



TO: Paul Holt, Director, Community Development, Planning Director, JCC
Glenn Brooks, P. E., VDOT
FROM: Dexter R. Williams, P. E.
SUBJECT: Traffic Impact Analysis For Former Radio Station Property/Ironbound
Crossing
DATE: December 17, 2018

INTRODUCTION

The upper section of Exhibit 1 shows the former WMBG Radio Station Property location within the VDOT Hampton Roads District.

The lower section of Exhibit 1 shows the former Radio Station Property boundaries on a Google Earth aerial photo. The Radio Property consists of two parcels: an existing parcel owned by G Square Inc. and a section of existing VDOT right of way to be abandoned. The existing right of way to be abandoned encompasses a circular cul-de-sac of Rt. 784 Ironbound Road stub. The circular cul-de-sac is to be replaced with a branch turnaround design.

Bush Construction Corporation (Bush) is the developer of the former Radio Station Property. Bush is a long-term lessor of the G Square, Inc. property and is also the applicant to VDOT for abandonment of the existing VDOT right of way with responsibility for removing the Rt. 784 Ironbound Road stub and constructing a new branch turnaround.

The G Square property is zoned B-1, and as such could be developed with up to 99 vehicles per hour under County zoning without a Special Use Permit. When the two properties are rezoned in combination, trip generation above 99 vehicles per hour will require either a SUP or an updated traffic analysis to evaluate actual trips and possible improvements resulting from a more definitive proposed office use. Uses triggering a Commercial SUP will require an updated traffic analysis to evaluate trips and improvements from such use.

This TIA has been prepared pursuant to a written workscope dated January 2, 2107 (see enclosed Appendix Exhibit X1), which was shared with VDOT and County Staff without objection. All vehicular access to the former Radio Station Property is currently and will remain via the Rt. 784 Ironbound Road stub.

The focus of analysis is on traffic operations at the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance intersection (CC Entrance). This intersection is unsignalized as follows:

- stop sign controls for the Ironbound Road stub and CC Entrance approaches
- single lane approach Ironbound Road stub (shared left/through/right movements).
- single lane approach CC entrance (shared left/through/right movements).
- single lane approach on southbound Ironbound Road (shared left/through/right movements)
- shared left/through lane and right turn lane on northbound Ironbound Road approach
- 45 mph speed limit on Ironbound Road

In addition, this study includes documentation of queuing on northbound Ironbound Road at the Monticello Avenue intersection. This includes recordation of existing queuing on the northbound Ironbound Road approach to the Monticello Avenue signal and a forecast of future queues for background traffic and for the addition of the site. Computer modeling of this queue and LOS analysis at the Monticello/Ironbound intersection requires replication of the coordinated system on Monticello Avenue. This replication is a work scope vastly outsized in scale with respect to this rezoning which does not involve an increase in allowable trip generation. It was recognized during the discussion of workscope that simulating the Monticello Avenue corridor was not justified.

2017 EXISTING TRAFFIC CONDITIONS

The upper row on Exhibit 2 shows AM and PM peak hour counts on the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance intersection (tabulated 7-9 AM and 4-6 PM peak hour counts are on Appendix Exhibit A, % Trucks calculations on Appendix Exhibit B and peak hour factor calculations are on Appendix Exhibit C).

Appendix Exhibits J1 and J2 respectively show HCS6 2017 unsignalized intersection level of service (LOS results) using Synchro, and Appendix Exhibits K1 and K2 respectively show 2017 SimTraffic queuing. LOS and 95th percentile queuing results are shown in the following table:

2017 COUNTS - TABLE 1									
Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance									
Traffic LOS And Seconds Delay By Lane Group					95th %ile Queues By Lane Group				
	AM		PM		Storage Length	HCS 2010		SimTraffic Q&B	
						AM	PM	AM	PM
EB LTR	B	11.5	C	15.1	-	3	5	44	26
WB LTR	A	9.2	B	11.5	-	3	25	29	52
NB LT	A	8.1	A	8.6	-			7	
SB LTR	A	7.4	A	7.9	-	3	5	16	37

All intersection LOS results are LOS C or better with the greatest queue of 52 feet for the westbound PM peak hour approach based on SimTraffic.

Queuing counts for the northbound Ironbound Road approach to the Rt. 10 signal are shown on

Appendix Exhibit D series. Appendix Exhibits D1 and D2 show queuing 7 to 9 AM and, and Appendix Exhibits D3 and D4 show queueing for 4 to 6 PM count period. Queues are tabulated for the northbound left turn lane and the northbound left/through/right lane. PM queues are appreciably greater than the AM queues (AM queues don't exceed 100 feet in either lane).

In the PM peak hour, the northbound left/through/right turn lane (right side lane) has a 95th percentile queue for the 4 to 5 PM peak hour of 195 feet, and 95th percentile queue for the 4 to 6 PM count period of 225 feet. For the northbound left turn lane, the 95th percentile queue for the 4 to 5 PM peak hour was 170 feet, and the 95th percentile queue for the 4 to 6 PM count period was 175 feet.

Exhibit 7 shows the 4 to 6 PM 95th percentile queues in green. There is 260 feet of storage on the left turn lane (full width 210 feet plus ½ of 100-foot taper), so that existing queuing (175 feet) is 85 feet less than storage. There is 300 feet storage for the left/through/right lane (from stop bar to curb radius at CC Entrance), so that existing queuing (225 feet) is 75 feet less than existing storage.

2024 BACKGROUND TRAFFIC CONDITIONS

The second row on Exhibit 2 shows 2024 AM and PM peak hour background traffic on the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance intersection. VDOT count locations on Ironbound Road have moved in the last five years producing inconsistent trend data. Two locations on Monticello Avenue that have not moved in the last five years are shown on Exhibit 3. Neither location shows a 2017 to 2024 growth factor over 1.04. A 1.07 growth factor is used on Exhibit 3 as a default value of 1% linear traffic growth for seven years.

Appendix Exhibits J3 and J4 respectively show HCS6 2024 background traffic unsignalized intersection level of service (LOS results) using Synchro, and Appendix Exhibits K3 and K4 respectively show 2024 background traffic SimTraffic queuing. LOS and 95th percentile queuing results are shown in the following table:

2024 BACKGROUND TRAFFIC - TABLE 2									
Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance									
Traffic LOS And Seconds Delay By Lane Group					95th %ile Queues By Lane Group				
	AM		PM		Storage Length	HCS 2010		SimTraffic Q&B	
						AM	PM	AM	PM
EB LTR	B	10.9	B	13.7	-			43	23
WB LTR	A	9.0	B	10.8	-	3	18	29	57
NB LT	A	8.0	A	8.6	-			7	
SB LTR	A	7.4	A	7.8	-	3	5	16	40

All intersection LOS results are LOS B or better with the greatest queue of 57 feet for the westbound PM peak hour approach based on SimTraffic.

For queues on northbound Ironbound Road at Monticello Avenue, the 2017 queues have been increases by a 1.07 growth factor for a 2024 background traffic estimate. For the northbound left/through/right turn lane, the 95th percentile queue for the 4 to 6 PM 2024 background traffic is 240 feet (rounded to nearest five feet). For the northbound left turn lane, the 95th percentile queue for the 4 to 6 PM 2024 background traffic is 190 feet. The 4 to 6 PM 95th percentile queues for 2024 background traffic are shown in yellow on Exhibit 7.

RADIO STATION PROPERTY TRIP GENERATION AND DISTRIBUTION

Specific uses for the former Radio Station Property have not been determined. The maximum trip generation permitted by the County zoning ordinance without a Special Use Permit (SUP) is 99 vehicles per hour. The proposed rezoning does not include a request for SUP so 99 vehicles per hour is the assumed maximum trip generation projected for the site in this analysis.

For site traffic, 99 vehicles per hour are assigned on the third row on Exhibit 2 for the AM and PM peak hours. The distribution is 85% north on Ironbound Road to Monticello Avenue and 15% south on Ironbound Road. This approximates the distribution of trips on the Courthouse Commons entrance.

TOTAL 2024 TRAFFIC

Total 2024 traffic forecast is shown on the bottom row on Exhibit 2. Appendix Exhibits J5 and J6 respectively show HCS6 2024 total traffic unsignalized intersection level of service (LOS results) using Synchro, and Appendix Exhibits K5 and K6 respectively show 2024 total traffic SimTraffic queuing. LOS and 95th percentile queuing results are shown in the following table:

2024 TOTAL TRAFFIC - TABLE 3									
Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance									
Traffic LOS And Seconds Delay By Lane Group					95th %ile Queues By Lane Group				
	AM		PM		Storage Length	HCS 2010		SimTraffic Q&B	
						AM	PM	AM	PM
EB LTR	B	12.2	C	17.4	-	10	15	55	52
WB LTR	A	9.1	B	10.9	-	3	18	29	52
NB LT	A	7.9	A	7.8	-			13	9
SB LTR	A	7.4	A	7.8	-	3	5	18	42

All intersection LOS results are LOS C or better with the greatest queue of 55 feet for the eastbound PM peak hour approach based on SimTraffic.

The former Radio Station Property site has 42 vehicles exiting to northbound Ironbound Road to the signal at Monticello Avenue in the PM peak hour. There are 25 cycles of the Monticello/Ironbound signal in a peak hour, so former Radio Station Property traffic at the signal is about 1.7 vehicles per cycle. Assuming one additional car (25 feet) from the former Radio Station Property in each of the northbound approach lanes for each cycle produces a 2024 total

traffic 95th percentile queue on the left turn lane of 215 feet and a 2024 total traffic 95th percentile queue on the left/through/right turn lane of 265 feet. These 2024 total traffic queues are shown in red on Exhibit 7.

There is 260 feet of storage on the left turn lane, so that total queuing (215 feet) is 45 feet less than storage. There is 300 feet storage for the left/through/right lane, so that total queuing (265 feet) is 35 feet less than storage.

