022	104-(O) PROPERTY DAMAGE ONLY	501-ANGLE - RIGHT ACROSS FLOW	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.798662	-90.818164
2022	104-(O) PROPERTY DAMAGE ONLY	000-NOT A COLLISION BETWEEN TWO M	NO	NONE	100-DAYLIGHT	000-DRY	TRUE	000-CLEAR	29.799296	-90.818036
2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798988	-90.818098
2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.799096	-90.818076
2022	104-(O) PROPERTY DAMAGE ONLY	100-ANGLE - LEFT OVERTAKE	NO	SHOULDERS (NONE, LOW, SC	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.799602	-90.817971
2021	103-(C) POSSIBLE INJURY	505-SIDESWIPE - SAME DIRECTION	NO	NONE	200-DAWN/DUSK	000-DRY	FALSE	102-CLOUDY	29.799128	-90.81807
2021	104-(O) PROPERTY DAMAGE ONLY	102-ANGLE - LEFT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79904	-90.818087
2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798906	-90.817974
2021	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798905	-90.817949
2021	103-(C) POSSIBLE INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798913	-90.8181
2021	104-(O) PROPERTY DAMAGE ONLY	100-ANGLE - LEFT OVERTAKE	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.798905	-90.817936
2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798887	-90.818798
2021	103-(C) POSSIBLE INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798915	-90.81814
2021	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	102-CLOUDY	29.798914	-90.818109
2022	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.798917	-90.81818
2022	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798915	-90.818129
2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798924	-90.818389
2021	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	102-CLOUDY	29.798914	-90.818123
2022	104-(O) PROPERTY DAMAGE ONLY	100-ANGLE - LEFT OVERTAKE	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798907	-90.817995
2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	YES	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798912	-90.818082
2022	104-(O) PROPERTY DAMAGE ONLY	400-BACKING - REAR TO FRONT	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798925	-90.818416
2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798915	-90.818131
2022	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79892	-90.818257
2022	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798921	-90.818287
2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.7989	-90.817817
2022	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798916	-90.818178
2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	NO	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798918	-90.818215
2023	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798912	-90.817962
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798717	-90.818004
2023	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798907	-90.817963
2023	104-(O) PROPERTY DAMAGE ONLY	102-ANGLE - LEFT INTO FLOW	YES	NONE	200-DAWN/DUSK	000-DRY	FALSE	000-CLEAR	29.798944	-90.817955
2023	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79894	-90.817956
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79941	-90.817857
2023	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798907	-90.817963
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.7988	-90.817986
2023	102-(B) SUSPECTED MINOR INJURY	200-FRONT TO FRONT - HEAD ON	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798917	-90.817961
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798918	-90.81796
2023	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798643	-90.818175
2023	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798719	-90.81816
2023	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798479	-90.818209
2023	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.799059	-90.81809
2023	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798933	-90.818116
2023	103-(C) POSSIBLE INJURY	505-SIDESWIPE - SAME DIRECTION	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798946	-90.818113
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	WEATHER CONDITIONS	100-DAYLIGHT	107-WET	FALSE	105-RAIN	29.798954	-90.818111
2023	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	29.798923	-90.818221
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798925	-90.818261
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798921	-90.818171

LA 1 at LA 20 (Canal Blvd)
Crash Query - 250'

Year	Severity	Manner of Collision	Intersection	Roadway Condition	Lighting	Surface Condition	Roadway Departure	Weather	Lat	Long
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79892	-90.818143
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798921	-90.818171
2023	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.79892	-90.818134
2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NO	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	29.798905	-90.817789
2023	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	NO	ROAD SURFACE CONDITION	100-DAYLIGHT	107-WET	FALSE	105-RAIN	29.798924	-90.818237
2023	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER AN	YES	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	29.798913	-90.818014

III. Crash Report Documentation

As part of the existing safety analysis, sixty-seven (67) total crashes were pulled between January 1, 2021 and December 31, 2023. All crashes were reviewed in detail for accuracy. Of all the crash reports reviewed, fifty-five (55) crashes were determined to occur within the study area between January 1, 2021 through December 31, 2023.

At the intersection of LA 1 at LA 20 (Canal Blvd), sixty-seven (67) crashes were listed in the CARTS database for 2021-2023. Twelve (12) crashes were determined to be segment related resulting in a total of fifty-five (55) crashes at this intersection for 2021-2023.

An overview of the reviewed data is provided in **Table C-2**.

Table C-2 Updated 2021-2023 Intersection Crashes

Intersection		Crashes	Segment Related	Updated Intersection Crash Total
1	LA 1 at LA 20 (Canal Blvd)	67	12	55

IV. Collision Diagrams

The 2021-2023 crashes were reviewed in detail for accuracy. When reviewing these crashes, the location, log-mile, and the collision manner were all checked. These crashes were also given a crash ID number that corresponds to the crash ID number found on the collision diagrams. After the crashes for 2021-2023 were reviewed, a collision diagram was developed. The collisions were plotted on aerial photographs of the intersection and identified with a crash ID number that corresponds with the crash ID number assigned to each crash in the crash report documentation. When a crash was placed on the collision diagram, it was given a specific symbol to reflect the type of crash as well as a color to distinguish the year. A legend is shown to identify the crash types. Severity was also distinguished on the collision diagram by using circles to illustrate which crashes were coded as injury or fatal crashes. Injury crash IDs (incapacitating to possible/complaint) were circled black while fatal crash IDs were circled in red. The crash ID numbers correspond to a crash details sheet which displays additional details about each crash including:

- Day of week
- Time of day
- Lighting conditions
- Driver condition
- Weather
- Intersection related
- Roadway surface condition

Based on the collision diagrams, the following observations were determined for the intersection of LA 1 at LA 20 (Canal Blvd) as shown in **Figure C-2**:

- There is a cluster of eight (8) left turn-f crashes between southbound left and northbound through.
- There is a cluster of six (6) left turn-f crashes between northbound left and southbound through.
- There is a cluster of four (4) right angle crashes between southbound through and westbound through.
- There is a cluster of six (6) southbound side swipe (sd) crashes.
- Various rear end and angled crashes occurring on every approach.

As shown in the collision diagram, several right angle and left turn crashes are experienced at this intersection. It should be noted that all left turn approaches have a 5-section left turn signal head that operates the protected/permitted left turns. In addition, the southbound approach has no dedicated left turn lane which causes drivers to attempt a lane change. The current left turns must stop in the left/through lane to wait to turn left.

The collision diagrams along with the crash summaries are included in this section.



LEGEND									
NON-COLLISION WITH MOTOR VEHICLE	RIGHT ANGLE	LEFT TURN-G	SIDESWIPE (SD)						
REAR END	LEFT TURN-E	RIGHT TURN-H	SIDESWIPE (OD)						
HEAD-ON	LEFT TURN-F	RIGHT TURN-I	OTHER						
SEVERITY									
ID# PROPERTY DAMAGE ONLY	ID# INJURY	ID# FATALITY	PEDESTRIAN	MULTIPLE CRASHES					

LA 1 AT LA 20 (CANAL BLVD)

COLLISION DIAGRAM

[2021-2023]

FIGURE C-2

LAFOURCHE PARISH

MAP DATA © GOOGLE EARTH

NEEL-SCHAFFER

Solutions you can build upon

C-9

Crash ID	Year	Severity	Manner of Collision	Roadway Condition	Lighting	Surface Condition	Roadway Departure	Weather	Hour	Day of Week	Summary
1	2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	1	SUNDAY	NB driver 1 attempted to switch to the outside lane near the intersection and struck NB driver 2.
2	2022	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	12	MONDAY	NB driver 1 rear ended NB driver 2 in the inside lane then fled the scene.
3	2022	102-(B) SUSPECTED MINOR INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	18	MONDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
4	2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	301-DARK - STREET LIGHTS AT INTERSECTION ONLY	000-DRY	FALSE	000-CLEAR	21	WEDNESDAY	NB driver 1 in the outside lane attempted to change into the inside lane and struck NB driver 2.
5	2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	FRIDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
6	2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	16	THURSDAY	NB driver 1 (18-Wheeler) turned left and struck EB driver 2 stopped in the left turn lane.
7	2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	TUESDAY	SB driver 1 struck SB driver 2 while changing lanes in the intersection.
8	2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	10	WEDNESDAY	SB driver 1 struck SB driver 2 while changing lanes into the outside lane.
9	2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	18	SATURDAY	NB driver 1 failed to yield to SB driver 2 while making a left turn.
10	2022	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	THURSDAY	SB driver 1 struck SB driver 2 while changing lanes into the outside lane.
11	2022	103-(C) POSSIBLE INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	20	THURSDAY	NB driver 1 failed to yield to SB driver 2 while making a left turn.
12	2022	102-(B) SUSPECTED MINOR INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	13	TUESDAY	NB driver 1 failed to yield to SB driver 2 while making a left turn.
13	2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	11	WEDNESDAY	SB driver 1 attempting to change lanes while in the intersection and struck SB driver 2.
14	2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	12	MONDAY	SB driver 1 rear ended SB driver 2 who was waiting for a chance to turn.
15	2021	104-(O) PROPERTY DAMAGE ONLY	102-ANGLE - LEFT INTO FLOW	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	12	FRIDAY	WB driver 1 ran red light and struck NB driver 2 making a left turn.
16	2021	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	THURSDAY	EB driver 1 was in the left turn lane but attempted to go straight and struck EB driver 2.
17	2021	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	10	TUESDAY	NB driver 1 ran red light and struck EB driver 2 crossing the intersection.
18	2021	103-(C) POSSIBLE INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	21	SATURDAY	NB driver 1 failed to yeild to SB driver 2 while making a left turn.
19	2021	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	14	SATURDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
20	2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	15	FRIDAY	EB driver 1 rear ended EB driver 2 stopped in traffic while attempting to get into the left turn lane.
21	2021	103-(C) POSSIBLE INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	8	MONDAY	NB driver 1 failed to yeild to SB driver 2 while making a left turn.
22	2021	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	102-CLOUDY	21	TUESDAY	SB driver 1 ran red light and struck EB driver 2 crossing the intersection.
23	2022	104-(O) PROPERTY DAMAGE ONLY	501-ANGLE - RIGHT ACROSS FLOW	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	12	TUESDAY	SB driver 1 took too wide a right turn and struck EB drivr 2 stopped in the left turn lane.
24	2022	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	14	SUNDAY	SB driver 1 ran red light and struck WB driver 2 crossing the intersection.
25	2021	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	FRIDAY	EB driver 1 wasn't paying attention and rear ended EB driver 2 still stopped for traffic.
26	2021	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	102-CLOUDY	19	SUNDAY	SB driver 1 ran red light and struck WB driver 2 crossing the intersection.
27	2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	18	TUESDAY	EB driver 1 failed to yield to WB driver 2 while making a left turn.

