



REPORT

**Fern Valley Commerce Center
4500 Fern Valley Road
Louisville, KY**

Traffic Impact Study

Louisville Metro Planning
Kentucky Transportation
Cabinet

February 9, 2016



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Introduction

Summit Construction is proposing a warehouse on Fern Valley Road (KY 1747) in Louisville, KY. The building is proposed as 332,500 square foot warehouse. **Figure 1** displays a map of the site. Access to the site will be from an entrance on Fern Valley Road and on Jefferson Boulevard. The purpose of this study is to examine the traffic impacts of the proposed development upon the adjacent highway system. For this study the impact area was defined to be the intersections of Fern Valley Road and Jefferson Boulevard.



Figure 1
Site Location

Existing Conditions

Fern Valley Road, KY 1747, is maintained by the Kentucky Transportation Cabinet (KYTC) with an estimated 2016 ADT of 32,400 vehicles per day between I 65 and Preston Highway (KY 61), as estimated from the Kentucky Transportation Cabinet count at station 606. The road is a six-lane road with twelve-foot lanes and curbs. The posted speed limit is 45 mph. There is a sidewalk on the north side. The intersection with Jefferson Boulevard is controlled with a traffic signal. All four approaches have dual left turn lanes. Three of the approaches have right turn lanes; westbound Fern Valley does not.

Jefferson Boulevard is maintained by Metro Louisville with an estimated 2016 ADT of 11,000 vehicles per day, as estimated from the turning movement count. The road is a four-lane road with twelve-foot lanes, curb and gutter. The posted speed limit is 35 mph. There are sidewalks on both sides.

A.m. and p.m. peak hour traffic counts were obtained at the intersection on January 7, 2016. The a.m. peak hour occurred between 7:15 and 8:15 and the p.m. peak hour occurred between 4:45 and 5:45 p.m. **Figure 2** illustrates the existing peak hour traffic volumes.

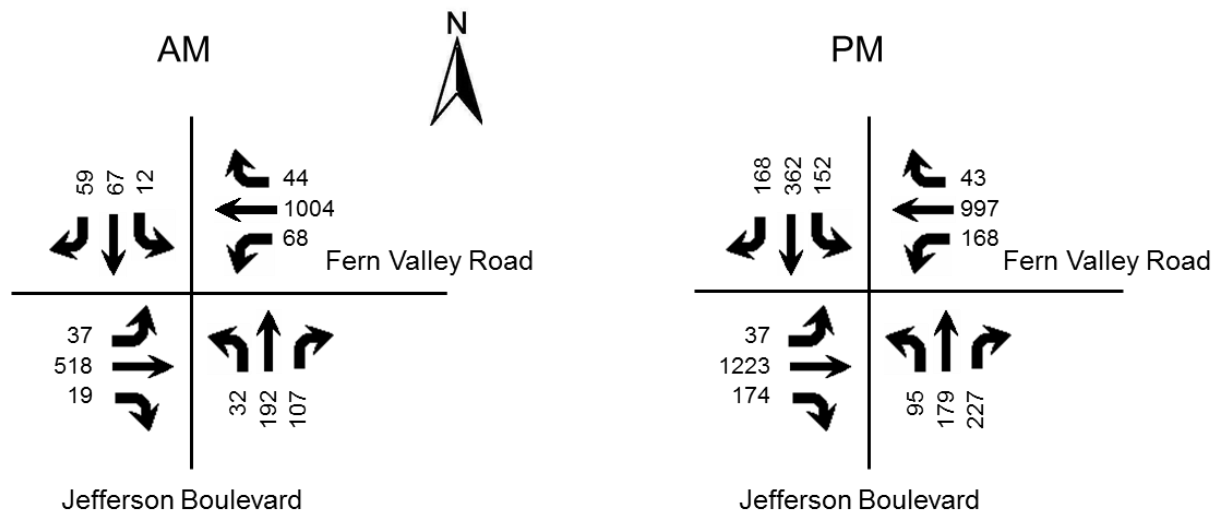


Figure 2
2016 Peak Hour Counts

Future Conditions

The projected completion year for this development is 2017, so the analysis year for this study is 2017. To predict traffic conditions in 2017, one percent annual growth in traffic was added as determined by reviewing historical trends. **Figure 3** displays the 2017 No Build volumes.