At the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance, a left turn lane on northbound Rt. 615 Ironbound Road at the stub is not warranted (see Exhibits 4 and 5). A southbound right turn taper on southbound Rt. 615 Ironbound Road at the stub is barely warranted (see Exhibit 6). Proffers have been submitted with this rezoning to reevaluate the need for this taper when the site plan and proposed land use are requested and completed and committed for construction if warranted before site plan approval.

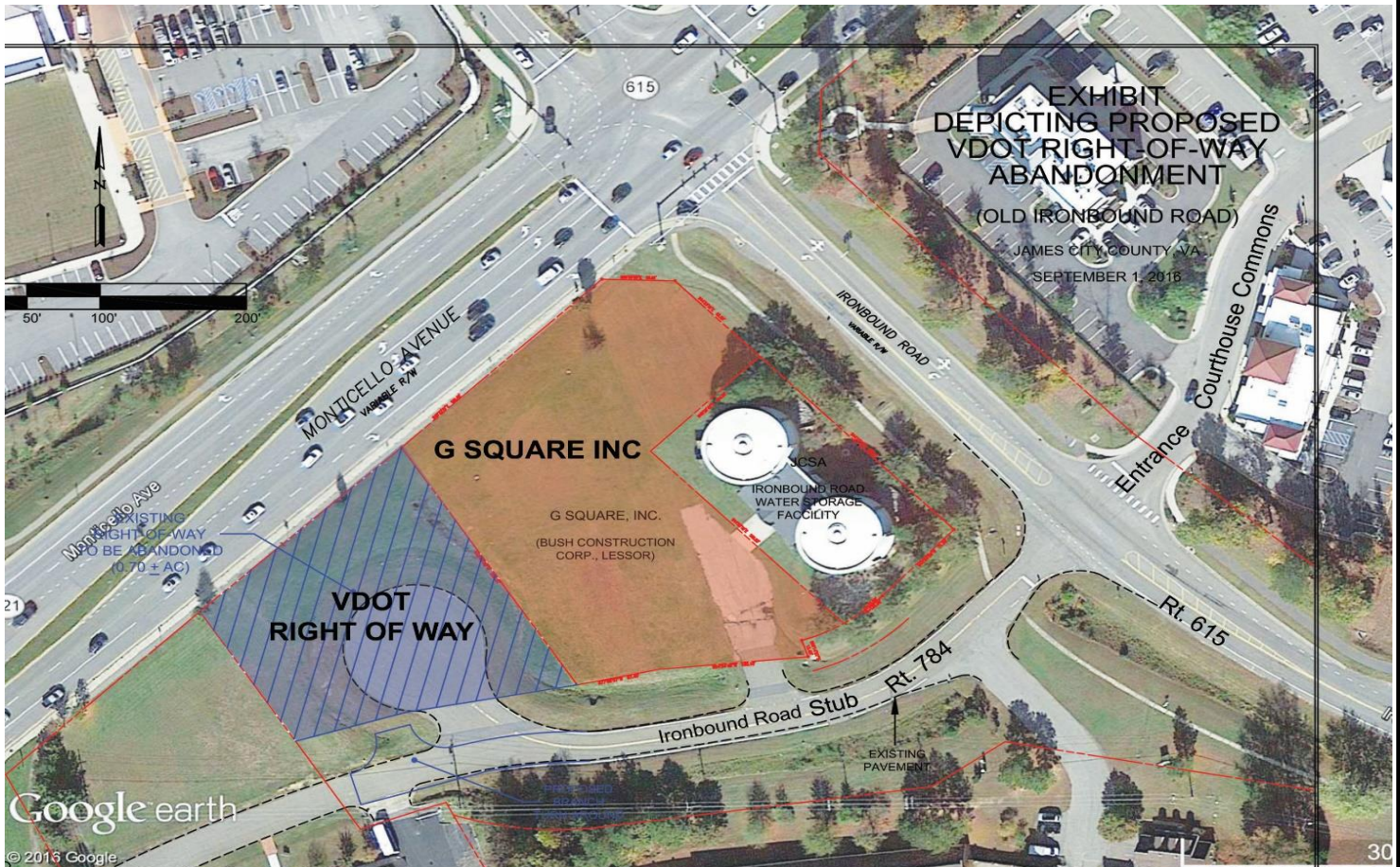
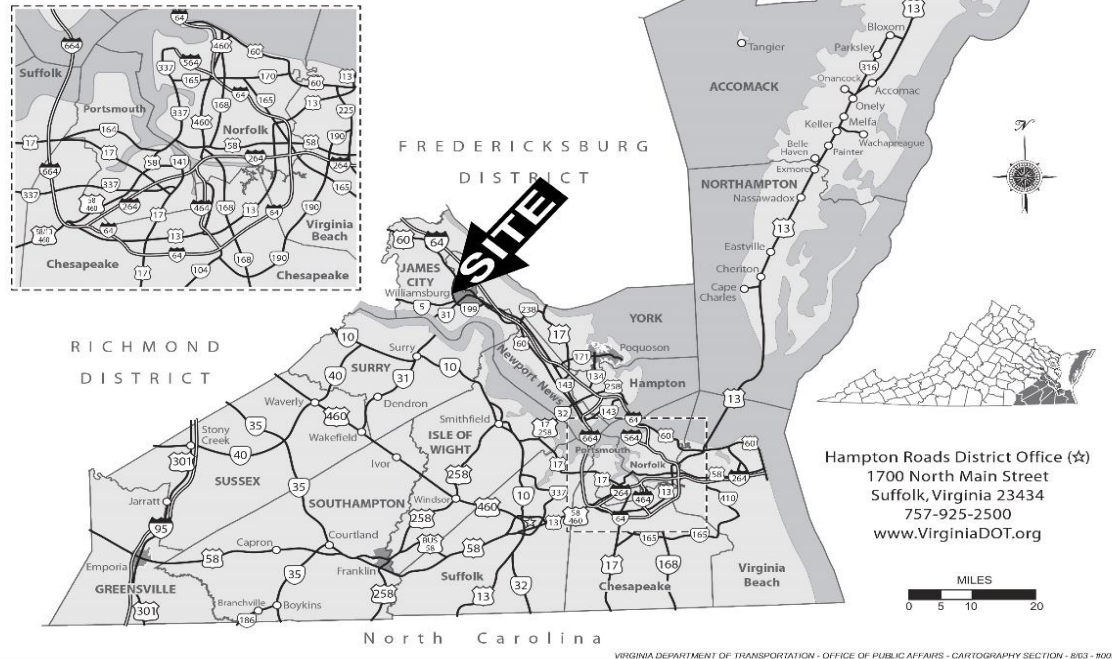
CONCLUSIONS

The former WMBG Radio Station Property traffic can be accommodated at the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance intersection with LOS C or better for all turning movements without any traffic improvements. There is adequate clearance between the northbound Ironbound Road queues at Monticello Avenue and the Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/Courthouse Commons Entrance intersection, with more than one car of storage available in each lane. A southbound right turn taper on southbound Rt. 615 Ironbound Road at the stub is barely warranted with site traffic and is proffered to be addressed and required if warranted. Site development with less than the maximum trip generation under zoning will tend to not warrant a right turn taper.

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Left Turn Lane Warrants – Northbound Ironbound Road At Ironbound Stub – 2024 PM.....	5
Right Turn Lane Warrants – Southbound Ironbound Road At Ironbound Stub	6
Northbound Ironbound Road At Monticello Avenue Queues	7

Virginia Department of Transportation HAMPTON ROADS DISTRICT

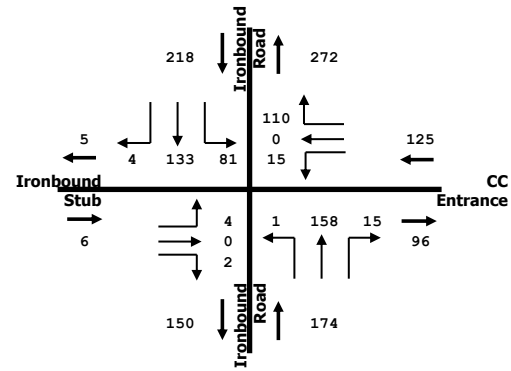
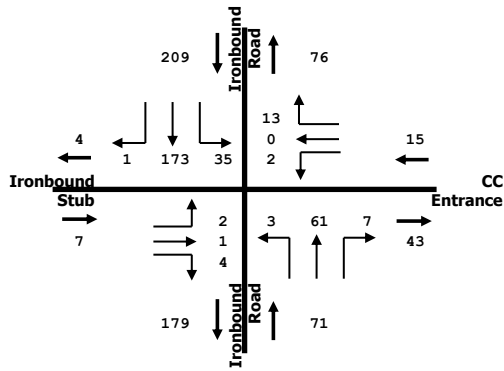


REGIONAL AND AREA MAPS
RADIO PROPERTY

DRW Consultants, LLC
804-794-7312

Exhibit 1

Counts

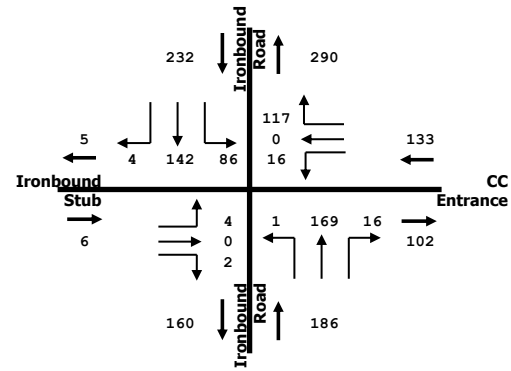
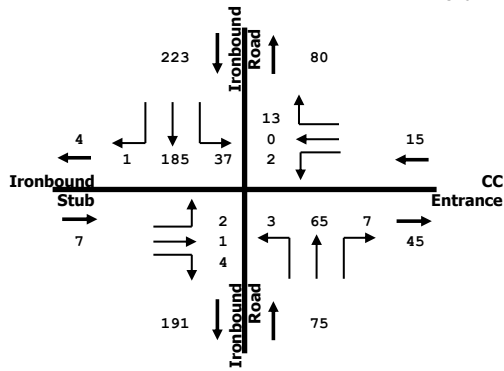