28	2022	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	19	SUNDAY	NB driver 1 failed to yield to SB driver 2 while making a left turn.
29	2022	104-(O) PROPERTY DAMAGE ONLY	400-BACKING - REAR TO FRONT	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	7	THURSDAY	EB driver 1 was stopped in traffic when they attempted to back-up and struck EB driver 2.
30	2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	16	MONDAY	SB driver 1 was crossing the intersection but veered to far right and struck EB driver 2 stopped at the stop bar.
31	2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	20	FRIDAY	Driver 1 attempting to exit the driveway and struck EB driver 2 stopped in traffic.
32	2022	104-(O) PROPERTY DAMAGE ONLY	402-BACKING - REAR TO SIDE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	9	MONDAY	Driver 1 backed out of the driveway and struck WB driver 2 stopped in traffic.
33	2022	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	13	TUESDAY	SB drive 1 ran red light and struck EB driver 2 crossing the intersection.
34	2022	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	18	TUESDAY	WB driver 1 attempted a left turn into the Circle K driveway and struck EB driver 2 stopped in traffic.
35	2023	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	19	THURSDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
36	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	14	FRIDAY	NB driver 1 foot slipped off the brake and rear ended NB driver 2.
37	2023	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	10	FRIDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
38	2023	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	NONE	200-DAWN/DUSK	000-DRY	FALSE	000-CLEAR	18	SUNDAY	WB driver 1 took a right turn and struck EB driver 2 who just made a left turn.
39	2023	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	17	MONDAY	NB driver ran red light and struck EB driver 2 crossing the intersection.
40	2023	104-(O) PROPERTY DAMAGE ONLY	103-ANGLE - RIGHT INTO FLOW	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	7	SUNDAY	WB driver 1 attempted a right turn on red and struck NB driver 2 crossing the intersection.
41	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	18	SUNDAY	NB driver 2 was stopped at the red light and was rear ended by NB driver 1 on purpose. Hit and Run.
42	2023	102-(B) SUSPECTED MINOR INJURY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	15	THURSDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
43	2023	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	16	FRIDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
44	2023	104-(O) PROPERTY DAMAGE ONLY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	12	TUESDAY	SB driver 1 with a trailer attempted to switch to the outside lane near the intersection and struck SB driver 2.
45	2023	102-(B) SUSPECTED MINOR INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	6	SATURDAY	SB driver 1 ran red light in outside lane and struck WB driver 2 crossing the intersection.
46	2023	103-(C) POSSIBLE INJURY	505-SIDESWIPE - SAME DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	18	FRIDAY	SB driver 1 attempted a lane change in the intersection and struck SB driver 2 in the outside lane.
47	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	WEATHER CONDITIONS	100-DAYLIGHT	107-WET	FALSE	105-RAIN	13	FRIDAY	SB driver 1 was unable to stop in time due to the weather conditions.
48	2023	104-(O) PROPERTY DAMAGE ONLY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	102-CLOUDY	11	WEDNESDAY	Driver 1 was waved through an attempted to enter the left turn lane and struck EB driver 2.
49	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	13	THURSDAY	NB driver 1 rear ended EB driver 2 who was stopped waiting for a vehicle to turn left.
50	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	7	TUESDAY	EB driver 1 rear ended EB driver 2 who was stopped for the red light.
51	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	16	WEDNESDAY	SB driver 1 rear ended SB driver 2 while they were both making a right turn.
52	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	12	TUESDAY	EB driver 1 slipped off the gas peddle and struck EB driver 2 at the red light.
53	2023	103-(C) POSSIBLE INJURY	105-ANGLE - PERPENDICULAR/OTHER ANGLE	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	10	TUESDAY	SB driver 1 ran red light and struck WB driver 2 crossing the intersection.
54	2023	104-(O) PROPERTY DAMAGE ONLY	300-FRONT TO REAR - REAR END	NONE	300-DARK - CONTINUOUS STREET LIGHTS	000-DRY	FALSE	000-CLEAR	23	SATURDAY	WB driver 2 in the turn lane was struck by WB driver 1 while their foot slipped off the brake.

55	2023	104-(O) PROPERTY DAMAGE ONLY	101-ANGLE - LEFT OPPOSITE DIRECTION	NONE	100-DAYLIGHT	000-DRY	FALSE	000-CLEAR	8	TUESDAY	SB driver 1 failed to yield to NB driver 2 when making a left turn.
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V. CARTS Analysis

As part of the existing safety analysis, detailed CARTS analyses were performed for the intersection of LA 1 at LA 20 (Canal Blvd) for 2021-2023. The CARTS analysis includes a determination of the LOSS (Level of Service of Safety) for all crash severities and for injury related crashes. An explanation of these performance measures is shown below:

- LOSS 1 – Negligible potential for safety improvement
- LOSS 2 – Low potential for safety improvement
- LOSS 3 – Moderate potential for safety improvement
- LOSS 4 – High potential for safety improvement

The CARTS analysis also flags crash types that are of a higher percentage than those found on similar roadways throughout the state of Louisiana. Those flagged crash types are detailed in this section.

The Annual Average Daily Traffic (AADT) for each CARTS analysis was based on the most current traffic count data available.

The crash data was provided within the CARTS pattern recognition tool for the intersection of LA 1 at LA 20 (Canal Blvd).

1. Intersection: LA 1 at LA 20 (Canal Blvd)

The intersection of LA 1 at LA 20 (Canal Blvd) has a LOSS (Level of Service of Safety) 3 for all severity crashes and a LOSS 2 for injury crashes with a total of fifty-five (55) crashes observed in 2021-2023. Left turn-f, right angle, and small vehicle crashes were all flagged as areas of concern by the CARTS pattern recognition analysis. Of the flagged crash types, there were fifteen (15) left turn-f crashes, thirteen (13) right angle crashes, and thirty-eight (38) small vehicle crashes.

The CARTS pattern recognition analysis flags crash types that could potentially represent a safety issue, however, some crash types may not be statistically significant based on the total number of crashes or when compared to statewide averages. A summary of all the CARTS analyses is shown in **Table C-3** and **Table C-4**.

Appendix C

Table C-3: CARTS Results Summary

Intersection		Number of Crashes	LOSS (ALL)	LOSS (Injury)
1	LA1 at LA20 (Canal Blvd)	55	3	2

Locations where the LOSS is 3 (moderate potential for safety improvement) or 4 (high potential for safety improvement) are highlighted in red.

Table C-4: CARTS Flagged Crashes – Intersection Summary

Intersections	CARTS Flagged Collision Manner and Crash Types		
LA1 at LA20 (Canal Blvd)	Left Turn-f	Right Angle	Small Vehicle
	15	13	38

1. Safety Comparison (All)

Project Name:	LA 1 at Canal_2021-2023
Major AADT:	17706
Minor AADT:	11817

Intersection Class:	Urban 4-Lane 4-Leg Divided Signalized
Period:	2021 - 2023
Duration:	3 years

All Severity Crashes - Safety Performance Function (SPF)

All Severity Crashes - Urban 4-Lane 4-Leg Divided Signalized SPF							
$\hat{E}\{\mu\} = y * e^{\beta_0} * AADT_{Major}^{\beta_1} * AADT_{Minor}^{\beta_2} * e^{\frac{AADT_{Major}}{10000} \beta_3}$							
y	β0	β1	β2	β3	β4	β5	b
0.20	-11.59	1.34	0.38	-0.32	0.00	0.00	4.59

Safety Level

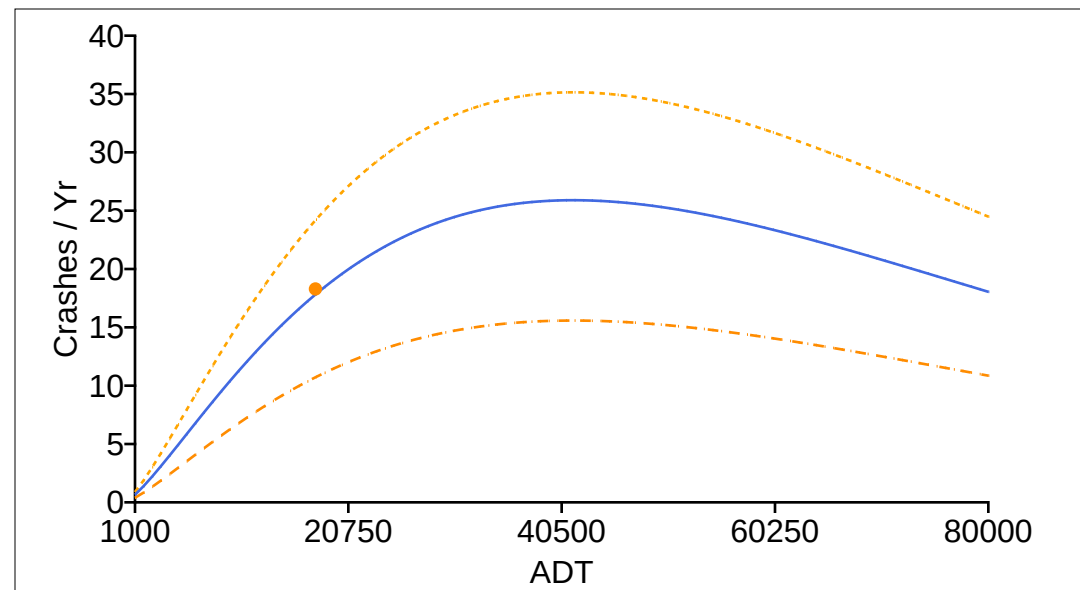
LOSS 4	: High Potential
LOSS 3	: Moderate Potential*
LOSS 2	: Low Potential*
LOSS 1	: Negligible Potential*

*for safety improvements

Observed:	18.33	Crashes/yr
Predicted (SPF):	17.81	Crashes/yr
Over-dispersion:	4.59	
Weighted Adjustment:	0.08	

Observed:	18.33	Crashes/yr
Expected (SPF+EB):	18.29	Crashes/yr
Safety Service Level:	LOSS 3	
Expected Percentile:	58%	

80th Percentile:	24.18	Crashes/yr
Predicted (SPF):	17.81	Crashes/yr
20th Percentile:	10.72	Crashes/yr



1. Safety Comparison (Injury)

Project Name:	LA 1 at Canal_2021-2023
Major AADT:	17706
Minor AADT:	11817

Intersection Class:	Urban 4-Lane 4-Leg Divided Signalized
Period:	2021 - 2023
Duration:	3 years

Injury Crashes - Safety Performance Function (SPF)

Injury Crashes - Urban 4-Lane 4-Leg Divided Signalized SPF							
$\hat{E}\{\mu\} = y * e^{\beta_0} * AADT_{Major}^{\beta_1} * AADT_{Minor}^{\beta_2} * e^{\frac{AADT_{Major}}{10000} \beta_3}$							
y	β0	β1	β2	β3	β4	β5	b
0.20	-11.98	1.32	0.33	-0.38	0.00	0.00	4.72

