final report

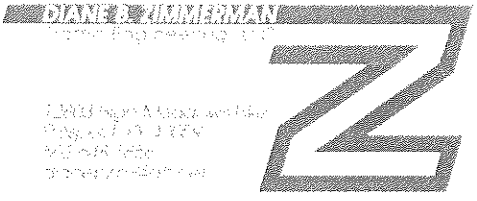
August 26, 2020

Traffic Impact Study

Residential
9300 Cooper Chapel Road (KY 864)
Louisville, KY

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet



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INTRODUCTION

The site plan for the proposed residential development shows 88 single-family lots and 432 apartments on Cooper Chapel Road (KY 864) at the intersection of Cedar Creek Road in Louisville, KY. **Figure 1** displays a map of the site. Access to the site will be from two entrances, one on Copper Chapel Road and one on Cedar Creek Road (KY 864). A connection will be made to Fantasy Trail to the south. The purpose of this study is to examine the traffic impacts of the development upon the adjacent highway system. For this study, the impact area was defined to be the intersections of Cedar Creek Road with Loyal Drive and Cooper Chapel Road, and the proposed entrances.

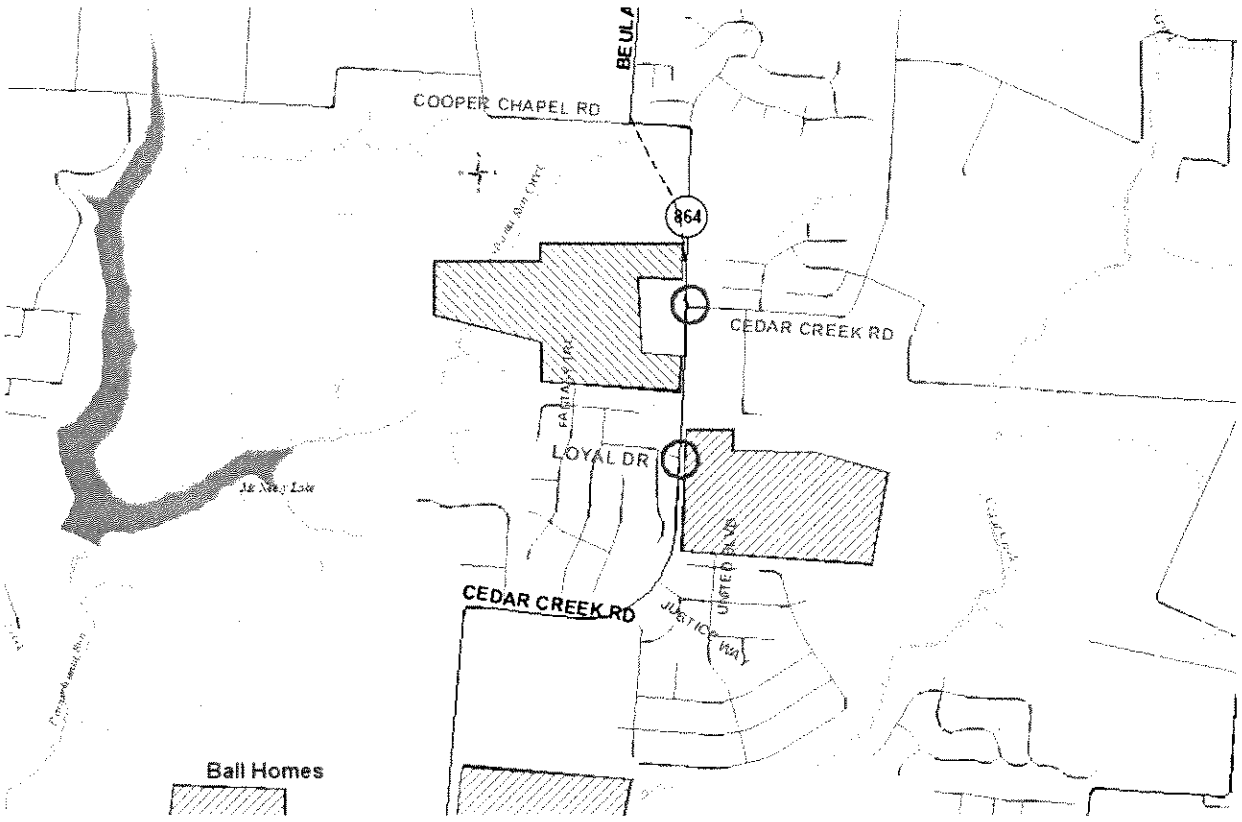


Figure 1. Site Map

EXISTING CONDITIONS

Cedar Creek Road, KY 864, is a state-maintained road with an estimated 2020 ADT of 2,400 vehicles per day between KY 2053 (Mt. Washington Road) and Cooper Chapel Road as estimated from the 2018 count at Kentucky Transportation Cabinet (KYTC) at station 279. The KYTC functional classification is Urban Major Collector. The road is a two-lane highway with ten-foot lanes with three-foot shoulders through the study area (provided by the Kentucky Transportation Cabinet). The speed limit is 35 mph. There are no sidewalks. The intersection at Loyal Drive is controlled with a stop sign on Loyal Drive. The intersection with Cedar Creek Road is controlled with a stop sign on Cedar Creek Road.

Peak hour traffic count for the intersection of Cedar Creek Road at Loyal Drive was obtained on Wednesday, January 15, 2020. The a.m. peak hour occurred between 7:00 and 8:00 and the p.m. peak hour occurred between 4:45 and

5:45. The turning movement data for the intersection of Cooper Chapel Road at Cedar Creek Road is from the KYTC traffic forecast for Cooper Chapel Road improvements (5-481.0) dated January 2013. The 2013 volumes have been project to 2020. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes. The Appendix contains the full count data.

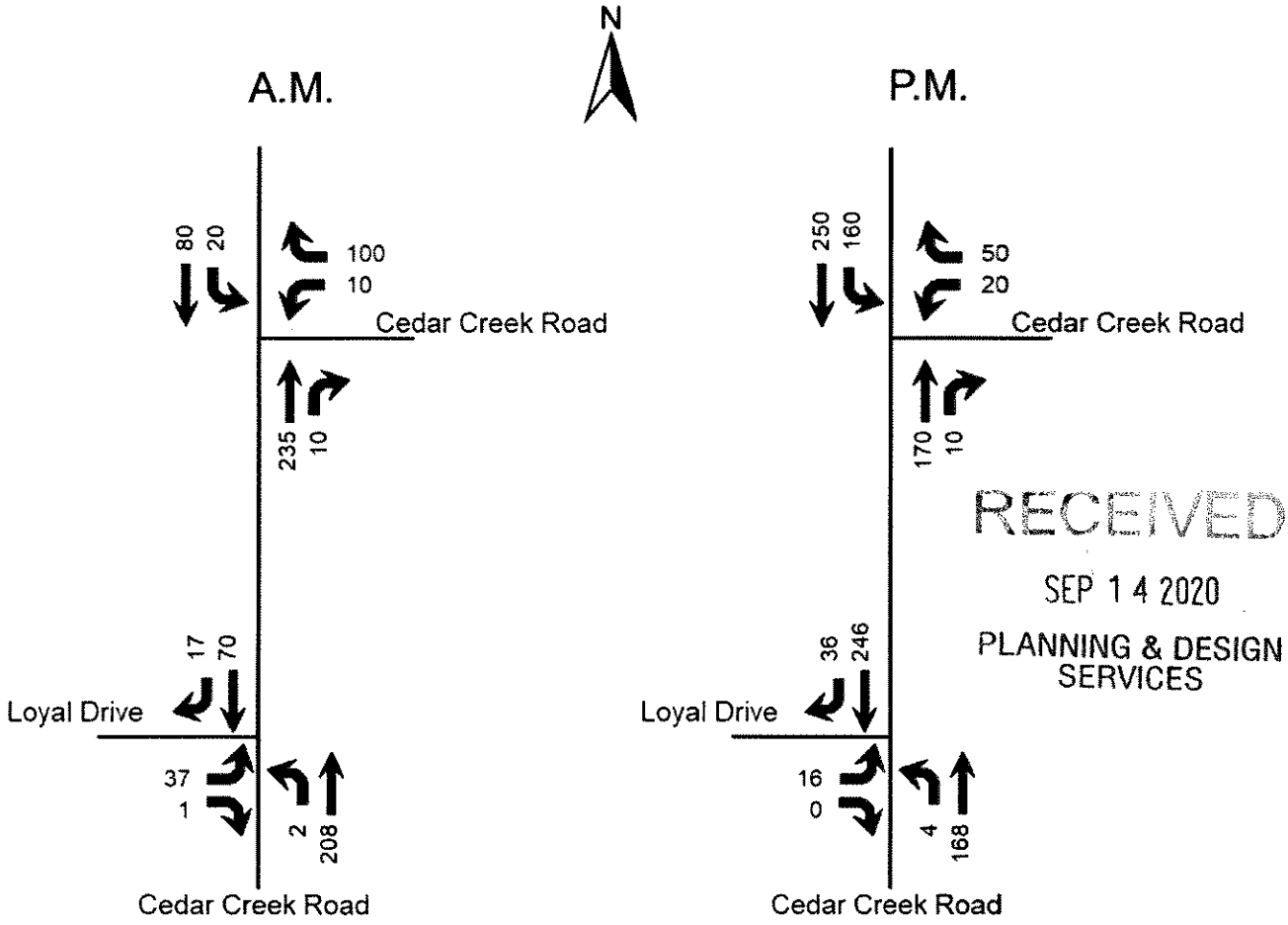


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The project completion date is 2024. An annual growth rate of 2 percent was applied to the 2020 thru volumes. This was determined by the historical growth at KYTC station 279. Trip generation for 523 lots from approved subdivisions to the south were included (see Appendix for detail). Trip generation for the remaining 62 lots to be accessed from Loyal Drive have been included on Loyal Drive. The Kentucky Transportation Cabinet and Louisville Metro will be constructing improvements to Cooper Chapel Road north to Beulah Church Road. This project will include a two-way left-turn lane. **Figure 3** displays the 2024 No Build peak hour volumes.