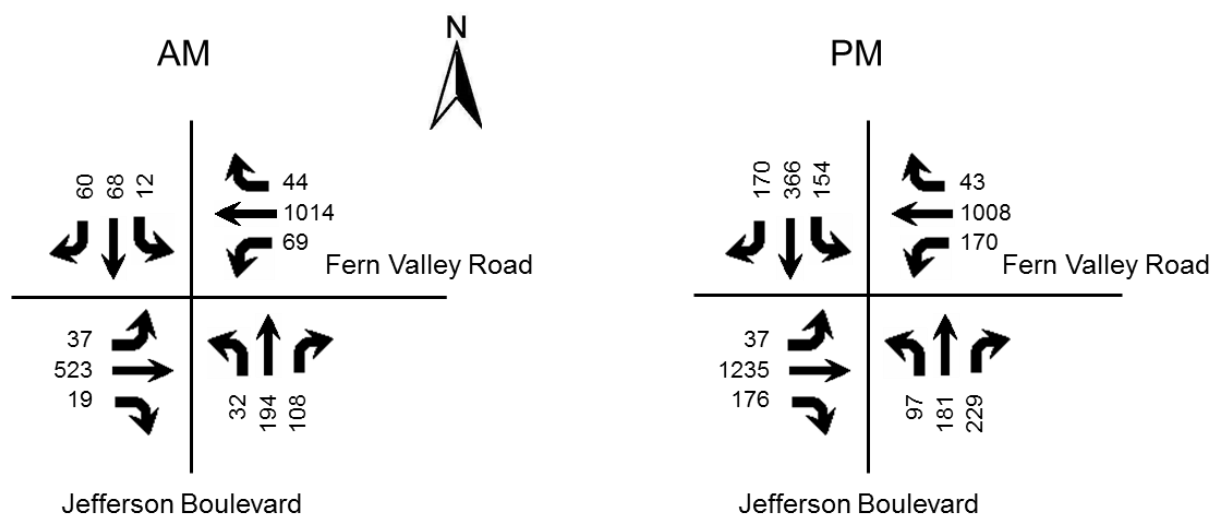


Figure 3
2017 No Build Peak Hour Volumes

Trip Generation

The Institute of Transportation Engineers Trip Generation Manual, 9th Edition contains trip generation rates for a wide range of developments. The land use of “Warehouse (150)” best describes this development. The access point on Fern Valley Road (KY 1747) will be a shared driveway. For this analysis, the adjacent property was assumed to be “Business Park (770)” with 58,250 square feet. The trip generation results are listed in **Table 1**. The results of the trip generation analysis are that this development will generate 244 a.m. peak hour trips and 220 p.m. peak hour trips. The trips were assigned to the highway network with 40 percent to/from the west, 20 percent to/from the east, 20 percent to/from the north and 20 percent to/from the south. **Figure 5** displays the individual turning movements for the year 2017 for the peak hours when the development is completed.

Table 1 – Trip Generation

	AM Peak Hour			PM Peak Hour		
	Total	Enter	Exit	Total	Enter	Exit
Warehouse (332,500 sq. ft.)	160	126	34	129	32	97
Business Park (58,250 sq. ft.)	84	71	13	91	24	67
TOTAL	244	197	47	220	56	164