Safety Level

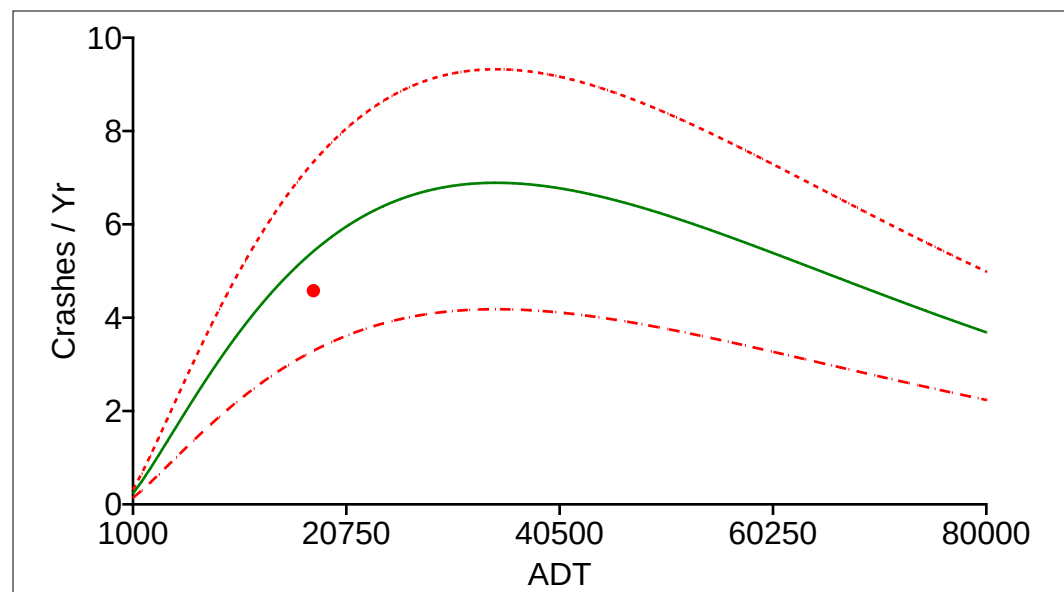
LOSS 4	: High Potential
LOSS 3	: Moderate Potential*
LOSS 2	: Low Potential*
LOSS 1	: Negligible Potential*

*for safety improvements

Observed:	4.33	Crashes/yr
Predicted (SPF):	5.42	Crashes/yr
Over-dispersion:	4.72	
Weighted Adjustment:	0.22	

Observed:	4.33	Crashes/yr
Expected (SPF+EB):	4.58	Crashes/yr
Safety Service Level:	LOSS 2	
Expected Percentile:	42%	

80th Percentile:	7.34	Crashes/yr
Predicted (SPF):	5.42	Crashes/yr
20th Percentile:	3.29	Crashes/yr



2. Pattern Recognition Analysis Overview

Project Name:	LA 1 at Canal_2021-2023
Major AADT:	17706
Minor AADT:	11817

Intersection Class:	Urban 4-Lane 4-Leg Divided Signalized
Period:	2021 - 2023
Duration:	3 years

Pattern Recognition Threshold: 90%

Code	Crash Types	Obs %	State %	>PRT
A	Pedestrian	0%	0.59%	No
B	Pedalcycle	0%	0.42%	No
C	Atv	0%	0.03%	No
D	Motorcycle	0%	0.75%	No
E	Parked	0%	0.89%	No
F	Not Fixed	0%	0.25%	No
G	Vertical Fixed	0%	1.02%	No
H	Structures	0%	0.1%	No
J	Train	0%	0.02%	No
K	Other Veh	0%	1.22%	No
M	Bus	0%	0.74%	No
N	Animal	0%	0.13%	No
P	Other Fixed	0%	0.74%	No
Q	Transport	5.45%	4.52%	No
R	3+ Vehicles	1.82%	5.95%	No
S	Small Veh	69.09%	59.57%	Yes
T	Miscellaneous	0%	0.3%	No
U	Medium Veh	23.64%	21.94%	No
X	Error	0%	0.82%	No

Code	Other Factors	Obs %	State %	>PRT
A	Non Coll	0%	3.31%	No
B	Rear End	21.82%	45.66%	No
C	Head On	0%	0.93%	No
D	Rt Angle	23.64%	14.91%	Yes
E	Left Turn-e	0%	2.32%	No
F	Left Turn-f	27.27%	8.26%	Yes
G	Left Turn-g	1.82%	2.04%	No
H	Right Turn-h	3.64%	2.73%	No
I	Right Turn-i	1.82%	0.43%	No
J	S Swipe(sd)	16.36%	12.59%	No
K	S Swipe(od)	0%	0.51%	No
Z	Other	3.64%	6.31%	No

Appendix C

VI. QAQC

Existing Safety Analysis QA/QC Checklist

✓	CRASH REPORT DOCUMENTATION	Comments
✓	Crash report has been verified for the appropriate year.	Yes. 2021-2023 crashes pulled and reviewed in detail.
✓	Crash documentation includes: Location, reason, Other significant observations, etc.	Yes.

✓	SAFETY CARTS	Comments
✓	All crash information input correctly & all graphs provided	Yes
✓	Any issues with these tools have been reviewed/verified/corrected/justified	Yes. No issues with CARTS

✓	COLLISION DIAGRAM	Comments
✓	Diagram is in correct year(s) for entire study area & includes:	Yes. 2021-2023 crashes shown
✓	- severity of collisions & injuries	Yes
✓	- weather conditions	Yes. Shown in crash details sheets
✓	- pavement conditions	Yes. Shown in crash details sheets
✓	- lighting conditions	Yes. Shown in crash details sheets
✓	- driver conditions	Yes. Shown in crash details sheets

Notes:

Engineer: Seth Popay Date given to Quality Checker: 10/1/2024

Quality Checker: Jonathan Duhe Date check completed: 10/1/2024

Appendix D

Existing and No Build Analysis

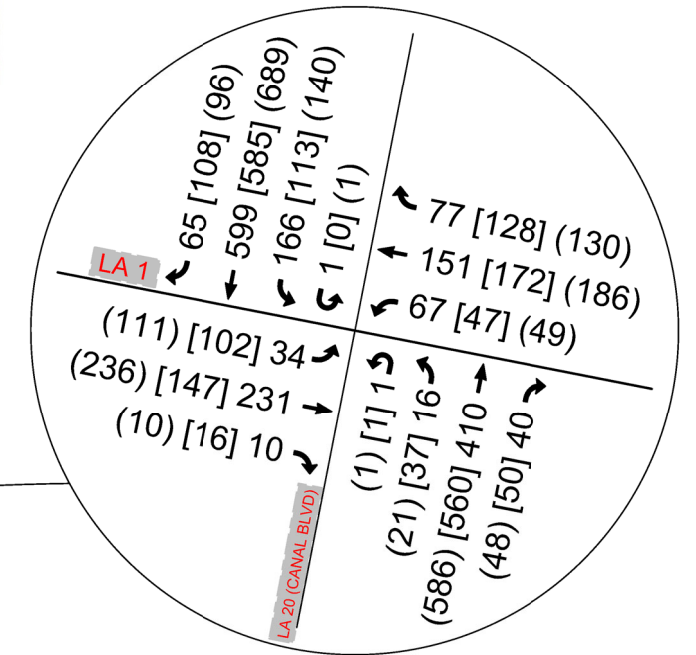
- I. Analysis Results Maps
 - a. Peak Hour Volumes
 - b. Analyses Results Maps
- II. Intersection Description / Synchro Analysis
 - a. LA 1 at LA 20 (Canal Blvd)
- III. QAQC

Appendix D

I. Analysis Results Maps

a. Peak Hour Volumes

2022 Existing peak hour volumes are required for operational analyses. A peak hour volume map is provided in **Figure D-1**.



LEGEND

- STUDY INTERSECTION
- XX [XX] (XX) AM [NOON] (PM)

FIGURE D-1
LA 1 AT LA 20 (CANAL BLVD) - ICE STUDY
2022 EXISTING TURNING MOVEMENT VOLUMES

LAFOURCHE PARISH



Appendix D

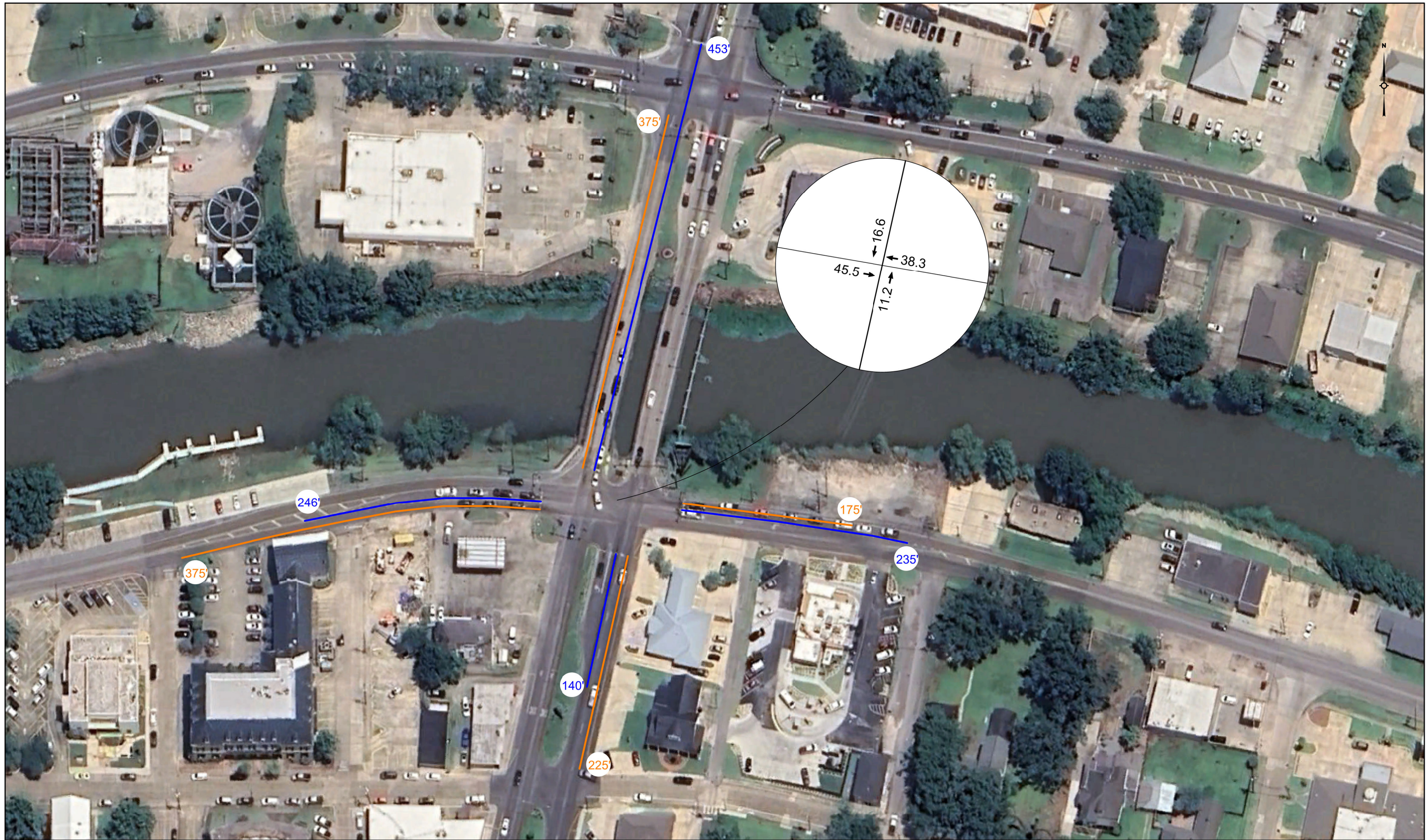
I. Analysis Results Maps

b. Analyses Results Maps

Operational analyses were performed for the intersection of LA 1 at LA 20 (Canal Blvd). The 95th percentile queues and approach delays of the intersection are presented on an aerial map in **Figure D-2** thru **Figure D-4**.

