

Appendix



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Appendix 1 - Traffic Data

Synchro Reports and Traffic Volume Figures



















Appendix 1: Traffic Data

Synchro Reports and Traffic Volume Figures



Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	240	10	40	210	30	20	160	70	50	80	90
Future Volume (vph)	60	240	10	40	210	30	20	160	70	50	80	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.985			0.962			0.945	
Flt Protected		0.990			0.993			0.996			0.989	
Satd. Flow (prot)	0	1837	0	0	1822	0	0	1785	0	0	1741	0
Flt Permitted		0.886			0.935			0.965			0.896	
Satd. Flow (perm)	0	1644	0	0	1716	0	0	1729	0	0	1577	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			17			31	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	261	11	43	228	33	22	174	76	54	87	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	304	0	0	272	0	0	239	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		18.2			23.5			15.3			15.3	
Actuated g/C Ratio		0.35			0.45			0.29			0.29	
v/c Ratio		0.59			0.39			0.53			0.50	
Control Delay		19.5			10.0			19.4			18.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		19.5			10.0			19.4			18.0	
LOS		B			B			B			B	
Approach Delay		19.5			10.0			19.4			18.0	
Approach LOS		B			B			B			B	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	52.5											
Natural Cycle:	80											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.59											
Intersection Signal Delay:	16.6						Intersection LOS: B					
Intersection Capacity Utilization	56.6%						ICU Level of Service B					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2		Ø3			Ø4		
10 s	41.7 s		24.5 s			30 s		

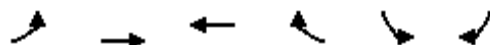
Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	120	230	210	98	120	120	
Future Volume (vph)	120	230	210	98	120	120	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.616				0.976		
Satd. Flow (perm)	1147	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				107	78		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	130	250	228	107	130	130	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	130	250	228	107	260	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	16.4	21.1	11.3	11.3	10.0		
Actuated g/C Ratio	0.41	0.52	0.28	0.28	0.25		
v/c Ratio	0.24	0.26	0.44	0.21	0.54		
Control Delay	7.0	6.7	15.3	4.4	14.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	7.0	6.7	15.3	4.4	14.5		
LOS	A	A	B	A	B		
Approach Delay		6.8	11.8		14.5		
Approach LOS		A	B		B		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	40.4
Natural Cycle:	65
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.54
Intersection Signal Delay:	10.6
Intersection Capacity Utilization	43.0%
Analysis Period (min)	15
Intersection LOS:	B
ICU Level of Service	A









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	310	50	60	280	0	0				
Future Volume (Veh/h)	310	50	60	280	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	337	54	65	304	0	0				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh										
Upstream signal (ft)	651									
pX, platoon unblocked			0.95		0.95	0.95				
vC, conflicting volume			391		798	364				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			332		760	303				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			94		100	100				
cM capacity (veh/h)			1165		335	699				
Direction, Lane #	EB 1	WB 1								
Volume Total	391	369								
Volume Left	0	65								
Volume Right	54	0								
cSH	1700	1165								
Volume to Capacity	0.23	0.06								
Queue Length 95th (ft)	0	4								
Control Delay (s)	0.0	1.9								
Lane LOS		A								
Approach Delay (s)	0.0	1.9								
Approach LOS										
Intersection Summary										
Average Delay			0.9							
Intersection Capacity Utilization			44.1%	ICU Level of Service	A					
Analysis Period (min)			15							

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

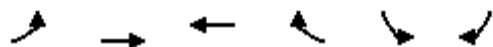
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	300	0	0	310	10	20	0	60	0	0	10
Future Volume (Veh/h)	10	300	0	0	310	10	20	0	60	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	326	0	0	337	11	22	0	65	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked												
vC, conflicting volume	348			326			702	696	326	756	690	342
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348			326			702	696	326	756	690	342
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			94	100	91	100	100	98
cM capacity (veh/h)	1211			1234			345	362	715	293	365	700
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	337	348	22	65	0	11						
Volume Left	11	0	22	0	0	0						
Volume Right	0	11	0	65	0	11						
cSH	1211	1700	345	715	1700	700						
Volume to Capacity	0.01	0.20	0.06	0.09	0.00	0.02						
Queue Length 95th (ft)	1	0	5	7	0	1						
Control Delay (s)	0.3	0.0	16.1	10.5	0.0	10.2						
Lane LOS	A		C	B	A	B						
Approach Delay (s)	0.3	0.0	12.0		10.2							
Approach LOS			B		B							
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			33.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	280	200	20	10	20
Future Volume (Veh/h)	20	280	200	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	304	217	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	239				565	217
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	239				565	217
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	97
cM capacity (veh/h)	1328				478	823
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	304	217	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1328	1700	1700	1700	663	
Volume to Capacity	0.02	0.18	0.13	0.01	0.05	
Queue Length 95th (ft)	1	0	0	0	4	
Control Delay (s)	7.8	0.0	0.0	0.0	10.7	
Lane LOS	A				B	
Approach Delay (s)	0.5		0.0		10.7	
Approach LOS					B	
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			26.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	360	25	25	305	25	15
Future Volume (Veh/h)	360	25	25	305	25	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	391	27	27	332	27	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked						
vC, conflicting volume			418		790	404
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			418		790	404
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		92	98
cM capacity (veh/h)			1141		350	646
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	418	359	43			
Volume Left	0	27	27			
Volume Right	27	0	16			
cSH	1700	1141	422			
Volume to Capacity	0.25	0.02	0.10			
Queue Length 95th (ft)	0	2	8			
Control Delay (s)	0.0	0.8	14.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.8	14.5			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			46.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	310	10	30	300	20	10		
Future Volume (Veh/h)	310	10	30	300	20	10		
Sign Control	Free			Free	Stop			
Grade	0%			0%	0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	337	11	33	326	22	11		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type	None			None				
Median storage veh								
Upstream signal (ft)	1216							
pX, platoon unblocked								
vC, conflicting volume			348		734	342		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol			348		734	342		
tC, single (s)			4.1		6.4	6.2		
tC, 2 stage (s)								
tF (s)			2.2		3.5	3.3		
p0 queue free %			97		94	98		
cM capacity (veh/h)			1211		376	700		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1				
Volume Total	348	33	326	33				
Volume Left	0	33	0	22				
Volume Right	11	0	0	11				
cSH	1700	1211	1700	445				
Volume to Capacity	0.20	0.03	0.19	0.07				
Queue Length 95th (ft)	0	2	0	6				
Control Delay (s)	0.0	8.1	0.0	13.7				
Lane LOS	A		B					
Approach Delay (s)	0.0	0.7		13.7				
Approach LOS			B					
Intersection Summary								
Average Delay			1.0					
Intersection Capacity Utilization			33.6%	ICU Level of Service	A			
Analysis Period (min)			15					

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	80	0	110
Future Volume (vph)	0	0	0	80	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	87	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	87	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	87	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.09	0.08	0.08			
Capacity (veh/h)	1008	781	773			
Control Delay (s)	6.9	6.8	6.8			
Approach Delay (s)	6.9	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.8			
Level of Service			A			
Intersection Capacity Utilization			8.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	250	10	50	230	30	20	180	80	50	90	100
Future Volume (vph)	70	250	10	50	230	30	20	180	80	50	90	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.987			0.961			0.944	
Flt Protected		0.990			0.992			0.996			0.990	
Satd. Flow (prot)	0	1837	0	0	1824	0	0	1783	0	0	1741	0
Flt Permitted		0.863			0.913			0.968			0.895	
Satd. Flow (perm)	0	1601	0	0	1679	0	0	1733	0	0	1574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			6			18			32	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	272	11	54	250	33	22	196	87	54	98	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	359	0	0	337	0	0	305	0	0	261	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.1			25.4			17.6			17.6	
Actuated g/C Ratio		0.35			0.45			0.31			0.31	
v/c Ratio		0.63			0.44			0.55			0.51	
Control Delay		21.4			11.5			20.4			18.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		21.4			11.5			20.4			18.8	
LOS		C			B			C			B	
Approach Delay		21.4			11.5			20.4			18.8	
Approach LOS		C			B			C			B	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	56.8											
Natural Cycle:	80											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.63											
Intersection Signal Delay:	18.0					Intersection LOS: B						
Intersection Capacity Utilization	60.1%					ICU Level of Service B						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2		Ø3			Ø4		
10 s	41.7 s		24.5 s			30 s		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	130	250	230	110	130	130	
Future Volume (vph)	130	250	230	110	130	130	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.591				0.976		
Satd. Flow (perm)	1101	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				113	78		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	141	272	250	120	141	141	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	141	272	250	120	282	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	17.5	22.1	12.3	12.3	10.8		
Actuated g/C Ratio	0.41	0.52	0.29	0.29	0.26		
v/c Ratio	0.26	0.28	0.46	0.22	0.58		
Control Delay	7.5	7.1	15.8	4.8	15.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	7.5	7.1	15.8	4.8	15.4		
LOS	A	A	B	A	B		
Approach Delay		7.3	12.2		15.4		
Approach LOS		A	B		B		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	42.2
Natural Cycle:	65
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.58
Intersection Signal Delay:	11.1
Intersection Capacity Utilization	45.7%
Analysis Period (min)	15
Intersection LOS:	B
ICU Level of Service	A

Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱		
Traffic Volume (veh/h)	340	50	60	310	0	0
Future Volume (Veh/h)	340	50	60	310	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	370	54	65	337	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			424		864	397
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			346		818	317
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	100
cM capacity (veh/h)			1131		304	674
Direction, Lane #	EB 1	WB 1				
Volume Total	424	402				
Volume Left	0	65				
Volume Right	54	0				
cSH	1700	1131				
Volume to Capacity	0.25	0.06				
Queue Length 95th (ft)	0	5				
Control Delay (s)	0.0	1.9				
Lane LOS		A				
Approach Delay (s)	0.0	1.9				
Approach LOS						
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		47.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	330	0	0	340	10	20	0	60	0	0	10
Future Volume (Veh/h)	10	330	0	0	340	10	20	0	60	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	359	0	0	370	11	22	0	65	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		926										
pX, platoon unblocked												
vC, conflicting volume	381			359			768	762	359	822	756	376
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	381			359			768	762	359	822	756	376
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			93	100	91	100	100	98
cM capacity (veh/h)	1177			1200			311	332	685	263	334	671
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	370	381	22	65	0	11						
Volume Left	11	0	22	0	0	0						
Volume Right	0	11	0	65	0	11						
cSH	1177	1700	311	685	1700	671						
Volume to Capacity	0.01	0.22	0.07	0.09	0.00	0.02						
Queue Length 95th (ft)	1	0	6	8	0	1						
Control Delay (s)	0.3	0.0	17.4	10.8	0.0	10.5						
Lane LOS	A		C	B	A	B						
Approach Delay (s)	0.3	0.0	12.5		10.5							
Approach LOS			B		B							
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			35.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	310	220	20	10	20
Future Volume (Veh/h)	20	310	220	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	337	239	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	261				620	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	261				620	239
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	97
cM capacity (veh/h)	1303				444	800
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	337	239	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1303	1700	1700	1700	631	
Volume to Capacity	0.02	0.20	0.14	0.01	0.05	
Queue Length 95th (ft)	1	0	0	0	4	
Control Delay (s)	7.8	0.0	0.0	0.0	11.0	
Lane LOS	A				B	
Approach Delay (s)	0.5		0.0		11.0	
Approach LOS					B	
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			26.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	360	30	30	330	20	20
Future Volume (Veh/h)	360	30	30	330	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	391	33	33	359	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			424		832	408
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			424		832	408
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	97
cM capacity (veh/h)			1135		329	644
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	424	392	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1135	435			
Volume to Capacity	0.25	0.03	0.10			
Queue Length 95th (ft)	0	2	8			
Control Delay (s)	0.0	1.0	14.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.0	14.2			
Approach LOS			B			
Intersection Summary						
Average Delay						
			1.2			
Intersection Capacity Utilization			52.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	380	10	10	340	10	10
Future Volume (Veh/h)	380	10	10	340	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	413	11	11	370	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked						
vC, conflicting volume			424		810	418
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			424		810	418
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1135		346	635
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	424	11	370	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	1135	1700	448		
Volume to Capacity	0.25	0.01	0.22	0.05		
Queue Length 95th (ft)	0	1	0	4		
Control Delay (s)	0.0	8.2	0.0	13.5		
Lane LOS	A		B			
Approach Delay (s)	0.0	0.2	13.5			
Approach LOS			B			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			30.6%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	80	0	110
Future Volume (vph)	0	0	0	80	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	87	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	87	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	87	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.09	0.08	0.08			
Capacity (veh/h)	1008	781	773			
Control Delay (s)	6.9	6.8	6.8			
Approach Delay (s)	6.9	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.8			
Level of Service			A			
Intersection Capacity Utilization			8.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	310	10	60	270	40	20	220	100	60	110	120
Future Volume (vph)	80	310	10	60	270	40	20	220	100	60	110	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.986			0.960			0.944	
Flt Protected		0.990			0.992			0.997			0.990	
Satd. Flow (prot)	0	1839	0	0	1822	0	0	1783	0	0	1741	0
Flt Permitted		0.848			0.891			0.972			0.862	
Satd. Flow (perm)	0	1575	0	0	1636	0	0	1738	0	0	1516	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			7			19			32	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	337	11	65	293	43	22	239	109	65	120	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	0	0	401	0	0	370	0	0	315	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156












12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		26.9			31.9			26.3			26.3	
Actuated g/C Ratio		0.38			0.45			0.37			0.37	
v/c Ratio		0.73			0.53			0.57			0.54	
Control Delay		26.7			14.7			23.0			22.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		26.7			14.7			23.0			22.0	
LOS		C			B			C			C	
Approach Delay		26.7			14.7			23.0			22.0	
Approach LOS		C			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	71.3											
Natural Cycle:	90											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.73											
Intersection Signal Delay:	21.7						Intersection LOS: C					
Intersection Capacity Utilization	72.9%						ICU Level of Service C					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	160	300	280	130	160	160	
Future Volume (vph)	160	300	280	130	160	160	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.496				0.976		
Satd. Flow (perm)	924	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				109	78		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	174	326	304	141	174	174	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	174	326	304	141	348	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	18.8	23.4	13.6	13.6	12.6		
Actuated g/C Ratio	0.42	0.52	0.30	0.30	0.28		
v/c Ratio	0.36	0.34	0.54	0.26	0.66		
Control Delay	9.4	8.3	17.9	6.2	18.2		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	9.4	8.3	17.9	6.2	18.2		
LOS	A	A	B	A	B		
Approach Delay		8.7	14.2		18.2		
Approach LOS		A	B		B		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 45.3
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 13.1
Intersection Capacity Utilization 53.5%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service A









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	420	50	60	380	0	0
Future Volume (Veh/h)	420	50	60	380	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	457	54	65	413	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			511		1027	484
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			349		949	317
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	100
cM capacity (veh/h)			1040		233	621
Direction, Lane #	EB 1	WB 1				
Volume Total	511	478				
Volume Left	0	65				
Volume Right	54	0				
cSH	1700	1040				
Volume to Capacity	0.30	0.06				
Queue Length 95th (ft)	0	5				
Control Delay (s)	0.0	1.8				
Lane LOS		A				
Approach Delay (s)	0.0	1.8				
Approach LOS						
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			55.1%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

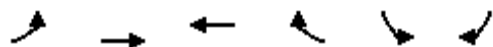
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	410	0	0	410	10	20	0	60	10	0	10
Future Volume (Veh/h)	10	410	0	0	410	10	20	0	60	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	446	0	0	446	11	22	0	65	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	
vC, conflicting volume	457			446			930	925	446	984	920	452
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	457			370			890	884	370	947	878	452
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			91	100	90	95	100	98
cM capacity (veh/h)	1104			1109			240	263	630	200	265	608
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	457	457	22	65	11	11						
Volume Left	11	0	22	0	11	0						
Volume Right	0	11	0	65	0	11						
cSH	1104	1700	240	630	200	608						
Volume to Capacity	0.01	0.27	0.09	0.10	0.05	0.02						
Queue Length 95th (ft)	1	0	7	9	4	1						
Control Delay (s)	0.3	0.0	21.5	11.4	24.0	11.0						
Lane LOS	A		C	B	C	B						
Approach Delay (s)	0.3	0.0	13.9		17.5							
Approach LOS			B		C							
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			39.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	380	270	20	10	20
Future Volume (Veh/h)	20	380	270	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	413	293	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	315				750	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	315				750	293
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1245				372	746
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	413	293	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1245	1700	1700	1700	559	
Volume to Capacity	0.02	0.24	0.17	0.01	0.06	
Queue Length 95th (ft)	1	0	0	0	5	
Control Delay (s)	7.9	0.0	0.0	0.0	11.8	
Lane LOS	A				B	
Approach Delay (s)	0.4		0.0		11.8	
Approach LOS					B	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			30.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	440	30	30	410	20	20
Future Volume (Veh/h)	440	30	30	410	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	478	33	33	446	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
1260						
pX, platoon unblocked						
vC, conflicting volume						
511						
1006						
494						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol						
511						
1006						
494						
tC, single (s)						
4.1						
6.4						
6.2						
tC, 2 stage (s)						
tF (s)						
2.2						
3.5						
3.3						
p0 queue free %						
97						
91						
96						
cM capacity (veh/h)						
1054						
259						
575						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	511	479	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1054	357			
Volume to Capacity	0.30	0.03	0.12			
Queue Length 95th (ft)	0	2	10			
Control Delay (s)	0.0	0.9	16.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	16.5			
Approach LOS			C			
Intersection Summary						
Average Delay						
1.1						
Intersection Capacity Utilization						
56.3%						
ICU Level of Service						
B						
Analysis Period (min)						
15						

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	460	10	10	420	10	10
Future Volume (Veh/h)	460	10	10	420	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	500	11	11	457	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked						
vC, conflicting volume			511		984	506
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			511		984	506
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		96	98
cM capacity (veh/h)			1054		272	567
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	511	11	457	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	1054	1700	368		
Volume to Capacity	0.30	0.01	0.27	0.06		
Queue Length 95th (ft)	0	1	0	5		
Control Delay (s)	0.0	8.5	0.0	15.4		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.2		15.4		
Approach LOS				C		
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			34.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	80	0	110
Future Volume (vph)	0	0	0	80	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	87	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	87	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	87	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.09	0.08	0.08			
Capacity (veh/h)	1008	781	773			
Control Delay (s)	6.9	6.8	6.8			
Approach Delay (s)	6.9	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.8			
Level of Service			A			
Intersection Capacity Utilization			8.3%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	268	10	53	236	36	20	180	85	68	90	100
Future Volume (vph)	70	268	10	53	236	36	20	180	85	68	90	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.985			0.960			0.948	
Flt Protected		0.990			0.992			0.996			0.987	
Satd. Flow (prot)	0	1837	0	0	1820	0	0	1781	0	0	1743	0
Flt Permitted		0.863			0.914			0.969			0.859	
Satd. Flow (perm)	0	1601	0	0	1677	0	0	1733	0	0	1517	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			19			28	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	291	11	58	257	39	22	196	92	74	98	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	378	0	0	354	0	0	310	0	0	281	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		21.9			27.0			23.8			23.8	
Actuated g/C Ratio		0.34			0.42			0.37			0.37	
v/c Ratio		0.69			0.49			0.47			0.49	
Control Delay		25.4			14.0			18.7			18.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.4			14.0			18.7			18.7	
LOS		C			B			B			B	
Approach Delay		25.4			14.0			18.7			18.7	
Approach LOS		C			B			B			B	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	64.1											
Natural Cycle:	90											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.69											
Intersection Signal Delay:	19.3					Intersection LOS: B						
Intersection Capacity Utilization	67.2%					ICU Level of Service C						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2		Ø3			Ø4		
10 s	41.7 s		24.5 s			30 s		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	136	254	245	110	130	148	
Future Volume (vph)	136	254	245	110	130	148	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.928		
Flt Protected	0.950				0.977		
Satd. Flow (prot)	1770	1863	1863	1583	1689	0	
Flt Permitted	0.563				0.977		
Satd. Flow (perm)	1049	1863	1863	1583	1689	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				106	89		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	148	276	266	120	141	161	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	148	276	266	120	302	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	17.9	22.5	12.7	12.7	11.2		
Actuated g/C Ratio	0.42	0.52	0.30	0.30	0.26		
v/c Ratio	0.28	0.28	0.48	0.22	0.60		
Control Delay	7.9	7.3	16.3	5.3	15.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	7.9	7.3	16.3	5.3	15.6		
LOS	A	A	B	A	B		
Approach Delay		7.5	12.9		15.6		
Approach LOS		A	B		B		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 43
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 11.6
Intersection Capacity Utilization 48.0%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service A









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	340	91	93	310	0	0
Future Volume (Veh/h)	340	91	93	310	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	370	99	101	337	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.90		0.90	0.90
vC, conflicting volume			469		958	420
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			350		896	295
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		100	100
cM capacity (veh/h)			1084		253	668
Direction, Lane #	EB 1	WB 1				
Volume Total	469	438				
Volume Left	0	101				
Volume Right	99	0				
cSH	1700	1084				
Volume to Capacity	0.28	0.09				
Queue Length 95th (ft)	0	8				
Control Delay (s)	0.0	2.8				
Lane LOS		A				
Approach Delay (s)	0.0	2.8				
Approach LOS						
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			51.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

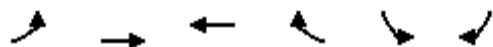
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	330	0	0	373	10	35	0	70	0	0	10
Future Volume (Veh/h)	10	330	0	0	373	10	35	0	70	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	359	0	0	405	11	38	0	76	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked												
vC, conflicting volume	416			359			802	797	359	868	792	410
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	416			359			802	797	359	868	792	410
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			87	100	89	100	100	98
cM capacity (veh/h)	1143			1200			295	316	685	241	319	641
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	370	416	38	76	0	11						
Volume Left	11	0	38	0	0	0						
Volume Right	0	11	0	76	0	11						
cSH	1143	1700	295	685	1700	641						
Volume to Capacity	0.01	0.24	0.13	0.11	0.00	0.02						
Queue Length 95th (ft)	1	0	11	9	0	1						
Control Delay (s)	0.3	0.0	19.0	10.9	0.0	10.7						
Lane LOS	A		C	B	A	B						
Approach Delay (s)	0.3	0.0	13.6		10.7							
Approach LOS			B		B							
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			36.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	310	235	20	10	20
Future Volume (Veh/h)	24	310	235	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	337	255	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	277				644	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	277				644	255
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1286				428	784
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	26	337	255	22	33	
Volume Left	26	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1286	1700	1700	1700	614	
Volume to Capacity	0.02	0.20	0.15	0.01	0.05	
Queue Length 95th (ft)	2	0	0	0	4	
Control Delay (s)	7.9	0.0	0.0	0.0	11.2	
Lane LOS	A				B	
Approach Delay (s)	0.6		0.0		11.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			29.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘↙	
Traffic Volume (veh/h)	370	30	30	363	20	20
Future Volume (Veh/h)	370	30	30	363	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	402	33	33	395	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked						
vC, conflicting volume			435		880	418
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			435		880	418
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	97
cM capacity (veh/h)			1125		308	635
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	435	428	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1125	415			
Volume to Capacity	0.26	0.03	0.11			
Queue Length 95th (ft)	0	2	9			
Control Delay (s)	0.0	0.9	14.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.9	14.7			
Approach LOS			B			
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		53.9%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	380	10	10	340	10	10
Future Volume (Veh/h)	380	10	10	340	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	413	11	11	370	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked						
vC, conflicting volume			424		810	418
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			424		810	418
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1135		346	635
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	424	11	370	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	1135	1700	448		
Volume to Capacity	0.25	0.01	0.22	0.05		
Queue Length 95th (ft)	0	1	0	4		
Control Delay (s)	0.0	8.2	0.0	13.5		
Lane LOS		A		B		
Approach Delay (s)	0.0	0.2		13.5		
Approach LOS				B		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			30.6%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	105	0	184
Future Volume (vph)	0	0	0	105	0	184
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	114	0	200
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	114	100	100			
Volume Left (vph)	0	0	0			
Volume Right (vph)	114	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.13	0.13			
Capacity (veh/h)	976	778	771			
Control Delay (s)	7.1	7.1	7.1			
Approach Delay (s)	7.1	7.1				
Approach LOS	A	A				
Intersection Summary						
Delay			7.1			
Level of Service			A			
Intersection Capacity Utilization			9.8%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	268	10	54	235	35	20	180	85	68	90	100
Future Volume (vph)	70	268	10	54	235	35	20	180	85	68	90	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.985			0.960			0.948	
Flt Protected		0.990			0.992			0.996			0.987	
Satd. Flow (prot)	0	1837	0	0	1820	0	0	1781	0	0	1743	0
Flt Permitted		0.863			0.911			0.969			0.860	
Satd. Flow (perm)	0	1601	0	0	1672	0	0	1733	0	0	1519	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			19			28	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	291	11	59	255	38	22	196	92	74	98	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	378	0	0	352	0	0	310	0	0	281	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		21.8			27.0			23.8			23.8	
Actuated g/C Ratio		0.34			0.42			0.37			0.37	
v/c Ratio		0.69			0.49			0.47			0.48	
Control Delay		25.4			13.9			18.7			18.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.4			13.9			18.7			18.7	
LOS		C			B			B			B	
Approach Delay		25.4			13.9			18.7			18.7	
Approach LOS		C			B			B			B	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	64.1											
Natural Cycle:	90											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.69											
Intersection Signal Delay:	19.3					Intersection LOS: B						
Intersection Capacity Utilization	66.9%					ICU Level of Service C						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	136	255	245	110	130	148	
Future Volume (vph)	136	255	245	110	130	148	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.928		
Flt Protected	0.950				0.977		
Satd. Flow (prot)	1770	1863	1863	1583	1689	0	
Flt Permitted	0.563				0.977		
Satd. Flow (perm)	1049	1863	1863	1583	1689	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				106	89		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	148	277	266	120	141	161	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	148	277	266	120	302	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	17.9	22.5	12.7	12.7	11.2		
Actuated g/C Ratio	0.42	0.52	0.30	0.30	0.26		
v/c Ratio	0.28	0.28	0.48	0.22	0.60		
Control Delay	7.9	7.3	16.3	5.3	15.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	7.9	7.3	16.3	5.3	15.6		
LOS	A	A	B	A	B		
Approach Delay		7.5	12.9		15.6		
Approach LOS		A	B		B		

Intersection Summary

Area Type:	Other
Cycle Length: 64	
Actuated Cycle Length: 43	
Natural Cycle: 65	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 11.6	Intersection LOS: B
Intersection Capacity Utilization 48.0%	ICU Level of Service A
Analysis Period (min) 15	









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	381	50	60	324	0	0				
Future Volume (Veh/h)	381	50	60	324	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	414	54	65	352	0	0				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh)										
Upstream signal (ft)	651									
pX, platoon unblocked			0.90		0.90	0.90				
vC, conflicting volume			468		923	441				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			349		856	318				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			94		100	100				
cM capacity (veh/h)			1085		276	647				
Direction, Lane #	EB 1	WB 1								
Volume Total	468	417								
Volume Left	0	65								
Volume Right	54	0								
cSH	1700	1085								
Volume to Capacity	0.28	0.06								
Queue Length 95th (ft)	0	5								
Control Delay (s)	0.0	1.9								
Lane LOS		A								
Approach Delay (s)	0.0	1.9								
Approach LOS										
Intersection Summary										
Average Delay		0.9								
Intersection Capacity Utilization		50.1%	ICU Level of Service	A						
Analysis Period (min)		15								

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

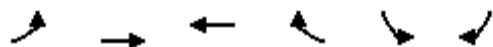
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	371	0	0	354	10	20	0	60	0	0	10
Future Volume (Veh/h)	10	371	0	0	354	10	20	0	60	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	403	0	0	385	11	22	0	65	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.99			0.99	0.99	0.99	0.99	0.99	
vC, conflicting volume	396			403			826	821	403	880	816	390
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	396			394			821	815	394	875	810	390
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			92	100	90	100	100	98
cM capacity (veh/h)	1163			1155			284	306	650	239	308	658
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	414	396	22	65	0	11						
Volume Left	11	0	22	0	0	0						
Volume Right	0	11	0	65	0	11						
cSH	1163	1700	284	650	1700	658						
Volume to Capacity	0.01	0.23	0.08	0.10	0.00	0.02						
Queue Length 95th (ft)	1	0	6	8	0	1						
Control Delay (s)	0.3	0.0	18.7	11.2	0.0	10.6						
Lane LOS	A		C	B	A	B						
Approach Delay (s)	0.3	0.0	13.1		10.6							
Approach LOS			B		B							
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			37.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	315	235	20	10	20
Future Volume (Veh/h)	20	315	235	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	342	255	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	277				641	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	277				641	255
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1286				432	784
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	342	255	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1286	1700	1700	1700	616	
Volume to Capacity	0.02	0.20	0.15	0.01	0.05	
Queue Length 95th (ft)	1	0	0	0	4	
Control Delay (s)	7.8	0.0	0.0	0.0	11.2	
Lane LOS	A				B	
Approach Delay (s)	0.5		0.0		11.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			26.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	371	30	30	363	20	20
Future Volume (Veh/h)	371	30	30	363	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	403	33	33	395	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)				1260		
pX, platoon unblocked						
vC, conflicting volume			436	880	420	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			436	880	420	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			97	93	97	
cM capacity (veh/h)			1124	308	634	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	436	428	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1124	415			
Volume to Capacity	0.26	0.03	0.11			
Queue Length 95th (ft)	0	2	9			
Control Delay (s)	0.0	0.9	14.7			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.9	14.7			
Approach LOS			B			
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			53.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	380	51	43	340	24	21
Future Volume (Veh/h)	380	51	43	340	24	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	413	55	47	370	26	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked						
vC, conflicting volume			468		904	440
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			468		904	440
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		91	96
cM capacity (veh/h)			1094		294	617
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	468	47	370	49		
Volume Left	0	47	0	26		
Volume Right	55	0	0	23		
cSH	1700	1094	1700	390		
Volume to Capacity	0.28	0.04	0.22	0.13		
Queue Length 95th (ft)	0	3	0	11		
Control Delay (s)	0.0	8.4	0.0	15.6		
Lane LOS		A		C		
Approach Delay (s)	0.0	1.0		15.6		
Approach LOS				C		
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			39.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	80	0	110
Future Volume (vph)	0	0	0	80	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	87	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	87	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	87	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.09	0.08	0.08			
Capacity (veh/h)	1008	781	773			
Control Delay (s)	6.9	6.8	6.8			
Approach Delay (s)	6.9	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.8			
Level of Service			A			
Intersection Capacity Utilization			8.3%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	347	10	52	282	64	20	220	107	97	110	120
Future Volume (vph)	80	347	10	52	282	64	20	220	107	97	110	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.978			0.958			0.951	
Flt Protected		0.991			0.993			0.997			0.985	
Satd. Flow (prot)	0	1840	0	0	1809	0	0	1779	0	0	1745	0
Flt Permitted		0.853			0.911			0.969			0.718	
Satd. Flow (perm)	0	1584	0	0	1660	0	0	1729	0	0	1272	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			11			20			26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	377	11	57	307	70	22	239	116	105	120	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	475	0	0	434	0	0	377	0	0	355	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		29.8			34.9			26.2			26.2	
Actuated g/C Ratio		0.40			0.47			0.35			0.35	
v/c Ratio		0.75			0.54			0.61			0.76	
Control Delay		26.6			14.6			25.2			34.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		26.6			14.6			25.2			34.6	
LOS		C			B			C			C	
Approach Delay		26.6			14.6			25.2			34.6	
Approach LOS		C			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length: 106.2												
Actuated Cycle Length: 74.2												
Natural Cycle: 120												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.76												
Intersection Signal Delay: 24.8						Intersection LOS: C						
Intersection Capacity Utilization 82.7%						ICU Level of Service E						
Analysis Period (min) 15												

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	173	310	310	130	160	196	
Future Volume (vph)	173	310	310	130	160	196	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.926		
Flt Protected	0.950				0.978		
Satd. Flow (prot)	1770	1863	1863	1583	1687	0	
Flt Permitted	0.444				0.978		
Satd. Flow (perm)	827	1863	1863	1583	1687	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				98	96		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	188	337	337	141	174	213	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	188	337	337	141	387	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings

6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	19.6	24.2	14.4	14.4	13.6		
Actuated g/C Ratio	0.42	0.51	0.31	0.31	0.29		
v/c Ratio	0.42	0.35	0.59	0.26	0.70		
Control Delay	10.7	8.7	19.2	7.0	18.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	10.7	8.7	19.2	7.0	18.9		
LOS	B	A	B	A	B		
Approach Delay		9.4	15.6		18.9		
Approach LOS		A	B		B		

Intersection Summary

Area Type: Other

Cycle Length: 64

Actuated Cycle Length: 47.1

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 14.2





Intersection LOS: B

Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	420	131	126	408	0	0
Future Volume (Veh/h)	420	131	126	408	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	457	142	137	443	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			599		1245	528
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		1194	335
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		100	100
cM capacity (veh/h)			950		147	590
Direction, Lane #	EB 1	WB 1				
Volume Total	599	580				
Volume Left	0	137				
Volume Right	142	0				
cSH	1700	950				
Volume to Capacity	0.35	0.14				
Queue Length 95th (ft)	0	13				
Control Delay (s)	0.0	3.6				
Lane LOS		A				
Approach Delay (s)	0.0	3.6				
Approach LOS						
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			65.2%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	410	0	0	476	10	48	0	83	10	0	10
Future Volume (Veh/h)	10	410	0	0	476	10	48	0	83	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	446	0	0	517	11	52	0	90	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.99			0.99	0.99	0.99	0.99	0.99	
vC, conflicting volume	528			446			1002	996	446	1080	990	522
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	528			437			997	992	437	1077	986	522
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			76	100	85	93	100	98
cM capacity (veh/h)	1039			1113			215	241	614	165	243	554
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	457	528	52	90	11	11						
Volume Left	11	0	52	0	11	0						
Volume Right	0	11	0	90	0	11						
cSH	1039	1700	215	614	165	554						
Volume to Capacity	0.01	0.31	0.24	0.15	0.07	0.02						
Queue Length 95th (ft)	1	0	23	13	5	2						
Control Delay (s)	0.3	0.0	27.0	11.9	28.4	11.6						
Lane LOS	A		D	B	D	B						
Approach Delay (s)	0.3	0.0	17.4		20.0							
Approach LOS			C		C							
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			42.3%		ICU Level of Service	A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	390	300	20	10	20
Future Volume (Veh/h)	20	390	300	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	424	326	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	348				794	326
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348				794	326
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1211				351	715
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	424	326	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1211	1700	1700	1700	531	
Volume to Capacity	0.02	0.25	0.19	0.01	0.06	
Queue Length 95th (ft)	1	0	0	0	5	
Control Delay (s)	8.0	0.0	0.0	0.0	12.2	
Lane LOS	A				B	
Approach Delay (s)	0.4		0.0		12.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			30.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	463	30	30	476	20	20
Future Volume (Veh/h)	463	30	30	476	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	503	33	33	517	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.98	
vC, conflicting volume			536		1102	520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			536		1093	520
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		90	96
cM capacity (veh/h)			1032		224	556
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	536	550	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1032	320			
Volume to Capacity	0.32	0.03	0.14			
Queue Length 95th (ft)	0	2	12			
Control Delay (s)	0.0	0.9	18.0			
Lane LOS			A	C		
Approach Delay (s)	0.0	0.9	18.0			
Approach LOS			C			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			59.6%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	483	10	10	486	10	10
Future Volume (Veh/h)	483	10	10	486	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	525	11	11	528	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked						
vC, conflicting volume			536		1080	530
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			536		1080	530
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	98
cM capacity (veh/h)			1032		239	549
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	536	11	528	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	1032	1700	333		
Volume to Capacity	0.32	0.01	0.31	0.07		
Queue Length 95th (ft)	0	1	0	5		
Control Delay (s)	0.0	8.5	0.0	16.6		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.2		16.6		
Approach LOS				C		
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			36.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	131	0	257
Future Volume (vph)	0	0	0	131	0	257
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	142	0	279
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	142	140	140			
Volume Left (vph)	0	0	0			
Volume Right (vph)	142	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.7	4.6	4.6			
Degree Utilization, x	0.15	0.18	0.18			
Capacity (veh/h)	958	766	769			
Control Delay (s)	7.3	7.4	7.4			
Approach Delay (s)	7.3	7.4				
Approach LOS	A	A				
Intersection Summary						
Delay			7.4			
Level of Service			A			
Intersection Capacity Utilization			11.4%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	347	10	64	282	52	20	220	107	97	110	120
Future Volume (vph)	80	347	10	64	282	52	20	220	107	97	110	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.982			0.958			0.951	
Flt Protected		0.991			0.992			0.997			0.985	
Satd. Flow (prot)	0	1840	0	0	1815	0	0	1779	0	0	1745	0
Flt Permitted		0.853			0.878			0.969			0.718	
Satd. Flow (perm)	0	1584	0	0	1606	0	0	1729	0	0	1272	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			9			20			26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	377	11	70	307	57	22	239	116	105	120	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	475	0	0	434	0	0	377	0	0	355	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		29.8			34.9			26.2			26.2	
Actuated g/C Ratio		0.40			0.47			0.35			0.35	
v/c Ratio		0.75			0.56			0.61			0.76	
Control Delay		26.6			15.0			25.2			34.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		26.6			15.0			25.2			34.6	
LOS		C			B			C			C	
Approach Delay		26.6			15.0			25.2			34.6	
Approach LOS		C			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	74.2											
Natural Cycle:	130											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.76											
Intersection Signal Delay:	24.9					Intersection LOS: C						
Intersection Capacity Utilization	80.3%					ICU Level of Service D						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	173	310	310	130	160	196	
Future Volume (vph)	173	310	310	130	160	196	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.926		
Flt Protected	0.950				0.978		
Satd. Flow (prot)	1770	1863	1863	1583	1687	0	
Flt Permitted	0.444				0.978		
Satd. Flow (perm)	827	1863	1863	1583	1687	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				98	96		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	188	337	337	141	174	213	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	188	337	337	141	387	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	19.6	24.2	14.4	14.4	13.6		
Actuated g/C Ratio	0.42	0.51	0.31	0.31	0.29		
v/c Ratio	0.42	0.35	0.59	0.26	0.70		
Control Delay	10.7	8.7	19.2	7.0	18.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	10.7	8.7	19.2	7.0	18.9		
LOS	B	A	B	A	B		
Approach Delay		9.4	15.6		18.9		
Approach LOS		A	B		B		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	47.1
Natural Cycle:	65
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.70
Intersection Signal Delay:	14.2
Intersection Capacity Utilization	58.0%
Analysis Period (min)	15
Intersection LOS:	B
ICU Level of Service	B









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	501	50	60	408	0	0
Future Volume (Veh/h)	501	50	60	408	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	545	54	65	443	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			599		1145	572
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		1074	387
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		100	100
cM capacity (veh/h)			950		189	551
Direction, Lane #	EB 1	WB 1				
Volume Total	599	508				
Volume Left	0	65				
Volume Right	54	0				
cSH	1700	950				
Volume to Capacity	0.35	0.07				
Queue Length 95th (ft)	0	5				
Control Delay (s)	0.0	1.9				
Lane LOS		A				
Approach Delay (s)	0.0	1.9				
Approach LOS						
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			60.9%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	491	0	0	438	10	20	0	60	10	0	10
Future Volume (Veh/h)	10	491	0	0	438	10	20	0	60	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	534	0	0	476	11	22	0	65	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	487			534			1048	1043	534	1102	1038	482
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	487			416			994	987	416	1054	981	482
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			89	100	89	93	100	98
cM capacity (veh/h)	1076			1019			195	218	567	160	220	585
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	545	487	22	65	11	11						
Volume Left	11	0	22	0	11	0						
Volume Right	0	11	0	65	0	11						
cSH	1076	1700	195	567	160	585						
Volume to Capacity	0.01	0.29	0.11	0.11	0.07	0.02						
Queue Length 95th (ft)	1	0	9	10	5	1						
Control Delay (s)	0.3	0.0	25.9	12.2	29.2	11.3						
Lane LOS	A		D	B	D	B						
Approach Delay (s)	0.3	0.0	15.6		20.2							
Approach LOS			C		C							
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			43.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	390	300	20	10	20
Future Volume (Veh/h)	20	390	300	20	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	424	326	22	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	348				794	326
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348				794	326
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1211				351	715
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	22	424	326	22	33	
Volume Left	22	0	0	0	11	
Volume Right	0	0	0	22	22	
cSH	1211	1700	1700	1700	531	
Volume to Capacity	0.02	0.25	0.19	0.01	0.06	
Queue Length 95th (ft)	1	0	0	0	5	
Control Delay (s)	8.0	0.0	0.0	0.0	12.2	
Lane LOS	A				B	
Approach Delay (s)	0.4		0.0		12.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			30.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	463	30	30	476	20	20
Future Volume (Veh/h)	463	30	30	476	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	503	33	33	517	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)			1260			
pX, platoon unblocked			0.98			
vC, conflicting volume			536		1102	520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			536		1093	520
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		90	96
cM capacity (veh/h)			1032		224	556
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	536	550	44			
Volume Left	0	33	22			
Volume Right	33	0	22			
cSH	1700	1032	320			
Volume to Capacity	0.32	0.03	0.14			
Queue Length 95th (ft)	0	2	12			
Control Delay (s)	0.0	0.9	18.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	18.0			
Approach LOS			C			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			59.6%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	460	91	76	420	38	33
Future Volume (Veh/h)	460	91	76	420	38	33
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	500	99	83	457	41	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			599		1172	550
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			555		1157	503
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		78	93
cM capacity (veh/h)			968		189	542
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	599	83	457	77		
Volume Left	0	83	0	41		
Volume Right	99	0	0	36		
cSH	1700	968	1700	272		
Volume to Capacity	0.35	0.09	0.27	0.28		
Queue Length 95th (ft)	0	7	0	28		
Control Delay (s)	0.0	9.1	0.0	23.4		
Lane LOS			A	C		
Approach Delay (s)	0.0	1.4		23.4		
Approach LOS				C		
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			48.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	80	0	110
Future Volume (vph)	0	0	0	80	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	87	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	87	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	87	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.09	0.08	0.08			
Capacity (veh/h)	1008	781	773			
Control Delay (s)	6.9	6.8	6.8			
Approach Delay (s)	6.9	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.8			
Level of Service			A			
Intersection Capacity Utilization			8.3%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	460	20	100	360	60	30	130	90	70	170	140
Future Volume (vph)	150	460	20	100	360	60	30	130	90	70	170	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.984			0.951			0.950	
Flt Protected		0.988			0.990			0.994			0.991	
Satd. Flow (prot)	0	1833	0	0	1815	0	0	1761	0	0	1754	0
Flt Permitted		0.752			0.762			0.917			0.870	
Satd. Flow (perm)	0	1395	0	0	1397	0	0	1624	0	0	1540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			25			26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	500	22	109	391	65	33	141	98	76	185	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	685	0	0	565	0	0	272	0	0	413	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.06			0.74			0.51			0.81	
Control Delay		78.0			20.8			24.5			39.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		78.0			20.8			24.5			39.0	
LOS		E			C			C			D	
Approach Delay		78.0			20.8			24.5			39.0	
Approach LOS		E			C			C			D	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.06											
Intersection Signal Delay:	45.5					Intersection LOS: D						
Intersection Capacity Utilization	88.7%					ICU Level of Service E						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2		Ø3			Ø4		
10 s	41.7 s		24.5 s			30 s		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	210	470	470	250	180	180	
Future Volume (vph)	210	470	470	250	180	180	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.250				0.976		
Satd. Flow (perm)	466	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				125	78		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	228	511	511	272	196	196	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	228	511	511	272	392	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.1	27.6	18.1	18.1	14.5		
Actuated g/C Ratio	0.45	0.54	0.35	0.35	0.28		
v/c Ratio	0.67	0.51	0.78	0.42	0.73		
Control Delay	21.6	10.5	26.8	10.0	21.8		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	21.6	10.5	26.8	10.0	21.8		
LOS	C	B	C	B	C		
Approach Delay		13.9	21.0		21.8		
Approach LOS		B	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 51.2
Natural Cycle: 80
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 18.4
Intersection Capacity Utilization 68.6%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	580	40	100	600	0	0
Future Volume (Veh/h)	580	40	100	600	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	630	43	109	652	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			673		1522	652
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			366		1529	336
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		100	100
cM capacity (veh/h)			870		82	515
Direction, Lane #	EB 1	WB 1				
Volume Total	673	761				
Volume Left	0	109				
Volume Right	43	0				
cSH	1700	870				
Volume to Capacity	0.40	0.13				
Queue Length 95th (ft)	0	11				
Control Delay (s)	0.0	3.1				
Lane LOS		A				
Approach Delay (s)	0.0	3.1				
Approach LOS						
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			76.7%	ICU Level of Service	D	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

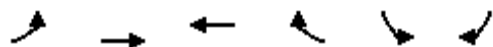
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	570	0	0	640	10	50	0	110	10	0	10
Future Volume (Veh/h)	10	570	0	0	640	10	50	0	110	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	620	0	0	696	11	54	0	120	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		926										
pX, platoon unblocked				0.78			0.78	0.78	0.78	0.78	0.78	
vC, conflicting volume	707			620			1354	1349	620	1464	1344	702
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	707			369			1313	1306	369	1453	1299	702
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			47	100	77	83	100	97
cM capacity (veh/h)	891			926			102	123	526	64	124	438
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	631	707	54	120	11	11						
Volume Left	11	0	54	0	11	0						
Volume Right	0	11	0	120	0	11						
cSH	891	1700	102	526	64	438						
Volume to Capacity	0.01	0.42	0.53	0.23	0.17	0.03						
Queue Length 95th (ft)	1	0	60	22	14	2						
Control Delay (s)	0.3	0.0	74.8	13.8	72.1	13.4						
Lane LOS	A		F	B	F	B						
Approach Delay (s)	0.3	0.0	32.8		42.7							
Approach LOS			D		E							
Intersection Summary												
Average Delay			4.5									
Intersection Capacity Utilization			51.0%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	520	730	20	20	50
Future Volume (Veh/h)	30	520	730	20	20	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	565	793	22	22	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	815				1424	793
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	815				1424	793
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				85	86
cM capacity (veh/h)	812				143	389
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	565	793	22	76	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	54	
cSH	812	1700	1700	1700	260	
Volume to Capacity	0.04	0.33	0.47	0.01	0.29	
Queue Length 95th (ft)	3	0	0	0	29	
Control Delay (s)	9.6	0.0	0.0	0.0	24.5	
Lane LOS	A				C	
Approach Delay (s)	0.5		0.0		24.5	
Approach LOS					C	
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			49.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	620	60	60	590	60	60
Future Volume (Veh/h)	620	60	60	590	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	674	65	65	641	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.78	
vC, conflicting volume			739		1478	706
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			739		1471	706
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		36	85
cM capacity (veh/h)			867		101	436
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	739	706	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	867	164			
Volume to Capacity	0.43	0.07	0.79			
Queue Length 95th (ft)	0	6	129			
Control Delay (s)	0.0	1.9	80.0			
Lane LOS		A	F			
Approach Delay (s)	0.0	1.9	80.0			
Approach LOS			F			
Intersection Summary						
Average Delay			7.5			
Intersection Capacity Utilization			87.6%	ICU Level of Service		E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	680	10	10	640	10	10
Future Volume (Veh/h)	680	10	10	640	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	739	11	11	696	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.82		0.82	0.82
vC, conflicting volume			750		1462	744
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			589		1454	583
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		91	97
cM capacity (veh/h)			812		116	422
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	750	11	696	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	812	1700	182		
Volume to Capacity	0.44	0.01	0.41	0.12		
Queue Length 95th (ft)	0	1	0	10		
Control Delay (s)	0.0	9.5	0.0	27.4		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.1		27.4		
Approach LOS				D		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			46.4%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	160	0	140
Future Volume (vph)	0	0	0	160	0	140
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	174	0	152
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	174	76	76			
Volume Left (vph)	0	0	0			
Volume Right (vph)	174	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.17	0.10	0.10			
Capacity (veh/h)	990	772	765			
Control Delay (s)	7.3	6.9	6.9			
Approach Delay (s)	7.3	6.9				
Approach LOS	A	A				
Intersection Summary						
Delay			7.1			
Level of Service			A			
Intersection Capacity Utilization			13.2%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	500	20	110	380	70	40	140	100	80	180	150
Future Volume (vph)	160	500	20	110	380	70	40	140	100	80	180	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.983			0.952			0.951	
Flt Protected		0.988			0.990			0.993			0.990	
Satd. Flow (prot)	0	1833	0	0	1813	0	0	1761	0	0	1754	0
Flt Permitted		0.749			0.733			0.873			0.830	
Satd. Flow (perm)	0	1390	0	0	1342	0	0	1548	0	0	1470	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			8			25			26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	543	22	120	413	76	43	152	109	87	196	163
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	739	0	0	609	0	0	304	0	0	446	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.15			0.83			0.60			0.92	
Control Delay		109.2			26.5			27.2			52.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		109.2			26.5			27.2			52.6	
LOS		F			C			C			D	
Approach Delay		109.2			26.5			27.2			52.6	
Approach LOS		F			C			C			D	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.15											
Intersection Signal Delay:	61.3						Intersection LOS: E					
Intersection Capacity Utilization	93.1%						ICU Level of Service F					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	230	510	510	270	200	190	
Future Volume (vph)	230	510	510	270	200	190	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.934		
Flt Protected	0.950				0.975		
Satd. Flow (prot)	1770	1863	1863	1583	1696	0	
Flt Permitted	0.221				0.975		
Satd. Flow (perm)	412	1863	1863	1583	1696	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				124	75		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	250	554	554	293	217	207	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	250	554	554	293	424	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.1	27.6	18.1	18.1	15.5		
Actuated g/C Ratio	0.44	0.53	0.35	0.35	0.30		
v/c Ratio	0.80	0.56	0.86	0.47	0.76		
Control Delay	32.9	11.7	33.8	11.0	23.8		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	32.9	11.7	33.8	11.0	23.8		
LOS	C	B	C	B	C		
Approach Delay		18.3	25.9		23.8		
Approach LOS		B	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 52.1
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 22.5
Intersection Capacity Utilization 73.6%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service D









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	640	40	100	650	0	0
Future Volume (Veh/h)	640	40	100	650	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	696	43	109	707	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.68		0.68	0.68
vC, conflicting volume			739		1642	718
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			384		1709	353
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		100	100
cM capacity (veh/h)			801		59	471
Direction, Lane #	EB 1	WB 1				
Volume Total	739	816				
Volume Left	0	109				
Volume Right	43	0				
cSH	1700	801				
Volume to Capacity	0.43	0.14				
Queue Length 95th (ft)	0	12				
Control Delay (s)	0.0	3.4				
Lane LOS		A				
Approach Delay (s)	0.0	3.4				
Approach LOS						
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			82.5%	ICU Level of Service	E	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

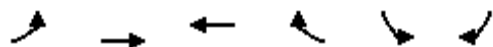
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	640	0	0	640	10	50	0	110	0	0	10
Future Volume (Veh/h)	10	640	0	0	640	10	50	0	110	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	696	0	0	696	11	54	0	120	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		926										
pX, platoon unblocked				0.73			0.73	0.73	0.73	0.73	0.73	
vC, conflicting volume	707			696			1430	1425	696	1540	1420	702
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	707			393			1404	1397	393	1554	1389	702
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			34	100	75	100	100	97
cM capacity (veh/h)	891			847			82	101	476	50	102	438
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	707	707	54	120	0	11						
Volume Left	11	0	54	0	0	0						
Volume Right	0	11	0	120	0	11						
cSH	891	1700	82	476	1700	438						
Volume to Capacity	0.01	0.42	0.66	0.25	0.00	0.03						
Queue Length 95th (ft)	1	0	77	25	0	2						
Control Delay (s)	0.3	0.0	109.4	15.1	0.0	13.4						
Lane LOS	A		F	C	A	B						
Approach Delay (s)	0.3	0.0	44.3		13.4							
Approach LOS			E		B							
Intersection Summary												
Average Delay			5.1									
Intersection Capacity Utilization			51.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	570	790	20	20	50
Future Volume (Veh/h)	30	570	790	20	20	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	620	859	22	22	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	881				1545	859
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	881				1545	859
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				82	85
cM capacity (veh/h)	767				121	356
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	620	859	22	76	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	54	
cSH	767	1700	1700	1700	228	
Volume to Capacity	0.04	0.36	0.51	0.01	0.33	
Queue Length 95th (ft)	3	0	0	0	35	
Control Delay (s)	9.9	0.0	0.0	0.0	28.6	
Lane LOS	A				D	
Approach Delay (s)	0.5		0.0		28.6	
Approach LOS					D	
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			52.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	680	60	60	640	60	60
Future Volume (Veh/h)	680	60	60	640	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	739	65	65	696	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.75	
vC, conflicting volume			804		1598	772
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			804		1629	772
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		16	84
cM capacity (veh/h)			820		78	400
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	804	761	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	820	130			
Volume to Capacity	0.47	0.08	1.00			
Queue Length 95th (ft)	0	6	175			
Control Delay (s)	0.0	2.0	144.2			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.0	144.2			
Approach LOS			F			
Intersection Summary						
Average Delay		12.0				
Intersection Capacity Utilization		93.4%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	680	10	10	640	10	10
Future Volume (Veh/h)	680	10	10	640	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	739	11	11	696	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			750		1462	744
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			593		1455	587
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		91	97
cM capacity (veh/h)			813		117	422
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	750	11	696	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	813	1700	183		
Volume to Capacity	0.44	0.01	0.41	0.12		
Queue Length 95th (ft)	0	1	0	10		
Control Delay (s)	0.0	9.5	0.0	27.3		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.1		27.3		
Approach LOS				D		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			46.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	160	0	140
Future Volume (vph)	0	0	0	160	0	140
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	174	0	152
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	174	76	76			
Volume Left (vph)	0	0	0			
Volume Right (vph)	174	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.17	0.10	0.10			
Capacity (veh/h)	990	772	765			
Control Delay (s)	7.3	6.9	6.9			
Approach Delay (s)	7.3	6.9				
Approach LOS	A	A				
Intersection Summary						
Delay			7.1			
Level of Service			A			
Intersection Capacity Utilization			13.2%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	610	20	130	460	80	50	170	120	100	220	180
Future Volume (vph)	190	610	20	130	460	80	50	170	120	100	220	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.984			0.952			0.951	
Flt Protected		0.989			0.990			0.993			0.990	
Satd. Flow (prot)	0	1837	0	0	1815	0	0	1761	0	0	1754	0
Flt Permitted		0.711			0.684			0.811			0.756	
Satd. Flow (perm)	0	1320	0	0	1254	0	0	1438	0	0	1339	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			8			24			25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	663	22	141	500	87	54	185	130	109	239	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	892	0	0	728	0	0	369	0	0	544	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.46			1.05			0.78			1.23	
Control Delay		241.3			67.1			37.1			148.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		241.3			67.1			37.1			148.3	
LOS		F			E			D			F	
Approach Delay		241.3			67.1			37.1			148.3	
Approach LOS		F			E			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.46											
Intersection Signal Delay:	141.5					Intersection LOS: F						
Intersection Capacity Utilization	111.2%					ICU Level of Service H						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	280	610	620	320	240	230	
Future Volume (vph)	280	610	620	320	240	230	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.934		
Flt Protected	0.950				0.975		
Satd. Flow (prot)	1770	1863	1863	1583	1696	0	
Flt Permitted	0.222				0.975		
Satd. Flow (perm)	414	1863	1863	1583	1696	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				121	75		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	304	663	674	348	261	250	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	304	663	674	348	511	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	1.02	0.71	1.10	0.58	0.84		
Control Delay	74.2	15.5	87.8	14.1	29.8		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	74.2	15.5	87.8	14.1	29.8		
LOS	E	B	F	B	C		
Approach Delay		34.0	62.7		29.8		
Approach LOS		C	E		C		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	54.5
Natural Cycle:	110
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.10
Intersection Signal Delay:	44.9
Intersection Capacity Utilization	86.8%
Analysis Period (min)	15
Intersection LOS:	D
ICU Level of Service	E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	780	40	60	790	0	0				
Future Volume (Veh/h)	780	40	60	790	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	848	43	65	859	0	0				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh)										
Upstream signal (ft)	651									
pX, platoon unblocked			0.59		0.59	0.59				
vC, conflicting volume			891		1858	870				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			466		2109	429				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			90		100	100				
cM capacity (veh/h)			645		30	369				
Direction, Lane #	EB 1	WB 1								
Volume Total	891	924								
Volume Left	0	65								
Volume Right	43	0								
cSH	1700	645								
Volume to Capacity	0.52	0.10								
Queue Length 95th (ft)	0	8								
Control Delay (s)	0.0	2.9								
Lane LOS		A								
Approach Delay (s)	0.0	2.9								
Approach LOS										
Intersection Summary										
Average Delay			1.5							
Intersection Capacity Utilization			94.3%	ICU Level of Service	F					
Analysis Period (min)			15							