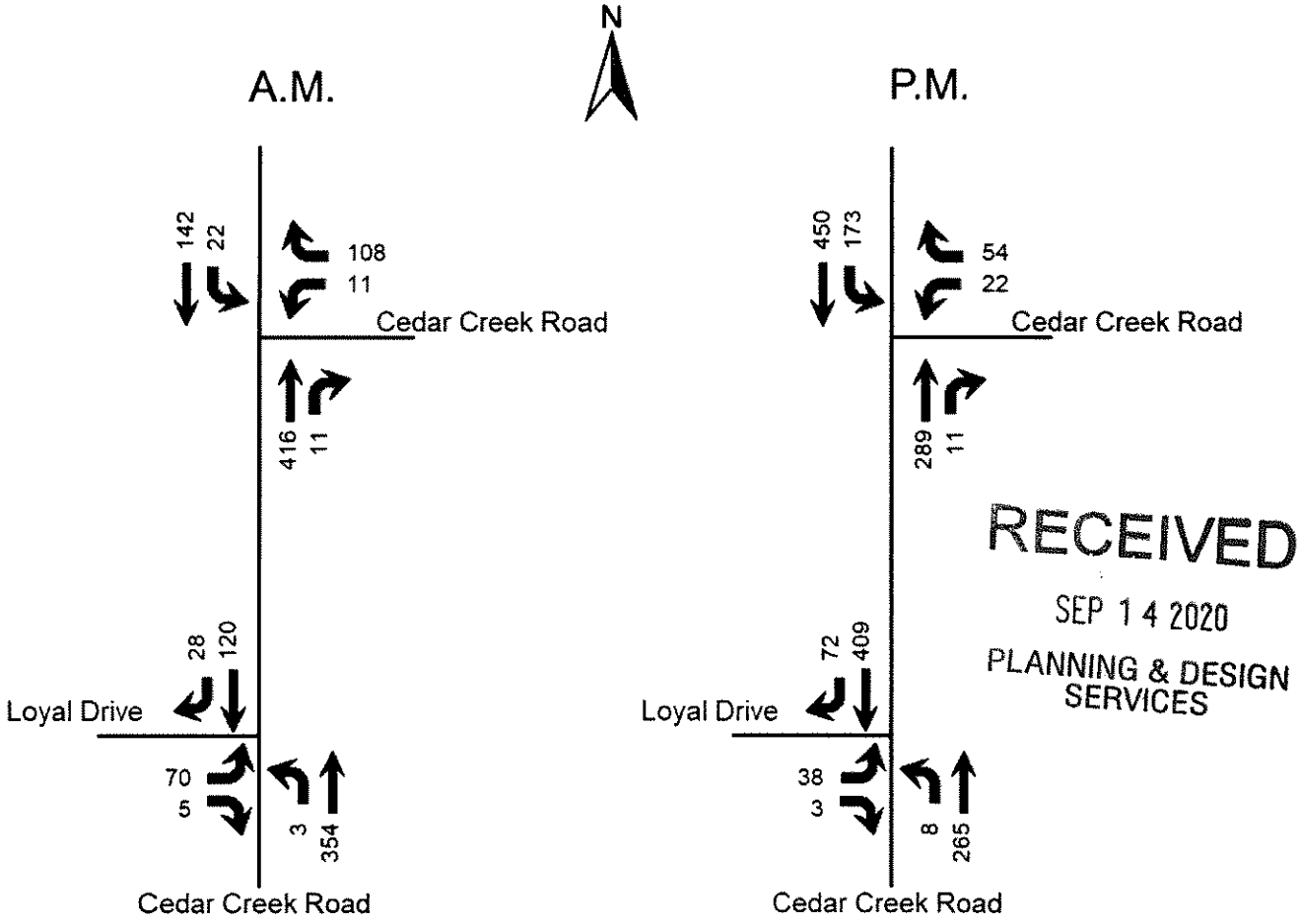


Figure 3. 2024 No Build Peak Hour Volumes

TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 10th Edition contains trip generation rates for a wide range of developments. The land uses of "Single-Family Detached (210)" and "Multifamily Housing (Mid-Rise) (221)" were reviewed and determined to be the best match. The trip generation results are listed in **Table 1**. The trips were assigned to the highway network with the percentages shown in **Figure 4**. **Figure 5** shows the trips generated by this development and distributed throughout the road network during the peak hours. **Figure 6** displays the individual turning movements for the peak hours when the development is completed.

Table 1. Peak Hour Trips Generated by Site

	A.M. Peak Hour			P.M. Peak Hour		
Land Use	**Trips**	**In**	**Out**	**Trips**	**In**	**Out**
Single-Family (88 units)	67	17	50	180	110	70
Multifamily (432 units)	144	37	107	180	110	70
TOTAL	**211**	**54**	**157**	**270**	**167**	**103**

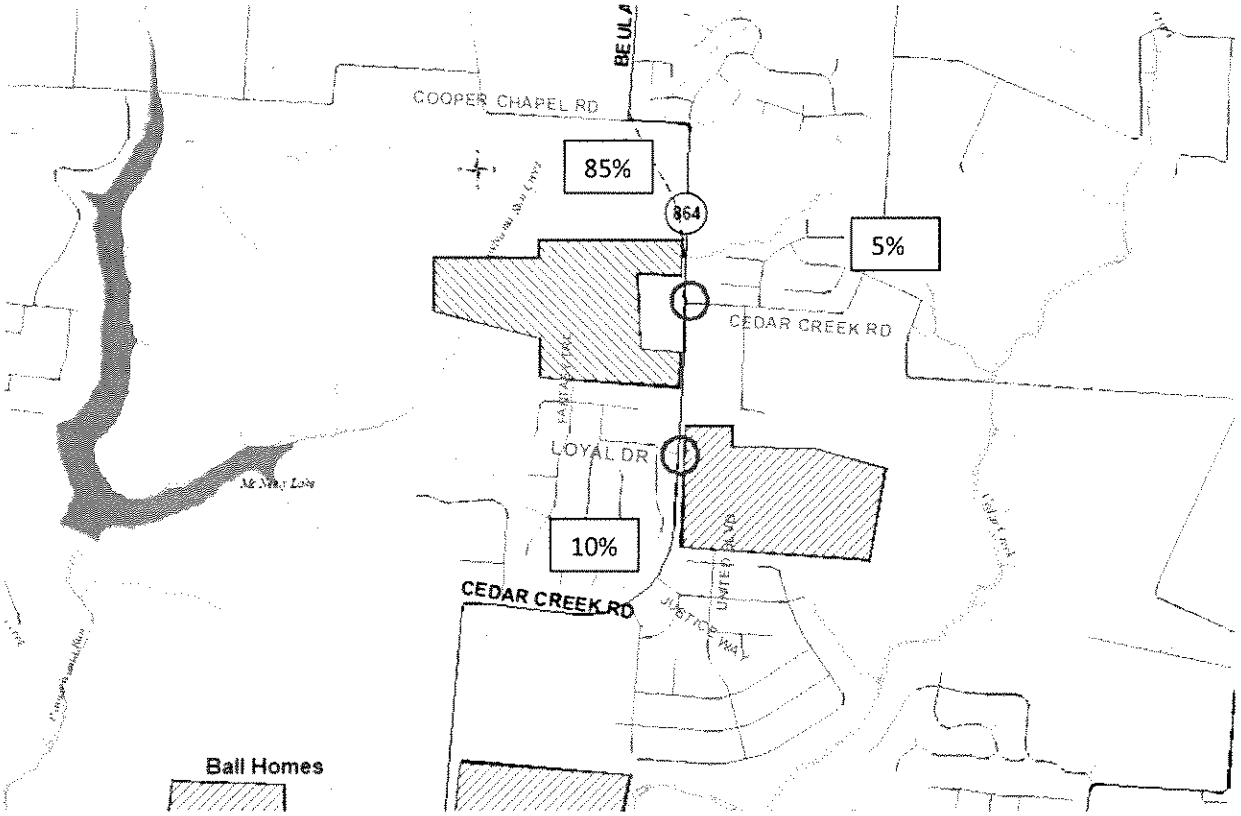


Figure 4. Trip Distribution Percentages

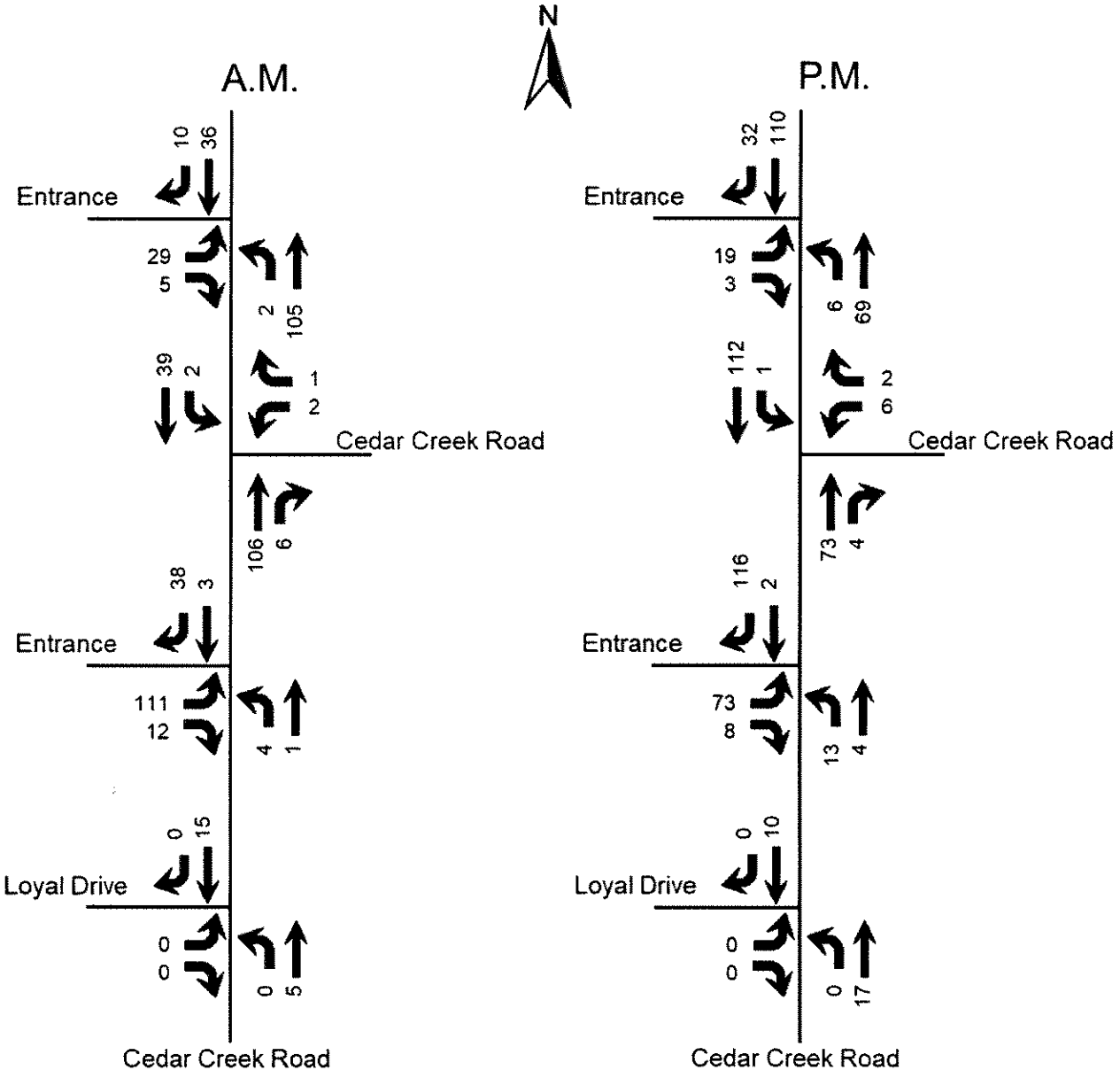


Figure 5. Peak Hour Trips Generated by Site

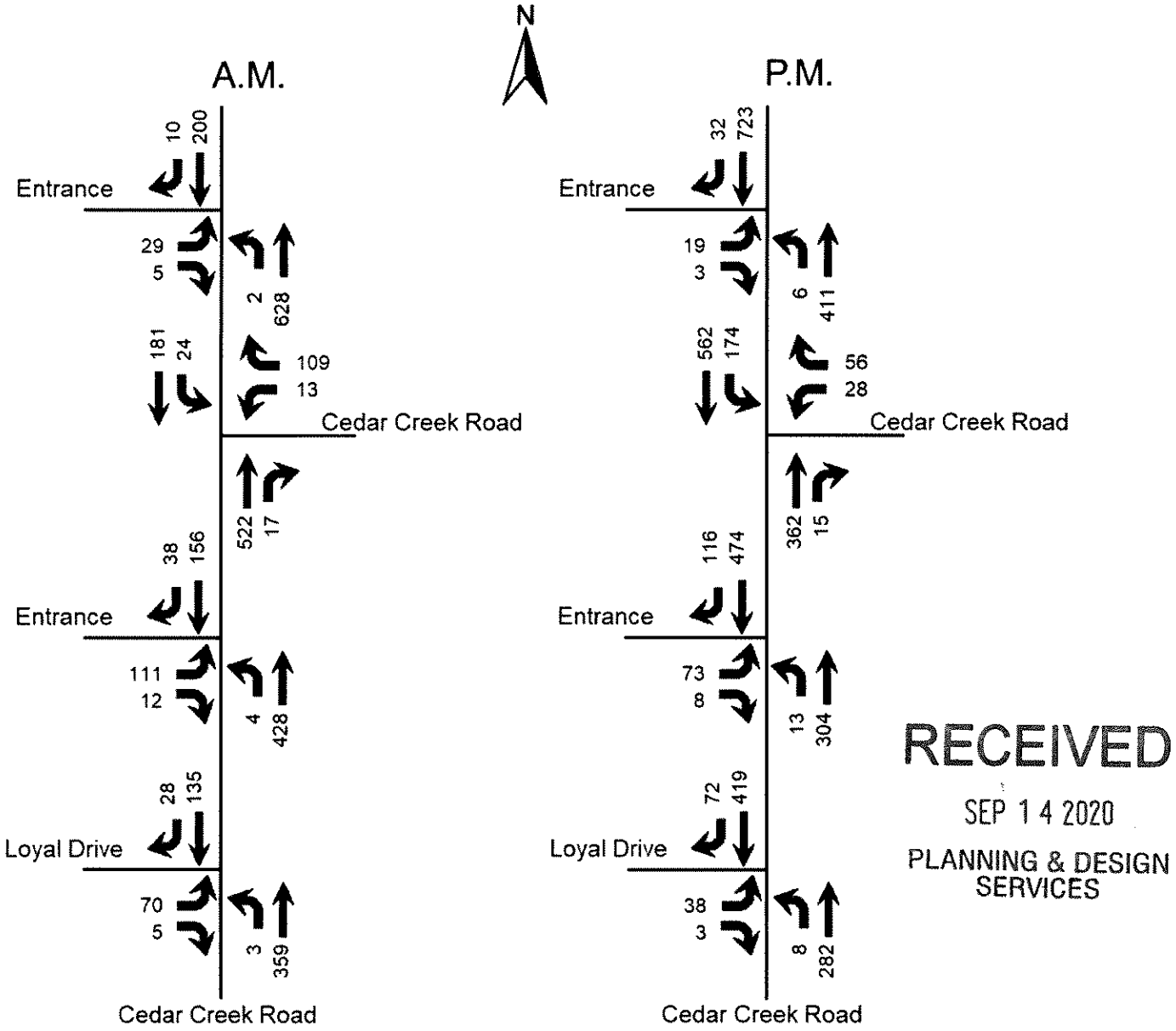


Figure 6. 2024 Build Peak Hour Volumes

ANALYSIS

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a "Level of Service". Level of Service is a ranking scale from A through F, "A" is the best operating condition and "F" is the worst. Level of Service results depend upon the facility that is analyzed. In this case, the Level of Service is based upon the total delay experienced for lanes at stop-controlled intersections.