During peak hour observations, maximum vehicle queueing was noted for the AM, Noon, and PM peak periods. These maximum vehicle queues were also included in the analyses results map for comparison to the operational analyses results 95th percentile queues. The results of the analyses and comparison of the analysis queues to observed queues are discussed in the next section of this report.

Discrepancies for the northbound, southbound, and eastbound queues are present. The southbound discrepancy is due to the observed queues only being collected up to the next intersection as the next northern intersection (LA 308 (E Bayou Rd) at LA 20 (Canal Blvd)) is not a part of the study area. The northbound queue was observed to be longer than the analysis 95th percentile queue due to the northern signalized intersection queue backing up past the LA 1 at LA 20 (Canal Blvd) intersection. Since the northbound queue from the signal to the north was mixed in with the northbound queue for the study intersection, the observed northbound queue is longer than the 95th percentile queue from the analysis. The eastbound queue was observed to be extended due to vehicles in the queue being unable to access the gas station driveway. Therefore, there were additional vehicles in the observed queue than the analysis shows.

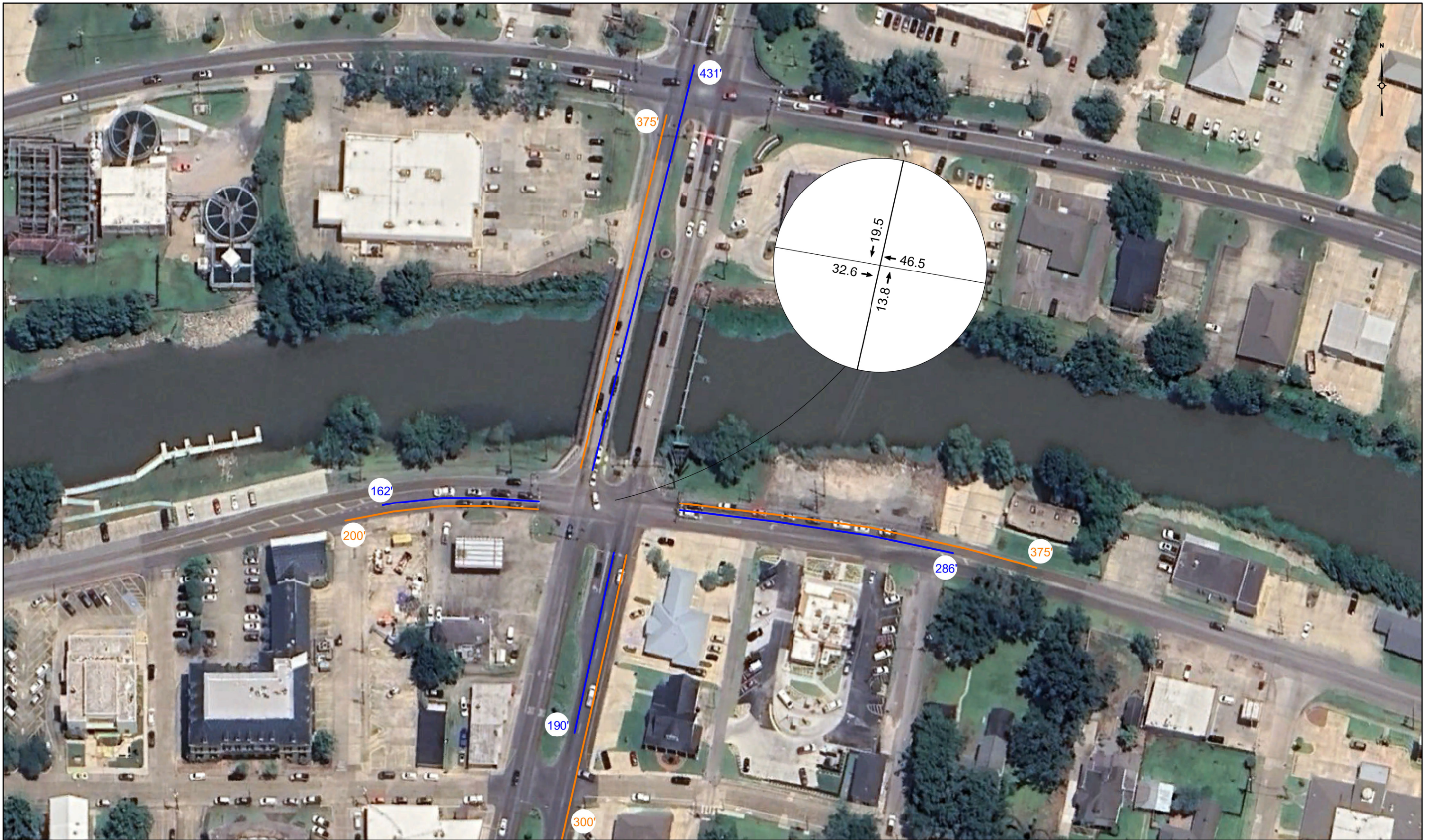


LEGEND

— OBSERVED MAX QUEUE
— EXISTING 95TH PERCENTILE QUEUE
 XX.X EXISTING DELAY (2022) (s/veh)

FIGURE D-2
 LA 1 AT LA 20 (CANAL BLVD)
 ANALYSIS RESULTS MAP - AM PEAK

LAFOURCHE PARISH



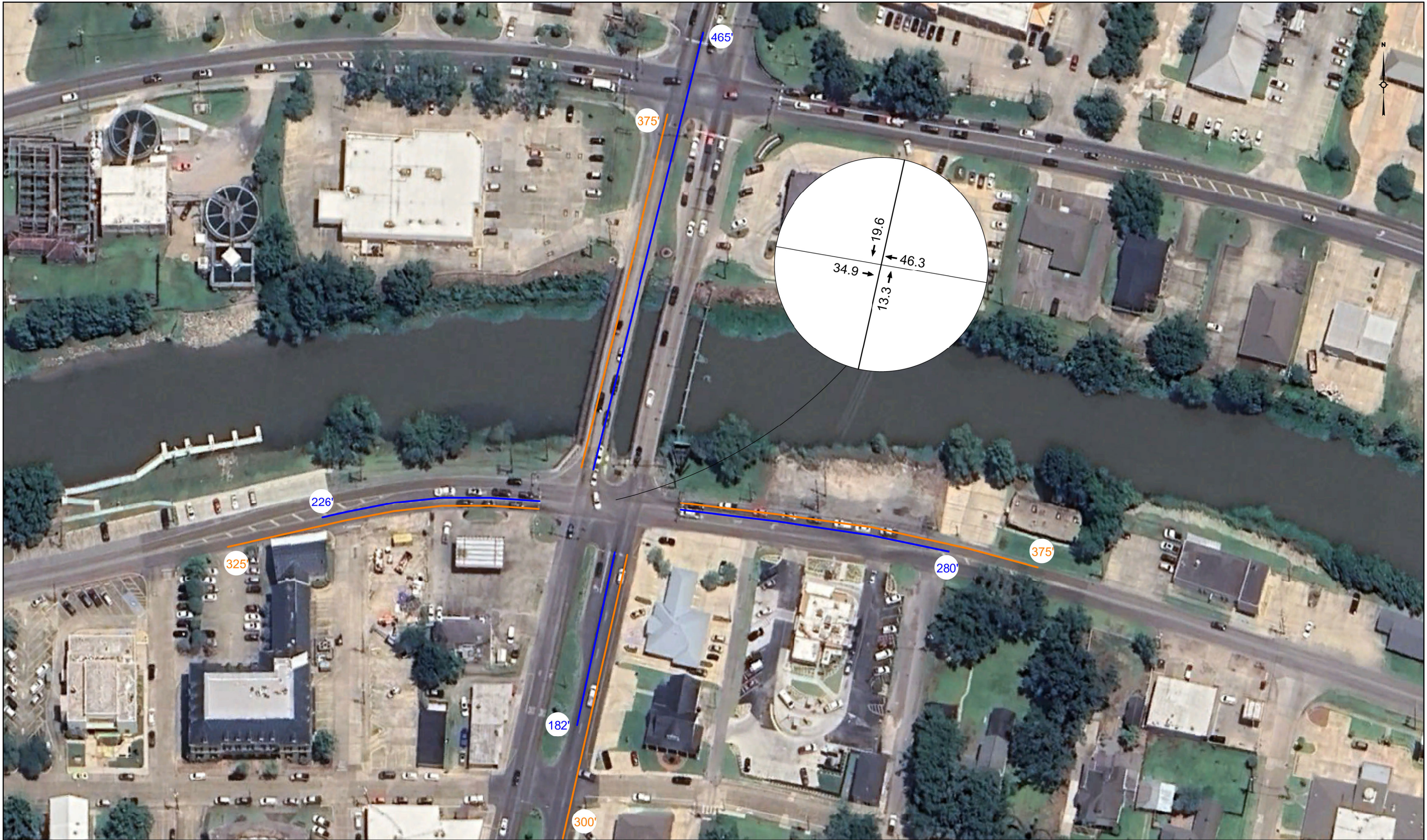
LEGEND

— OBSERVED MAX QUEUE
— EXISTING 95TH PERCENTILE QUEUE
XX.X EXISTING DELAY (2022) (s/veh)

FIGURE D-3
 LA 1 AT LA 20 (CANAL BLVD)
 ANALYSIS RESULTS MAP - NOON PEAK

LAFOURCHE PARISH

NEEL-SCHAFFER
 Solutions you can build upon



LEGEND

- OBSERVED MAX QUEUE
- EXISTING 95TH PERCENTILE QUEUE
- XX.X EXISTING DELAY (2022) (s/veh)

FIGURE D-4
LA 1 AT LA 20 (CANAL BLVD)
ANALYSIS RESULTS MAP - PM PEAK

LAFOURCHE PARISH

Appendix D

II. Intersection Description / Synchro Analysis

a. LA 1 at LA 20 (Canal Blvd)

Existing and No Build Conditions

The intersection of LA 1 at Canal Blvd is a four-legged signalized intersection. This intersection is located within a residential and commercial area with a gas station and a bank located in the southwest and southeast quadrants, respectively. Bayou Lafourche is located in the northern quadrants and is crossed by LA 20 (Canal Blvd). The crossing consists of two, two-lane, one-way bridges, separated by a gap of 25 feet. LA 20 (Canal Blvd) is a four-lane divided highway that runs north-south with a grass median south of the intersection. LA 20 (Canal Blvd) has a posted speed of 35 mph. The northbound approach on LA 20 (Canal Blvd) consists of one (1) exclusive left turn lane, one (1) through lane, and one (1) shared through/right turn lane. The southbound approach on LA 20 (Canal Blvd) consists of one (1) shared left/through lane and one (1) shared through/right turn lane. LA 1 is a two-lane roadway running east-west with a posted speed of 25 mph westbound and 35 mph eastbound. The eastbound and westbound approaches on LA 1 consist of one (1) exclusive left turn lane and one (1) shared through/right turn lane. This intersection does not have a bus stop, crosswalk, or train crossing. A sidewalk is present along LA 1 in the northwest quadrant and there are ramps for pedestrians to cross the southbound approach, but crosswalk striping is not present. The layout of this intersection as well as the Existing peak hour volumes are illustrated in **Figure D-8**.