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	770	0	0	830	10	50	0	110	10	0	10
Future Volume (Veh/h)	10	770	0	0	830	10	50	0	110	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	837	0	0	902	11	54	0	120	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.62			0.62	0.62	0.62	0.62	0.62	
vC, conflicting volume	913			837			1778	1772	837	1886	1766	908
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	913			435			1946	1937	435	2121	1928	908
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			0	100	69	29	100	97
cM capacity (veh/h)	746			700			29	40	387	16	41	334
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	848	913	54	120	11	11						
Volume Left	11	0	54	0	11	0						
Volume Right	0	11	0	120	0	11						
cSH	746	1700	29	387	16	334						
Volume to Capacity	0.01	0.54	1.86	0.31	0.71	0.03						
Queue Length 95th (ft)	1	0	158	32	44	3						
Control Delay (s)	0.4	0.0	699.1	18.4	451.2	16.2						
Lane LOS	A		F	C	F	C						
Approach Delay (s)	0.4	0.0	229.7		233.7							
Approach LOS			F		F							
Intersection Summary												
Average Delay			23.2									
Intersection Capacity Utilization			61.2%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	690	950	20	20	60
Future Volume (Veh/h)	30	690	950	20	20	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	750	1033	22	22	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1055				1849	1033
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1055				1849	1033
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				72	77
cM capacity (veh/h)	660				78	282
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	750	1033	22	87	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	65	
cSH	660	1700	1700	1700	169	
Volume to Capacity	0.05	0.44	0.61	0.01	0.51	
Queue Length 95th (ft)	4	0	0	0	63	
Control Delay (s)	10.7	0.0	0.0	0.0	46.7	
Lane LOS	B				E	
Approach Delay (s)	0.5		0.0		46.7	
Approach LOS					E	
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			61.5%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	830	60	60	790	60	60
Future Volume (Veh/h)	830	60	60	790	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	902	65	65	859	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.71	
vC, conflicting volume			967		1924	934
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			967		2093	934
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		0	80
cM capacity (veh/h)			712		37	322
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	967	924	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	712	67			
Volume to Capacity	0.57	0.09	1.94			
Queue Length 95th (ft)	0	8	299			
Control Delay (s)	0.0	2.6	573.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.6	573.7			
Approach LOS			F			
Intersection Summary						
Average Delay			38.1			
Intersection Capacity Utilization			104.7%	ICU Level of Service		G
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	890	10	10	840	10	10
Future Volume (Veh/h)	890	10	10	840	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	967	11	11	913	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.65		0.65	0.65
vC, conflicting volume			978		1908	972
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			700		2124	692
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		69	96
cM capacity (veh/h)			585		35	290
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	978	11	913	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	585	1700	63		
Volume to Capacity	0.58	0.02	0.54	0.35		
Queue Length 95th (ft)	0	1	0	32		
Control Delay (s)	0.0	11.3	0.0	90.5		
Lane LOS		B		F		
Approach Delay (s)	0.0	0.1		90.5		
Approach LOS				F		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			57.4%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	160	0	100
Future Volume (vph)	0	0	0	160	0	100
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	174	0	109
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	174	55	55			
Volume Left (vph)	0	0	0			
Volume Right (vph)	174	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.5	4.6	4.6			
Degree Utilization, x	0.17	0.07	0.07			
Capacity (veh/h)	1001	772	765			
Control Delay (s)	7.3	6.8	6.8			
Approach Delay (s)	7.3	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			7.1			
Level of Service			A			
Intersection Capacity Utilization			13.2%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	505	20	115	398	88	40	140	100	85	180	150
Future Volume (vph)	160	505	20	115	398	88	40	140	100	85	180	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.980			0.952			0.951	
Flt Protected		0.988			0.991			0.993			0.990	
Satd. Flow (prot)	0	1833	0	0	1809	0	0	1761	0	0	1754	0
Flt Permitted		0.740			0.732			0.872			0.817	
Satd. Flow (perm)	0	1373	0	0	1336	0	0	1546	0	0	1447	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			10			25			25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	549	22	125	433	96	43	152	109	92	196	163
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	745	0	0	654	0	0	304	0	0	451	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.18			0.89			0.60			0.95	
Control Delay		118.8			32.8			27.2			57.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		118.8			32.8			27.2			57.7	
LOS		F			C			C			E	
Approach Delay		118.8			32.8			27.2			57.7	
Approach LOS		F			C			C			E	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.18											
Intersection Signal Delay:	67.0						Intersection LOS: E					
Intersection Capacity Utilization	95.0%						ICU Level of Service F					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

 Ø1	 Ø2	 Ø3	 Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	248	525	515	270	200	196	
Future Volume (vph)	248	525	515	270	200	196	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.933		
Flt Protected	0.950				0.975		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.221				0.975		
Satd. Flow (perm)	412	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				123	77		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	270	571	560	293	217	213	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	270	571	560	293	430	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.1	27.6	18.1	18.1	15.7		
Actuated g/C Ratio	0.44	0.53	0.35	0.35	0.30		
v/c Ratio	0.87	0.58	0.87	0.47	0.77		
Control Delay	41.6	12.1	35.2	11.2	24.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	41.6	12.1	35.2	11.2	24.0		
LOS	D	B	D	B	C		
Approach Delay		21.6	26.9		24.0		
Approach LOS		C	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 52.3
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 24.2
Intersection Capacity Utilization 75.2%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service D









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	640	54	111	691	0	0
Future Volume (Veh/h)	640	54	111	691	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	696	59	121	751	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.68		0.68	0.68
vC, conflicting volume			755		1718	726
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			398		1823	354
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			85		100	100
cM capacity (veh/h)			785		49	466
Direction, Lane #	EB 1	WB 1				
Volume Total	755	872				
Volume Left	0	121				
Volume Right	59	0				
cSH	1700	785				
Volume to Capacity	0.44	0.15				
Queue Length 95th (ft)	0	14				
Control Delay (s)	0.0	3.9				
Lane LOS		A				
Approach Delay (s)	0.0	3.9				
Approach LOS						
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			86.1%	ICU Level of Service	E	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

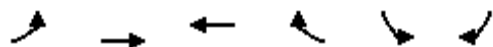
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	640	0	0	651	10	91	0	143	0	0	10
Future Volume (Veh/h)	10	640	0	0	651	10	91	0	143	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	696	0	0	708	11	99	0	155	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.73			0.73	0.73	0.73	0.73	0.73	
vC, conflicting volume	719			696			1442	1437	696	1586	1432	714
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	719			399			1421	1414	399	1618	1406	714
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			0	100	67	100	100	97
cM capacity (veh/h)	882			847			80	99	475	40	100	432
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	707	719	99	155	0	11						
Volume Left	11	0	99	0	0	0						
Volume Right	0	11	0	155	0	11						
cSH	882	1700	80	475	1700	432						
Volume to Capacity	0.01	0.42	1.23	0.33	0.00	0.03						
Queue Length 95th (ft)	1	0	184	35	0	2						
Control Delay (s)	0.3	0.0	268.7	16.2	0.0	13.6						
Lane LOS	A		F	C	A	B						
Approach Delay (s)	0.3	0.0	114.6		13.6							
Approach LOS			F		B							
Intersection Summary												
Average Delay			17.4									
Intersection Capacity Utilization			53.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	585	795	20	20	50
Future Volume (Veh/h)	30	585	795	20	20	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	636	864	22	22	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	886				1566	864
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	886				1566	864
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				81	85
cM capacity (veh/h)	764				117	354
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	636	864	22	76	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	54	
cSH	764	1700	1700	1700	223	
Volume to Capacity	0.04	0.37	0.51	0.01	0.34	
Queue Length 95th (ft)	3	0	0	0	36	
Control Delay (s)	9.9	0.0	0.0	0.0	29.2	
Lane LOS	A				D	
Approach Delay (s)	0.5		0.0		29.2	
Approach LOS					D	
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			52.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘↙	
Traffic Volume (veh/h)	680	60	60	643	60	60
Future Volume (Veh/h)	680	60	60	643	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	739	65	65	699	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.75	
vC, conflicting volume			804		1600	772
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			804		1633	772
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		16	84
cM capacity (veh/h)			820		77	400
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	804	764	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	820	130			
Volume to Capacity	0.47	0.08	1.00			
Queue Length 95th (ft)	0	6	175			
Control Delay (s)	0.0	2.0	145.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.0	145.7			
Approach LOS			F			
Intersection Summary						
Average Delay		12.1				
Intersection Capacity Utilization		93.6%	ICU Level of Service		F	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	713	10	10	651	10	10
Future Volume (Veh/h)	713	10	10	651	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	775	11	11	708	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			786		1510	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			644		1513	638
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		90	97
cM capacity (veh/h)			785		109	398
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	786	11	708	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	785	1700	171		
Volume to Capacity	0.46	0.01	0.42	0.13		
Queue Length 95th (ft)	0	1	0	11		
Control Delay (s)	0.0	9.7	0.0	29.2		
Lane LOS		A		D		
Approach Delay (s)	0.0	0.1		29.2		
Approach LOS				D		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			48.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	234	0	165
Future Volume (vph)	0	0	0	234	0	165
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	254	0	179
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	254	90	90			
Volume Left (vph)	0	0	0			
Volume Right (vph)	254	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.7	4.7			
Degree Utilization, x	0.25	0.12	0.12			
Capacity (veh/h)	984	755	757			
Control Delay (s)	7.8	7.1	7.1			
Approach Delay (s)	7.8	7.1				
Approach LOS	A	A				
Intersection Summary						
Delay			7.5			
Level of Service			A			
Intersection Capacity Utilization			17.8%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	505	20	115	398	88	40	140	104	85	180	150
Future Volume (vph)	160	505	20	115	398	88	40	140	104	85	180	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.980			0.950			0.951	
Flt Protected		0.988			0.991			0.993			0.990	
Satd. Flow (prot)	0	1833	0	0	1809	0	0	1757	0	0	1754	0
Flt Permitted		0.740			0.732			0.873			0.814	
Satd. Flow (perm)	0	1373	0	0	1336	0	0	1545	0	0	1442	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			10			26			25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	549	22	125	433	96	43	152	113	92	196	163
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	745	0	0	654	0	0	308	0	0	451	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156












12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7		42.7			26.0			26.0		
Actuated g/C Ratio		0.46		0.52			0.32			0.32		
v/c Ratio		1.18		0.89			0.61			0.95		
Control Delay		118.8		32.8			27.4			58.6		
Queue Delay		0.0		0.0			0.0			0.0		
Total Delay		118.8		32.8			27.4			58.6		
LOS		F		C			C			E		
Approach Delay		118.8		32.8			27.4			58.6		
Approach LOS		F		C			C			E		
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.18											
Intersection Signal Delay:	67.1						Intersection LOS: E					
Intersection Capacity Utilization	95.2%						ICU Level of Service F					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	248	525	515	270	200	196	
Future Volume (vph)	248	525	515	270	200	196	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.933		
Flt Protected	0.950				0.975		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.221				0.975		
Satd. Flow (perm)	412	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				123	77		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	270	571	560	293	217	213	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	270	571	560	293	430	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.1	27.6	18.1	18.1	15.7		
Actuated g/C Ratio	0.44	0.53	0.35	0.35	0.30		
v/c Ratio	0.87	0.58	0.87	0.47	0.77		
Control Delay	41.6	12.1	35.2	11.2	24.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	41.6	12.1	35.2	11.2	24.0		
LOS	D	B	D	B	C		
Approach Delay		21.6	26.9		24.0		
Approach LOS		C	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 52.3
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 24.2
Intersection Capacity Utilization 75.2%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service D

Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑		
Traffic Volume (veh/h)	640	54	100	691	0	0
Future Volume (Veh/h)	640	54	100	691	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	696	59	109	751	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.68		0.68	0.68
vC, conflicting volume			755		1694	726
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			398		1788	354
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		100	100
cM capacity (veh/h)			785		52	466
Direction, Lane #	EB 1	WB 1				
Volume Total	755	860				
Volume Left	0	109				
Volume Right	59	0				
cSH	1700	785				
Volume to Capacity	0.44	0.14				
Queue Length 95th (ft)	0	12				
Control Delay (s)	0.0	3.6				
Lane LOS		A				
Approach Delay (s)	0.0	3.6				
Approach LOS						
Intersection Summary						
Average Delay		1.9				
Intersection Capacity Utilization		85.5%		ICU Level of Service		E
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	654	0	0	681	10	50	0	110	0	0	10
Future Volume (Veh/h)	10	654	0	0	681	10	50	0	110	0	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	711	0	0	740	11	54	0	120	0	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (ft)	926											
pX, platoon unblocked				0.73				0.73	0.73	0.73	0.73	0.73
vC, conflicting volume	751				711				1490	1484	711	1598
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	751				419				1486	1478	419	1635
tC, single (s)	4.1				4.1				7.1	6.5	6.2	7.1
tC, 2 stage (s)												
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5
p0 queue free %	99				100				25	100	74	100
cM capacity (veh/h)	858				832				72	91	463	43
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	722	751	54	120	0	11						
Volume Left	11	0	54	0	0	0						
Volume Right	0	11	0	120	0	11						
cSH	858	1700	72	463	1700	414						
Volume to Capacity	0.01	0.44	0.75	0.26	0.00	0.03						
Queue Length 95th (ft)	1	0	87	26	0	2						
Control Delay (s)	0.3	0.0	139.2	15.5	0.0	13.9						
Lane LOS	A		F	C	A	B						
Approach Delay (s)	0.3	0.0	53.9		13.9							
Approach LOS			F		B							
Intersection Summary												
Average Delay			5.9									
Intersection Capacity Utilization			53.1%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	585	795	20	20	50
Future Volume (Veh/h)	30	585	795	20	20	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	636	864	22	22	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	886				1566	864
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	886				1566	864
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				81	85
cM capacity (veh/h)	764				117	354
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	636	864	22	76	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	54	
cSH	764	1700	1700	1700	223	
Volume to Capacity	0.04	0.37	0.51	0.01	0.34	
Queue Length 95th (ft)	3	0	0	0	36	
Control Delay (s)	9.9	0.0	0.0	0.0	29.2	
Lane LOS	A				D	
Approach Delay (s)	0.5		0.0		29.2	
Approach LOS					D	
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			52.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	713	60	60	651	60	60
Future Volume (Veh/h)	713	60	60	651	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	775	65	65	708	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)			1260			
pX, platoon unblocked			0.75			
vC, conflicting volume			840	1646 808		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			840	1694 808		
tC, single (s)			4.1	6.4 6.2		
tC, 2 stage (s)						
tF (s)			2.2	3.5 3.3		
p0 queue free %			92	8 83		
cM capacity (veh/h)			795	70 381		
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	840	773	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	795	119			
Volume to Capacity	0.49	0.08	1.10			
Queue Length 95th (ft)	0	7	193			
Control Delay (s)	0.0	2.1	180.9			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.1	180.9			
Approach LOS			F			
Intersection Summary						
Average Delay			14.4			
Intersection Capacity Utilization			95.7%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	680	24	21	640	51	43
Future Volume (Veh/h)	680	24	21	640	51	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	739	26	23	696	55	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.84		0.84	0.84
vC, conflicting volume			765		1494	752
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			622		1493	607
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		50	89
cM capacity (veh/h)			803		110	416
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	765	23	696	102		
Volume Left	0	23	0	55		
Volume Right	26	0	0	47		
cSH	1700	803	1700	167		
Volume to Capacity	0.45	0.03	0.41	0.61		
Queue Length 95th (ft)	0	2	0	83		
Control Delay (s)	0.0	9.6	0.0	55.6		
Lane LOS		A		F		
Approach Delay (s)	0.0	0.3		55.6		
Approach LOS				F		
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			49.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	160	0	154
Future Volume (vph)	0	0	0	160	0	154
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	174	0	167
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	174	84	84			
Volume Left (vph)	0	0	0			
Volume Right (vph)	174	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.17	0.11	0.11			
Capacity (veh/h)	986	772	765			
Control Delay (s)	7.3	7.0	7.0			
Approach Delay (s)	7.3	7.0				
Approach LOS	A	A				
Intersection Summary						
Delay			7.2			
Level of Service			A			
Intersection Capacity Utilization			13.2%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	622	20	137	497	117	50	170	124	112	220	180
Future Volume (vph)	190	622	20	137	497	117	50	170	124	112	220	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.979			0.951			0.952	
Flt Protected		0.989			0.991			0.993			0.989	
Satd. Flow (prot)	0	1837	0	0	1807	0	0	1759	0	0	1754	0
Flt Permitted		0.684			0.688			0.814			0.723	
Satd. Flow (perm)	0	1270	0	0	1255	0	0	1442	0	0	1282	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			10			25			24	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	676	22	149	540	127	54	185	135	122	239	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	905	0	0	816	0	0	374	0	0	557	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.54			1.17			0.79			1.31	
Control Delay		276.3			112.5			37.6			183.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		276.3			112.5			37.6			183.7	
LOS		F			F			D			F	
Approach Delay		276.3			112.5			37.6			183.7	
Approach LOS		F			F			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.54											
Intersection Signal Delay:	172.8					Intersection LOS: F						
Intersection Capacity Utilization	116.1%					ICU Level of Service H						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	316	640	630	320	240	243	
Future Volume (vph)	316	640	630	320	240	243	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.222				0.976		
Satd. Flow (perm)	414	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				119	79		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	343	696	685	348	261	264	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	343	696	685	348	525	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	1.15	0.74	1.11	0.58	0.86		
Control Delay	116.3	17.0	94.2	14.3	31.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	116.3	17.0	94.2	14.3	31.6		
LOS	F	B	F	B	C		
Approach Delay		49.8	67.3		31.6		
Approach LOS		D	E		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 54.5
Natural Cycle: 120
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 53.1
Intersection Capacity Utilization 90.1%
Analysis Period (min) 15

Intersection LOS: D
ICU Level of Service E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	780	68	83	871	0	0
Future Volume (Veh/h)	780	68	83	871	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	848	74	90	947	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.58		0.58	0.58
vC, conflicting volume			922		2012	885
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			512		2375	449
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			85		100	100
cM capacity (veh/h)			616		19	357
Direction, Lane #	EB 1	WB 1				
Volume Total	922	1037				
Volume Left	0	90				
Volume Right	74	0				
cSH	1700	616				
Volume to Capacity	0.54	0.15				
Queue Length 95th (ft)	0	13				
Control Delay (s)	0.0	4.6				
Lane LOS		A				
Approach Delay (s)	0.0	4.6				
Approach LOS						
Intersection Summary						
Average Delay		2.4				
Intersection Capacity Utilization		102.3%	ICU Level of Service		G	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	770	0	0	853	10	131	0	176	10	0	10
Future Volume (Veh/h)	10	770	0	0	853	10	131	0	176	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	837	0	0	927	11	142	0	191	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.63			0.63	0.63	0.63	0.63	0.63	
vC, conflicting volume	938			837			1802	1797	837	1982	1792	932
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	938			442			1983	1974	442	2270	1965	932
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			0	100	50	0	100	97
cM capacity (veh/h)	730			701			27	38	386	9	39	323
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	848	938	142	191	11	11						
Volume Left	11	0	142	0	11	0						
Volume Right	0	11	0	191	0	11						
cSH	730	1700	27	386	9	323						
Volume to Capacity	0.02	0.55	5.17	0.50	1.23	0.03						
Queue Length 95th (ft)	1	0	Err	66	54	3						
Control Delay (s)	0.4	0.0	Err	23.2	933.5	16.5						
Lane LOS	A		F	C	F	C						
Approach Delay (s)	0.4	0.0	4277.1		475.0							
Approach LOS			F		F							
Intersection Summary												
Average Delay			670.3									
Intersection Capacity Utilization			66.1%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	720	960	20	20	60
Future Volume (Veh/h)	30	720	960	20	20	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	783	1043	22	22	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1065				1892	1043
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1065				1892	1043
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				70	77
cM capacity (veh/h)	654				73	279
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	783	1043	22	87	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	65	
cSH	654	1700	1700	1700	163	
Volume to Capacity	0.05	0.46	0.61	0.01	0.53	
Queue Length 95th (ft)	4	0	0	0	67	
Control Delay (s)	10.8	0.0	0.0	0.0	50.0	
Lane LOS	B				F	
Approach Delay (s)	0.4		0.0		50.0	
Approach LOS					F	
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			62.0%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	896	60	60	813	60	60
Future Volume (Veh/h)	896	60	60	813	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	974	65	65	884	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.71	
vC, conflicting volume			1039		2020	1006
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1039		2229	1006
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	78
cM capacity (veh/h)			669		30	293
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	1039	949	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	669	55			
Volume to Capacity	0.61	0.10	2.36			
Queue Length 95th (ft)	0	8	327			
Control Delay (s)	0.0	2.8	778.1			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.8	778.1			
Approach LOS			F			
Intersection Summary						
Average Delay		49.0				
Intersection Capacity Utilization		105.8%		ICU Level of Service		G
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	890	10	10	863	10	10
Future Volume (Veh/h)	890	10	10	863	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	967	11	11	938	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.69		0.69	0.69
vC, conflicting volume			978		1932	972
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			741		2129	733
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		70	96
cM capacity (veh/h)			595		37	289
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	978	11	938	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	595	1700	65		
Volume to Capacity	0.58	0.02	0.55	0.34		
Queue Length 95th (ft)	0	1	0	31		
Control Delay (s)	0.0	11.2	0.0	85.7		
Lane LOS		B		F		
Approach Delay (s)	0.0	0.1		85.7		
Approach LOS				F		
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			57.4%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	307	0	153
Future Volume (vph)	0	0	0	307	0	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	334	0	166
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	334	83	83			
Volume Left (vph)	0	0	0			
Volume Right (vph)	334	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.7	4.7			
Degree Utilization, x	0.33	0.11	0.11			
Capacity (veh/h)	988	747	749			
Control Delay (s)	8.4	7.1	7.1			
Approach Delay (s)	8.4	7.1				
Approach LOS	A	A				
Intersection Summary						
Delay			8.0			
Level of Service			A			
Intersection Capacity Utilization			22.3%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	622	20	137	497	117	50	170	124	112	220	180
Future Volume (vph)	190	622	20	137	497	117	50	170	124	112	220	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.979			0.951			0.952	
Flt Protected		0.989			0.991			0.993			0.989	
Satd. Flow (prot)	0	1837	0	0	1807	0	0	1759	0	0	1754	0
Flt Permitted		0.684			0.688			0.814			0.723	
Satd. Flow (perm)	0	1270	0	0	1255	0	0	1442	0	0	1282	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			10			25			24	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	676	22	149	540	127	54	185	135	122	239	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	905	0	0	816	0	0	374	0	0	557	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	













Lanes, Volumes, Timings

1: Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.54			1.17			0.79			1.31	
Control Delay		276.3			112.5			37.6			183.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		276.3			112.5			37.6			183.7	
LOS		F			F			D			F	
Approach Delay		276.3			112.5			37.6			183.7	
Approach LOS		F			F			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.54											
Intersection Signal Delay:	172.8					Intersection LOS: F						
Intersection Capacity Utilization	116.1%					ICU Level of Service H						
Analysis Period (min)	15											

Splits and Phases: 1: Route 156

											
10 s	41.7 s		24.5 s			30 s					

Lanes, Volumes, Timings

1: Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	316	640	630	320	240	243	
Future Volume (vph)	316	640	630	320	240	243	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.932		
Flt Protected	0.950				0.976		
Satd. Flow (prot)	1770	1863	1863	1583	1694	0	
Flt Permitted	0.222				0.976		
Satd. Flow (perm)	414	1863	1863	1583	1694	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				119	79		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	343	696	685	348	261	264	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	343	696	685	348	525	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	D.P+P	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	1.15	0.74	1.11	0.58	0.86		
Control Delay	116.3	17.0	94.2	14.3	31.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	116.3	17.0	94.2	14.3	31.6		
LOS	F	B	F	B	C		
Approach Delay		49.8	67.3		31.6		
Approach LOS		D	E		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 54.5
Natural Cycle: 120
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 53.1
Intersection Capacity Utilization 90.1%
Analysis Period (min) 15

Intersection LOS: D
ICU Level of Service E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	808	40	60	871	0	0
Future Volume (Veh/h)	808	40	60	871	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	878	43	65	947	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.59		0.59	0.59
vC, conflicting volume			921		1976	900
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			510		2314	474
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		100	100
cM capacity (veh/h)			617		22	346
Direction, Lane #	EB 1	WB 1				
Volume Total	921	1012				
Volume Left	0	65				
Volume Right	43	0				
cSH	1700	617				
Volume to Capacity	0.54	0.11				
Queue Length 95th (ft)	0	9				
Control Delay (s)	0.0	3.3				
Lane LOS		A				
Approach Delay (s)	0.0	3.3				
Approach LOS						
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		98.5%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	798	0	0	911	10	50	0	110	10	0	10
Future Volume (Veh/h)	10	798	0	0	911	10	50	0	110	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	867	0	0	990	11	54	0	120	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (ft)	926											
pX, platoon unblocked				0.62				0.62	0.62	0.62	0.62	0.62
vC, conflicting volume	1001				867			1896	1890	867	2004	1884
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1001				473			2142	2133	473	2319	2124
tC, single (s)	4.1				4.1			7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2				2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	98				100			0	100	67	0	100
cM capacity (veh/h)	692				671			21	30	364	11	30
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	878	1001	54	120	11	11						
Volume Left	11	0	54	0	11	0						
Volume Right	0	11	0	120	0	11						
cSH	692	1700	21	364	11	297						
Volume to Capacity	0.02	0.59	2.61	0.33	1.02	0.04						
Queue Length 95th (ft)	1	0	176	35	51	3						
Control Delay (s)	0.5	0.0	1118.4	19.7	736.0	17.6						
Lane LOS	A		F	C	F	C						
Approach Delay (s)	0.5	0.0	360.7		376.8							
Approach LOS			F		F							
Intersection Summary												
Average Delay	34.4											
Intersection Capacity Utilization	65.2%			ICU Level of Service					C			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	720	960	20	20	60
Future Volume (Veh/h)	30	720	960	20	20	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	783	1043	22	22	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1065				1892	1043
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1065				1892	1043
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				70	77
cM capacity (veh/h)	654				73	279
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	33	783	1043	22	87	
Volume Left	33	0	0	0	22	
Volume Right	0	0	0	22	65	
cSH	654	1700	1700	1700	163	
Volume to Capacity	0.05	0.46	0.61	0.01	0.53	
Queue Length 95th (ft)	4	0	0	0	67	
Control Delay (s)	10.8	0.0	0.0	0.0	50.0	
Lane LOS	B				F	
Approach Delay (s)	0.4		0.0		50.0	
Approach LOS					F	
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			62.0%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	896	60	60	813	60	60
Future Volume (Veh/h)	896	60	60	813	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	974	65	65	884	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.71	
vC, conflicting volume			1039		2020	1006
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1039		2229	1006
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	78
cM capacity (veh/h)			669		30	293
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	1039	949	130			
Volume Left	0	65	65			
Volume Right	65	0	65			
cSH	1700	669	55			
Volume to Capacity	0.61	0.10	2.36			
Queue Length 95th (ft)	0	8	327			
Control Delay (s)	0.0	2.8	778.1			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.8	778.1			
Approach LOS			F			
Intersection Summary						
Average Delay		49.0				
Intersection Capacity Utilization		105.8%		ICU Level of Service		G
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	890	38	33	840	91	76
Future Volume (Veh/h)	890	38	33	840	91	76
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	967	41	36	913	99	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.64		0.64	0.64
vC, conflicting volume			1008		1972	988
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			737		2233	705
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		0	70
cM capacity (veh/h)			560		28	281
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1008	36	913	182		
Volume Left	0	36	0	99		
Volume Right	41	0	0	83		
cSH	1700	560	1700	48		
Volume to Capacity	0.59	0.06	0.54	3.79		
Queue Length 95th (ft)	0	5	0	Err		
Control Delay (s)	0.0	11.9	0.0	Err		
Lane LOS		B		F		
Approach Delay (s)	0.0	0.5		Err		
Approach LOS				F		
Intersection Summary						
Average Delay			851.0			
Intersection Capacity Utilization			65.5%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	160	0	100
Future Volume (vph)	0	0	0	160	0	100
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	174	0	109
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	174	55	55			
Volume Left (vph)	0	0	0			
Volume Right (vph)	174	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.5	4.6	4.6			
Degree Utilization, x	0.17	0.07	0.07			
Capacity (veh/h)	1001	772	765			
Control Delay (s)	7.3	6.8	6.8			
Approach Delay (s)	7.3	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			7.1			
Level of Service			A			
Intersection Capacity Utilization			13.2%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	420	30	70	260	50	30	140	100	60	140	110
Future Volume (vph)	110	420	30	70	260	50	30	140	100	60	140	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.982			0.950			0.952	
Flt Protected		0.990			0.991			0.994			0.990	
Satd. Flow (prot)	0	1831	0	0	1813	0	0	1759	0	0	1756	0
Flt Permitted		0.838			0.826			0.941			0.866	
Satd. Flow (perm)	0	1550	0	0	1511	0	0	1665	0	0	1536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			9			26			25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	457	33	76	283	54	33	152	109	65	152	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	610	0	0	413	0	0	294	0	0	337	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			25.6			25.6	
Actuated g/C Ratio		0.46			0.53			0.31			0.31	
v/c Ratio		0.85			0.50			0.54			0.68	
Control Delay		32.7			13.3			25.3			30.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		32.7			13.3			25.3			30.2	
LOS		C			B			C			C	
Approach Delay		32.7			13.3			25.3			30.2	
Approach LOS		C			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.3											
Natural Cycle:	120											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.85											
Intersection Signal Delay:	26.0					Intersection LOS: C						
Intersection Capacity Utilization	76.2%					ICU Level of Service D						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	200	410	400	180	230	180	
Future Volume (vph)	200	410	400	180	230	180	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.941		
Flt Protected	0.950				0.973		
Satd. Flow (prot)	1770	1863	1863	1583	1706	0	
Flt Permitted	0.311				0.973		
Satd. Flow (perm)	579	1863	1863	1583	1706	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				106	61		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	217	446	435	196	250	196	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	217	446	435	196	446	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	22.0	26.5	16.9	16.9	16.3		
Actuated g/C Ratio	0.42	0.51	0.33	0.33	0.31		
v/c Ratio	0.60	0.47	0.72	0.33	0.77		
Control Delay	16.9	10.6	24.1	8.8	25.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	16.9	10.6	24.1	8.8	25.1		
LOS	B	B	C	A	C		
Approach Delay		12.6	19.3		25.1		
Approach LOS		B	B		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 51.9
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 18.3
Intersection Capacity Utilization 67.1%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	530	30	80	410	0	0
Future Volume (Veh/h)	530	30	80	410	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	576	33	87	446	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.79		0.79	0.79
vC, conflicting volume			609		1212	592
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			369		1135	348
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		100	100
cM capacity (veh/h)			937		160	548
Direction, Lane #	EB 1	WB 1				
Volume Total	609	533				
Volume Left	0	87				
Volume Right	33	0				
cSH	1700	937				
Volume to Capacity	0.36	0.09				
Queue Length 95th (ft)	0	8				
Control Delay (s)	0.0	2.5				
Lane LOS		A				
Approach Delay (s)	0.0	2.5				
Approach LOS						
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			62.4%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	520	0	0	470	10	10	0	90	10	0	10
Future Volume (Veh/h)	10	520	0	0	470	10	10	0	90	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	565	0	0	511	11	11	0	98	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		926										
pX, platoon unblocked				0.84			0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	522			565			1114	1109	565	1202	1104	516
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	522			382			1039	1032	382	1143	1026	516
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			94	100	82	91	100	98
cM capacity (veh/h)	1044			984			170	192	556	121	194	559
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	576	522	11	98	11	11						
Volume Left	11	0	11	0	11	0						
Volume Right	0	11	0	98	0	11						
cSH	1044	1700	170	556	121	559						
Volume to Capacity	0.01	0.31	0.06	0.18	0.09	0.02						
Queue Length 95th (ft)	1	0	5	16	7	2						
Control Delay (s)	0.3	0.0	27.7	12.8	37.7	11.6						
Lane LOS	A		D	B	E	B						
Approach Delay (s)	0.3	0.0	14.3		24.6							
Approach LOS			B		C							
Intersection Summary												
Average Delay			1.9									
Intersection Capacity Utilization			46.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018













Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	510	390	10	10	40
Future Volume (Veh/h)	40	510	390	10	10	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	554	424	11	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	435				1064	424
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	435				1064	424
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				95	93
cM capacity (veh/h)	1125				237	630
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	554	424	11	54	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	43	
cSH	1125	1700	1700	1700	471	
Volume to Capacity	0.04	0.33	0.25	0.01	0.11	
Queue Length 95th (ft)	3	0	0	0	10	
Control Delay (s)	8.3	0.0	0.0	0.0	13.6	
Lane LOS	A				B	
Approach Delay (s)	0.6		0.0		13.6	
Approach LOS					B	
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			37.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (veh/h)	550	70	70	510	60	60
Future Volume (Veh/h)	550	70	70	510	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	598	76	76	554	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.85	
vC, conflicting volume			674		1342	636
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			674		1314	636
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		52	86
cM capacity (veh/h)			917		136	478
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	674	630	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	917	212			
Volume to Capacity	0.40	0.08	0.61			
Queue Length 95th (ft)	0	7	89			
Control Delay (s)	0.0	2.1	45.8			
Lane LOS		A	E			
Approach Delay (s)	0.0	2.1	45.8			
Approach LOS			E			
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			80.9%	ICU Level of Service	D	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	550	70	10	470	10	10
Future Volume (Veh/h)	550	70	10	470	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	598	76	11	511	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			674		1169	636
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			566		1126	523
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		94	98
cM capacity (veh/h)			890		198	490
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	674	11	511	22		
Volume Left	0	11	0	11		
Volume Right	76	0	0	11		
cSH	1700	890	1700	282		
Volume to Capacity	0.40	0.01	0.30	0.08		
Queue Length 95th (ft)	0	1	0	6		
Control Delay (s)	0.0	9.1	0.0	18.8		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.2		18.8		
Approach LOS				C		
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			43.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	100	0	110
Future Volume (vph)	0	0	0	100	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	109	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	109	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	109	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.08	0.08			
Capacity (veh/h)	1008	779	771			
Control Delay (s)	7.0	6.8	6.8			
Approach Delay (s)	7.0	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.5%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	440	40	80	270	60	40	150	110	70	150	120
Future Volume (vph)	120	440	40	80	270	60	40	150	110	70	150	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.980			0.950			0.952	
Flt Protected		0.990			0.990			0.993			0.990	
Satd. Flow (prot)	0	1828	0	0	1807	0	0	1757	0	0	1756	0
Flt Permitted		0.824			0.788			0.909			0.823	
Satd. Flow (perm)	0	1521	0	0	1438	0	0	1609	0	0	1459	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			10			26			24	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	478	43	87	293	65	43	163	120	76	163	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	651	0	0	445	0	0	326	0	0	369	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		0.92			0.57			0.62			0.77	
Control Delay		42.5			14.8			27.6			36.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		42.5			14.8			27.6			36.1	
LOS		D			B			C			D	
Approach Delay		42.5			14.8			27.6			36.1	
Approach LOS		D			B			C			D	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.92											
Intersection Signal Delay:	31.6					Intersection LOS: C						
Intersection Capacity Utilization	80.1%					ICU Level of Service D						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	220	440	430	200	250	200	
Future Volume (vph)	220	440	430	200	250	200	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.940		
Flt Protected	0.950				0.973		
Satd. Flow (prot)	1770	1863	1863	1583	1704	0	
Flt Permitted	0.264				0.973		
Satd. Flow (perm)	492	1863	1863	1583	1704	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				109	62		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	239	478	467	217	272	217	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	239	478	467	217	489	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	22.4	26.9	17.4	17.4	17.5		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.74	0.51	0.77	0.37	0.81		
Control Delay	25.9	11.4	27.2	9.4	28.3		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	25.9	11.4	27.2	9.4	28.3		
LOS	C	B	C	A	C		
Approach Delay		16.2	21.6		28.3		
Approach LOS		B	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 53.4
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 21.3
Intersection Capacity Utilization 72.2%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service C









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	610	30	80	450	0	0
Future Volume (Veh/h)	610	30	80	450	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	663	33	87	489	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.75		0.75	0.75
vC, conflicting volume			696		1342	680
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			431		1291	409
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		100	100
cM capacity (veh/h)			849		122	483
Direction, Lane #	EB 1	WB 1				
Volume Total	696	576				
Volume Left	0	87				
Volume Right	33	0				
cSH	1700	849				
Volume to Capacity	0.41	0.10				
Queue Length 95th (ft)	0	9				
Control Delay (s)	0.0	2.7				
Lane LOS		A				
Approach Delay (s)	0.0	2.7				
Approach LOS						
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			68.7%	ICU Level of Service	C	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

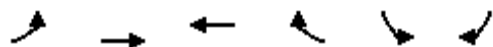
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	580	0	0	510	10	10	0	90	10	0	20
Future Volume (Veh/h)	10	580	0	0	510	10	10	0	90	10	0	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	630	0	0	554	11	11	0	98	11	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		926										
pX, platoon unblocked				0.81			0.81	0.81	0.81	0.81	0.81	
vC, conflicting volume	565			630			1234	1217	630	1310	1212	560
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	565			425			1171	1150	425	1265	1143	560
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			92	100	81	88	100	96
cM capacity (veh/h)	1007			918			130	159	509	95	160	528
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	641	565	11	98	11	22						
Volume Left	11	0	11	0	11	0						
Volume Right	0	11	0	98	0	22						
cSH	1007	1700	130	509	95	528						
Volume to Capacity	0.01	0.33	0.08	0.19	0.12	0.04						
Queue Length 95th (ft)	1	0	7	18	10	3						
Control Delay (s)	0.3	0.0	35.1	13.7	47.9	12.1						
Lane LOS	A		E	B	E	B						
Approach Delay (s)	0.3	0.0	15.9		24.1							
Approach LOS			C		C							
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			50.0%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	560	420	10	10	20
Future Volume (Veh/h)	40	560	420	10	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	609	457	11	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	468				1152	457
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	468				1152	457
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				95	96
cM capacity (veh/h)	1094				210	604
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	609	457	11	33	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	22	
cSH	1094	1700	1700	1700	371	
Volume to Capacity	0.04	0.36	0.27	0.01	0.09	
Queue Length 95th (ft)	3	0	0	0	7	
Control Delay (s)	8.4	0.0	0.0	0.0	15.6	
Lane LOS	A				C	
Approach Delay (s)	0.6		0.0		15.6	
Approach LOS					C	
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			39.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	600	70	70	560	60	60
Future Volume (Veh/h)	600	70	70	560	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	652	76	76	609	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.81	
vC, conflicting volume			728		1451	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			728		1439	690
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		40	85
cM capacity (veh/h)			876		108	445
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	728	685	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	876	174			
Volume to Capacity	0.43	0.09	0.75			
Queue Length 95th (ft)	0	7	119			
Control Delay (s)	0.0	2.2	69.8			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.2	69.8			
Approach LOS			F			
Intersection Summary						
Average Delay		6.9				
Intersection Capacity Utilization		86.2%		ICU Level of Service		E
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	670	10	10	510	10	10
Future Volume (Veh/h)	670	10	10	510	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	728	11	11	554	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			739		1310	734
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			611		1278	605
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	97
cM capacity (veh/h)			829		155	426
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	739	11	554	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	829	1700	227		
Volume to Capacity	0.43	0.01	0.33	0.10		
Queue Length 95th (ft)	0	1	0	8		
Control Delay (s)	0.0	9.4	0.0	22.5		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.2		22.5		
Approach LOS				C		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			45.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	100	0	110
Future Volume (vph)	0	0	0	100	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	109	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	109	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	109	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.08	0.08			
Capacity (veh/h)	1008	779	771			
Control Delay (s)	7.0	6.8	6.8			
Approach Delay (s)	7.0	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.5%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	530	50	100	330	70	50	180	130	80	190	140
Future Volume (vph)	140	530	50	100	330	70	50	180	130	80	190	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.981			0.951			0.954	
Flt Protected		0.990			0.990			0.993			0.990	
Satd. Flow (prot)	0	1828	0	0	1809	0	0	1759	0	0	1759	0
Flt Permitted		0.796			0.717			0.855			0.772	
Satd. Flow (perm)	0	1469	0	0	1310	0	0	1515	0	0	1372	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			9			25			23	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	576	54	109	359	76	54	196	141	87	207	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	782	0	0	544	0	0	391	0	0	446	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.15			0.75			0.78			0.99	
Control Delay		107.9			21.5			36.7			68.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		107.9			21.5			36.7			68.2	
LOS		F			C			D			E	
Approach Delay		107.9			21.5			36.7			68.2	
Approach LOS		F			C			D			E	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.15											
Intersection Signal Delay:	65.1						Intersection LOS: E					
Intersection Capacity Utilization	92.7%						ICU Level of Service F					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

 Ø1	 Ø2	 Ø3	 Ø4
10 s	41.7 s	24.5 s	30 s

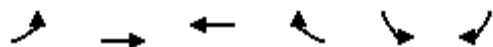
Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

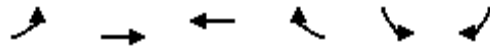
12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	260	530	520	240	300	240	
Future Volume (vph)	260	530	520	240	300	240	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.940		
Flt Protected	0.950				0.973		
Satd. Flow (prot)	1770	1863	1863	1583	1704	0	
Flt Permitted	0.222				0.973		
Satd. Flow (perm)	414	1863	1863	1583	1704	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				108	63		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	283	576	565	261	326	261	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	283	576	565	261	587	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.95	0.61	0.92	0.44	0.97		
Control Delay	56.7	13.2	42.1	11.1	50.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	56.7	13.2	42.1	11.1	50.5		
LOS	E	B	D	B	D		
Approach Delay		27.5	32.3		50.5		
Approach LOS		C	C		D		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 54.5
Natural Cycle: 100
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 35.2
Intersection Capacity Utilization 84.3%
Analysis Period (min) 15

Intersection LOS: D
ICU Level of Service E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	700	30	80	550	0	0
Future Volume (Veh/h)	700	30	80	550	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	761	33	87	598	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.65		0.65	0.65
vC, conflicting volume			794		1550	778
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			406		1577	380
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		100	100
cM capacity (veh/h)			744		69	430
Direction, Lane #	EB 1	WB 1				
Volume Total	794	685				
Volume Left	0	87				
Volume Right	33	0				
cSH	1700	744				
Volume to Capacity	0.47	0.12				
Queue Length 95th (ft)	0	10				
Control Delay (s)	0.0	3.0				
Lane LOS		A				
Approach Delay (s)	0.0	3.0				
Approach LOS						
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		78.7%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

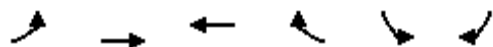
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	690	0	0	610	10	10	0	90	10	0	10
Future Volume (Veh/h)	10	690	0	0	610	10	10	0	90	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	750	0	0	663	11	11	0	98	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.68			0.68	0.68	0.68	0.68	0.68	
vC, conflicting volume	674			750			1452	1446	750	1538	1440	668
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	674			402			1429	1421	402	1556	1413	668
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			85	100	78	77	100	98
cM capacity (veh/h)	917			790			74	92	443	48	93	458
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	761	674	11	98	11	11						
Volume Left	11	0	11	0	11	0						
Volume Right	0	11	0	98	0	11						
cSH	917	1700	74	443	48	458						
Volume to Capacity	0.01	0.40	0.15	0.22	0.23	0.02						
Queue Length 95th (ft)	1	0	12	21	19	2						
Control Delay (s)	0.3	0.0	61.7	15.4	100.2	13.1						
Lane LOS	A		F	C	F	B						
Approach Delay (s)	0.3	0.0	20.1		56.6							
Approach LOS			C		F							
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			55.8%	ICU Level of Service					B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	680	510	10	10	40
Future Volume (Veh/h)	40	680	510	10	10	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	739	554	11	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	565				1379	554
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	565				1379	554
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	92
cM capacity (veh/h)	1007				153	532
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	739	554	11	54	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	43	
cSH	1007	1700	1700	1700	353	
Volume to Capacity	0.04	0.43	0.33	0.01	0.15	
Queue Length 95th (ft)	3	0	0	0	13	
Control Delay (s)	8.7	0.0	0.0	0.0	17.0	
Lane LOS	A				C	
Approach Delay (s)	0.5		0.0		17.0	
Approach LOS					C	
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			45.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	730	70	70	690	60	60
Future Volume (Veh/h)	730	70	70	690	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	793	76	76	750	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.74	
vC, conflicting volume			869		1733	831
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			869		1813	831
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	82
cM capacity (veh/h)			775		58	370
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	869	826	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	775	100			
Volume to Capacity	0.51	0.10	1.30			
Queue Length 95th (ft)	0	8	228			
Control Delay (s)	0.0	2.5	268.4			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.5	268.4			
Approach LOS			F			
Intersection Summary						
Average Delay		20.3				
Intersection Capacity Utilization		99.9%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	790	10	10	740	10	10
Future Volume (Veh/h)	790	10	10	740	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	859	11	11	804	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.72		0.72	0.72
vC, conflicting volume			870		1690	864
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			624		1765	617
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		83	97
cM capacity (veh/h)			688		65	353
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	870	11	804	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	688	1700	110		
Volume to Capacity	0.51	0.02	0.47	0.20		
Queue Length 95th (ft)	0	1	0	18		
Control Delay (s)	0.0	10.3	0.0	45.6		
Lane LOS		B		E		
Approach Delay (s)	0.0	0.1		45.6		
Approach LOS				E		
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			52.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	100	0	110
Future Volume (vph)	0	0	0	100	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	109	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	109	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	109	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.08	0.08			
Capacity (veh/h)	1008	779	771			
Control Delay (s)	7.0	6.8	6.8			
Approach Delay (s)	7.0	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.5%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	448	40	80	271	60	40	150	111	78	150	120
Future Volume (vph)	120	448	40	80	271	60	40	150	111	78	150	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.980			0.950			0.954	
Flt Protected		0.990			0.990			0.993			0.989	
Satd. Flow (prot)	0	1828	0	0	1807	0	0	1757	0	0	1758	0
Flt Permitted		0.826			0.786			0.907			0.795	
Satd. Flow (perm)	0	1525	0	0	1435	0	0	1605	0	0	1413	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			10			26			24	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	487	43	87	295	65	43	163	121	85	163	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	660	0	0	447	0	0	327	0	0	378	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		0.94			0.57			0.62			0.81	
Control Delay		44.3			14.8			27.7			39.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		44.3			14.8			27.7			39.8	
LOS		D			B			C			D	
Approach Delay		44.3			14.8			27.7			39.8	
Approach LOS		D			B			C			D	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.94											
Intersection Signal Delay:	33.1					Intersection LOS: C						
Intersection Capacity Utilization	82.5%					ICU Level of Service E						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	220	440	436	200	250	208	
Future Volume (vph)	220	440	436	200	250	208	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.939		
Flt Protected	0.950				0.973		
Satd. Flow (prot)	1770	1863	1863	1583	1702	0	
Flt Permitted	0.256				0.973		
Satd. Flow (perm)	477	1863	1863	1583	1702	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				107	65		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	239	478	474	217	272	226	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	239	478	474	217	498	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	22.6	27.1	17.6	17.6	17.7		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.75	0.51	0.78	0.37	0.83		
Control Delay	27.1	11.4	27.8	9.5	29.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	27.1	11.4	27.8	9.5	29.1		
LOS	C	B	C	A	C		
Approach Delay		16.6	22.1		29.1		
Approach LOS		B	C		C		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 53.8
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 21.9
Intersection Capacity Utilization 73.0%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service C









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	610	47	94	451	0	0				
Future Volume (Veh/h)	610	47	94	451	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	663	51	102	490	0	0				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh)										
Upstream signal (ft)	651									
pX, platoon unblocked			0.74		0.74	0.74				
vC, conflicting volume			714		1382	688				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			444		1342	410				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			88		100	100				
cM capacity (veh/h)			831		110	478				
Direction, Lane #	EB 1	WB 1								
Volume Total	714	592								
Volume Left	0	102								
Volume Right	51	0								
cSH	1700	831								
Volume to Capacity	0.42	0.12								
Queue Length 95th (ft)	0	10								
Control Delay (s)	0.0	3.1								
Lane LOS		A								
Approach Delay (s)	0.0	3.1								
Approach LOS										
Intersection Summary										
Average Delay			1.4							
Intersection Capacity Utilization			70.6%	ICU Level of Service	C					
Analysis Period (min)			15							

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

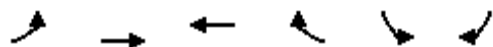
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	580	0	0	524	10	11	0	90	10	0	20
Future Volume (Veh/h)	10	580	0	0	524	10	11	0	90	10	0	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	630	0	0	570	11	12	0	98	11	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.81			0.81	0.81	0.81	0.81	0.81	
vC, conflicting volume	581			630			1250	1233	630	1326	1228	576
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	581			429			1192	1171	429	1285	1165	576
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			91	100	81	88	100	96
cM capacity (veh/h)	993			918			127	155	508	92	156	517
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	641	581	12	98	11	22						
Volume Left	11	0	12	0	11	0						
Volume Right	0	11	0	98	0	22						
cSH	993	1700	127	508	92	517						
Volume to Capacity	0.01	0.34	0.09	0.19	0.12	0.04						
Queue Length 95th (ft)	1	0	8	18	10	3						
Control Delay (s)	0.3	0.0	36.4	13.8	49.4	12.3						
Lane LOS	A		E	B	E	B						
Approach Delay (s)	0.3	0.0	16.2		24.6							
Approach LOS			C		C							
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			50.0%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018












Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	560	426	10	10	20
Future Volume (Veh/h)	40	560	426	10	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	609	463	11	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	474				1158	463
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	474				1158	463
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				95	96
cM capacity (veh/h)	1088				208	599
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	609	463	11	33	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	22	
cSH	1088	1700	1700	1700	368	
Volume to Capacity	0.04	0.36	0.27	0.01	0.09	
Queue Length 95th (ft)	3	0	0	0	7	
Control Delay (s)	8.4	0.0	0.0	0.0	15.7	
Lane LOS	A				C	
Approach Delay (s)	0.6		0.0		15.7	
Approach LOS					C	
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			39.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	600	70	70	574	60	60
Future Volume (Veh/h)	600	70	70	574	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	652	76	76	624	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.80	
vC, conflicting volume			728		1466	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			728		1458	690
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		38	85
cM capacity (veh/h)			876		104	445
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	728	700	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	876	169			
Volume to Capacity	0.43	0.09	0.77			
Queue Length 95th (ft)	0	7	124			
Control Delay (s)	0.0	2.2	74.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.2	74.7			
Approach LOS			F			
Intersection Summary						
Average Delay		7.2				
Intersection Capacity Utilization		86.9%	ICU Level of Service	E		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	670	10	10	524	10	10
Future Volume (Veh/h)	670	10	10	524	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	728	11	11	570	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			739		1326	734
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			619		1298	612
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	97
cM capacity (veh/h)			830		152	426
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	739	11	570	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	830	1700	224		
Volume to Capacity	0.43	0.01	0.34	0.10		
Queue Length 95th (ft)	0	1	0	8		
Control Delay (s)	0.0	9.4	0.0	22.8		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.2		22.8		
Approach LOS				C		
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			45.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

















12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	101	0	141
Future Volume (vph)	0	0	0	101	0	141
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	110	0	153
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	110	77	77			
Volume Left (vph)	0	0	0			
Volume Right (vph)	110	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.10	0.10			
Capacity (veh/h)	998	779	771			
Control Delay (s)	7.0	6.9	6.9			
Approach Delay (s)	7.0	6.9				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.6%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	448	40	80	271	60	40	150	111	78	150	120
Future Volume (vph)	120	448	40	80	271	60	40	150	111	78	150	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.980			0.950			0.954	
Flt Protected		0.990			0.990			0.993			0.989	
Satd. Flow (prot)	0	1828	0	0	1807	0	0	1757	0	0	1758	0
Flt Permitted		0.826			0.786			0.907			0.795	
Satd. Flow (perm)	0	1525	0	0	1435	0	0	1605	0	0	1413	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			10			26			24	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	487	43	87	295	65	43	163	121	85	163	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	660	0	0	447	0	0	327	0	0	378	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings

1: Black Point Rd & Route 156













12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		0.94			0.57			0.62			0.81	
Control Delay		44.3			14.8			27.7			39.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		44.3			14.8			27.7			39.8	
LOS		D			B			C			D	
Approach Delay		44.3			14.8			27.7			39.8	
Approach LOS		D			B			C			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 106.2												
Actuated Cycle Length: 81.7												
Natural Cycle: 150												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.94												
Intersection Signal Delay: 33.1												
Intersection LOS: C												
Intersection Capacity Utilization 82.5%												
ICU Level of Service E												
Analysis Period (min) 15												