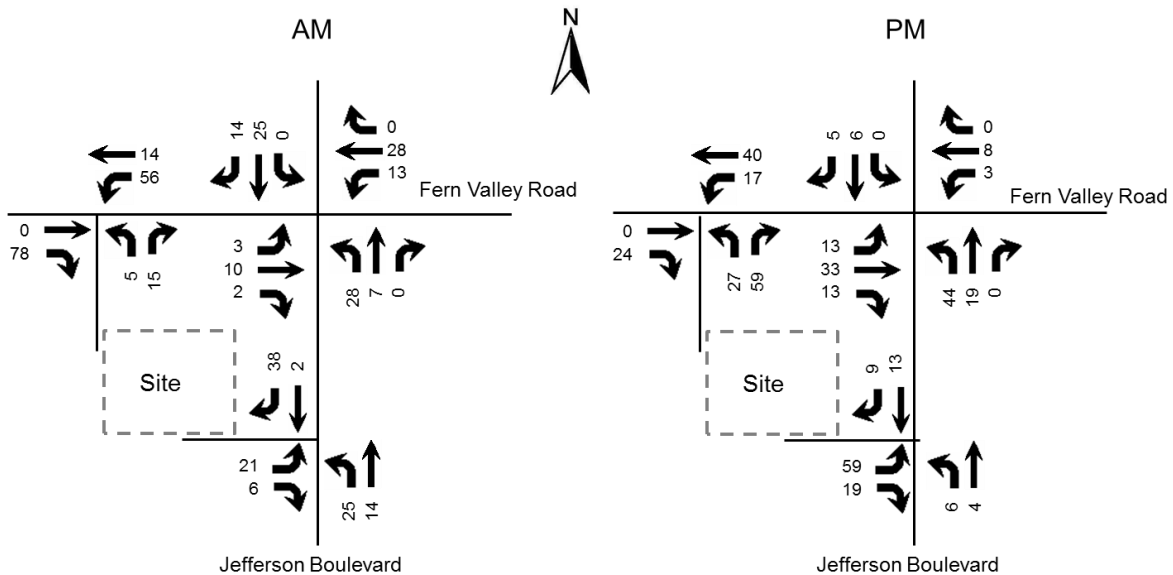


Figure 4
Trip Distribution for Site

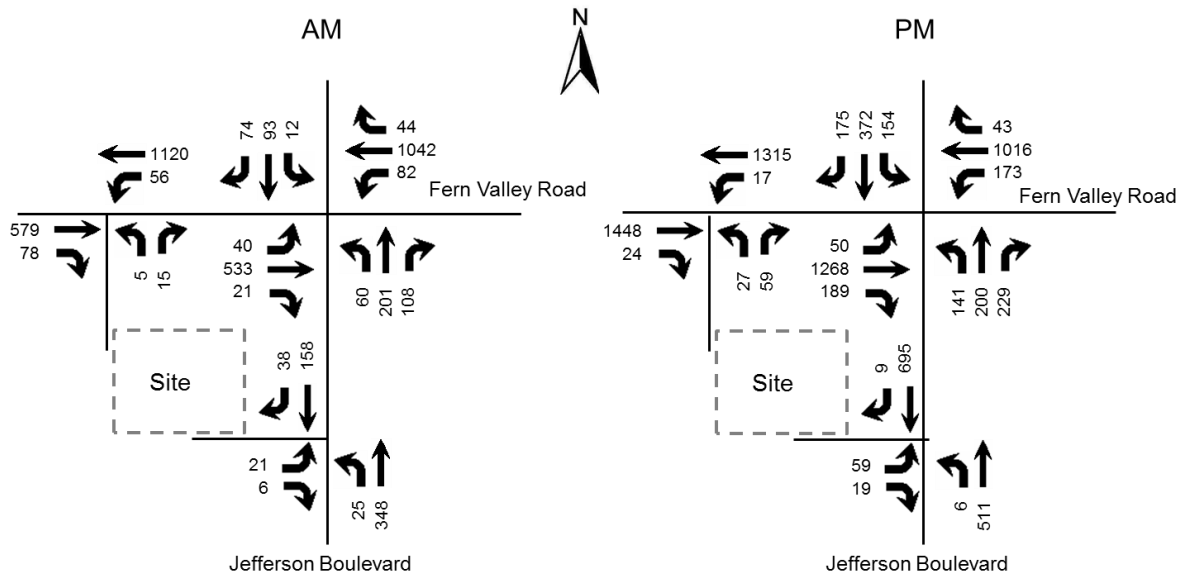


Figure 5
2017 Build Peak Hour Volumes

Analysis

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a “Level of Service” or LOS. Level of Service is a ranking scale from A through F with each level representing a range. LOS results depend upon the type of facility that is analyzed. In this case, the LOS is based upon the average vehicle delay each movement experiences at an intersection.

To evaluate the impact of the proposed development, the vehicle delays at the intersection were determined using procedures detailed in the Highway Capacity Manual, 2010 edition. Future delay and Level of Service were determined for the intersection using HCS 2010 Streets and TWSC (version 6.70) and software. **Table 2** shows the results of the analysis for the three scenarios analyzed. The full printouts are included in Appendix B.

Using the Kentucky Transportation Cabinet Auxiliary Turn Lane Policy dated 7/20/2009 and the volumes in **Figure 5**, the volumes do not meet the warrants for an eastbound right turn lane on Fern Valley Road.

Table 2 - Level of Service Results

	AM Peak Hour			PM Peak Hour		
	2016 Existing	2017 No Build	2017 Build	2016 Existing	2017 No Build	2017 Build
Fern Valley Road at Jefferson Boulevard	C 27.4	C 27.5	C 29.4	D 38.9	D 39.8	D 40.8
Fern Valley Road Eastbound	B 19.5	B 19.6	B 21.7	D 37.0	D 38.3	D 39.3
Fern Valley Road Westbound	C 20.3	C 20.4	C 23.1	D 33.4	D 34.2	D 35.7
Jefferson Boulevard Northbound	D 53.7	D 53.6	D 49.8	D 47.9	D 48.1	D 48.5
Jefferson Boulevard Southbound	D 54.5	D 54.5	D 54.0	D 46.5	D 46.7	D 46.8
Fern Valley Road at Entrance						
Fern Valley Road Westbound			B 12.6			C 24.3
Entrance Northbound			B 13.6			D 34.8
Jefferson Boulevard at Entrance						
Entrance Eastbound			B 10.7			C 16.8
Jefferson Boulevard Northbound			A 7.7			A 9.3

Note: Level of Service, delay in seconds

Conclusions

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2017, there will be manageable impacts to the existing highway network. The existing westbound left turn lane on Fern Valley Road will need to meet KYTC requirements.

Appendix A

Traffic Counts

Study Name Fern Valley Rd & Jefferson Blvd

Start Date 01/07/2016

Start Time 7:00 AM

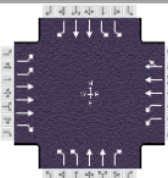
Site Code

	Southbound Approach Southbound			Westbound Approach Westbound			Northbound Approach Northbound			Eastbound Approach Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
7:00 AM	12	9	10	7	182	14	17	30	6	9	95	7	398
7:15 AM	17	14	0	13	215	7	22	42	5	1	137	9	482
7:30 AM	11	22	5	11	256	21	33	49	10	4	140	7	569
7:45 AM	16	18	1	10	258	24	30	71	15	7	133	13	596
8:00 AM	15	13	6	10	275	16	22	30	2	7	108	8	512
8:15 AM	14	18	4	18	217	9	28	27	10	7	99	12	463
8:30 AM	18	16	3	9	194	11	26	20	6	10	89	8	410
8:45 AM	16	27	6	12	224	15	21	20	11	21	120	7	500
4:00 PM	22	63	23	11	185	37	46	51	27	35	238	12	750
4:15 PM	30	73	16	10	192	50	53	41	28	46	272	14	825
4:30 PM	28	63	21	12	211	53	60	43	19	46	250	10	816
4:45 PM	53	90	39	10	234	38	56	45	31	45	270	7	918
5:00 PM	37	105	26	12	235	61	47	50	26	45	304	10	958
5:15 PM	48	99	35	10	250	47	52	49	28	42	348	8	1016
5:30 PM	30	68	25	11	278	22	62	35	10	42	301	12	896
5:45 PM	29	72	16	11	234	28	59	51	25	54	278	7	864

	Southbound Approach Southbound			Westbound Approach Westbound			Northbound Approach Northbound			Eastbound Approach Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
7:15 AM	17	14	0	13	215	7	22	42	5	1	137	9	482
7:30 AM	11	22	5	11	256	21	33	49	10	4	140	7	569
7:45 AM	16	18	1	10	258	24	30	71	15	7	133	13	596
8:00 AM	15	13	6	10	275	16	22	30	2	7	108	8	512
TOTAL	59	67	12	44	1004	68	107	192	32	19	518	37	2159
4:45 PM	53	90	39	10	234	38	56	45	31	45	270	7	918
5:00 PM	37	105	26	12	235	61	47	50	26	45	304	10	958
5:15 PM	48	99	35	10	250	47	52	49	28	42	348	8	1016
5:30 PM	30	68	25	11	278	22	62	35	10	42	301	12	896
TOTAL	168	362	125	43	997	168	217	179	95	174	1223	37	3788