To evaluate the impact of the proposed development, the vehicle delays at the intersections were determined using procedures detailed in the Highway Capacity Manual, 6th edition. Future delays and Level of Service were determined for the intersections using the HCS Streets (version 7.9) software. The delays and Level of Service are summarized in **Table 2**.

Table 2. Peak Hour Level of Service

	A.M.			P.M.		
Approach	2020 Existing	2024 No Build	2024 Build	2020 Existing	2024 No Build	2024 Build
Cooper Chapel Road at Entrance (N)						
Entrance Eastbound			C 15.1			C 18.2
Cooper Chapel Road Northbound (left)			A 7.7			A 9.8
Cooper Chapel Road at Cedar Creek Road						
Cedar Creek Road Westbound	B 10.7	B 14.0	B 16.7	B 12.1	B 14.8	C 18.2
Cooper Chapel Road Southbound (left)	A 7.9	A 8.6	A 9.0	A 7.9	A 8.6	A 9.0
Cedar Creek Road at Loyal Drive						
Loyal Drive Eastbound	B 11.0	B 14.4	B 14.8	B 12.3	C 17.6	C 18.3
Cedar Creek Road Northbound (left)	A 7.4	A 7.6	A 7.6	A 7.9	A 8.6	A 8.6
Cedar Creek Road at Entrance						
Entrance Eastbound			C 18.7			C 22.8
Cedar Creek Road Northbound (left)			A 7.7			A 9.0

Key: Level of Service, Delay in seconds per vehicle

The entrances were evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated July, 2020. The traffic impact policy requires using volumes for ten years beyond opening date, or 2034. The 2034 volumes were determined by using 2% annual growth from the 2020 volumes and adding trip generation for all the recently approved lots (770 total). See appendix for trip generation. Figure 7 is the 2034 No Build and Figure 8 is the Build. The volumes in Figure 8 were utilized to determine turn lane requirements. The south entrance will require a southbound right turn lane. Table 3 displays the level of service results for 2034.

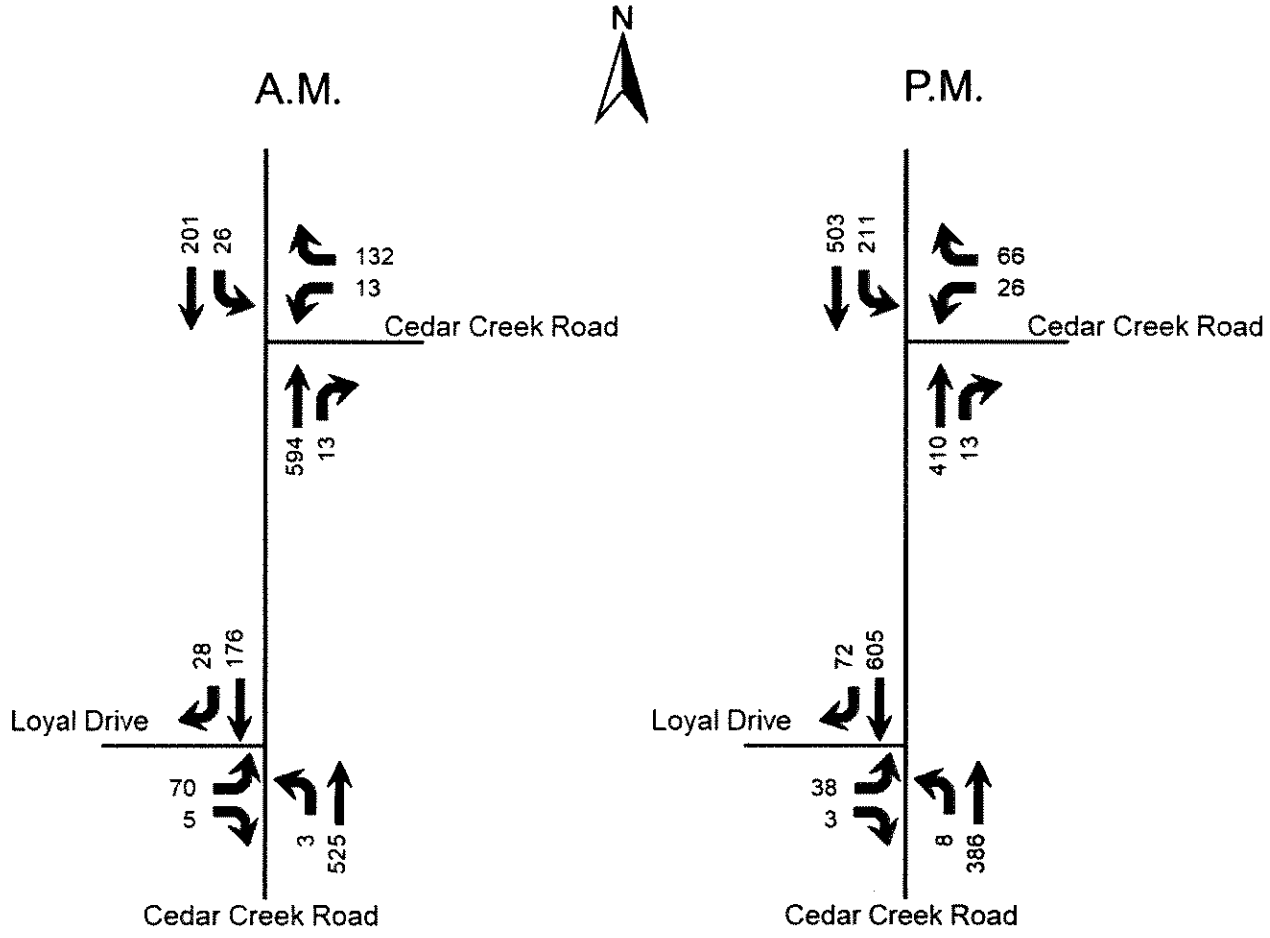


Figure 7. 2034 No Build Peak Hour Volumes

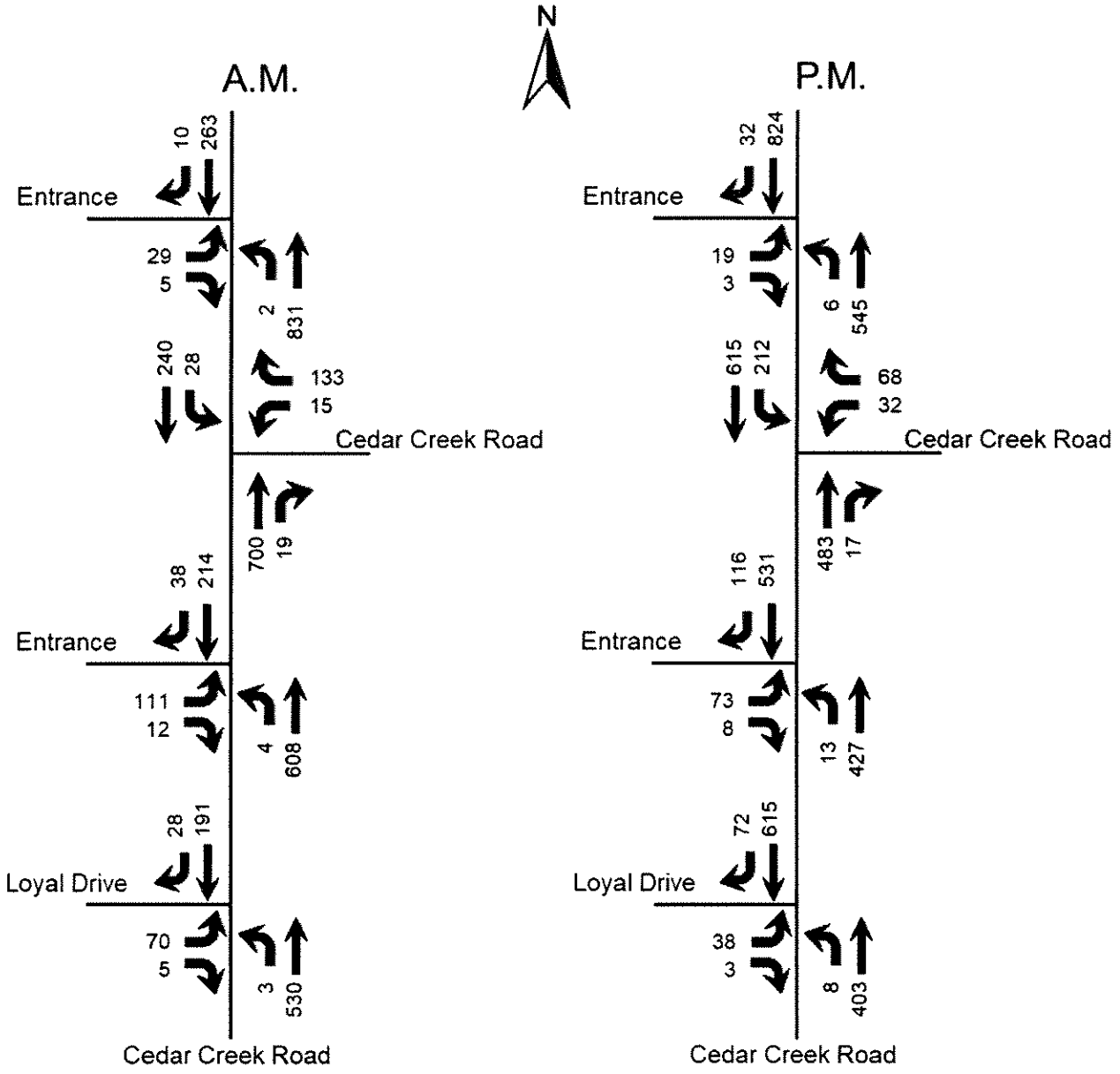


Figure 8. 2034 Build Peak Hour Volumes

Table 3. Peak Hour Level of Service 2034

Approach	A.M.			P.M.		
	2020 Existing	2034 No Build	2034 Build	2020 Existing	2034 No Build	2034 Build
Cooper Chapel Road at Entrance (N)						
Entrance Eastbound			C 18.8			C 21.4
Cooper Chapel Road Northbound (left)			A 7.9			B 10.3
Cooper Chapel Road at Cedar Creek Road						
Cedar Creek Road Westbound	B 10.7	C 20.5	D 27.0	B 12.1	C 19.1	D 25.1
Cooper Chapel Road Southbound (left)	A 7.9	A 9.4	A 10.0	A 7.9	A 9.5	A 10.0
Cedar Creek Road at Loyal Drive						
Loyal Drive Eastbound	B 11.0	C 20.2	C 21.0	B 12.3	D 28.8	D 30.2
Cedar Creek Road Northbound (left)	A 7.4	A 7.7	A 7.8	A 7.9	A 9.4	A 9.4
Cedar Creek Road at Entrance						
Entrance Eastbound			D 32.1			D 32.8
Cedar Creek Road Northbound (left)			A 7.9			A 9.3

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2034, there will be a slight impact to the existing highway network. A southbound right-turn lane will be required at the south entrance. No other improvements are required.

