

Appendix D

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Crossover Analysis

Appendix D

◆ Segment #1

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #1							
600/Wise Point Ln/Seaside Rd	70.09			Retain	3,221	Unsignalized	2
681/Latimers Bluff Rd	70.70			Retain	2,957	Unsignalized	0
718/Latimers Siding Rd	71.26			Retain	6,758	Unsignalized	0
645/Arlington Rd/Short St/Cedar Grove Rd	72.54	Close		Retain	1,320	Unsignalized	0
704/Kiptopeke Dr.	72.79	Close		Realign Intersection or relocate entrance to 645/Arlington	317	Unsignalized	1
704/Kiptopeke Dr.	72.85			Close	1,267	Unsignalized	0
	73.09	Close		Close	686	Commercial	0
	73.22	Close		Add turn lanes	1,373	Farm	0
646/Townsend Dr.	73.48			Retain	845	Unsignalized	6
	73.64			Retain	1,742	Commercial	1
	73.97			Retain	3,062	Farm	0
	74.55			Retain	1,637	Commercial	0

◆ Segment #2

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #2							
	74.78	CLOSED					
683/Capeville Rd.	74.86			Retain	739	Unsignalized	4
	75.00	Close		Close	792	Commercial	0
	75.15	Close		Retain	634	Commercial	0
	75.27	Close		Close & Modify Frontage	317	Stingray's	2
	75.33			Add turn lanes	845	Joint Use Dr	4
	75.49	Close		Add SB Left turn lane	845	Commercial	2
	75.65	Close		Retain	950	Median Break	0
644/Arlington Rd	75.83			Add SB Left turn lane	1,003	Unsignalized	1
	76.02			Retain	845	Residential	0
	76.18	Close		Retain	792	Residential	0
	76.33			Retain	1,003	Farm	0
	76.52	Close		Retain	739	Farm	0
	76.66	Close		Close	634	Commercial	1
	76.78			Lengthen left turn lanes	1,954	Commercial	0
	76.96	CLOSED					
	77.15	Close		Retain	1,003	Median Break	0
643/Holly Dale/Plantation	77.24			Retain	792	Unsignalized	3
	77.49	Close		Retain	792	Median Break	0
	77.64			Retain	1,003	Church	0
882/Jacobia Ln	77.83	Close		Retain	686	Unsignalized	0
Edwin Farm Rd	77.96	Close		Close	686	Farm	0
684/Fairview Rd	78.09			Add NB left turn lane	1,162	Unsignalized	0
	78.31			Add turn lanes	1,056	Farm	1
	78.51	Close		Retain	1,584	Commercial	0
	78.81	Close		Retain	950	Residential	0

◆ Segment #3

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #3							
641/Parsons Cir/Bayview Cir	78.99			Retain	1,003	Unsignalized	4
	79.18			Widen median for two-stage left	1,214	Commercial	4
184/Stone Rd/S Bayside Rd	79.41			Retain	1,214	Signalized	5
641/Parsons Cir/Bayview Cir	79.64			Lengthen SB left turn lane	1,267	Unsignalized	3
	79.88	Close		Close	792	Median Break	0
	80.03	Close		Add NB left turn lanes	950	Commercial	2
	80.21			Add left turn lanes	2,165	Connector Rd	1
6807/Townfield/Cherrystone Rd	80.62			Lengthen left turn lanes	2,482	Signalized	2
13 Bus/N Bayside Rd	81.09			Add NB left turn lane	1,214	Unsignalized	0
	81.32	Close		Add left turn lanes	950	Farm	0
				Lengthen SB left turn lane. Add NB LTL	1,320	Commercial	0
	81.50	Close		Add left turn lanes	1,848	Farm	2
	82.10	Close		Add left turn lanes	1,584	Farm	0
636/Eyrehall Dr(Pvt)/Cobbs Station Rd	82.40			Create RCUT treatment	1,531	Unsignalized	2
	82.69			Add left turn lanes	1,320	Farm	0
	82.94	Close		Add left turn lanes	1,426	Farm	0
	83.21	Close		Add left turn lanes	792	Residential	2
	83.36	Close		Retain	1,373	Commercial	0
				Lengthen left turn lanes. Frontage	1,426	Unsignalized	2
633/Eyreville Dr(Pvt)/Simpkins Dr	83.62			Add left turn lanes	1,320	Commercial	0
	83.89	Close		Retain	845	Connector Rd	1
Captain Howe Ln	84.14	Close					
13 Bus/Courthouse Rd/632/Indian Walk Ln	84.30			Retain	2,218	Unsignalized	1
648/Stumptown Dr	84.72			Lengthen left turn lanes	2,112	Unsignalized	0
	85.12	Close		Add left turn lanes	2,059	Median Break	0
631/Willow Oak Rd	85.51			Lengthen left turn lanes	1,162	Signalized	0
	85.73	Close		Add NB left turn lane	3,274	Commercial	0
	86.35	Close		Move crossing south. Add LTLs	1,373	Median Break	0