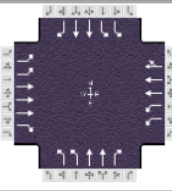
Appendix B

HCS Reports

HCS 2010 Signalized Intersection Results Summary																
General Information							Intersection Information									
Agency	CDM Smith						Duration, h	0.25								
Analyst	DBZ		Analysis Date		Feb 9, 2016		Area Type	Other								
Jurisdiction			Time Period		AM Peak		PHF	0.91								
Urban Street	Fern Valley Road		Analysis Year		2016		Analysis Period	1> 7:15								
Intersection	Jefferson Boulevard		File Name		AM 16.xus											
Project Description	Jefferson Commerce Center															
																
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				37	518	19	68	1004	44	32	192	107	12	67	59	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	11.1	2.6	59.7	3.6	3.3	10.2						
				Yellow	3.5	0.0	4.3	3.5	0.0	3.6						
				Red	4.2	0.0	2.3	4.0	0.0	4.0						
Force Mode	Fixed	Simult. Gap N/S	On													
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2	1	6	3	8	7	4					
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0					
Phase Duration, s				18.8	66.3	21.5	68.9	14.4	21.2	11.1	17.8					
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6					
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2					
Queue Clearance Time (g s), s				3.4		4.4		3.2	10.7	2.5	7.0					
Green Extension Time (g e), s				0.2	0.0	0.4	0.0	0.1	2.9	0.0	2.9					
Phase Call Probability				0.74		0.92		0.69	1.00	0.36	1.00					
Max Out Probability				0.00		0.00		0.00	0.00	0.00	0.00					
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v), veh/h				41	569	21	75	773	378	35	211	118	13	74	65	
Adjusted Saturation Flow Rate (s), veh/h/ln				1583	1597	1220	1673	1827	1786	1740	1773	1563	1528	1756	1491	
Queue Service Time (g s), s				1.4	8.1	1.1	2.4	15.5	15.5	1.2	6.7	8.7	0.5	2.4	5.0	
Cycle Queue Clearance Time (g c), s				1.4	8.1	1.1	2.4	15.5	15.5	1.2	6.7	8.7	0.5	2.4	5.0	
Green Ratio (g/C)				0.09	0.50	0.50	0.11	0.52	0.52	0.06	0.11	0.11	0.03	0.09	0.09	
Capacity (c), veh/h				294	2384	607	384	1898	928	200	402	177	91	300	127	
Volume-to-Capacity Ratio (X)				0.138	0.239	0.034	0.195	0.408	0.408	0.176	0.525	0.664	0.146	0.246	0.510	
Available Capacity (c a), veh/h				1109	2384	607	1173	1898	928	507	1133	499	446	1024	435	
Back of Queue (Q), veh/ln (50 th percentile)				0.6	2.9	0.3	1.0	6.3	6.3	0.5	3.1	3.7	0.2	1.1	2.0	
Queue Storage Ratio (RQ) (50 th percentile)				0.08	0.06	0.03	0.08	0.20	0.20	0.05	0.16	0.29	0.03	0.05	0.27	
Uniform Delay (d 1), s/veh				50.0	17.2	15.4	48.1	17.6	17.6	53.8	50.2	51.0	56.7	51.3	52.5	
Incremental Delay (d 2), s/veh				0.3	0.2	0.1	0.3	0.7	1.3	0.6	1.5	6.0	1.0	0.6	4.4	
Initial Queue Delay (d 3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				50.3	17.4	15.5	48.5	18.2	18.9	54.4	51.7	57.0	57.8	51.9	56.9	
Level of Service (LOS)				D	B	B	D	B	B	D	D	E	E	D	E	
Approach Delay, s/veh / LOS				19.5		B	20.3		C	53.7		D	54.5		D	
Intersection Delay, s/veh / LOS				27.4					C							
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				3.0		C	3.0		C	3.4		C	3.5		C	
Bicycle LOS Score / LOS				0.8		A	1.2		A	0.8		A	0.6		A	