APPENDIX

Traffic Counts

Jefferson County, KY
Classified Turn Movement Count

Site 6 of 6
KY-864 Cedar Creek Rd (North)

KY-864 Cedar Creek Rd (South)
Loyal Dr

Lat/Long
38.099388°, -85.614268°

Weather
Cloudy
51°F

Date
Wednesday, January 15, 2020

Marr Traffic
Transportation Data Collection

41 Peabody Street, Nashville, TN 37210
10 Glenlake Parkway, Suite 130, Atlanta, GA 30328
555 Fayetteville Street, Suite 201, Raleigh, NC 27601
1229 South Shelby Street, Louisville, KY 40203
6565 North MacArthur Boulevard, Suite 225, Dallas, TX 75039

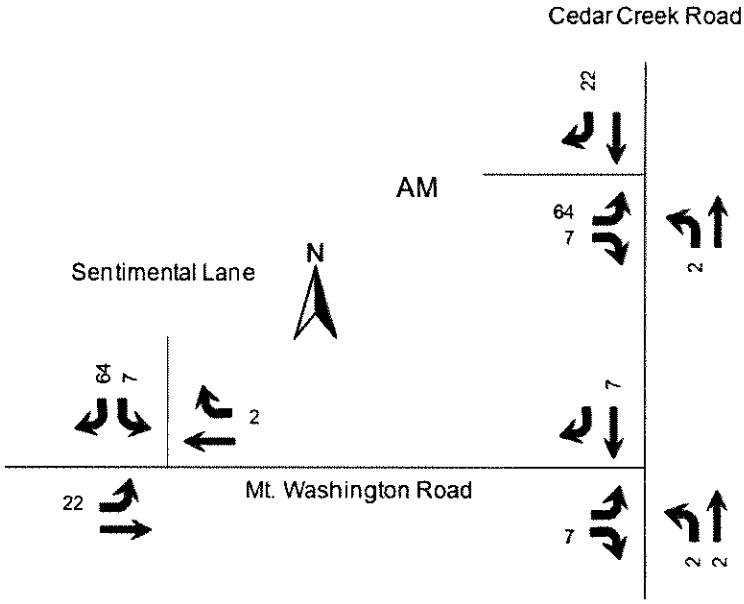
hello@marrtraffic.com
www.marrtraffic.com

1 (800) 615-3765

	Southbound					Northbound					Eastbound					
	KY-864 Cedar Creek Rd (North)					KY-864 Cedar Creek Rd (South)					Loyal Dr					
	U-Turn	Thru	Right	Peds	App	U-Turn	Left	Thru	Peds	App	U-Turn	Left	Right	Peds	App	Int
0700 - 0715	0	11	6	0	17	0	0	64	0	64	0	18	1	0	19	100
0715 - 0730	0	19	4	0	23	0	1	69	0	70	0	11	0	0	11	104
0730 - 0745	0	12	2	0	14	0	0	30	0	30	0	3	0	0	3	47
0745 - 0800	0	28	5	0	33	0	1	45	0	46	0	5	0	0	5	84
0800 - 0815	0	17	4	0	21	0	0	45	0	45	0	7	0	0	7	73
0815 - 0830	0	21	3	0	24	0	0	40	0	40	0	7	1	0	8	72
0830 - 0845	0	12	1	0	13	0	0	41	0	41	0	4	0	0	4	58
0845 - 0900	0	14	5	0	19	0	1	31	0	32	0	7	1	0	8	59
1600 - 1615	0	46	12	0	58	0	0	35	0	35	0	4	0	0	4	97
1615 - 1630	0	51	5	0	56	0	0	24	0	24	0	4	0	0	4	84
1630 - 1645	0	55	10	0	65	0	1	38	0	39	0	9	0	0	9	113
1645 - 1700	0	65	11	0	76	0	1	33	0	34	0	2	0	0	2	112
1700 - 1715	0	54	5	0	59	0	1	74	0	75	0	4	0	2	6	140
1715 - 1730	0	59	8	0	67	0	0	33	0	33	0	4	0	0	4	104
1730 - 1745	0	68	12	0	80	0	2	28	0	30	0	6	0	0	6	116
1745 - 1800	0	52	5	1	58	0	1	38	0	39	0	7	4	0	11	108

0700 - 0715	0	11	6	0	17	0	0	64	0	64	0	18	1	0	19	100
0715 - 0730	0	19	4	0	23	0	1	69	0	70	0	11	0	0	11	104
0730 - 0745	0	12	2	0	14	0	0	30	0	30	0	3	0	0	3	47
0745 - 0800	0	28	5	0	33	0	1	45	0	46	0	5	0	0	5	84
AM PEAK TOTAL	**0**	**70**	**17**	**0**	**87**	**0**	**2**	**208**	**0**	**210**	**0**	**37**	**1**	**0**	**38**	**335**
1645 - 1700	0	65	11	0	76	0	1	33	0	34	0	2	0	0	2	112
1700 - 1715	0	54	5	0	59	0	1	74	0	75	0	4	0	2	6	140
1715 - 1730	0	59	8	0	67	0	0	33	0	33	0	4	0	0	4	104
1730 - 1745	0	68	12	0	80	0	2	28	0	30	0	6	0	0	6	116
PM PEAK TOTAL	**0**	**246**	**36**	**0**	**282**	**0**	**4**	**168**	**0**	**172**	**0**	**16**	**0**	**2**	**18**	**472**

TRIP GENERATION NEARBY SUBDIVISIONS



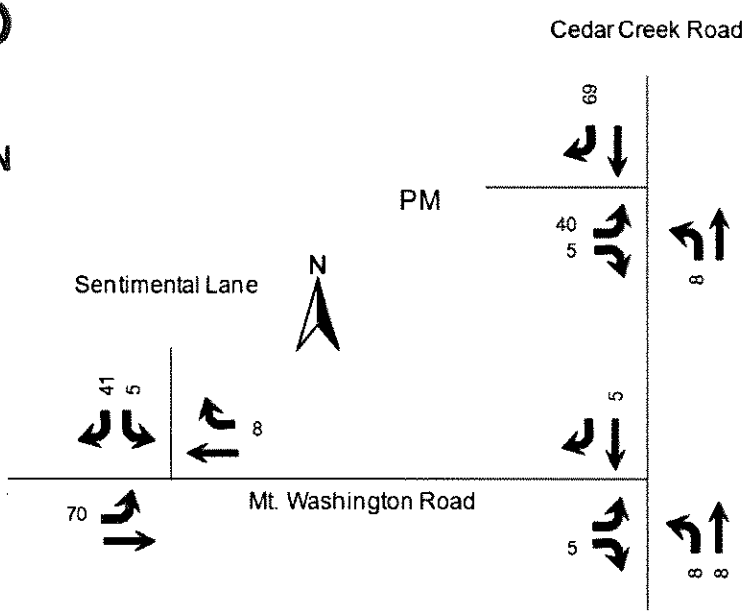


Figure 5. Peak Hour Trips Generated by Site

Cedar Creek Conservation Subdivision
10803 Cedar Creek Road
Traffic Impact Study

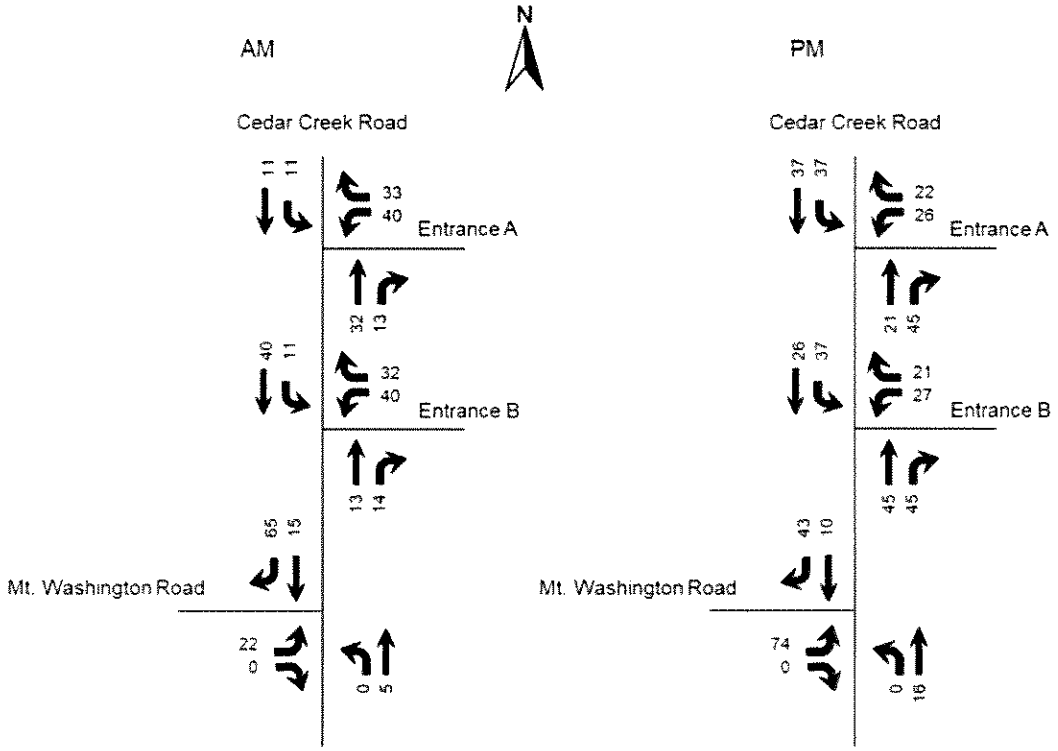


Figure 5. Peak Hour Trips Generated by Site

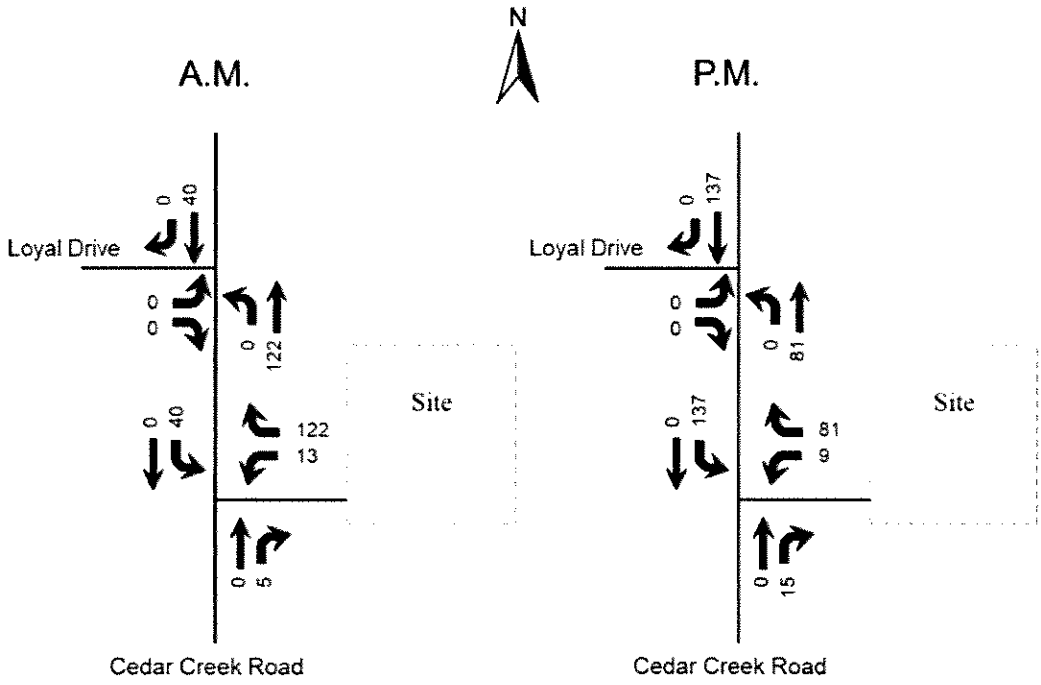


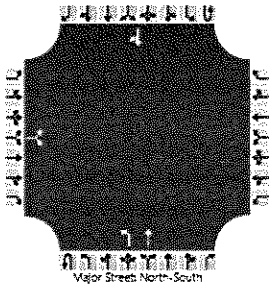
Figure 5. Peak Hour Trips Generated by Site

HCS Reports

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Ent N
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Entrance North
Analysis Year	2024	North/South Street	Cooper Chapel Road
Time Analyzed	AM Peak	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cooper Chapel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0
Configuration			LR							L	T					TR
Volume (veh/h)		29		5						2	628				200	10
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			42							2						
Capacity, c (veh/h)			399							1317						
v/c Ratio			0.11							0.00						
95% Queue Length, Q_{95} (veh)			0.4							0.0						
Control Delay (s/veh)			15.1							7.7						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		15.1								0.0						
Approach LOS		C														