Ironbound Road
Ironbound Road
Ironbound Stub
CC Entrance

TO RT. 199

GROWTH FACTOR: 1.07

Background



Site Traffic

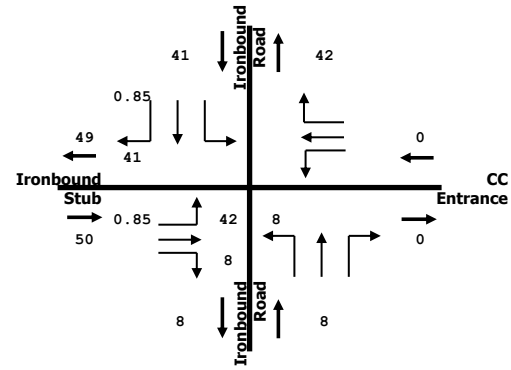
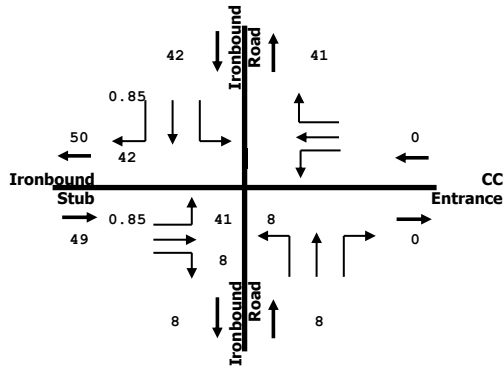
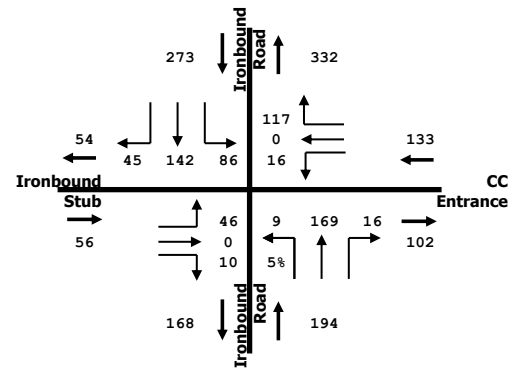
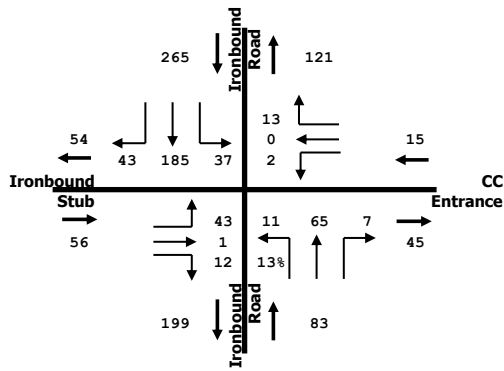


Exhibit Reference

Total Traffic



AM Peak Hour

PM Peak Hour

IRONBOUND ROAD INTERSECTION AT
IRONBOUND STUB/COURTHOUSE COMMONS ENTRANCE
2017 TRAFFIC COUNTS AND 2024 FORECASTS

DRW Consultants, LLC
804-794-7312

Exhibit 2

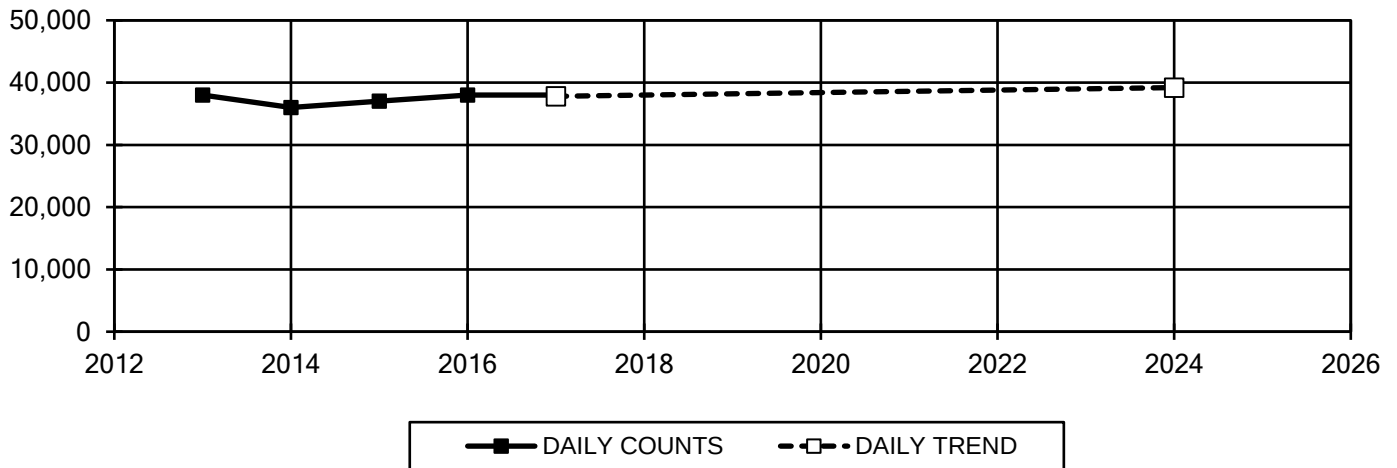
Street: Rt. 5000 Monticello Avenue
 From: Rt. 199
 To: News Road

Street: Rt. 321 Monticello Avenue
 From: Ironbound Road
 To: Compton Dr.

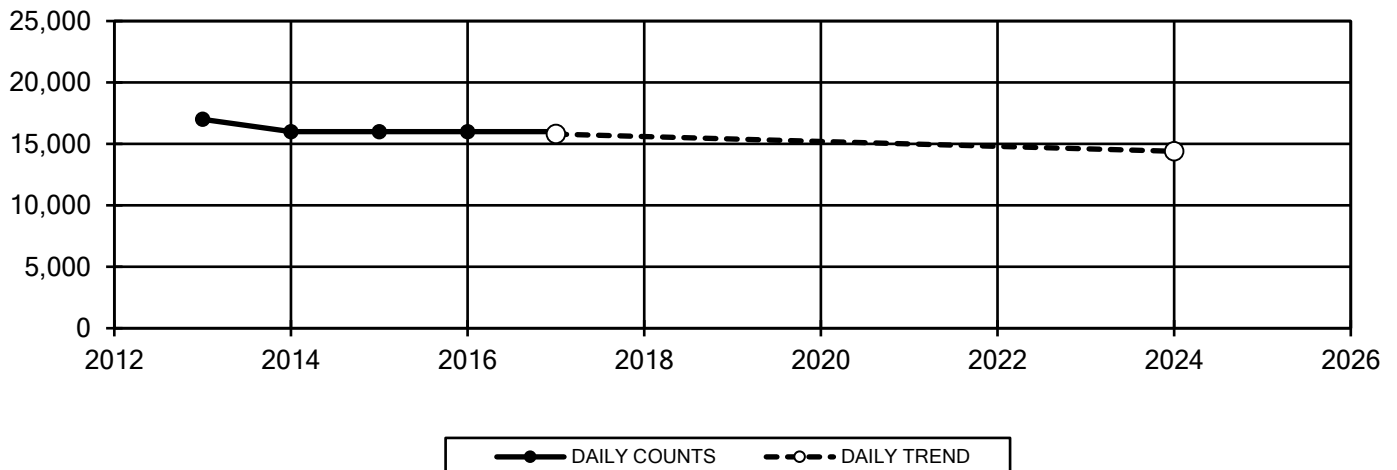
Year	DAILY COUNTS	
2013	38,000	
2014	36,000	
2015	37,000	
2016	38,000	
2017	38,000	
Year	DAILY TREND	
2017	37,800	Δ17
2024	39,200	1.04

Year	DAILY COUNTS	
2013	17,000	
2014	16,000	
2015	16,000	
2016	16,000	
2017	16,000	
Year	DAILY TREND	
2017	15,800	Δ17
2024	14,400	0.91