HCS 2010 Signalized Intersection Results Summary															
General Information							Intersection Information								
Agency	CDM Smith						Duration, h	0.25							
Analyst	DBZ		Analysis Date	Feb 9, 2016		Area Type	Other								
Jurisdiction			Time Period	AM Peak		PHF	0.91								
Urban Street	Fern Valley Road		Analysis Year	2017 NB		Analysis Period	1> 7:15								
Intersection	Jefferson Boulevard		File Name	AM 17 NB.xus											
Project Description	Jefferson Commerce Center														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				37	523	19	69	1014	44	32	194	108	12	68	60
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6	3	8	7	4				
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0				
Phase Duration, s				18.8	66.1	21.5	68.8	14.4	21.3	11.1	18.0				
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6				
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2				
Queue Clearance Time (g_s), s				3.4		4.5		3.2	10.7	2.5	7.1				
Green Extension Time (g_e), s				0.2	0.0	0.4	0.0	0.1	3.0	0.0	3.0				
Phase Call Probability				0.74		0.92		0.69	1.00	0.36	1.00				
Max Out Probability				0.00		0.00		0.00	0.00	0.00	0.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h				41	575	21	76	781	382	35	213	119	13	75	66
Adjusted Saturation Flow Rate (s), veh/h/ln				1583	1597	1220	1673	1827	1786	1740	1773	1563	1528	1756	1491
Queue Service Time (g_s), s				1.4	8.2	1.1	2.5	15.7	15.7	1.2	6.8	8.7	0.5	2.4	5.1
Cycle Queue Clearance Time (g_c), s				1.4	8.2	1.1	2.5	15.7	15.7	1.2	6.8	8.7	0.5	2.4	5.1
Green Ratio (g/C)				0.09	0.50	0.50	0.12	0.52	0.52	0.06	0.11	0.11	0.03	0.09	0.09
Capacity (c), veh/h				294	2378	605	385	1894	926	200	405	178	91	303	129
Volume-to-Capacity Ratio (X)				0.138	0.242	0.034	0.197	0.412	0.413	0.176	0.526	0.665	0.146	0.247	0.513
Available Capacity (c_a), veh/h				1106	2378	605	1170	1894	926	507	1133	499	446	1024	435
Back of Queue (Q), veh/ln (50 th percentile)				0.6	2.9	0.3	1.0	6.4	6.4	0.5	3.1	3.7	0.2	1.1	2.0
Queue Storage Ratio (RQ) (50 th percentile)				0.08	0.06	0.03	0.08	0.21	0.21	0.05	0.16	0.29	0.03	0.05	0.27
Uniform Delay (d_1), s/veh				50.0	17.3	15.5	48.1	17.7	17.7	53.8	50.1	50.9	56.7	51.2	52.4
Incremental Delay (d_2), s/veh				0.3	0.2	0.1	0.4	0.7	1.4	0.6	1.5	5.9	1.0	0.6	4.4
Initial Queue Delay (d_3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh				50.3	17.5	15.6	48.4	18.4	19.1	54.4	51.6	56.9	57.8	51.8	56.8
Level of Service (LOS)				D	B	B	D	B	B	D	D	E	E	D	E
Approach Delay, s/veh / LOS				19.6	B		20.4	C		53.6	D		54.5	D	
Intersection Delay, s/veh / LOS				27.5						C					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				3.0	C		3.0	C		3.4	C		3.5	C	
Bicycle LOS Score / LOS				0.8	A		1.2	A		0.8	A		0.6	A	

HCS 2010 Signalized Intersection Results Summary

General Information						Intersection Information										
Agency		CDM Smith				Duration, h		0.25								
Analyst		DBZ		Analysis Date		Feb 9, 2016		Area Type		Other						
Jurisdiction				Time Period		AM Peak		PHF		0.91						
Urban Street		Fern Valley Road		Analysis Year		2017 B		Analysis Period		1> 7:15						
Intersection		Jefferson Boulevard		File Name		AM 17 B.xus										
Project Description		Jefferson Commerce Center														
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				40	533	21	82	1042	44	60	201	108	12	93	74	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	11.5	2.7	56.0	3.6	5.3	11.5						
				Yellow	3.5	0.0	4.3	3.5	0.0	3.6						
Force Mode	Fixed	Simult. Gap N/S	On	Red	4.2	0.0	2.3	4.0	0.0	4.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2	1	6	3	8	7	4					
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0					
Phase Duration, s				19.2	62.6	22.0	65.3	16.4	24.4	11.1	19.1					
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6					
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2					
Queue Clearance Time (g s), s				3.5		4.9		4.1	10.5	2.5	8.3					
Green Extension Time (g e), s				0.2	0.0	0.5	0.0	0.2	3.3	0.0	3.2					
Phase Call Probability				0.77		0.95		0.89	1.00	0.36	1.00					
Max Out Probability				0.00		0.00		0.00	0.00	0.00	0.01					
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v), veh/h				44	586	23	90	801	392	66	221	119	13	102	81	
Adjusted Saturation Flow Rate (s), veh/h/ln				1583	1597	1220	1673	1827	1787	1740	1773	1563	1528	1756	1491	
Queue Service Time (g s), s				1.5	8.9	1.2	2.9	17.2	17.2	2.1	6.9	8.5	0.5	3.3	6.3	
Cycle Queue Clearance Time (g c), s				1.5	8.9	1.2	2.9	17.2	17.2	2.1	6.9	8.5	0.5	3.3	6.3	
Green Ratio (g/C)				0.10	0.47	0.47	0.12	0.49	0.49	0.07	0.14	0.14	0.03	0.10	0.10	
Capacity (c), veh/h				304	2235	569	398	1787	874	258	497	219	91	337	143	
Volume-to-Capacity Ratio (X)				0.144	0.262	0.041	0.227	0.448	0.449	0.256	0.444	0.541	0.146	0.304	0.569	
Available Capacity (c a), veh/h				1024	2235	569	1082	1787	874	507	1133	499	446	966	410	
Back of Queue (Q), veh/ln (50 th percentile)				0.6	3.2	0.4	1.2	7.1	7.2	1.0	3.1	3.5	0.2	1.5	0.2	
Queue Storage Ratio (RQ) (50 th percentile)				0.08	0.07	0.03	0.09	0.23	0.23	0.09	0.16	0.27	0.03	0.07	0.03	
Uniform Delay (d 1), s/veh				49.7	19.5	17.4	47.9	20.1	20.1	52.4	47.3	48.0	56.7	50.5	51.9	
Incremental Delay (d 2), s/veh				0.3	0.3	0.1	0.4	0.8	1.7	0.7	0.9	2.9	1.0	0.7	5.0	
Initial Queue Delay (d 3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				50.0	19.8	17.6	48.3	20.9	21.7	53.2	48.2	50.9	57.8	51.2	56.9	
Level of Service (LOS)				D	B	B	D	C	C	D	D	D	E	D	E	
Approach Delay, s/veh / LOS				21.7	C		23.1	C		49.8	D		54.0	D		
Intersection Delay, s/veh / LOS				29.4						C						
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				3.0	C		3.0	C		3.4	C		3.5	C		
Bicycle LOS Score / LOS				0.8	A		1.2	A		0.8	A		0.6	A		