◆ Segment #4

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #4							
13 Bus/Courthouse Rd/630/Cherrydale Dr	86.61			Lengthen NB left turn lanes	581	Unsignalized	2
674/Kendall Grove Rd	86.72	Close		Close	1,426	Unsignalized	0
	86.99	Close		Add left turn lanes	898	Median Break	1
	87.16			Lengthen SB left turn lane. Add NB LTL	1,267	Church	0
	87.40	Close		Add left turn lanes	634	Farm	0
	87.52	Close		Close	1,373	Median Break	0
Reedtown Ln	87.78			Lengthen SB left turn lane. Add NB LTL	1,267	Farm	0
Bell Ln	88.02			Lengthen SB left turn lane. Add NB LTL	1,214	Residential	0
	88.25	Close		Close	739	Residential	0
T-1702	88.39	Close		Lengthen SB left turn lane. Add NB LTL	1,742	Connector Rd	0
628/James Allen Dr	88.72			Lengthen SB left turn lane. Add NB LTL	1,637	Unsignalized	2
628/Wilsona Neck Dr	89.03			Lengthen NB left turn lane. Add SB LTL	2,323	Unsignalized	1

◆ Segment #5

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #5							
	89.24	CLOSED					
627/Young St	89.47			Lengthen NB left turn lane. Add SB LTL	898	Unsignalized	0
626/connector road to Machipongo Dr	89.64			Lengthen SB left turn lane. Add NB LTL. Access management of commercial property	1,531	Unsignalized	1
	89.93		Close	Add left turn lanes	2,323	Farm	1
625/Sylvan Scene Dr	90.37	Close		Add left turn lanes	1,426	Farm	0
	90.64			Lengthen left turn lanes	2,112	Unsignalized	1
	91.04			Add left turn lanes	1,003	Residential	0
T-1502	91.23	Close		Lengthen NB left turn lane. Add SB LTL	1,003	Unsignalized	0
622/Treherneville Dr	91.42			Retain	3,749	Unsignalized	3
	91.79	CLOSED					
	92.13	Close		Lengthen NB left turn lane. Add SB LTL	1,003	Commercial	0
620/Birds Nest Dr	92.32			Retain	2,746	Unsignalized	0
	92.57	CLOSED					
	92.84		Close	Add left turn lanes	2,165	Farm	0
	93.25		Close	Close	2,006	Median Break	0
	93.63	Close		Lengthen NB left turn lane. Add SB LTL. Perform access management	1,162	Mix of Access	0
617/Bayford Rd/Red Bank Rd	93.85			Retain	1,373	Unsignalized	1

◆ Segment #6

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #6							
	94.11	Close		Add turn lanes	1,795	Farm	0
	94.45	Close	Close	Add turn lanes	2,112	Farm	0
609/Franktown Rd	94.85			Retain	1,003	Unsignalized	0
601/Mill St	95.04			Lengthen SB left turn lane. Add NB LTL	898	Unsignalized	0
606/Rogers Dr	95.21			Retain	898	Signalized	3
	95.38			Close	950	Median Break	0
T-678/Pine Ave	95.56			Lengthen NB left turn lane. Add SB LTL	898	Unsignalized	0
	95.73	Close		Lengthen NB left turn lane. Add SB LTL	2,165	Commercial	0
688/Hare Valley Dr	96.14			Lengthen left turn lanes	1,267	Unsignalized	1
	96.38			Retain	2,429	Church	1
605/Brickhouse Dr	96.84			Retain	2,429	Unsignalized	0
Oakland Dr	97.30			Add left turn lanes	3,802	Farm	0
	98.02			Lengthen NB left turn lane. Add SB LTL	1,531	Farm	0
13 Bus/Main St	98.31			Close	739	Unsignalized	2
618/Hadlock Ln/604/Oakland Dr	98.45			Lengthen left turn lanes	1,426	Signalized	9