Rt. 199 To News Road



Ironbound Road To Compton Drive



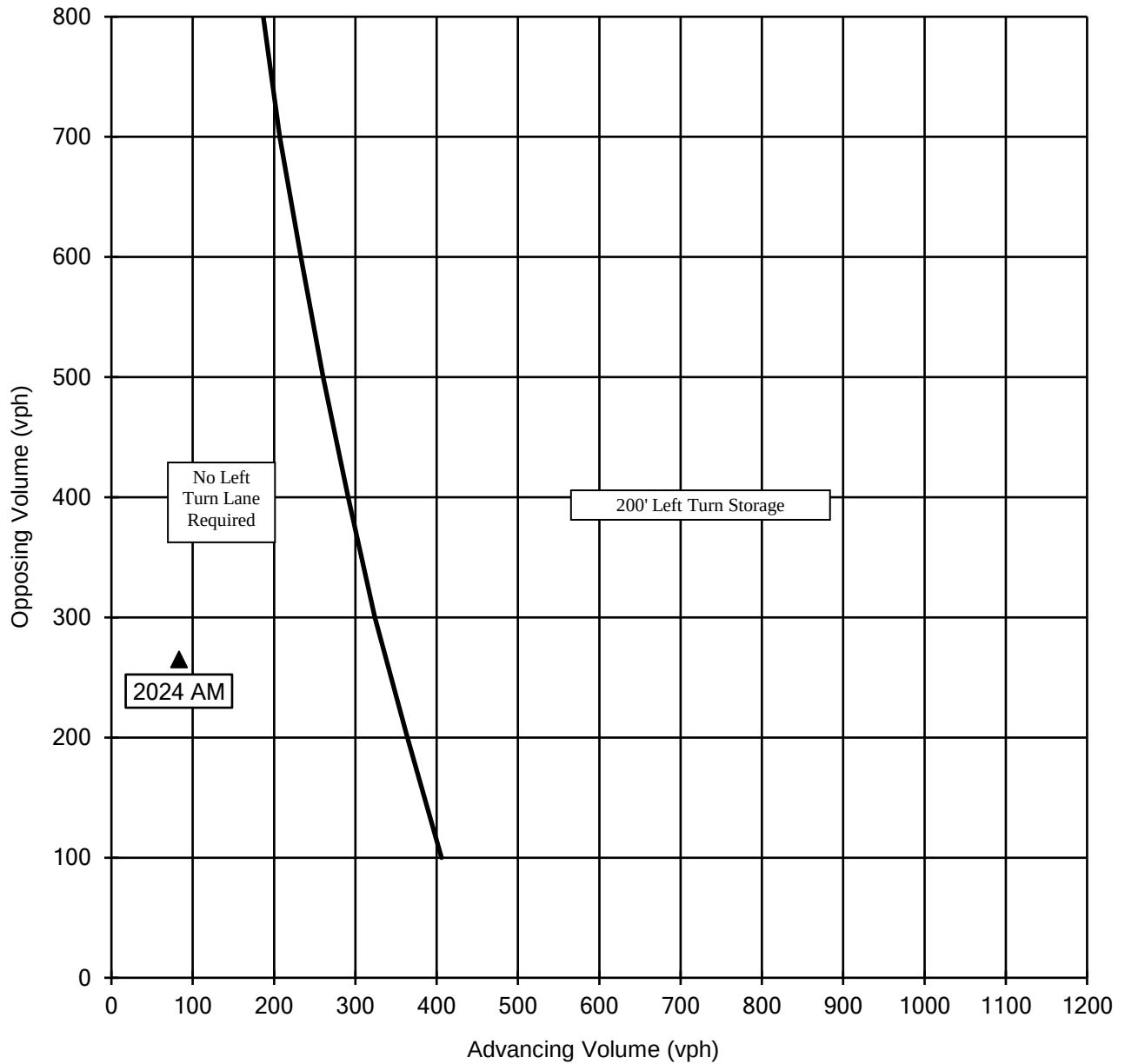
VDOT Average Annual Daily Traffic (AADT) Volume Estimates

MONTICELLO AVENUE
 DAILY TRAFFIC COUNTS AND TRENDS

DRW Consultants, LLC
 804-794-7312

Exhibit 3

LEFT TURN LANE WARRANT
50 mph Design Speed
% Left Turns = 13%



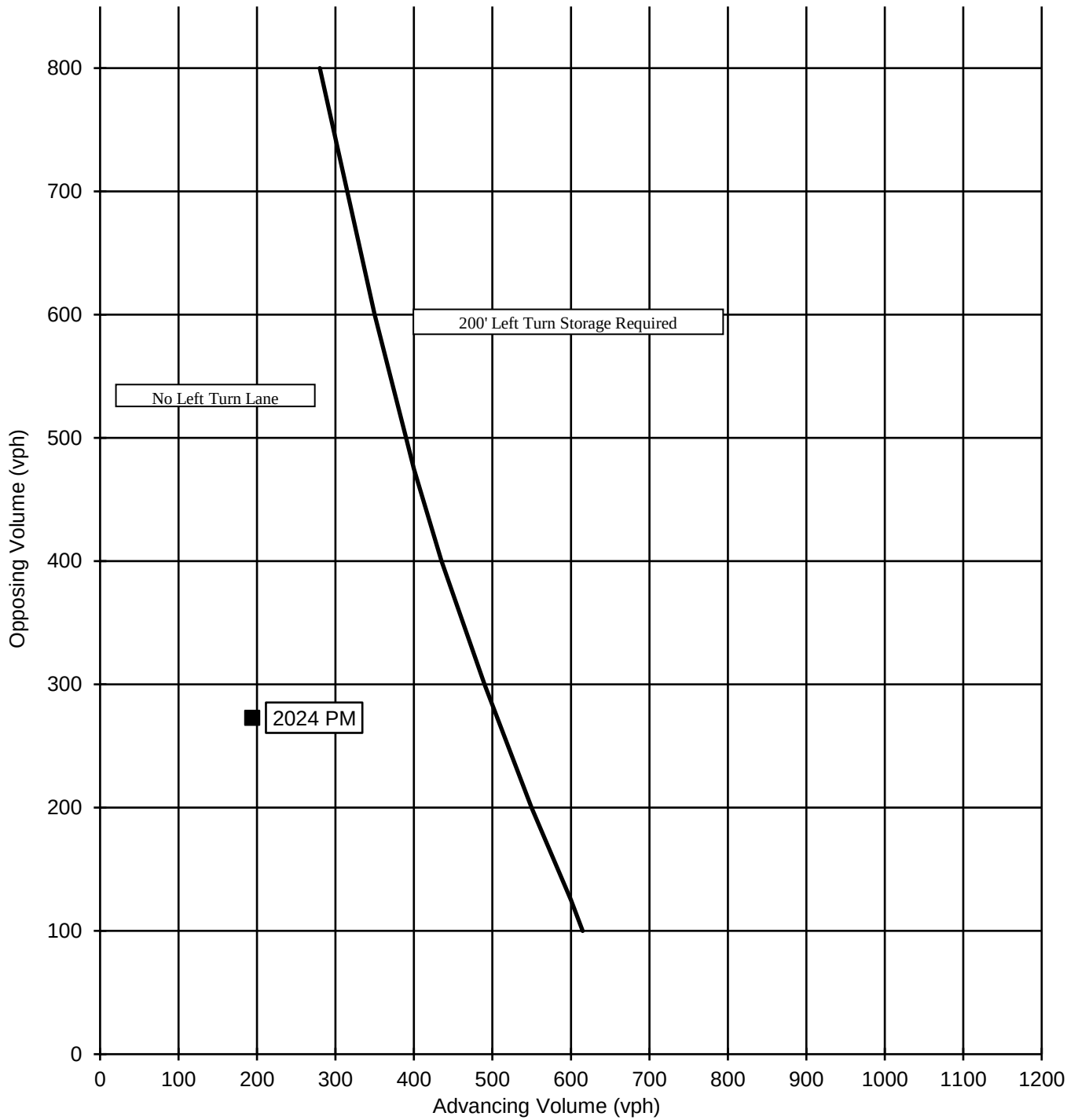
Source: Interpolated from VDOT Road Design Manual, Appendix F, derived from Highway Research Record Number 211

VDOT LEFT TURN LANE WARRANTS
 NORTHBOUND IRONBOUND ROAD AT IRONBOUND ROAD STUB
 2024 AM PEAK HOUR

DRW Consultants, LLC
 804-794-7312

Exhibit 4

LEFT TURN LANE WARRANT
50 mph Design Speed
% Left Turns = 5%



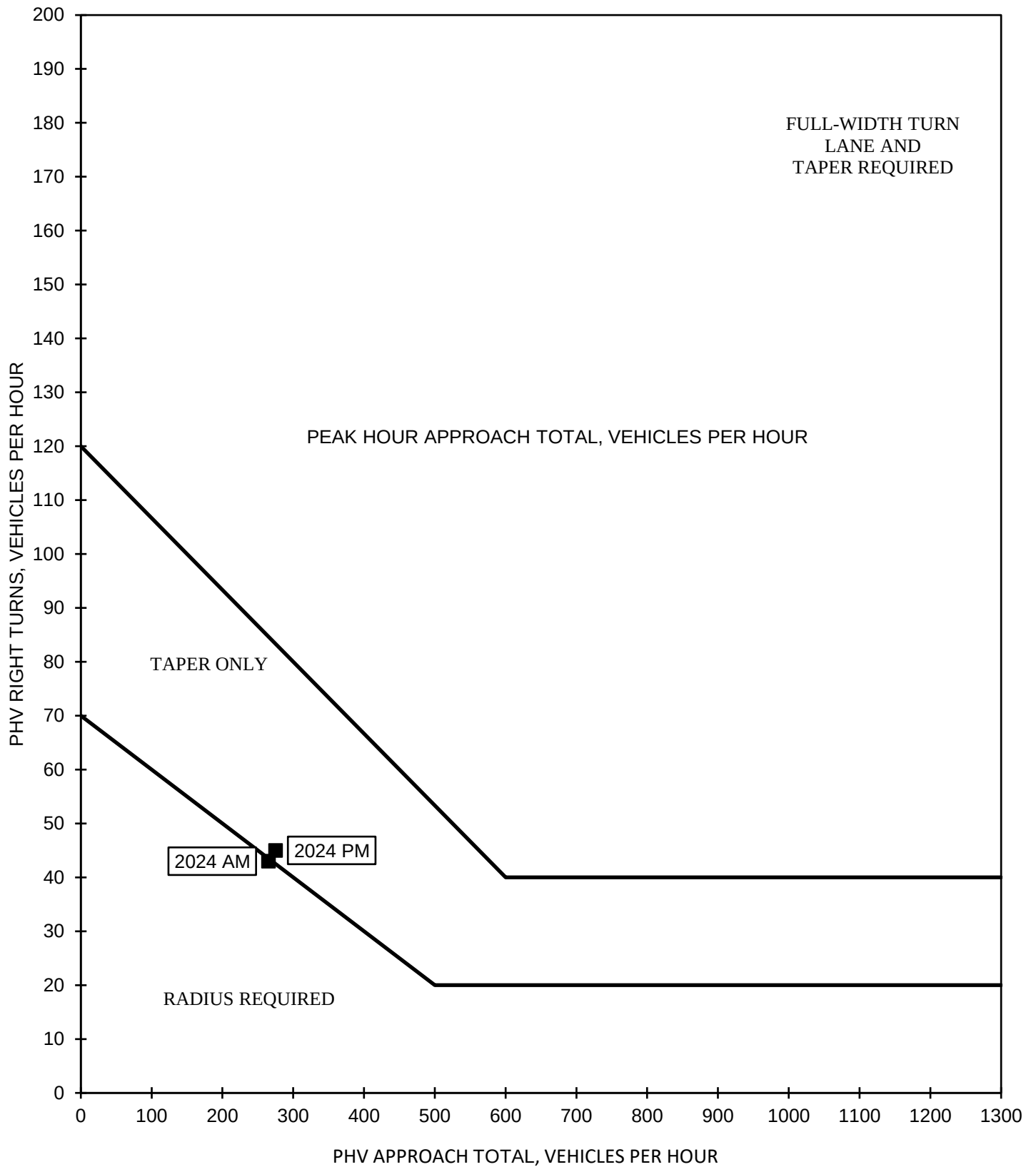
Source: VDOT Road Design Manual, Appendix F