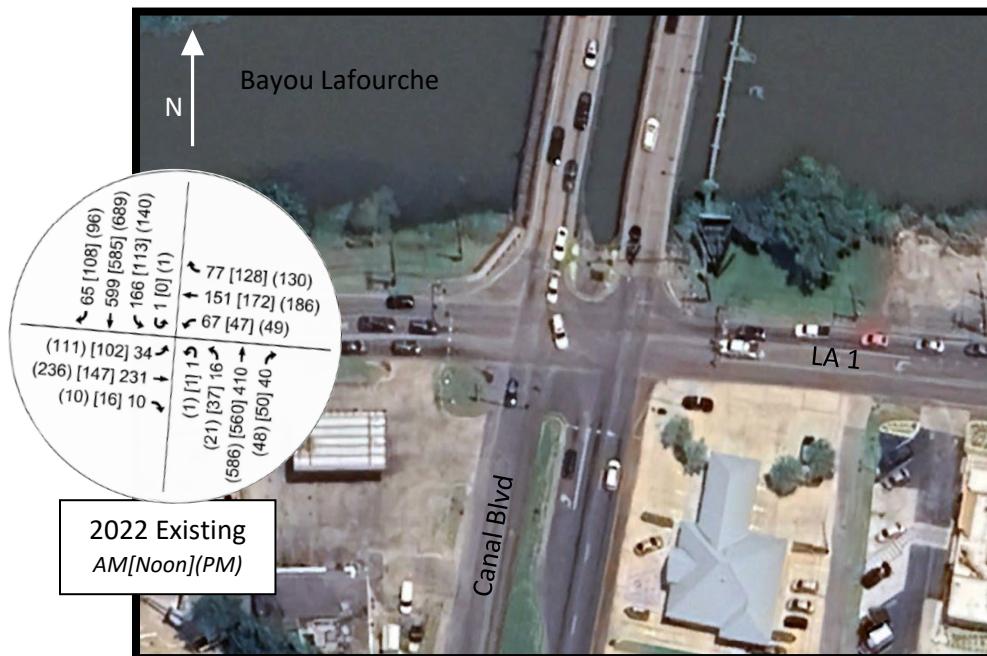


Figure D-5: LA 1 at LA 20 (Canal Blvd)

Peak Period Observations

Peak hour observations were performed at this intersection, and it was noted that vehicles trying to perform a southbound left would stop to wait for a gap, resulting in a queue forming behind that vehicle. Steady traffic flows in the northbound and southbound directions were noted during the AM and PM peak hours. Detailed peak hour observations can be found in **Appendix B**

Crash Analysis

A crash analysis was performed for this intersection. After reviewing the crash data, it was determined that fifty-five (55) crashes occurred at this intersection between January 1, 2021 and December 31, 2023. The CARTS pattern recognition analysis flagged right angle (13 crashes) and left turn-f (15 crashes) crashes. It should be noted that the southbound approach currently has a shared left/through lane and operates under protected/permitted phasing. Detailed crash analysis can be found in **Appendix C**.

Intersection Analysis

The intersection analyses were performed using Synchro 12 Software. It should be noted that the “HCM 6” module does not support an intersection geometry that contains a shared lane with protected/permitted phasing. Therefore, the “HCM 2000 – Signalized” module was utilized for analysis. The capacity analyses for this intersection during the AM, Noon, and PM analyses periods for Existing conditions are presented in **Table D-1** for the approach results and **Table D-2** for the left turn movement results.

Table D-1: LA 1 at LA 20 (Canal Blvd) Approaches

Scenario	EB Approach (LA 1)				WB Approach (LA 1)				NB Approach (Canal Blvd)				SB Approach (Canal Blvd)			
	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)
<i>AM Peak</i>																
Existing	D	45.5	0.73	246	D	38.3	0.61	235	B	11.2	0.25	140	B	16.6	0.74	#453
<i>Noon Peak</i>																
Existing	C	32.6	0.45	162	D	46.5	0.77	286	B	13.8	0.34	190	B	19.5	0.76	#431
<i>PM Peak</i>																
Existing	C	34.9	0.54	226	D	46.3	0.76	280	B	13.3	0.32	182	C	19.6	0.79	#465

These analyses indicate that under existing conditions, the approaches at this intersection operate with acceptable delays.

Table D-2: LA 1 at LA 20 (Canal Blvd) Left Turns

Scenario	EB Left (LA 1)				WB Left (LA 1)				NB Left (Canal Blvd)				SB Left (Canal Blvd)			
	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)
<i>AM Peak</i>																
Existing	C	32.2	0.17	33	C	30.1	0.33	60	B	17.5	0.07	19	--	--	--	--
<i>Noon Peak</i>																
Existing	C	28.9	0.45	87	C	29.4	0.15	47	C	20.1	0.14	33	--	--	--	--
<i>PM Peak</i>																
Existing	C	29.1	0.45	88	C	30.0	0.17	46	B	19.9	0.08	21	--	--	--	--

These analyses indicate that under existing conditions, the approaches at this intersection operate with acceptable delays. The southbound left results are not available as the HCM 2000 reports do not provide results for shared left/through lanes.

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Existing AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	34	231	10	67	151	77	1	16	410	40	1	166
Future Volume (vph)	34	231	10	67	151	77	1	16	410	40	1	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			
Frt	1.00	0.99		1.00	0.95			1.00	0.99			
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)	1805	1870		1805	1762			1803	3514			
Flt Permitted	0.41	1.00		0.27	1.00			0.22	1.00			
Satd. Flow (perm)	778	1870		509	1762			422	3514			
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.86
Adj. Flow (vph)	40	269	12	78	176	90	1	19	477	47	1	193
RTOR Reduction (vph)	0	2	0	0	18	0	0	0	4	0	0	0
Lane Group Flow (vph)	40	279	0	78	248	0	0	20	520	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	5%	2%	0%	1%	5%	2%	1%
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		custom	pm+pt
Protected Phases	3	8		7	4			1	6			5
Permitted Phases	8			4			1	6			5	2
Actuated Green, G (s)	27.5	22.7		32.7	25.3			64.9	64.9			
Effective Green, g (s)	27.5	22.7		32.7	25.3			64.9	64.9			
Actuated g/C Ratio	0.25	0.21		0.30	0.23			0.59	0.59			
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	239	385		238	405			276	2073			
v/s Ratio Prot	0.01	c0.15		c0.02	c0.14			0.00	c0.15			
v/s Ratio Perm	0.03			0.08				0.04				
v/c Ratio	0.17	0.73		0.33	0.61			0.07	0.25			
Uniform Delay, d1	31.9	40.7		29.3	38.0			17.4	10.9			
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2	0.3	6.7		0.8	2.7			0.1	0.1			
Delay (s)	32.2	47.4		30.1	40.7			17.5	10.9			
Level of Service	C	D		C	D			B	B			
Approach Delay (s/veh)		45.5			38.3				11.2			
Approach LOS		D			D				B			
Intersection Summary												
HCM 2000 Control Delay (s/veh)		22.9			HCM 2000 Level of Service				C			
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		110.0			Sum of lost time (s)				20.0			
Intersection Capacity Utilization		73.7%			ICU Level of Service				D			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Existing AM Peak

	↓	↙
Movement	SBT	SBR
Lane Configurations	4T	
Traffic Volume (vph)	599	65
Future Volume (vph)	599	65
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	
Lane Util. Factor	0.95	
Frt	0.99	
Flt Protected	0.99	
Satd. Flow (prot)	3494	
Flt Permitted	0.70	
Satd. Flow (perm)	2485	
Peak-hour factor, PHF	0.86	0.86
Adj. Flow (vph)	697	76
RTOR Reduction (vph)	5	0
Lane Group Flow (vph)	962	0
Heavy Vehicles (%)	1%	2%
Turn Type	NA	
Protected Phases	2	
Permitted Phases		
Actuated Green, G (s)	57.7	
Effective Green, g (s)	57.7	
Actuated g/C Ratio	0.52	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	1303	
v/s Ratio Prot		
v/s Ratio Perm	c0.39	
v/c Ratio	0.74	
Uniform Delay, d1	20.3	
Progression Factor	0.72	
Incremental Delay, d2	2.0	
Delay (s)	16.6	
Level of Service	B	
Approach Delay (s/veh)	16.6	
Approach LOS	B	
Intersection Summary		

Queues

1: Canal Blvd & LA 1

10/08/2024

							
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	56	291	88	288	24	521	1131
v/c Ratio	0.24	0.77	0.36	0.74	0.09	0.25	0.84
Control Delay (s/veh)	25.9	54.3	29.0	48.0	14.3	11.8	27.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Total Delay (s/veh)	25.9	54.3	29.0	48.0	14.3	11.8	29.0
Queue Length 50th (ft)	27	193	43	172	7	87	404
Queue Length 95th (ft)	33	246	60	235	19	140	#453
Internal Link Dist (ft)		486		543		406	326
Turn Bay Length (ft)	215		250		150		
Base Capacity (vph)	268	511	258	497	278	2109	1339
Starvation Cap Reductn	0	0	0	0	0	0	78
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.57	0.34	0.58	0.09	0.25	0.90