◆ Segment #7

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #7							
652/Broadwater Rd/Cathey Ave	98.72			Lengthen SB left turn lane	1,109	Signalized	10
	98.93			Remove Signal. Install RCLUT - or - Add ped crossings	792	Signalized	5
	99.08			Add NB left turn lane	739	Commercial	0
T-1043/ Benjamin St	99.22			Retain	1,003	Unsignalized	1
Sojourn Truth Rd	99.41			Add SB Left turn lane	1,478	Community	1
183/Occohannock Neck Rd	99.69			Retain	2,640	Signalized	0
178/Belle Haven Rd/Main St	100.19			Retain	950	Signalized	1
	100.37			Lengthen SB left turn lane. Add NB LTL	950	Commercial	0
687/Tower Way/Lincoln Ave	100.55			Lengthen left turn lanes	1,426	Unsignalized	5
601/Merry Cat Ln	100.82			Lengthen left turn lanes	2,165	Signalized	3
181/King St	101.23			Lengthen left turn lanes	370	Unsignalized	3
	101.30	Close		Close	475	Commercial	3
603/Savagetown Rd	101.39			Lengthen left turn lanes	2,798	Unsignalized	0
	101.92			Lengthen NB left turn lane. Add SB LTL	1,954	Commercial	0
	102.29	Close		Confirm land use. Access mngt? RCUT?	739	Commercial	1
	102.43	Close		Confirm land use. Access mngt? RCUT?	1,954	Commercial	1
	102.80	Close		Lengthen NB left turn lane. Add SB LTL	845	Church	0
607/Coal Kiln Rd	102.96			Lengthen left turn lanes	2,323	Unsignalized	0

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◆ Segment #8

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #8							
	103.21	CLOSED		0			
	103.40			Add left turn lanes	3,643	Residential	2
	103.66	CLOSED					
	103.76						
614/Wayside Dr/Rte 1203	104.09				Flush Median	Signalized	4
	104.35						
	104.69		Close	Close	1,637	Farm	0
620/Keller Pond Rd	105.00			Lengthen left turn lanes	686	Unsignalized	1
	105.13			close	317	Civic	0
	105.19			Add left turn lanes	1,584	Civic	0
	105.49			Add SB Left turn lane	2,376	Commercial	0
	105.94			Add left turn lanes	2,746	Residential	0
620/West St/Keller Pond Rd	106.46			Lengthen left turn lanes	898	Unsignalized	0
	106.58						
1403/Second St	106.63					Unsignalized	1
1402/First St	106.70					Unsignalized	0
1401/180/N.R. North St/696/N.R. St	106.77			Access Mgmt		Unsignalized	1
	106.95						
623/Adams Crossing/Wachapreague Rd	107.22			Lengthen left turn lanes.	2,006	Signalized	3
	107.60			Add left turn lanes	845	Residential	1
734/Gospel Temple Road	107.76	Close		RCUT Partial Closure. Lengthen NB LTL	317	Unsignalized	2
734/connector road to Rack Track Rd	107.82	Close		RCUT Partial Closure. Lengthen SB LTL	1,056	Unsignalized	1
Airport Access	108.02			Add SB Left turn lane	1,426	Commercial	1
Eastern Shore Community College	108.29			Lengthen NB left turn. Add SB LTL		Civic	1
	108.62						
626/Main St	109.12			Add pedestrian crossing	Flush Median	Signalized	4
	109.70						
	109.94		Close	Add left turn lanes	1,954	Farm	0
639/Dogwood Dr/Phillips Dr	110.31			RCUT	1,003	Unsignalized	8

◆ Segment #9

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #9							
	110.50	Close		Add SB left turn lane	950	Commercial	2
	110.68			Lengthen SB left turn lane	1,901	Commercial	1
	111.04			Lengthen NB left turn lane	1,056	Commercial	0
	111.24			Lengthen NB left turn lane. Add SB LTL	1,373	Civic	1
716/Warrior Dr	111.50	Close		Retain	1,056	Unsignalized	2
Onley Rd	111.70			Lengthen left turn lanes.	1,003	Signalized	8
South of the Wal-mart	111.89	Close			845	Connector Rd	0
609/Coastal Blvd	112.05			Lengthen left turn lanes. Improve gtry	1,848	Signalized	0
1610/Washington St	112.40			Lengthen NB left turn lane. Acces mgmt	1,109	Unsignalized	0
Bank St	112.61			Remove signal. RCUT partial closure	792	Signalized	2
179/Market St	112.76			Retain	1,478	Signalized	1
Chesapeake Square/AutoZone	113.04			Retain	3,432	Signalized	8
650/Taylor Rd	113.69			Lengthen left turn lanes	845	Unsignalized	5
	113.85	Close		Lengthen left turn lanes	739	Commercial	2
648/Daugherty Rd	113.99			RCUT partial closure	1,162	Unsignalized	13
	114.21	Close		Lengthen SB left turn. Add NB left turn	898	Residential	0
	114.38		Close	Close	1,003	Farm	0
657/Edgar Thomas Rd	114.57	Close		Lengthen NB left turn lane. Add SB LTL	1,373	Unsignalized	2
13 Bus/Tasley Rd/Front St	114.83			Lengthen left turn lanes. Check signal visibility.	1,214	Signalized	5
	115.06	Close		Add left turn lanes	4,646	Farm	2
	115.40	CLOSED					
764/Accomac Rd/Courthouse Ave	115.94			Lengthen left turn lanes. Check signal visibility.	1,478	Signalized	6
Accomac Office Center	116.22			Lengthen NB left turn lane. Add SB LTL	1,109	Commercial	0