VDOT LEFT TURN LANE WARRANTS
NORTHBOUND IRONBOUND ROAD AT IRONBOUND ROAD STUB
2024 PM PEAK HOUR

DRW Consultants, LLC
804-794-7312

Exhibit 5

Guidelines for Right Turn Treatments 2 - Lane Highway

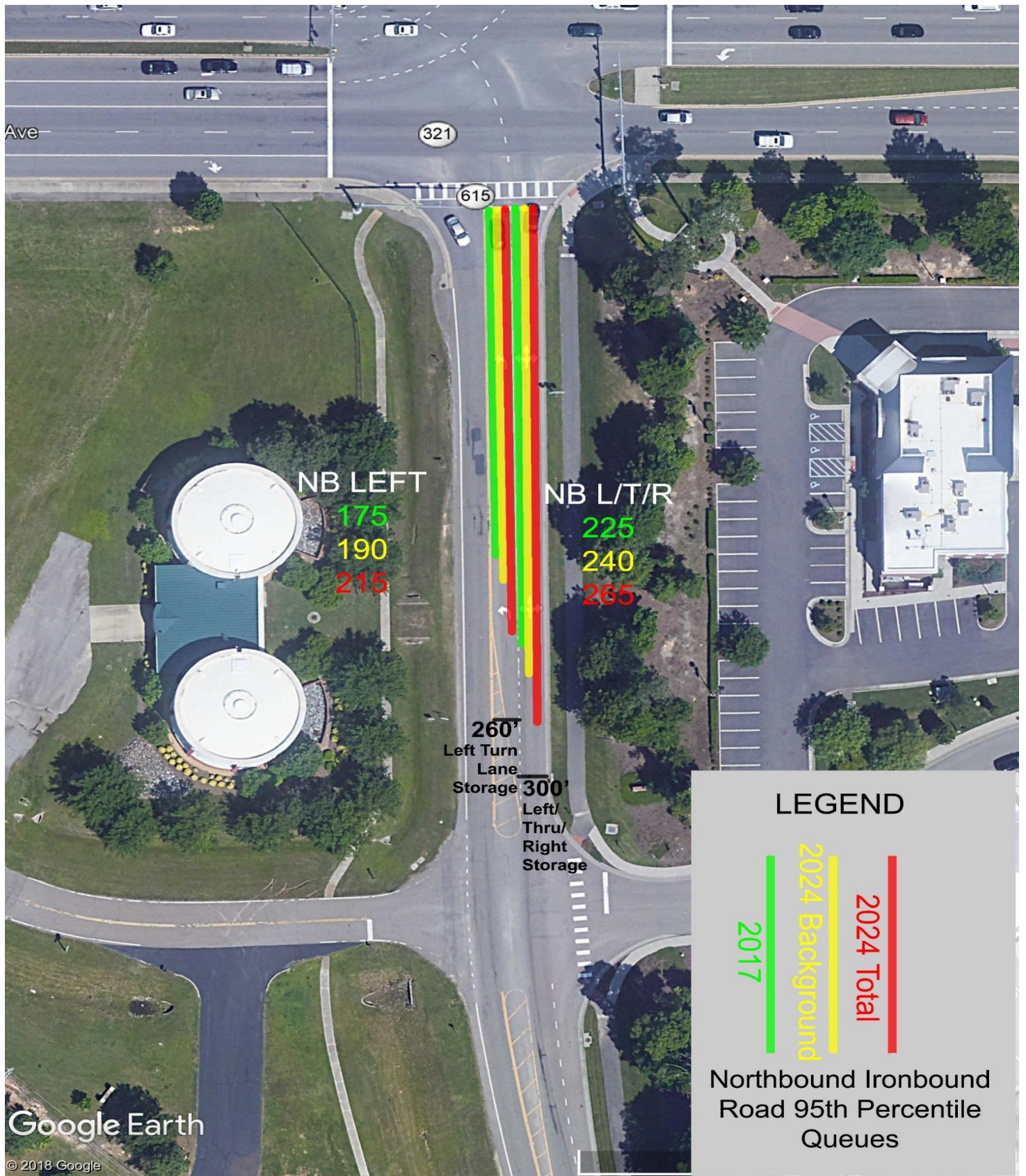


Source: VDOT Road Design Manual, Appendix F

VDOT RIGHT TURN LANE WARRANT
SOUTHBOUND IRONBOUND ROAD AT IRONBOUND ROAD STUB
2024 AM AND PM PEAK HOUR

DRW Consultants, LLC
804-794-7312

Exhibit 6



NORTHBOUND IRONBOUND ROAD
AT MONTICELLO AVENUE
95TH PERCENTILE QUEUES
4 TO 6 PM

DRW Consultants, LLC
804-794-7312

Exhibit 7

APPENDIX TABLE OF CONTENTS

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2024 Background.....	K3 K4
Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/ Courthouse Commons Entrance Intersection.....	Page 1
2024 Total.....	K5 K6
Rt. 615 Ironbound Road/Rt. 784 Ironbound Road stub/ Courthouse Commons Entrance Intersection.....	Page 1
Scope Of Work Documents	
02-07-17 Email.....	X1
01-02-17 Work Scope Memo	X2

Peggy Malone & Associates, Inc.
(888) 247-8602

File Name : Ironbound Rd and Mini Storage Rd AM
Site Code :
Start Date : 4/11/2017
Page No : 1

Groups Printed- Car

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	1	0	0	0	1	0	10	3	0	13	3	13	0	0	16	30
07:15 AM	0	0	0	2	2	2	0	3	0	5	1	9	1	0	11	7	25	0	2	34	52
07:30 AM	0	0	0	0	0	3	0	0	1	4	0	12	0	0	12	4	35	0	0	39	55
07:45 AM	0	0	0	0	0	0	0	1	0	1	0	16	2	0	18	5	64	0	0	69	88
Total	0	0	0	2	2	6	0	4	1	11	1	47	6	0	54	19	137	0	2	158	225
08:00 AM	0	1	1	0	2	1	0	2	0	3	0	13	1	0	14	9	42	0	0	51	70
08:15 AM	1	0	0	0	1	1	0	4	0	5	1	10	1	0	12	10	32	0	0	42	60
08:30 AM	1	0	1	0	2	0	0	6	0	6	1	11	3	0	15	11	28	0	0	39	62
08:45 AM	2	0	0	0	2	1	0	2	0	3	1	18	0	0	19	12	40	4	0	56	80
Total	4	1	2	0	7	3	0	14	0	17	3	52	5	0	60	42	142	4	0	188	272
Grand Total	4	1	2	2	9	9	0	18	1	28	4	99	11	0	114	61	279	4	2	346	497
Apprch %	44.4	11.1	22.2	22.2		32.1	0	64.3	3.6		3.5	86.8	9.6	0		17.6	80.6	1.2	0.6		
Total %	0.8	0.2	0.4	0.4	1.8	1.8	0	3.6	0.2	5.6	0.8	19.9	2.2	0	22.9	12.3	56.1	0.8	0.4	69.6	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	0	1	1	0	16	2	18	5	64	0	69	88
08:00 AM	0	1	1	2	1	0	2	3	0	13	1	14	9	42	0	51	70
08:15 AM	1	0	0	1	1	0	4	5	1	10	1	12	10	32	0	42	60
08:30 AM	1	0	1	2	0	0	6	6	1	11	3	15	11	28	0	39	62
Total Volume	2	1	2	5	2	0	13	15	2	50	7	59	35	166	0	201	280
% App. Total	40	20	40		13.3	0	86.7		3.4	84.7	11.9		17.4	82.6	0		
PHF	.500	.250	.500	.625	.500	.000	.542	.625	.500	.781	.583	.819	.795	.648	.000	.728	.795

Peggy Malone & Associates, Inc.
(888) 247-8602

File Name : Ironbound Rd and Mini Storage Rd AM
Site Code :
Start Date : 4/11/2017
Page No : 1

Groups Printed- Truck

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
07:30 AM	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	3	0	0	3	5
07:45 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	3	1	0	4	6
Total	1	0	0	0	1	0	0	0	0	0	1	3	0	0	4	0	6	2	0	8	13
08:00 AM	0	0	2	0	2	0	0	0	0	0	0	7	0	0	7	0	3	0	0	3	12
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	1	0	0	1	3
08:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	4	0	0	4	5
Total	0	0	2	0	2	0	0	0	0	0	1	10	0	0	11	0	8	0	0	8	21
Grand Total	1	0	2	0	3	0	0	0	0	0	2	13	0	0	15	0	14	2	0	16	34
Apprch %	33.3	0	66.7	0		0	0	0	0		13.3	86.7	0	0		0	87.5	12.5	0		
Total %	2.9	0	5.9	0	8.8	0	0	0	0	0	5.9	38.2	0	0	44.1	0	41.2	5.9	0	47.1	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
07:30 AM	1	0	0	1	0	0	0	0	0	1	0	1	0	0	3	3	5
07:45 AM	0	0	0	0	0	0	0	0	1	1	0	2	0	3	1	4	6
08:00 AM	0	0	2	2	0	0	0	0	0	7	0	7	0	3	0	3	12
Total Volume	1	0	2	3	0	0	0	0	1	10	0	11	0	9	1	10	24
% App. Total	33.3	0	66.7		0	0	0		9.1	90.9	0		0	90	10		
PHF	.250	.000	.250	.375	.000	.000	.000	.000	.250	.357	.000	.393	.000	.750	.250	.625	.500