HCS 2010 Signalized Intersection Results Summary															
General Information							Intersection Information								
Agency	CDM Smith						Duration, h	0.25							
Analyst	DBZ		Analysis Date	Feb 9, 2016		Area Type	Other								
Jurisdiction			Time Period	PM Peak		PHF	0.93								
Urban Street	Fern Valley Road		Analysis Year	2016		Analysis Period	1> 4:45								
Intersection	Jefferson Boulevard		File Name	PM 16.xus											
Project Description	Jefferson Commerce Center														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				37	1223	174	168	997	43	95	179	217	125	362	168
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	11.0	3.9	41.9	9.7	0.2	23.8									
Yellow	3.5	0.0	4.3	3.5	0.0	3.6									
Red	4.2	0.0	2.3	4.0	0.0	4.0									
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6	3	8	7	4				
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0				
Phase Duration, s				18.7	48.5	22.7	52.5	17.2	31.4	17.4	31.7				
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6				
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2				
Queue Clearance Time (g_s), s				3.3		7.8		5.4	18.7	7.0	14.7				
Green Extension Time (g_e), s				0.1	0.0	0.9	0.0	0.3	5.2	0.5	5.9				
Phase Call Probability				0.73		1.00		0.97	1.00	0.99	1.00				
Max Out Probability				0.00		0.00		0.00	0.35	0.03	0.20				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h				40	1315	187	181	751	368	102	192	233	134	389	181
Adjusted Saturation Flow Rate (s), veh/h/ln				1740	1675	1388	1723	1827	1786	1723	1809	1579	1555	1809	1548
Queue Service Time (g_s), s				1.3	27.7	12.2	5.8	19.2	19.2	3.4	5.4	16.7	5.0	11.6	12.7
Cycle Queue Clearance Time (g_c), s				1.3	27.7	12.2	5.8	19.2	19.2	3.4	5.4	16.7	5.0	11.6	12.7
Green Ratio (g/C)				0.09	0.35	0.35	0.12	0.38	0.38	0.08	0.20	0.20	0.08	0.20	0.20
Capacity (c), veh/h				319	1755	485	430	1396	683	278	718	314	256	725	310
Volume-to-Capacity Ratio (X)				0.125	0.749	0.386	0.420	0.538	0.538	0.368	0.268	0.744	0.525	0.537	0.582
Available Capacity (c_a), veh/h				739	1755	485	732	1396	683	502	965	421	454	972	416
Back of Queue (Q), veh/ln (50 th percentile)				0.5	11.2	4.2	2.5	8.3	8.5	1.5	2.4	7.0	2.0	5.2	5.0
Queue Storage Ratio (RQ) (50 th percentile)				0.07	0.24	0.37	0.18	0.27	0.27	0.14	0.12	0.55	0.28	0.26	0.65
Uniform Delay (d_1), s/veh				50.1	34.4	29.4	48.5	28.8	28.8	52.3	40.7	45.2	52.8	43.0	43.4
Incremental Delay (d_2), s/veh				0.2	3.0	2.3	0.9	1.5	3.0	1.2	0.3	6.1	2.4	0.9	2.5
Initial Queue Delay (d_3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh				50.3	37.4	31.7	49.4	30.3	31.9	53.4	41.0	51.3	55.2	43.9	45.9
Level of Service (LOS)				D	D	C	D	C	C	D	D	D	E	D	D
Approach Delay, s/veh / LOS				37.0		D	33.4		C	47.9		D	46.5		D
Intersection Delay, s/veh / LOS				38.9						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				3.1		C	3.1		C	3.4		C	3.5		C
Bicycle LOS Score / LOS				1.3		A	1.2		A	0.9		A	1.1		A

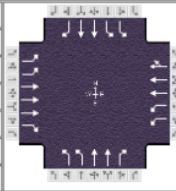
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HCS 2010 Signalized Intersection Results Summary