◆ Segment #10

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #10							
	117.69				Flush Median		
	118.68						
661/Evans Rd/Johnson Rd	118.83			Lengthen SB left turn lane	2,059	Unsignalized	1
	119.03	CLOSED					
Cardinal Acres Dr	119.22	Close		Lengthen SB left turn lane	739	Residential	1
665/Orchard Rd	119.36	Close		Add NB left turn lane	1,003	Unsignalized	0
176/Parkley Rd	119.55			Lengthen left turn lanes	1,214	Signalized	9
Head Start	119.78			Lengthen left turn lanes	528	Civic	0
	119.88			Close	792	Farm	2
679/Metompkin Rd	120.03			Lengthen SB left turn lane. Add NB left turn lane	2,165	Unsignalized	2
	120.23	CLOSED					

◆ Segment #11

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #11							
Kinsey Dr	120.44			Add left turn lanes	1,742	Unsignalized	0
	120.61	CLOSED					
	120.77	Close		Close	686	Commercial	0
Johnson Warton Ln	120.90			Add left turn lanes	2,112	Residential	0
	121.12	CLOSED					
	121.22	CLOSED					
677/Whites Neck Rd	121.30			Lengthen left turn lanes. Access mgmt.	2,218	Unsignalized	1
	121.43	CLOSED					
	121.72	Close		Add left turn lanes	686	Residential	0
676/Mutton Hunk Rd	121.85			Close	264	Unsignalized	5
676/Dennis Dr	121.90	Close		Close. Add RCUT north of Dennis Dr	1,531	Unsignalized	5
	122.19			Lengthen NB left turn lane	1,003	Commercial	1
	122.38		Close	Close	1,320	Median Break	1
	122.63	Close		Add left turn lanes	475	Commercial	1
Residential/Medical Office	122.72			RCUT partial closure	686	Residential	0
680/Gargatha Landing Rd	122.85	Close		Lengthen left turn lanes	370	Unsignalized	4
680/Berry Rd	122.92			Close	739	Unsignalized	1
	123.06			Add left turn lanes	1,373	Median Break	0
681/Mason Rd	123.32			Close	528	Unsignalized	0
				Close. Add RCUT north of Littleton Rd			
681/Littleton Rd	123.42	Close			1,267	Unsignalized	0

◆ Segment #12

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #12							
	123.66	Close		Add left turn lanes	898	Residential	0
	123.83			Add left turn lanes	4,330	Residential	1
	123.94						
187/Nelsonia Rd	124.23			Access Mgmt	Flush Median	Signalized	
	124.36						
	124.65			Lengthen SB left turn lane	1,109	Commercial	0
				Close. Add RCUT south of driveway	528	Commercial	0
	124.86	Close					
775/Sherwood Dr	124.96			Lengthen the SB left turn lane	1,109	Unsignalized	1
	125.17	Close		Add left turn lanes	1,320	Residential	0
	125.33	CLOSED					
				Lengthen NB left turn lane. Add SB LTL	422	Unsignalized	2
729/Finney Mason Ln	125.42			Close	1,056	Farm	1
Gillespie Ln	125.50	Close					

◆ Segment #13

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #13							
	128.94			Add left turn lanes	845	Median Break	0
				Lengthen NB left turn lane. Add SB LTL	950	Farm	0
	129.10	Close		Close	686	Median Break	0
	129.28						
	129.41			Lengthen NB left turn lane. Add SB LTL	739	Commercial	2
	129.55			Widen roadway to provide left		Residential	0
				Close roadway access completely	Flush Median	Unsignalized	8
695/Old Temperanceville Rd	129.98			Lengthen NB left turn lane		Unsignalized	8
695/Saxis Rd/Temperanceville Rd	130.08						
	130.32						
				Widen roadway to provide left turn lanes	845	Residential	
	130.42			Close	2,270	Median Break	0
	130.58		Close				
	131.01			Lengthen left turn lanes	792	Poultry Farm	0
	131.16			Close	792	Median Break	0
	131.31		Close	Close	1,003	Median Break	0
	131.50		Close	Add left turn lanes	739	Median Break	0
	131.64		Close	Close	475	Median Break	0
	131.73		Close	Close	739	Median Break	0
				Lengthen SB left turn lane. Add NB LTL	686	Unsignalized	2
694/Jesusalem Rd	131.87						
702/Horsey Rd/Nocks Landing Rd	132.00			Lengthen left turn lanes	792	Signalized	8
	132.15			Retain	634	Civic	1
	132.27			Close	264	Civic	3
705/Paige Fisher Rd	132.32			Lengthen left turn lanes	264	Unsignalized	5
	132.37			Close	898	Commercial	1
	132.54			Close	370	Commercial	1
	132.61			Add left turn lanes	317	Farm	0
	132.67						
703/Withams Rd	133.01			Retain	Flush Median	Unsignalized	
	133.27						
				Lengthen the NB left turn lane. Add SB LTL	792	Median Break	2
	133.46						
Oak Hall	133.61			Retain	634	Signalized	5
175/Chincoteague Rd	133.73			Lengthen left turn lanes	1,109	Signalized	19