Intersection Summary

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

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Existing Noon Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	102	147	16	47	172	128	1	37	560	50	113	585
Future Volume (vph)	102	147	16	47	172	128	1	37	560	50	113	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0			5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			0.95
Frt	1.00	0.99		1.00	0.94			1.00	0.99			0.98
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.99
Satd. Flow (prot)	1805	1828		1770	1761			1804	3522			3473
Flt Permitted	0.21	1.00		0.60	1.00			0.24	1.00			0.69
Satd. Flow (perm)	407	1828		1127	1761			452	3522			2406
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	112	162	18	52	189	141	1	41	615	55	124	643
RTOR Reduction (vph)	0	4	0	0	26	0	0	0	4	0	0	10
Lane Group Flow (vph)	112	176	0	52	304	0	0	42	666	0	0	876
Heavy Vehicles (%)	0%	2%	6%	2%	1%	1%	2%	0%	1%	4%	2%	1%
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		pm+pt	NA
Protected Phases	3	8		7	4			1	6		5	2
Permitted Phases	8			4			1	6			2	
Actuated Green, G (s)	36.5	27.3		31.1	24.6			61.2	61.2			52.9
Effective Green, g (s)	36.5	27.3		31.1	24.6			61.2	61.2			52.9
Actuated g/C Ratio	0.33	0.25		0.28	0.22			0.56	0.56			0.48
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	251	453		356	393			292	1959			1157
v/s Ratio Prot	c0.04	0.10		0.01	c0.17			0.00	c0.19			
v/s Ratio Perm	0.11			0.03				0.08				c0.36
v/c Ratio	0.45	0.39		0.15	0.77			0.14	0.34			0.76
Uniform Delay, d1	27.6	34.4		29.2	40.1			19.8	13.3			23.3
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			0.72
Incremental Delay, d2	1.3	0.6		0.2	9.1			0.2	0.1			2.8
Delay (s)	28.9	35.0		29.4	49.2			20.1	13.5			19.5
Level of Service	C	C		C	D			C	B			B
Approach Delay (s/veh)		32.6			46.5				13.8			19.5
Approach LOS		C			D				B			B
Intersection Summary												
HCM 2000 Control Delay (s/veh)			24.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			79.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Existing Noon Peak

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	108
Future Volume (vph)	108
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	119
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Heavy Vehicles (%)	1%
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s/veh)	
Approach LOS	
Intersection Summary	

Queues
1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Existing Noon Peak

							
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	112	180	52	330	42	670	886
v/c Ratio	0.46	0.39	0.14	0.82	0.13	0.34	0.72
Control Delay (s/veh)	29.8	36.0	23.1	52.8	15.0	14.1	21.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total Delay (s/veh)	29.8	36.0	23.1	52.8	15.0	14.1	21.5
Queue Length 50th (ft)	54	104	24	200	13	128	295
Queue Length 95th (ft)	87	162	47	286	33	190	#431
Internal Link Dist (ft)		486		543		406	326
Turn Bay Length (ft)	215		250		150		
Base Capacity (vph)	257	504	402	505	338	1998	1233
Starvation Cap Reductn	0	0	0	0	0	0	75
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.36	0.13	0.65	0.12	0.34	0.77

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Existing PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	111	236	10	49	186	130	1	21	586	48	1	140
Future Volume (vph)	111	236	10	49	186	130	1	21	586	48	1	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			
Frt	1.00	0.99		1.00	0.94			1.00	0.99			
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)	1805	1871		1736	1775			1803	3536			
Flt Permitted	0.22	1.00		0.46	1.00			0.22	1.00			
Satd. Flow (perm)	415	1871		845	1775			418	3536			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.92	0.98	0.98	0.98	0.92	0.98
Adj. Flow (vph)	113	241	10	50	190	133	1	21	598	49	1	143
RTOR Reduction (vph)	0	2	0	0	25	0	0	0	4	0	0	0
Lane Group Flow (vph)	113	249	0	50	298	0	0	22	643	0	0	0
Heavy Vehicles (%)	0%	1%	0%	4%	0%	1%	2%	0%	1%	0%	2%	0%
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		custom	pm+pt
Protected Phases	3	8		7	4			1	6			5
Permitted Phases	8			4			1	6			5	2
Actuated Green, G (s)	36.2	27.0		30.6	24.2			61.6	61.6			
Effective Green, g (s)	36.2	27.0		30.6	24.2			61.6	61.6			
Actuated g/C Ratio	0.33	0.25		0.28	0.22			0.56	0.56			
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	252	459		286	390			261	1980			
v/s Ratio Prot	c0.04	0.13		0.01	c0.17			0.00	c0.18			
v/s Ratio Perm	0.11			0.04				0.05				
v/c Ratio	0.45	0.54		0.17	0.76			0.08	0.32			
Uniform Delay, d1	27.8	36.1		29.7	40.2			19.7	13.0			
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2	1.3	1.3		0.3	8.6			0.1	0.1			
Delay (s)	29.1	37.5		30.0	48.9			19.9	13.1			
Level of Service	C	D		C	D			B	B			
Approach Delay (s/veh)		34.9			46.3				13.3			
Approach LOS		C			D				B			
Intersection Summary												
HCM 2000 Control Delay (s/veh)		24.4			HCM 2000 Level of Service				C			
HCM 2000 Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		110.0			Sum of lost time (s)				20.0			
Intersection Capacity Utilization		84.5%			ICU Level of Service				E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Existing PM Peak

	↓	↙
Movement	SBT	SBR
Lane Configurations	←←	
Traffic Volume (vph)	689	96
Future Volume (vph)	689	96
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	5.0	
Lane Util. Factor	0.95	
Frt	0.98	
Flt Protected	0.99	
Satd. Flow (prot)	3501	
Flt Permitted	0.68	
Satd. Flow (perm)	2413	
Peak-hour factor, PHF	0.98	0.98
Adj. Flow (vph)	703	98
RTOR Reduction (vph)	7	0
Lane Group Flow (vph)	938	0
Heavy Vehicles (%)	1%	0%
Turn Type	NA	
Protected Phases	2	
Permitted Phases		
Actuated Green, G (s)	54.4	
Effective Green, g (s)	54.4	
Actuated g/C Ratio	0.49	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	1193	
v/s Ratio Prot		
v/s Ratio Perm	c0.39	
v/c Ratio	0.79	
Uniform Delay, d1	23.0	
Progression Factor	0.71	
Incremental Delay, d2	3.4	
Delay (s)	19.6	
Level of Service	B	
Approach Delay (s/veh)	19.6	
Approach LOS	B	
Intersection Summary		

Queues

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Existing PM Peak

							
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	113	251	50	323	22	647	945
v/c Ratio	0.46	0.55	0.17	0.81	0.07	0.32	0.74
Control Delay (s/veh)	30.0	40.6	23.7	52.4	13.3	13.8	20.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	30.0	40.6	23.7	52.4	13.3	13.8	20.6
Queue Length 50th (ft)	55	156	23	197	5	121	141
Queue Length 95th (ft)	88	226	46	280	21	182	#465
Internal Link Dist (ft)		486		543		406	326
Turn Bay Length (ft)	215		250		150		
Base Capacity (vph)	257	513	336	507	327	2015	1285
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.49	0.15	0.64	0.07	0.32	0.74

Intersection Summary

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

Queue shown is maximum after two cycles.

Appendix D

V. QAQC

Existing and No Build Analysis QA/QC Checklist

√	ANALYSIS - HCM	Comments
√	Assumptions, analysis and findings	
√	Compare the resulting queue, delay from analysis to the observed Peak Period conditions.	
√	Verify Origin-Destination observations	Study area is a single intersection
√	Volume input checked	
√	Number of Lanes	
√	Lane width	
√	Median width	
√	Storage Length and number	
√	TWLTL	n/a
√	Parameters such as Cycle Length, Splits, Protected and Permitted phases, detectors, Lead/Lag should match existing TSI(s)	
√	Locked Timing	Study area is a single intersection
√	Verify if the signal controllers have coordinated phases	

√	ANALYSIS - VISSIM	Comments
N/A	All items in Phase 1 Checklist	
N/A	All items in Phase 2 Checklist	

√	CHAPTER 2	Comments
√	All items listed in Chapter 2: Existing and No Build Document	
√	Summaries for crash results are found in respective locations	

√	APPENDIX D	Comments
√	All items listed in Appendix D: Existing and No Build Document	

Notes:

Engineer: Britton Overby Date given to Quality Checker: 10/11/24

Quality Checker: Jonathan Duhe Date check completed: 10/21/24

Appendix E

Alternative Analysis

- I. Build Geometry
- II. Analysis Results Maps
 - a. Peak Hour Volumes
 - b. Analyses Results Maps
- III. Clearance Calculations
- IV. Intersection Description / Synchro Analysis
 - a. LA 1 at LA 20 (Canal Blvd)
- V. Alternative Safety Analysis
 - a. LA 1 at LA 20 (Canal Blvd)
- VI. QAQC

Appendix E

I. Build Geometry

The build design that will be analyzed for this intersection within this appendix will be the addition of a southbound left turn lane on LA 20 (Canal Boulevard). The Build Geometry can be seen in **Figure E-1**.



FIGURE E-1
 LA 1 AT LA 20 (CANAL BLVD)
 BUILD GEOMETRY

LAFOURCHE PARISH



Appendix E

II. Analysis Results Maps

a. Peak Hour Volumes

2022 Build peak hour volumes are required for operational analyses. The proposed build geometry along with the 2022 peak hour volume map is provided in **Figure E-2**.



LEGEND

—	EXISTING 95TH PERCENTILE QUEUE
—	BUILD 95TH PERCENTILE QUEUE
XX.X	EXISTING DELAY (2022) (s/veh)
(XX.X)	BUILD DELAY (2022) (s/veh)

FIGURE E-3
LA 1 AT LA 20 (CANAL BLVD)
ANALYSIS RESULTS MAP - AM PEAK

LAFOURCHE PARISH

Appendix E

II. Analysis Results Maps

b. Analyses Results Maps

Operational analyses were performed for the four-legged signalized intersection within the study area. The 95th percentile queues and approach delays of the signalized intersection are presented on the following aerial maps, **Figure E-3** thru **Figure E-5**.



LEGEND

—	EXISTING 95TH PERCENTILE QUEUE
—	BUILD 95TH PERCENTILE QUEUE
XX.X	EXISTING DELAY (2022) (s/veh)
(XX.X)	BUILD DELAY (2022) (s/veh)