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HCS7 Two-Way Stop-Control Report

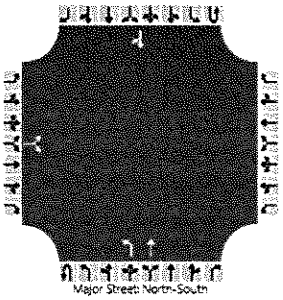
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cooper Chapel at Ent N
Jurisdiction	
East/West Street	Entrance North
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0
Configuration			LR							L	T					TR
Volume (veh/h)		29		5						2	831				263	10
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			42							2						
Capacity, c (veh/h)			303							1233						
v/c Ratio			0.14							0.00						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			18.8							7.9						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)	18.8								0.0							
Approach LOS	C															

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HCS7 Two-Way Stop-Control Report

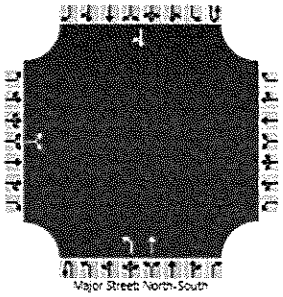
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cooper Chapel at Ent N
Jurisdiction	
East/West Street	Entrance North
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0
Configuration			LR							L	T					TR
Volume (veh/h)		19		3						6	411				723	32
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

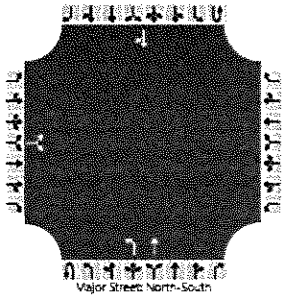
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			26							7						
Capacity, c (veh/h)			298							764						
v/c Ratio			0.09							0.01						
95% Queue Length, Q_{95} (veh)			0.3							0.0						
Control Delay (s/veh)			18.2							9.8						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		18.2								0.1						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Ent N
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Entrance North
Analysis Year	2034	North/South Street	Cooper Chapel Road
Time Analyzed	PM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cooper Chapel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0
Configuration			LR							L	T					TR
Volume (veh/h)		19		3						6	545				824	32
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			26							7						
Capacity, c (veh/h)			246							689						
v/c Ratio			0.11							0.01						
95% Queue Length, Q_{95} (veh)			0.4							0.0						
Control Delay (s/veh)			21.4							10.3						
Level of Service (LOS)			C							B						
Approach Delay (s/veh)	21.4								0.1							
Approach LOS	C															

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HCS7 Two-Way Stop-Control Report

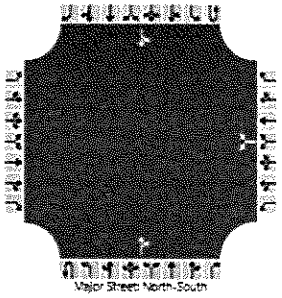
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2020
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Cooper Chapel at Cedar Cr
Jurisdiction	
East/West Street	Cedar Creek Road
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		90			210	10		20	60	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							123							25		
Capacity, c (veh/h)							750							1286		
v/c Ratio							0.16							0.02		
95% Queue Length, Q_{95} (veh)							0.6							0.1		
Control Delay (s/veh)							10.7							7.9		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					10.7								2.1			
Approach LOS					B											

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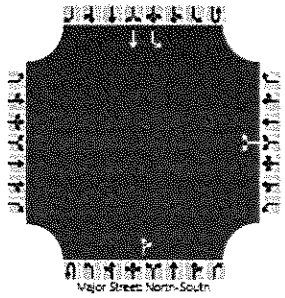
HCS7 Two-Way Stop-Control Report

General Information

Analyst	DBZ	Intersection	Cooper Chapel at Cedar Cr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Cedar Creek Road
Analysis Year	2024	North/South Street	Cooper Chapel Road
Time Analyzed	AM Peak No Build	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						11		108			416	11		22	142	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

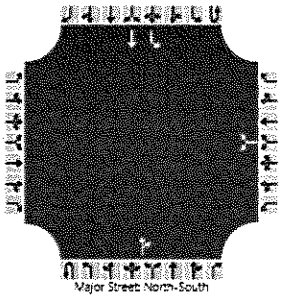
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							147							27		
Capacity, c (veh/h)							545							1035		
v/c Ratio							0.27							0.03		
95% Queue Length, Q_{95} (veh)							1.1							0.1		
Control Delay (s/veh)							14.0							8.6		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					14.0								1.2			
Approach LOS					B											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Cedar Cr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Cedar Creek Road
Analysis Year	2024	North/South Street	Cooper Chapel Road
Time Analyzed	AM Peak Build	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						13		109			522	17		24	181	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							151							30		
Capacity, c (veh/h)							456							919		
v/c Ratio							0.33							0.03		
95% Queue Length, Q_{95} (veh)							1.4							0.1		
Control Delay (s/veh)							16.7							9.0		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)						16.7								1.1		
Approach LOS						C										

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HCS7 Two-Way Stop-Control Report

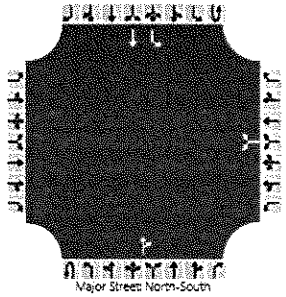
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	AM Peak No Build
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Cooper Chapel at Cedar Cr
Jurisdiction	
East/West Street	Cedar Creek Road
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						13		132			594	13		26	201	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							179							32		
Capacity, c (veh/h)							409							855		
v/c Ratio							0.44							0.04		
95% Queue Length, Q_{95} (veh)							2.2							0.1		
Control Delay (s/veh)							20.5							9.4		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)						20.5							1.1			
Approach LOS						C										

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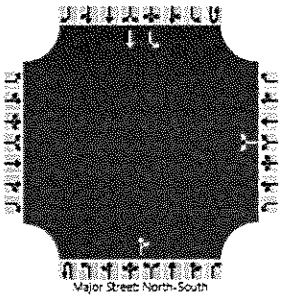
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Cedar Cr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Cedar Creek Road
Analysis Year	2034	North/South Street	Cooper Chapel Road
Time Analyzed	AM Peak Build	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						15		133			700	19		28	240	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							183							35		
Capacity, c (veh/h)							342							759		
v/c Ratio							0.53							0.05		
95% Queue Length, Q_{95} (veh)							3.0							0.1		
Control Delay (s/veh)							27.0							10.0		
Level of Service (LOS)							D							A		
Approach Delay (s/veh)						27.0								1.0		
Approach LOS						D										

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HCS7 Two-Way Stop-Control Report

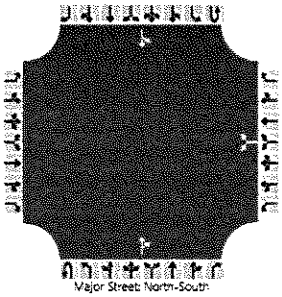
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2020
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Cooper Chapel at Cedar Cr
Jurisdiction	
East/West Street	Cedar Creek Road
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						20		50			110	10		150	230	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							83							179		
Capacity, c (veh/h)							590							1434		
v/c Ratio							0.14							0.12		
95% Queue Length, Q_{95} (veh)							0.5							0.4		
Control Delay (s/veh)							12.1							7.9		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)						12.1								3.8		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

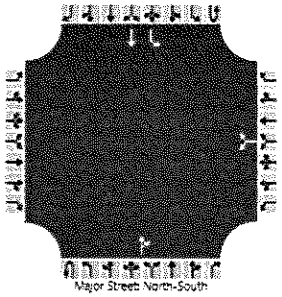
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	PM Peak No Build
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Cooper Chapel at Cedar Cr
Jurisdiction	
East/West Street	Cedar Creek Road
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						22		54			289	11		173	450	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							90							206		
Capacity, c (veh/h)							457							1196		
v/c Ratio							0.20							0.17		
95% Queue Length, Q_{95} (veh)							0.7							0.6		
Control Delay (s/veh)							14.8							8.6		
Level of Service (LOS)							B							A		
Approach Delay (s/veh)					14.8								2.4			
Approach LOS					B											

HCS7 Two-Way Stop-Control Report

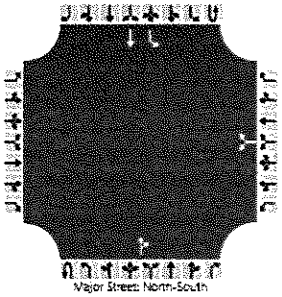
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	PM Peak Build
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Cooper Chapel at Cedar Cr
Jurisdiction	
East/West Street	Cedar Creek Road
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						28		56			362	15		174	562	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							100							207		
Capacity, c (veh/h)							372							1106		
v/c Ratio							0.27							0.19		
95% Queue Length, Q_{95} (veh)							1.1							0.7		
Control Delay (s/veh)							18.2							9.0		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)					18.2								2.1			
Approach LOS					C											

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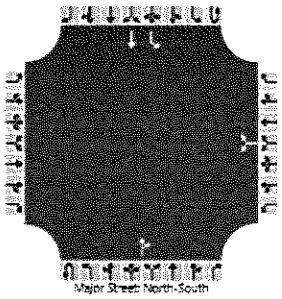
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Cedar Cr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Cedar Creek Road
Analysis Year	2034	North/South Street	Cooper Chapel Road
Time Analyzed	PM Peak No Build	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						26		66			410	13		211	503	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							110							251		
Capacity, c (veh/h)							364							1056		
v/c Ratio							0.30							0.24		
95% Queue Length, Q_{95} (veh)							1.2							0.9		
Control Delay (s/veh)							19.1							9.5		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)						19.1								2.8		
Approach LOS						C										

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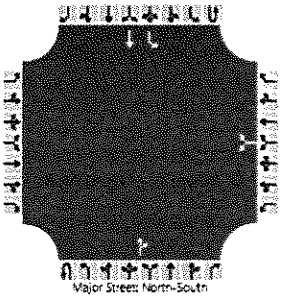
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Cedar Cr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Cedar Creek Road
Analysis Year	2034	North/South Street	Cooper Chapel Road
Time Analyzed	PM Peak Build	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						32		68			483	17		212	615	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							119							252		
Capacity, c (veh/h)							296							976		
v/c Ratio							0.40							0.26		
95% Queue Length, Q_{95} (veh)							1.9							1.0		
Control Delay (s/veh)							25.1							10.0		
Level of Service (LOS)							D							A		
Approach Delay (s/veh)					25.1								2.6			
Approach LOS					D											

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Cedar Creek PM 34 B.xtw

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HCS7 Two-Way Stop-Control Report

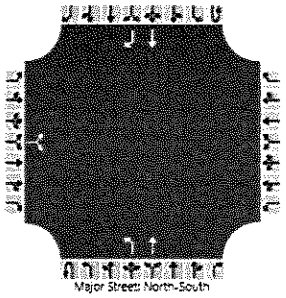
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cooper Chapel at Ent S
Jurisdiction	
East/West Street	Entrance South
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		111		12						4	428				156	38
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized														No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			152							5						
Capacity, c (veh/h)			412							1339						
v/c Ratio			0.37							0.00						
95% Queue Length, Q_{95} (veh)			1.7							0.0						
Control Delay (s/veh)			18.7							7.7						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		18.7								0.1						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

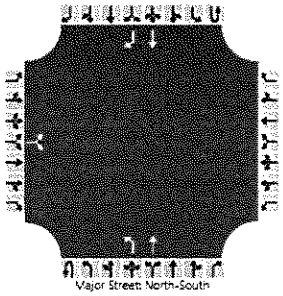
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cooper Chapel at Ent S
Jurisdiction	
East/West Street	Entrance South
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		111		12						4	608				214	38
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized														No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

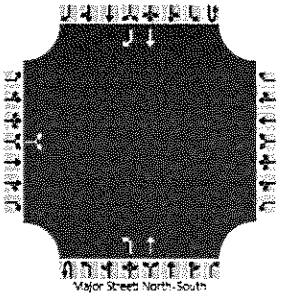
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			152							5						
Capacity, c (veh/h)			280							1261						
v/c Ratio			0.54							0.00						
95% Queue Length, Q_{95} (veh)			3.0							0.0						
Control Delay (s/veh)			32.1							7.9						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)		32.1								0.1						
Approach LOS		D														