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◆ Segment #14

Intersection/Route #	Mile Post	2002 Recommendation	2014 VDOT Recommendation	2015 Study Recommendation	Distance to Crossover North (ft)	Notes	Total Number of Crashes 2010-2014
SEGMENT #14							
	133.94	Close		Lengthen left turn lanes	1,531	Commercial	2
	134.23			Lengthen NB left turn lane. Access mgmt	475	Commercial	1
	134.32	Close		Close	2,165	Residential	0
	134.73	Close		Add left turn lanes	950	Median Break	0
704/Coardtown Rd	134.91	Close		Close	739	Unsignalized	1
704/Green Hill Rd	135.05			Lengthen left turn lanes	845	Unsignalized	0
Riverside	135.21	Close	Close	Close	1,267	Commercial	0
	135.45	Close		Add left turn lanes	792	Residential	1
	135.60			Lengthen NB left turn lane	950	Commercial	1
710/Nelson Rd	135.78	Close		Lengthen NB left lane. Add SB LTL	581	Unsignalized	1
Weigh Station	135.89	Retain for Authorized Vehicles Only. Consider moving north. If truck is on scales, it obstructs driver's sight line.			528		1
	135.99	Close		Close	317	Commercial	1
2304/Hudson St	136.05			Close	581	Unsignalized	2
709/Horntown Rd	136.16	Close		Lengthen NB left turn lane.	475	Unsignalized	4
	136.25	Close		Close	792	Residential	1
710/Nelson Rd	136.40	Close		Close	370	Unsignalized	1
710/Davis Rd	136.47			Lengthen SB left turn lane. Add NB LTL	1,901	Unsignalized	3
Rest Area	136.83			Add SB left turn lane	581	Rest Area	0
Rest Area	136.94			Lengthen NB left turn lane	898	Rest Area	0
Substation	137.11			Lengthen NB left turn lane. Add SB LTL	2,165	Commercial	2
	137.30	CLOSED					
	137.52			Lengthen left turn lanes	739	Commercial	0
710/Davis Rd	137.66			Retain	845	Unsignalized	1
780/Sparrow Rd/MarVa Rd	137.82			Length NB left turn lane		Unsignalized	3

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Site Specific Cost Estimate

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		Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8	Location 9	Location 10	Location 11	Location 12	Location 13
Tier 1	Signage	\$ 5,585	\$ 71,167	\$ 28,302	\$ 22,717	\$ 49,448	\$49,448	\$ 5,585	\$ 43,862	\$28,302	\$ 29,114	\$ 43,862	\$ 43,862	\$ 34,699
	Pavement Markings	\$ 8,882	\$ 31,039	\$ 30,717	\$ 8,215	\$ 24,267	\$37,748	\$ 4,798	\$ 9,527	\$15,302	\$ 9,375	\$ 9,969	\$ 10,115	\$ 25,848
	Signal	\$ -	\$ 792	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 950	\$ -	\$ -	\$ 792
	Other	\$ 166	\$ 332	\$ 166	\$ 166	\$ 332	\$ 332	\$ 166	\$ 166	\$ 332	\$ 79,366	\$ 166	\$ 166	\$ 332
	Total	\$ 14,633	\$ 103,329	\$ 59,185	\$ 31,098	\$ 74,046	\$87,528	\$ 10,549	\$ 53,555	\$43,936	\$ 118,804	\$ 53,997	\$ 54,143	\$ 61,671
Tier 2	Signage	\$ -	\$ 24,275	\$ 2,657	\$ 2,657	\$ 6,218	\$ 6,218	\$ -	\$ 6,218	\$ 2,657	\$ 10,534	\$ 6,218	\$ 6,218	\$ 10,534
	Pavement Markings	\$ -	\$ 1,663	\$ 185	\$ 554	\$ 515	\$ 554	\$ -	\$ 554	\$ 370	\$ 1,188	\$ 739	\$ 739	\$ 739
	Signal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Other	\$ 500	\$ 1,320	\$ -	\$ -	\$ 1,320	\$ 660	\$ 660	\$ 660	\$ 1,320	\$ 660	\$ 660	\$ 660	\$ 1,320
	Total	\$ 500	\$ 27,258	\$ 2,842	\$ 3,211	\$ 8,053	\$ 7,432	\$ 660	\$ 7,432	\$ 4,347	\$ 12,382	\$ 7,617	\$ 7,617	\$ 12,593
Tier 3	Signage	\$ 2,345	\$ 22,420	\$ 11,694	\$ 9,349	\$ 15,374	\$15,374	\$ 2,345	\$ 13,029	\$11,694	\$ 7,441	\$ 13,029	\$ 13,029	\$ 9,785
	Pavement Markings	\$ -	\$ 417	\$ 417	\$ 417	\$ 832	\$ 832	\$ -	\$ 832	\$ 417	\$ -	\$ 832	\$ 832	\$ -
	Signal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Other	\$ 9,077	\$ 6,653	\$ 2,376	\$ 2,376	\$ 11,993	\$16,253	\$ 4,277	\$ 951	\$ 3,327	\$ 2,376	\$ 2,376	\$ 2,376	\$ 18,653
	Lengthen Turn Lanes		\$ 147,000	\$ 21,000	\$ 63,000	\$ 63,000	\$21,000			\$ 57,173	\$ 63,000	\$ 84,000	\$ 84,000	\$ 84,000
	Install Turn Lanes	\$ 96,000		\$ 144,000	\$ 48,000									
	Access Management								\$ 16,213				\$ 16,213	
	Pave Driveway Apron			\$ 3,000						\$ 3,000				
	Roadway Lighting		\$ 40,000			\$ 20,000								
	Widen Shoulder & Add Guardrail							\$ 30,000		\$30,000				
	Widening		\$ 167,272					\$41,818	\$ 83,636					\$ 83,636
	New Signal		\$ 490,000											
	RCUT		\$ 196,102	\$ 196,102									\$ 196,102	
Total	\$ 107,422	\$ 1,069,864	\$ 378,589	\$ 123,142	\$ 111,199	\$95,277	\$ 120,258	\$ 88,198	\$48,438	\$ 72,817	\$ 100,237	\$ 312,552	\$ 196,074	