FIGURE E-3
LA 1 AT LA 20 (CANAL BLVD)
ANALYSIS RESULTS MAP - AM PEAK

LAFOURCHE PARISH

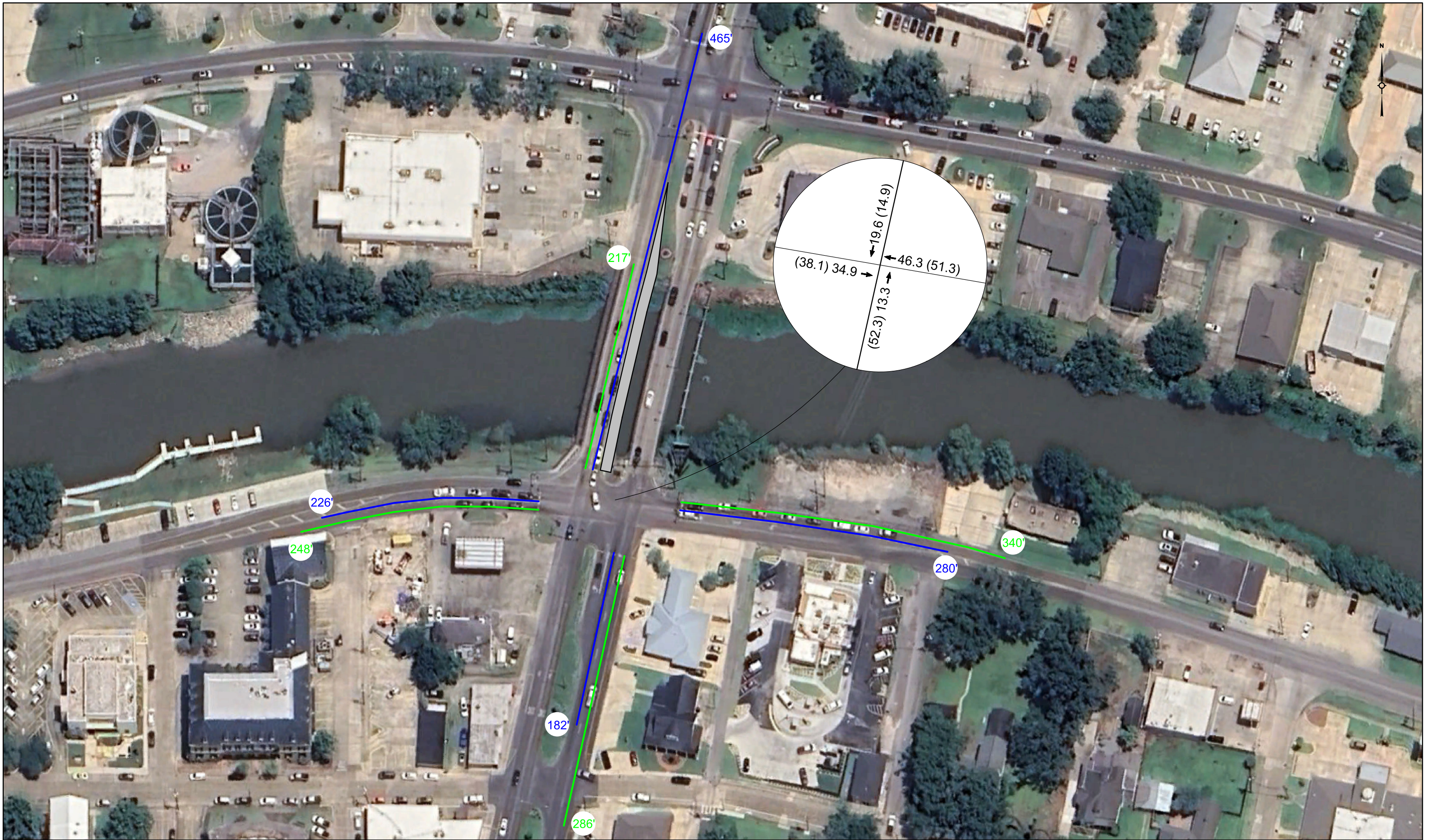


LEGEND

—	EXISTING 95TH PERCENTILE QUEUE
—	BUILD 95TH PERCENTILE QUEUE
XX.X	EXISTING DELAY (2022) (s/veh)
(XX.X)	BUILD DELAY (2022) (s/veh)

FIGURE E-4
LA 1 AT LA 20 (CANAL BLVD)
ANALYSIS RESULTS MAP - NOON PEAK

LAFOURCHE PARISH



LEGEND

—	EXISTING 95TH PERCENTILE QUEUE
—	BUILD 95TH PERCENTILE QUEUE
XX.X	EXISTING DELAY (2022) (s/veh)
(XX.X)	BUILD DELAY (2022) (s/veh)

FIGURE E-5
LA 1 AT LA 20 (CANAL BLVD)
ANALYSIS RESULTS MAP - PM PEAK

LAFOURCHE PARISH

Appendix E

Table E-1: LA 1 at LA 20 (Canal Blvd) Approach Results

Scenario	EB Approach (LA 1)				WB Approach (LA 1)				NB Approach (Canal Blvd)				SB Approach (Canal Blvd)			
	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)
AM Peak																
Existing	D	45.5	0.73	246	D	38.3	0.61	235	B	11.2	0.25	140	B	16.6	0.74	#453
Proposed	D	45	0.72	247	D	40.3	0.64	221	D	36.8	0.63	212	B	15.6	0.47	199
Noon Peak																
Existing	C	32.6	0.45	162	D	46.5	0.77	286	B	13.8	0.34	190	B	19.5	0.76	#431
Proposed	D	35.1	0.52	171	D	48.5	0.79	#304	C	32.2	0.55	256	B	19.8	0.48	171
PM Peak																
Existing	C	34.9	0.54	226	D	46.3	0.76	280	B	13.3	0.32	182	C	19.6	0.79	#465
Proposed	D	38.1	0.60	248	D	51.3	0.81	#340	D	52.3	0.83	286	B	14.9	0.47	217

As shown in **Table E-1**, the results show that all of the approaches are anticipated to operate with acceptable delays. There is an increase in the northbound approach delay under Build conditions. Due to the existing safety issues found during the safety analysis, the northbound and southbound left turns were analyzed as protected only left turns. Additionally, the clearance intervals were increased. These two changes could account for the increase in the delay. However, it should be noted that the southbound queue in the Build condition is anticipated to decrease to a much more acceptable length. The left turn movement results were also recorded. The results for all left turn movements can be seen below in **Table E-2**.

Table E-2: LA 1 at LA 20 (Canal Blvd) Left Turn Results

Scenario	EB Left (LA 1)				WB Left (LA 1)				NB Left (Canal Blvd)				SB Left (Canal Blvd)			
	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)	LOS	Delay (s/Veh)	V/C	95th Percentile Queue (ft)
AM Peak																
Existing	C	32.2	0.17	33	C	30.1	0.33	60	B	17.5	0.07	19	--	--	--	--
Proposed	C	32.8	0.18	39	C	32.4	0.35	65	F	86	0.63	38	C	31.5	0.47	199
Noon Peak																
Existing	C	28.9	0.45	87	C	29.4	0.15	47	C	20.1	0.14	33	--	--	--	--
Proposed	C	32.7	0.52	96	C	30.7	0.16	52	D	55	0.48	64	D	38.7	0.47	m149
PM Peak																
Existing	C	29.1	0.45	88	C	30.0	0.17	46	B	19.9	0.08	21	--	--	--	--
Proposed	C	32.4	0.51	99	C	31.4	0.19	52	F	93	0.66	41	C	25.7	0.29	m145

The results in **Table E-2** show that all of the left turn movements, excluding northbound left, are anticipated to operate with acceptable delays. As previously stated, The Existing southbound left results are unavailable due to the "HCM 2000" report not being able to provide left turn movement results for shared left/through lanes. The northbound left turn movement is anticipated to increase in delay. However, it should be noted that this movement is a low volume movement (under 40 vph in each peak) and is anticipated to have v/c ratios less than 1.0 with 95th percentile queues under 3 vehicles.

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	34	231	10	67	151	77	1	16	410	40	1	166
Future Volume (vph)	34	231	10	67	151	77	1	16	410	40	1	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.0	6.0			6.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95			1.00
Frt	1.00	0.99		1.00	0.95			1.00	0.99			1.00
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00			0.95
Satd. Flow (prot)	1805	1870		1805	1762			1805	3514			1787
Flt Permitted	0.41	1.00		0.32	1.00			0.95	1.00			0.95
Satd. Flow (perm)	781	1870		613	1762			1805	3514			1787
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.86	0.86	0.86	0.92	0.86
Adj. Flow (vph)	40	269	12	78	176	90	1	19	477	47	1	193
RTOR Reduction (vph)	0	2	0	0	18	0	0	0	6	0	0	0
Lane Group Flow (vph)	40	279	0	78	248	0	0	20	518	0	0	194
Heavy Vehicles (%)	0%	1%	0%	0%	1%	5%	0%	0%	1%	5%	0%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	Prot	NA		Prot	Prot
Protected Phases	3	8		7	4		1	1	6		5	5
Permitted Phases	8			4								
Actuated Green, G (s)	26.8	22.9		29.4	24.2			2.0	31.3			25.6
Effective Green, g (s)	26.8	22.9		29.4	24.2			2.0	31.3			25.6
Actuated g/C Ratio	0.24	0.21		0.27	0.22			0.02	0.28			0.23
Clearance Time (s)	6.5	6.5		6.5	6.5			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	226	389		220	387			32	999			415
v/s Ratio Prot	0.01	c0.15		c0.02	0.14			0.01	c0.15			0.11
v/s Ratio Perm	0.04			0.08								
v/c Ratio	0.18	0.72		0.35	0.64			0.63	0.52			0.47
Uniform Delay, d1	32.4	40.5		31.4	39.0			53.6	33.0			36.3
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00			0.85
Incremental Delay, d2	0.4	6.2		1.0	3.6			32.4	1.9			0.8
Delay (s)	32.8	46.8		32.4	42.6			86.0	34.9			31.5
Level of Service	C	D		C	D			F	C			C
Approach Delay (s/veh)		45.0			40.3				36.8			
Approach LOS		D			D				D			
Intersection Summary												
HCM 2000 Control Delay (s/veh)			29.2			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			25.0			
Intersection Capacity Utilization			63.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Proposed AM Peak

	↓	↙
Movement	SBT	SBR
Lane Configurations	↑↑	
Traffic Volume (vph)	599	65
Future Volume (vph)	599	65
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	6.0	
Lane Util. Factor	0.95	
Frt	0.99	
Flt Protected	1.00	
Satd. Flow (prot)	3518	
Flt Permitted	1.00	
Satd. Flow (perm)	3518	
Peak-hour factor, PHF	0.86	0.86
Adj. Flow (vph)	697	76
RTOR Reduction (vph)	7	0
Lane Group Flow (vph)	766	0
Heavy Vehicles (%)	1%	2%
Turn Type	NA	
Protected Phases	2	
Permitted Phases		
Actuated Green, G (s)	54.9	
Effective Green, g (s)	54.9	
Actuated g/C Ratio	0.50	
Clearance Time (s)	6.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	1755	
v/s Ratio Prot	c0.22	
v/s Ratio Perm		
v/c Ratio	0.44	
Uniform Delay, d1	17.6	
Progression Factor	0.62	
Incremental Delay, d2	0.7	
Delay (s)	11.6	
Level of Service	B	
Approach Delay (s/veh)	15.6	
Approach LOS	B	
Intersection Summary		