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	220	440	436	200	250	208	
Future Volume (vph)	220	440	436	200	250	208	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.939		
Flt Protected	0.950				0.973		
Satd. Flow (prot)	1770	1863	1863	1583	1702	0	
Flt Permitted	0.256				0.973		
Satd. Flow (perm)	477	1863	1863	1583	1702	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				107	65		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	239	478	474	217	272	226	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	239	478	474	217	498	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	22.6	27.1	17.6	17.6	17.7		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.75	0.51	0.78	0.37	0.83		
Control Delay	27.1	11.4	27.8	9.5	29.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	27.1	11.4	27.8	9.5	29.1		
LOS	C	B	C	A	C		
Approach Delay		16.6	22.1		29.1		
Approach LOS		B	C		C		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	53.8
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.83
Intersection Signal Delay:	21.9
Intersection Capacity Utilization	73.0%
Analysis Period (min)	15
Intersection LOS:	C
ICU Level of Service	C









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	627	30	80	451	0	0
Future Volume (Veh/h)	627	30	80	451	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	682	33	87	490	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	651					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			715		1362	698
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			445		1315	423
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		100	100
cM capacity (veh/h)			830		116	469
Direction, Lane #	EB 1	WB 1				
Volume Total	715	577				
Volume Left	0	87				
Volume Right	33	0				
cSH	1700	830				
Volume to Capacity	0.42	0.10				
Queue Length 95th (ft)	0	9				
Control Delay (s)	0.0	2.7				
Lane LOS		A				
Approach Delay (s)	0.0	2.7				
Approach LOS						
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			69.6%		ICU Level of Service	
Analysis Period (min)			15		C	

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	597	0	0	510	10	10	0	90	10	0	20
Future Volume (Veh/h)	10	597	0	0	510	10	10	0	90	10	0	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	649	0	0	554	11	11	0	98	11	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	565			649			1252	1236	649	1328	1230	560
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	565			435			1190	1169	435	1285	1163	560
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			91	100	80	88	100	96
cM capacity (veh/h)	1007			899			125	152	496	90	154	528
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	660	565	11	98	11	22						
Volume Left	11	0	11	0	11	0						
Volume Right	0	11	0	98	0	22						
cSH	1007	1700	125	496	90	528						
Volume to Capacity	0.01	0.33	0.09	0.20	0.12	0.04						
Queue Length 95th (ft)	1	0	7	18	10	3						
Control Delay (s)	0.3	0.0	36.6	14.0	50.5	12.1						
Lane LOS	A		E	B	F	B						
Approach Delay (s)	0.3	0.0	16.3		24.9							
Approach LOS			C		C							
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			50.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	560	426	10	10	20
Future Volume (Veh/h)	40	560	426	10	10	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	609	463	11	11	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	474				1158	463
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	474				1158	463
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				95	96
cM capacity (veh/h)	1088				208	599
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	609	463	11	33	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	22	
cSH	1088	1700	1700	1700	368	
Volume to Capacity	0.04	0.36	0.27	0.01	0.09	
Queue Length 95th (ft)	3	0	0	0	7	
Control Delay (s)	8.4	0.0	0.0	0.0	15.7	
Lane LOS	A				C	
Approach Delay (s)	0.6		0.0		15.7	
Approach LOS					C	
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			39.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘↙	
Traffic Volume (veh/h)	600	70	70	574	60	60
Future Volume (Veh/h)	600	70	70	574	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	652	76	76	624	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.80	
vC, conflicting volume			728		1466	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			728		1458	690
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		38	85
cM capacity (veh/h)			876		104	445
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	728	700	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	876	169			
Volume to Capacity	0.43	0.09	0.77			
Queue Length 95th (ft)	0	7	124			
Control Delay (s)	0.0	2.2	74.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.2	74.7			
Approach LOS			F			
Intersection Summary						
Average Delay		7.2				
Intersection Capacity Utilization		86.9%	ICU Level of Service	E		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI









12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	670	27	24	510	11	10
Future Volume (Veh/h)	670	27	24	510	11	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	728	29	26	554	12	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			757		1348	742
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			621		1321	604
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		92	97
cM capacity (veh/h)			811		141	421
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	757	26	554	23		
Volume Left	0	26	0	12		
Volume Right	29	0	0	11		
cSH	1700	811	1700	207		
Volume to Capacity	0.45	0.03	0.33	0.11		
Queue Length 95th (ft)	0	2	0	9		
Control Delay (s)	0.0	9.6	0.0	24.5		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.4		24.5		
Approach LOS				C		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			46.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	100	0	110
Future Volume (vph)	0	0	0	100	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	109	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	109	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	109	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.08	0.08			
Capacity (veh/h)	1008	779	771			
Control Delay (s)	7.0	6.8	6.8			
Approach Delay (s)	7.0	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.5%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	545	50	100	331	71	50	180	134	95	190	140
Future Volume (vph)	140	545	50	100	331	71	50	180	134	95	190	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.981			0.950			0.956	
Flt Protected		0.991			0.990			0.993			0.989	
Satd. Flow (prot)	0	1829	0	0	1809	0	0	1757	0	0	1761	0
Flt Permitted		0.799			0.712			0.855			0.723	
Satd. Flow (perm)	0	1475	0	0	1301	0	0	1513	0	0	1288	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			9			26			22	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	592	54	109	360	77	54	196	146	103	207	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	798	0	0	546	0	0	396	0	0	462	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156












12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	










Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.17			0.76			0.79			1.09	
Control Delay		115.8			22.0			37.4			98.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		115.8			22.0			37.4			98.5	
LOS		F			C			D			F	
Approach Delay		115.8			22.0			37.4			98.5	
Approach LOS		F			C			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.17											
Intersection Signal Delay:	74.8					Intersection LOS: E						
Intersection Capacity Utilization	97.1%					ICU Level of Service F						
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

								
Ø1	Ø2	Ø3	Ø4					
10 s	41.7 s	24.5 s	30 s					

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	260	531	533	240	300	255	
Future Volume (vph)	260	531	533	240	300	255	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.938		
Flt Protected	0.950				0.974		
Satd. Flow (prot)	1770	1863	1863	1583	1702	0	
Flt Permitted	0.222				0.974		
Satd. Flow (perm)	414	1863	1863	1583	1702	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				106	66		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	283	577	579	261	326	277	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	283	577	579	261	603	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.95	0.61	0.94	0.44	1.00		
Control Delay	56.7	13.2	45.9	11.2	55.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	56.7	13.2	45.9	11.2	55.9		
LOS	E	B	D	B	E		
Approach Delay		27.5	35.1		55.9		
Approach LOS		C	D		E		

Intersection Summary

Area Type: Other
Cycle Length: 64
Actuated Cycle Length: 54.5
Natural Cycle: 110
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 37.7
Intersection Capacity Utilization 86.0%
Analysis Period (min) 15

Intersection LOS: D
ICU Level of Service E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

										
Movement	EBT	EBR	WBL	WBT	NBL	NBR				
Lane Configurations										
Traffic Volume (veh/h)	700	64	108	552	0	0				
Future Volume (Veh/h)	700	64	108	552	0	0				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	761	70	117	600	0	0				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type	None		None							
Median storage veh)										
Upstream signal (ft)	651									
pX, platoon unblocked			0.63		0.63	0.63				
vC, conflicting volume			831		1630	796				
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol			434		1707	378				
tC, single (s)			4.1		6.4	6.2				
tC, 2 stage (s)										
tF (s)			2.2		3.5	3.3				
p0 queue free %			83		100	100				
cM capacity (veh/h)			706		52	420				
Direction, Lane #	EB 1	WB 1								
Volume Total	831	717								
Volume Left	0	117								
Volume Right	70	0								
cSH	1700	706								
Volume to Capacity	0.49	0.17								
Queue Length 95th (ft)	0	15								
Control Delay (s)	0.0	4.2								
Lane LOS		A								
Approach Delay (s)	0.0	4.2								
Approach LOS										
Intersection Summary										
Average Delay		1.9								
Intersection Capacity Utilization		82.4%	ICU Level of Service	E						
Analysis Period (min)		15								

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	690	0	0	638	10	12	0	91	10	0	10
Future Volume (Veh/h)	10	690	0	0	638	10	12	0	91	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	750	0	0	693	11	13	0	99	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		926										
pX, platoon unblocked				0.69			0.69	0.69	0.69	0.69	0.69	
vC, conflicting volume	704			750			1482	1476	750	1570	1470	698
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	704			407			1473	1465	407	1601	1457	698
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			81	100	78	76	100	98
cM capacity (veh/h)	894			790			69	87	442	45	88	440
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	761	704	13	99	11	11						
Volume Left	11	0	13	0	11	0						
Volume Right	0	11	0	99	0	11						
cSH	894	1700	69	442	45	440						
Volume to Capacity	0.01	0.41	0.19	0.22	0.24	0.02						
Queue Length 95th (ft)	1	0	16	21	20	2						
Control Delay (s)	0.3	0.0	68.4	15.5	109.1	13.4						
Lane LOS	A		F	C	F	B						
Approach Delay (s)	0.3	0.0	21.6		61.3							
Approach LOS			C		F							
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			55.8%	ICU Level of Service					B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	681	523	10	10	40
Future Volume (Veh/h)	40	681	523	10	10	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	740	568	11	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	579				1394	568
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	579				1394	568
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	92
cM capacity (veh/h)	995				149	522
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	740	568	11	54	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	43	
cSH	995	1700	1700	1700	346	
Volume to Capacity	0.04	0.44	0.33	0.01	0.16	
Queue Length 95th (ft)	3	0	0	0	14	
Control Delay (s)	8.8	0.0	0.0	0.0	17.3	
Lane LOS	A				C	
Approach Delay (s)	0.5		0.0		17.3	
Approach LOS					C	
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			45.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘↙	
Traffic Volume (veh/h)	731	70	70	718	60	60
Future Volume (Veh/h)	731	70	70	718	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	795	76	76	780	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.74	
vC, conflicting volume			871		1765	833
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			871		1860	833
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	82
cM capacity (veh/h)			774		53	369
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	871	856	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	774	93			
Volume to Capacity	0.51	0.10	1.39			
Queue Length 95th (ft)	0	8	241			
Control Delay (s)	0.0	2.6	310.4			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.6	310.4			
Approach LOS			F			
Intersection Summary						
Average Delay		22.9				
Intersection Capacity Utilization		101.4%	ICU Level of Service	G		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	790	10	10	768	10	10
Future Volume (Veh/h)	790	10	10	768	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	859	11	11	835	11	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			870		1722	864
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			635		1804	628
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		82	97
cM capacity (veh/h)			691		63	352
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	870	11	835	22		
Volume Left	0	11	0	11		
Volume Right	11	0	0	11		
cSH	1700	691	1700	106		
Volume to Capacity	0.51	0.02	0.49	0.21		
Queue Length 95th (ft)	0	1	0	18		
Control Delay (s)	0.0	10.3	0.0	47.5		
Lane LOS		B		E		
Approach Delay (s)	0.0	0.1		47.5		
Approach LOS				E		
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			52.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

















28: Columbus Ave & Katherine St

12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	103	0	172
Future Volume (vph)	0	0	0	103	0	172
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	112	0	187
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	112	94	94			
Volume Left (vph)	0	0	0			
Volume Right (vph)	112	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.12	0.12			
Capacity (veh/h)	980	779	771			
Control Delay (s)	7.1	7.0	7.0			
Approach Delay (s)	7.1	7.0				
Approach LOS	A	A				
Intersection Summary						
Delay			7.0			
Level of Service			A			
Intersection Capacity Utilization			9.7%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	545	50	100	331	71	50	180	134	95	190	140
Future Volume (vph)	140	545	50	100	331	71	50	180	134	95	190	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		150	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.981			0.950			0.956	
Flt Protected		0.991			0.990			0.993			0.989	
Satd. Flow (prot)	0	1829	0	0	1809	0	0	1757	0	0	1761	0
Flt Permitted		0.799			0.712			0.855			0.723	
Satd. Flow (perm)	0	1475	0	0	1301	0	0	1513	0	0	1288	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			9			26			22	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		252			651			492			70	
Travel Time (s)		5.7			14.8			11.2			1.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	592	54	109	360	77	54	196	146	103	207	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	798	0	0	546	0	0	396	0	0	462	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	1 2			4			4	
Permitted Phases	2	2		2	2		4			4		

Lanes, Volumes, Timings
1: Black Point Rd & Route 156












12/05/2018

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	





Lanes, Volumes, Timings

1: Black Point Rd & Route 156

12/05/2018

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2		1	1 2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0			4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		9.5			20.0	20.0		20.0	20.0	
Total Split (s)	41.7	41.7		10.0			30.0	30.0		30.0	30.0	
Total Split (%)	39.3%	39.3%		9.4%			28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	37.7	37.7		5.5			26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5		3.5			3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		1.0			0.5	0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Max			None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		37.7			42.7			26.0			26.0	
Actuated g/C Ratio		0.46			0.52			0.32			0.32	
v/c Ratio		1.17			0.76			0.79			1.09	
Control Delay		115.8			22.0			37.4			98.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		115.8			22.0			37.4			98.5	
LOS		F			C			D			F	
Approach Delay		115.8			22.0			37.4			98.5	
Approach LOS		F			C			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length:	106.2											
Actuated Cycle Length:	81.7											
Natural Cycle:	150											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	1.17											
Intersection Signal Delay:	74.8						Intersection LOS: E					
Intersection Capacity Utilization	97.1%						ICU Level of Service F					
Analysis Period (min)	15											

Splits and Phases: 1: Black Point Rd & Route 156

			
Ø1	Ø2	Ø3	Ø4
10 s	41.7 s	24.5 s	30 s

Lanes, Volumes, Timings
1: Black Point Rd & Route 156

12/05/2018

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	24.5
Total Split (s)	24.5
Total Split (%)	23%
Maximum Green (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	260	531	533	240	300	255	
Future Volume (vph)	260	531	533	240	300	255	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	50			50	0	0	
Storage Lanes	1			1	1	0	
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt				0.850	0.938		
Flt Protected	0.950				0.974		
Satd. Flow (prot)	1770	1863	1863	1583	1702	0	
Flt Permitted	0.222				0.974		
Satd. Flow (perm)	414	1863	1863	1583	1702	0	
Right Turn on Red				Yes		Yes	
Satd. Flow (RTOR)				106	66		
Link Speed (mph)		30	30		30		
Link Distance (ft)		840	1238		881		
Travel Time (s)		19.1	28.1		20.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	283	577	579	261	326	277	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	283	577	579	261	603	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(ft)		12	12		12		
Link Offset(ft)		0	0		0		
Crosswalk Width(ft)		16	16		16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15			9	15	9	
Number of Detectors	1	2	2	1	1		
Detector Template	Left	Thru	Thru	Right	Left		
Leading Detector (ft)	20	100	100	20	20		
Trailing Detector (ft)	0	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0	0		
Detector 1 Size(ft)	20	6	6	20	20		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		
Detector 2 Position(ft)		94	94				
Detector 2 Size(ft)		6	6				
Detector 2 Type		Cl+Ex	Cl+Ex				
Detector 2 Channel							
Detector 2 Extend (s)		0.0	0.0				
Turn Type	pm+pt	NA	NA	Prot	Prot		
Protected Phases	1	1 2	2	2	4		3
Permitted Phases	1 2						

Lanes, Volumes, Timings
6: Pennsylvania Ave (Route 161)

12/05/2018







Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Detector Phase	1	1 2	2	2	4		
Switch Phase							
Minimum Initial (s)	4.0		5.0	5.0	5.0		5.0
Minimum Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (s)	9.5		22.5	22.5	22.5		9.5
Total Split (%)	14.8%		35.2%	35.2%	35.2%		15%
Maximum Green (s)	5.0		18.0	18.0	18.0		5.0
Yellow Time (s)	3.5		3.5	3.5	3.5		3.5
All-Red Time (s)	1.0		1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0		
Total Lost Time (s)	4.5		4.5	4.5	4.5		
Lead/Lag	Lead		Lag	Lag	Lag		Lead
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0		3.0	3.0	3.0		3.0
Recall Mode	Min		Min	Min	None		None
Walk Time (s)			7.0	7.0	7.0		
Flash Dont Walk (s)			11.0	11.0	11.0		
Pedestrian Calls (#/hr)			0	0	0		
Act Effect Green (s)	23.0	27.5	18.0	18.0	18.0		
Actuated g/C Ratio	0.42	0.50	0.33	0.33	0.33		
v/c Ratio	0.95	0.61	0.94	0.44	1.00		
Control Delay	56.7	13.2	45.9	11.2	55.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	56.7	13.2	45.9	11.2	55.9		
LOS	E	B	D	B	E		
Approach Delay		27.5	35.1		55.9		
Approach LOS		C	D		E		

Intersection Summary

Area Type:	Other
Cycle Length:	64
Actuated Cycle Length:	54.5
Natural Cycle:	110
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	37.7
Intersection Capacity Utilization	86.0%
Analysis Period (min)	15
Intersection LOS:	D
ICU Level of Service	E









Splits and Phases: 6: Pennsylvania Ave (Route 161)

 Ø1	 Ø2	 Ø3	 Ø4
9.5 s	22.5 s	9.5 s	22.5 s

HCM Unsignalized Intersection Capacity Analysis

2: Columbus Ave & Route 156



















12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	734	30	80	552	0	0
Future Volume (Veh/h)	734	30	80	552	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	798	33	87	600	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	651					
pX, platoon unblocked			0.63		0.63	0.63
vC, conflicting volume			831		1588	814
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			434		1641	408
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		100	100
cM capacity (veh/h)			706		61	404
Direction, Lane #	EB 1	WB 1				
Volume Total	831	687				
Volume Left	0	87				
Volume Right	33	0				
cSH	1700	706				
Volume to Capacity	0.49	0.12				
Queue Length 95th (ft)	0	10				
Control Delay (s)	0.0	3.2				
Lane LOS		A				
Approach Delay (s)	0.0	3.2				
Approach LOS						
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		80.6%	ICU Level of Service		D	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Haigh Ave

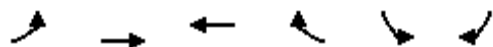
12/05/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	724	0	0	612	10	10	0	90	10	0	10
Future Volume (Veh/h)	10	724	0	0	612	10	10	0	90	10	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	787	0	0	665	11	11	0	98	11	0	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	926											
pX, platoon unblocked				0.66				0.66	0.66	0.66	0.66	0.66
vC, conflicting volume	676			787				1490	1485	787	1578	1480
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	676			425				1486	1477	425	1617	1469
tC, single (s)	4.1			4.1				7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0
p0 queue free %	99			100				83	100	77	74	100
cM capacity (veh/h)	915			752				66	83	417	42	83
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	798	676	11	98	11	11						
Volume Left	11	0	11	0	11	0						
Volume Right	0	11	0	98	0	11						
cSH	915	1700	66	417	42	457						
Volume to Capacity	0.01	0.40	0.17	0.23	0.26	0.02						
Queue Length 95th (ft)	1	0	14	23	22	2						
Control Delay (s)	0.3	0.0	70.3	16.3	119.3	13.1						
Lane LOS	A		F	C	F	B						
Approach Delay (s)	0.3	0.0	21.7		66.2							
Approach LOS			C		F							
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			57.6%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

10: River Rd

12/05/2018









Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	681	523	10	10	40
Future Volume (Veh/h)	40	681	523	10	10	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	740	568	11	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	579				1394	568
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	579				1394	568
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	92
cM capacity (veh/h)	995				149	522
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	43	740	568	11	54	
Volume Left	43	0	0	0	11	
Volume Right	0	0	0	11	43	
cSH	995	1700	1700	1700	346	
Volume to Capacity	0.04	0.44	0.33	0.01	0.16	
Queue Length 95th (ft)	3	0	0	0	14	
Control Delay (s)	8.8	0.0	0.0	0.0	17.3	
Lane LOS	A				C	
Approach Delay (s)	0.5		0.0		17.3	
Approach LOS					C	
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			45.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Baptist Ln & Route 156











12/05/2018

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	↑
Traffic Volume (veh/h)	731	70	70	718	60	60
Future Volume (Veh/h)	731	70	70	718	60	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	795	76	76	780	65	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				1260		
pX, platoon unblocked					0.74	
vC, conflicting volume			871		1765	833
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			871		1860	833
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	82
cM capacity (veh/h)			774		53	369
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	871	856	130			
Volume Left	0	76	65			
Volume Right	76	0	65			
cSH	1700	774	93			
Volume to Capacity	0.51	0.10	1.39			
Queue Length 95th (ft)	0	8	241			
Control Delay (s)	0.0	2.6	310.4			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.6	310.4			
Approach LOS			F			
Intersection Summary						
Average Delay		22.9				
Intersection Capacity Utilization		101.4%		ICU Level of Service		G
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

27: McCook PI










12/05/2018

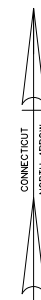
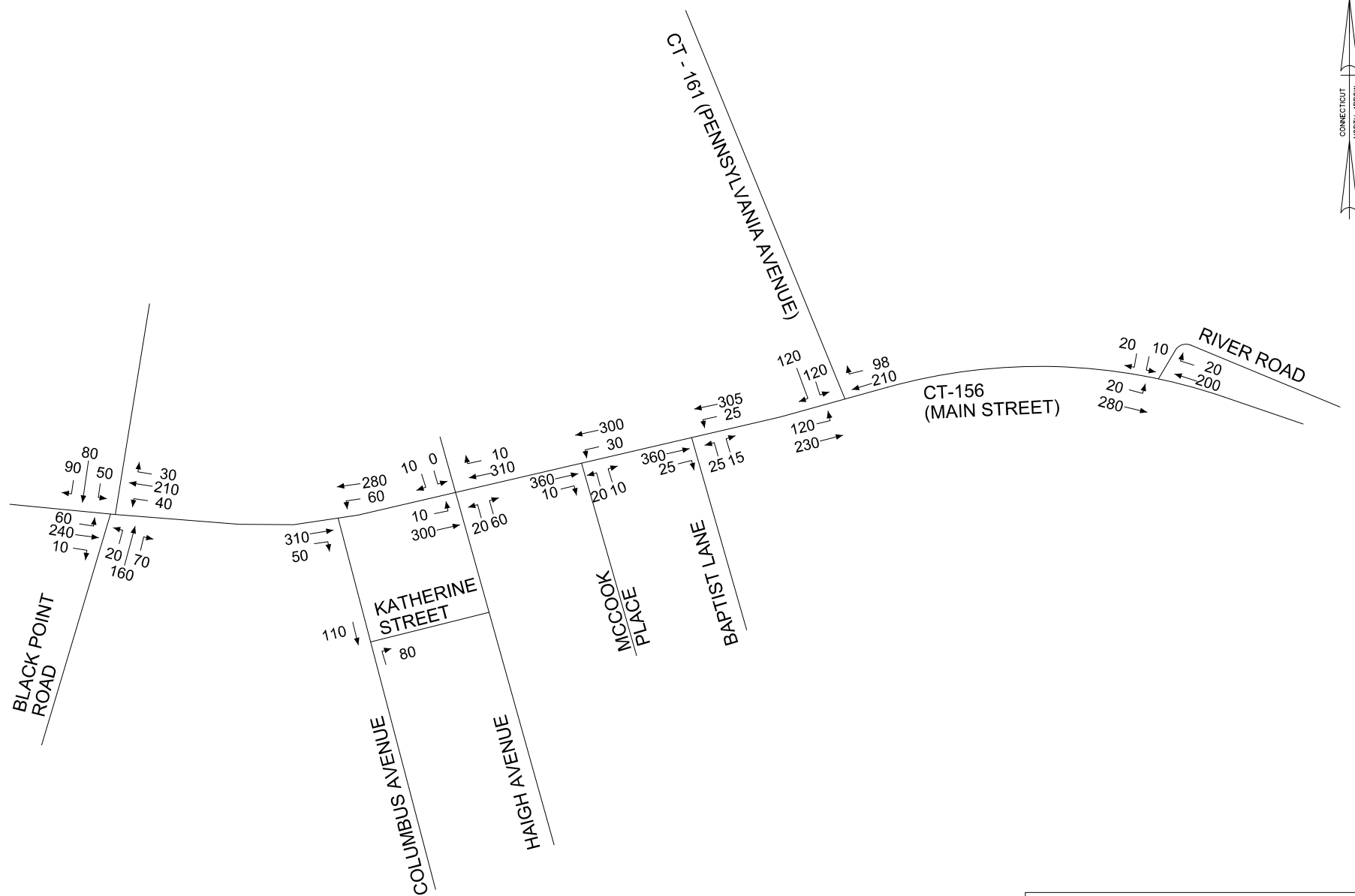
						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	790	44	38	740	12	11
Future Volume (Veh/h)	790	44	38	740	12	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	859	48	41	804	13	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)	1216					
pX, platoon unblocked			0.70		0.70	0.70
vC, conflicting volume			907		1769	883
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			650		1886	615
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		74	96
cM capacity (veh/h)			653		51	342
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	907	41	804	25		
Volume Left	0	41	0	13		
Volume Right	48	0	0	12		
cSH	1700	653	1700	86		
Volume to Capacity	0.53	0.06	0.47	0.29		
Queue Length 95th (ft)	0	5	0	27		
Control Delay (s)	0.0	10.9	0.0	63.3		
Lane LOS		B		F		
Approach Delay (s)	0.0	0.5		63.3		
Approach LOS				F		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			54.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbus Ave & Katherine St

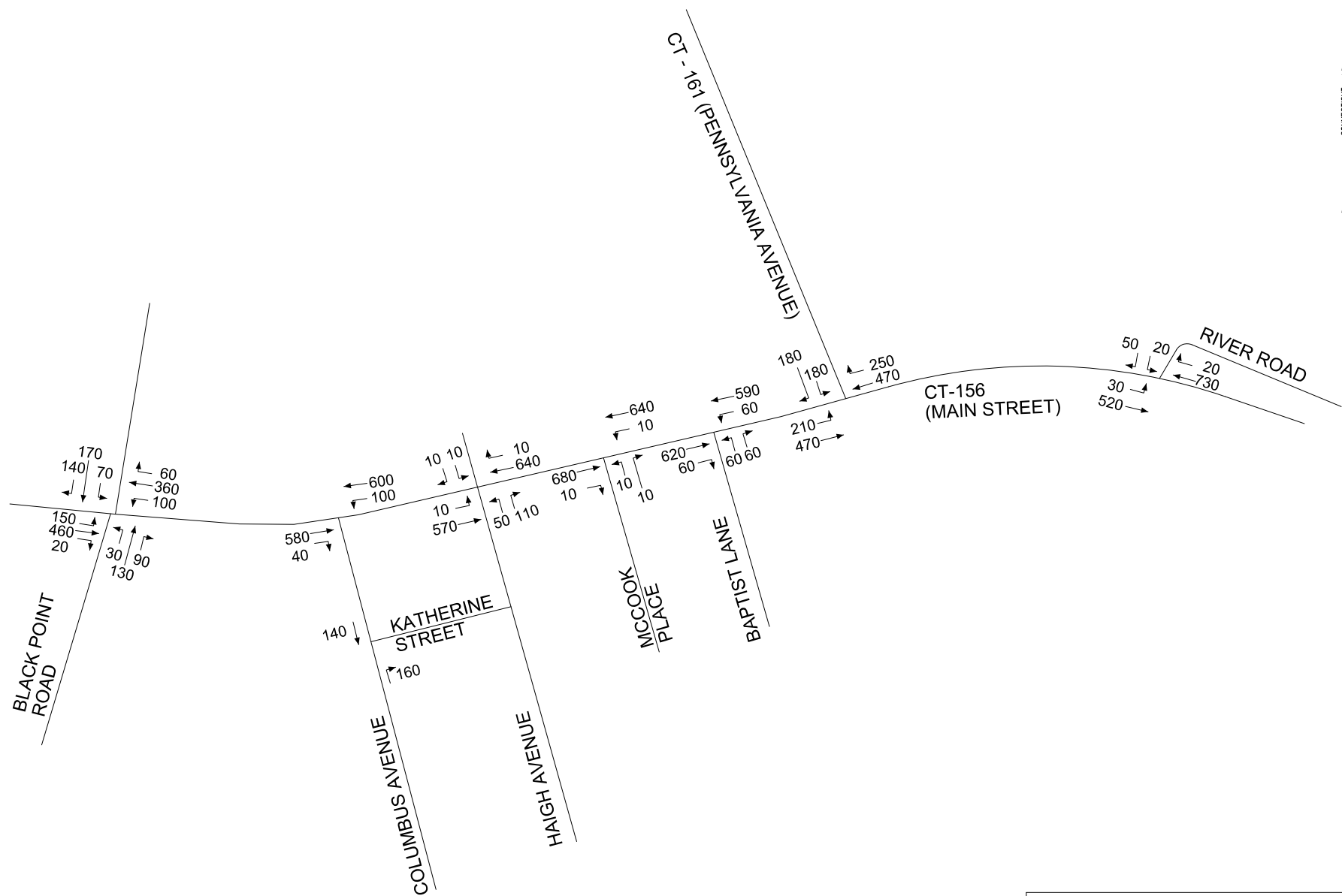
12/05/2018

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	0	0	0	100	0	110
Future Volume (vph)	0	0	0	100	0	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	109	0	120
Direction, Lane #	NB 1	SB 1	SB 2			
Volume Total (vph)	109	60	60			
Volume Left (vph)	0	0	0			
Volume Right (vph)	109	0	0			
Hadj (s)	-0.57	0.03	0.03			
Departure Headway (s)	3.6	4.6	4.6			
Degree Utilization, x	0.11	0.08	0.08			
Capacity (veh/h)	1008	779	771			
Control Delay (s)	7.0	6.8	6.8			
Approach Delay (s)	7.0	6.8				
Approach LOS	A	A				
Intersection Summary						
Delay			6.9			
Level of Service			A			
Intersection Capacity Utilization			9.5%	ICU Level of Service	A	
Analysis Period (min)			15			



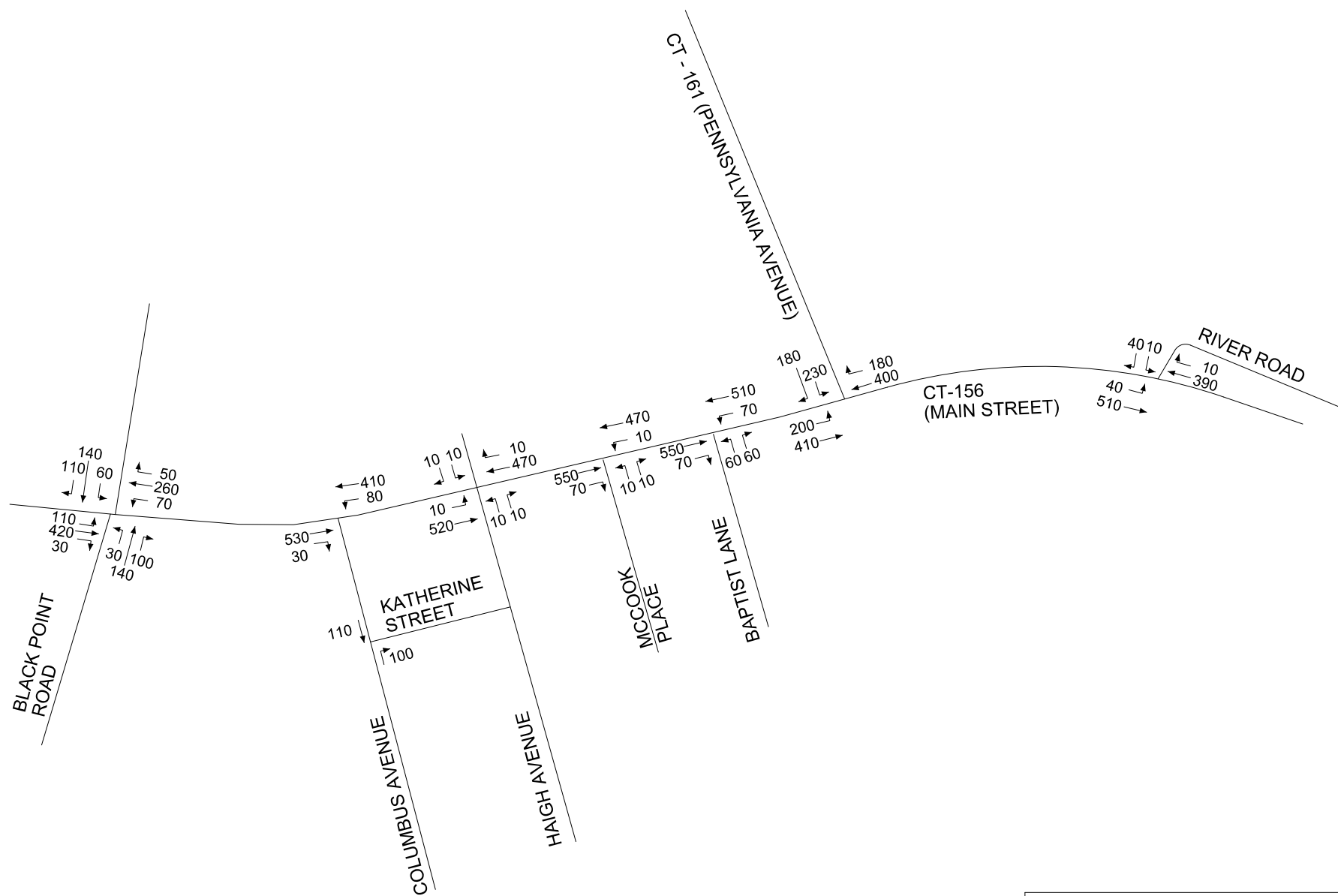
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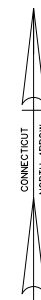
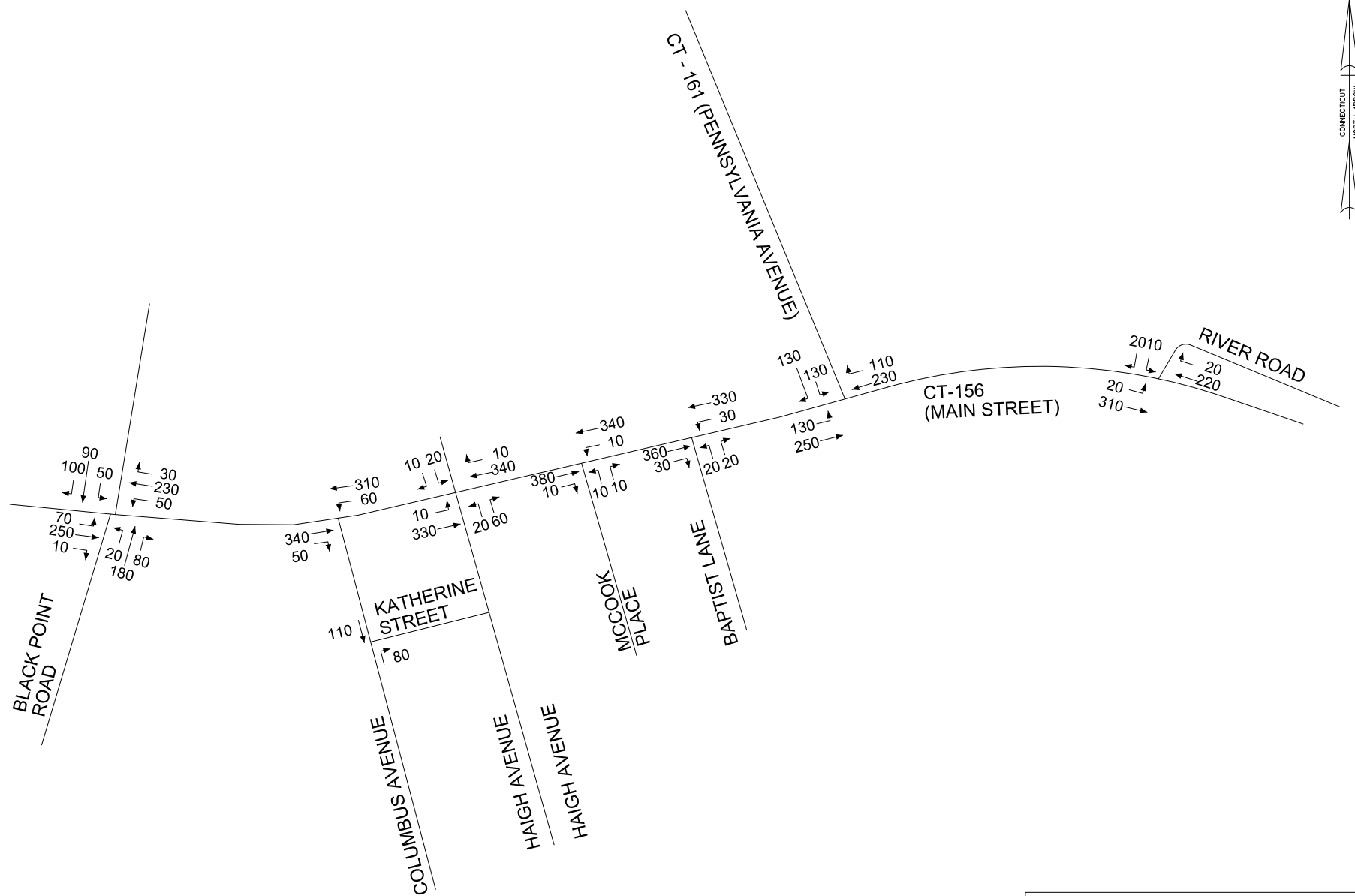
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	EXISTING (2017) TRAFFIC AM PEAK HOUR	FIG. NO. 1



AECOM

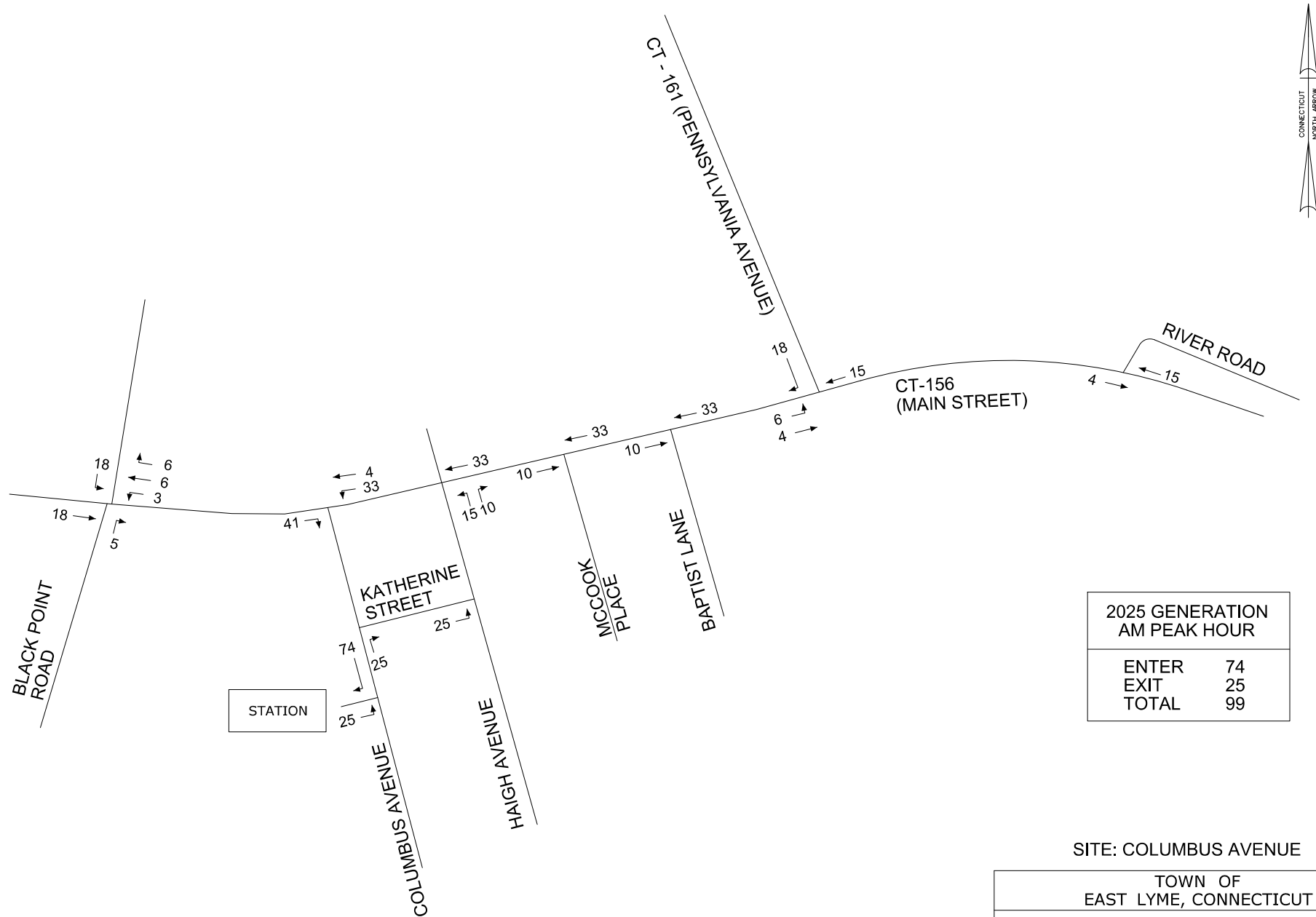
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	2017 EXISTING TRAFFIC PM PEAK HOUR	FIG. NO. 2





AECOM

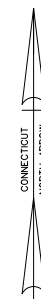
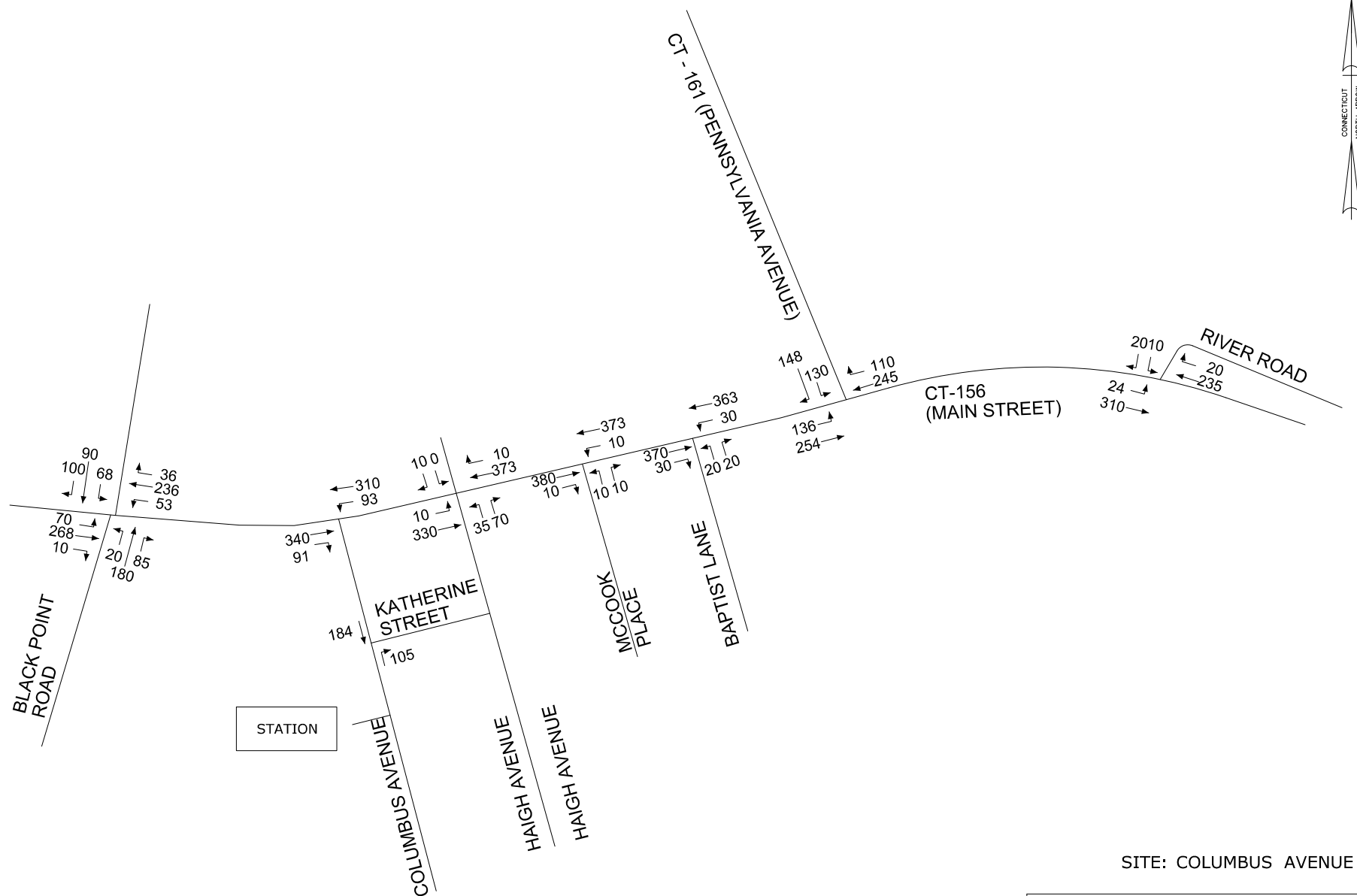
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	BACKGROUND (2025) TRAFFIC AM PEAK HOUR	FIG. NO. 4



SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC AM PEAK HOUR	FIG. NO. 5

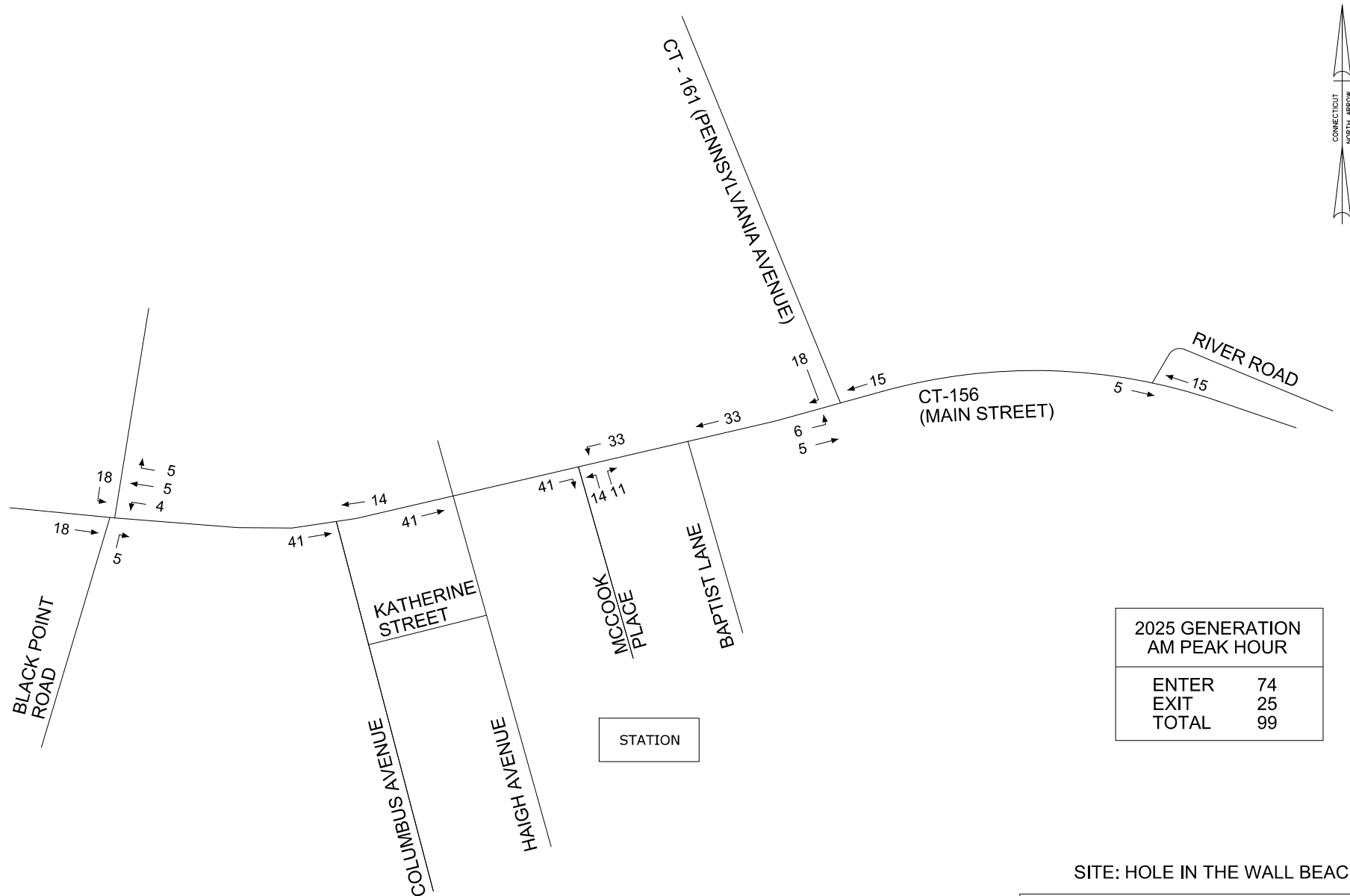
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC AM PEAK HOUR	FIG. NO. 6

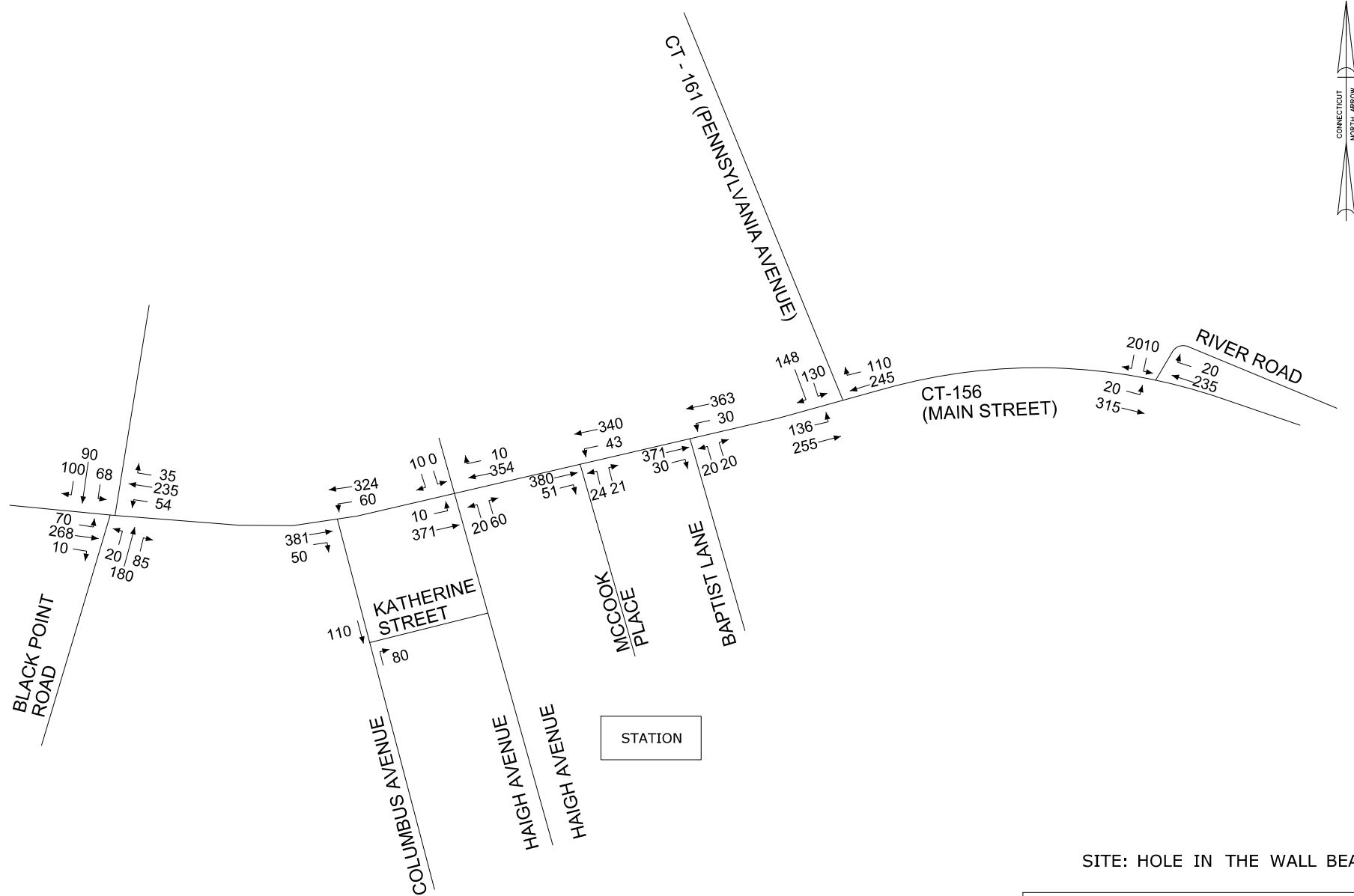
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2025 GENERATION AM PEAK HOUR	
ENTER	74
EXIT	25
TOTAL	99

SITE: HOLE IN THE WALL BEACH

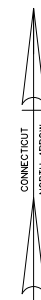
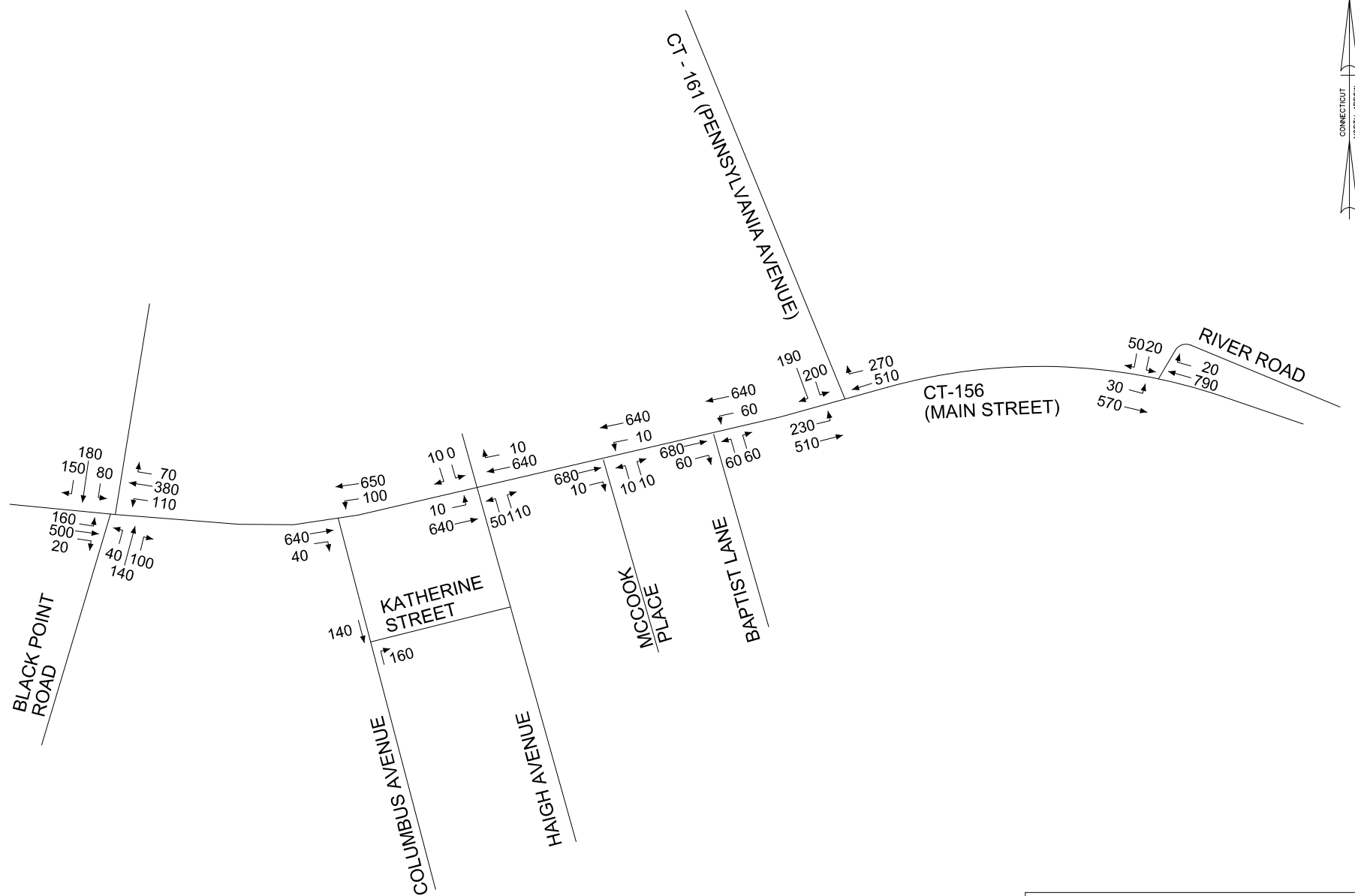
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC AM PEAK HOUR	FIG. NO. 7