		Location 14	Location 15	Location 16	Location 17	Location 18	Location 19	Location 20	Location 21	Location 22	Location 23	Location 24	Location 25
Tier 1	Signage	\$ 71,511	\$ 53,727	\$ 12,129	\$ 58,374	\$ 29,114	\$ 65,799	\$ 51,019	\$ 127,335	\$29,114	\$ 5,075	\$ -	\$ -
	Pavement Markings	\$ 28,606	\$ 9,837	\$ 9,557	\$ 23,014	\$ 11,728	\$ 38,577	\$ 17,302	\$ 40,008	\$10,126	\$ -	\$ -	\$ 5,940
	Signal	\$ -	\$ -	\$ 634	\$ -	\$ 792	\$ 554	\$ -	\$ -	\$ 871	\$ -	\$ -	\$ -
	Other	\$ 830	\$ 166	\$ 166	\$ 498	\$ 79,366	\$ 79,698	\$ 498	\$ 12,958	\$ 166	\$ 166	\$ 166	\$ 166
	Total	\$ 100,947	\$ 63,731	\$ 22,486	\$ 81,885	\$ 121,000	\$ 184,628	\$ 68,819	\$ 180,301	\$40,277	\$ 5,241	\$ 6,106	\$ 6,106
Tier 2	Signage	\$ 15,841	\$ 19,603	\$ 2,771	\$ 8,521	\$ 10,534	\$ 68,596	\$ 5,314	\$ 148,786	\$10,534	\$ 5,817	\$ -	\$ -
	Pavement Markings	\$ 739	\$ 554	\$ 554	\$ 185	\$ 370	\$ 4,911	\$ 740	\$ 555	\$ 924	\$ -	\$ -	\$ 3,630
	Signal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Other	\$ 3,300	\$ 660	\$ 660	\$ 1,980	\$ 660	\$ 1,980	\$ 1,980	\$ 1,980	\$ 660	\$ 660	\$ 660	\$ 660
	Total	\$ 19,880	\$ 20,817	\$ 3,985	\$ 10,686	\$ 11,564	\$ 75,487	\$ 8,034	\$ 151,321	\$12,118	\$ 6,477	\$ 4,290	\$ 4,290
Tier 3	Signage	\$ 30,957	\$ 15,374	\$ 11,670	\$ 26,238	\$ 7,441	\$ 88,710	\$ 21,043	\$ 165,194	\$ 7,441	\$ 3,620	\$ -	\$ -
	Pavement Markings	\$ 2,083	\$ 1,664	\$ 417	\$ 834	\$ 832	\$ 417	\$ 834	\$ 1,249	\$ 417	\$ 832	\$ 2,640	\$ -
	Signal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Other	\$ 28,229	\$ 16,032	\$ 2,376	\$ 18,216	\$ 2,376	\$ 20,650	\$ 7,128	\$ 7,128	\$ 2,535	\$ 8,477	\$ 2,376	\$ -
	Lengthen Turn Lanes	\$ 63,000	\$ 63,000	\$ 42,000	\$ 63,000	\$ 63,000	\$ 21,000	\$ 84,000	\$ 84,000	\$63,000			
	Install Turn Lanes				\$ 96,000	\$ 96,000							
	Access Management				\$ 16,213	\$ 16,213	\$ 244,688	\$ 16,213					
	Pave Driveway Apron												
	Roadway Lighting	\$ 20,000			\$ 40,000					\$20,000			
	Widen Shoulder & Add Guardrail		\$ 30,000		\$ 30,000		\$ 30,000	\$ 30,000					
	Widening	\$ 83,636	\$ 41,818		\$ 83,636		\$ 83,636						
	New Signal												
	RCUT								\$ 196,102	\$ 196,102			
Total	\$ 227,905	\$ 167,888	\$ 56,463	\$ 374,137	\$ 122,862	\$ 489,101	\$ 355,320	\$ 453,673	\$93,393	\$12,929	\$ 5,016	\$ 5,016	