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File Name : Ironbound Rd and Mini Storage Rd AM
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Groups Printed- Combined

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	1	0	0	0	1	0	10	3	0	13	3	13	1	0	17	31
07:15 AM	0	0	0	2	2	2	0	3	0	5	1	10	1	0	12	7	25	0	2	34	53
07:30 AM	1	0	0	0	1	3	0	0	1	4	0	13	0	0	13	4	38	0	0	42	60
07:45 AM	0	0	0	0	0	0	0	1	0	1	1	17	2	0	20	5	67	1	0	73	94
Total	1	0	0	2	3	6	0	4	1	11	2	50	6	0	58	19	143	2	2	166	238
08:00 AM	0	1	3	0	4	1	0	2	0	3	0	20	1	0	21	9	45	0	0	54	82
08:15 AM	1	0	0	0	1	1	0	4	0	5	1	11	1	0	13	10	32	0	0	42	61
08:30 AM	1	0	1	0	2	0	0	6	0	6	1	13	3	0	17	11	29	0	0	40	65
08:45 AM	2	0	0	0	2	1	0	2	0	3	2	18	0	0	20	12	44	4	0	60	85
Total	4	1	4	0	9	3	0	14	0	17	4	62	5	0	71	42	150	4	0	196	293
Grand Total	5	1	4	2	12	9	0	18	1	28	6	112	11	0	129	61	293	6	2	362	531
Apprch %	41.7	8.3	33.3	16.7		32.1	0	64.3	3.6		4.7	86.8	8.5	0		16.9	80.9	1.7	0.6		
Total %	0.9	0.2	0.8	0.4	2.3	1.7	0	3.4	0.2	5.3	1.1	21.1	2.1	0	24.3	11.5	55.2	1.1	0.4	68.2	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	0	1	1	1	17	2	20	5	67	1	73	94
08:00 AM	0	1	3	4	1	0	2	3	0	20	1	21	9	45	0	54	82
08:15 AM	1	0	0	1	1	0	4	5	1	11	1	13	10	32	0	42	61
08:30 AM	1	0	1	2	0	0	6	6	1	13	3	17	11	29	0	40	65
Total Volume	2	1	4	7	2	0	13	15	3	61	7	71	35	173	1	209	302
% App. Total	28.6	14.3	57.1		13.3	0	86.7		4.2	85.9	9.9		16.7	82.8	0.5		
PHF	.500	.250	.333	.438	.500	.000	.542	.625	.750	.763	.583	.845	.795	.646	.250	.716	.803

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File Name : Ironbound Rd and Mini Storage Rd PM
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Groups Printed- Car

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	3	0	2	0	5	2	0	26	0	28	0	33	5	0	38	27	31	3	0	61	132
04:15 PM	0	0	0	0	0	3	0	24	0	27	1	42	5	0	48	15	34	1	0	50	125
04:30 PM	1	0	0	0	1	6	0	16	0	22	0	54	3	0	57	20	31	0	0	51	131
04:45 PM	0	0	0	0	0	4	0	43	0	47	0	28	2	0	30	18	30	0	0	48	125
Total	4	0	2	0	6	15	0	109	0	124	1	157	15	0	173	80	126	4	0	210	513
05:00 PM	1	0	1	0	2	5	0	16	0	21	1	53	2	0	56	18	24	1	0	43	122
05:15 PM	1	0	1	0	2	7	0	29	0	36	2	50	4	0	56	11	21	1	0	33	127
05:30 PM	0	0	0	0	0	4	0	10	0	14	1	25	5	0	31	14	25	2	0	41	86
05:45 PM	0	1	1	0	2	2	0	13	0	15	0	24	0	0	24	14	22	2	0	38	79
Total	2	1	3	0	6	18	0	68	0	86	4	152	11	0	167	57	92	6	0	155	414
Grand Total	6	1	5	0	12	33	0	177	0	210	5	309	26	0	340	137	218	10	0	365	927
Apprch %	50	8.3	41.7	0		15.7	0	84.3	0		1.5	90.9	7.6	0		37.5	59.7	2.7	0		
Total %	0.6	0.1	0.5	0	1.3	3.6	0	19.1	0	22.7	0.5	33.3	2.8	0	36.7	14.8	23.5	1.1	0	39.4	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	3	0	2	5	2	0	26	28	0	33	5	38	27	31	3	61	132
04:15 PM	0	0	0	0	3	0	24	27	1	42	5	48	15	34	1	50	125
04:30 PM	1	0	0	1	6	0	16	22	0	54	3	57	20	31	0	51	131
04:45 PM	0	0	0	0	4	0	43	47	0	28	2	30	18	30	0	48	125
Total Volume	4	0	2	6	15	0	109	124	1	157	15	173	80	126	4	210	513
% App. Total	66.7	0	33.3		12.1	0	87.9		0.6	90.8	8.7		38.1	60	1.9		
PHF	.333	.000	.250	.300	.625	.000	.634	.660	.250	.727	.750	.759	.741	.926	.333	.861	.972

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Groups Printed- Truck

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	3	0	0	4	5
Total	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	1	7	0	0	8	10
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	3	0	0	3	5
05:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	1	0	0	0	0	0	1	1	0	0	2	0	5	0	0	5	8
Grand Total	1	0	0	0	1	0	0	1	0	1	1	2	0	0	3	1	12	0	0	13	18
Apprch %	100	0	0	0		0	0	100	0		33.3	66.7	0	0		7.7	92.3	0	0		
Total %	5.6	0	0	0	5.6	0	0	5.6	0	5.6	5.6	11.1	0	0	16.7	5.6	66.7	0	0	72.2	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
04:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	1	1	0	0	0	0	1	3	0	4	5
05:00 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	3	0	3	5
Total Volume	0	0	0	0	0	0	1	1	1	2	0	3	1	10	0	11	15
% App. Total	0	0	0		0	0	100		33.3	66.7	0		9.1	90.9	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.250	.500	.000	.375	.250	.625	.000	.688	.750

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File Name : Ironbound Rd and Mini Storage Rd PM
Site Code :
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Groups Printed- Combined

	Mini Storage Rd Eastbound					Shopping Center Westbound					Ironbound Rd Northbound					Ironbound Rd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	3	0	2	0	5	2	0	26	0	28	0	33	5	0	38	27	31	3	0	61	132
04:15 PM	0	0	0	0	0	3	0	24	0	27	1	42	5	0	48	15	38	1	0	54	129
04:30 PM	1	0	0	0	1	6	0	16	0	22	0	55	3	0	58	20	31	0	0	51	132
04:45 PM	0	0	0	0	0	4	0	44	0	48	0	28	2	0	30	19	33	0	0	52	130
Total	4	0	2	0	6	15	0	110	0	125	1	158	15	0	174	81	133	4	0	218	523
05:00 PM	1	0	1	0	2	5	0	16	0	21	2	54	2	0	58	18	27	1	0	46	127
05:15 PM	2	0	1	0	3	7	0	29	0	36	2	50	4	0	56	11	23	1	0	35	130
05:30 PM	0	0	0	0	0	4	0	10	0	14	1	25	5	0	31	14	25	2	0	41	86
05:45 PM	0	1	1	0	2	2	0	13	0	15	0	24	0	0	24	14	22	2	0	38	79
Total	3	1	3	0	7	18	0	68	0	86	5	153	11	0	169	57	97	6	0	160	422
Grand Total	7	1	5	0	13	33	0	178	0	211	6	311	26	0	343	138	230	10	0	378	945
Apprch %	53.8	7.7	38.5	0		15.6	0	84.4	0		1.7	90.7	7.6	0		36.5	60.8	2.6	0		
Total %	0.7	0.1	0.5	0	1.4	3.5	0	18.8	0	22.3	0.6	32.9	2.8	0	36.3	14.6	24.3	1.1	0	40	

	Mini Storage Rd Eastbound				Shopping Center Westbound				Ironbound Rd Northbound				Ironbound Rd Southbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	3	0	2	5	2	0	26	28	0	33	5	38	27	31	3	61	132
04:15 PM	0	0	0	0	3	0	24	27	1	42	5	48	15	38	1	54	129
04:30 PM	1	0	0	1	6	0	16	22	0	55	3	58	20	31	0	51	132
04:45 PM	0	0	0	0	4	0	44	48	0	28	2	30	19	33	0	52	130
Total Volume	4	0	2	6	15	0	110	125	1	158	15	174	81	133	4	218	523
% App. Total	66.7	0	33.3		12	0	88		0.6	90.8	8.6		37.2	61	1.8		
PHF	.333	.000	.250	.300	.625	.000	.625	.651	.250	.718	.750	.750	.750	.875	.333	.893	.991

AM PEAK HOUR

Date: Wed, 4/11/18

COUNTS CONDUCTED BY PEGGY MALONE & ASSC.

LOCATION: Ironbound Road/Ironbound Road Stub/Courthouse Commons Entrance

	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	
TIME	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
TRUCKS	1	0	2	0	0	0	1	10	0	0	9	1	
TOTAL	2	1	4	2	0	13	3	61	7	35	173	1	
%TRUCKS	50%	0%	50%	0%	####	0%	33%	16%	0%	0%	5%	100%	

PM PEAK HOUR

Date: Wed, 4/11/18

COUNTS CONDUCTED BY PEGGY MALONE & ASSC.