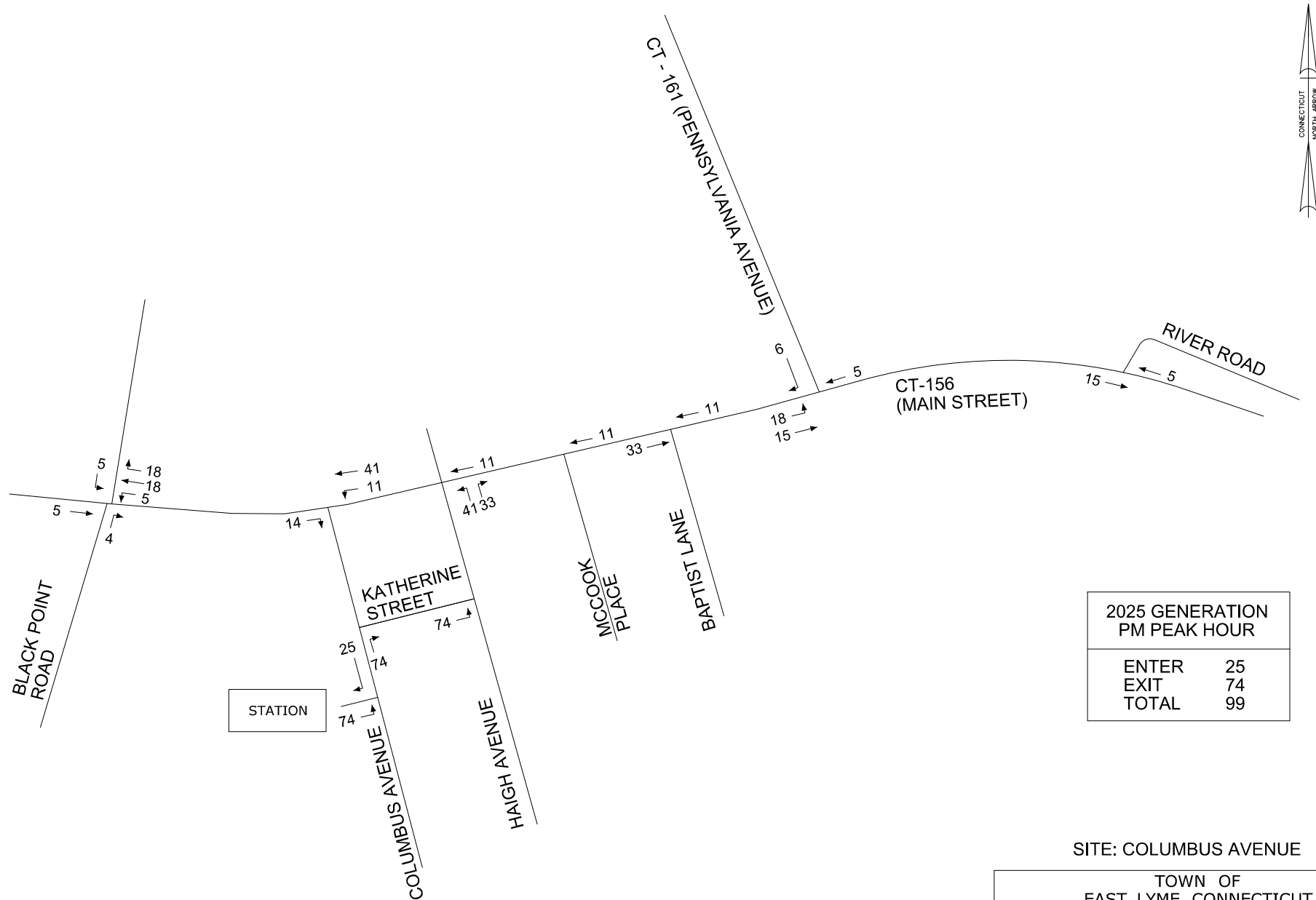


SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC AM PEAK HOUR	FIG. NO. 8

AECOM

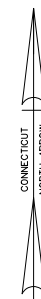
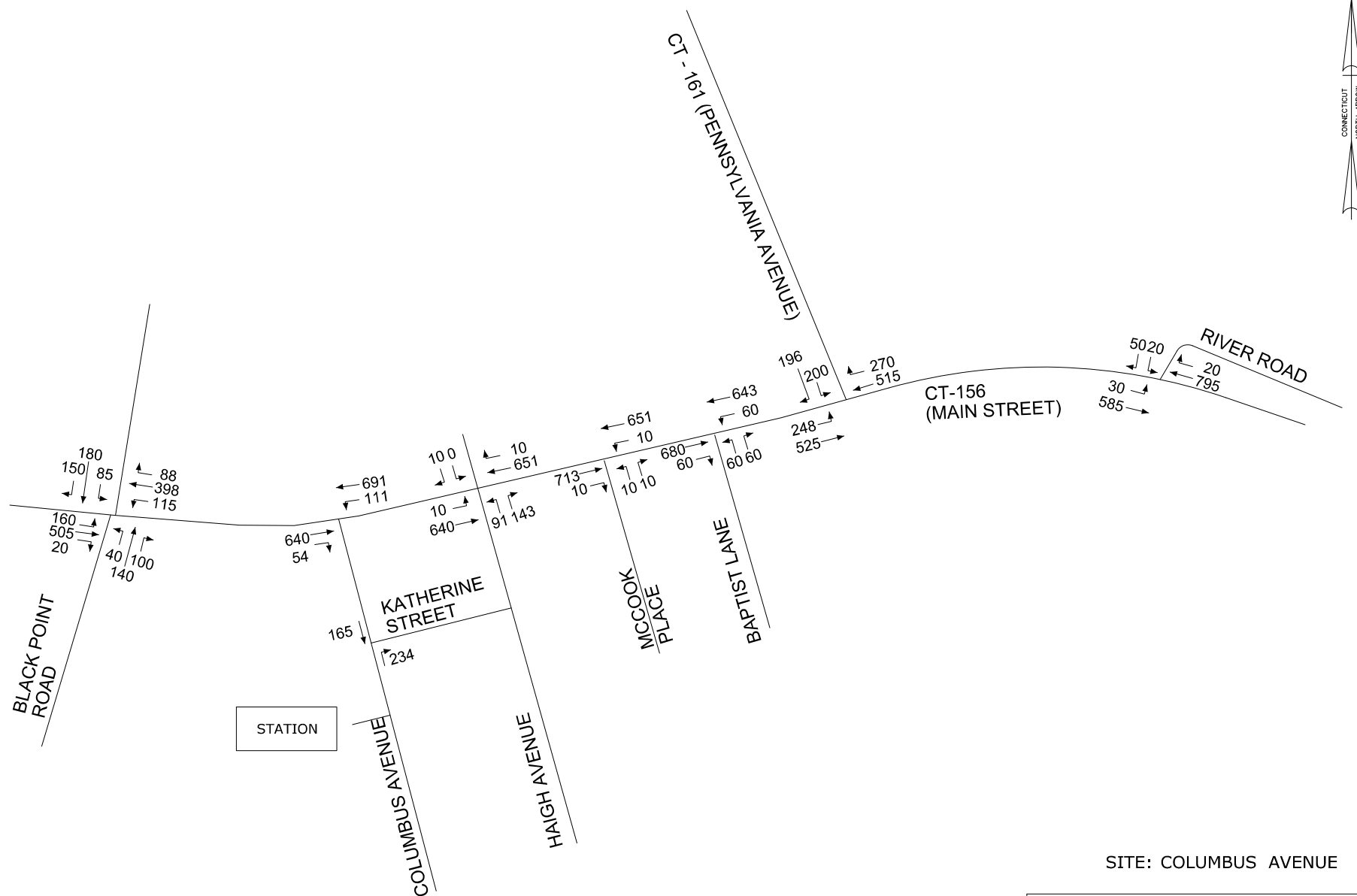




SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC PM PEAK HOUR	FIG. NO. 10

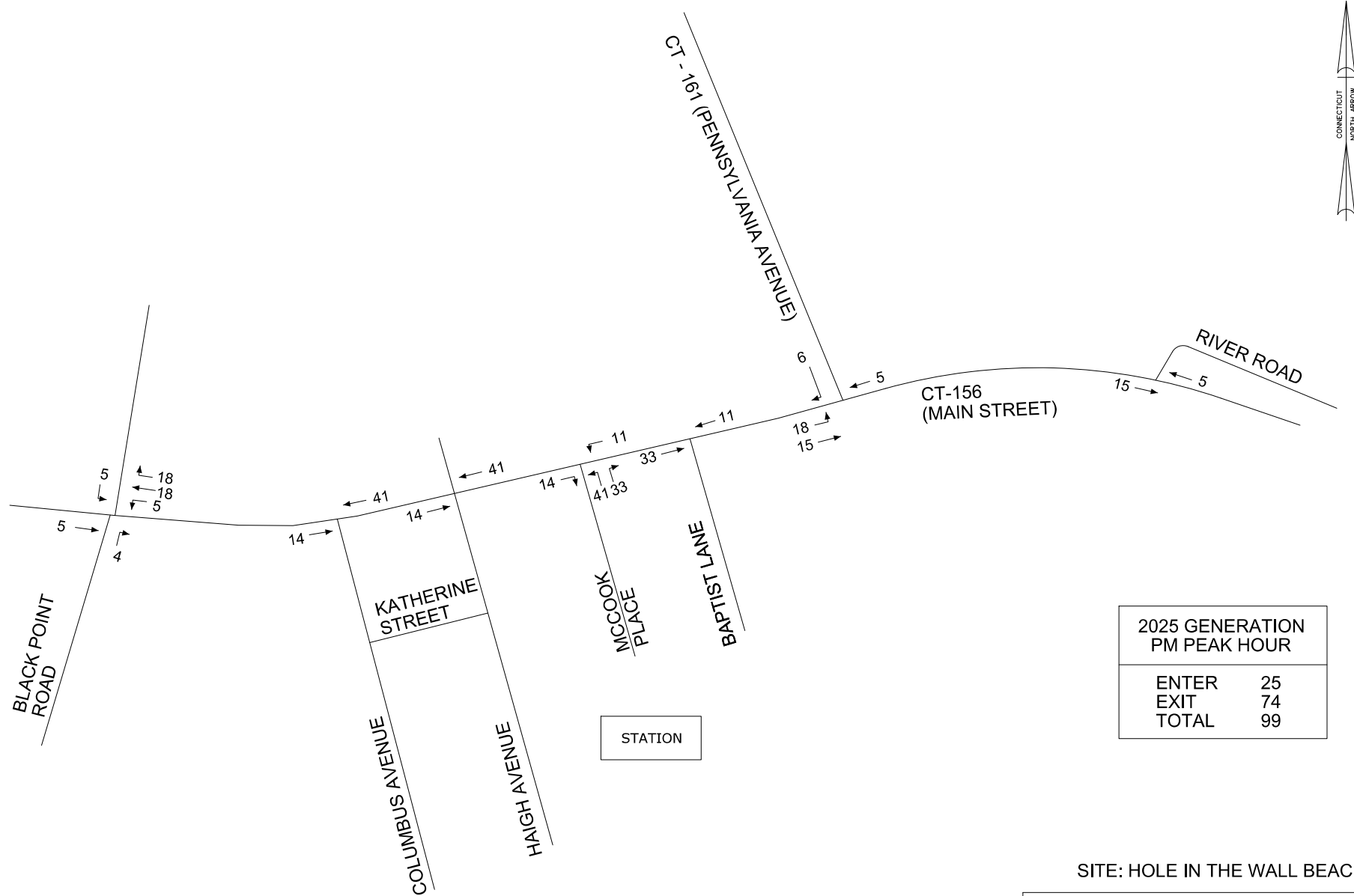
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC PM PEAK HOUR	FIG. NO. 11

AECOM



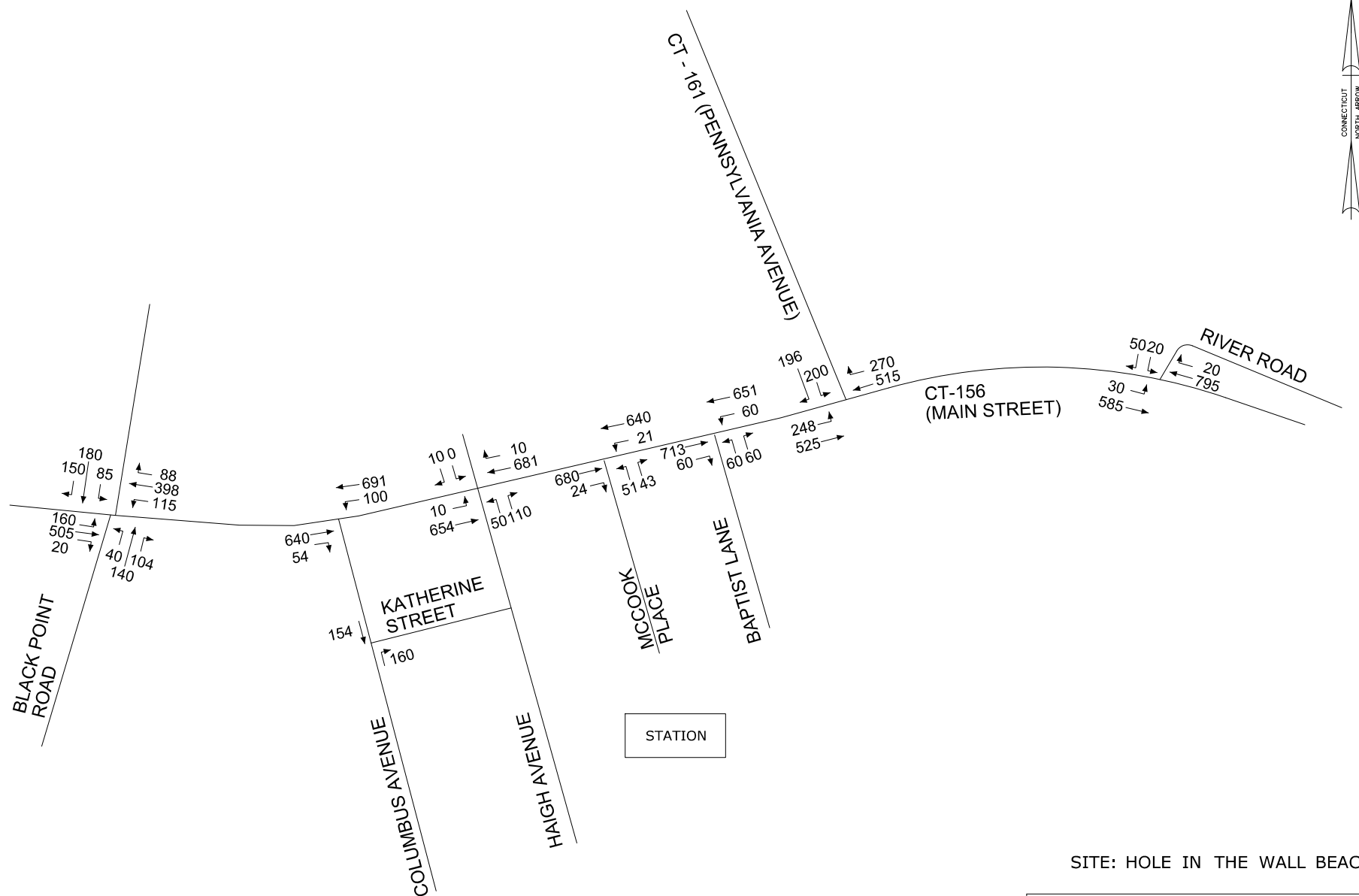
2025 GENERATION
PM PEAK HOUR

ENTER	25
EXIT	74
TOTAL	99

SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC PM PEAK HOUR	FIG. NO. 12

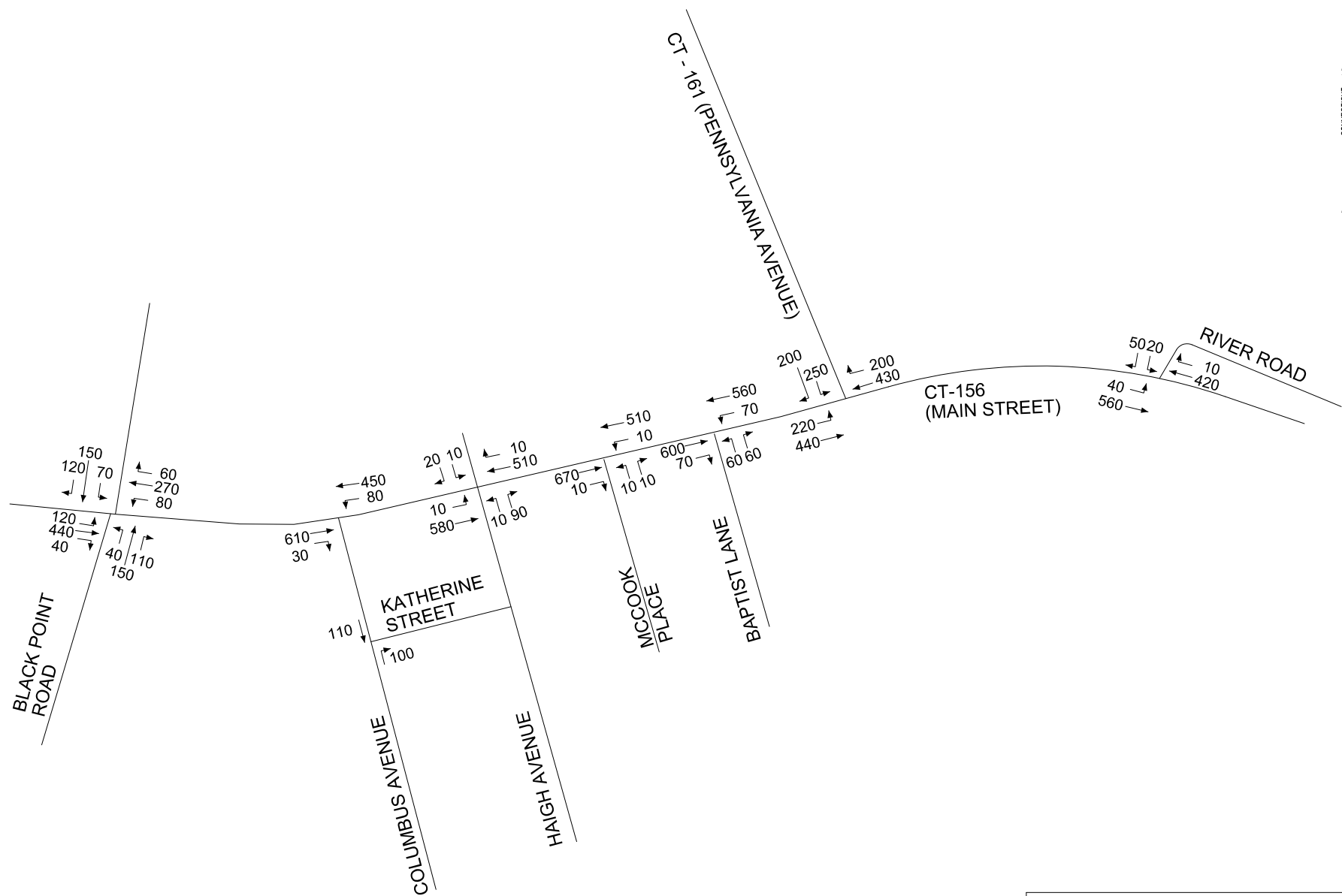
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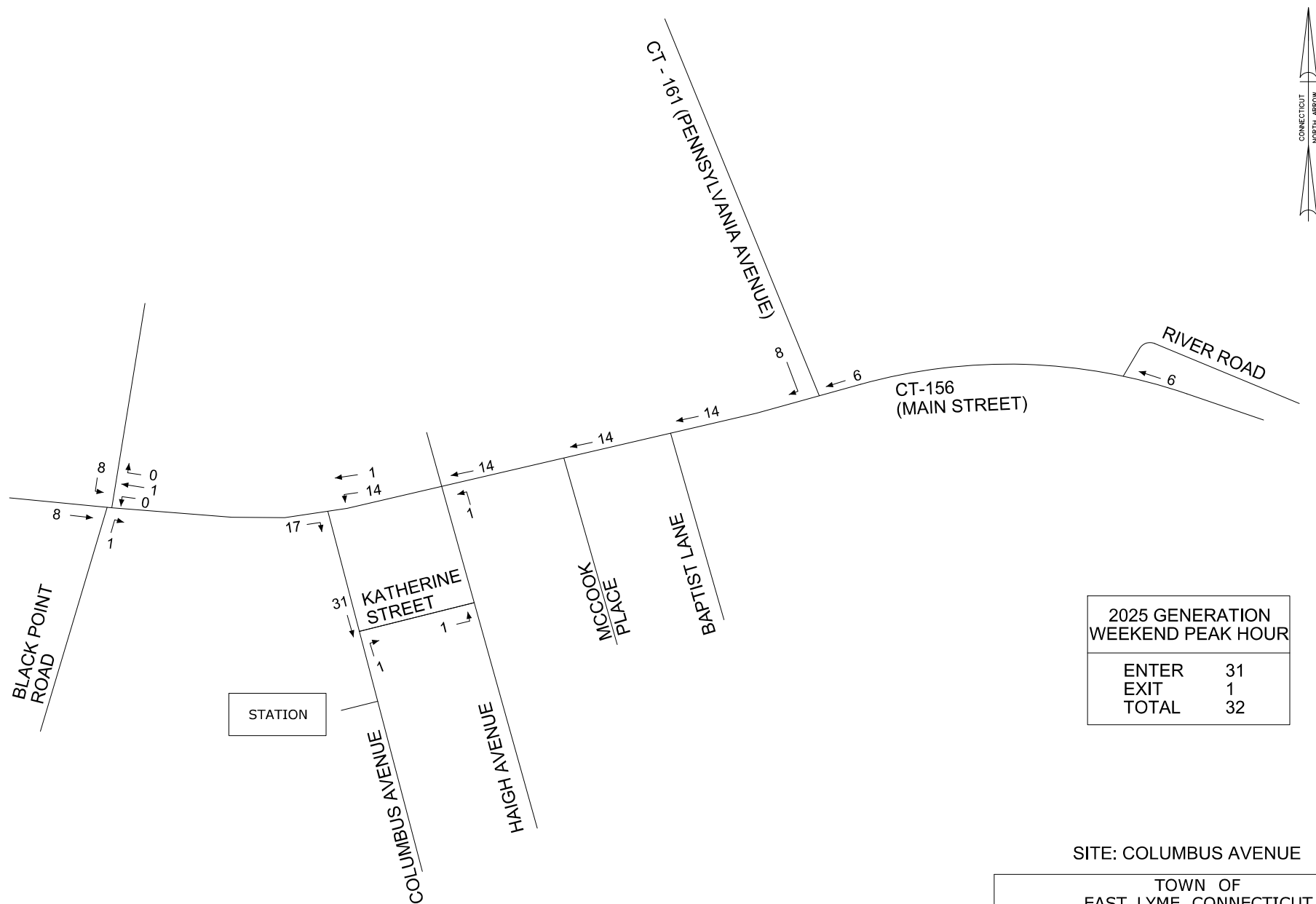
SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC PM PEAK HOUR	FIG. NO. 13

AECOM



TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	BACKGROUND (2025) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 14

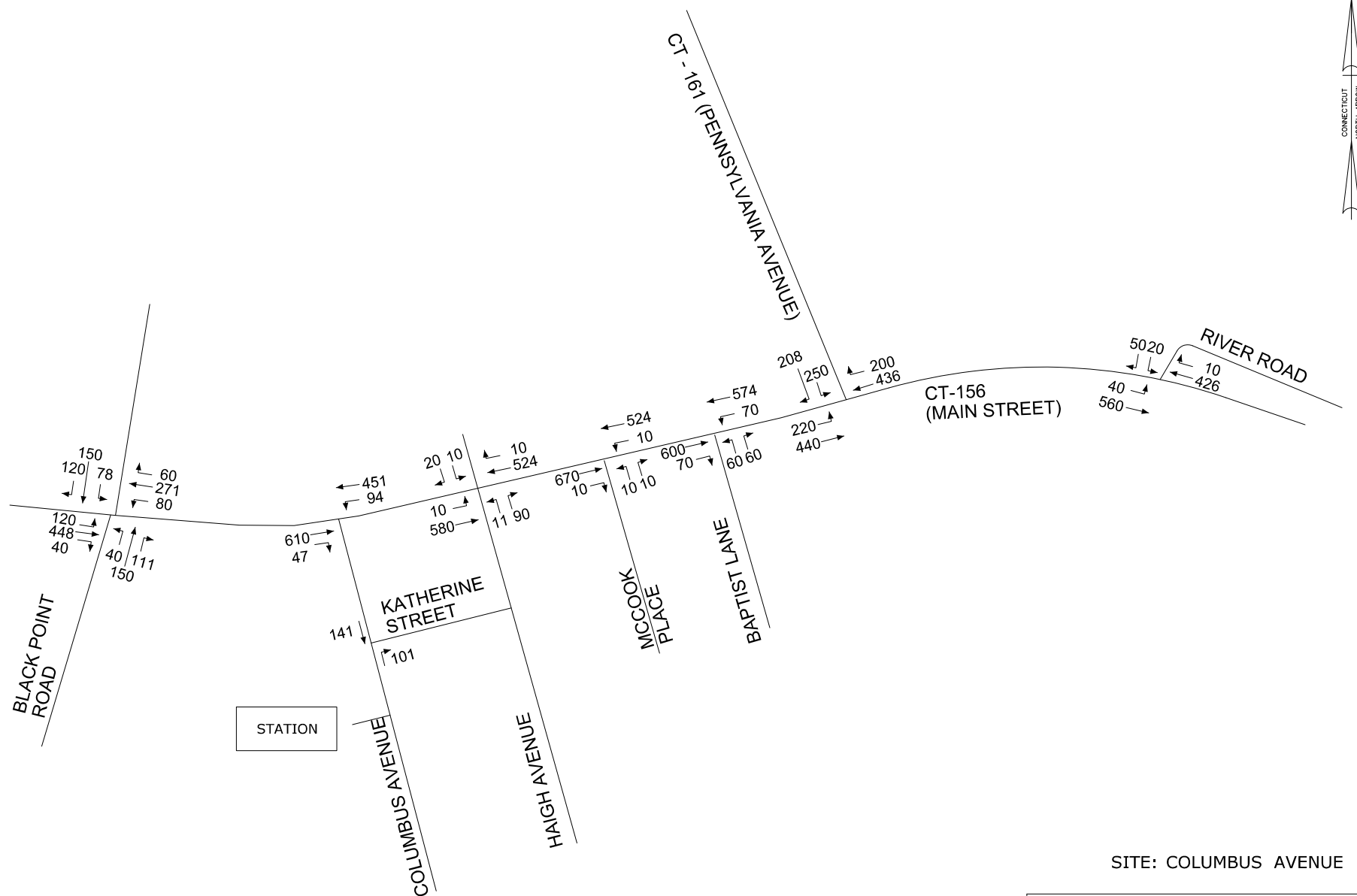


2025 GENERATION WEEKEND PEAK HOUR	
ENTER	31
EXIT	1
TOTAL	32

SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 15

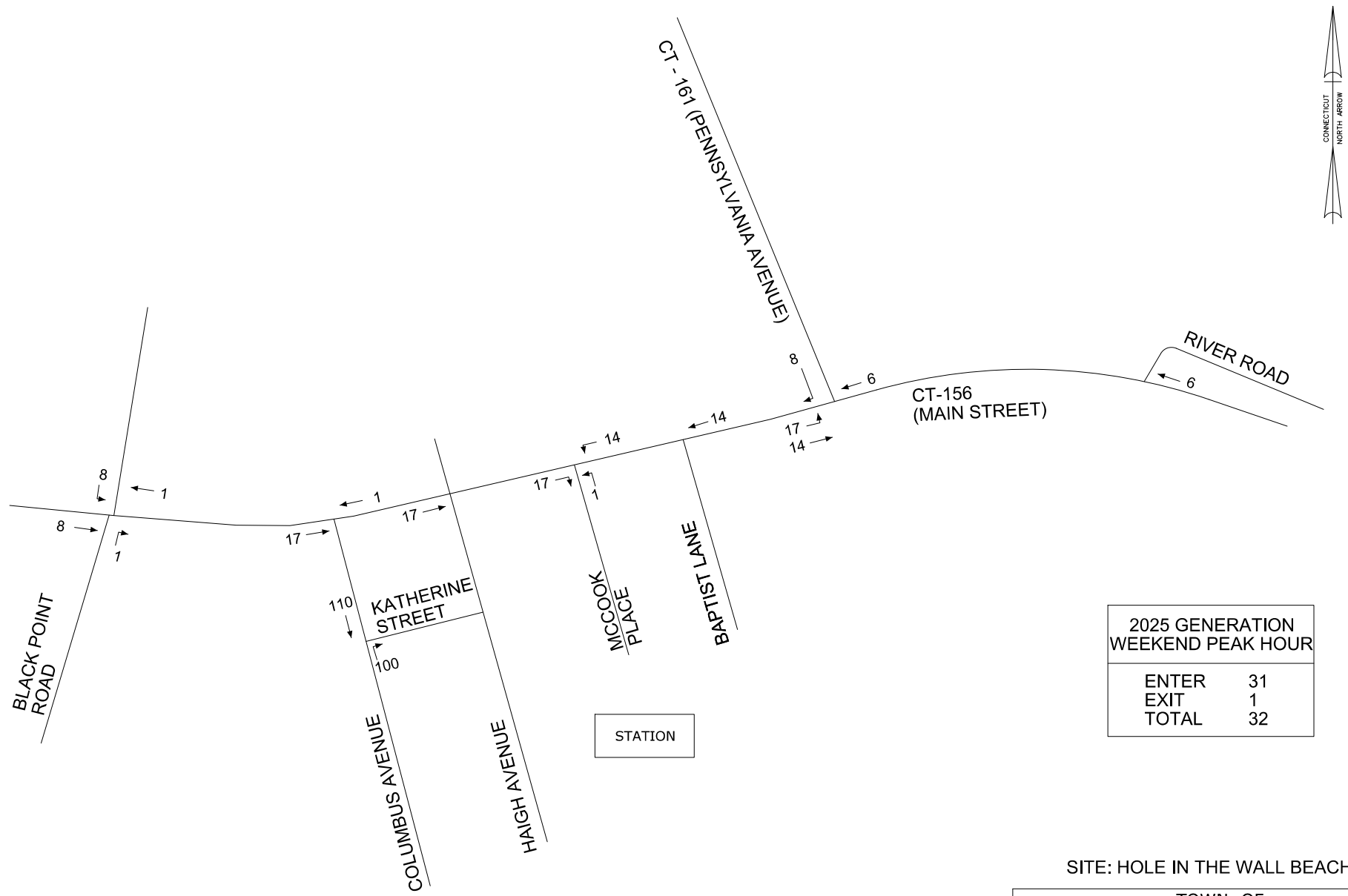
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 16

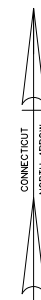
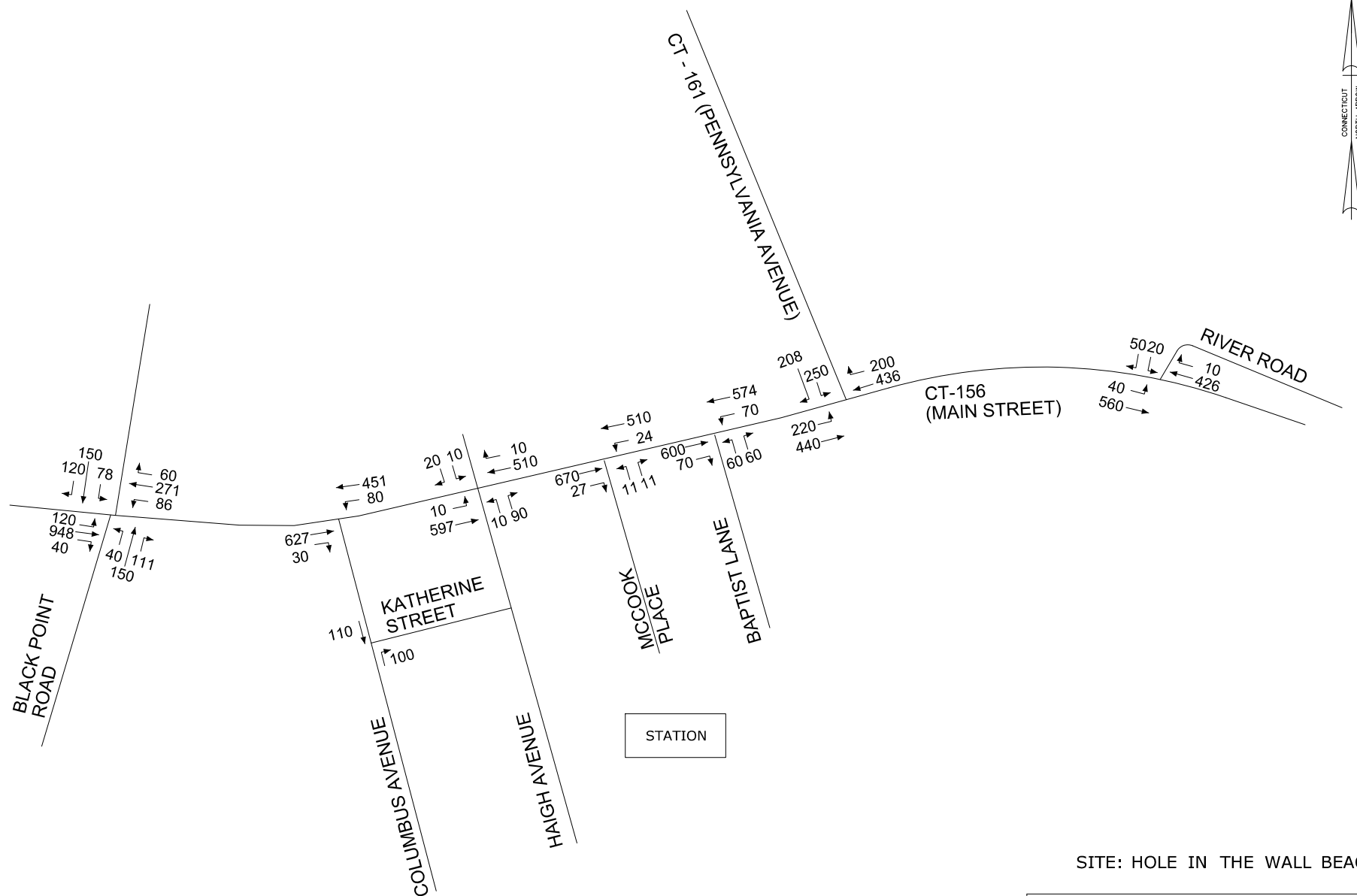
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2025 GENERATION WEEKEND PEAK HOUR	
ENTER	31
EXIT	1
TOTAL	32

SITE: HOLE IN THE WALL BEACH

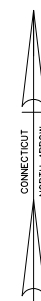
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2025) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 17

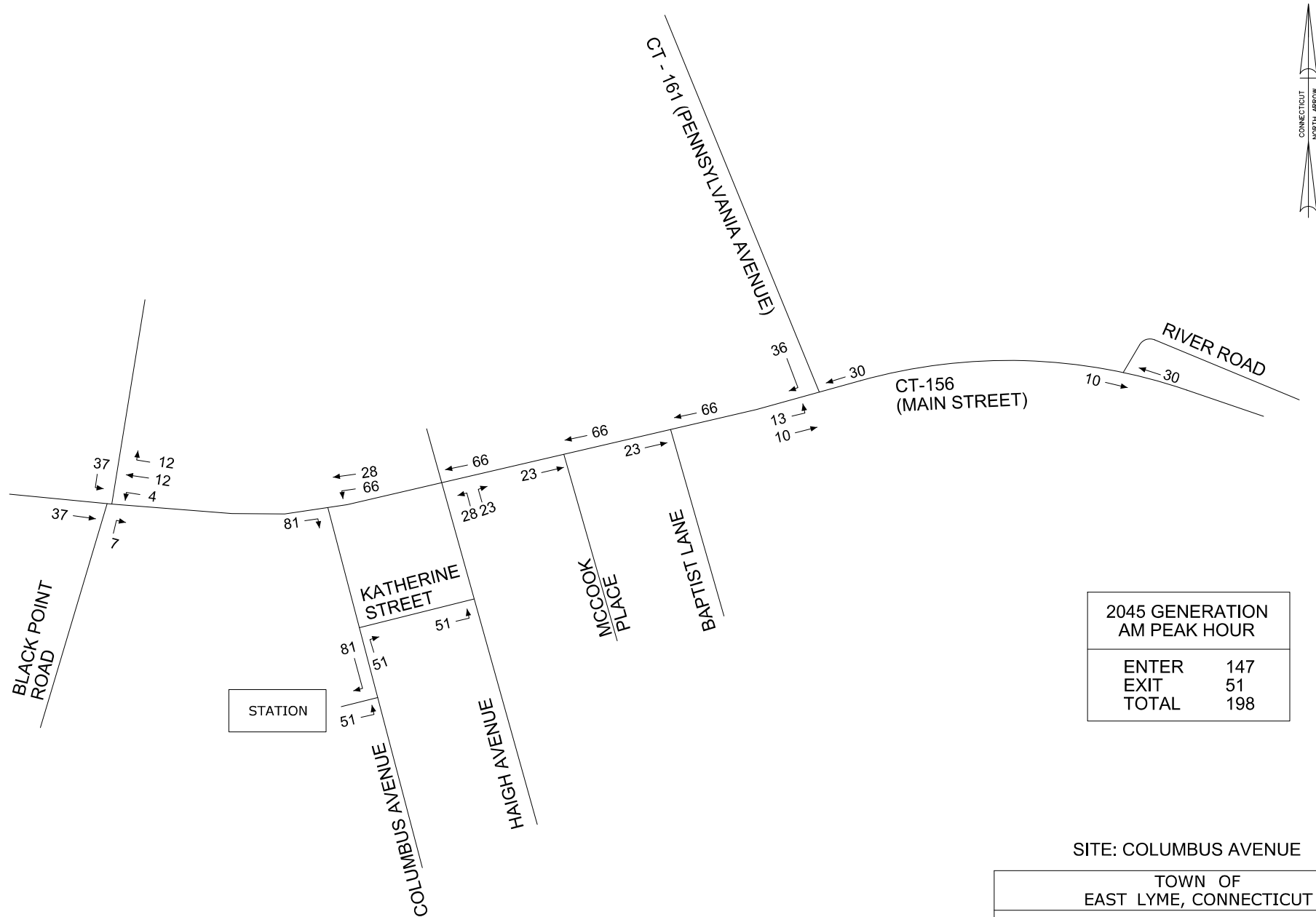


SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2025) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 18

AECOM





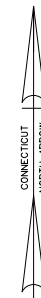
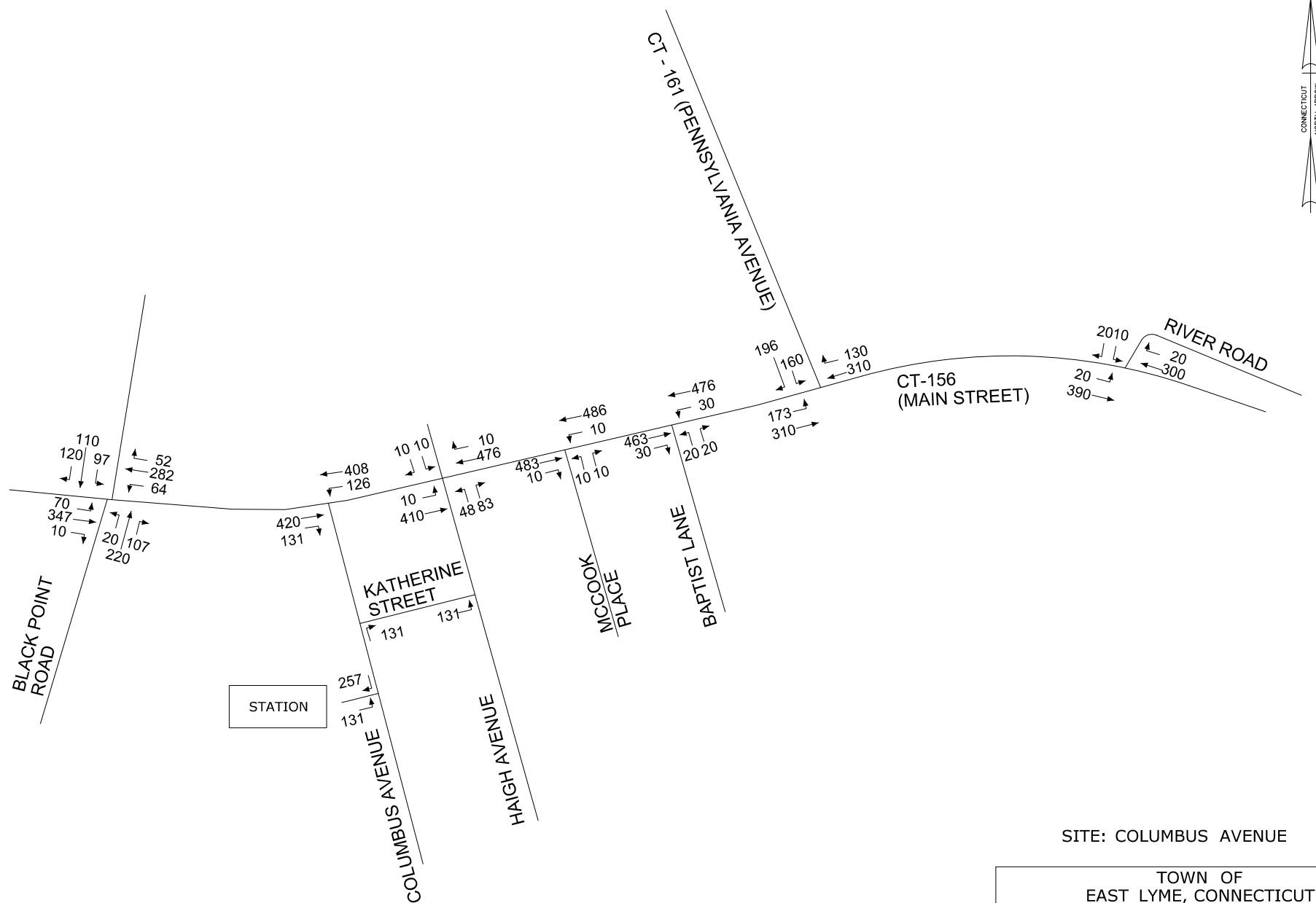
2045 GENERATION
AM PEAK HOUR

ENTER	147
EXIT	51
TOTAL	198

SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC AM PEAK HOUR	FIG. NO. 20

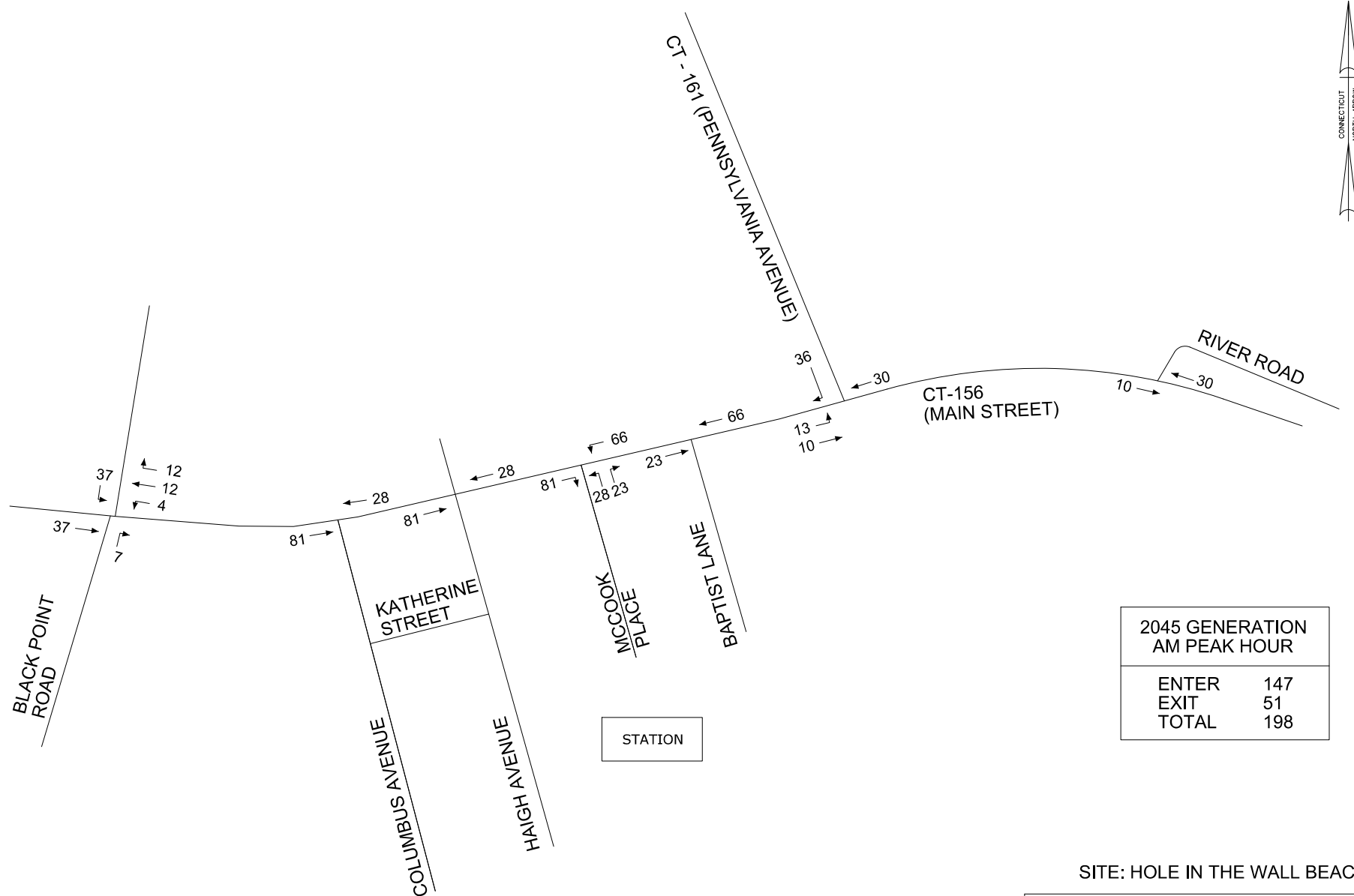
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC AM PEAK HOUR	FIG. NO. 21

AECOM



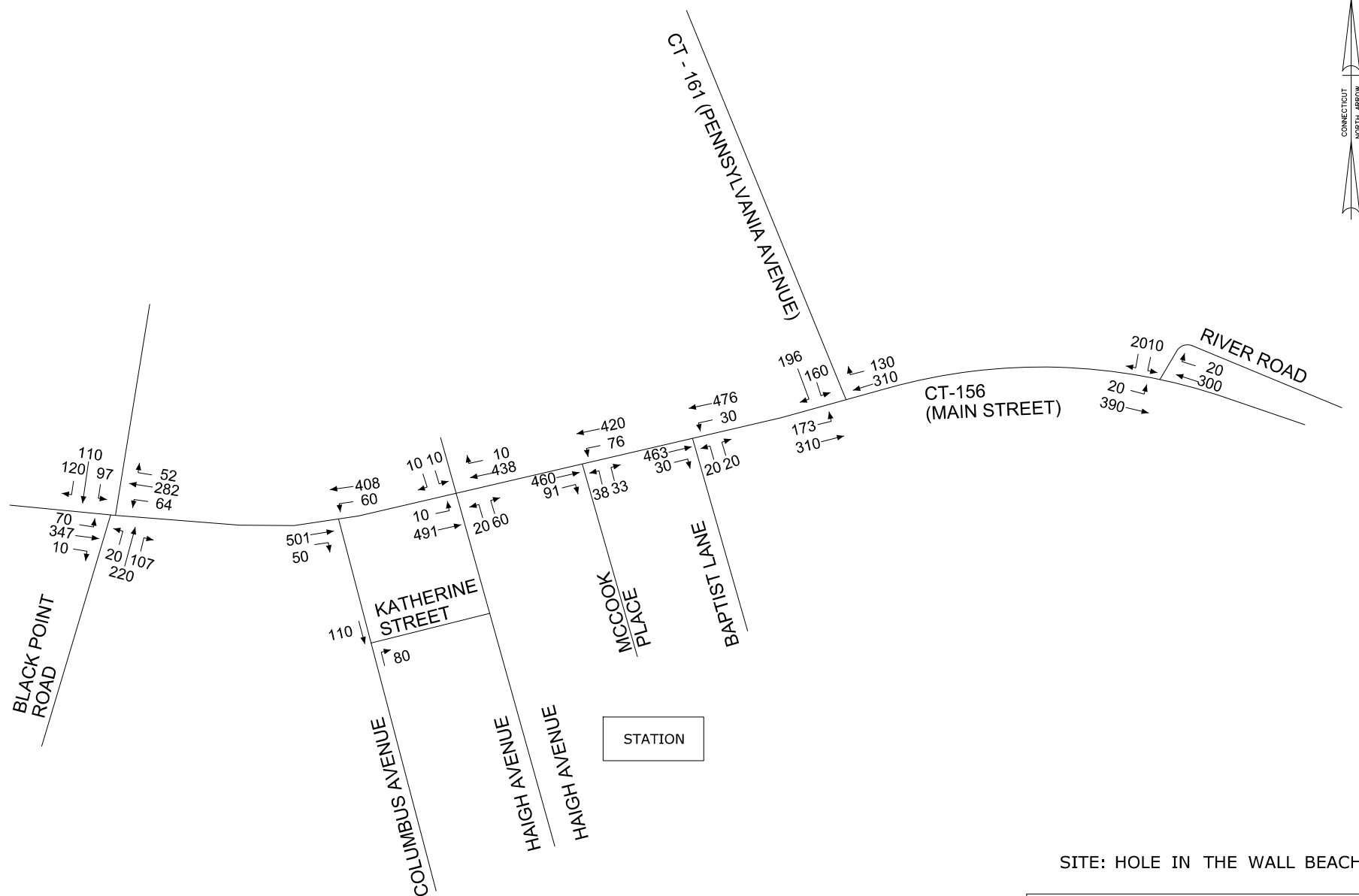
2045 GENERATION
AM PEAK HOUR

ENTER	147
EXIT	51
TOTAL	198

SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC AM PEAK HOUR	FIG. NO. 22

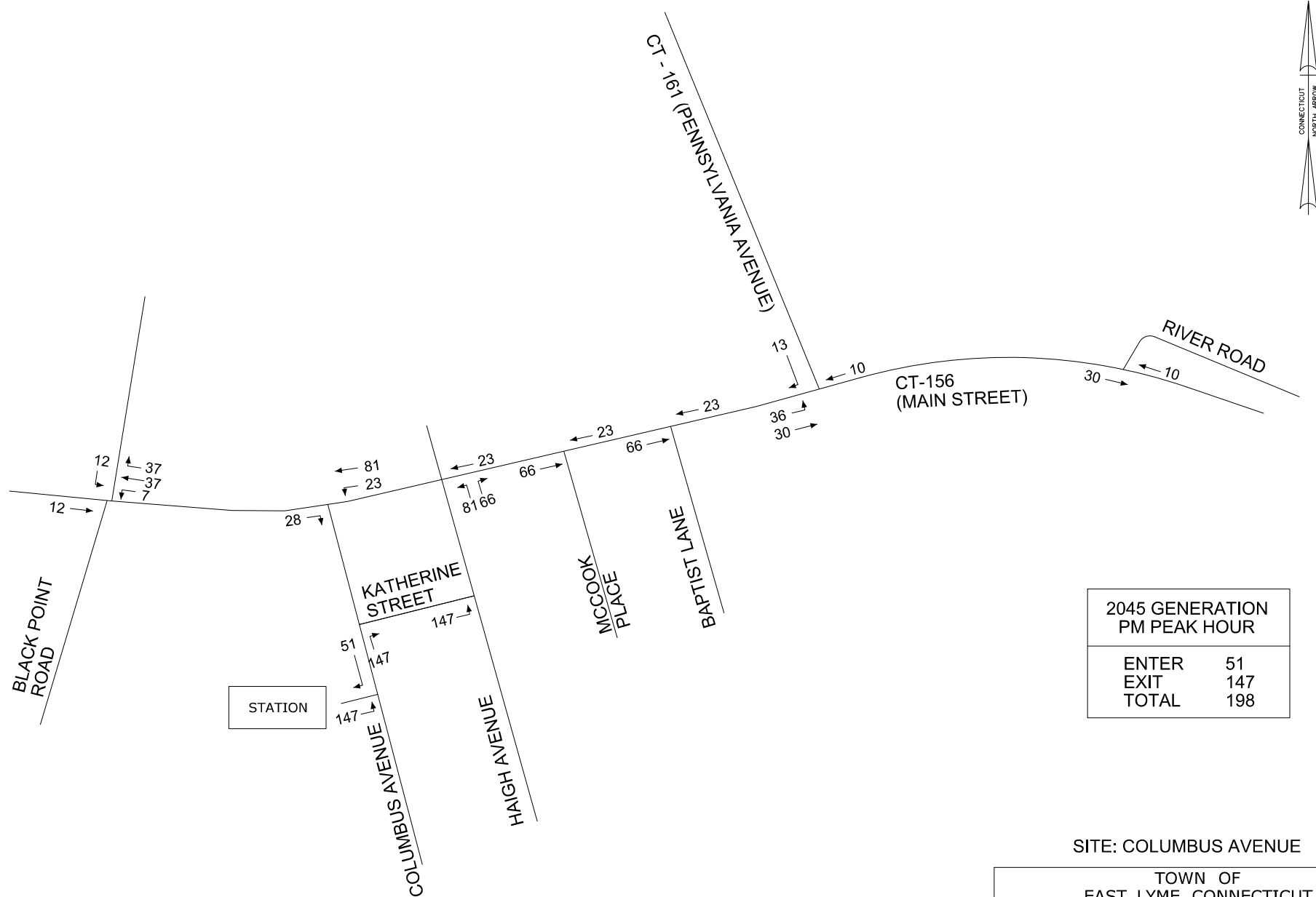
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SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC AM PEAK HOUR	FIG. NO. 23