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cooper Chapel at Ent S
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Entrance South
Analysis Year	2024	North/South Street	Cooper Chapel Road
Time Analyzed	PM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cooper Chapel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		73		8						13	304				474	116
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized														No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			96							15						
Capacity, c (veh/h)			297							904						
v/c Ratio			0.32							0.02						
95% Queue Length, Q_{95} (veh)			1.4							0.1						
Control Delay (s/veh)			22.8							9.0						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		22.8								0.4						
Approach LOS		C														

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HCS7 Two-Way Stop-Control Report

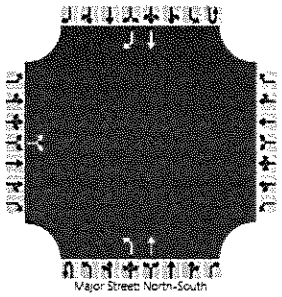
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cooper Chapel at Ent S
Jurisdiction	
East/West Street	Entrance South
North/South Street	Cooper Chapel Road
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		73		8						13	427				531	116
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized														No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			96							15						
Capacity, c (veh/h)			223							853						
v/c Ratio			0.43							0.02						
95% Queue Length, Q_{95} (veh)			2.0							0.1						
Control Delay (s/veh)			32.8							9.3						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)		32.8								0.3						
Approach LOS		D														

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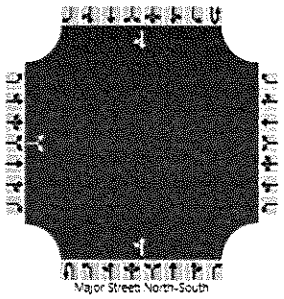
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cedar Creek at Loyal Dr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Loyal Dr
Analysis Year	2020	North/South Street	Cedar Creek Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cedar Creek		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		37		1						2	208				70	17
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			47							2						
Capacity, c (veh/h)			648							1496						
v/c Ratio			0.07							0.00						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
Control Delay (s/veh)			11.0							7.4						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)	11.0								0.1							
Approach LOS	B															

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HCS7 Two-Way Stop-Control Report

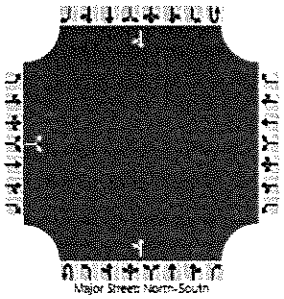
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	AM Peak No Build
Intersection Orientation	North-South
Project Description	8300 Cedar Creek

Site Information

Intersection	Cedar Creek at Loyal Dr
Jurisdiction	
East/West Street	Loyal Dr
North/South Street	Cedar Creek Rd
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		70		5						3	354				120	28
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93							4						
Capacity, c (veh/h)			475							1405						
v/c Ratio			0.20							0.00						
95% Queue Length, Q_{95} (veh)			0.7							0.0						
Control Delay (s/veh)			14.4							7.6						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		14.4								0.1						
Approach LOS		B														

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Loyal AM 24 NB.xtw
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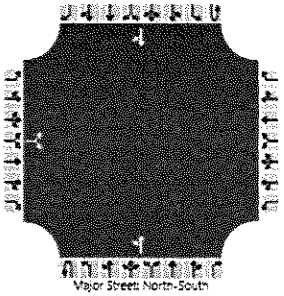
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cedar Creek at Loyal Dr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Loyal Dr
Analysis Year	2024	North/South Street	Cedar Creek Rd
Time Analyzed	AM Peak Build	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cedar Creek		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		70		5						3	359				135	28
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93							4						
Capacity, c (veh/h)			459							1383						
v/c Ratio			0.20							0.00						
95% Queue Length, Q_{95} (veh)			0.7							0.0						
Control Delay (s/veh)			14.8							7.6						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)	14.8								0.1							
Approach LOS	B															

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Loyal AM 24 B.xtw
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HCS7 Two-Way Stop-Control Report

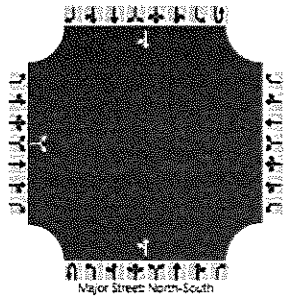
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	AM Peak No Build
Intersection Orientation	North-South
Project Description	8300 Cedar Creek

Site Information

Intersection	Cedar Creek at Loyal Dr
Jurisdiction	
East/West Street	Loyal Dr
North/South Street	Cedar Creek Rd
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		70		5						3	525				176	28
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93							4						
Capacity, c (veh/h)			328							1325						
v/c Ratio			0.28							0.00						
95% Queue Length, Q_{95} (veh)			1.1							0.0						
Control Delay (s/veh)			20.2							7.7						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)	20.2								0.1							
Approach LOS	C															

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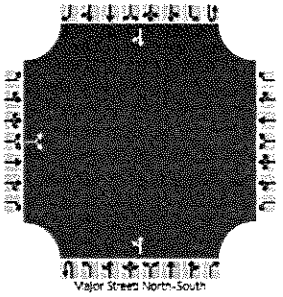
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cedar Creek at Loyal Dr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Loyal Dr
Analysis Year	2034	North/South Street	Cedar Creek Rd
Time Analyzed	AM Peak Build	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cedar Creek		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		70		5						3	530				191	28
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93							4						
Capacity, c (veh/h)			317							1305						
v/c Ratio			0.29							0.00						
95% Queue Length, Q_{95} (veh)			1.2							0.0						
Control Delay (s/veh)			21.0							7.8						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)	21.0								0.1							
Approach LOS	C															

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Loyal AM 34 B.xtw

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HCS7 Two-Way Stop-Control Report

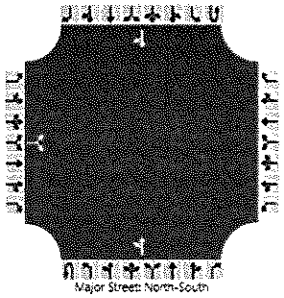
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2020
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cedar Creek at Loyal Dr
Jurisdiction	
East/West Street	Loyal Dr
North/South Street	Cedar Creek Rd
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		16		0						4	168				246	36
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

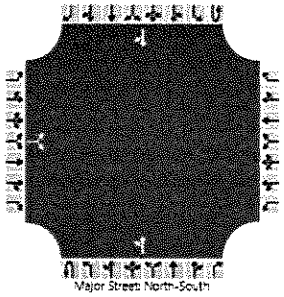
Flow Rate, v (veh/h)			19							5						
Capacity, c (veh/h)			515							1235						
v/c Ratio			0.04							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			12.3							7.9						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		12.3								0.2						
Approach LOS		B														

20-1 ZONE P-0057

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cedar Creek at Loyal Dr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Loyal Dr
Analysis Year	2024	North/South Street	Cedar Creek Rd
Time Analyzed	PM Peak No Build	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cooper Chapel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		38		3						8	265				409	72
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49							10						
Capacity, c (veh/h)			334							1010						
v/c Ratio			0.15							0.01						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			17.6							8.6						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)	17.6								0.3							
Approach LOS	C															

HCS™ TWSC Version 7.9
Loyal PM 24 NB.xtw

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HCS7 Two-Way Stop-Control Report

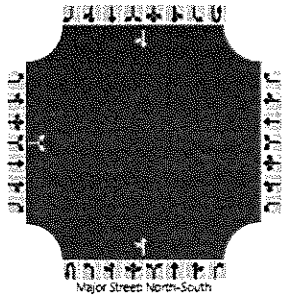
General Information

Analyst	D8Z
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2024
Time Analyzed	PM Peak Build
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cedar Creek at Loyal Dr
Jurisdiction	
East/West Street	Loyal Dr
North/South Street	Cedar Creek Rd
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		38		3						8	282				419	72
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49							10						
Capacity, c (veh/h)			320							1000						
v/c Ratio			0.15							0.01						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			18.3							8.6						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		18.3								0.3						
Approach LOS		C														

HCS™ TWSC Version 7.9
Loyal PM 24 8.xtw
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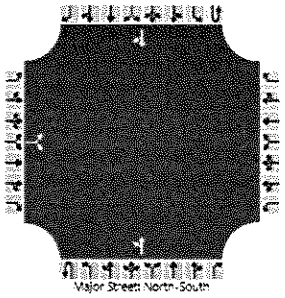
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Cedar Creek at Loyal Dr
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	8/26/2020	East/West Street	Loyal Dr
Analysis Year	2034	North/South Street	Cedar Creek Rd
Time Analyzed	PM Peak No Build	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	8300 Cooper Chapel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		38		3						8	386				605	72
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49							10						
Capacity, c (veh/h)			200							828						
v/c Ratio			0.24							0.01						
95% Queue Length, Q_{95} (veh)			0.9							0.0						
Control Delay (s/veh)			28.8							9.4						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)	28.8								0.3							
Approach LOS	D															

HCS™ TWSC Version 7.9
Loyal PM 34 NB.xtw

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HCS7 Two-Way Stop-Control Report

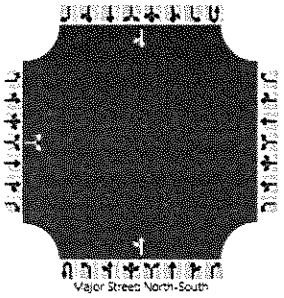
General Information

Analyst	DBZ
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	8/26/2020
Analysis Year	2034
Time Analyzed	PM Peak Build
Intersection Orientation	North-South
Project Description	8300 Cooper Chapel

Site Information

Intersection	Cedar Creek at Loyal Dr
Jurisdiction	
East/West Street	Loyal Dr
North/South Street	Cedar Creek Rd
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		38		3						8	403				615	72
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49							10						
Capacity, c (veh/h)			191							819						
v/c Ratio			0.26							0.01						
95% Queue Length, Q_{95} (veh)			1.0							0.0						
Control Delay (s/veh)			30.2							9.4						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)	30.2								0.3							
Approach LOS	D															

HCS™ TWSC Version 7.9
Loyal PM 34 B.xtw

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REDWING ECOLOGICAL SERVICES, INC 1139 South Fourth Street • Louisville, KY 40203 • Phone 502.625.3009 • Fax 502.625.3077

VIA EMAIL

December 30, 2019

Ms. Ramona Vasta
LDG Development, LLC
1469 South Fourth Street
Louisville, Kentucky 40208
RVasta@ldgdevelopment.com

Subject: **Water/Wetland Delineation Summary Report**
8300 Cooper Chapel Road Property
Jefferson County, Kentucky
Redwing Proposal No.: 19-213

Dear Ms. Vasta:

Redwing Ecological Services, Inc. (Redwing) is pleased to provide LDG Development, LLC (LDG) with this Water/Wetland Delineation Summary Report for the 8300 Cooper Chapel Road Property located in southern Jefferson County, Kentucky. The goal of these services was to identify the location and extent of jurisdictional water/wetland features within the project boundary in order to assist LDG with development planning for this project.

Based on the delineation, jurisdictional water/wetland features present within the project boundary include:

- two perennial streams totaling 2,167 linear feet (0.497 acre)
- one intermittent stream totaling 1,091 linear feet (0.150 acre)
- nine ephemeral streams totaling 2,041 linear feet (0.113 acres)

In addition, the mature wooded portions of the site represent suitable summer roosting habitat for the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*). There are several cedar/limestone glades along Perennial Stream 1 and Intermittent Stream 1, which represent potential habitat for Kentucky glade cress (*Leavenworthia exigua var. laciniata)*. This report presents the study methodology, results, and a discussion of development-related issues.

METHODOLOGY

The delineation included in-house and field components. In-house research involved review of the USGS topographic quadrangle map, aerial photography, the Jefferson County soil survey, and Federal Emergency Management Agency (FEMA) floodplain mapping. Following review of these materials, Redwing conducted a field delineation on December 10, 2019 to identify the location and extent of jurisdictional waters/wetlands on the project site. The presence of jurisdictional streams and open water bodies was evaluated based on ordinary high-water mark (OHWM), defined bed and bank features, and flow regimes. The quality of the perennial and intermittent streams within the project area was evaluated using the Rapid Bioassessment Protocol developed by the U.S. Environmental Protection Agency. Potential wetland areas were investigated using the Routine On-Site Determination Method as defined in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region – Version 2.0* (April 2012). This technique uses a multi-parameter approach that requires positive evidence of three criteria: wetland hydrology, hydric soils, and hydrophytic vegetation. This delineation has not been verified by the U.S. Army Corps of Engineers (USACE), who holds final authority over determinations of the location and extent of jurisdictional waters/wetlands. Additionally, Redwing assessed the site for the presence of suitable habitat for federally threatened/endangered (T/E) species.