Appendix E

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Appendix F

CONTENTS

Restricted Crossing U-Turn Intersection

TECHBRIEF
Restricted Crossing U-Turn Intersection



FHWA Publication No.: FHWA-HRT-09-059
 FHWA Contact: Joe Bared, HRDS-05, (202) 493-3314, joe.bared@dot.gov

This document is a technical summary of the Federal Highway Administration report, *Alternative Intersections/Interchanges: Information Report (AIIR)* (FHWA-HRT-09-060).

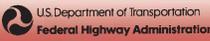
Objective

Today’s transportation professionals, with limited resources available to them, are challenged to meet the mobility needs of an increasing population. At many highway junctions, congestion continues to worsen, and drivers, pedestrians, and bicyclists experience increasing delays and heightened exposure to risk. Today’s traffic volumes and travel demands often lead to safety problems that are too complex for conventional junction designs to properly handle. Consequently, more engineers are considering various innovative treatments as they seek solutions to these complex problems.

The corresponding report, *Alternative Intersections/Interchanges: Informational Report (AIIR)* (FHWA-HRT-09-060), covers four intersection designs and two interchange designs. These designs offer substantial advantages over conventional at-grade intersections and grade-separated diamond interchanges. The *AIIR* provides information on each alternative treatment and covers salient geometric design features, operational and safety issues, access management, costs, construction sequencing, and applicability. This TechBrief summarizes information on one alternative intersection design—the restricted crossing U-turn (RCUT) intersection (see figure 1).



Figure 1. RCUT intersection in Troy, MI.



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Introduction

The RCUT, also referred to as the superstreet intersection or J-turn intersection, is characterized by the prohibition of left-turn and through movements from side street approaches as permitted in conventional designs. Instead, the RCUT intersection accommodates these movements by requiring drivers to turn right onto the main road and then make a U-turn maneuver at a one-way median opening 400 to 1,000 ft after the intersection. Left turns from the main road approaches are executed in a manner similar to left turns at conventional intersections and are unchanged in this design (see figure 2). Left-turn movements from the major road could also be removed at primarily rural unsignalized RCUT designs.

RCUT intersections have been constructed in several States following the introduction of the concept in the early 1980s.⁽¹⁾ An RCUT at a location in Michigan is shown in figure 1. Other installations include three unsignalized RCUT intersections on U.S. Route 301 on Maryland’s Eastern Shore and two on U.S. Route 15 in Emmitsburg, MD. One of the Emmitsburg, MD, installations is shown in figure 3. RCUT intersections have also been recently installed at several locations in North Carolina, including a 2.5-mi stretch of U.S. Route 23/74 in Haywood County, where three RCUT intersections were installed. Five RCUTs were also installed on Route 1 in Lee and Moore Counties, and three were installed on a signalized corridor of U.S. Route 17 in Brunswick County.

Geometric Design

Geometric aspects of RCUT intersections can vary, but a typical design is shown in figure 2 and discussed as follows:

- The RCUT intersection has either no median openings at the intersection or has only one-way median openings for the exclusive use of left-turning traffic from the main road.
- Desirable minimum median widths between 40 and 60 ft are typically needed to accommodate large trucks so that they do not encroach on curbs or shoulders. RCUT intersections

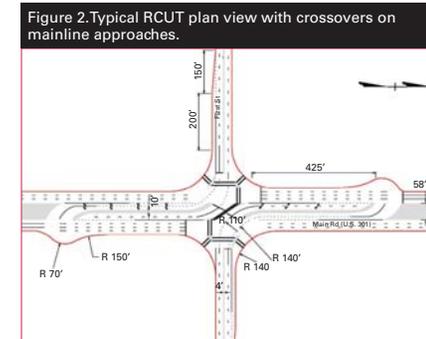


Figure 2. Typical RCUT plan view with crossovers on mainline approaches.



Figure 3. U.S. Route 15 RCUT intersection in Emmitsburg, MD.

with narrower medians need bulb-outs or loons at U-turn crossovers (see figure 4).