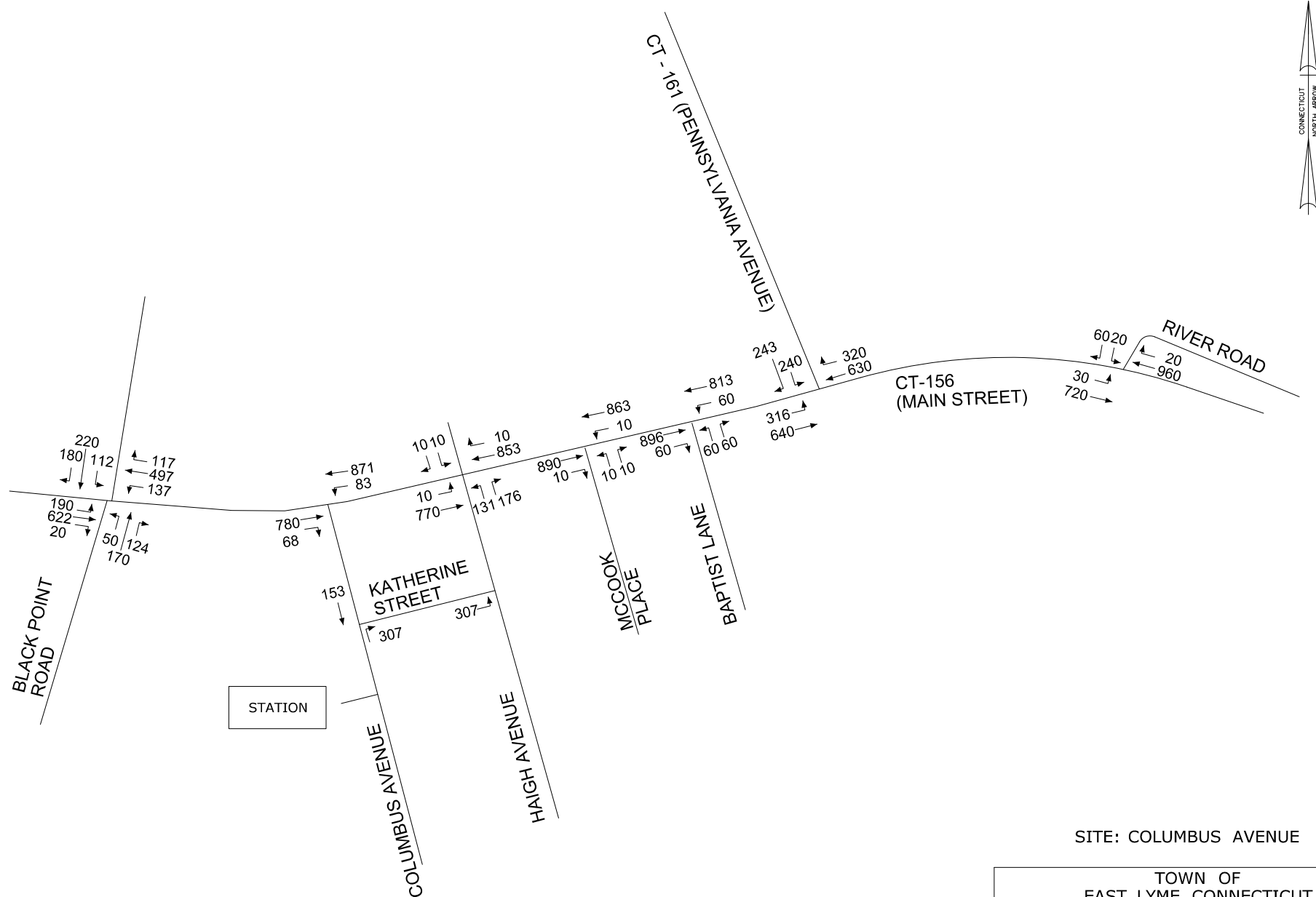
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC PM PEAK HOUR	FIG. NO. 25

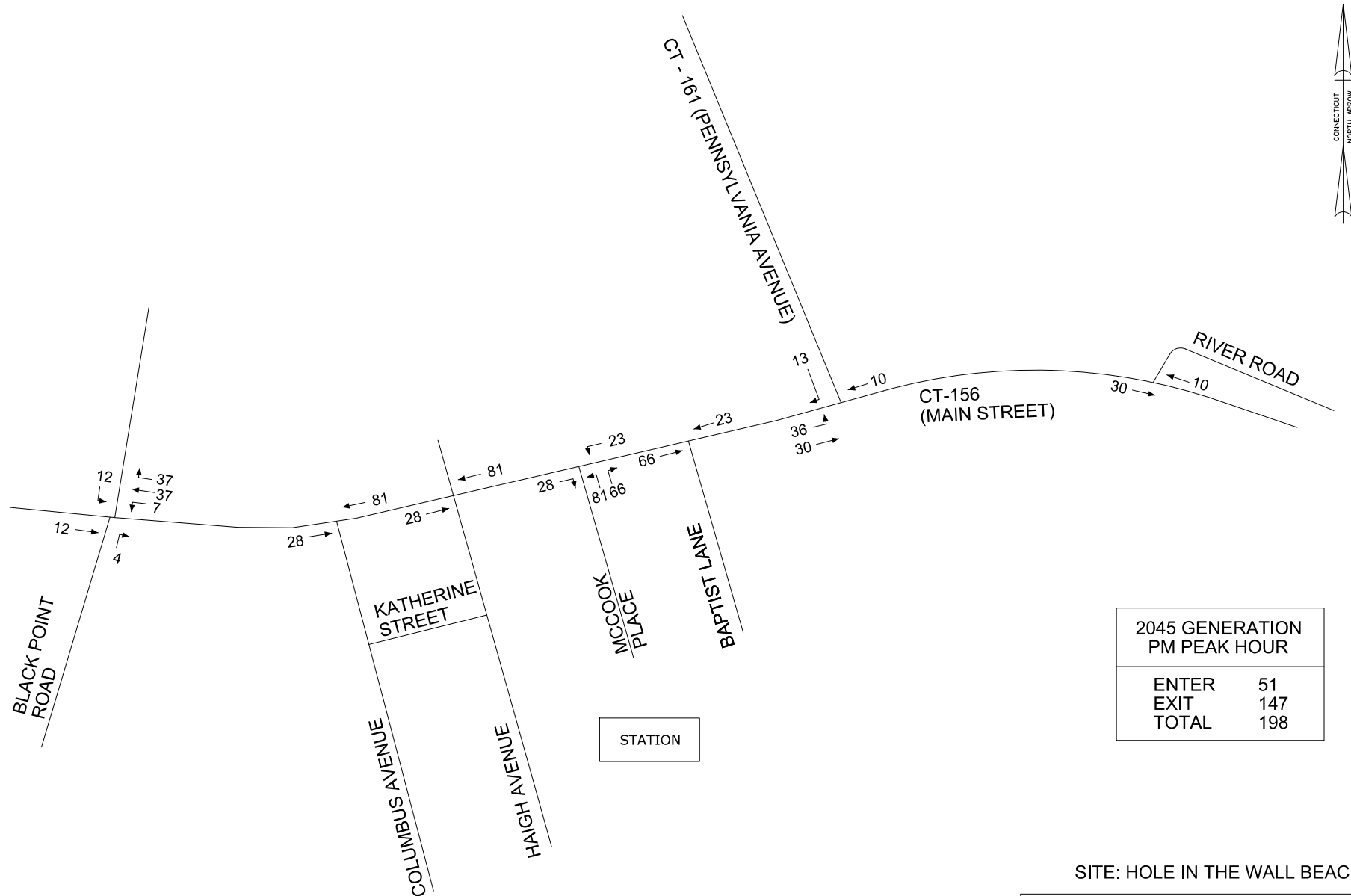
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SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC PM PEAK HOUR	FIG. NO. 26

AECOM



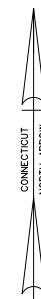
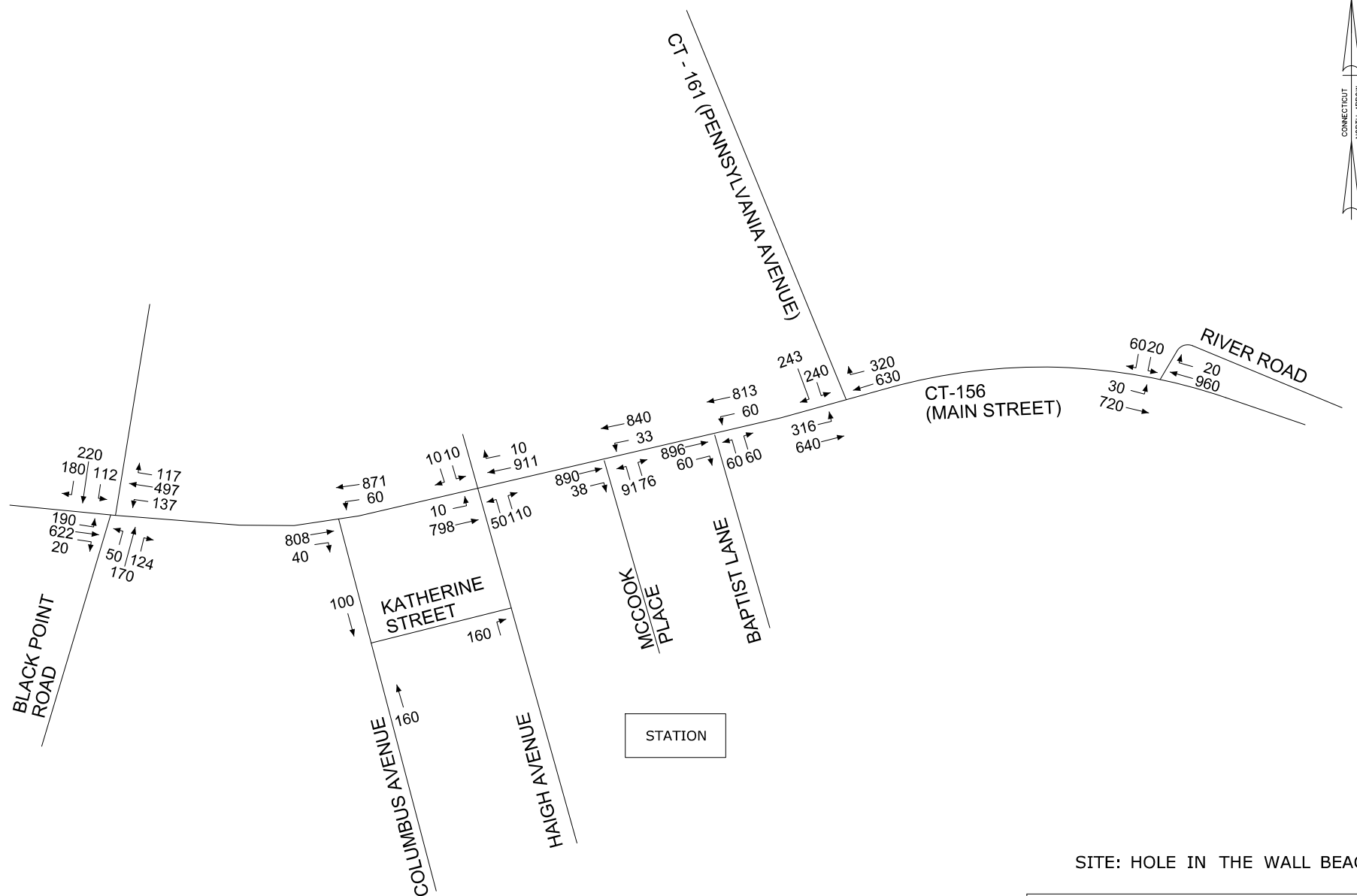
2045 GENERATION
PM PEAK HOUR

ENTER	51
EXIT	147
TOTAL	198

SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC PM PEAK HOUR	FIG. NO. 27

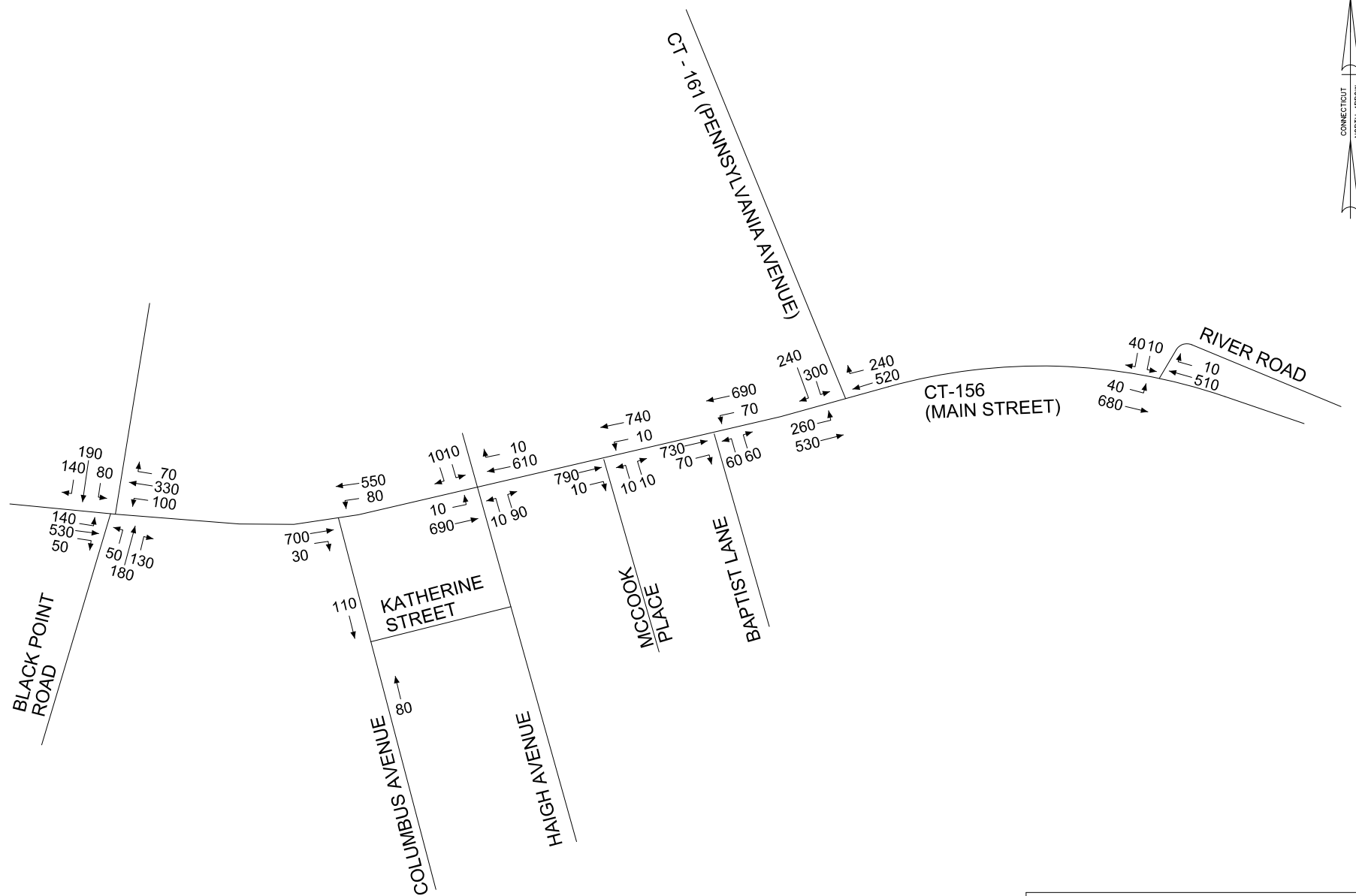
AECOM



SITE: HOLE IN THE WALL BEACH

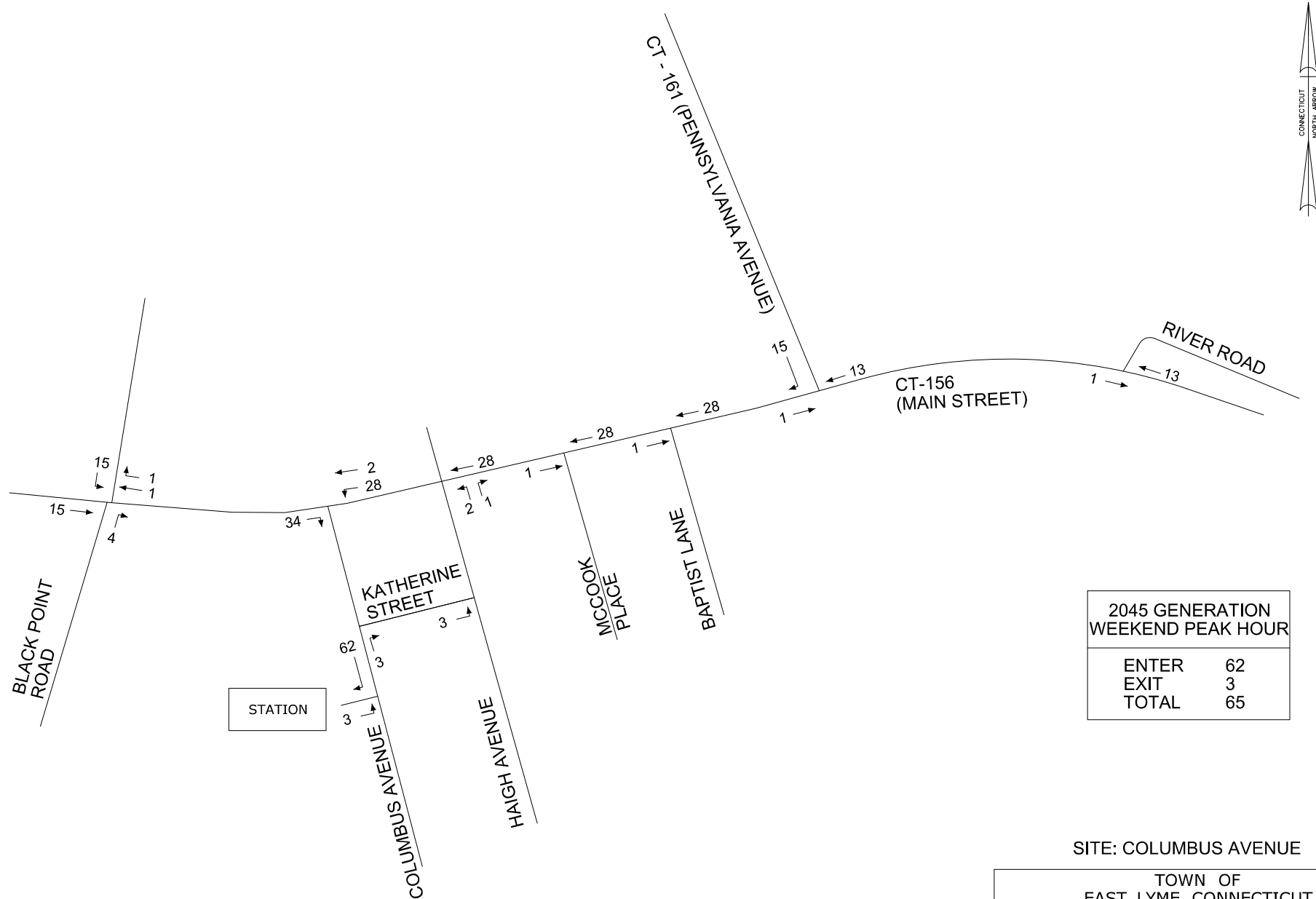
TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC PM PEAK HOUR	FIG. NO. 28

AECOM



TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	BACKGROUND (2045) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 29

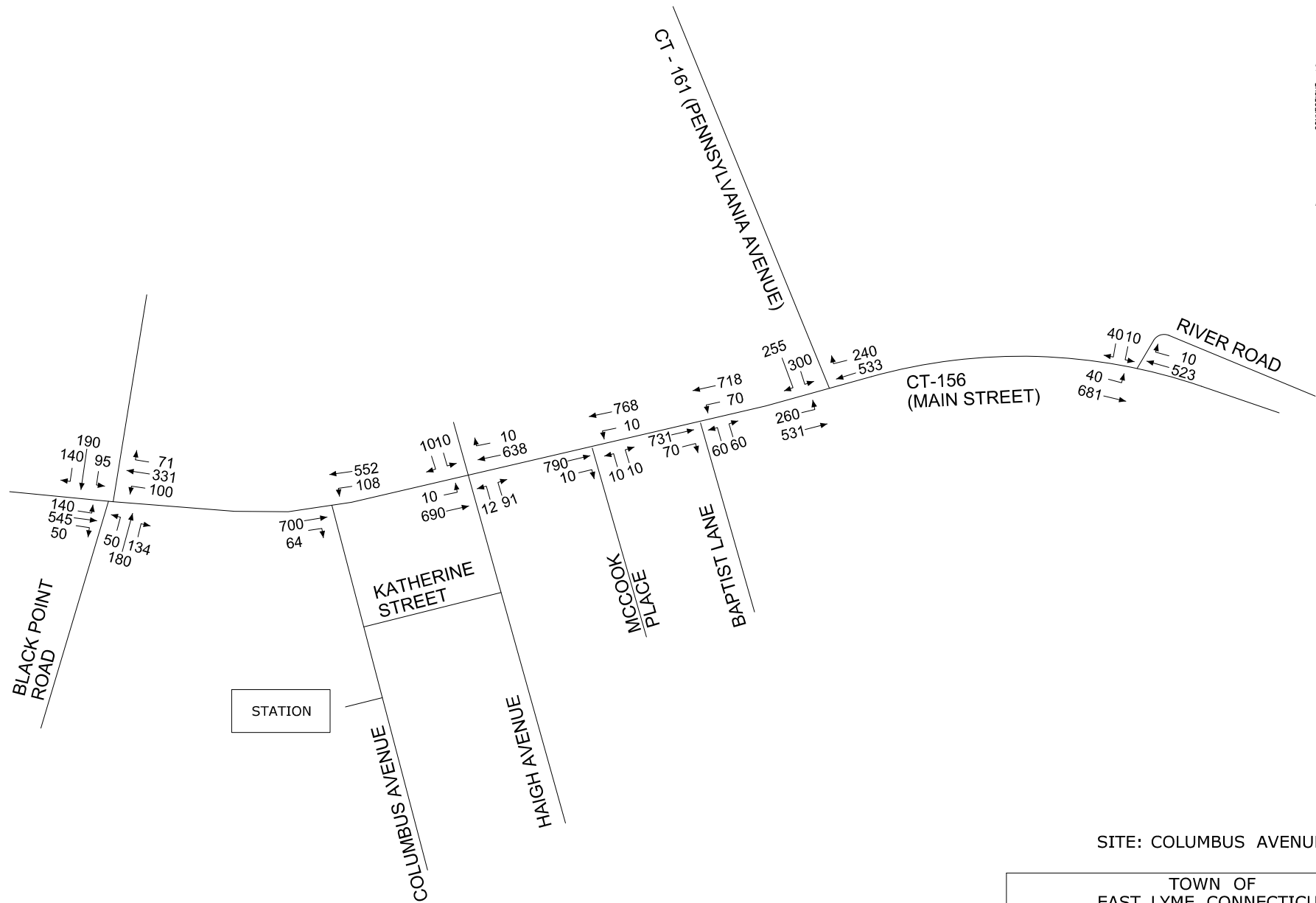
AECOM



SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 30

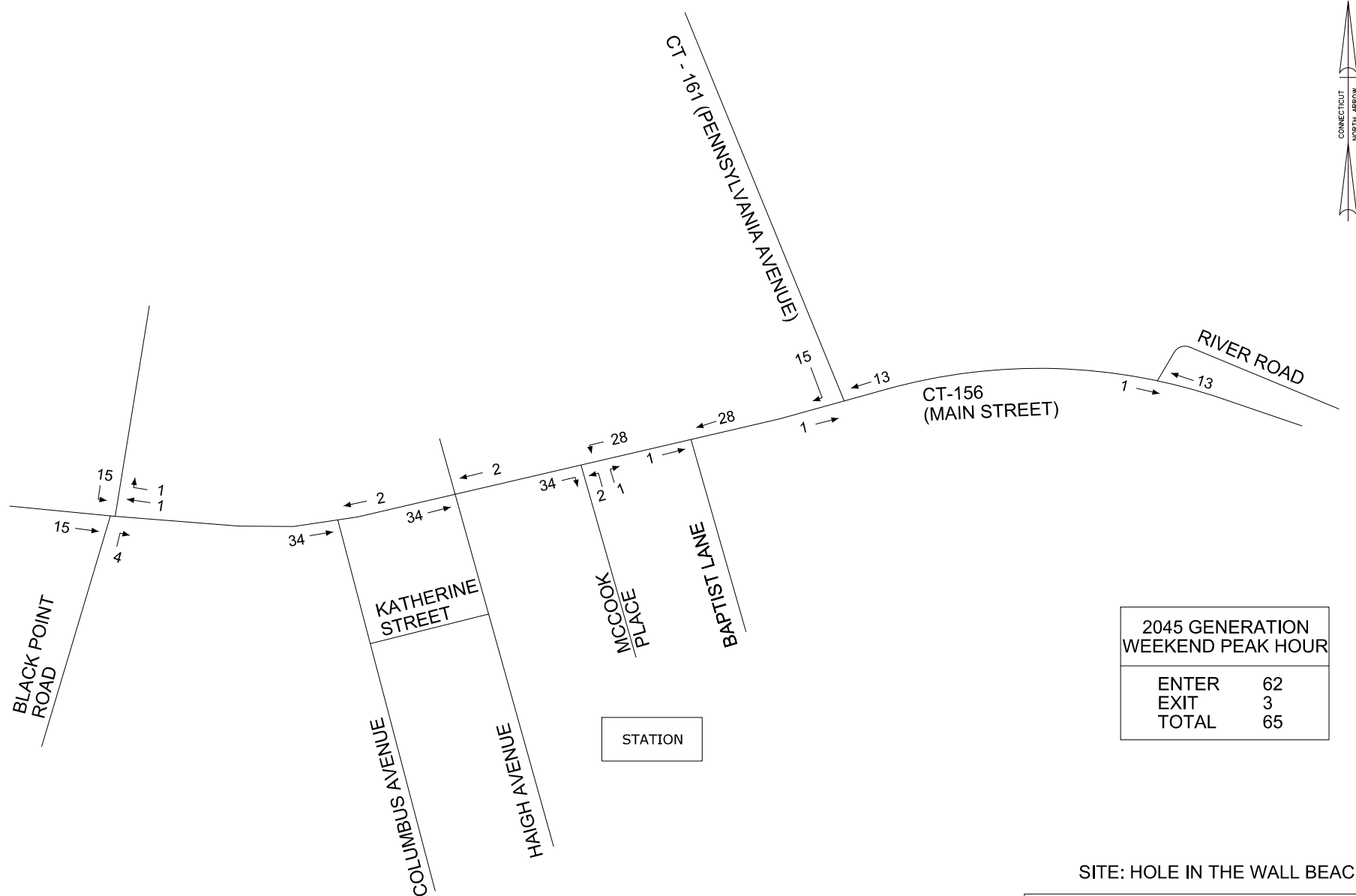
AECOM



SITE: COLUMBUS AVENUE

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 31

AECOM

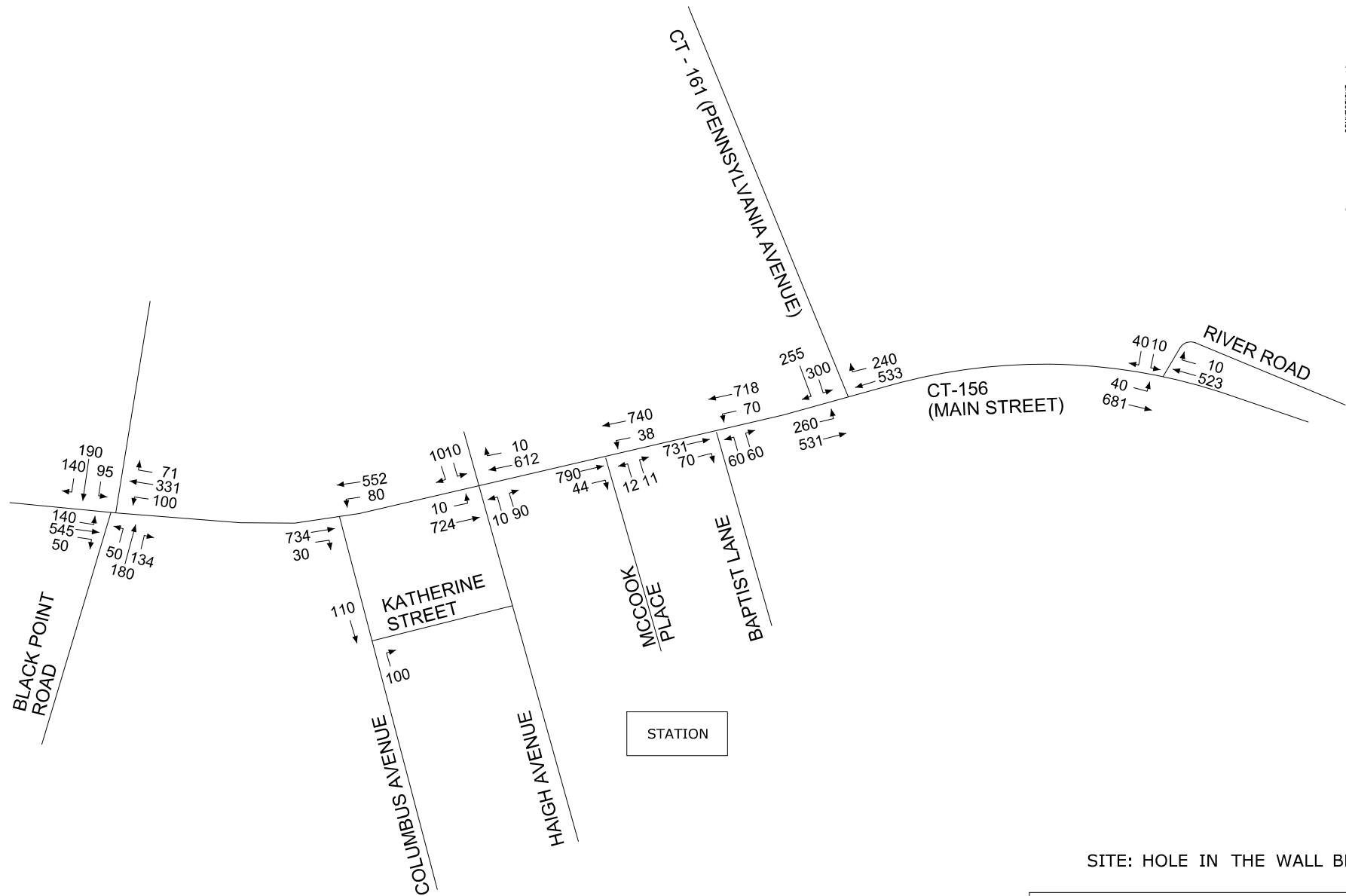


2045 GENERATION WEEKEND PEAK HOUR	
ENTER	62
EXIT	3
TOTAL	65

SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	SITE GENERATED (2045) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 32

AECOM



SITE: HOLE IN THE WALL BEACH

TOWN OF EAST LYME, CONNECTICUT		
CONNECTICUT STATION STOP SHORE LINE EAST		
2018	COMBINED (2045) TRAFFIC WEEKEND PEAK HOUR	FIG. NO. 33

AECOM

Appendix 2 - Crash Data

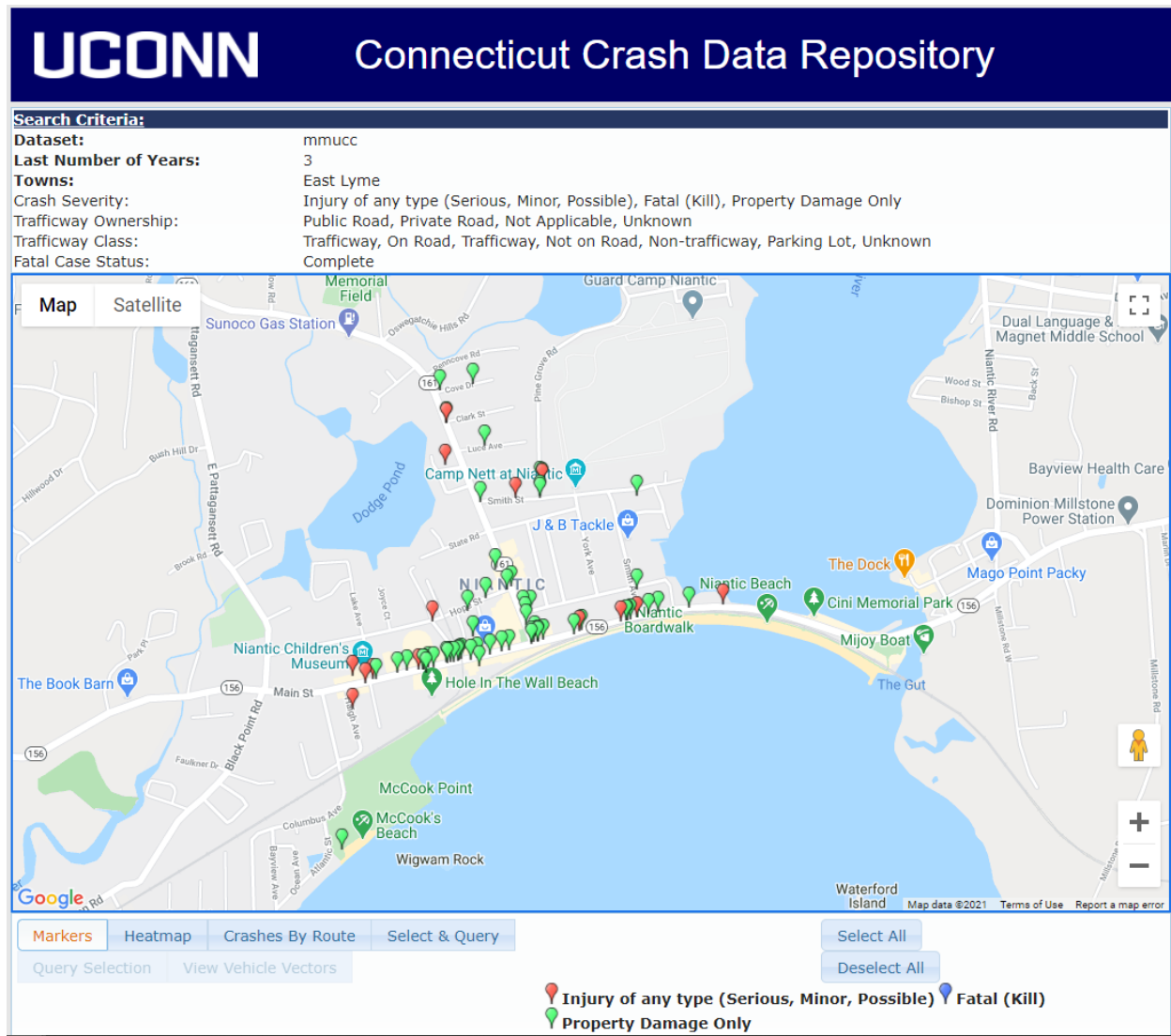


Appendix 2: Crash Data



Data: 3 years (2018-2020)

Crash Data Map



Road Surface Condition	Number of Accidents	
Dry	63	88%
Wet	8	11%
Snow	1	1%
Ice / Frost	0	0%
Unknown	0	0%
Slush	0	0%
Other	0	0%
Total	72	

Weather Condition	Number of Accidents	
Clear	63	88%
Rain	6	8%
Cloudy	2	3%
Snow	1	1%
Unknown	0	0%
Blowing Snow	0	0%
Not Applicable	0	0%
Freezing Rain or Freezing Drizzle	0	0%
Other	0	0%
Total	72	

Manner of Crash / Collision Impact	Number of Accidents	
Front to rear	29	40%
Angle	13	18%
Not Applicable	10	14%
Sideswipe, same direction	5	7%
Other	4	6%
Rear to side	3	4%
Front to front	3	4%
Sideswipe, opposite direction	2	3%
Unknown	2	3%
Rear to rear	1	1%
Total	72	

Severity Type	Number of Accidents	
Property Damage Only	58	81%
Injury of any type (Serious, Minor, Possible)	14	19%
Fatal (Kill)	0	0%
Total	72	

Light Condition	Number of Accidents	
Daylight	56	78%
Dark-Lighted	11	15%

Dark-Not Lighted	4	6%
Unknown	1	1%
Dusk	0	0%
Dark-Unknown Lighting	0	0%
Dawn	0	0%
Other	0	0%
Total	72	

Time of Accident		Number of Accidents	
0:00	0:59	0	0%
1:00	1:59	0	0%
2:00	2:59	0	0%
3:00	3:59	0	0%
4:00	4:59	0	0%
5:00	5:59	0	0%
6:00	6:59	2	3%
7:00	7:59	2	3%
8:00	8:59	2	3%
9:00	9:59	2	3%
10:00	10:59	2	3%
11:00	11:59	5	7%
12:00	12:59	4	6%
13:00	13:59	8	11%
14:00	14:59	4	6%
15:00	15:59	7	10%
16:00	16:59	10	14%
17:00	17:59	9	13%
18:00	18:59	4	6%
19:00	19:59	5	7%
20:00	20:59	3	4%
21:00	21:59	2	3%
22:00	22:59	1	1%
23:00	23:59	0	0%
Total		72	

Appendix 3 - Individual Site Analyses



Appendix 3: Full Site Analyses

The following section provides detailed analyses that were conducted as part of this study for each individual site. The individual site analysis includes a review of the environmental and demographic indicators, environmental and demographic mapping, and site visits. A favorability graphic is provided for each site in Figure 1 to indicate the general sentiment towards the viability of the site as a potential Niantic station. Additional details pertaining to the comparative analysis of all sites is included in Chapter “6 - Scoring of Conceptual Station Alternatives.

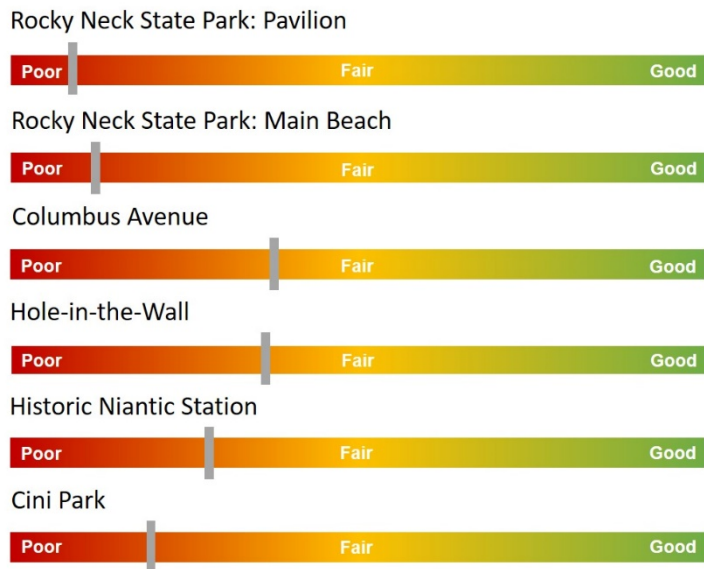


Figure 1 Conceptual Site Favorabilities

1. Rocky Neck State Park: Pavilion

This proposed station would be located towards the western end of Rocky Neck State Park near the historic pavilion structure. Due to grade constraints, it is unclear where a station could be sited at this location. The facility would need to expand on currently available parking; either the paved parking on the north side of the tracks or the larger parking facilities to the east of the proposed site.

1.1 Compatibility with Surrounding Land Uses

The Pavilion and the surrounding area are only a little over 1,500 ft from the Main Beach area (see Main Beach analysis in the previous section). The Main Beach area’s surrounding land uses also apply to the Pavilion area, therefore the compatibility concerns are identical.

Table 1 Rocky Neck Pavillion Surrounding Land Use

Surrounding Land Use	
Dominant Land Use	Recreational
Parks	Rocky Neck State Park
4F Lands	Yes
6F Lands	Yes
Dominant Zoning	Residential, Tidal Marsh
Historic Sites	Yes
Archaeological Sites	No
Antique Buildings	Yes
Antique or Historical Parcel	Yes
Stone Wall	No

1.2 Environmental Considerations

This site is located within the boundary of a Department of Energy and Environmental Protection- (DEEP) owned State Park, the land is considered protected. This site is not impacted by wetlands, tidal wetlands, or marshes; however, there are wetland soils within a quarter-mile of the site.

The site is above both the 100yr and 500yr flood zones, making it resilient to hurricanes, however, the primary beach parking area is located within a 500yr flood zone. Towards the eastern end of the parcel, Bride Brook traverses the property north to south, there is a tidal marsh associated with this surface water, as such there is a large area of wetlands in the eastern section of the parcel. The site is located within an existing or potential water supply, suitable for consumption without treatment, although it is not a current area of contribution to the public water supply. The site is located within a Natural Diversity Database Area but not a national wildlife refuge.

Table 2 Rocky Neck Pavilion Environmental Considerations

Environmental Considerations	
NDDB	Yes
National Wildlife Refuge	No
Hurricane Inundation Zone	Yes Cat. 1-4
Public Water Supply Area	Yes
Potential Water Supply Area	Yes
Tidal Wetlands	Yes
100 yr. Flood	Yes
500 yr. Flood	Yes
Wetland Soils	Yes

1.3 Site Constraints

Topography may limit the feasibility of placing a station at this location. To the north of the tracks, there is an almost vertical embankment, and on the south side, there is a similarly steep embankment. Surface materials at these locations are categorized as 'Thin Till', this would suggest that bedrock at this location is very close to the surface and would make the excavation difficult and costly, making this an impractical location to site a rail station. As you move west from the footbridge over the tracks the vertical gap decreases, the difference between track level and surrounding grade is between 5 and 10 feet at the extreme western end, and 15 to 25 feet at the footbridge.

Additionally, access to the main parking area is limited from this location and would be around 1,000ft +/- 200ft. The steep grades on either side of the tracks at this location will pose concerns to both site construction as well as a continued operation.

There is a small parking area directly adjacent to this site that is currently used to serve the Pavilion. The site currently has an estimated 60 spaces. This parking facility could reasonably be expanded to meet the 200 dedicated parking spaces requirement. Directly east of this parking area, the terrain slopes up making it unsuitable for parking facility expansion. This would mean that any parking expansion at this site would either have to occur to the north or west of the current facility. The southwestern edge of the parking area is ~ 400 feet to the tidal zone of the Four Mile River; it would be possible to clear approximately two additional acres of land to build the 200 required parking spaces.

Table 3 Rocky Neck Pavilion Site Constraints

Site Constraints	
Elevation/Grade Issues	Large
Parcel Ownership	State of Connecticut
Existing Parking	Yes
Existing Under or Overpass	Yes
Existing Restroom Facilities	Yes

Like the Main Beach site, the Pavilion is not close to the public water supply or sewer and would also likely be subject to lengthy permitting and construction processes.

1.4 Operations Feasibility

This site faces similar limitations to the Main Beach location including the use of the long access road to get into Rocky Neck State Park as well as the poor proximity to downtown Niantic and development. While there are commercial land uses to the north and residential zones to the east, the site is generally isolated.

Access to the upper parking lot mentioned above is currently unavailable. The reason for this is not currently known.

1.5 Transit-Supportive Land Uses

Due to their identical surrounding land use, the Pavilion site faces the same obstacles as the Main Beach site in terms of supporting TOD and bus, bicycle and pedestrian infrastructure.

Table 4 Rocky Neck Pavilion Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	No
Sidewalk Access	No
Bicycle Access	No
Mixed-Use Zoning	No
High Density	No

1.6 Market Considerations

The Pavilion has the same ridership potential and challenges as the Main Beach site, given their proximity to each other within Rocky Neck State Park.

1.7 Development Potential

Like the Main Beach site, the Pavilion site has limited development potential due to its location in a state park and isolation from commercial and dense residential development.

2. Rocky Neck State Park: Main Beach Area

This station would likely be situated at the eastern end of the currently established parking area for Rocky Neck State Park, on the North side of the tracks within the state-owned boundary of Rocky Neck. The existing parking facilities would have to be expanded.

2.1 Compatibility with Surrounding Land Uses

Table 5 Rocky Neck Main Beach Surrounding Land Use

Surrounding Land Use	
Dominant Land Use	Recreation

The surrounding land use is primarily recreation and is considered protected and historic land. Additionally, several buildings on-site are considered historic. This location is zoned RU-40 and TM. RU-40 is a rural residential zone that has 1-acre minimum lot sizes and TM stands for Tidal Marsh. The eastern portion of this site contains a tidal marsh and wetland soils, which would pose development concerns. The area to the east is zoned R-10 and GNBA. R-10 is a ¼ acre residential zone and GNBA is Giants Neck Beach Association, a residential overlay zone. Due to the zoning and land-use in this location, conflicts could arise from building a station at this location.

Parks	Rocky Neck State Park
4F Lands	Yes
6F Lands	Yes
Dominant Zoning	Residential, Tidal Marsh
Historic Sites	No
Archaeological Sites	No
Antique Buildings	Yes
Antique or Historical Building Parcel	No
Stone Wall	No

This site is the location of Rocky Neck State Park, which is designated as 4F and 6F lands. The entire parcel is both a historic and antique building parcel, with the Pavilion classified as an antique building. There is the potential for conflicts to arise between the recreational land use of the site and the proposed land use of the rail station. There are also likely to be conflicts associated with developing station infrastructure on a historic/antique building parcel, particularly within the bounds of 6F lands, and in close proximity to an antique building.

2.2 Environmental Considerations

This site is located within a 500yr flood zone and is susceptible to inundation from hurricanes category 2 or higher. Additionally, portions of the parking facility would likely be prone to flooding and inundation from hurricane events. Portions of the facility lie within both the 100yr and 500yr flood zones and are susceptible to hurricane events categories 1 through 4. The site is located within a zone designated as an existing or potential water supply, suitable for consumption without treatment, but it is not a current public water supply area. Portions of the parking area are within wetland soils. To the north of the site are tidal wetlands. The site is located within a Natural Diversity Database Area but is not a National Wildlife Refuge.

Table 6 Rocky Neck Main Beach Environmental Considerations

Environmental Considerations	
NDDDB	Yes
National Wildlife Refuge	No
Hurricane Inundation zone	Yes Cat. 1
Public Water Supply Area	No
Potential Water Supply Area	Yes
Tidal Wetlands	No
100 yr. Flood	Yes
500 yr. Flood	Yes
Wetland Soils	Yes

2.3 Site Constraints

This site is elevated from the surrounding topography and would require an elevated platform to meet grade with the tracks. On the north side of the tracks, there is ample space for a platform; however, this is not the case on the south side of the tracks where the beach directly abuts the viaduct, with only 15 to 20 feet of shrubby sandy soil that carries a pathway along the beach. The site is close to the large and unpaved parking lot of Rocky Neck State Park.

Table 7 Rocky Neck Main Beach Site Constraints

Site Constraints	
Elevation/Grade issues	Moderate
Parcel Ownership	State of Connecticut
Existing Parking	Yes
Existing Under or Overpass	Yes
Existing Restroom Facilities	Yes

There is an existing underpass at the east side of the site adjacent to the viaduct that is currently used for beach access. The pedestrian underpass consists of a boardwalk over Bride Brook where it passes under the rail tracks and exits into Long Island Sound. The pathway is estimated at 3.5 to 4 feet wide, with a vertical clearance of fewer than 7 feet. It is uncertain whether this infrastructure would be sufficient to carry the load from a potential rail station, or whether this facility would meet current ADA standards.

The main parking area covers approximately 12 acres and is estimated to contain around 1,200 parking spaces. This is a significant size; however, it is currently unknown what percentage of this lot fills during peak summer beach season. Regardless of existing facility size, the station would require an additional 200 spaces, requiring around two acres of land. There is limited feasibility of expanding the parking facility due to grade and wetland constraints in the vicinity.

This site is not proximal to the public water supply or sewer and permits would have to be acquired prior to the development of these utilities on site. It is probable that the permitting and construction process would be lengthy and expensive. However, the site is currently host to two sets of seasonally available restroom facilities that serve the beach areas.

2.4 Operations Feasibility

This site provides ample space, particularly on the north side of the track, for developing platform and station infrastructure. However, this location is not close to downtown Niantic or other residential or commercial development. The site can be accessed via an approximately 1.25-mile access road that travels south from State Rte. 156 (Main Street) through the Rocky Neck campground towards Long Island Sound. The speed limit on this access road is limited to 20 mph, making access to this location impractical. The situation is further hampered by the broader operation of the state park. Currently, anyone entering the park must enter through the front gateway. During the summer months, there is a stop-controlled gatehouse that requires an entrance fee. The park is free for state residents. There is a concern that during peak beach season, this entrance could become backed-up with cars entering the park, further limiting the access feasibility of this site.

2.5 Transit-Supportive Land Uses

This site is not proximal to any current bus route. Access to the 3 SEAT Bus Route would be approximately 3.5 miles from the site. There are currently no sidewalks connecting the site to State Rte. 156 (Main Street) and no dedicated bike infrastructure for access into or out of the site. The pedestrian underpass currently prohibits cyclists, meaning those wishing to access the station would have to lock up their bike on the north side of the tracks. There is currently a walking path that connects from the station area to Giants Neck Road to the east. The overall condition of this pathway is not known. The western end of the pathway is a narrow boardwalk that heads west across Bride Brook and then turns northwest along a strip of land bordered by tidal marsh before exiting into a small parking area on Giants Neck Road. For broader use of this path, it would likely need to be widened, have a hard surface added, and lighting installed.

Table 8 Rocky Neck Main Beach Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	No
Sidewalk Access	No
Bicycle Access	No
Mixed-Use Zoning	No
High Density	No

There is limited development in the area surrounding Rocky Neck State Park. State Rte. 156 (Main Street) is approximately a mile north of the site. Along this corridor, there are a variety of land-use types. To the east of the site, there is a denser residential zone, and as stated above, there is access from this area via a footpath. There is no development near the west of the site.

This location is zoned as RU-40, or a rural residential zone, and would not readily allow for commercial development. This is compounded by the site's location in a state park. Development directly surrounding the site is not practical. Additionally, the zones adjacent to this site are categorized as R-10 and Giants Neck Beach Association (GNBA).

R-10 is a residential zone with a minimum lot size of a $\frac{1}{4}$ of an acre and GNBA is a residential overlay zone with similar standards. Neither of these adjacent zones would be likely to accept commercial or mixed-use development.

2.6 Market Considerations

The site is far from the town center and may not be a convenient location to serve commuters. Conversely, being situated within the state park could serve as a draw during the beach season particularly on weekends, for people who do not want to deal with the hassle of driving to the beach. Ample space is available for parking, and this site could be turned into a modal hub given its proximity to Interstate 95. West Main Street has an Average Daily Traffic (ADT) of 11,200 vehicles per day which is sizable and could support the modal hub option, especially during off-peak beach season. This idea would likely only help to ease congestion on I-95 as there is not much of a local market in the vicinity of this site location.

As mentioned above, a path connects the eastern beach area of Rocky Neck State Park to Giants Neck Road. This road provides access to a small and dense community, part of which is managed by the Giants Neck Beach Association. A substantial portion of homes within this neighborhood are not owned by residents of East Lyme. This suggests a seasonal beach community. Ease of train access, such as being able to walk from a rail station to a second home or a rental cottage without the need for a car ride would be valued. The site is close to both the York Correctional Institution and the Bride Brook Health and Rehabilitation Center.

2.7 Development Potential

The site itself likely has limited development potential due to its location within a state park. This could mean that station structure would need to be limited in nature to not disrupt the surrounding public lands. Given the location, it would be unlikely to foster mixed-use and redevelopment as almost all surrounding land is protected open space or is residentially developed land. A train station at this location would not realistically be a catalyst for development and would only support the beachgoers and potentially the adjacent neighborhood, but likely only during the beach season. This proposed station would be located towards the western end of Rocky Neck State Park near the historic pavilion structure. Due to grade constraints, it is unclear where the station would be sited at this location. The facility would need to expand on currently available parking; either the paved parking on the north side of the tracks or the larger parking facilities to the east of the proposed site.

3. Columbus Avenue

This site is located at approximately 35 Columbus Avenue in the north end of the Black Point section of Niantic. A station at this location could be sited west of Columbus Avenue on the town-owned parcel behind VFW Post #5849 on the south side of the tracks. Parking facilities would have to be developed in conjunction with the VFW, or on the adjacent parcel that is part of McCook Point Park.

3.1 Compatibility with Surrounding Land Uses

This site is along the boundary of three different zones, RU-40/20, Crescent Beach Association Overlay (CBA), and Commercial Marine (CM). The residential area north of the tracks is zoned RU-40/20 which is residentially zoned with a one-acre minimum lot size and a 20% cap on the total buildable area. Southeast of the tracks is Commercial Marine (CM) and southwest of the tracks is the Crescent Beach Association (CBA) overlay zone. While a platform on the south side of the tracks would have limited impact on surrounding parcels, a platform structure on the north side of tracks has the potential to impact the adjacent road and the residences it serves. This site has the potential to disrupt the surrounding land uses and create conflicts with both residents and those seeking to use McCook Point Park. Portions of the site are an archaeological site and the site is proximal to a historic site.

Table 9 Columbus Avenue Surrounding Land Use

Surrounding Land Use	
Dominant Land Use	Residential
Parks	McCook Point Park
4F Lands	Yes
6F Lands	No
Dominant Zoning	Residential, Commercial Marine, CBA overlay
Historic Sites	No
Archaeological Sites	Yes
Antique Buildings	No
Antique or Historical Building Parcel	Yes
Stone Wall	Yes

3.2 Site Constraints

At this location, the tracks run below grade and measures would have to be taken to support platform and station infrastructure. This site is located adjacent to McCook Point Park and further analysis would have to be completed to determine how to best leverage this parcel. There is limited development within the park adjacent to the rail line. Access to the site would be through residential streets with lower traffic volumes. The increased traffic volume the station would bring could frustrate surrounding residents.

Table 10 Columbus Avenue Site Constraints

Site Constraints	
Elevation/Grade Issues	Severe
Parcel Ownership	East Lyme
Existing Parking	No
Existing Under or Overpass	No
Existing Restroom Facilities	No

This site has no parking infrastructure. The 200 spaces required by CTDOT would need ± 2 acres to implement. The parcel that contains the VFW is ≈ 2.57 acres but it is doubtful that the site could support both the necessary parking facilities and station structure; it is likely that supplementary site options would need to be investigated; options include the adjacent McCook Point Park or privately held land adjacent to the VFW and rail right-of-way. McCook Point Park has two parking areas, one that is in the northern portion of the site and another closer to the waterfront. The former would be the logical option to support the onsite parking, it currently has 77 parking spaces with the potential to expand further if needed.