RESULTS

The approximately 75-acre site is located immediately west of the Cedar Creek Road and Cooper Chapel Road intersection in Jefferson County, Kentucky. This site consists primarily of wooded areas, old fields, and stream corridors. The streams within the project boundary are tributaries to McNeely Lake and Pennsylvania Run, which are located just downstream. The water/wetland features delineated within the project boundary are depicted on Figure 1 and summarized in the following table.

Feature	Length (feet)	Stream Width (feet)	Area (acres)	Status
Perennial Stream 1	1,090	9	0.225	Jurisdictional
Perennial Stream 2	1,077	11	0.272	Jurisdictional
Perennial Stream Total	**2,167**		**0.497**	
Intermittent Stream 1	1,091	6	0.150	Jurisdictional
Intermittent Stream Total	**1,091**		**0.150**	
Ephemeral Stream 1	106	2	0.005	Jurisdictional
Ephemeral Stream 2	82	2	0.004	Jurisdictional
Ephemeral Stream 3	36	3.5	0.003	Jurisdictional
Ephemeral Stream 4	90	1.5	0.003	Jurisdictional
Ephemeral Stream 5	374	1.5	0.013	Jurisdictional
Ephemeral Stream 6	825	3	0.057	Jurisdictional
Ephemeral Stream 7	188	2.5	0.011	Jurisdictional
Ephemeral Stream 8	136	2.5	0.008	Jurisdictional
Ephemeral Stream 9	204	2	0.009	Jurisdictional
Ephemeral Stream Total	**2,041**		**0.113**	
Jurisdictional Features Total	**5,299**		**0.760**	

DISCUSSION

Jurisdictional waters of the U.S., including wetlands, are defined by 33 CFR Part 328.3 and are protected by Section 404 of the Clean Water Act (33 USC 1344), which is administered and enforced by the USACE. Many water/wetland impacts are also regulated by the Kentucky Division of Water (KDOW) – Water Quality Certification (WQC) Section. Current permitting thresholds are as follows:

- Impacts to less than 0.5 acre of waters/wetlands and 300 feet of stream can be authorized under a Nationwide Permit (NWP). This requires submittal of a Preconstruction Notification to the USACE. The USACE can issue a waiver for greater than 300 feet of stream impacts to be authorized under the NWP program.
- Impacts to greater than 0.5 acre of waters or significantly greater than 300 feet of stream require an Individual Section 404 Permit from the USACE.
- Impacts to less than 0.5 acre of wetland and 300 feet of intermittent/perennial stream will qualify for a General WQC and no coordination with KDOW-WQC Section is required.
- Impacts to greater than 0.5 acre of wetland or 300 feet of intermittent/perennial stream will require Individual WQC from the KDOW.
- Impacts to greater than 300 feet of stream and/or 0.1 acre of waters will require compensatory mitigation.

A NWP generally requires three to six months to obtain, depending on agency backlog, while an Individual Section 404 Permit with the USACE often requires six to 12 months to complete. Individual

Section 401 WQCs with the KDOW can generally be completed within the federal time frames. Mitigation for poor quality perennial, intermittent and ephemeral streams require multipliers of 1.5, 1.0 and 0.5, respectively. Current stream mitigation rates in the Salt River Service Area for mitigation banks or the ILF program are approximately $325 to $400 per foot/credit, respectively.

Under the Section 404 permitting process, the USACE determines if consultation with the U.S. Fish and Wildlife Service (USFWS) or the State Historic Preservation Office (SHPO) is required to address potential impacts to T/E species or significant archaeological/historic features, respectively. We are not aware of any archaeological features or studies that have been done on the site; however, a survey may be required during review of the permit application. The major T/E issues of concern are the clearing of suitable Indiana bat and northern long-eared bat summer habitat and impacting Kentucky glade cress habitat. Based on maps released by the USFWS, the project is located in a Known Habitat Zone for the Indiana bat. Suitable summer habitat for the Indiana and northern long-eared bats is represented within the mature woods through the site. Impacts to this habitat will likely require consultation with the USFWS and could include a Biological Assessment, limiting clearing to the unoccupied period (October 15 to March 31), conducting presence/absence surveys, and/or paying a per-acre fee. Kentucky glade cress potential habitat within the project boundary includes cedar/limestone glades, which consist of shallow soils interlaid with flat-bedded limestone areas. A spring flowering season (late February through April) survey will likely be required by the USFWS for this species.

CONCLUSION

In conclusion, based on Redwing's delineation, jurisdictional water/wetland features present on the site include two perennial streams totaling 2,167 linear feet, one intermittent stream totaling 1,091 linear feet, and nine ephemeral streams totaling 2,041 linear feet. This delineation has not been verified by the USACE. As proposed site design plans are developed, permit requirements and mitigation costs can be further determined.

We appreciate the opportunity to assist you on this important project. Please call Neil Guthals at (502) 625-3009 with any questions on this report or the overall project.

Sincerely,

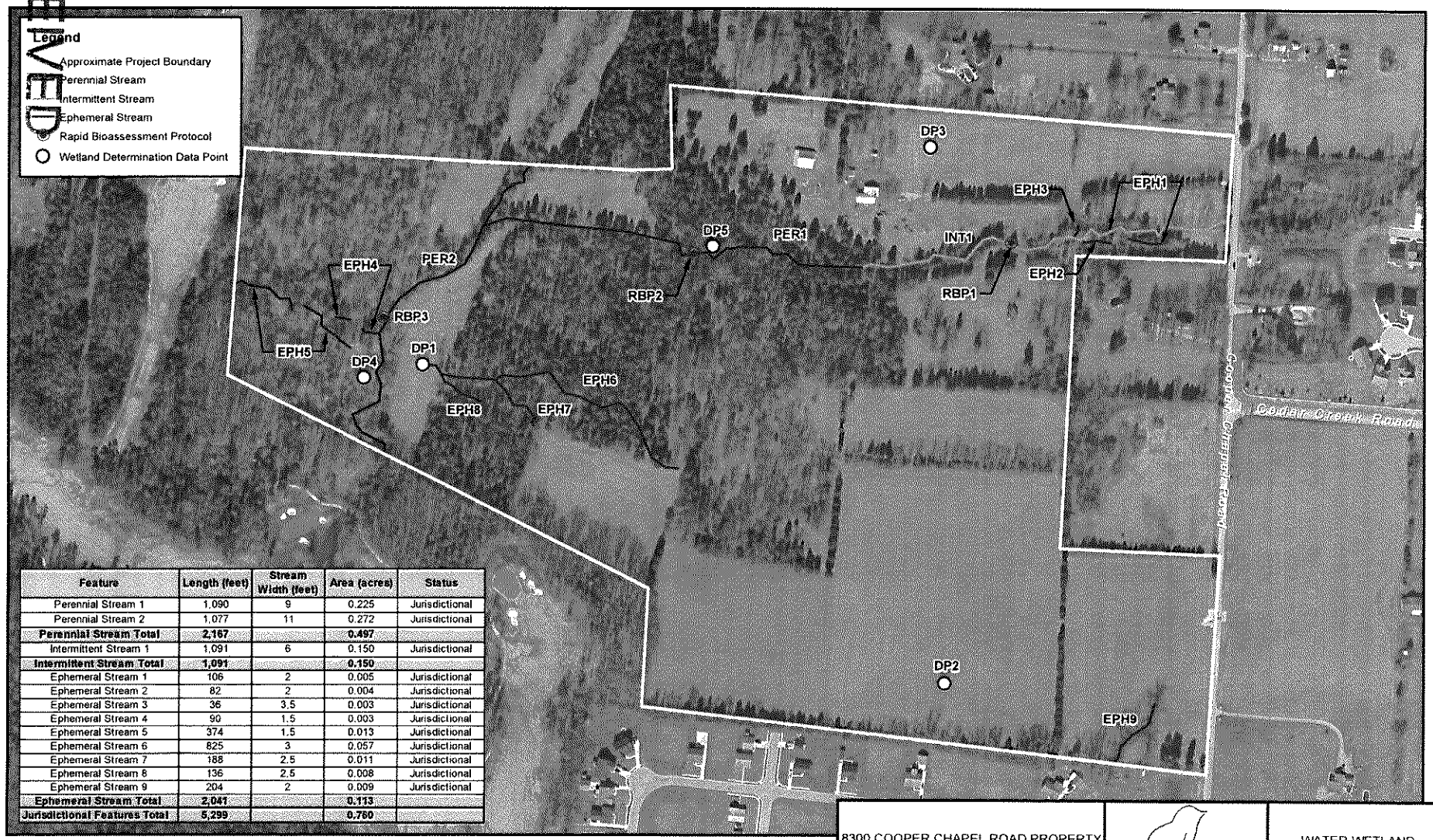
Zachary T. Triplett
Staff Ecologist

Neil Guthals
Senior Ecologist

P:\2019 Projects\19-213-8300 Cooper Chapel Rd\Reports\WaterWetland Summary Report.docx

Attachment: Figure 1 – Water/Wetland Location Map

FIGURE



Feature	Length (feet)	Stream Width (feet)	Area (acres)	Status
Perennial Stream 1	1,090	9	0.225	Jurisdictional
Perennial Stream 2	1,077	11	0.272	Jurisdictional
Perennial Stream Total	**2,167**		**0.497**	
Intermittent Stream 1	1,091	6	0.150	Jurisdictional
Intermittent Stream Total	**1,091**		**0.150**	
Ephemeral Stream 1	106	2	0.005	Jurisdictional
Ephemeral Stream 2	82	2	0.004	Jurisdictional
Ephemeral Stream 3	36	3.5	0.003	Jurisdictional
Ephemeral Stream 4	90	1.5	0.003	Jurisdictional
Ephemeral Stream 5	374	1.5	0.013	Jurisdictional
Ephemeral Stream 6	825	3	0.057	Jurisdictional
Ephemeral Stream 7	188	2.5	0.011	Jurisdictional
Ephemeral Stream 8	136	2.5	0.008	Jurisdictional
Ephemeral Stream 9	204	2	0.009	Jurisdictional
Ephemeral Stream Total	**2,041**		**0.113**	
Jurisdictional Features Total	**5,299**		**0.760**	

NOTE: JURISDICTIONAL WATER/WETLAND BOUNDARIES WERE DELINEATED AND SURVEYED BY REDWING WETLAND SCIENTISTS ON DECEMBER 10, 2019. THESE BOUNDARIES HAVE NOT BEEN VERIFIED BY THE U.S. ARMY CORPS OF ENGINEERS. USE OF THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

8300 COOPER CHAPEL ROAD PROPERTY
JEFFERSON COUNTY, KENTUCKY

REVISED DATE: 12-30-19 | DRAWN BY: ZTT

REDWING ECOLOGICAL SERVICES, INC.

WATER WETLAND LOCATION MAP

FIGURE 1

P:\2019 Projects\19-213-8300 Cooper Chapel Rd\Figures\Water\Wetland Location Map.mxd, 12-30-2019, Temp

20-ZONE-0057

GREENBAUM ASSOCIATES, INC.
GEOTECHNICAL & MATERIALS ENGINEERS
994 Longfield Avenue
Louisville, Kentucky 40215
502/361-8447
FAX 502/361-4793

November 19, 2020

Mr. Chase Durrett
LDG Development, LLC
1469 S. 4th Street
Louisville, KY 40208

Re: Slope Stability Survey
8300 Cooper Chapel Road
Louisville, Kentucky
Project Number 20-174G

Dear Mr. Durrett:

On November 19th, 2020, I, Luke Van Nevel, walked the above referenced property and viewed a number of slopes with a greater than 20-degree inclination. Included is a drawing showing the approximate locations of the slopes (indicated by yellow shading) as well as a drawing showing the geologic mapping taken from the Kentucky Geological Survey. Also included are photos of several of the slopes taken during a walkover of the site.

During the walkover, no evidence was found of slope movement, i.e. no visual indication of landslide.

The formations shown on the section taken from the geologic map are described by the Kentucky Geological Survey are described below. These limestone formations are not prone to landslide activity as some shale formations are.