LOCATION: Ironbound Road/Ironbound Road Stub/Courthouse Commons Entrance

	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	
TIME	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
TRUCKS	0	0	0	0	0	1	1	2	0	1	10	0	
TOTAL	4	0	2	15	0	110	1	158	15	81	133	4	
%TRUCKS	0%	####	0%	0%	####	1%	100%	1%	0%	1%	8%	0%	

AM PEAK HOUR

Date: Wed, 4/11/18

COUNTS CONDUCTED BY PEGGY MALONE & ASSC.

LOCATION: Ironbound Road/Ironbound Road Stub/Courthouse Commons Entrance

PEAK HOUR FACTOR BY APPROACH

	EB	WB	NB	SB
7:45 to 8:00	0	1	20	73
8:00 to 8:15	4	3	21	54
8:15 to 8:30	1	5	13	42
8:30 to 8:45	2	6	17	40
PHF	0.44	0.63	0.85	0.72

Exhibit C1

PM PEAK HOUR

Date: Wed, 4/11/18

COUNTS CONDUCTED BY PEGGY MALONE & ASSC.

LOCATION: Ironbound Road/Ironbound Road Stub/Courthouse Commons Entrance

PEAK HOUR FACTOR BY APPROACH

	EB	WB	NB	SB
4:00 to 4:15	5	28	38	61
4:15 to 4:30	0	27	48	54
4:30 to 4:45	1	22	58	51
4:45 to 5:00	0	48	30	52
PHF	0.30	0.65	0.75	0.89

Exhibit C2

QUEUE STUDY

Peggy Malone and Associates

Date:	4/11/2017	Observer: T. Ogg		
Intersection Name: Ironbound Rd. & Monticello Ave.				
AM Shift: 7:00-9:00 AM / PM SHIFT: 4:00-6:00 PM				
	Approach: NB Ironbound Rd.			
	Left (1 lane)		Left/Thru/Right (1 lane)	
Time:	# veh	distance (feet)	# veh	distance (feet)
7:00	1	25	1	25
	0	-	1	25
	0	-	2	50
	1	25	0	-
	0	-	2	50
	1	25	0	-
	0	-	1	25
	0	-	2	50
7:15	1	25	1	25
	0	-	2	75
	0	-	1	25
	0	-	1	25
	0	-	1	25
	1	25	0	-
7:30	1	25	1	25
	0	-	2	50
	1	25	0	-
	0	-	1	25
	1	25	3	125
	1	25	3	75
7:45	0	-	1	25
	1	25	1	25
	2	50	0	-
	1	25	2	50
	1	25	1	25
	3	75	3	100
8:00	0	-	3	100
	0	-	1	25
	2	100	2	50
	1	75	2	100
	1	25	2	75
	1	25	0	-
8:15	0	-	3	75
	1	25	0	-
	2	50	2	50
	3	100	0	-
	1	25	1	25
	1	25	1	25
8:30	0	-	2	75

QUEUE STUDY

Peggy Malone and Associates

Date:	4/11/2017	Observer: T. Ogg		
Intersection Name: Ironbound Rd. & Monticello Ave.				
AM Shift: 7:00-9:00 AM / PM SHIFT: 4:00-6:00 PM				
	Approach: NB Ironbound Rd.			
	Left (1 lane)		Left/Thru/Right (1 lane)	
Time:	# veh	distance (feet)	# veh	distance (feet)
	1	25	1	25
	1	25	0	-
	0	-	3	100
	0	-	1	25
	2	50	0	-
	1	25	1	25
	0	-	1	25
8:45	2	50	1	25
	1	25	0	-
	1	25	0	-
	1	25	2	50
	0	-	2	50
	1	25	0	-
	1	25	1	25
	3	75	3	75
95TH PERCENTILE QUEUE AM COUNT				
2 HOUR	2.35	83.75	3	100
7 TO 8	1.75	58.75	3	100
8 TO 9	2.65	100	3	100
Notes:				
1. Passenger Vehicles 25', Medium Trucks 50', Heavy Trucks 75'				
2. Signalized Intersection: Measure all Queues at green light start				
3. Approach movements with more than one lane - measured queue distance of longest lane, with # of vehicles in both lanes				

QUEUE STUDY

Peggy Malone and Associates

Date:	4/11/2017	Observer: T. Ogg		
Intersection Name: Ironbound Rd. & Monticello Ave.				
AM Shift: 7:00-9:00 AM / PM SHIFT: 4:00-6:00 PM				
	Approach: NB Ironbound Rd.			
	Left (1 lane)		Left/Thru/Right (1 lane)	
Time:	# veh	distance (feet)	# veh	distance (feet)
4:00	1	25	5	125
	4	100	8	200
	3	75	4	100
	4	100	5	125
	8	200	6	150
	3	75	2	50
4:15	4	100	4	100
	5	125	1	25
	5	125	3	75
	5	125	10	250
	3	75	5	125
	3	75	6	150
4:30	5	125	2	50
	1	25	5	125
	2	50	5	125
	4	100	6	150
	2	50	3	75
	1	25	5	125
	4	100	6	150
4:45	3	75	4	125
	2	50	2	50
	6	150	5	125
	3	75	5	125
	6	150	7	175
	7	175	4	100
5:00	2	50	3	100
	5	125	11	275
	2	50	0	0
	6	175	6	150
	4	100	2	50
	4	100	9	225
	3	75	4	100
5:15	6	150	0	0
	2	50	9	225
	4	100	2	50
	9	225	9	225
	5	125	3	75
	4	100	3	75
	5	125	4	100

QUEUE STUDY

Peggy Malone and Associates

Date:	4/11/2017	Observer: T. Ogg			
Intersection Name: Ironbound Rd. & Monticello Ave.					
AM Shift: 7:00-9:00 AM / PM SHIFT: 4:00-6:00 PM					
	Approach: NB Ironbound Rd.				
	Left (1 lane)		Left/Thru/Right (1 lane)		
Time:	# veh	distance (feet)	# veh	distance (feet)	
5:30	4	100	2	50	40
	1	25	3	75	41
	1	25	3	75	42
	3	75	4	100	43
	2	50	4	100	44
	5	125	3	75	45
5:45	0	0	1	25	46
	2	50	1	25	47
	1	25	0	0	48
	5	125	3	75	49
	5	125	8	200	50
	0	0	2	50	51
95TH PERCENTILE QUEUE PM COUNT					
2 HOUR	6.5	175	9	225	
4 TO 5	6.8	170	7.8	195	
5 TO 6	6	168.75	9	225	
Notes:					
1. Passenger Vehicles 25', Medium Trucks 50', Heavy Trucks 75'					
2. Signalized Intersection: Measure all Queues at green light start					
3. Approach movements with more than one lane - measured queue distance of longest lane, with # of vehicles in both lanes					

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	1	4	2	0	13	3	61	7	35	173	1
Future Vol, veh/h	2	1	4	2	0	13	3	61	7	35	173	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	44	44	44	63	63	63	85	85	85	72	72	72
Heavy Vehicles, %	50	0	50	0	0	0	33	16	0	0	5	100
Mvmt Flow	5	2	9	3	0	21	4	72	8	49	240	1
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	434	427	241	424	419	72	241	0	0	80	0	0
Stage 1	339	339	-	80	80	-	-	-	-	-	-	-
Stage 2	95	88	-	344	339	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.5	6.7	7.1	6.5	6.2	4.43	-	-	4.1	-	-
Critical Hdwy Stg 1	6.6	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.95	4	3.75	3.5	4	3.3	2.497	-	-	2.2	-	-
Pot Cap-1 Maneuver	458	523	693	544	528	996	1164	-	-	1531	-	-
Stage 1	586	643	-	934	832	-	-	-	-	-	-	-
Stage 2	806	826	-	676	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	435	502	693	518	506	996	1164	-	-	1531	-	-
Mov Cap-2 Maneuver	435	502	-	518	506	-	-	-	-	-	-	-
Stage 1	584	619	-	930	829	-	-	-	-	-	-	-
Stage 2	786	823	-	640	619	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.5		9.2		0.3		1.2					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1164	-	-	566	887	1531	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.028	0.027	0.032	-	-				
HCM Control Delay (s)	8.1	0	-	11.5	9.2	7.4	0	-				
HCM Lane LOS	A	A	-	B	A	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	-	-				

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	0	2	15	0	110	1	158	15	81	133	4
Future Vol, veh/h	4	0	2	15	0	110	1	158	15	81	133	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	30	30	30	65	65	65	75	75	75	89	89	89
Heavy Vehicles, %	0	0	0	0	0	1	100	1	0	1	8	0
Mvmt Flow	13	0	7	23	0	169	1	211	20	91	149	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	641	566	151	550	548	211	153	0	0	231	0	0
Stage 1	333	333	-	213	213	-	-	-	-	-	-	-
Stage 2	308	233	-	337	335	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.21	5.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.309	3.1	-	-	2.209	-	-
Pot Cap-1 Maneuver	390	436	901	449	447	832	998	-	-	1343	-	-
Stage 1	685	647	-	794	730	-	-	-	-	-	-	-
Stage 2	706	716	-	681	646	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	293	403	901	420	413	832	998	-	-	1343	-	-
Mov Cap-2 Maneuver	293	403	-	420	413	-	-	-	-	-	-	-
Stage 1	684	599	-	793	729	-	-	-	-	-	-	-
Stage 2	562	715	-	626	598	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	15.1		11.5		0		2.9					
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	998	-	-	378	744	1343	-	-				
HCM Lane V/C Ratio	0.001	-	-	0.053	0.258	0.068	-	-				
HCM Control Delay (s)	8.6	0	-	15.1	11.5	7.9	0	-				
HCM Lane LOS	A	A	-	C	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.2	1	0.2	-	-				