This site is close to both sewer lines and the public water supply. The VFW post located on the site likely uses both the public water and sewer lines.

3.3 Operations Feasibility

This site is connected to Main Street (State Rte. 156) by two one-way street segments, Columbus Avenue and Katherine Street, which turns into Haigh Street before intersecting with Main Street. Columbus Avenue is a one-way street heading south between Main Street and Katherine Street, where it then transitions to a two-way street. Katherine/Haigh Streets are one-way streets heading north to Main Street from Columbus Avenue. These streets would be the primary station access route for Niantic rail passengers. Columbus Avenue is one of two streets that provide access to McCook Point Park and the Black Point area, which are both crowded with beach traffic in the summer months. Street redesigns could necessary—possibly including the installation of traffic signals, if the station was sited at this location.

3.4 Transit-Supportive Land Uses

This site is close to the 3 SEAT bus route. This route provides east-west service from East Lyme to Groton and travels north from downtown Niantic to I-95 before heading east towards Groton. Depending on scheduling, the 3 SEAT bus service could provide a means of rail access to the proposed station stop for those without access to a private vehicle.

Table 11 Columbus Avenue Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	Yes

Sidewalk Access	Yes
Bicycle Access	Yes
Mixed Use Zoning	Yes
High Density	Yes

This area is currently served by a sidewalk that runs along the west side of Columbus Avenue for much of the way before it intersects with Katherine Street where it switches to the east side of Columbus Avenue. Additionally, the site is serviced by the Niantic Bay Boardwalk, which traverses the shoreline from Cini Park in the east to McCook Point Park in the west.

There is currently no dedicated bicycle infrastructure serving the area. However, the low traffic volumes on streets in the vicinity of the site make dedicated bike structures less critical. The speed limit on Columbus Avenue (south of the rail tracks) is limited to 20mph. The roadways are likely limited to a similarly low speed north of the rail tracks.

The site is within a residential zone; however, just to the north of the tracks, there is substantial commercial and mixed-use development. The population density of the surrounding area is greater than other sites within the study area.

3.5 Market Considerations

This location is under ½ a mile west of Niantic’s downtown. Limited space is available for parking. Niantic’s Main Street and downtown area are within walking distance. Main Street has an Average Daily Traffic (ADT) of 9,700 vehicles per day, which is sizable. This location offers access to a host of modes and amenities that would support growth in the current and future market.

3.6 Development Potential

The Columbus Avenue site has limited development potential due to the constraints mentioned above. Its proximity to the downtown area, however, could induce demand for mixed-use development in the surrounding area. A train station at this location could be a catalyst for development, similar to what occurred in the case of Old Saybrook. Additionally, a train station at Columbus Avenue could economically support the existing downtown while helping it grow westward along Main Street.

4. Downtown Niantic

This proposed station is located in the proximity of 4 Baptist Lane, and while it may utilize the facilities of Hole in the Wall Beach, it is unclear where parking would be located. The station would be sited on the north side of the tracks within the town-owned parcel for Hole in the Wall Beach, and west of the disused railroad wye.

4.1 Compatibility with Surrounding Land Uses

This site is close to Main Street, with a connection via Baptist Lane. State Route 156 (Main Street) has primarily commercial land uses, including shops and restaurants. To the west of the site, the land uses are primarily residential, although there is a church adjacent to the site. The location itself is a recreational site, providing access to both Long Island Sound and the Niantic Bay Boardwalk. Conflicts could arise between the current recreational land use of the site and what would become a shared land use with the new station. If so, conflicts would be higher during the summer months when town and state residents would use the beach and boardwalk. Conversely, use conflicts would be lower during late fall, winter, and early spring when the weather is less favorable.

Table 12 Downtown Niantic Surrounding Land Use

Surrounding Land Use	
Dominant Land Use	Commercial, Residential
Parks	McCook Point Park, Hole in the Wall Beach
4F Lands	Yes
6F Lands	No
Dominant Zoning	CB
Historic Sites	Yes
Archaeological Sites	No
Antique Buildings	No
Antique or Historical Building Parcel	Yes
Stone Wall	No

The site's land use aligns with the current zoning along Main Street which is commercial and zoned "Central Business Commercial District". It is characterized by intensive commercial and related development with the purpose of concentrating the main commercial enterprises within the center of town. The area which the tracks cover and the small piece of land south of the tracks are zoned commercial marine. These are lands that have frontage to public waterways and their purpose is to encourage the retention and development of water-dependent uses. Beyond the commercial district, it is zoned residential (R-10 and RU-40/20). R-10 is moderately high-density residential use mixed with limited purpose commercial. It acts as a transition between commercial and residential. RU – 40/20 are rural districts outside of the developed town. It is marked by low-density development. North of the tracks is a parking overlay zone in the central business district. Overall, the zoning is compatible with the potential development and siting of a train station.

The parcels to the north and east of the downtown site are predominantly commercial and could see benefits from having a station at this location. The parcel directly adjacent to the site on the western side is owned by a church. The site parcels are not listed as historical sites, nor do they contain any historical structures. There are adjacent parcels with historical concerns. The site abuts municipally-owned McCook Point Park and the Hole in the Wall Beach, both of which are protected from being used by the Federal Transit Administration (FTA) and other U.S. Department of Transportation (USDOT) agencies unless there are no feasible alternatives as they are designated as "open space".⁵

4.2 Environmental Considerations

These parcels are not prone to surge inundation from hurricane events. The location is, however, on the border of both the 100yr and 500yr flood zones making flooding unlikely but possible. Future sea-level rise will increase the probability that this site will experience inundation from storm events. Additionally, it is unclear whether state flood data accounts for the pedestrian underpass at the Hole in the Wall Beach or whether it only accounts for the higher elevation of the physical rail line. This location is proximal to Long Island Sound whose surface water is categorized as saltwater where fish and shellfish are safe for human consumption. Site Constraints

Table 13 Downtown Niantic Environmental Considerations

Environmental Considerations	
NDDB	Yes

National Wildlife Refuge	No
Hurricane Inundation Zone	Yes
Public Water Supply Area	Yes
Potential Water Supply Area	No
Tidal Wetlands	No
100 yr. Flood	Yes
500 yr. Flood	Yes
Wetland Soils	No

The parking lot for the Hole-in-the-Wall Beach was designed to improve stormwater quality before it is discharged into Long Island Sound. This includes pervious parking, rain gardens, drainage, swales, detention/infiltration basins, and other elements. These soils are not considered wetlands. The site is approximately ¼ mile from the nearest area of contribution to the public water drinking supply. The site is within a National Diversity Database Area but not a National Wildlife Refuge.

At this location the track is elevated; any station and platform would need to be elevated to match grade with the rail line. There is currently a pedestrian underpass that would allow access to the south side of the tracks and could eliminate the need for an up and over to reach the platform on the other side. The site also has bathroom facilities on-site; their suitability for year-round use is not known.

This downtown site is proximal to both city sewer and the public water supply; however, it is not apparent if the site is served by either facility. Buildable space at the site may be limited. The majority of the two parcels within the site are currently used for parking, however, more parking would be required to meet the CTDOT required 200-space threshold. Alternatives would need to be explored to increase parking capacity to meet current standards. The adjacent undeveloped parcel is owned by St. John's Parish and could alleviate some of the potential parking shortage. The undeveloped portion of their property is ≈ 3.48 acres and would provide sufficient capacity. The church parcel fronts onto a small residential road. Residents who live along this road would potentially have concerns regarding the additional noise and traffic that would be associated with it.

4.3 Site Constraints

The groundwater at the site is categorized as “May Be Impaired”, which indicates that the quality of the groundwater doesn't meet the assigned standards for drinking water. The parking lot for the Hole-in-the-Wall Beach was designed to improve stormwater quality before it is discharged into Long Island Sound. This includes pervious parking, rain gardens, drainage swales, detention/infiltration basins, and other elements. These soils are not considered wetlands. The site is approximately ¼ -mile from the nearest area of contribution to the public water drinking supply. The site is within a Natural Diversity Database Area but not a National Wildlife Refuge.

Table 14 Downtown Niantic Site Constraints

Site Constraints	
Elevation/grade Issues	Moderate
Parcel Ownership	East Lyme
Existing Parking	Yes
Existing Under or Overpass	Yes

Existing Restroom Facilities	Yes
------------------------------	-----

4.4 Operations Feasibility

This site is accessed through a narrow local road that intersects Main Street. The intersection is currently controlled by a stop sign. If a station is built at this location the increase in traffic volume could create a need for intersection or roadway improvements, particularly to aid vehicles attempting to make a left into or out of the site. Average Daily Traffic on State Rte. 156 (Main Street) at this location is well over 9,000 vehicles per day (VPD) which is a significant volume for this two-lane road. Additional traffic caused by a station at this location could further cause concerns on the main road where cars have the potential to back up in the westbound lane as motorists attempt to make a left turn into the site location.

While the adjacent parcel is owned privately by St. John's Parish, one option to consider investigating is the potential purchase of a portion of the parcel to create a one-way traffic flow through the site that would connect with McCook Place. Doing this may create a better flow through the station and relieve pressure from the small side street. However, depending on how this is done, it could potentially create conflicts with neighboring residents and business owners.

4.5 Transit-Supportive Land Uses

The access point via Baptist Lane is currently too narrow and has tight corners that wouldn't readily allow for bus service into the site. Additionally, the current parking area is not set up to support the circulation of large vehicles. However, the site is close to the 3 Southeast Area Transit route. This route provides east-west service from downtown East Lyme to Groton and facilitates connections throughout the region. The site has good pedestrian access. Sidewalks connect the site to State Rte. 156 Main Street and on the south side of the tracks the site is connected to the Niantic Bay Boardwalk. While there is no specific infrastructure intended for cyclists, and currently connecting streets do not have painted shoulders, the lane width is wide enough to accommodate bicyclists. Bicycles are not allowed on the boardwalk.

Table 15 Downtown Niantic Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	Yes
Sidewalk Access	Yes
Bicycle Access	Yes
Mixed-Use or Supportive Zoning	Yes
High Density	Yes

While the predominant zoning surrounding the site is the central business district, it appears there are mixed-use parcels within the area. West of the site is zoned primarily residential, specifically R-40/20. R-40 typically refers to a residential zone where there is a minimum lot size of 40,000 ft² or around .91 of an acre, typically known as 1-acre zoning. The /20 in the zone refers to the maximum percent, in area, that is buildable on a given lot within this zone. This type of zoning protects against over-development of an area, however, when working to re-establish rail service, denser zoning more readily allows for Transit-Oriented Development and ultimately would be better able to support the addition of a rail station.

4.6 Market Considerations

This location is the most central to Niantic’s downtown (under a ½ mile) of all proposed site locations. While limited space is available for parking, there is additional parking available within walking distance along State Rte. 156 (Main Street). Additionally, from this site restaurants, beaches and shopping are all easily accessible and within walking distance. This location does not border the town of Waterford it is close to its border, for this reason, a station in Niantic could draw residents living in western Waterford. The bridge over the Niantic River provides narrow shoulders for cyclists and an unprotected sidewalk beyond the westbound shoulder for pedestrian use. While these would provide alternative modes’ access, they are not robust infrastructures. Main Street has an Average Daily Traffic (ADT) of 9,700 which is substantial considering the constraints of the corridor and its alignment through downtown Niantic. This location offers unparalleled access to a host of current modes and amenities that have the potential to support and offer growth in the current and future market.

4.7 Development Potential

The site itself has limited development potential due to the physical constraints mentioned above but given the proximity to the downtown area, this site could foster mixed-use and redevelopment in the surrounding area. A train station at this location has the potential to be a catalyst for development and would broaden the economic sustainability of this town. To achieve these modifications changes would have to be made to allow for transit-oriented development (TOD) downtown. Recently, the historic rail station located at approximately 220 Main Street was torn down; the site is currently vacant but is poised for redevelopment.

While Niantic is a smaller town than Old Saybrook, the redevelopment of their commuter and intercity rail station served to catalyze the development of vacant land that has become known as Post & Main. This development is located directly adjacent to the rail station, offers both one- and two-bedroom apartments, a host of onsite amenities, and access to Old Saybrook’s downtown.

5. Historic Niantic Station

This proposed site is located at the junction of State Routes 156 and 161, on the south side of the intersection and north of the tracks. It is the site of Niantic’s historic rail station, which operated until service was suspended in 1971. The historic station building is no longer standing and the site is currently vacant. The parcel is privately held. While some parking could be established on the site as it currently stands, it is unclear whether additional parking could be added in order to meet the state’s requirement of 200 dedicated spaces.

5.1 Compatibility with Surrounding Land Uses

This site is located at the main intersection in Niantic and abuts the Central Business District (CB) and the Commercial Marine (CM) zone. A CM zone is defined as land which has frontage to public waterways; its purpose is to encourage the development of water-dependent uses which are consistent with the Connecticut Coastal Management Act. CB zones are intended to promote dense and intensive commercial development. A station at this location will not likely conflict with surrounding land-use; in fact, having a station at this location could be complementary to the surrounding dense commercial activities. There are no competing land uses on site. However, the following would need to be considered at this site: the design would need to account for the Niantic Bay Boardwalk which is situated on the south side of the rail line; also, the siting of additional required parking could require land takings.

Table 16 Historic Niantic Station Surrounding Land Use

Surrounding Land Use	
Dominant Land Use	Commercial
Parks	Yes

4F Lands	Yes
6F Lands	No
Dominant Zoning	Central Business, R10, AHD, Commercial Marine
Historic Sites	No
Archaeological Sites	No
Antique Buildings	Yes
Antique or Historical Building Parcel	Yes
Stone Wall	No

Traffic flow at this location would be impacted by any station structure and could require a redesign of the intersection of Rte 156 and 161. This site does not contain any land categorized as 4F or 6F however it is close to land categorized as 4F. Additionally, this site is not comprised of any historic or archaeological sites and does not contain historic structures. However, there are both historic buildings and parcels in close proximity to this site.

5.2 Environmental Considerations

Surge inundation data demonstrates that a station location on the north side of the tracks would not likely be impacted from hurricane surge events categories 1 through 4; however, facilities to the south of the tracks could be impacted. This assertion is evidenced by damage incurred to the Niantic Bay Boardwalk from tropical weather systems Sandy and Irene. FEMA flood maps indicate that portions of the site just to the south of the rail line could be prone to flooding from 100yr ood events, and lands close to the site are at risk from 500yr flood events. A station at this location would need to be designed with consideration to resiliency measures.

Table 17 Historic Niantic Station Environmental Conditions

Environmental Considerations	
NDDB	No
National Wildlife Refuge	No
Hurricane Inundation Zone	Yes/No
Public Water Supply Area	No
Potential Water Supply Area	No
Tidal Wetlands	No
100 yr. Flood	Yes
500 yr. Flood	No
Wetland Soils	No

This site is within a Natural Diversity Database area but is not within a National Wildlife Refuge, and there are no national wildlife refuges nearby. There are no wetland soils onsite or close to the site. The groundwater at this site is categorized as 'May be Impaired'; the quality of groundwater does not meet the assigned standard. This is a modified class designation unique to digital data.⁶ The site is not within an existing or potential area of contribution to the public water supply.

5.3 Site Constraints

The site is situated close to the center of the Niantic downtown and is flanked by development on three sides. At this location, the rail line runs at grade to just above grade. This means that grade issues, particularly on the north side of the track, shouldn't be a concern. However, facilities would have to be erected on the south side of the tracks to support the northbound platform where the terrain drops off steeply towards the Long Island Sound.

This site is heavily constrained by development and natural features despite being entirely vacant. At this location the rail line directly abuts the Niantic Bay Boardwalk and Long Island Sound; both of these features could limit prohibit development beyond a simple platform structure on the southern side of the tracks. Parking and station facilities would have to be located on the northern edge of the tracks. It is probable that the northern platform would interfere with the alignment of the Niantic Bay Boardwalk. This walking path is both a recreation and transportation facility and any interference with it would face opposition.

Table 18 Historic Niantic Station Site Constraints

Site Constraints	
Elevation/Grade Issues	Moderate
Parcel Ownership	East Lyme
Existing Parking	Limited
Existing Under or Overpass	No
Existing Restroom Facilities	No

The alignment of the rail line at this location follows the coastline. This location is situated on the curve forming the most inland portion of the Niantic Bay. It is likely that this curve exceeds 1° which could exclude it from further consideration. Siting a platform on a curve is typically avoided because the curve can create a gap in between the train and the platform, making it unsafe for passengers to board or disembark. This site is also constrained to the east by the movable rail bridge over the Niantic River. Further inquiry could assess the possibility of constructing a siding that would be able to return to the mainline before reaching this bridge.

5.4 Operations Feasibility

While the site is proximal to high commercial and residential density, the site's limited footprint and heavy surrounding development would limit its operational capacity to meet CTDOT standards. This includes the flow of traffic into and out of the site and proximity and access to parking infrastructure. The intersection of Rte. 156 (Main Street) and Rte. 161 (Pennsylvania Avenue) is controlled by a traffic light, with independent left-turning movement in the Rte. 156 (Main Street) eastbound direction. A dedicated signal phase would be required to accommodate the increase in traffic leaving the site. However, most concerning (outside of track constraints) is the site's likely inability to fit 200± parking spaces. The station would have to acquire adjacent commercial parcels or parking facilities or would need to construct a parking structure to meet mandated requirements.

5.5 Transit-Supportive Land Uses

This site is served by the Route 3 of the SEAT bus service. Its sole bus stop in Niantic is across the street from this location. This transit route provides east-west service between New London and Niantic and connects to various other regional services. At this location, sidewalks serve both sides of State Rte. 156 (Main Street) and a crosswalk on the west side of the route's intersection with State Rte. 161 (Pennsylvania Ave) provides access between the northern and southern sides of the street. A sidewalk continues east after the intersection on Rte. 156 (Main St.).

Additionally, there are sidewalks on both the east and west sides of Rte. 161 (Pennsylvania Ave) that provide pedestrian access to commercial activity and residential neighborhoods north of the site. This is the extent of pedestrian facilities with access to the downtown area. There are no dedicated cycling facilities within a ½ mile radius. However, the low traffic volumes and wide shoulders in much of the study area make it ideal for dedicated cycling infrastructure. If a station occurs, concurrent plans should be made to establish dedicated cycling infrastructure. This site could serve as a transit hub, bringing together bus and rail transit, and cycling and pedestrian facilities.

Table 19 Historic Niantic Station Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	Yes
Sidewalk Access	Yes
Bicycle Access	Yes
Mixed-Use Zoning	Yes
High Density	Yes

5.6 Market Considerations

This site is the closest of the potential sites to Niantic’s downtown and offers dense commercial development. At this location, Rte. 156 (Main Street) has an Average Daily Traffic (ADT) of 9,300 vehicles per day which is substantial for this community. The site could serve as a strong catalyst for further redevelopment within Niantic’s downtown area. Increased available travel modes would result in investment and growth in other amenities, like TOD.

5.7 Development Potential

Due to this site’s central location in the town of Niantic, the station could serve as an anchor, catalyzing development within the town. Having rail infrastructure can lead to a more dynamic and financially stable community through encouraging higher-density residential and mixed-use developments. A land-use value study completed in 2009, in conjunction with the University of Connecticut and the Town of East Lyme, recommended that the town promote compatible businesses in appropriate locations to encourage local employment opportunities, a favorable tax base, the provision of goods and services for local residents, and a year-round and seasonal economy that improves the quality of life for East Lyme residents. It was recommended that the town should work to revitalize the downtown Niantic area and strengthen its connection to the Long Island Sound. The study included a rendering of a potential rail station that included a large overhead structure that provided access to two platforms and attached dock space in Long Island Sound.

6. Cini Park

This conceptual location is on the parcel containing Cini Park. Given the lack of space on the south side of the tracks, the rail station would need to be sited on the north side of the tracks, adjacent to the current parking area and within the parcel own by the rail company. However, due to the physical constraints of the site, there is no room for rail parking within the site footprint, meaning it would have to be located away from the station area.

6.1 Compatibility with Surrounding Land Uses

The potential rail station would need to be located on a thin strip of land surrounded by a beach on one side and water to the east and north of the site. The site itself is recreational, and there are no other proximal or supportive

land uses. On the east side of the Niantic River, there are several marinas that are bordered by larger residential zones. Conflicts with the recreational nature of the site may arise.

Table 20 Cini Park Surround Land Use

Surrounding Land Use	
Dominant Land Use	Recreational
Parks	Cini Park, Niantic Bay Board- walk
4F Lands	Yes
6F Lands	No
Dominant Zoning	Commercial Marine
Historic Sites	No
Archaeological Sites	No
Antique Buildings	No
Antique or Historical Building Parcel	No
Stone Wall	No

The land use does not align with the zoning. The zoning is commercial marine while the land use is recreational. These are lands that have frontage to public waterways and their purpose is to encourage the development of water-dependent uses that are consistent with the Connecticut Coastal Management Act.

The site is located within the boundary of Cini Park, which is owned and maintained by the Town of East Lyme (a 4f land) and that provides access to the beach and the Niantic Bay Boardwalk. There is a potential for conflicts to arise between these two land uses, beach property, and a rail station. The existing site has around 180 parking spaces, which during the summer months are typically filled. Additional parking for the station would likely be required but due to the site location, additional parking would have to be located off-site. While it would be feasible to construct some form of structured parking, it would likely be cost-prohibitive. This site contains no 6f lands, historic structures, or archaeological sites.

6.2 Environmental Considerations

Much of the parking area for this location would be within the 100yr Flood Zone and it is likely that portions of the platform structure and the elevated tracks would be at risk for a 500yr flood event as well. Similarly, the parking area would be vulnerable to inundation from hurricane surge events, category 1 through 4, and it is likely that portions of the platform and structure and elevated tracks would be at risk from hurricane inundation category 2 through 4. This location is close to the Long Island Sound, which has surface water categorized as Saltwater. Fish and shellfish are safe for human consumption.

Table 21 Cini Park Environmental Considerations

Environmental Considerations	
NDDB	Yes
National Wildlife Refuge	No
Hurricane Inundation Zone	Yes Cat. 1-4
Public Water Supply Area	No

Potential Water Supply Area	No
Tidal Wetlands	No
100 yr. Flood	Yes
500 yr. Flood	Yes
Wetland Soils	No

Groundwater is classified as “May Be Impaired”, meaning that the quality of the groundwater does not meet the assigned standards for consumption. There are no public water supply areas within half a mile of the site. Proximity to wetland soils is not a factor. The site is within a Natural Diversity Database Area.

6.3 Site Constraints

This site is located at the edge of a curve just before the Niantic rail bridge; the design would need to accommodate this. This is not favorable from a design or rail operations standpoint as it is very close to a movable bridge. The rail line is elevated from the surrounding area; however, the viaduct that the tracks are constructed on would provide sufficient area for a platform structure to be built for the north track. It would be difficult to construct a platform on the south side of the rail line. Below the south sidetrack is the Niantic Bay Boardwalk, where the elevation difference between the boardwalk and the tracks is between 10 and 15 feet. The platform for this side of the tracks would have to be cantilevered out over the boardwalk. This would add significantly to construction costs due to the engineering and construction required, and is likely to draw opposition from residents due to the adjacent Niantic Bay Boardwalk.

Table 22 Cini Park Site Constraints

Site Constraints	
Elevation/Grade Issues	Moderate
Parcel Ownership	East Lyme
Existing Parking	Yes
Existing Under or Overpass	Yes
Existing Restroom Facilities	Yes

The parcels are owned by the Town of East Lyme and the National Railroad Passenger Company (Amtrak). Currently, the parking serves Cini Park which provides access to the beach and the Niantic Bay Boardwalk, access to both is provided by a pedestrian underpass. Depending on the time of the day and day of the week the current lot has the potential to either be close to or at capacity. Currently, there are ~ 150 spaces, of which ~ 7 are handicap spaces.

It is not feasible to sufficiently expand parking at this location and there are no other proximal or feasible locations. This means that parking would likely be limited to those spaces already on-site and would therefore disqualify the site from further review.

This site lies near the city sewer main but is not close to the public water supply. It currently has seasonally available restroom facilities for boardwalk/beach users.

6.4 Operations Feasibility

This site is relatively close to State Rte. 156 (Main Street), downtown Niantic and the Waterford town line. This makes it likely that this location would serve both Niantic and Waterford residents. The station would be directly connected to State Rte. 156 (Main Street) which would increase ease of access, however depending on traffic volumes along this stretch, exiting the site could be difficult.

As mentioned above, the site's parking area is prone to flooding and surge inundation. This would pose a threat to station infrastructure and its ability to operate during or after severe weather events.

6.5 Transit-Supportive Land Uses

This location is not part of a current bus route, however, it is reasonably proximal to the 3 SEAT Bus route which provides east to west service between East Lyme and Groton, with connections to broader regional service at the New London rail station. The closest bus stop is for the SEAT bus service is around 0.7 miles from where the station would be located inside Cini Park; the stop is located at the corner of Rte. 161 and State Rte. 156 (Main Street). This location benefits from being at the eastern terminus of the Niantic Bay Boardwalk. This walking path travels both inland and along the bay, providing access to Cini Park, downtown Niantic, McCook Point Park, and the northern portion of the Black Point area. Shoulders along State Rte. 156 (Main Street) are serviceable but not generous enough to quantify as bicycle infrastructure, making access to this station via bike feasible but not widely accessible.

Table 23 Transit Supportiveness

Transit Supportiveness	
Access to Existing Bus Route	No
Sidewalk Access	Yes
Bicycle Access	No
Mixed-Use Zoning	No
High Density	No

6.6 Market Considerations

This site is just over 1/2 a mile away from downtown Niantic and is accessible to residents of southwestern Waterford. The bridge between Niantic and Waterford (over the Niantic River) has limited alternative travel modes: narrow shoulders for cyclists and an unprotected sidewalk on the north side of the bridge for pedestrian use. There is limited space for potential parking within walking distance of the site. Main Street has an Average Daily Traffic (ADT) of 9,300 vehicles per day, a substantial volume for the community and road facility. This location is spatially constrained, making it a poor candidate for TOD.

6.7 Development Potential

This site suffers from limited potential for broader development and has no proximal commercial, residential, or mixed-used development. The site is zoned as Marine Commercial, a subcategory of the commercial district. The zone would technically allow for additional commercial or potential mixed-use development; however, there is not enough space within the ¼ or ½ mile buffers.

Appendix 4 - Mapping



Appendix 4: Niantic Rail Study Mapping



Site Mapping

Niantic Rail Study: Conceptual Station Locations



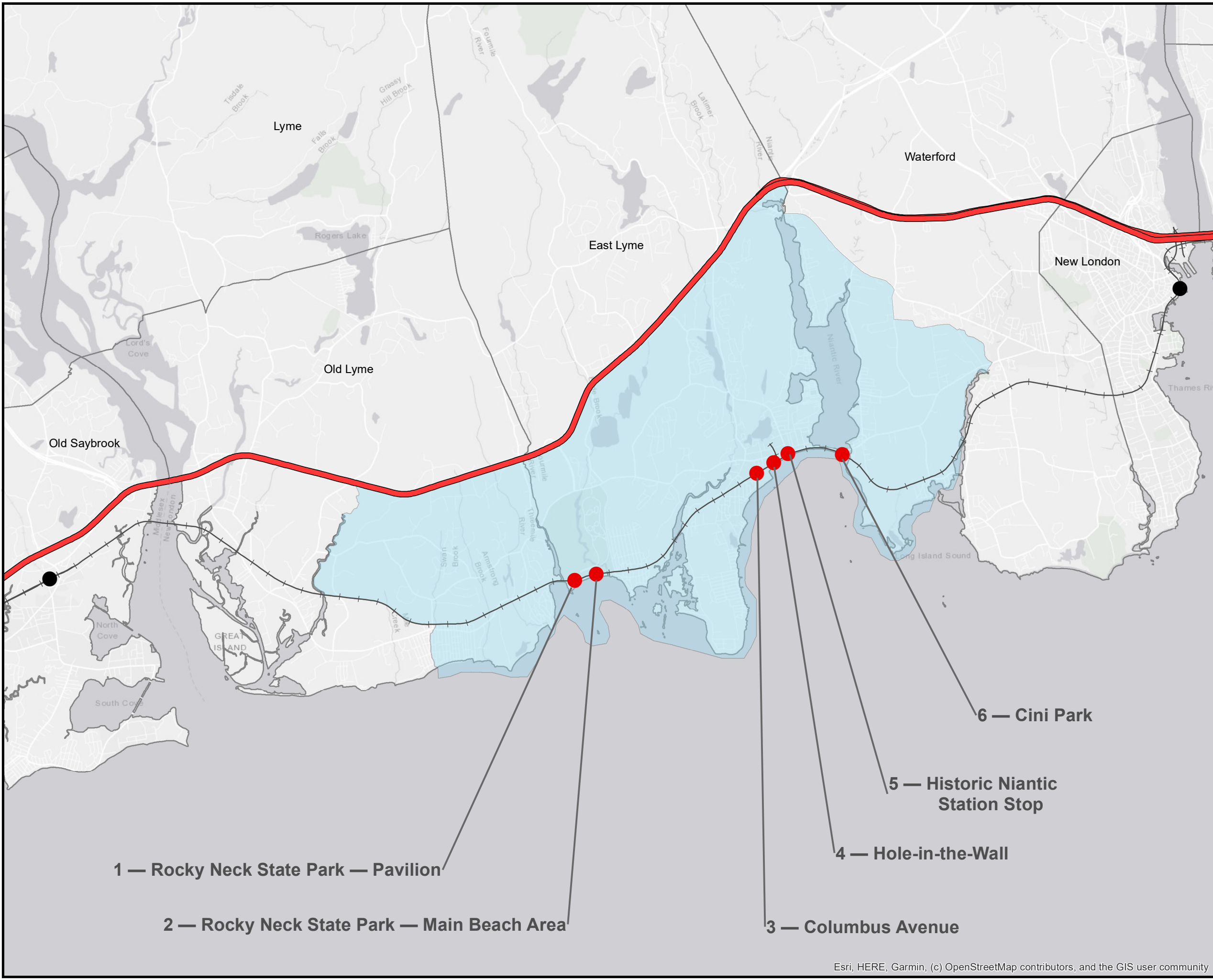
Study Area

- Existing Station
- Conceptual Station Location
- I-95
- Rail Line
- Study Area



0 0.75 1.5 3 Miles

DATA SOURCE: Study area derived from Census defined Blockgroups





Niantic Rail Study: Conceptual Station Locations



Shore Line East Service Area

- Shore Line East Station
- Conceptual Station Location
- I-95
- Rail Line
- Study Area



0 2.25 4.5 9 Miles

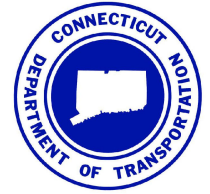
DATA SOURCE: Study area derived from Census defined Blockgroups

1 — Rocky Neck State Park — Pavilion

CONNECTICUT STATE OF

CONNECTICUT STATE OF

Niantic Rail Study: 1 — Pavilion



Site Location

● Conceptual Station Location

—+—+— Rail Line

▭ Parcels

▭ Likely Affected Parcels



0 20 40 80 120 160 200 Feet

DATA SOURCE: DEEP Bedrock Geology Layer; CT
ECO 2016 Orthophotography

Date: 9/29/2017

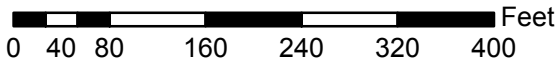
AECOM

Niantic Rail Study:
2 — Main Beach



Site Location

- Conceptual Station Location
- +—+— Rail Line
- ▭ Parcels
- ▭ Likely Affected Parcels



DATA SOURCE: DEEP Bedrock Geology Layer; CT
ECO 2016 Orthphotography
DISCLAIMER: Station locations are NOT
exact and are only representative
Date: 9/29/2017

AECOM





Niantic Rail Study: 3 — Columbus Avenue



Site Location

- Conceptual Station Location
- +— Rail Line
- ▭ Parcels
- ▭ Likely Affected Parcels



0 25 50 100 150 200 250 Feet

DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 Orthophotography DEM
DISCLAIMER: Station locations are NOT exact and are only representative
Date: 9/29/2017





**Niantic Rail Study:
4 — Hole-in-the-Wall**



Site Location

● Conceptual Station Location

—+—+—+— Rail Line

▭ Likely Affected Parcels

▭ Parcels



0 20 40 80 120 160 200 Feet

DATA SOURCE: CT ECO 2016 Orthophotography
DISCLAIMER: Station locations are NOT
exact and are only representative

Date: 2/1/2021

AECOM Imagine it.
Delivered.



**Niantic Rail Study:
5 — Historic Niantic Rail
Station**



Site Location



Conceptual Station Location



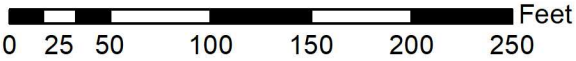
Rail Line



Parcels



Likely Affected Parcels



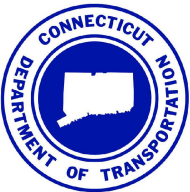
DATA SOURCE: CT ECO 2016 Orthophotography
DISCLAIMER: Station locations are NOT
exact and are only representative

Date: 2/16/2021

AECOM Imagine it.
Delivered.

5 — Historic Niantic Rail Station

Niantic Rail Study:
6 — Cini Park



Site Location

● Conceptual Station Location

—+—+—+— Rail Line

▭ Parcels

▭ Likely Affected Parcels



0 20 40 80 120 160 200 Feet

DATA SOURCE: CT ECO 2016 Orthophotography
DISCLAIMER: Station locations are NOT
exact and are only representative



6 — Cini Park

Rt. 156 (Main St.)

NATIONAL RR PASSENGER CO

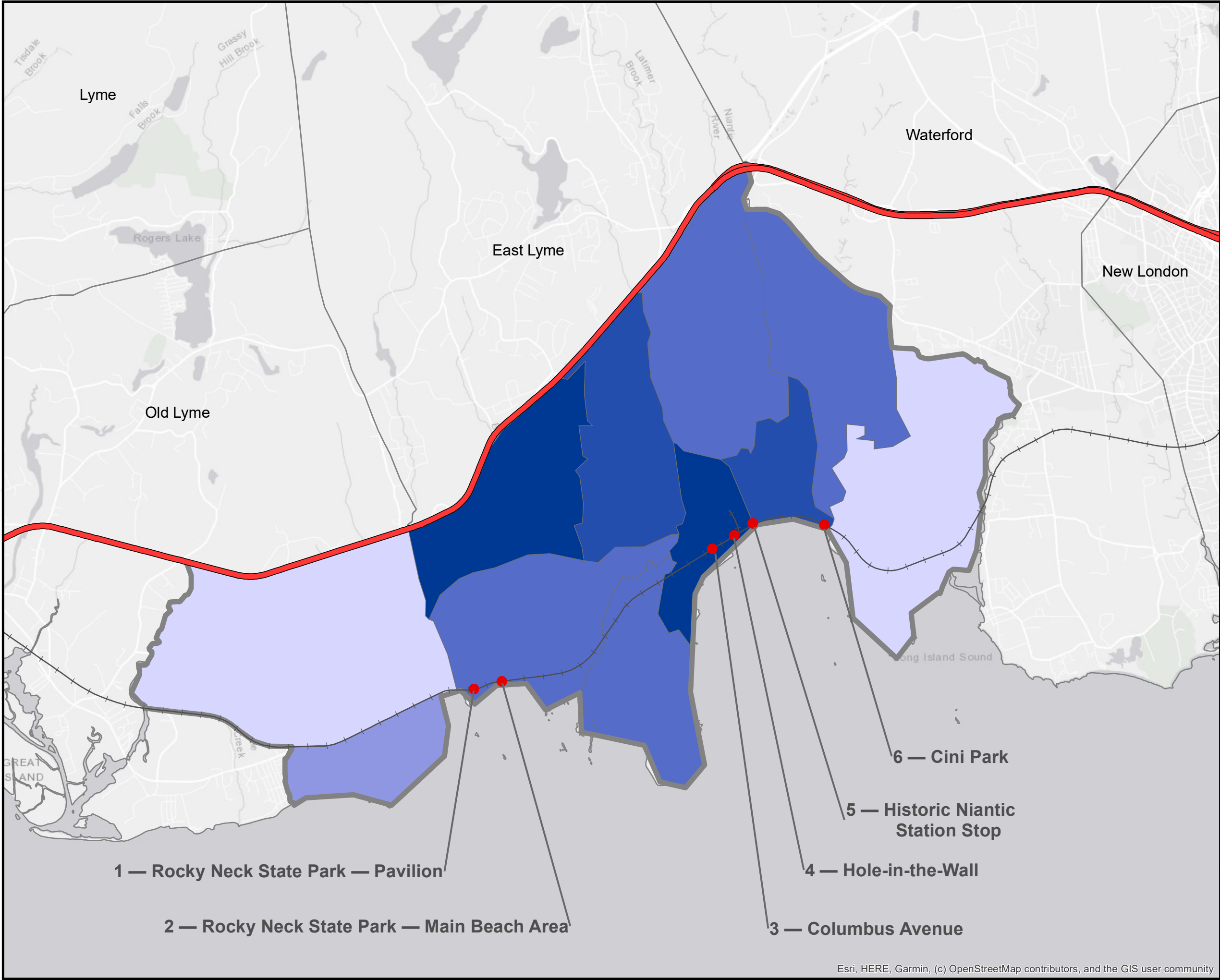
EAST LYME TOWN OF

NATIONAL RR PASSENGER CO

EAST LYME TOWN OF



Demographic and Community Mapping



**Niantic Rail Study:
Conceptual Station
Locations**



Population Density

● Conceptual Station Location

— I-95

— Rail Line

▭ Study Area

Population Density (Pop/Sq.Mile)

398 - 600

601 - 700

701 - 800

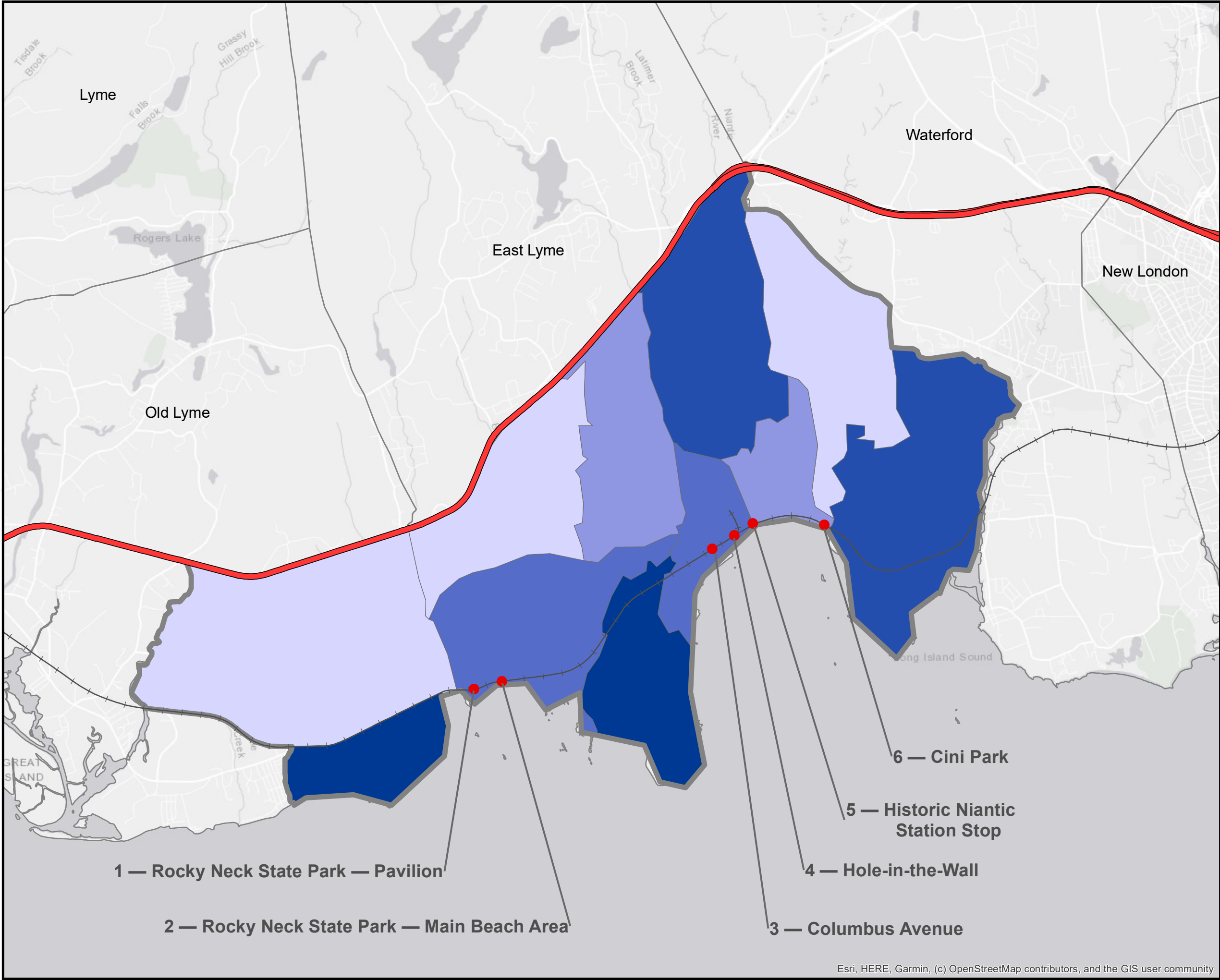
801 - 900

901 - 2073



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B01001;
Connecticut block group data.



**Niantic Rail Study:
Conceptual Station
Locations**



Older Populations

● Conceptual Station Location

— I-95

— Rail Line

▭ Study Area

Percent of Population 65 and Older

16% - 18%

19% - 27%

28% - 30%

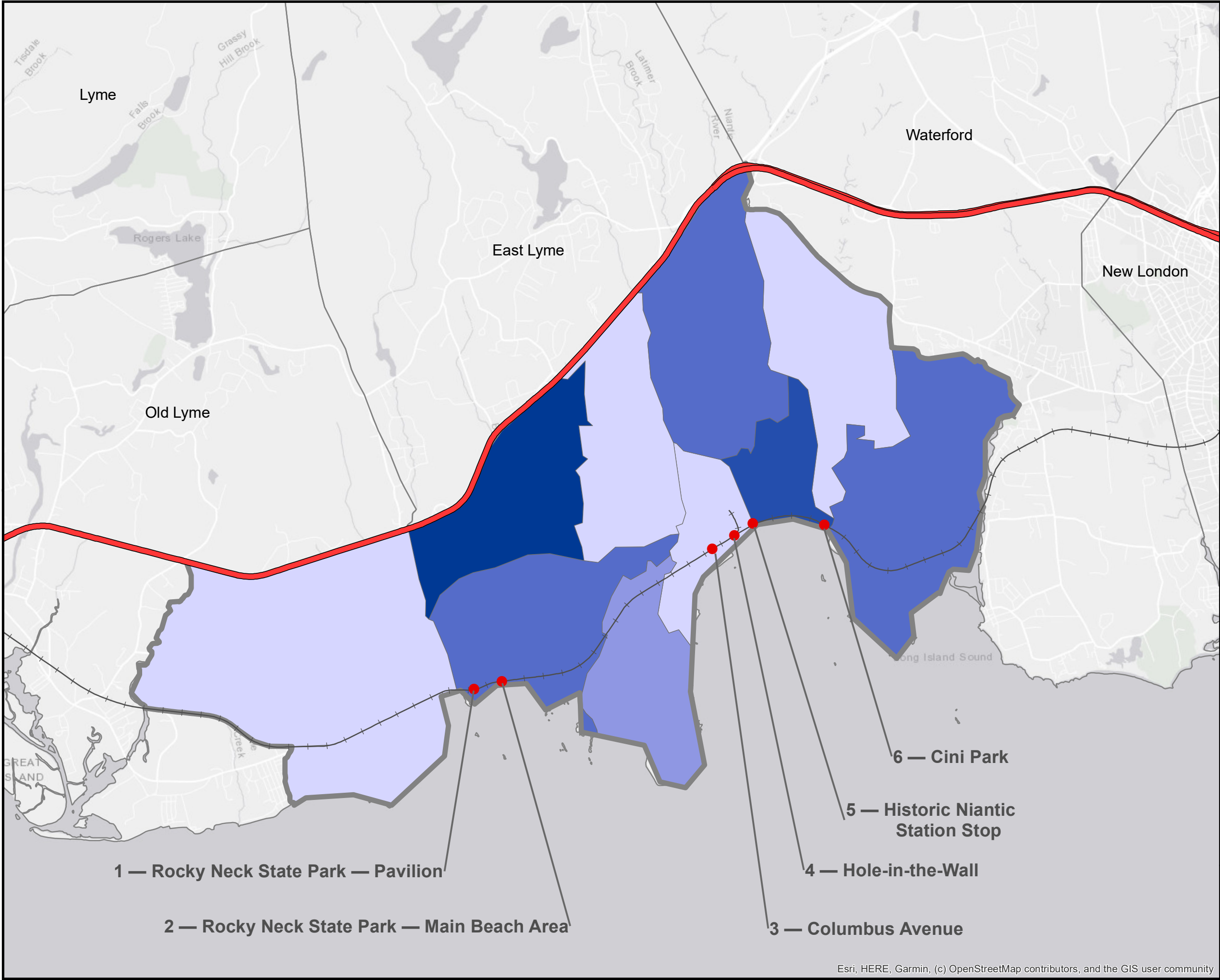
31% - 37%

38% - 40%



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B01001;
Connecticut block group data.



**Niantic Rail Study:
Conceptual Station
Locations**



Zero-Vehicle Households

● Conceptual Station Location

— I-95

--- Rail Line

▭ Study Area

% Vehicleless Households

0%

1% - 2%

3% - 4%

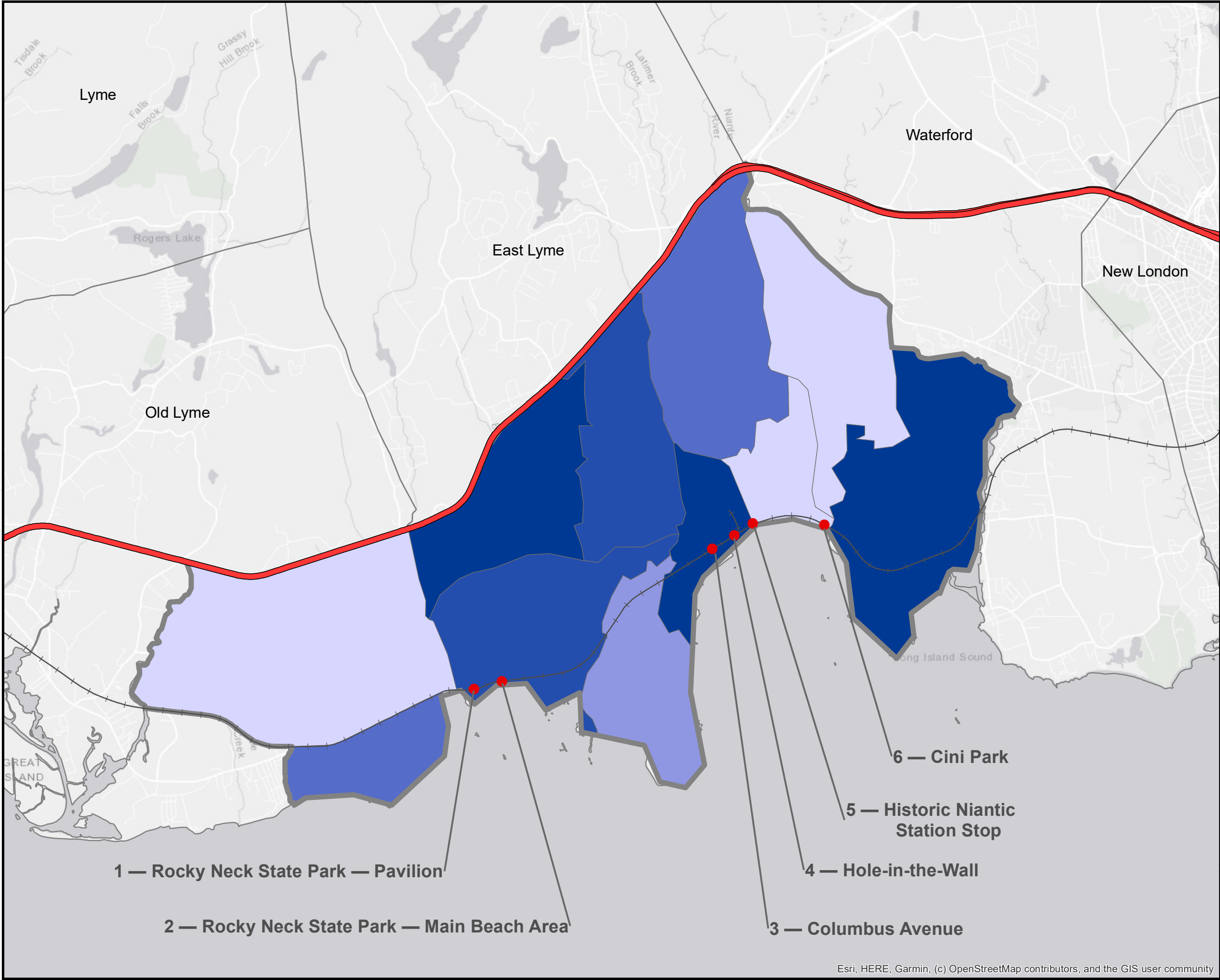
5% - 6%

7% - 17%



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B25044;
Connecticut block group data.



**Niantic Rail Study:
Conceptual Station
Locations**



Median Household Income

● Conceptual Station Location

— I-95

— Rail Line

Study Area

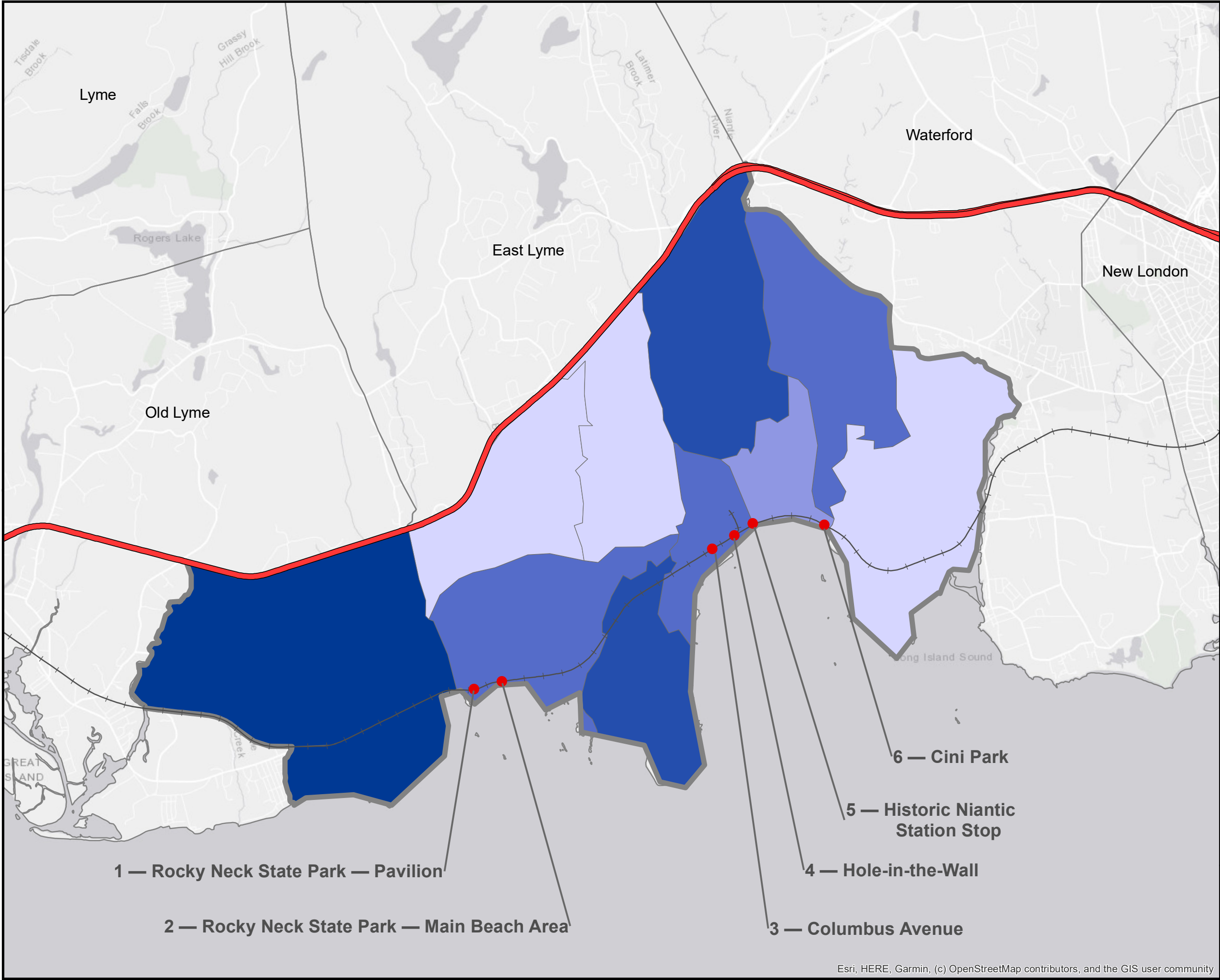
Median Household Income

- \$35,543 - \$65,000
- \$65,001 - \$85,000
- \$85,001 - \$90,000
- \$90,001 - \$100,500
- \$100,501+



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B19013;
Connecticut block group data.



**Niantic Rail Study:
Conceptual Station
Locations**



Median Household Value

● Conceptual Station Location

— I-95

--- Rail Line

Study Area

Median Household Value

- \$240,400 - \$250,000
- \$250,001 - \$285,000
- \$285,001 - \$315,000
- \$315,001 - \$395,000
- \$395,001+



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B25077;
Connecticut block group data.