General Information						Intersection Information										
Agency		CDM Smith				Duration, h		0.25								
Analyst		DBZ		Analysis Date		Feb 9, 2016		Area Type		Other						
Jurisdiction				Time Period		PM Peak		PHF		0.93						
Urban Street		Fern Valley Road		Analysis Year		2017 NB		Analysis Period		1> 4:45						
Intersection		Jefferson Boulevard		File Name		PM 17 NB.xus										
Project Description		Jefferson Commerce Center														
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				37	1235	176	170	1008	43	97	181	229	154	366	170	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	11.0	3.9	41.0	9.7	0.3	24.7						
				Yellow	3.5	0.0	4.3	3.5	0.0	3.6						
Force Mode	Fixed	Simult. Gap N/S	On	Red	4.2	0.0	2.3	4.0	0.0	4.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2	1	6	3	8	7	4					
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0					
Phase Duration, s				18.7	47.6	22.7	51.6	17.2	32.3	17.5	32.5					
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6					
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2					
Queue Clearance Time (g s), s				3.3		7.9		5.4	19.6	8.2	14.7					
Green Extension Time (g e), s				0.1	0.0	0.9	0.0	0.4	5.0	0.6	6.0					
Phase Call Probability				0.73		1.00		0.97	1.00	1.00	1.00					
Max Out Probability				0.00		0.00		0.00	0.41	0.08	0.22					
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v), veh/h				40	1328	189	183	759	371	104	195	246	166	394	183	
Adjusted Saturation Flow Rate (s), veh/h/ln				1740	1675	1388	1723	1827	1787	1723	1809	1579	1555	1809	1548	
Queue Service Time (g s), s				1.3	28.4	12.5	5.9	19.7	19.7	3.4	5.4	17.6	6.2	11.6	12.7	
Cycle Queue Clearance Time (g c), s				1.3	28.4	12.5	5.9	19.7	19.7	3.4	5.4	17.6	6.2	11.6	12.7	
Green Ratio (g/C)				0.09	0.34	0.34	0.12	0.37	0.37	0.08	0.21	0.21	0.08	0.21	0.21	
Capacity (c), veh/h				319	1718	474	430	1369	670	278	743	324	258	751	322	
Volume-to-Capacity Ratio (X)				0.125	0.773	0.399	0.425	0.554	0.555	0.375	0.262	0.759	0.642	0.524	0.568	
Available Capacity (c a), veh/h				713	1718	474	706	1369	670	502	963	420	454	971	416	
Back of Queue (Q), veh/ln (50 th percentile)				0.5	11.6	4.4	2.5	8.6	8.7	1.5	2.4	7.4	2.5	5.2	5.0	
Queue Storage Ratio (RQ) (50 th percentile)				0.07	0.25	0.38	0.18	0.28	0.28	0.14	0.12	0.58	0.35	0.26	0.65	
Uniform Delay (d 1), s/veh				50.1	35.3	30.1	48.5	29.6	29.6	52.3	40.0	44.9	53.3	42.3	42.7	
Incremental Delay (d 2), s/veh				0.2	3.5	2.5	1.0	1.6	3.3	1.2	0.3	7.0	3.8	0.8	2.2	
Initial Queue Delay (d 3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				50.3	38.8	32.6	49.5	31.2	32.9	53.5	40.3	51.9	57.0	43.1	44.9	
Level of Service (LOS)				D	D	C	D	C	C	D	D	D	E	D	D	
Approach Delay, s/veh / LOS				38.3	D		34.2	C		48.1	D		46.7	D		
Intersection Delay, s/veh / LOS				39.8						D						
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				3.1	C		3.1	C		3.4	C		3.5	C		
Bicycle LOS Score / LOS				1.3	A		1.2	A		0.9	A		1.1	A		

HCS 2010 Signalized Intersection Results Summary															
General Information							Intersection Information								
Agency	CDM Smith						Duration, h	0.25							
Analyst	DBZ		Analysis Date	Feb 9, 2016			Area Type	Other							
Jurisdiction			Time Period	PM Peak			PHF	0.93							
Urban Street	Fern Valley Road		Analysis Year	2017 B			Analysis Period	1> 4:45							
Intersection	Jefferson Boulevard		File Name	PM 17 B.xus											
Project Description	Jefferson Commerce Center														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				50	1268	189	173	1016	43	141	200	229	154	372	175
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	12.5	2.5	40.9	9.9	24.8	0.0									
Yellow	3.5	0.0	4.3	3.5	3.6	0.0									
Red	4.2	0.0	2.3	4.0	4.0	0.0									
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6	3	8	7	4				
Case Number				2.0	3.0	2.0	4.0	2.0	3.0	2.0	3.0				
Phase Duration, s				20.2	47.5	22.7	49.9	17.4	32.4	17.5	32.4				
Change Period, (Y+R), s				7.7	6.6	7.7	6.6	7.5	7.6	7.5	7.6				
Max Allow Headway (MAH), s				5.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2				
Queue Clearance Time (g s), s				3.7		8.0		7.1	19.6	8.2	15.2				
Green Extension Time (g e), s				0.2	0.0	0.9	0.0	0.5	5.2	0.6	6.1				
Phase Call Probability				0.83		1.00		0.99	1.00	1.00	1.00				
Max Out Probability				0.00		0.00		0.03	0.42	0.08	0.25				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h				54	1363	203	186	764	374	152	215	246	166	400	188
Adjusted Saturation Flow Rate (s), veh/h/ln				1740	1675	1388	1723	1827	1787	1723	1809	1579	1555	1809	1548
Queue Service Time (g s), s				1.7	29.5	13.6	6.0	20.3	20.3	5.1	6.0	17.6	6.2	11.8	13.2
Cycle Queue Clearance Time (g c), s				1.7	29.5	13.6	6.0	20.3	20.3	5.1	6.0	17.6	6.2	11.8	13.2
Green Ratio (g/C)				0.10	0.34	0.34	0.12	0.36	0.36	0.08	0.21	0.21	0.08	0.21	0.21
Capacity (c), veh/h				362	1712	473	430	1320	646	285	747	326	258	748	320
Volume-to-Capacity Ratio (X)				0.148	0.797	0.430	0.433	0.579	0.580	0.531	0.288	0.755	0.642	0.535	0.588
Available Capacity (c a), veh/h				709	1712	473	702	1320	646	502	963	420	454	964	412
Back of Queue (Q), veh/ln (50 th percentile)				0.7	12.1	4.8	2.6	8.9	9.1	2.3	2.7	7.4	2.5	5.3	5.2
Queue Storage Ratio (RQ) (50 th percentile)				0.09	0.26	0.41	0.19	0.29	0.29	0.21	0.14	0.58	0.35	0.27	0.67
Uniform Delay (d 1), s/veh				48.9	35.8	30.6	48.6	31.0	31.0	52.8	40.2	44.7	53.3	42.4	43.0
Incremental Delay (d 2), s/veh				0.3	3.9	2.8	1.0	1.9	3.8	2.2	0.3	6.8	3.8	0.8	2.4
Initial Queue Delay (d 3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh				49.2	39.7	33.4	49.6	32.8	34.7	55.0	40.5	51.6	57.0	43.3	45.4
Level of Service (LOS)				D	D	C	D	C	C	D	D	D	E	D	D
Approach Delay, s/veh / LOS				39.3		D	35.7		D	48.5		D	46.8		D
Intersection Delay, s/veh / LOS				40.8						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				3.1		C	3.1		C	3.4		C	3.5		C
Bicycle LOS Score / LOS				1.4		A	1.2		A	1.0		A	1.1		A