Queues

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed AM Peak

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	40	281	78	266	20	524	194	773
v/c Ratio	0.16	0.76	0.35	0.66	0.24	0.44	0.54	0.39
Control Delay (s/veh)	26.0	54.7	30.2	43.5	58.1	31.0	39.3	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Delay (s/veh)	26.0	54.7	30.2	43.5	58.1	31.0	39.3	10.9
Queue Length 50th (ft)	20	188	39	163	14	152	128	63
Queue Length 95th (ft)	39	247	65	221	38	212	199	181
Internal Link Dist (ft)		486		543		406		326
Turn Bay Length (ft)	215		250		150		150	
Base Capacity (vph)	250	486	226	483	82	1204	357	1959
Starvation Cap Reductn	0	0	0	0	0	0	0	443
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.58	0.35	0.55	0.24	0.44	0.54	0.51
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed Noon Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	102	147	16	47	172	128	1	37	560	50	113	585
Future Volume (vph)	102	147	16	47	172	128	1	37	560	50	113	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	0.95		1.00	0.95
Frt	1.00	0.99		1.00	0.94			1.00	0.99		1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1805	1828		1770	1761			1804	3522		1770	3491
Flt Permitted	0.25	1.00		0.60	1.00			0.95	1.00		0.95	1.00
Satd. Flow (perm)	475	1828		1120	1761			1804	3522		1770	3491
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	112	162	18	52	189	141	1	41	615	55	124	643
RTOR Reduction (vph)	0	4	0	0	25	0	0	0	6	0	0	12
Lane Group Flow (vph)	112	176	0	52	305	0	0	42	664	0	124	750
Heavy Vehicles (%)	0%	2%	6%	2%	1%	1%	2%	0%	1%	4%	2%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	Prot	NA		Prot	NA
Protected Phases	3	8		7	4		1	1	6		5	2
Permitted Phases	8			4								
Actuated Green, G (s)	31.9	25.4		29.3	24.1			5.4	38.0		16.4	49.0
Effective Green, g (s)	31.9	25.4		29.3	24.1			5.4	38.0		16.4	49.0
Actuated g/C Ratio	0.29	0.23		0.27	0.22			0.05	0.35		0.15	0.45
Clearance Time (s)	6.5	6.5		6.5	6.5			6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	216	422		329	385			88	1216		263	1555
v/s Ratio Prot	c0.03	0.10		0.01	c0.17			0.02	c0.19		0.07	c0.21
v/s Ratio Perm	0.12			0.03								
v/c Ratio	0.52	0.42		0.16	0.79			0.48	0.55		0.47	0.48
Uniform Delay, d1	30.6	36.0		30.5	40.6			50.9	29.0		42.8	21.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		0.87	0.73
Incremental Delay, d2	2.1	0.7		0.2	10.7			4.0	1.8		1.3	1.0
Delay (s)	32.7	36.7		30.7	51.2			55.0	30.8		38.7	16.7
Level of Service	C	D		C	D			D	C		D	B
Approach Delay (s/veh)		35.1			48.5				32.2			19.8
Approach LOS		D			D				C			B
Intersection Summary												
HCM 2000 Control Delay (s/veh)			30.5			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			25.0			
Intersection Capacity Utilization			67.1%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Proposed Noon Peak

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	108
Future Volume (vph)	108
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	119
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Heavy Vehicles (%)	1%
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s/veh)	
Approach LOS	
Intersection Summary	

Queues

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed Noon Peak

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	112	180	52	330	42	670	124	762
v/c Ratio	0.53	0.42	0.16	0.85	0.33	0.50	0.55	0.45
Control Delay (s/veh)	36.1	38.6	25.5	57.1	54.7	28.2	49.0	16.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (s/veh)	36.1	38.6	25.5	57.1	54.7	28.2	49.0	16.1
Queue Length 50th (ft)	55	107	25	201	29	190	88	103
Queue Length 95th (ft)	96	171	52	#304	64	256	m149	171
Internal Link Dist (ft)		486		543		406		326
Turn Bay Length (ft)	215		250		150		150	
Base Capacity (vph)	210	452	337	448	164	1339	225	1683
Starvation Cap Reductn	0	0	0	0	0	0	0	215
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.40	0.15	0.74	0.26	0.50	0.55	0.52

Intersection Summary

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

Queue shown is maximum after two cycles.

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

HCM Signalized Intersection Capacity Analysis

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	111	236	10	49	186	130	21	586	48	1	140	689
Future Volume (vph)	111	236	10	49	186	130	21	586	48	1	140	689
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.0	6.0			6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95			1.00	0.95
Frt	1.00	0.99		1.00	0.94		1.00	0.99			1.00	0.98
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1805	1871		1736	1775		1805	3536			1805	3513
Flt Permitted	0.24	1.00		0.45	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	454	1871		825	1775		1805	3536			1805	3513
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.92	0.98	0.98
Adj. Flow (vph)	113	241	10	50	190	133	21	598	49	1	143	703
RTOR Reduction (vph)	0	2	0	0	23	0	0	5	0	0	0	9
Lane Group Flow (vph)	113	249	0	50	300	0	21	642	0	0	144	792
Heavy Vehicles (%)	0%	1%	0%	4%	0%	1%	0%	1%	0%	0%	0%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases	8			4								
Actuated Green, G (s)	31.9	24.5		28.7	22.9		2.0	24.1			30.6	52.7
Effective Green, g (s)	31.9	24.5		28.7	22.9		2.0	24.1			30.6	52.7
Actuated g/C Ratio	0.29	0.22		0.26	0.21		0.02	0.22			0.28	0.48
Clearance Time (s)	6.5	6.5		6.5	6.5		6.0	6.0			6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	222	416		263	369		32	774			502	1683
v/s Ratio Prot	c0.03	0.13		0.01	c0.17		0.01	c0.18			0.08	c0.23
v/s Ratio Perm	0.11			0.04								
v/c Ratio	0.51	0.60		0.19	0.81		0.66	0.83			0.29	0.47
Uniform Delay, d1	30.6	38.4		31.1	41.5		53.7	41.0			31.1	19.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			0.82	0.62
Incremental Delay, d2	1.8	2.3		0.4	12.8		39.4	10.0			0.3	0.9
Delay (s)	32.4	40.7		31.4	54.3		93.0	51.0			25.7	12.9
Level of Service	C	D		C	D		F	D			C	B
Approach Delay (s/veh)		38.1			51.3			52.3				14.9
Approach LOS		D			D			D				B
Intersection Summary												
HCM 2000 Control Delay (s/veh)		34.9			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		110.0			Sum of lost time (s)			25.0				
Intersection Capacity Utilization		71.0%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

1: Canal Blvd & LA 1

LA 1 at Canal Bridge Signal Improvements

Proposed PM Peak

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	96
Future Volume (vph)	96
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.98
Adj. Flow (vph)	98
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Heavy Vehicles (%)	0%
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s/veh)	
Approach LOS	
Intersection Summary	

Queues

LA 1 at Canal Bridge Signal Improvements

1: Canal Blvd & LA 1

Proposed PM Peak

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	113	251	50	323	21	647	144	801
v/c Ratio	0.52	0.60	0.18	0.87	0.26	0.69	0.33	0.43
Control Delay (s/veh)	35.8	45.6	26.9	62.4	58.6	41.1	30.1	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay (s/veh)	35.8	45.6	26.9	62.4	58.6	41.1	30.1	11.8
Queue Length 50th (ft)	56	161	24	200	15	220	88	76
Queue Length 95th (ft)	99	248	52	#340	41	286	m145	217
Internal Link Dist (ft)		486		543		406		326
Turn Bay Length (ft)	215		250		150		150	
Base Capacity (vph)	218	423	280	402	82	937	443	1848
Starvation Cap Reductn	0	0	0	0	0	0	0	468
Spillback Cap Reductn	0	0	0	0	0	1	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.59	0.18	0.80	0.26	0.69	0.33	0.58

Intersection Summary

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

Queue shown is maximum after two cycles.

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

Appendix E

IV. Alternative Safety Analysis

a. LA 1 at LA 20 (Canal Blvd)

During the existing safety analysis found in **Appendix C**, it was determined that during the study period of January 1, 2021 through December 31, 2023 there were fifty-five (55) crashes within the study area.

In this section of the Appendix, the proposed geometry for build conditions for the intersection of LA 1 at LA 20 (Canal Boulevard) was utilized to determine if the crash issues determined in **Appendix C** would be mitigated by these improvements. This was done by utilizing crash modification factors.

In order to analyze the effects of the proposed geometry on safety, Crash Modification Factors (CMFs) were utilized. These CMFs were obtained from the Crash Modification Factors Clearinghouse (a searchable database). Several CMFs were considered in determining the anticipated safety improvements by the build scenario. A summary of the CMFs is shown in **Table E-3**.

Table E-3: CMF Summary Table

CMF Name	CMF ID	CMF	Applies to:
Increase Total Change Interval	4219	0.92	All Crashes
Install left-turn lane (signal has left-turn phase)	1581	0.65	All Crashes
Protected/permissive to protected only left turn phasing	11159	0.745	All Crashes

As shown in the table, a CMF for Increase Total Change Interval, install left-turn lane (signal has left-turn phase), and protected/permissive to protected only left turn phasing were utilized. Because these CMFs apply to all crash types, they can be multiplied together to make a single CMF for the proposed geometry.

Using the calculated CMF, a reduction in crashes along with the anticipated total number of crashes after the proposed geometry and recommendations are implemented was determined. These numbers can be seen below in **Table E-4**.

Appendix E

Table E-4: Crash Reduction Summary

Crash Code	Crash Type	Existing # of Crashes	CMF	Reduction Due to CMF	Expected # of Crashes
A	Non-Collision	0	0.45	0	0
B	Rear End	12	0.45	-7	5
C	Head On	0	0.45	0	0
D	Right Angle	13	0.45	-7	6
E	Left Turn-e	0	0.45	0	0
F	Left Turn-f	15	0.45	-8	7
G	Left Turn-g	1	0.45	-1	0
H	Right Turn-h	2	0.45	-1	1
I	Right Turn-i	1	0.45	-1	0
J	Side Swipe (sd)	9	0.45	-5	4
K	Side Swipe (od)	0	0.45	0	0
Z	Other	2	0.45	-1	1
Total		55		-31	24

As shown in the table above, of the fifty-five (55) crashes that occurred at the study intersection, thirty-one (31) of these crashes may have been corrected with the new geometry, the increased total change interval, and switching to protected only left turns. This would have resulted in a reduction of 56.4% for a total of twenty-four (24) total crashes.

While the protected only phasing and increased clearance times are recommended, it is DOTD District 02H's preference to keep the existing clearance intervals as well as the protected/permitted left turn phasing due to operational concerns. Furthermore, a 5-section left turn signal head is preferred by the district for consistency as the remainder of LA 20 (Canal Boulevard) has existing 5-section left turn signal heads. It should be noted that while the additional safety benefits from the protected only phasing and increased clearance intervals would not be present under these preferences, the safety benefits from the added southbound left turn lane will still be present.

Appendix E

V. QAQC

Alternative Analysis QA/QC Checklist

√	CAP X	Comments
N/A	Lane Configuration is correct	
N/A	Input volumes are correct	
N/A	Truck Percentage and Growth Rates are correct	
√	REDISTRIBUTED VOLUMES MAP	Comments
√	Volumes correspond with the correct layout (i.e. any removed left turn volumes are added to downstream u-turn movement)	
√	CONCEPTUAL LAYOUTS	Comments
√	Geometric meet approved design guideline report	
√	SAFETY ANALYSIS	Comments
N/A	Verify figure matches tables	
√	SOFTWARE ANALYSIS	Comments
√	No parameter changed from No Build	
√	Volume entered correctly	
√	Geometry entered correctly	
√	AERIAL OF MOES ALONG CORRIDOR	Comments
√	MOEs transposed correctly on tables	

Notes:

Engineer: Britton Overby Date given to Quality Checker: 10-14-2024

Quality Checker: Jonathan Duhe Date check completed: 10-19-2024