1 — Rocky Neck State Park — Pavilion

2 — Rocky Neck State Park — Main Beach Area

3 — Columbus Avenue

4 — Hole-in-the-Wall

5 — Historic Niantic
Station Stop

6 — Cini Park

Long Island Sound

Waterford

New London

East Lyme

Old Lyme

Lyme

Tisdale
Brook

Falls
Brook

Grassy
Hill Brook

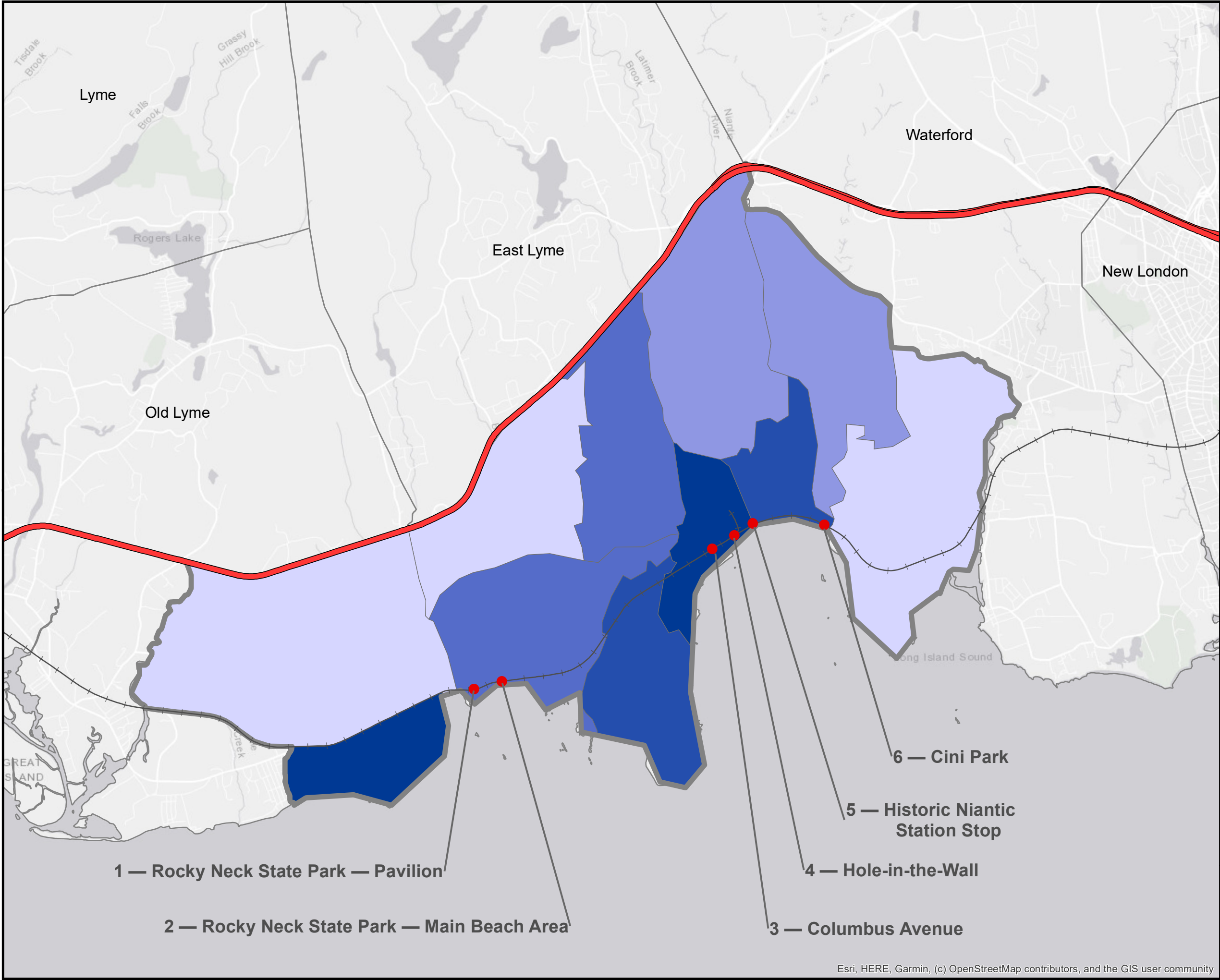
Rogers Lake

Lalimer
Brook

Niantic
River

GREAT
SAND

Creek



**Niantic Rail Study:
Conceptual Station
Locations**



Housing Unit Density

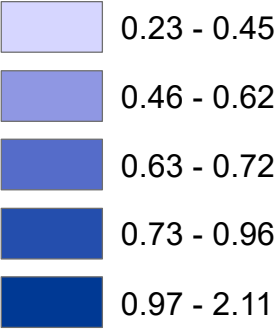
● Conceptual Station Location

— I-95

— Rail Line

Study Area

Housing Units/Acre



DATA SOURCE: ACS_2019_5YR_B25001;
Connecticut block group data.

1 — Rocky Neck State Park — Pavilion

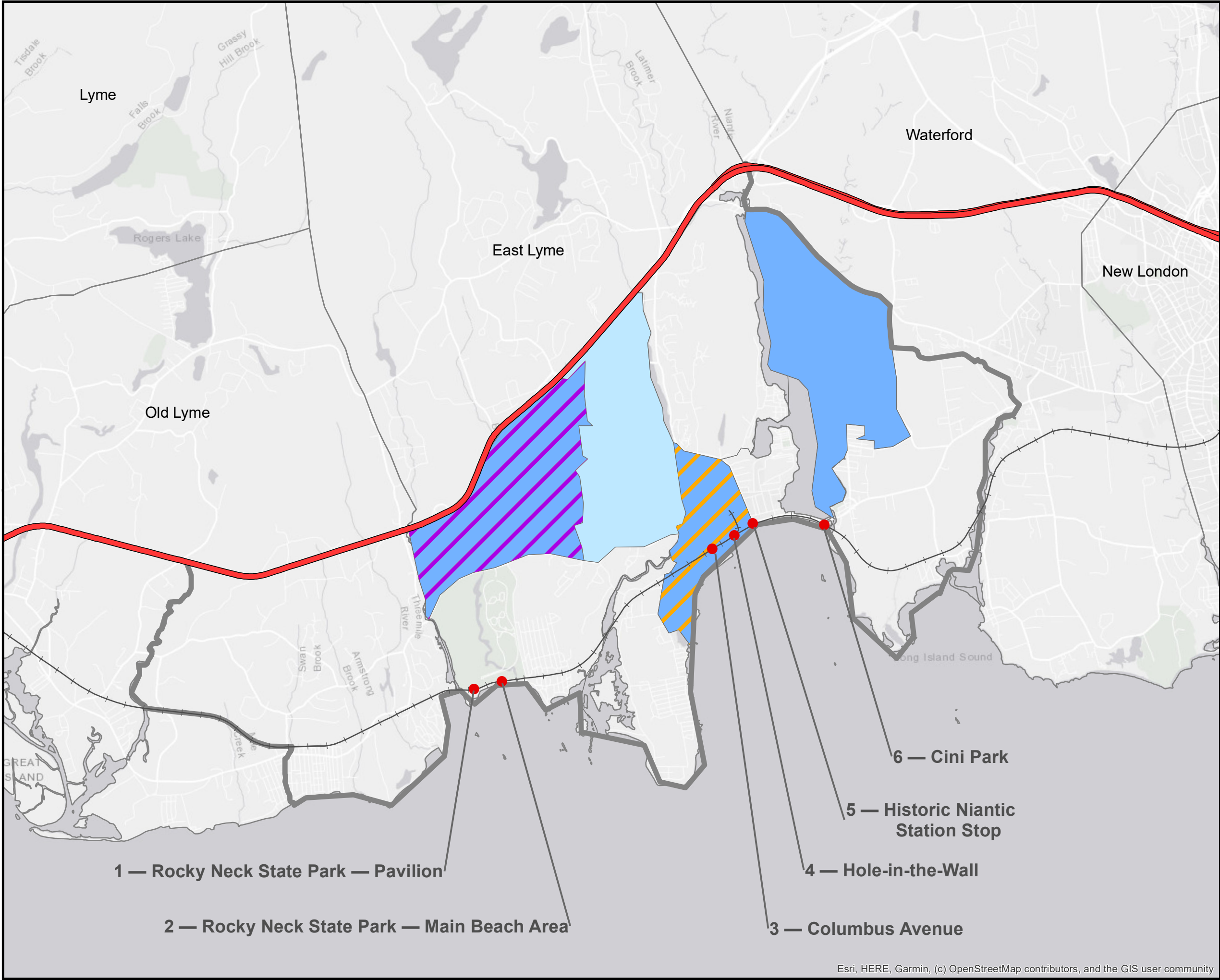
2 — Rocky Neck State Park — Main Beach Area

3 — Columbus Avenue

4 — Hole-in-the-Wall

5 — Historic Niantic
Station Stop

6 — Cini Park



**Niantic Rail Study:
Conceptual Station
Locations**



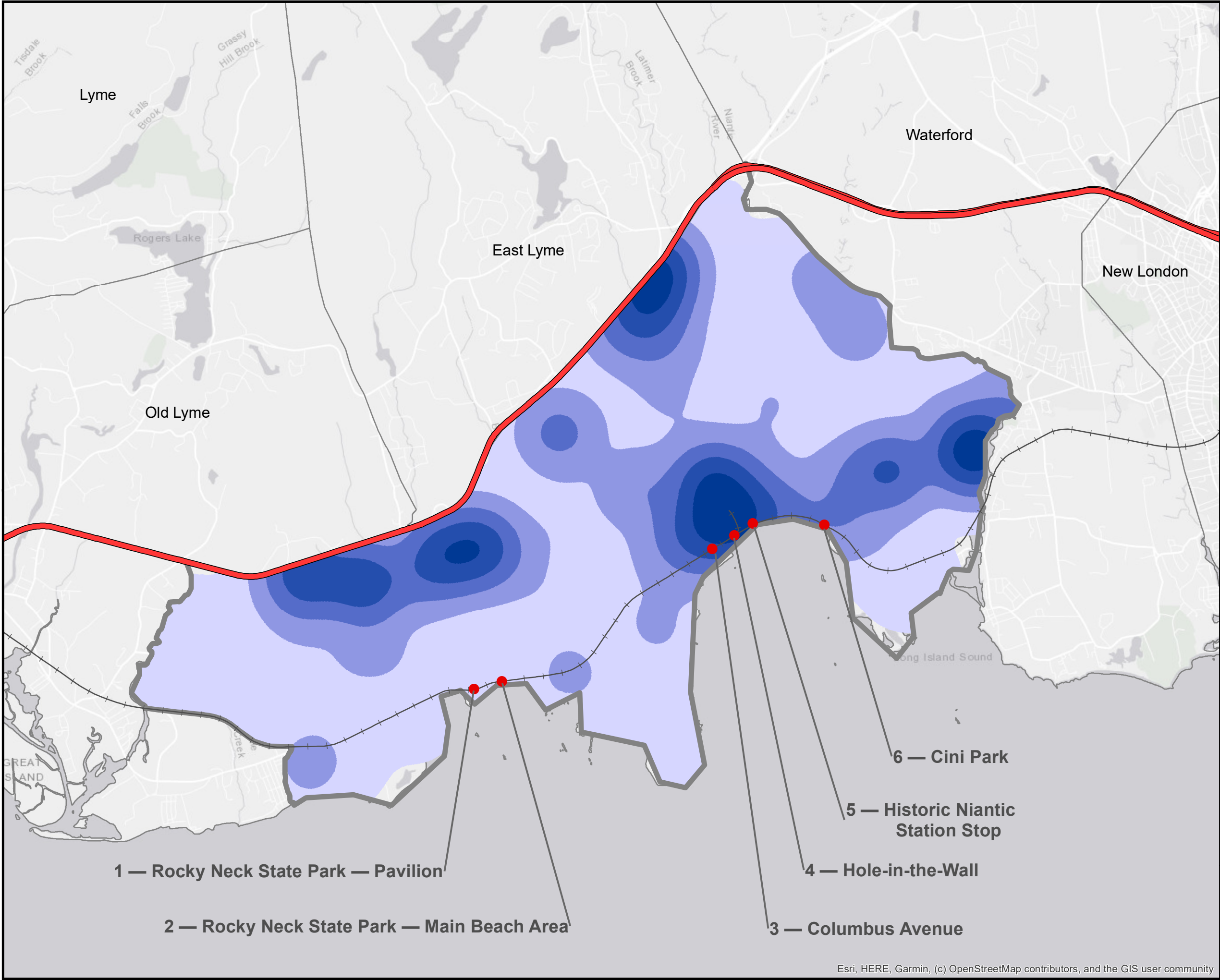
Environmental Justice Populations

- Conceptual Station Location
- I-95
- Rail Line
- ▭ Study Area
- Block Groups Where:**
 - $\geq 25.9\%$ of the population is not white
 - $\geq 11.85\%$ of households have an income \leq the FPL
 - 11.85% - 15% of households have an income $\leq 150\%$ of the FPL
 - $>15\%$ of households have an income $\leq 150\%$ of the FPL



0 0.5 1 2 Miles

DATA SOURCE: ACS_2019_5YR_B02001
and ACS_2019_5YR_19001;
Connecticut block group data.



**Niantic Rail Study:
Conceptual Station
Locations**



Job Density

● Conceptual Station Location

— I-95

— Rail Line

Study Area

Jobs/Sq.Mile

5 - 65

66 - 250

251 - 550

551 - 1,000

1,001 - 1,552



0 0.5 1 2 Miles

DATA SOURCE: LEHD OnTheMap 2017
Job Density

1 — Rocky Neck State Park — Pavilion

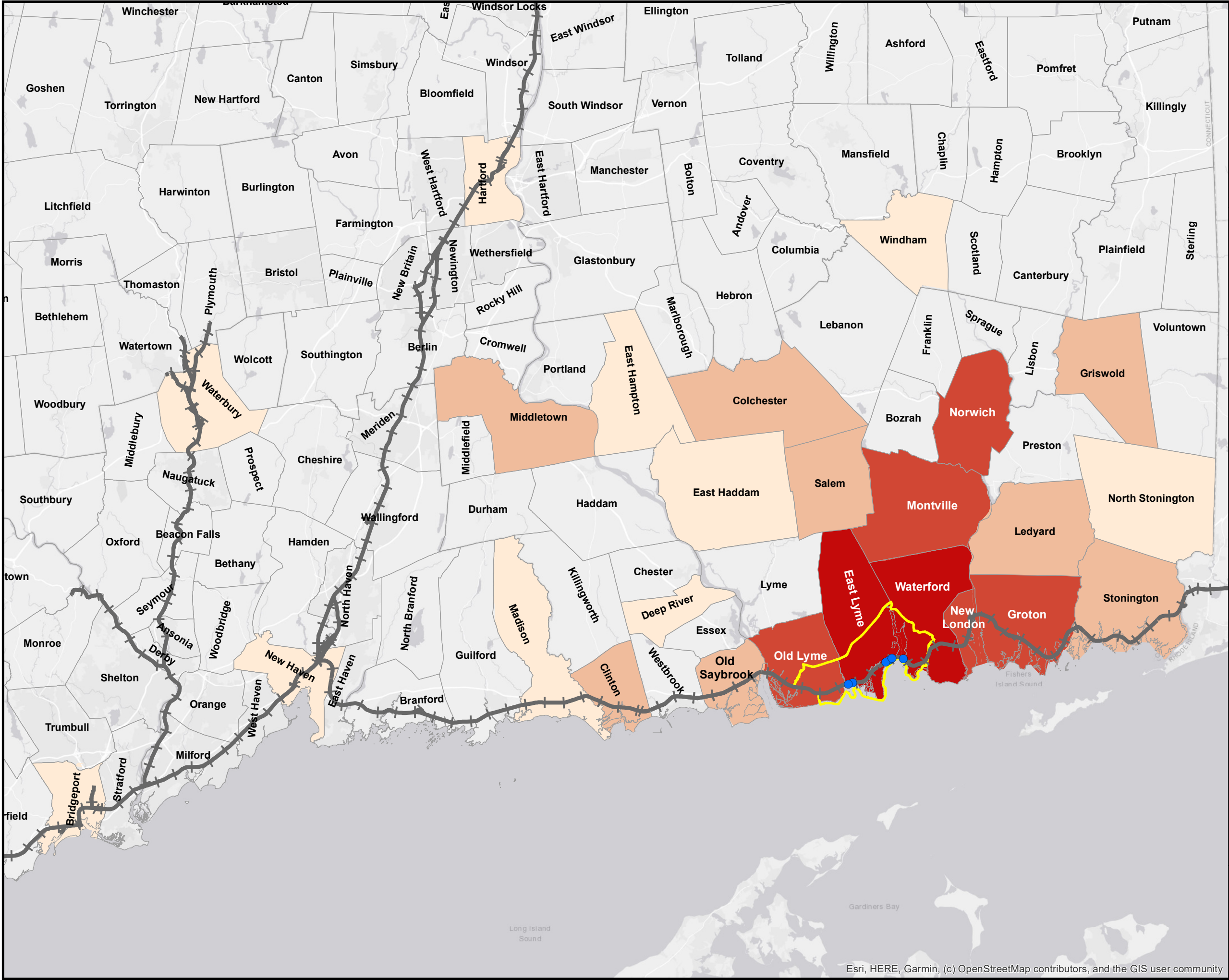
2 — Rocky Neck State Park — Main Beach Area

3 — Columbus Avenue

4 — Hole-in-the-Wall

5 — Historic Niantic
Station Stop

6 — Cini Park



Niantic Rail Study:
Conceptual Station
Locations



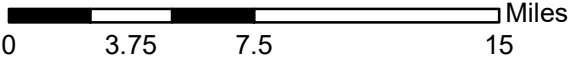
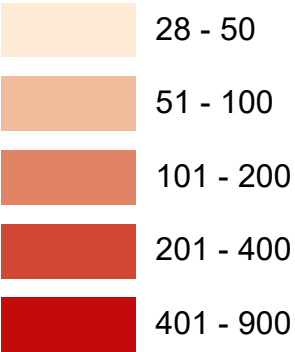
Employment Destination

● Conceptual Station Location

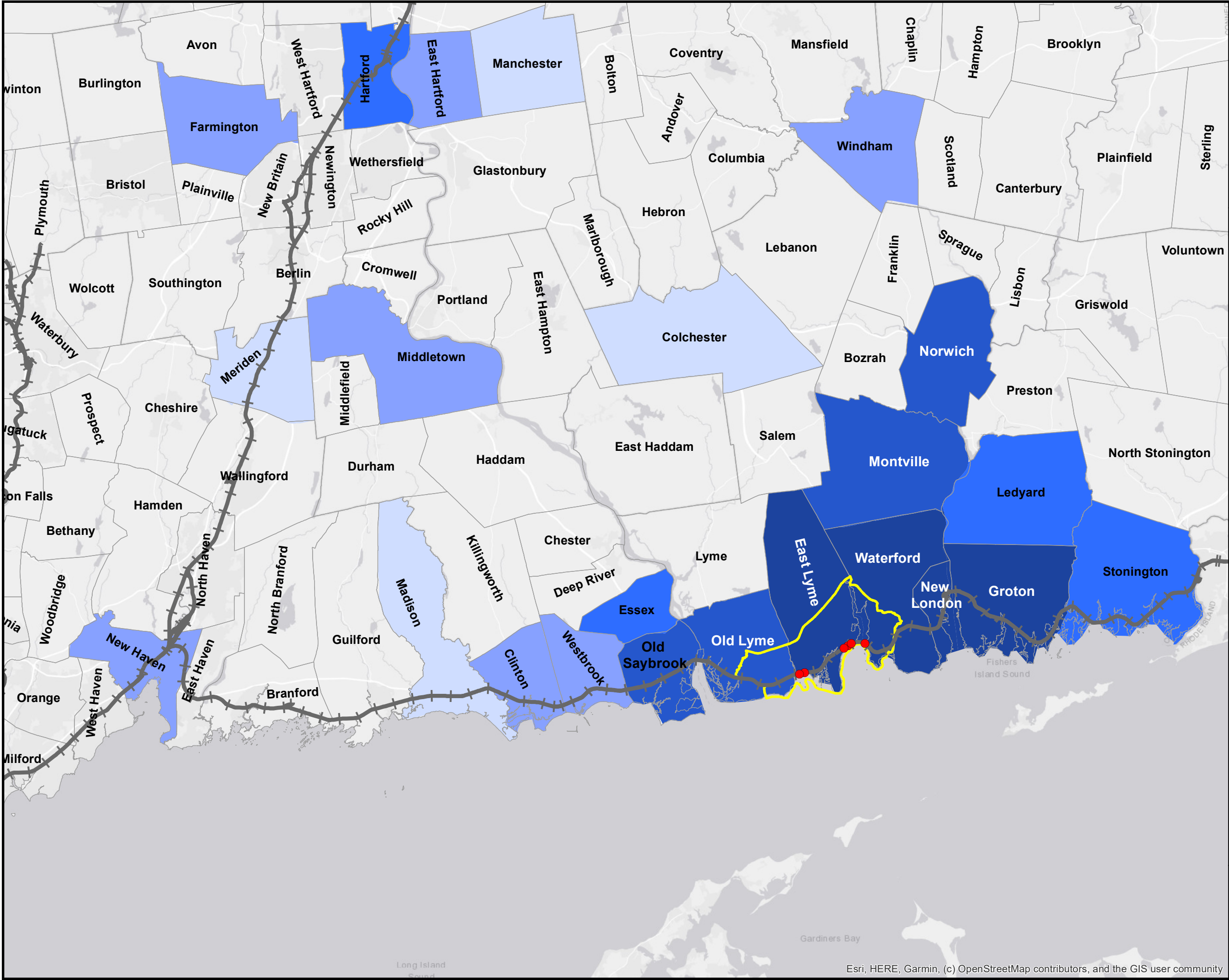
—+—+— Rail Line

▭ Study Boundary

Individuals Commuting into
the Study Boundary for Work



DATA SOURCE: LEHD OnTheMap 2017
Primary Employment Destination Data by
County Subdivision



**Niantic Rail Study:
Conceptual Station
Locations**



Employment Destination

- Conceptual Station Location
- Rail Line
- Study Boundary

**Individuals Commuting Out of
the Study Boundary for Work**

- 39 - 50
- 51 - 100
- 101 - 200
- 201 - 400
- 401 - 1091



0 3 6 12 Miles

DATA SOURCE: LEHD OnTheMap 2017
Primary Employment Destination Data by
County Subdivision

Parcel and Historic Mapping

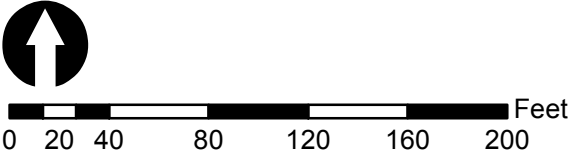


**Niantic Rail Study:
1 — Pavilion**



Parcel and Historic Mapping (D.9)

- Conceptual Station Location
- ▭ Parcels
- +—+— Rail Line
- Stone Wall
- Antique Buildings
- ▨ Archaeological Sites
- ▨ Historical Building Parcel
- Antique Building Parcel**
 - ▨ Entire visible area is under this category
- Historic Sites**
 - Entire visible area is under this category

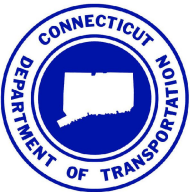


DATA SOURCE: CT ECO 2016 Orthophotography;
DISCLAIMER: Station locations are NOT
exact and are only representative

AECOM

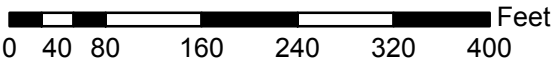


**Niantic Rail Study:
2 — Main Beach Area**



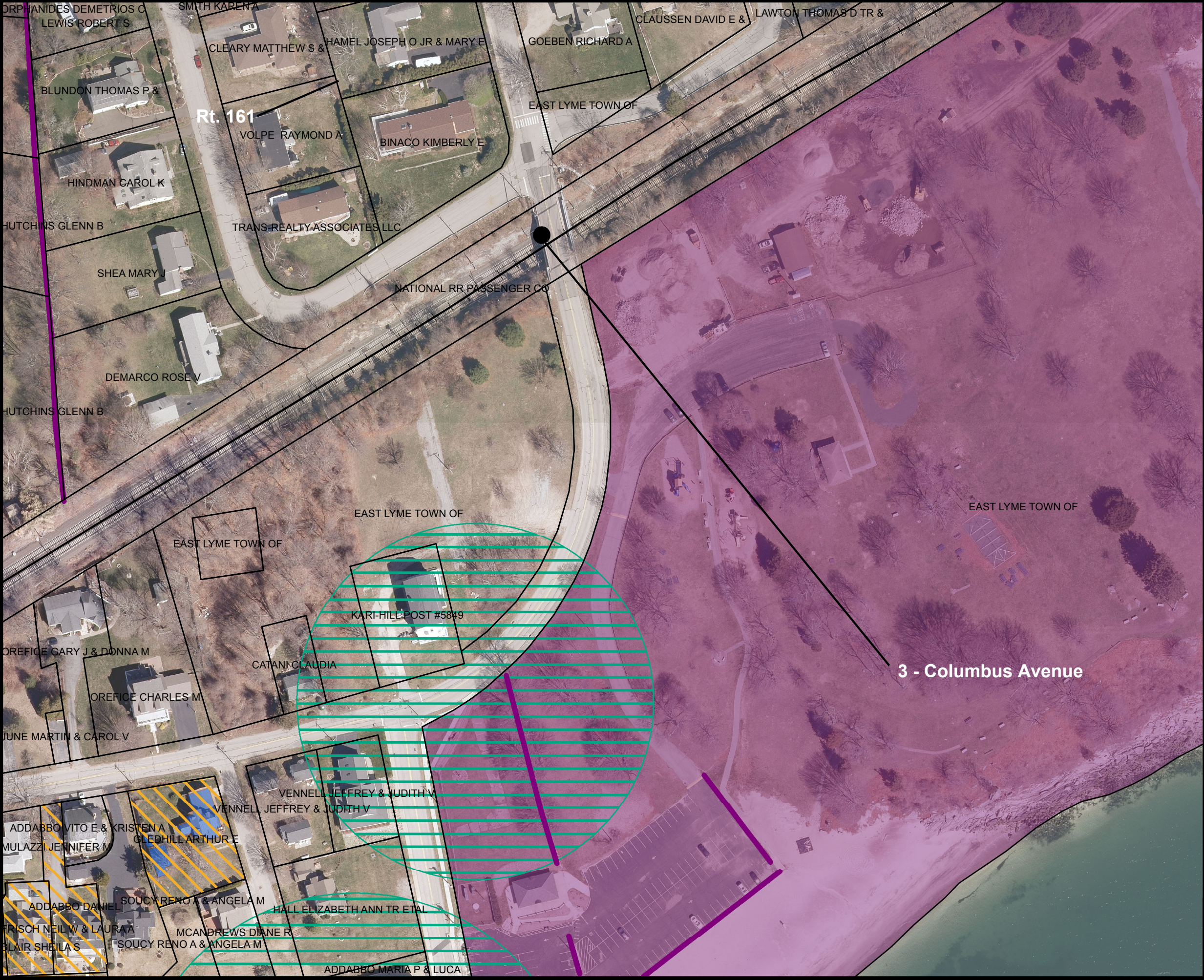
Parcel and Historic Mapping (D.8)

- Conceptual Station Location
- +— Rail Line
- Parcels
- Stone Wall
- Antique Buildings
- ▭ Archeological Sites
- ▨ Historical Building Parcel
- Antique Building Parcel**
 - ▨ Entire visible area is under this category
- Historic Sites**
 - Entire visible area is under this category



DATA SOURCE: CT ECO 2016 Orthophotography
DISCLAIMER: Station locations are NOT
exact and are only representative



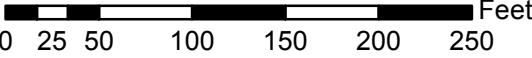


Niantic Rail Study:
3 — Columbus Avenue



Parcel and Historic Mapping (D.10)

- Conceptual Station Location
- +—+— Rail Line
- ▭ Parcels
- Stone Wall
- ▨ Antique Building Parcel
- ▭ Antique Buildings
- ▨ Archaeological Site
- ▨ Historical Building Parcel
- ▭ Historic Site



DATA SOURCE: CT ECO 2016 Orthphotography
DISCLAIMER: Station locations are NOT
exact and are only representative



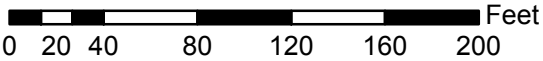


Niantic Rail Study:
4 — Downtown Niantic



Parcel and Historic Mapping (D.6)

- Conceptual Station Location
- ▭ Parcels
- +— Rail Line
- Stone Wall
- ▨ Antique Building Parcel
- Antique Buildings
- ▨ Archaeological Sites
- ▨ Historical Building Parcel
- Historic Sites



DATA SOURCE: CT ECO 2016 Orthphotography
DISCLAIMER: Station locations are NOT
exact and are only representative





Niantic Rail Study:
5 — Historic Niantic Rail
Station



Parcel and Historic Mapping (D.10)

- Conceptual Station Location
- +— Rail Line
- ▭ Parcels
- Stone Wall
- ▨ Antique Building Parcel
- Antique Buildings
- ▤ Archaeological Site
- ▦ Historical Building Parcel
- Historic Site

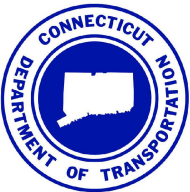


0 25 50 100 150 200 250 Feet

DATA SOURCE: CT ECO 2016 Orthphotography
DISCLAIMER: Station locations are NOT
exact and are only representative

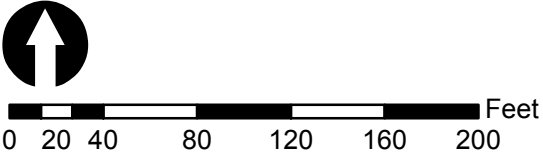


Niantic Rail Study:
6 — Cini Park



Parcel and Historic Mapping (D.7)

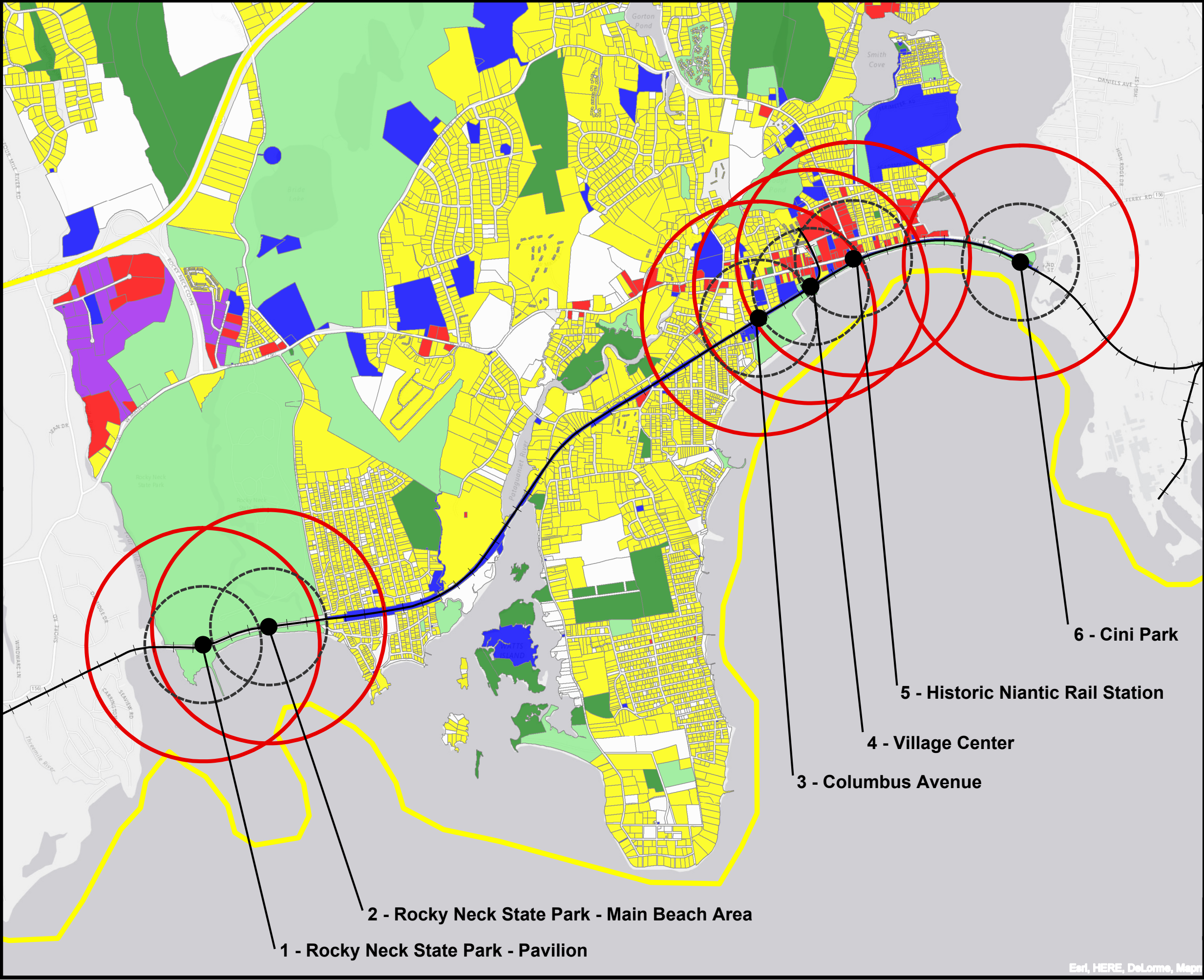
- Conceptual Station Location
- Stone Wall
- Rail Line
- Antique Building Parcel
- Antique Buildings
- Archaeological Site
- Historical Building Parcel
- Historic Site
- Parcels



DATA SOURCE: CT ECO 2016 Orthophotography
DISCLAIMER: Station locations are NOT
exact and are only representative



Zoning and Land Use



Niantic Rail Study: Conceptual Station Locations



Land Use (LU.1)

- Conceptual Station Location
- +— Rail Line
- ⬡ Quarter Mile Station Buffer
- ⬡ Half Mile Station Buffer
- ⬡ Study Boundary
- Land Use**
 - ⬡ Residential
 - ⬡ Commercial
 - ⬡ Industrial
 - ⬡ Social/ Institutional/ Infrastructure
 - ⬡ Leisure Activities
 - ⬡ Natural Resources
 - ⬡ Vacant/ Beyond Categorization



0 0.25 0.5 1 Miles

DATA SOURCE: 2016 Parcels Layer, Town of East Lyme
Note: Land use has been generalized from town categories for display purposes, categories align with LBCS



Niantic Rail Study:
Eastern Conceptual
Station Locations



Land Use

● Conceptual Station Location

—+—+— Rail Line

--- Quarter Mile Station Buffer

--- Half Mile Station Buffer

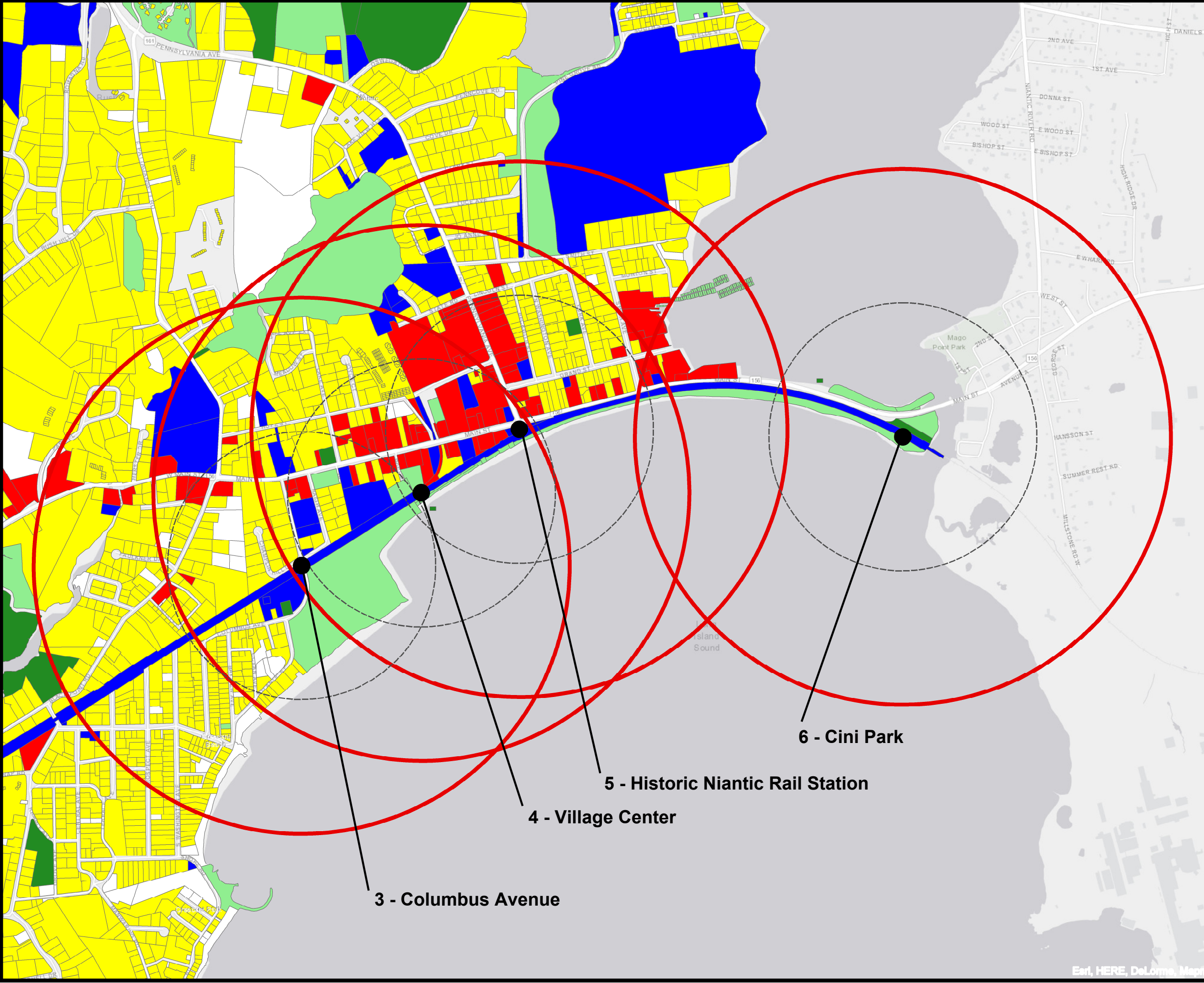
Land Use

- Residential
- Commercial
- Industrial
- Social/ Institutional/ Infrastructure
- Leisure Activities
- Natural Resources
- Vacant/ Beyond Categorization



0 312.5 625 1,250 1,875 2,500 Feet

DATA SOURCE: 2016 Parcels Layer, Town of East Lyme
Note: Land use has been generalized from town categories for display purposes, categories align with LBCS



Niantic Rail Study:
Eastern Conceptual
Station Locations



Land Use

● Conceptual Station Location

—+—+— Rail Line

--- Quarter Mile Station Buffer

■ Half Mile Station Buffer

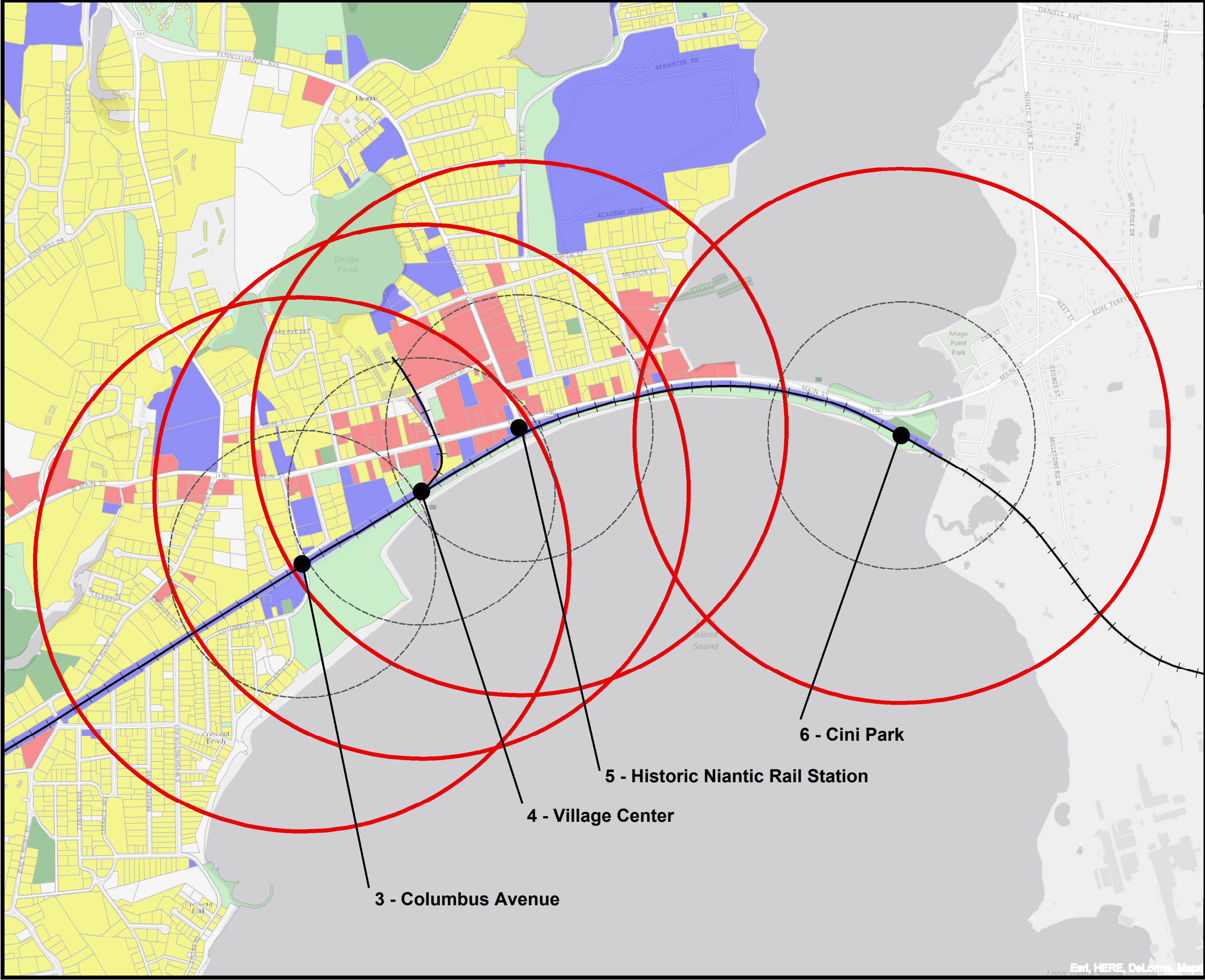
Land Use

- Residential
- Commercial
- Industrial
- Social/ Institutional/ Infrastructure
- Leisure
- Natural Resources
- Vacant/ Beyond Categorization



0 312.5 625 1,250 1,875 2,500 Feet

DATA SOURCE: 2016 Parcels Layer, Town of East Lyme
Note: Land use has been generalized from town categories for display purposes, categories align with LBCS

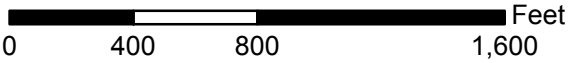


Niantic Rail Study:
Western Conceptual
Station Locations

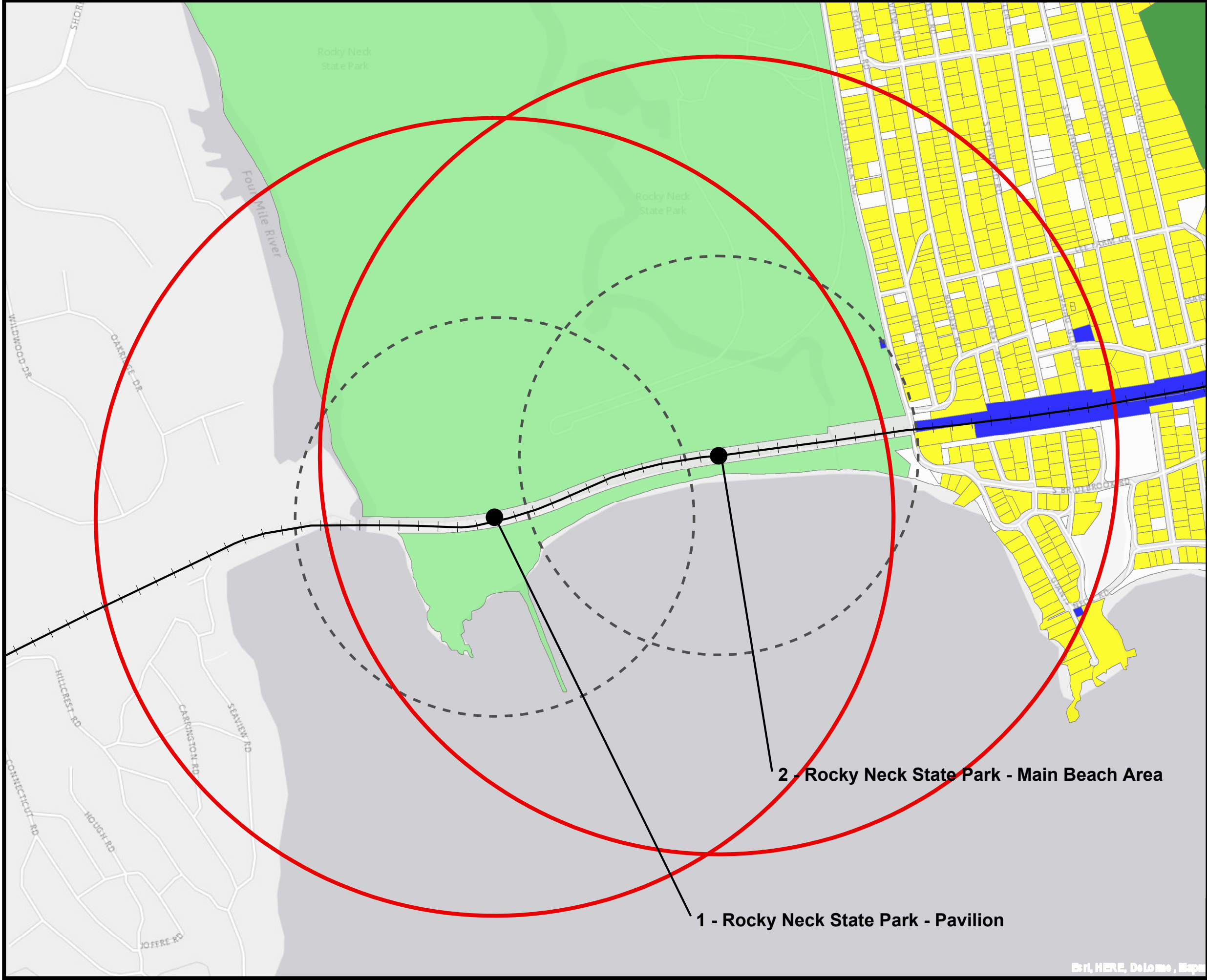


Land Use (LU.3)

- Conceptual Station Location
- +—+— Rail Line
- Half Mile Station Buffer
- - - Quarter Mile Station Buffer
- Land Use**
 - Residential
 - Commercial
 - Industrial
 - Social/ Institutional/ Infrastructure
 - Leisure Activities
 - Natural Resources
 - Vacant/ Beyond Categorization



DATA SOURCE: 2016 Parcels Layer, Town of East Lyme
Note: Land use has been generalized from town categories for display purposes, categories align with LBCS



Environmental Mapping

Niantic Rail Study:
Eastern Conceptual
Station Locations



Bedrock Geology (E.1)

● Conceptual Station Location

—+—+— Rail Line

⋯ Quarter Mile Station Buffer

▭ Half Mile Station Buffer Town

— Boundary

Bedrock Geology

Ota; Tatnic Hill Formation

Pw; Westerly Granite

Zsh; Hope Valley Alaskite Gneiss

Zsph; Potter Hill Granite Gneiss

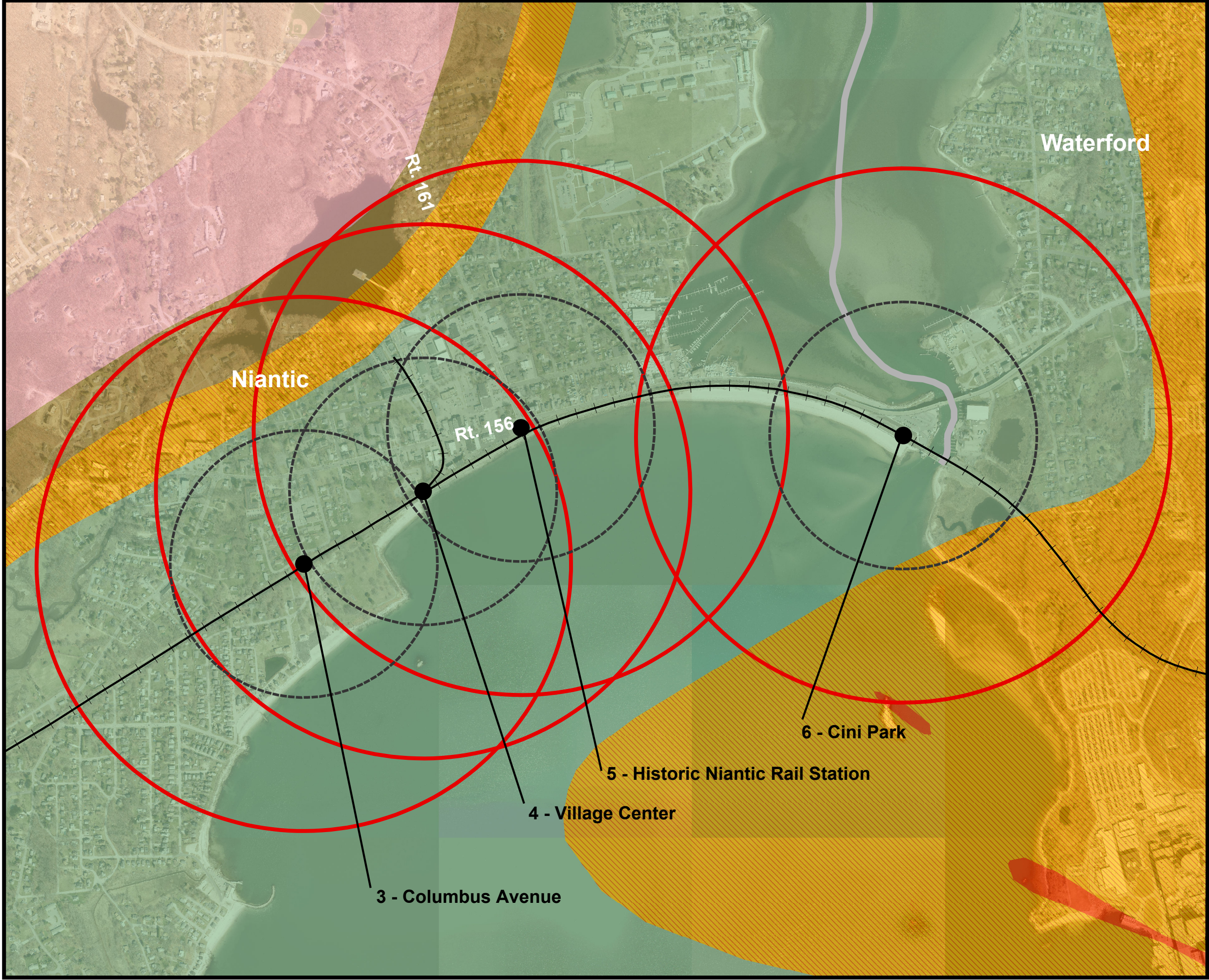
Zwm; Mamacoke Formation

Zwr; Rope Ferry Gneiss



0 250 500 1,000 1,500 2,000 2,500 Feet

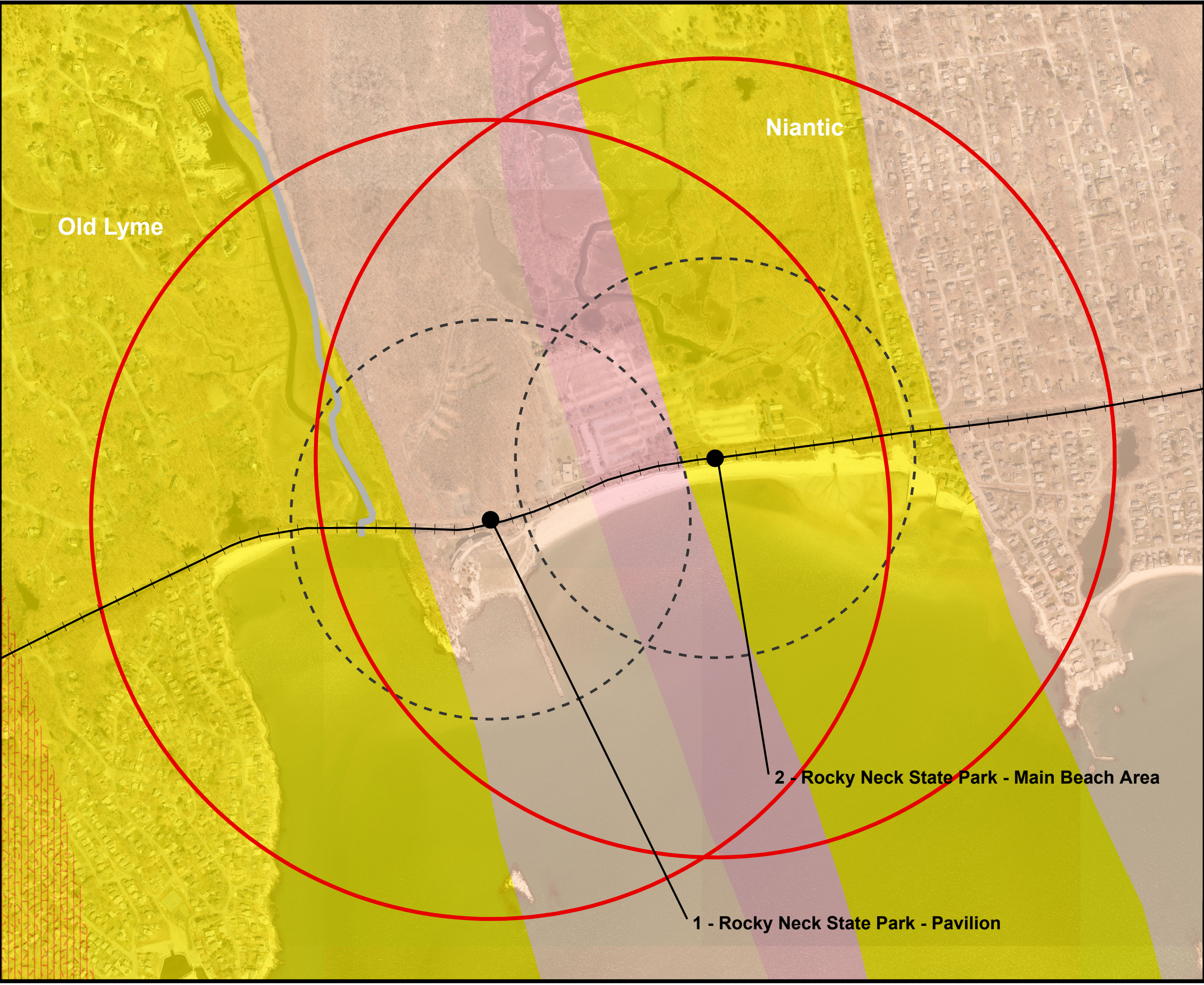
DATA SOURCE: DEEP Bedrock Geology Layer; CT
ECO 2016 Orthophotography



Niantic Rail Study:
Western Conceptual
Station Locations



Bedrock Geology (E.2)