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↗		↕	
Traffic Vol, veh/h	2	1	4	2	0	13	3	65	7	37	185	1
Future Vol, veh/h	2	1	4	2	0	13	3	65	7	37	185	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	50	0	50	0	0	0	33	16	0	0	5	100
Mvmt Flow	2	1	4	2	0	14	3	71	8	40	201	1
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	370	367	202	361	359	71	202	0	0	79	0	0
Stage 1	282	282	-	77	77	-	-	-	-	-	-	-
Stage 2	88	85	-	284	282	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.5	6.7	7.1	6.5	6.2	4.43	-	-	4.1	-	-
Critical Hdwy Stg 1	6.6	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.95	4	3.75	3.5	4	3.3	2.497	-	-	2.2	-	-
Pot Cap-1 Maneuver	508	565	731	598	571	997	1205	-	-	1532	-	-
Stage 1	632	681	-	937	835	-	-	-	-	-	-	-
Stage 2	814	828	-	727	681	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	489	547	731	579	553	997	1205	-	-	1532	-	-
Mov Cap-2 Maneuver	489	547	-	579	553	-	-	-	-	-	-	-
Stage 1	630	661	-	934	832	-	-	-	-	-	-	-
Stage 2	800	826	-	701	661	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.9		9		0.3		1.2					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1205	-	-	615	909	1532	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.012	0.018	0.026	-	-				
HCM Control Delay (s)	8	0	-	10.9	9	7.4	0	-				
HCM Lane LOS	A	A	-	B	A	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0.1	-	-				

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	3.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	0	2	16	0	117	1	169	16	86	142	4
Future Vol, veh/h	4	0	2	16	0	117	1	169	16	86	142	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	1	100	1	0	1	8	0
Mvmt Flow	4	0	2	17	0	127	1	184	17	93	154	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	600	545	156	529	530	184	158	0	0	201	0	0
Stage 1	342	342	-	186	186	-	-	-	-	-	-	-
Stage 2	258	203	-	343	344	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.21	5.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.309	3.1	-	-	2.209	-	-
Pot Cap-1 Maneuver	416	449	895	463	457	861	993	-	-	1377	-	-
Stage 1	677	642	-	820	750	-	-	-	-	-	-	-
Stage 2	751	737	-	676	640	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	334	415	895	435	423	861	993	-	-	1377	-	-
Mov Cap-2 Maneuver	334	415	-	435	423	-	-	-	-	-	-	-
Stage 1	676	594	-	819	749	-	-	-	-	-	-	-
Stage 2	639	736	-	624	593	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	13.7		10.8		0		2.9					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	993	-	-	422	770	1377	-	-				
HCM Lane V/C Ratio	0.001	-	-	0.015	0.188	0.068	-	-				
HCM Control Delay (s)	8.6	0	-	13.7	10.8	7.8	0	-				
HCM Lane LOS	A	A	-	B	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0	0.7	0.2	-	-				

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↗		↕	
Traffic Vol, veh/h	43	1	12	2	0	13	11	65	7	37	185	43
Future Vol, veh/h	43	1	12	2	0	13	11	65	7	37	185	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	0	10	0	0	0	15	16	0	0	5	5
Mvmt Flow	47	1	13	2	0	14	12	71	8	40	201	47
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	411	408	225	407	423	71	248	0	0	79	0	0
Stage 1	305	305	-	95	95	-	-	-	-	-	-	-
Stage 2	106	103	-	312	328	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.5	6.3	7.1	6.5	6.2	4.25	-	-	4.1	-	-
Critical Hdwy Stg 1	6.15	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4	3.39	3.5	4	3.3	2.335	-	-	2.2	-	-
Pot Cap-1 Maneuver	546	536	795	558	526	997	1245	-	-	1532	-	-
Stage 1	698	666	-	917	820	-	-	-	-	-	-	-
Stage 2	892	814	-	703	651	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	522	515	795	531	505	997	1245	-	-	1532	-	-
Mov Cap-2 Maneuver	522	515	-	531	505	-	-	-	-	-	-	-
Stage 1	691	646	-	908	812	-	-	-	-	-	-	-
Stage 2	871	806	-	670	631	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	12.2		9.1		1		1					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1245	-	-	563	893	1532	-	-				
HCM Lane V/C Ratio	0.01	-	-	0.108	0.018	0.026	-	-				
HCM Control Delay (s)	7.9	0	-	12.2	9.1	7.4	0	-				
HCM Lane LOS	A	A	-	B	A	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0.1	-	-				

HCM 6th TWSC
11: Old Ironbound & Ironbound Stub/CC Entrance

12/16/2018

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	46	0	10	16	0	117	9	169	16	86	142	45
Future Vol, veh/h	46	0	10	16	0	117	9	169	16	86	142	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	1	15	1	0	1	8	0
Mvmt Flow	50	0	11	17	0	127	10	184	17	93	154	49
Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	641	586	179	574	593	184	203	0	0	201	0	0
Stage 1	365	365	-	204	204	-	-	-	-	-	-	-
Stage 2	276	221	-	370	389	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.21	4.25	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.309	2.335	-	-	2.209	-	-
Pot Cap-1 Maneuver	390	425	869	433	421	861	1295	-	-	1377	-	-
Stage 1	658	627	-	803	737	-	-	-	-	-	-	-
Stage 2	735	724	-	654	612	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	311	389	869	400	385	861	1295	-	-	1377	-	-
Mov Cap-2 Maneuver	311	389	-	400	385	-	-	-	-	-	-	-
Stage 1	652	579	-	796	730	-	-	-	-	-	-	-
Stage 2	621	717	-	596	565	-	-	-	-	-	-	-
Approach	EB		WB		NB			SB				
HCM Control Delay, s	17.4		10.9		0.4			2.5				
HCM LOS	C		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1295	-	-	351	756	1377	-	-				
HCM Lane V/C Ratio	0.008	-	-	0.173	0.191	0.068	-	-				
HCM Control Delay (s)	7.8	0	-	17.4	10.9	7.8	0	-				
HCM Lane LOS	A	A	-	C	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.6	0.7	0.2	-	-				

Queuing and Blocking Report
Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LTR
Maximum Queue (ft)	62	28	13	26
Average Queue (ft)	11	10	0	3
95th Queue (ft)	44	29	7	16
Link Distance (ft)	584	392	809	409
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report
Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	39	70	54
Average Queue (ft)	6	30	12
95th Queue (ft)	26	52	37
Link Distance (ft)	584	392	409
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report
Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LTR
Maximum Queue (ft)	61	28	13	26
Average Queue (ft)	11	10	0	3
95th Queue (ft)	43	29	7	16
Link Distance (ft)	584	392	809	409
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report

Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	34	79	54
Average Queue (ft)	5	32	13
95th Queue (ft)	23	57	40
Link Distance (ft)	584	392	409
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report
Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LTR
Maximum Queue (ft)	63	28	28	34
Average Queue (ft)	28	10	2	3
95th Queue (ft)	55	29	13	18
Link Distance (ft)	584	392	809	409
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report
Baseline

12/16/2018

Intersection: 11: Old Ironbound & Ironbound Stub/CC Entrance

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LT	LTR
Maximum Queue (ft)	60	60	24	55
Average Queue (ft)	27	31	1	14
95th Queue (ft)	52	52	9	42
Link Distance (ft)	584	392	809	409
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Network Summary

Network wide Queuing Penalty: 0

From: Dexter Williams
To: ["Brooks, Glenn \(VDOT\)"; "Paul Holt"](#)
Cc: ["Mark Rinaldi"; "Vernon Geddy"](#)
Subject: RE: Radio Property
Date: Tuesday, February 7, 2017 9:23:00 AM
Attachments: [DRW 01-02-17 Radio Property TIA Scope to JCC&VDOT.PDF](#)

Glenn & Paul:

I have not received any comment on the TIA scope for the Radio Property.

Please advise if you have comments or that the scope is adequate.

Paul:

Do you have a planner assigned to this project?

Thanks.

Dexter R. Williams, P.E.
DRW Consultants, LLC
2319 Latham Place
Midlothian, VA 23113
804-794-7312

From: Dexter Williams [mailto:dexrwil@verizon.net]
Sent: Wednesday, January 11, 2017 2:38 PM
To: 'Brooks, Glenn (VDOT)'; 'Paul Holt'
Cc: 'Mark Rinaldi'; 'Vernon Geddy'
Subject: Radio Property

Glenn:

Enclosed is workscope Radio Property per our telephone discussion.

Please confirm before we proceed.

Thanks.

Dexter R. Williams, P.E.
DRW Consultants, LLC
2319 Latham Place
Midlothian, VA 23113
804-794-7312



MEMORANDUM

TO: Glenn Brooks, VDOT Area Land Use Engineer
FROM: Dexter R. Williams
SUBJECT: TIA For Development Of Radio Property
DATE: January 2, 2017

This memo has been provided to define the elements of the study.

I. TRAFFIC COUNT AND ANALYSIS LOCATION

1. Rt. 615 Ironbound Road/Rt. 784 Ironbound stub/Courthouse Commons entrance
Turning movement counts for total vehicles and truck traffic will be recorded in 15 minute intervals from 7 to 9 AM and 4 to 6 PM.

II. TRAFFIC ANALYSIS SCENARIOS

There are three AM and PM peak hour analysis scenarios proposed:

1. 2017 Existing Traffic
2. 2024 Background Traffic (one year build out of site plus six year forecast) plus trip assignment for GSquare Inc property 4007 Ironbound Road.
3. 2024 Traffic With Site Development

VDOT daily traffic Ironbound Road will be evaluated for linear regression analysis growth trend. If trend is negative, a default value of 1% average annual linear growth rate will be applied. This translates to a 1.07 growth factor applied to 2017 counts to produce 2024 background traffic.

III. SITE TRIP GENERATION AND DISTRIBUTION

Trip generation and distribution for the site using Trip Generation Manual, 9th Edition (TGM9), by the Institute Of Transportation Engineers.

Trip distribution based on turning movements on Rt. 784 Ironbound stub at Rt. 615 Ironbound Road.

IV. SYNCHRO 9 ANALYSIS

1. HCM2010 unsignalized LOS and queuing.

V. SIMTRAFFIC ANALYSIS

1. Number of Intervals: Two: 10 minutes seeding, 60 minute recording
2. Number of Runs: Five

EXHIBIT X2