HCS 2010 Two-Way Stop Control Summary Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Fern Valley Entrance							
Agency/Co.	CDM Smith							Jurisdiction								
Date Performed	2/11/2016							East/West Street	Fern Valley Road							
Analysis Year	2017							North/South Street	Entrance							
Time Analyzed	AM Peak							Peak Hour Factor	0.91							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Fern Valley Commerce Center															
Lanes																
Major Street: East-West																
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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	3	0	0	1	3	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			579	78		56	1120			5		15				
Percent Heavy Vehicles						1				1		1				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															
Delay, Queue Length, and Level of Service																
Flow Rate (veh/h)						62					5		16			
Capacity						535					254		545			
v/c Ratio						0.12					0.02		0.03			
95% Queue Length						0.4					0.1		0.1			
Control Delay (s/veh)						12.6					19.4		11.8			
Level of Service (LOS)						B					C		B			
Approach Delay (s/veh)					0.6				13.6							
Approach LOS					A				B							

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HCS 2010 Two-Way Stop Control Summary Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Fern Valley Entrance							
Agency/Co.	CDM Smith							Jurisdiction								
Date Performed	2/11/2016							East/West Street	Fern Valley Road							
Analysis Year	2017							North/South Street	Entrance							
Time Analyzed	PM Peak							Peak Hour Factor	0.93							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Fern Valley Commerce Center															
Lanes																
Major Street: East-West																
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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	3	0	0	1	3	0		1	0	1		0	0	0
Configuration			T	TR		L	T			L		R				
Volume (veh/h)			1448	24		17	1315			27		59				
Percent Heavy Vehicles						1				1		1				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															
Delay, Queue Length, and Level of Service																
Flow Rate (veh/h)						18					29		63			
Capacity						205					88		287			
v/c Ratio						0.09					0.33		0.22			
95% Queue Length						0.3					1.3		0.8			
Control Delay (s/veh)						24.3					64.7		21.1			
Level of Service (LOS)						C					F		C			
Approach Delay (s/veh)					0.3				34.8							
Approach LOS					A				D							

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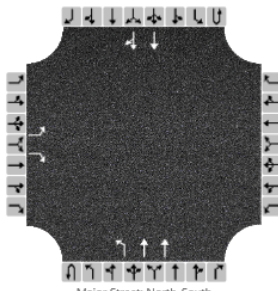
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HCS 2010 Two-Way Stop Control Summary Report																
General Information								Site Information								
Analyst	DBZ							Intersection				Jefferson Boulevard Entra				
Agency/Co.	CDM Smith							Jurisdiction								
Date Performed	2/11/2016							East/West Street				Entrance				
Analysis Year	2017							North/South Street				Jefferson Boulevard				
Time Analyzed	AM Peak							Peak Hour Factor				0.91				
Intersection Orientation	North-South							Analysis Time Period (hrs)				0.25				
Project Description	Fern Valley Commerce Center															
Lanes																
Major Street: North-South																
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		1	0	1		0	0	0	0	1	2	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		21		6						25	348				158	38
Percent Heavy Vehicles		1		1						1						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															
Delay, Queue Length, and Level of Service																
Flow Rate (veh/h)		23		7						27						
Capacity		598		928						1359						
v/c Ratio		0.04		0.01						0.02						
95% Queue Length		0.1		0.0						0.1						
Control Delay (s/veh)		11.3		8.9						7.7						
Level of Service (LOS)		B		A						A						
Approach Delay (s/veh)	10.7								0.5							
Approach LOS	B								A							

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JB entrance AM.xtw

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HCS 2010 Two-Way Stop Control Summary Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Jefferson Boulevard Entra							
Agency/Co.	CDM Smith							Jurisdiction								
Date Performed	2/11/2016							East/West Street	Entrance							
Analysis Year	2017							North/South Street	Jefferson Boulevard							
Time Analyzed	PM Peak							Peak Hour Factor	0.91							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Fern Valley Commerce Center															
Lanes																
 Major Street: North-South																
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		1	0	1		0	0	0	0	1	2	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		59		19						6	511				695	9
Percent Heavy Vehicles		1		1						1						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															
Delay, Queue Length, and Level of Service																
Flow Rate (veh/h)		65		21						7						
Capacity		329		614						844						
v/c Ratio		0.20		0.03						0.01						
95% Queue Length		0.7		0.1						0.0						
Control Delay (s/veh)		18.6		11.1						9.3						
Level of Service (LOS)		C		B						A						
Approach Delay (s/veh)	16.8								0.1							
Approach LOS	C								A							

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