- The spacing from the main intersection to the U-turn crossover varies in practice. The American Association of State Highway and Transportation Officials recommends spacing of 400 to 600 ft based on signal timing.⁽²⁾ The Michigan Department of Transportation recommends 660 ft ±100 ft, and the North Carolina Department Transportation standard minimum spacing between main intersections and crossovers is 800 ft.
- Driveways should not be allowed near the main intersection or on the opposite side of

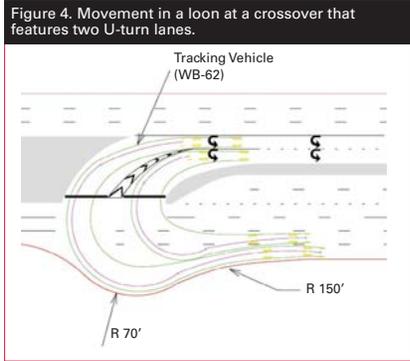


Figure 4. Movement in a loon at a crossover that features two U-turn lanes.

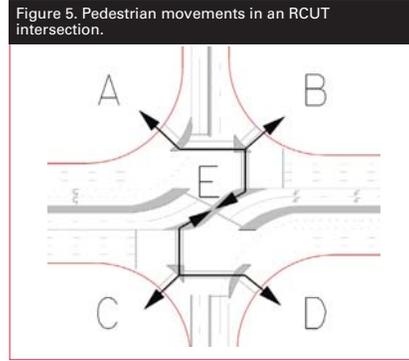


Figure 5. Pedestrian movements in an RCUT intersection.

the arterial from the median U-turn (MUT) to reduce the chance of wrong-way movements in the crossover.

- Pedestrian crossings of the major road at the RCUT intersection are usually accommodated on one diagonal path from one corner to the opposite corner (see figure 5).

Traffic Signal Control

One typical design (as in figure 2) of an RCUT intersection may have three distinct intersections operating under traffic signal control with just two phases and relatively short cycles. Signal warrants provided in the *Manual on Uniform Traffic Control Devices (MUTCD)* provide key guidance on the justification for signal control at the locations where U-turns are made.⁽³⁾ One theoretical benefit of the RCUT intersection is that signal controllers for one direction of the arterial could be operated independently of the signal controllers for the opposite direction of the arterial. It is also feasible to use one controller for the three signal locations.

Operational Performance

The traffic simulation software VISSIM was used to compare the operational performance of RCUTs to conventional intersections. Five RCUT designs were modeled for three traffic scenarios and

compared to conventional intersections. For the case where the minor flow was less than 0.2 of the total flow, simulation results indicated the following:

- Up to a 30-percent increase in throughput (i.e., the number of vehicles exiting the intersection).
- Up to a 40-percent reduction in network intersection travel time.

Safety Performance

RCUT intersections have 18 conflict points compared to 32 at conventional intersections. The RCUT intersection appears to offer substantial safety advantages over conventional intersections. For example, for the RCUT intersections on the U.S. Route 23/74 corridor in North Carolina, there was a 17-percent decrease in total crashes, a 31-percent decrease in total crash rate, a 41-percent decrease in fatal/injury crashes, and a 51-percent decrease in fatal injury crash rate. Higher reductions were observed for the three unsignalized RCUTs that replaced conventional intersections on the Eastern Shore of Maryland. For the U.S. Route 17 corridor in North Carolina, total crash rates were found to be lower than the 10-year average for 25 signalized conventional intersections in Charlotte, NC, with comparable annual average daily traffic.

Applicability

RCUT intersections are typically implemented as part of a corridor treatment; however, they can be used at isolated intersections. Unsignalized RCUT intersections preserve corridor capacity and can be installed without the adverse effects of signal control. Scenarios where RCUT intersections are most applicable include the following:

- Relatively low to medium side-street through volumes and heavy left-turn volumes from the major road.
- The minor road total volume to total intersection volume ratio is typically less than or equal to 0.20.
- Areas where median widths are greater than 40 ft. For narrower medians, loons on the shoulders need to be constructed.
- For intersections with very high left-turn and through volumes from the side road approaches, RCUT intersection design is not the optimum choice. Refer to the *AIRR* for other alternative treatments.

Summary

RCUT intersections reroute minor street left-turn and through movements to an MUT crossover and thereby provide major advantages, including reduced delay and congestion for through traffic on the major road and reduced opportunities for crashes compared to conventional designs. More details on the RCUT intersection can be found in the full *AIRR* available from the Federal Highway Administration.

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3. Federal Highway Administration. (2003). *The Manual on Uniform Traffic Control Devices (MUTCD)*, Washington, DC.

Researchers—This study was performed by Principal Investigators Warren Hughes and Ram Jagannathan. For more information about this research, contact Joe Bared, FHWA Project Manager, HRDS-05 at (202) 493-3314, joe.bared@dot.gov.

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Key Words—Superstreet, Alternative intersection, Restricted crossing U-turn, and RCUT.

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