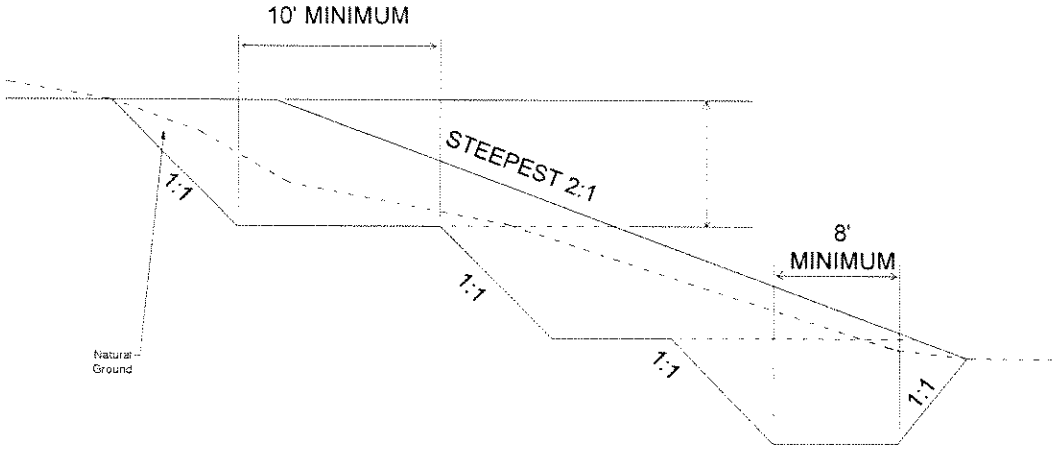
JEFFERSONVILLE LIMESTONE

Limestone, olive, brownish, and medium to light gray; weathers pale yellowish brown to very light gray and light yellowish gray; fossil fragments abound in matrix of sparry calcite or calcareous mudstone; pyritic; dolomitic in part; prominent stylolites in quarry exposures; scattered banded chert in thin irregular stringers. Abundant whole fossils include large colonial corals in lower part and the brachiopods Brevispirifer gregarius and Paraspirifer acuminatus in upper part. Weathered outcrops are characteristically thin slabs of crossbedded limestone on which fossils are etched in relief. Residuum typically contains silicified brachiopods and solitary corals. Unit disconformable with underlying Louisville Limestone; otherwise obscure contact commonly marked by abrupt transition from coarse grained limestone of Jeffersonville to fine grained dolomitic limestone of underlying unit.

LOUISVILLE LIMESTONE

Dolomitic limestone, light gray, yellowish gray, and light brownish gray, mottled medium dark gray; weathers yellowish gray and grayish orange to very pale orange; micro-grained to fine grained; very thin to thick bedded; stylolitic. Bedding locally nodular or thinly laminated. Six to 10 feet above base is persistent shaly zone 1 to 2 feet thick. Fossils, commonly as casts, include the distinctive chain coral Halysites, the brachiopod Conchidium, stromatoporoids, and colonial corals such as Arachvophyllum and Favosites. Calcite filled joints half an inch wide trend N. 10? E., extend into overlying Jeffersonville Limestone; rare calcite filled vugs as much as 0.5 foot across; chert locally common in discontinuous 0.2 foot thick layers in upper part. Unit forms distinctive northwest inclined plain in southeastern part of quadrangle. Basal contact distinct; exposed at only three localities in quadrangle: in underground mine at quarry northeast of Poplar Level Road interchange of Watterson Expressway, in tributary to Fern Creek in southeastern part of quadrangle, and along Middle Fork Beargrass Creek in Cherokee Park.

The topography of this property is rolling, resulting in substantial cuts and fills. When fill is to be placed on an existing slope it is imperative that the existing slope be benched as shown in the diagram below to prevent the formation of a plane of weakness along which a slope failure can develop. Benching will have to be adjusted as necessary, in consultation with this office, where limestone bedrock is encountered that prevents benching as shown from being achieved



To prevent shallow slips of these slopes downward in elevation, preventative measures must be taken prior to construction. These are: 1) trimming; 2) embedment of geotextile; or 3) emplacement of deep rooting woody vegetation.

Trimming requires that the fill be placed 18 inches beyond the final fill point. Once fill is complete the top 18 inches of soil must be bladed-off the slope to be removed for use as fill elsewhere.

Embedment of geotextiles requires that a woven-geotextile of uniaxial geogrid be placed vertically every two feet along the outer edge of the fill. This slope reinforcement must extend at least five feet in from the outer edge of the slope.

Soil fill must be no steeper than 2 horizontal to 1 vertical in order that it remain stable. Where there is a sharp angle in the slope, such as near the corner of a building or pavement corner, the slope must be no steeper than 2.5 to 1. If the slope is to be mowed with normal lawncare equipment, it should be no steeper than 3 to 1.

This survey is intended to address existing slopes at this site. This is not a geotechnical investigation and does not include any boring, laboratory testing nor modeling of slope stability to determine factor of safety against sliding.

If you have any questions regarding this study, please call.

Sincerely,

GREENBAUM ASSOCIATES, INC.

Sandor R. Greenbaum

Sandor R. Greenbaum, P.E.
Principal Engineer

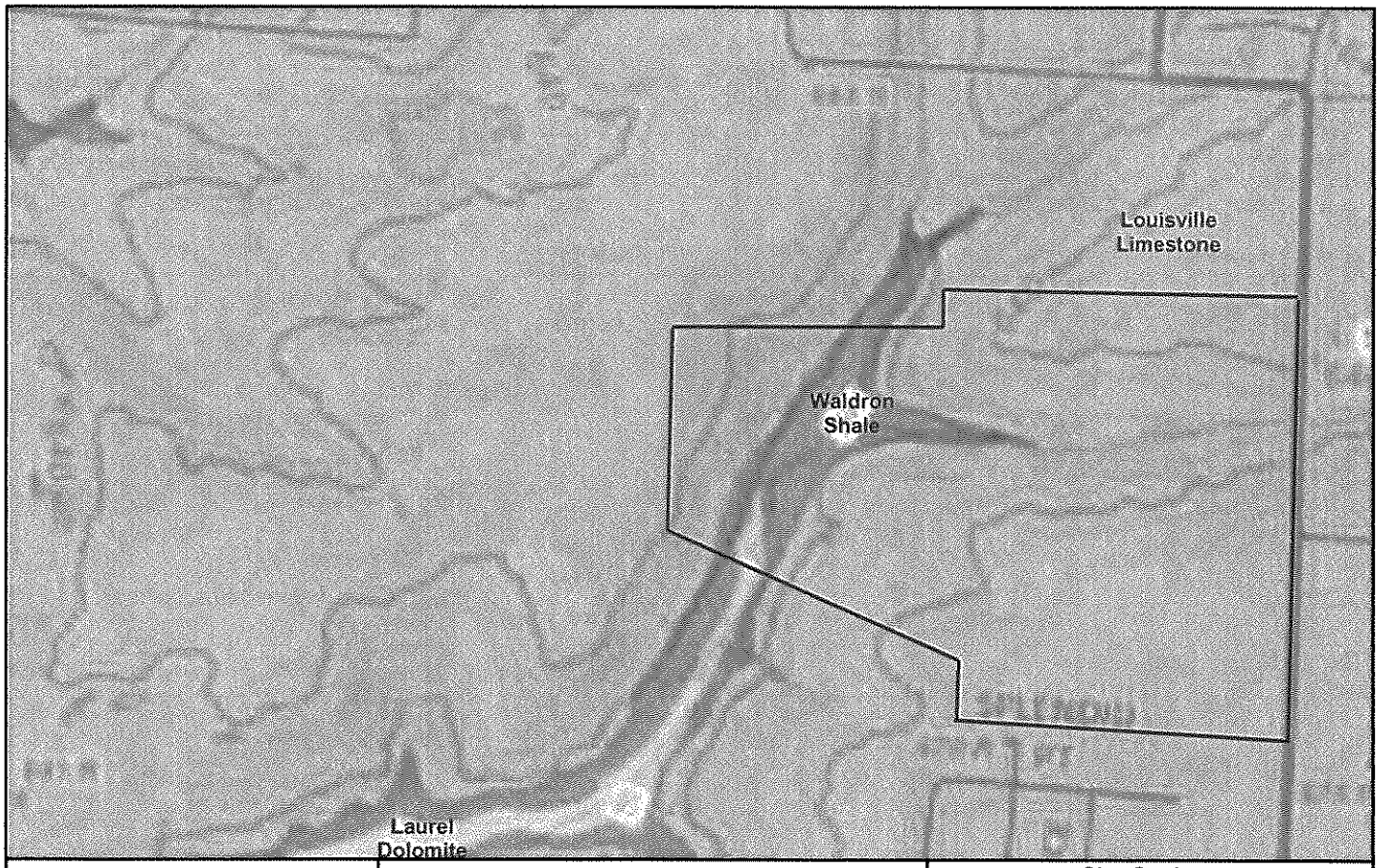
Luke Van Nevel

Luke Van Nevel
Geological Engineering Trainee

20-ZONE-0057

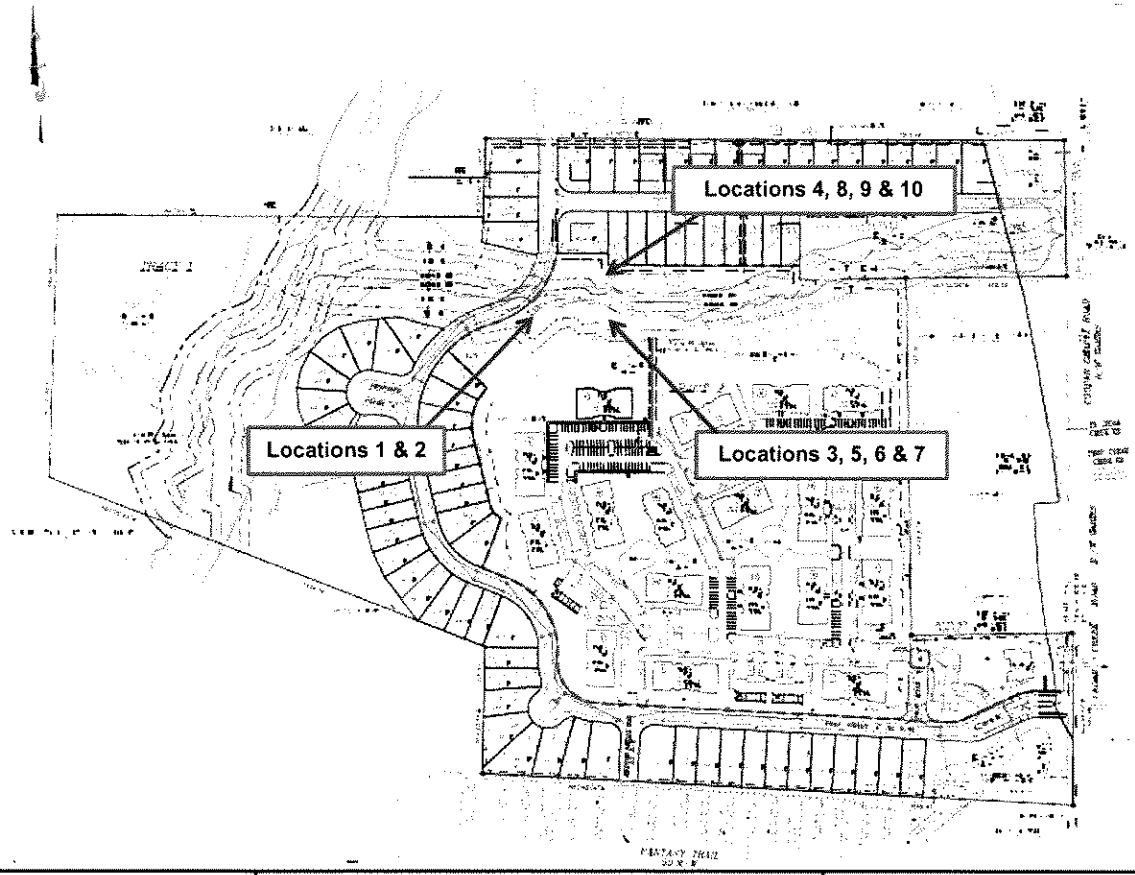
LDG Development, LLC	Greenbaum Associates, Inc.	**Site Location Plan** 8300 Cooper Chapel Road Louisville, Kentucky Greenbaum Project Number: 20-174G

20-ZONE-0057



LDG Development, LLC	Greenbaum Associates, Inc.	**Site Geology** Cooper Chapel Road Property 8300 Cooper Chapel Rd., Louisville, Kentucky Greenbaum Project Number: 20-174G

20-ZONE-0057



LDG Development, LLC	Greenbaum Associates, Inc.	**Photo Locations** 8300 Cooper Chapel Road Louisville, Kentucky Greenbaum Project Number: 20-174G

20-ZONE-0057

20-ZONE-0057

20-ZONE-005

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