● Conceptual Station Location

—+—+— Rail Line

□ Half Mile Station Buffer

□ Quarter Mile Station Buffer

— Town Boundary

Bedrock Geology

Zp; Plainfield Formation

Zp+Zsph+Pn?; Plainfield Formation, Potter Hill Granite Gneiss and Narragansett Pier Granite undivided

Zsh; Hope Valley Alaskite Gneiss

Zsph; Potter Hill Granite Gneiss



0 400 800 1,600 Feet

DATA SOURCE: DEEP Bedrock Geology Layer;
CT ECO 2016 Orthophotography

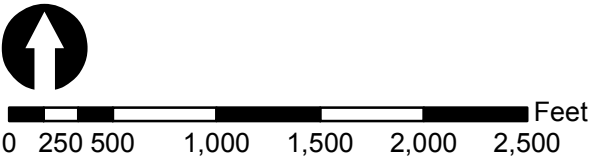


Niantic Rail Study:
Eastern Conceptual
Station Locations



Surficial Materials (E.3)

- Conceptual Station Location
 - +—+— Rail Line
 - Town Boundary
 - - - Quarter Mile Station Buffer
 - ▭ Half Mile Station Buffer
- Surficial Materials**
- Thin Till
 - Thick Till
 - Till, Sand+Gravel, Boulders
 - Gravel
 - Sand and Gravel
 - Sand and Gravel overlying Sand
 - Sand and Gravel overlying Sand overlying Fines
 - Alluvium overlying undifferentiated Coarse Deposits
 - Beach deposits
 - Salt-Marsh and Tidal-Marsh deposits



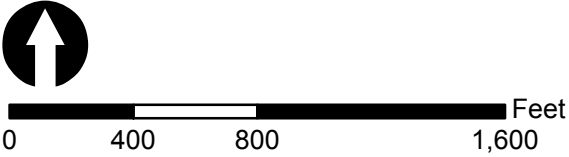
Niantic Rail Study:
Western Conceptual
Station Locations



Surficial Materials (E.4)



- Conceptual Station Location
 - Rail Line
 - Half Mile Station Buffer
 - Quarter Mile Station Buffer
 - Town Boundary
- Surficial Materials**
- Thin Till
 - Till, Sand+Gravel, Boulders
 - Sand and Gravel
 - Sand and Gravel overlying Sand
 - Beach deposits
 - Salt-Marsh and Tidal-Marsh deposits



Niantic Rail Study:
Eastern Conceptual
Station Locations



Storm Surge Inundation (E.5)

● Conceptual Station Location

—+— Rail Line

— Town Boundary

- - - Quarter Mile Station Buffer

□ Half Mile Station Buffer

CT Hurricane Surge Inundation

Category 1

Category 2

Category 3

Category 4



0 250 500 1,000 1,500 2,000 2,500 Feet

DATA SOURCE: DEEP CT Hurricane Inundation Layer; CT
ECO 2016 Orthophotography

AECOM





**Niantic Rail Study:
Western Conceptual
Station Locations**



Storm Surge Inundation (E.6)

- Conceptual Station Location
- +—+— Rail Line
- Half Mile Station Buffer Quarter
- Mile Station Buffer Town
- Boundary

CT Hurricane Surge Inundation

- Category 1
- Category 2
- Category 3
- Category 4



0 400 800 1,600 Feet

DATA SOURCE: DEEP CT Hurricane Surge Inundation; CT ECO 2016 Orthophotography



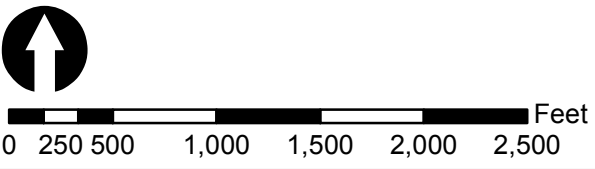
Niantic Rail Study:
Eastern Conceptual
Station Locations



Water Quality Mapping (E.7)



- Conceptual Station Location
- +—+— Rail Line
- Town Boundary
- - - Quarter Mile Station Buffer
- ▭ Half Mile Station Buffer
- Surface Water Quality**
 - ▭ A; Potential water supply
 - ▨ SA; Saltwater, fish and shellfish safe for human consumption
 - ▨ Area of contribution to public water supply
- Ground Water Quality**
 - ▭ Existing or potential water supply, suitable for consumption without treatment
 - ▭ May be impaired; Quality of groundwater doesn't meet the assigned standards, modified class designation unique to digital data



DATA SOURCE: DEEP Ground Water Quality Classifications Layer; DEEP Surface Water Quality Classifications Layer; CT ECO 2016 Orthophotography



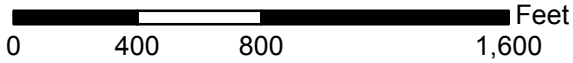


**Niantic Rail Study:
Western Conceptual
Station Locations**



Water Quality Mapping (E.8)

- Conceptual Station Location
 - +— Rail Line
 - Half Mile Station Buffer Quarter
 - Mile Station Buffer Town
 - Boundary
- Surface Water Quality**
- A; Potential water supply
 - ▨ SA; Saltwater, fish and shellfish safe for human consumption
 - ▨ Area of contribution to public water supply
- Ground Water Quality**
- Existing or potential water supply, suitable for consumption without treatment
 - May be impaired; Quality of groundwater doesn't meet the assigned standards, modified class designation unique to digital data



DATA SOURCE: DEEP Ground Water Quality Classifications Layer; DEEP Surface Water Quality Classifications Layer; CT ECO 2016 Orthophotography





Niantic Rail Study: Western Conceptual Station Locations



Hydric Soils and Flood Mapping (E.10)

- Conceptual Station Location
- +—+— Rail Line
- Half Mile Station Buffer
- Quarter Mile Station Buffer
- Town Boundary
- FEMA Flood Zones**
 - 100 Yr Flood Zone
 - 500 Yr Flood Zone
 - Tidal Wetland 1990s
- Water**
 - Surface Water Boundary
 - Dam
- Wetland Soils**
 - Poorly Drained and Very Poorly Drained Soils



0 400 800 1,600 Feet

DATA SOURCE: DEEP Tidal Wetlands 1990s Layer;
DEEP Hydric Soils Layer in conjunction with SSURGO
Database; CT ECO 2016 Orthophotography

AECOM

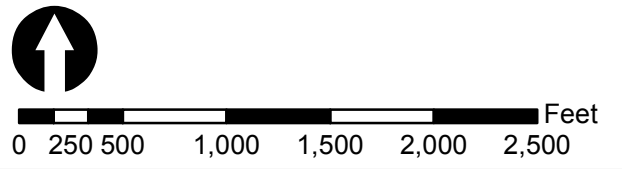


**Niantic Rail Study:
Eastern Conceptual
Station Locations**



Hydric Soils and Flood Mapping (E.9)

- Conceptual Station Location
- +— Rail Line
- Town Boundary
- - - Quarter Mile Station Buffer
- Half Mile Station Buffer
- FEMA Flood Zones**
 - 100 Yr Flood Zone
 - 500 Yr Flood Zone
 - Tidal Wetland 1990s
- Water**
 - Surface Water Boundary
 - Dam
- Wetland Soils**
 - Poorly Drained and Very Poorly Drained Soils



DATA SOURCE: DEEP Ground Water Quality Classifications Layer; DEEP Surface Water Quality Classifications Layer; CT ECO 2016 Orthophotography

AECOM

**Niantic Rail Study:
Eastern Conceptual
Station Locations**



NDDB & Wildlife Refuges (E.11)

- Conceptual Station Location
- +—+— Rail Line
- Town Boundary
- - - Quarter Mile Station Buffer
- Half Mile Station Buffer

**Natural Diversity Database
Area**

- Natural Diversity

National Wildlife Refuge

- National Wildlife Refuge



0 250 500 1,000 1,500 2,000 2,500 Feet

DATA SOURCE: DEEP Natural Diversity Database Area Layer;
DEEP Federally Protected Open Space Layer;
CT ECO 2016 Orthophotography



Niantic Rail Study: Western Conceptual Station Locations



NDDB & Wildlife Refuges (E.12)

- Conceptual Station Location
- +—+— Rail Line
- Half Mile Station Buffer Quarter
- Mile Station Buffer Town
- Boundary

Natural Diversity Database Area

- Natural Diversity

National Wildlife Refuge

- National Wildlife Refuge



0 400 800 1,600 Feet

DATA SOURCE: DEEP Natural Diversity Database Area Layer;
DEEP Federally Protected Open Space Layer;
CT ECO 2016 Orthophotography

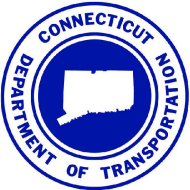
AECOM





1 - Rocky Neck State Park - Pavilion

Niantic Rail Study:
1 — Pavilion



Elevation Contours (E.16)

● Conceptual Station Location

—+— Rail Line

▭ Parcels

Elevation Contours

1 foot contours

- ≤ 5
- 6 — 10
- 11 — 15
- 16 — 20
- 21 — 25
- 26 — 30
- 31 — 35
- 36 — 40
- 41 — 45
- > 45



0 20 40 80 120 160 200 Feet

DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 DEM
DISCLAIMER: Station locations are NOT exact and are only representative



Niantic Rail Study:
2 — Main Beach



Elevation Contours (E.15)

● Conceptual Station Location

—+—+— Rail Line

▭ Parcels

Elevation Contours

1 foot contours

- ≤ 5
- 6 — 10
- 11 — 15
- 16 — 20
- 21 — 25
- 26 — 30
- 31 — 35
- 36 — 40
- 41 — 45
- > 45



0 40 80 160 240 320 400 Feet

DATA SOURCE: CTECO 2016 Orthophotography; CT ECO 2016 DEM
DISCLAIMER: Station locations are NOT exact and are only representative



2 - Rocky Neck State Park - Main Beach



Niantic Rail Study: 3 — Columbus Avenue



Elevation Contours (E.17)

● Conceptual Station Location

—+—+— Rail Line

▭ Parcels

Elevation Contours

1 foot contours

- ≤ 5
- 6 — 10
- 11 — 15
- 16 — 20
- 21 — 25
- 26 — 30
- 31 — 35
- 36 — 40
- 41 — 45
- > 45



0 25 50 100 150 200 250 Feet

DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 DEM
DISCLAIMER: Station locations are NOT exact and are only representative

AECOM



**Niantic Rail Study:
4 — Downtown Niantic**



Elevation Contours (E.13)

● Conceptual Station Location

—+— Rail Line

▭ Parcels

Elevation Contours

1 foot contours

- ≤ 5
- 6 — 10
- 11 — 15
- 16 — 20
- 21 — 25
- 26 — 30
- 31 — 35
- 36 — 40
- 41 — 45
- > 45



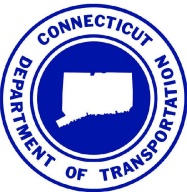
0 20 40 80 120 160 200 Feet

DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 DEM
DISCLAIMER: Station locations are NOT exact and are only representative





Niantic Rail Study: 5 — Historic Niantic Station



Elevation Contours (E.18)

- Conceptual Station Location
- +— Rail Line
- ▭ Parcels

Elevation Contours

1 foot contours

- ≤ 2
- 3 — 4
- 5 — 6
- 7 — 8
- 9 — 10
- 11 — 12
- 13 — 16
- 17 — 20
- 21 — 25
- > 25



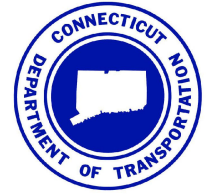
0 25 50 100 150 200 250 Feet

5 - Historic Niantic Rail Station

DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 Orthophotography DEM
DISCLAIMER: Station locations are NOT exact and are only representative



Niantic Rail Study: 6 — Cini Park



Elevation Contours (E.14)

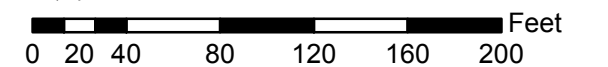
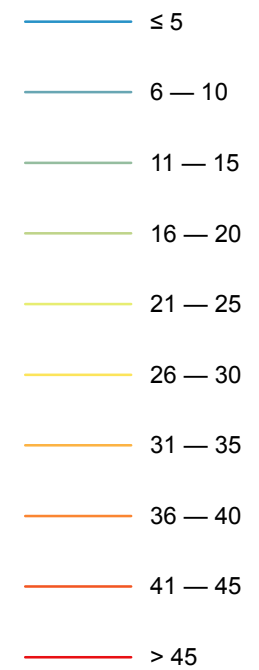
● Conceptual Station Location

—+—+— Rail Line

▭ Parcels

Elevation Contours

1 foot contours



DATA SOURCE: CT ECO 2016 Orthophotography; CT ECO 2016 DEM
DISCLAIMER: Station locations are NOT exact and are only representative

AECOM

6 - Cini Park

Rt. 156 (Main St.)



**Niantic Rail Study:
Eastern Conceptual
Station Locations**



Conserved Lands (E.18)

- Conceptual Station Location
- +—+— Rail Line
- Town Boundary
- - - Quarter Mile Station Buffer
- Half Mile Station Buffer

Conserved Lands

- National Wildlife Refuge
- 6F Lands
- 4F Lands
- Municipal Open Space



0 250 500 1,000 1,500 2,000 2,500 Feet

DATA SOURCE: DEEP Natural Diversity Database Area Layer;
DEEP Federally Protected Open Space Layer;
CT ECO 2016 Orthophotography





Niantic Rail Study: Western Conceptual Station Locations



Conserved Lands (E.19)

Conceptual Station Location

Rail Line

Half Mile Station Buffer

Quarter Mile Station Buffer

Town Boundary

Conserved Lands

National Wildlife Refuge

6F Lands

4F Lands

Municipal Open Space

Feet
0 400 800 1,600

Appendix 5 - Corridor Capacity Analysis



BACKGROUND INFORMATION

This operations analysis assumes and evaluates a new Niantic Station on Amtrak's Northeast Corridor somewhere in the vicinity of Mile Post 115.7. The exact location of the new station does not affect this analysis in any significant way. The station will have two side platforms, one for each track.

It is estimated that adding a Niantic stop to SLE trains will increase trip time by approximately 2.5 to 3.0 minutes due to the time lost while decelerating, stopping for dwell time, and accelerating back to speed. For this analysis, a scheduled trip-time increase of 3 minutes is assumed for any train stopping at the new Niantic Station.

No Train Performance Calculator (TPC) simulations have been processed, therefore precise recommended times for the new scheduled station stops cannot be set. By using TPC, the precise station-stop times can be set so that ideal on-time trains will never be early at the station and have to wait for time and will never be more than about 60 seconds late.

Two options were evaluated:

- Option 1 – Stopping at Niantic only the SLE trains that pass-through Niantic in the provided timetable.
- Option 2 – Extending all SLE Old Saybrook trains in the provided timetable to and from New London and stopping all SLE trains at Niantic.

ANALYSIS OF THE PROVIDED TRAIN SCHEDULES

Before conducting this analysis, provided Amtrak and SLE train schedules were reviewed. An integrated set of the westbound Amtrak and SLE train schedules as well as eastbound train schedules were prepared. See Exhibit 1 titled “Baseline Provided Timetable”.

For east of New London, only the Amtrak trains are listed. The MBTA trains are not included. For the New Haven area, only the Amtrak Boston and SLE trains are listed. The Amtrak Springfield and MNR trains are not included.

For the territory between New London and New Haven, an earlier timetable provided in 2017 time-versus-location “string lines” graphically showing the (2017) scheduled train movements during the morning time period between 12 Midnight and 10 AM was previously plotted for. This was primarily done to help understand the peculiarities of the morning train operations within the territory being studied.

Pertinent observations and comments about the earlier Amtrak and SLE (2017) train schedules are as follows:

Because the Clinton and Madison Stations only have a platform on Track 2 (the eastbound track), westbound trains stopping at these stations must operate on Track 2 (the eastbound track). It was observed that the westbound SLE trains stopping at these two stations also operated on Track 2 at Westbrook and Branford Stations, and on Track 4 at Guilford Station.

All the morning SLE westbound revenue trains to and including SLE 1651 stopped at both of these “one-side-platform” stations and operated on eastbound Track 2. This and the eastbound train traffic necessitated that a number of Amtrak westbound trains also operated on Track 2 (the eastbound track) during this time period.

For the remainder of the day, the westbound SLE trains normally operated on Track 1 (the westbound track) (along with the Amtrak trains) and did NOT stop at Clinton or Madison Stations.

Because of this morning westbound traffic, all the morning eastbound SLE revenue trains from SLE 1600 until SLE 1610 inclusive operated on Track 1 (the westbound track) and did NOT stop at Clinton or Madison Stations. And because Track 2 was used by so many westbound trains, all eastbound Amtrak and SLE trains (both revenue and deadhead) from SLE DH 9704 (and possibly Amtrak 66) until Amtrak 2150 inclusive operated on Track 1 (the westbound track) in this area.

Starting with SLE 1616, all the eastbound SLE revenue trains operated on Track 2 (the eastbound track) (Track 4 at Guilford) and stopped at both Clinton and Madison Stations.

In the composite timetable provided in 2017, three westbound Amtrak trains (2151, 95, and 93/83) carried SLE passengers, one of which was an Acela. Five eastbound Amtrak trains (190, 174, 176, 94, and 178) also carried SLE passengers.

SLE operated several westbound deadhead trains from Old Saybrook to New Haven. Except for one, they all operated during the evening and late-evening hours. SLE also operated several eastbound deadhead trains from New Haven to Old Saybrook, one of which continued to New London. They all operated during the early-morning hours.

For the 2017 SLE train schedules, the interlocking passing times were provided, however, such information for the Amtrak trains were not provided. Therefore, many passing times for Amtrak trains were estimated to help understand the overall train operations. The passing times were shown in brackets on the 2017 graphics. Again, the brackets denote passing times for trains not scheduled to stop at that timing point.

The morning was and is more complex than expected because of eastbound trains operating on the westbound track, and westbound trains operating on the eastbound track. However, this analysis determined that none of this affects the Niantic Station analysis or the ability to provide a new SLE station at Niantic.

The newly provided (2021) Amtrak/SLE composite timetable of revenue trains were also examined for this analysis. This composite timetable is presented in Exhibit 1 titled Baseline Provided Timetable.

No new operational abnormalities or issues affecting this Niantic Station analysis were found.

ANALYSIS OF EXISTING TRACK AND INTERLOCKING CONFIGURATIONS

Shaws Cove Interlocking provides universal flexibility immediately west of New London Station. The next interlocked connections west of Shaws Cove between Tracks 1 and 2 is Crescent Interlocking located at MP 115.0, which is a very short distance west of the proposed Niantic Station. The analysis as presented in this report is that the existing interlocking locations, configurations and functionality will fully support providing a new SLE station at Niantic and the Option 1 train service as defined later in this document.

However, the SLE Option 2 train service as defined in this report presents additional and challenging operational and train-scheduling issues. This portion of Amtrak's Northeast Corridor between New Haven and New London is primarily a two-track rail line and intercity corridor having limited train-passing capabilities for same-direction "overtakes." This territory was not configured for a high density of Amtrak intercity express trains and slower SLE commuter trains. While both main tracks are equipped with bidirectional signaling, the current train densities generally preclude scheduling the opposite-direction track to be used for same-direction train overtakes. A footnote in the September 30, 2019 SLE public timetable makes the infrastructure limitations very clear:

“SLE Train 3638 may be held in Guilford for 10 to 15 minutes to allow the Amtrak express train to pass.”

While SLE Train 3638 only operates on weekends, this type of timetable footnote warning about significant 10- to 15-minute delays because of a possible train overtake is not found on typical commuter rail systems. SLE is a user of Amtrak’s two-track Northeast Corridor and its trains must generally be scheduled to avoid impacting the many Amtrak higher-speed intercity trains.

OPTIONS FOR PROVIDING TRAIN SERVICE AT THE NEW NIANTIC STATION

The three primary options for providing new train service at Niantic Station include:

- Option 1 – Stopping existing SLE trains currently passing Niantic.
- Option 2 – Extending all SLE Old Saybrook originating and terminating trains to New London and having these trains stop at Niantic, in addition to the existing SLE New London trains.

There are numerous possible variations in the above three primary options.

It is believed that Amtrak will not be willing to have any of their trains stop at Niantic to carry SLE passengers since Niantic will be a non-Amtrak Station.

The analysis presented in this report only addresses Options 1 and 2.

OPTION 1 – STOPPING EXISTING SLE TRAINS PASSING NIANTIC AT A NEW NIANTIC STATION

The following is an analysis by individual SLE revenue train. Exhibit 2 shows the proposed conceptual timetable modifications to the Baseline Provided Timetable. Exhibit 2 incorporates the new Niantic stops and is titled Option 1 Conceptual Timetable. In lieu of the scheduled stopping time at Niantic, XXX in the timetable exhibit means that the precise scheduled times for Niantic Station need to be computed by TPC simulation, but that (if done later) does not affect this analysis in any way.

Westbound

SLE 1633 – Recommended to depart New London 3 minutes earlier. Times at all other stations remain unchanged. This is deemed best because Amtrak 2151 is following SLE 1633 approaching New Haven. This is also deemed very desirable because SLE 1633 is a thru train to Stamford, and the proposed schedule adjustment will keep the train in the same exact operating slot on MNR.

SLE 1641 – Recommended to depart New London at same time, and operate 3 minutes later at all stations west of Niantic. This maintains the 20-minute equipment-turn time at New London, and still provides adequate clearance with following Amtrak 2153 at New Haven, as well as sufficient connecting time with MNR 1541 at New Haven.

SLE 1667 – Recommended to depart New London at same time, and operate 3 minutes later at all stations west of Niantic. This maintains the existing 13-minute equipment-turn time at New London, and still provides adequate clearance with following Amtrak 2163 at New Haven, as well as sufficient connecting time with MNR 1565 at New Haven.

SLE 1691 – Recommended to depart New London 1 minute earlier. Times at all other stations moved 2 minutes later. This provides a 4-minute minimal clearance with following Amtrak 2175 approaching New Haven. Turn time at New London from Train SLE 1636 will be 16 minutes.

SLE 1695 – Recommended to depart New London at same time. Times at all other stations moved 3 minutes later. This shortens the connection time with MNR 1595 at New Haven to 6 minutes. This is necessary to provide a very minimal 12-minute turn time from Train SLE 1640 at New London. This overall scenario involving Trains SLE 1640 and SLE 1695 will be separately addressed at the end of this section.

SLE 1697 – Departing New London is shown 3 minutes earlier, but keeping all other station times unchanged. However, the New London time could be kept constant, and the other times made 3 minutes later. In short, the 3 minutes for the added station stop can be allocated however desired, because there are no apparent constraints.

SLE 1699 – Recommended to depart New London 3 minutes later (because of SLE 1674 arriving 3 minutes later). SLE 1699 would then operate 6 minutes later at all stations west of Niantic. This maintains the 19-minute equipment-turn time at New London from Train SLE 1674.

Eastbound

SLE 1600 – Recommended to depart New Haven and all stations up to Old Saybrook inclusive 3 minutes earlier. Time at New London remains unchanged. This is necessary to maintain the existing 20-minute turn time at New London.

SLE 1616 – Recommended to depart New Haven and all stations up to Old Saybrook inclusive 3 minutes earlier. Time at New London remains unchanged. This is necessary to maintain the existing 13-minute turn time at New London. There will still be 11 minutes connection time at New Haven with MNR 1512.

SLE 1636 – Recommended to depart New Haven and all stations to Old Saybrook inclusive at same time, and operate 3 minutes later arriving New London. This maintains the 6-minute connection time with MNR 1536 at New Haven. The turn time at New London for SLE 1691 will be 16 minutes.

SLE 1640 – Recommended to depart Stamford and all stations to Old Saybrook inclusive at same time, and operate 3 minutes later arriving New London. This has been done to keep the operational slotting of SLE 1640 on MNR unchanged. The turn time at New London to become SLE 1695 will be a very minimal 12 minutes. This overall scenario involving Trains SLE 1640 and SLE 1695 will be specifically addressed at the end of this section.

SLE 1646 – Recommended to depart New Haven and all stations to Old Saybrook inclusive at same time, and operate 3 minutes later arriving New London. This maintains the 6-minute clearance with Amtrak 2168 departing New Haven.

SLE 1674 – Cannot depart New Haven any earlier because of the connection with MNR 1574. Recommended to depart New Haven and all stations to Old Saybrook inclusive at same time, and operate 3 minutes later arriving New London. To not shorten the New London turn time, SLE 1699 is being scheduled to depart New London 3 minutes later.

For Option 1, the revenue-to-revenue train-equipment turn times at New London have been considered. The scheduling concepts presented for Option 1 in Exhibit 2 provide the following revenue-to-revenue scheduled turn times:

Table 1 Option 1 - Proposed Train Service Pattern

Eastbound Train	Arrival Time	Westbound Train	Departure Time	Turn Time	Comments
1600	6:30 AM	1641	6:50 AM	20"	Same as existing.
1616	11:47 AM	1667	12:00 Noon	13"	Same as existing.
1636	5:53 PM	1691	6:09 PM	16"	Shortened from 20 minutes.
1640	7:11 PM	1695	7:23 PM	12"	Shortened from 15 minutes.
1646	8:07 PM	1697	9:02 PM	55"	
1674	10:19 PM	1699	10:38 PM	19"	Same as existing.

Option 1 Proposed Niantic Train-Service Pattern

The following table shows the proposed Option 1 train service at Niantic based upon the station being served only by the existing SLE trains operating to and from New London. The times shown for the Niantic station stops are very approximate and are only provided to illustrate the relative service times and gaps in train service.

Table 2: Option 1 - Niantic Train Service

Option 1 Niantic Train Service	
Westbound	Eastbound
5:50 AM	
	6:20 AM
7:00 AM	
	11:37 AM
12:10 PM	
	5:43 PM
6:19 PM	
	7:01 PM
7:33 PM	
	7:57 PM
9:12 PM	
	10:09 PM
10:48 PM	

Option 1 results in significant gaps in train service at Niantic, including gaps of 5 and 6 hours, as seen in Table 4.

Option 1 Operational Concerns

Train turn times at terminal stations are an important component of schedule reliability and on-time performance. Turn times can increase or reduce the propagation of train delays. For this SLE train service, it is suggested that the desirable minimum scheduled turn time at New London should be 20 minutes, and the absolute minimum scheduled turn time should be 15 minutes.

The following two SLE turn times at New London under Option 1 are of concern:

SLE 1616 – SLE 1667: The 13-minute schedule turn time contained in the Baseline Provided Timetable were maintained. However, this short turn time is undesirable. This task being performed does not include modifying the provided train schedules except as necessary for a new Niantic Station.

SLE 1640 – SLE 1695: This undesirable 12-minute short turn time occurs under Option 1 because of the following:

- SLE 1640 is a thru train from Stamford and it was not deemed appropriate for us under this assignment to modify SLE train schedules on MNR territory.
- SLE 1695 could not be moved later because of the 6-minute connection with MNR 1595 at New Haven.

The SLE 1640 - SLE 1695 turn time at New London can only be lengthen by timetable modifications involving MNR.

Option 1 Summary Comments

Our analysis has established that stopping the existing SLE New London trains at Niantic will not have any significant impact on Amtrak's train operations in the Baseline Provided Timetable.

SLE train-equipment requirements would not change, and crew duty times would increase very slightly for the SLE New London trains.

The level of train service that can be provided at Niantic under Option 1 is limited and very irregular with large gaps in service.

OPTION 2 – EXTENDING SLE OLD SAYBROOK TRAINS TO NEW LONDON AND STOPPING ALL SLE TRAINS AT NIANTIC

The following is an analysis by individual SLE revenue train. Exhibit 3 is titled the Option 2 Conceptual Timetable and shows the proposed timetable modifications to the Baseline Provided Timetable and to the Option 1 Conceptual Timetable. Again, in lieu of listing the scheduled stopping times at Niantic, the notation XXX in the exhibit means that the precise scheduled times for Niantic Station need to be computed by TPC simulation, but that (if done later) does not affect this analysis in any way.

Option 2 Major Study Assumptions

Extending the SLE Old Saybrook trains to New London, even without adding stops at a new Niantic Station, will invalidate the existing SLE trainset-manipulation program and raise serious questions about the SLE trainset and crewing requirements.

For instance, consider SLE 1622 that turns at Old Saybrook in the Baseline Provided Timetable for SLE 1671. These two trains are currently handled by one singular trainset. Extending these two trains to New

London and adding station stops at Niantic will (if only one trainset is to be required) necessitate adjusting one or both of these two train schedules by a total of approximately 50 minutes if the 13-minute turn time is to be maintained. Considering the longer train-operating distance to New London versus Old Saybrook, and if a 20-minute scheduled turn time was to be provided at New London, the schedules of one or both of these two trains would have to be adjusted by a total of approximately 57 minutes. Which of the two train schedules are to be adjusted and by how much is not just a technical operational and train-scheduling question, but this issue also raises agency policy questions about what train services are to be provided and in what time frames.

In discussing these issues with the client, it was agreed that we would not make such significant/radical train-schedule and train-service adjustments. For Option 2, we would keep the SLE trains operating during the same time periods as much as feasible, and we would not concern ourselves with or address equipment turns, the number of trainsets required, crewing issues or crewing costs. The focus of this study is primarily to determine whether there is sufficient available track capacity for the SLE Old Saybrook trains to be extended to New London while also making station stops at Niantic, without negatively impacting the Amtrak Northeast Corridor intercity train operations.

However, it is clear that Option 2 may require significant train-schedule and train-service adjustments and/or may require one or two additional trainsets. These issues are beyond the scope of this study.

Our Option 2 scheduled running times for SLE trains between Old Saybrook and New London are largely based on the existing scheduled running times contained in the Exhibit 1 Baseline Provided Timetable, to which we added 3 minutes of running time for each Niantic station stop.

The eastbound Old Saybrook to New London SLE running times for five trains in Exhibit 1 ranges from 26 to 27 minutes. However, one SLE train (1600) is only provided a much lesser 20 minutes. Our analysis is that because of the overall train operations during that timeframe when SLE 1600 operates, the Amtrak dispatchers may be turning SLE 1600 on the mainline (Track 1 or 2), and not routing that eastbound train into New London Track 6. This would avoid the very low signal-system-enforced speeds eastbound approaching and entering Track 6.

The westbound New London to Old Saybrook SLE scheduled running times for seven trains in Exhibit 1 ranges from 20 to 25 minutes. Our analysis is that because of the train operations during the involved timeframes, the Amtrak dispatchers may be turning one or more of these trains on the mainline (Track 1 or 2), and not on Track 6. These details have not been researched.

Regardless, and using our judgment, in the eastbound direction we have provided 26 minutes scheduled running time (between Old Saybrook and New London) plus 3 minutes for the Niantic station stop. Based on our experience, this includes a couple of minutes of eastbound end-of-line schedule-reliability “pad.”

In the westbound direction, we have provided 22 minutes scheduled running time plus 3 minutes for the Niantic station stop.

The only SLE trains that needed schedule adjustments for Option 2 were the existing Old Saybrook trains that are being extended to New London. The existing New London train schedules remain unchanged from the solutions that were developed in Option 1.

Westbound

SLE 1621 – Recommended to depart New London at 4:35 AM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1627 – Recommended to depart New London at 5:07 AM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1637 – Recommended to depart New London at 6:12 AM. After stopping at Niantic, enters Track 3 at Old Saybrook to allow Amtrak 2151 to pass. Time departing Old Saybrook and times at all other stations to New Haven remain unchanged.

SLE 1645 – Recommended to depart New London at 7:12 AM. After stopping at Niantic, enters Track 3 at Old Saybrook to allow Amtrak 2153 to pass. Time departing Old Saybrook and times at all other stations to New Haven remain unchanged.

SLE 1649 – Recommended to depart New London at 7:50 AM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1651 – Recommended to depart New London at 9:00 AM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1659 – Recommended to depart New London at 10:16 AM. After stopping at Niantic, enters Track 3 at Old Saybrook to allow Amtrak 2159 to pass. Time departing Old Saybrook and times at all other stations to New Haven adjusted 5 minutes earlier to minimize waiting time at Old Saybrook.

SLE 1671 – Recommended to depart New London at 1:49 PM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1675 – Recommended to depart New London at 2:57 PM. After the Niantic stop, times at all other stations at and west of Old Saybrook adjusted 3 minutes earlier so as to improve the clearance interval with following-train Amtrak 137 approaching New Haven and increase the connection time with MNR 1577 at New Haven.

SLE 1681 – Recommended to depart New London at 4:00 PM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

SLE 1687 – Recommended to depart New London at 5:55 PM. After the Niantic stop, times at all other stations at and west of Old Saybrook remain unchanged.

Eastbound

SLE 1602 – Recommended to depart New Haven and all stations up to and including Old Saybrook at same times. After stopping at Niantic, arrives New London at 7:33 AM.

SLE 1604 – Recommended to depart New Haven and all stations up to and including Old Saybrook at same times. After stopping at Niantic, arrives New London at 8:07 AM.

SLE 1606 – Recommended to depart New Haven and all stations up to and including Old Saybrook 2 minutes earlier. After stopping at Niantic, arrives New London at 9:28 AM. This scheduling provides 5-minutes clearance with following-train Amtrak 190 arriving New London.

SLE 1610 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for Amtrak 2150 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 10:34 AM.

SLE 1622 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for Amtrak 2158 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 2:39 PM.

SLE 1626 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for Amtrak 2160 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 3:39 PM.

SLE 1632 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for Amtrak 174 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 4:48 PM.

SLE 1638 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for both Amtrak 2166 and Amtrak 176 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 6:37 PM.

SLE 1644 – Recommended to depart New Haven and all stations prior to Old Saybrook at same times. At Old Saybrook crosses over to Track 3 and waits for Amtrak 2168 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 7:38 PM.

SLE 1656 – Recommended to depart New Haven and all stations prior to Old Saybrook 5 minutes later. At Old Saybrook crosses over to Track 3 and waits for both Amtrak 2170 and Amtrak 94 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 8:39 PM.

SLE 1668 – Recommended to depart New Haven and all stations prior to Old Saybrook 5 minutes later. At Old Saybrook crosses over to Track 3 and waits for Amtrak 2172 to pass. Then crosses back to Track 2, stops at Niantic, and arrives New London at 9:34 PM.

SLE 1682 – Recommended to depart New Haven and all stations up to and including Old Saybrook at same times. After stopping at Niantic, arrives New London at 11:31 PM.

Option 2 Equipment Manipulations and New London Turn Times

Per client direction, we did not address Option 2 equipment turns, the number of trainsets required, crewing issues or crewing costs. The focus of this study is to determine whether there is sufficient available track capacity for the SLE Old Saybrook trains to be extended to New London while also making station stops at Niantic, without negatively impacting the Amtrak Northeast Corridor intercity train operations.

Option 2 Proposed Niantic Train-Service Pattern

Under Option 2, Niantic will have the same or better train-service pattern as provided at all of the other SLE stations that are not also served by Amtrak. Some of the SLE trains that are being extended to and from New London will have longer running times to and from Niantic and New London because of the many necessary scheduled “overtakes” at Old Saybrook.

Option 2 Operational Concerns and Issues

We have identified several operational concerns under Option 2 that should be considered.

New London Area Track Configuration – Under the Baseline Provided Timetable (Exhibit 1) and the Option 1 Conceptual Timetable (Exhibit 2), some SLE trains terminate at Old Saybrook and the others at New London. This generally avoids any potential for terminal congestion at either location. Under the Option 2 Conceptual Timetable (Exhibit 3), all of the SLE trains will terminate and originate at New London. New London Track 6 and the surrounding interlocking configurations are likely not adequate to maintain operational reliability under Option 2 at New London, and to avoid operational impacts to the time-sensitive Amtrak trains. This New London track layout and configuration issue should be studied in detail before extending all the SLE trains from Old Saybrook to New London, regardless of whether a new station at Niantic is constructed.

New London Track 6 and Crossover Operating Speeds – Currently, the operating speeds at New London approaching, entering, exiting and while on Track 6 are a very low 15 mph. And Amtrak Timetable Special Instruction (TTSI) 586-B1 even prescribes a 10-mph speed restriction applying to trains reversing direction on Track 6 because of limitations of the PTC ACSES system. To lessen train delays under Option 2 and to provide for the higher train volumes, the Track 6 switch geometry should ideally be upgraded to a #15 turnout and the signaling should be designed to provide 30-mph operating speeds to, from and on Track 6 (or 25 mph when necessary because of track curvature). The crossover west of the Shaws Cove movable bridge that is used by westbound SLE trains crossing from Track 2 to Track 1, if not already #20 geometrics, should be upgraded to a #20 crossover, and the signaling should allow westbound trains to diverge over this crossover at 45 mph.

Train Overtakes and Interlocking Conflicts at Old Saybrook – Eight eastbound SLE trains are required to cross westbound Track 1 twice at Old Saybrook, while entering Track 3 at Saybrook Interlocking and then again while exiting Track 3 at View Interlocking. The operational impacts of these interlocking conflicts on the westbound train traffic (as well as on these eight eastbound SLE trains) need to be examined in detail, and network simulation may be required. The nine SLE trains that are scheduled to be overtaken at Old Saybrook by one Amtrak train in the same direction have been assigned approximately 9 minutes of increased trip time to facilitate the overtake. The two SLE eastbound trains that are scheduled to be overtaken at Old Saybrook by two following Amtrak trains in the same direction have been assigned 14 to 15 minutes of increased trip time.

Track 3 Speeds at Old Saybrook – The diverging-route speeds to and from Track 3 at both Saybrook and View Interlockings, and on Track 3 between the two interlockings, should be upgraded to at least 45 mph. This will minimize the train delays occurring because of the same-direction train overtakes as well as the Track 1 interlocking conflicts.

Old Saybrook Passing-Track Alternatives – For all of the Option 2 same-direction train overtakes at Old Saybrook, it has been assumed that the SLE train will use Station Track 3. An option for the nine eastbound overtakes scheduled to occur at Old Saybrook is to upgrade and use Track 4 west of Old Saybrook Station between Brook and Saybrook Interlockings. However, we deem it far better (for multiple reasons) that a train be held in a station for an overtaking train rather than be held on a siding not located at a station. But having the eastbound SLE trains cross Track 1 twice to access and exit Track 3 creates the possibility of undesirable interlocking conflicts. It should be studied to determine which is the better of the two less-than-ideal alternatives. Another much more expensive alternative that was not considered is to construct a new Track 4 and station platform at Old Saybrook Station.

SLE Train Type – The Amtrak TTSIs prescribe four sets of passenger-train speeds, for Train Types A, B, C and D. Each train type has its own set of maximum operating speeds over each segment and track of the Northeast Corridor. Type A is for high-speed trainsets (HST) with tilting active, and is not pertinent to this discussion. Type B is for specified types of modern train equipment. Most if not all of the Amtrak

regional trains qualify for and operate per Type B. The SLE trains fall into either Type C or D, which at many locations requires SLE trains to operate slower than Type B trains. This, in turn, causes SLE trains to require longer running times and consume more line and track capacity. As SLE desires to add train service to the Northeast Corridor (longer train runs, additional trains, and/or additional station stops), it would be beneficial to SLE and its mission to have the SLE trains qualify for and operate per Train Type B. This would require certification in some form that SLE trains meet the Type B signal-system so-called AEM7 safe-braking rate of 1.168 mphps, and not just the historic CE205 0.88 mphps safe-braking rate. There may also be some “mechanical” vehicle issues to be considered. This train-type issue would need to be investigated in concert with Amtrak.

Benefits of SLE Electric Trains Instead of SLE Diesel Trains on Line Capacity

The amount of Northeast Corridor line capacity consumed by a SLE commuter train on double-track portions of the Northeast Corridor is directly affected by the longer trip and running times of the commuter trains compared with the faster intercity trains. Adding Niantic station stops and/or extending the SLE Old Saybrook trains to and from New London will require and consume some additional amount of line capacity.

The amount of additional line capacity required and consumed by the SLE commuter trains can be mitigated, lessened or offset by speeding up the SLE commuter trains, and this can be accomplished by electrifying the SLE commuter trains.

Electric SLE commuter trains will have faster trip times because of the following:

Higher acceleration rates departing stations and accelerating from speed restrictions.

Possible higher top speed of the electric train equipment compared with the diesel train equipment.

Possible higher speeds on some curves and line segments for electrified equipment than for the diesel equipment, because of a difference in train type. For instance, between the Division Post and Mill River, Type B trains are allowed 50 mph while Type C and D trains are restricted to not exceeding 35 mph. On the curves at MP 85.8 and MP 87.3, Type B trains are allowed to operate 10 mph faster than Type C and D trains. Any new SLE electric trains should be qualified to operate at the Type B speeds.

In short, it is possible that electrifying the SLE trains could mitigate or eliminate the trip-time increases associated with adding station stops at Niantic and/or extending the SLE Old Saybrook trains to New London. An appropriate simulation tool (software modeling) would need to be used to quantify the trip-time reductions/improvements that electrified SLE trains would achieve when compared with the existing SLE diesel trains.

SLE Train Layup Location(s) – During our earlier work and analyses, we determined that five deadhead trains are operated from New Haven in the early morning to Old Saybrook or New London and that four deadhead trains are operated in the late evening back to New Haven. When all of the SLE trains are extended to New London, the amount of train deadhead miles will increase. It should be investigated whether some or most of the SLE trainsets should be stored and serviced in the New London area, instead of at New Haven. The location of overnight train storage has profound implications on train crewing, train servicing, interlocking configurations and other related issues.

Old Saybrook Train-Schedule Times

In reviewing the Exhibit 3 Option 2 Conceptual Timetable, it can be seen that we show two Old Saybrook times for the SLE trains being overtaken – an arrival time and a departure time. We have done this only to clearly portray that the overtaken trains will be delayed there for the following Amtrak trains to pass by. For actual operations, we are not recommending listing two Old Saybrook times for these trains. We recommend setting one singular time for each train so that the delayed SLE trains are approaching Saybrook and View Interlockings at the times those signals are expected to clear.

Option 2 Summary Comments

Our analysis has established that it is feasible to extend all of the SLE Old Saybrook trains to New London and have all SLE trains stop at a new Niantic Station without causing any significant impacts to Amtrak's train operations as described in the Exhibit 1 Baseline Provided Timetable.

SLE train-equipment requirements, equipment manipulation and turns, and crew duty times have not been investigated.

Under Option 2, Niantic will have the same or better service pattern as provided at all of the other SLE stations that are not also served by Amtrak.

However, before extending all the Old Saybrook trains to New London, we suggest that the following issues be explored in more detail:

- Determine whether an additional trainset or two will be required for the “extended” train service. It is suggested for the revised timetable presented herein that an equipment assignment and manipulation plan be developed for that timetable. After that is accomplished, a new crewing plan should be prepared. It is our experience that the timetable train schedules may have to be revised somewhat by an iterative process to minimize and/or optimize the train-equipment and crewing requirements.
- Using the final operating plan, the New London area track configuration should be analyzed to ensure that it will properly accommodate the operating plan without impacting the Amtrak or SLE train operations. It is not clear that New London Track 6 will be adequate for handling all of the SLE train traffic.
- The need for train-overtake capability at or near Old Saybrook Station has been firmly established. It should be decided upon as to what train-overtake/passing option will be used for the eastbound trains, as well as what speed improvements will be provided for both directions.
- We recommend trying to qualify the SLE trains for the Amtrak Train Type B speeds.
- We recommend quantifying the speed, trip time and capacity improvements that SLE electric trains would bring when compared with the existing SLE diesel trains. We believe that having this information available will be useful to the client.
- When the SLE Old Saybrook trains are extended to New London regardless of whether a new Niantic Station is constructed, the location(s) of SLE train storage and servicing should be examined.

Many of the issues identified in this report for Option 2 apply to the extension of the SLE Old Saybrook trains to New London regardless of whether a new Niantic Station is constructed.

TO NEW HAVEN	SLE 1621	SLE 1627	SLE 1633	ACELA 2151	SLE 1637	SLE 1641	ACELA 2153	SLE 1645	NE Regional 95	SLE 1649	ACELA 2155	SLE 1651	NE Regional 171	ACELA 2159	SLE 1659	NE Regional 93	SLE 1667	ACELA 2163	NE Regional 173
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
Boston				5:05 AM			6:05 AM		6:10 AM		7:15 AM		8:15 AM	9:10 AM		9:30 AM		11:05 AM	11:15 AM
Boston Back Bay				5:10 AM			6:11 AM		6:15 AM		7:20 AM		8:21 AM	9:15 AM		9:36 AM		11:11 AM	11:21 AM
Route 128				5:19 AM			6:21 AM		6:25 AM		7:29 AM		8:31 AM	9:25 AM		9:46 AM		11:20 AM	11:32 AM
Providence				5:40 AM			6:43 AM		6:50 AM		7:50 AM		8:55 AM	9:46 AM		10:11 AM		11:43 AM	11:56 AM
Kingston									7:11 AM				9:15 AM			10:32 AM			12:16 PM
Westerly									7:25 AM							10:46 AM			
Mystic																10:56 AM			
New London			5:43 AM	6:24 AM		6:50 AM			7:45 AM				9:48 AM			11:12 AM	12:00 PM		12:48 PM
Niantic																			
Old Saybrook	5:00 AM	5:32 AM	6:08 AM		6:47 AM	7:15 AM		7:45 AM	8:04 AM	8:15 AM		9:25 AM			10:55 AM	11:31 AM	12:20 PM		
Westbrook	5:05 AM	5:37 AM	6:13 AM		6:52 AM	7:20 AM		7:50 AM		8:20 AM		9:30 AM			11:01 AM		12:25 PM		
Clinton	5:10 AM	5:42 AM	6:18 AM		6:57 AM	7:25 AM		7:55 AM		8:25 AM		9:35 AM							
Madison	5:15 AM	5:47 AM	6:23 AM		7:02 AM	7:30 AM		8:00 AM		8:30 AM		9:40 AM							
Guilford	5:21 AM	5:53 AM	6:29 AM		7:08 AM	7:36 AM		8:06 AM		8:36 AM		9:46 AM			11:13 AM		12:36 PM		
Branford	5:30 AM	6:02 AM	6:38 AM		7:17 AM	7:45 AM		8:15 AM		8:45 AM		9:54 AM			11:22 AM		12:45 PM		
New Haven State St	5:43 AM	6:15 AM	6:51 AM		7:29 AM	7:57 AM		8:27 AM		8:57 AM		10:07 AM			11:34 AM		12:57 PM		
New Haven	5:45 AM	6:17 AM	6:54 AM	7:04 AM	7:32 AM	8:00 AM	8:12 AM	8:30 AM	8:41 AM	9:00 AM		10:10 AM	10:38 AM	11:13 AM	11:37 AM	12:04 PM	1:00 PM	1:12 AM	1:38 PM
<div>MNR 1517 - 5:56MNR 1523 - 6:24MNR 1633 - 7:03MNR 1535 - 7:12MNR 1637 - 7:38MNR 1541 - 8:14MNR 1545 - 8:41MNR 1549 - 9:18STAMFORD 9:59MNR 1553 - 10:21MNR 1559 - 11:43MNR 1561 - 12:21MNR 1565 - 1:21</div>																			

TO BOSTON	NE Regional 66	SLE 1600	SLE 1602	SLE 1604	ACELA 2190	SLE 1606	NE Regional 190	SLE 1610	ACELA 2150	NE Regional 170	SLE 1616	ACELA 2154	NE Regional 172	SLE 1622	ACELA 2158	NE Regional 86	SLE 1626	ACELA 2160	SLE 1632
		M-F	M-F	M-F	M-F	M-F		M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
New Haven	4:43 AM	5:30 AM	6:20 AM	6:55 AM	8:00 AM	8:20 AM	8:43 AM	9:16 AM	9:39 AM	10:15 AM	10:30 AM	11:37 AM	12:45 PM	1:16 PM	1:44 PM	2:10 PM	2:16 PM	2:43 PM	3:24 PM
New Haven State St			6:22 AM	6:57 AM		8:22 AM		9:18 AM			10:32 AM			1:18 PM			2:18 PM		3:26 PM
Branford			6:33 AM	7:08 AM		8:33 AM		9:29 AM			10:46 AM			1:29 PM			2:29 PM		3:37 PM
Guilford		5:50 AM	6:42 AM	7:17 AM		8:41 AM		9:37 AM			10:57 AM			1:37 PM			2:37 PM		3:45 PM
Madison											11:05 AM			1:42 PM			2:42 PM		3:50 PM
Clinton											11:11 AM			1:47 PM			2:47 PM		3:55 PM
Westbrook		6:04 AM	6:54 AM	7:30 AM		8:53 AM		9:49 AM			11:16 AM			1:52 PM			2:53 PM		4:00 PM
Old Saybrook	5:15 AM	6:10 AM	7:04 AM	7:38 AM		9:01 AM	9:13 AM	9:57 AM			11:21 AM		1:15 PM	2:01 PM			3:01 PM		4:09 PM
Niantic																			
New London	5:35 AM	6:30 AM			8:39 AM		9:33 AM			11:04 AM	11:47 AM		1:35 PM			2:52 PM			
Mystic	5:49 AM									11:16 AM									
Westerly	6:01 AM									11:26 AM									
Kingston	6:18 AM						10:04 AM			11:41 AM			2:07 PM			3:26 PM			
Providence	6:56 AM				9:23 AM		10:24 AM		10:59 AM	11:59 AM		1:00 PM	2:26 PM		3:09 PM	3:45 PM		4:09 PM	
Route 128	7:34 AM				9:48 AM		10:52 AM		11:26 AM	12:32 PM		1:28 PM	3:01 PM		3:41 AM	4:17 PM		4:40 PM	
Boston Back Bay	7:53 AM				9:58 AM		11:03 AM		11:35 AM	12:43 PM		1:39 PM	3:12 PM		3:52 AM	4:28 PM		4:52 PM	
Boston	7:58 AM				10:03 AM		11:09 AM		11:41 AM	12:49 PM		1:45 PM	3:18 PM		3:58 AM	4:38 PM		4:59 PM	
MNR 1502 - 3:56MNR 1504 - 7:53MNR 1506 - 8:26THRUMNR 1512 - 10:16MNR 1520 - 12:34MNR 1524 - 1:34MNR 1530 - 3:14																			

BOSTON - NEW HAVEN		MONDAY - FRIDAY	
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	

TO NEW HAVEN	ACELA 2165	SLE 1671	ACELA 2167	SLE 1675	NE Regional 137	SLE 1681	ACELA 2171	NE Regional 175	ACELA 2173	SLE 1687	SLE 1691	ACELA 2175	NE Regional 177	SLE 1695	NE Regional 179	SLE 1697	SLE 1699	NE Regional 65/67
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
Boston	12:10 PM		1:05 PM		1:40 PM		3:10 PM	3:20 PM	4:15 PM			5:20 PM	5:35 PM		6:45 PM			9:30 PM
Boston Back Bay	12:15 PM		1:11 PM		1:46 PM		3:15 PM	3:26 PM	4:20 PM			5:26 PM	5:40 PM		6:51 PM			9:36 PM
Route 128	12:24 PM		1:20 PM		1:57 PM		3:24 PM	3:37 PM	4:29 PM			5:35 PM	5:50 PM		7:01 PM			9:50 PM
Providence	12:46 PM		1:41 PM		2:21 PM		3:45 PM	4:01 PM	4:50 PM			5:55 PM	6:14 PM		7:25 PM			10:22 PM
Kingston					2:42 PM			4:22 PM					6:38 PM		7:45 PM			10:48 PM
Westerly													6:52 PM					11:05 PM
Mystic								4:44 PM					7:01 PM					11:17 PM
New London					3:14 PM			4:57 PM			6:10 PM		7:15 PM	7:23 PM	8:17 PM	9:05 PM	10:35 PM	11:31 PM
Niantic																		
Old Saybrook		2:14 PM		3:25 PM	3:32 PM	4:25 PM		5:15 PM		6:20 PM	6:32 PM		7:36 PM	7:44 PM		9:25 PM	10:55 PM	11:53 PM
Westbrook		2:21 PM		3:31 PM		4:32 PM				6:27 PM	6:37 PM			7:51 PM		9:30 PM	11:01 PM	
Clinton																		
Madison																		
Guilford		2:32 PM		3:40 PM		4:43 PM				6:37 PM	6:48 PM			8:02 PM		9:42 PM	11:14 PM	
Branford		2:41 PM		3:49 PM		4:52 PM				6:46 PM	6:57 PM			8:11 PM		9:51 PM		
New Haven State St		2:53 PM		4:02 PM		5:04 PM				6:58 PM	7:09 PM			8:23 PM		10:03 PM		
New Haven	2:14 PM	2:56 PM	3:13 PM	4:05 PM	4:07 PM	5:07 PM	5:11 PM	5:43 PM	6:18 PM	7:01 PM	7:12 PM	7:18 PM	8:11 PM	8:26 PM	9:08 PM	10:06 PM	11:35 PM	12:30 AM
MNR 1671 - 3:17				MNR 1577 - 4:12		MNR 1581 - 5:28		MNR 1591 - 7:41					MNR 1595 - 8:35			MNR 1497 - 10:35		

TO BOSTON	NE Regional 174	ACELA 2164	SLE 1636	SLE 1638	ACELA 2166	NE Regional 176	SLE 1640	SLE 1644	ACELA 2168	SLE 1646	SLE 1656	ACELA 2170	NE Regional 94	SLE 1668	ACELA 2172	SLE 1674	NE Regional 178	SLE 1682
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F		M-F
New Haven	3:44 PM		4:40 PM	5:08 PM	5:33 PM	5:34 PM	5:50 PM	6:15 PM	6:40 AM	6:46 PM	7:06 PM	7:36 PM	7:37 PM	8:06 PM	8:39 PM	9:06 PM	9:42 PM	10:15 PM
New Haven State St			4:42 PM	5:10 PM			5:52 PM	6:17 PM		6:48 PM	7:08 PM			8:08 PM		9:08 PM		10:17 PM
Branford			4:53 PM	5:21 PM			6:06 PM	6:28 PM		7:02 PM	7:19 PM			8:19 PM		9:19 PM		10:28 PM
Guilford			5:01 PM	5:29 PM			6:14 PM	6:36 PM		7:10 PM	7:27 PM			8:29 PM		9:27 PM		10:36 PM
Madison			5:07 PM	5:35 PM			6:21 PM	6:42 PM		7:17 PM	7:33 PM			8:35 PM		9:33 PM		10:42 PM
Clinton			5:12 PM	5:40 PM			6:27 PM	6:47 PM		7:23 PM	7:38 PM			8:40 PM		9:38 PM		10:47 PM
Westbrook			5:17 PM	5:45 PM			6:33 PM	6:52 PM		7:29 PM	7:43 PM			8:45 PM		9:43 PM		10:52 PM
Old Saybrook	4:15 PM		5:23 PM	5:53 PM		6:04 PM	6:42 PM	7:00 PM		7:38 PM	7:51 PM		8:06 PM	8:51 PM		9:49 PM	10:12 PM	11:02 PM
Niantic																		
New London	4:35 PM		5:50 PM			6:24 PM	7:08 PM			8:04 PM			8:24 PM		9:18 PM	10:16 PM	10:32 PM	
Mystic																	10:44 PM	
Westerly	4:56 PM					6:44 PM											10:54 PM	
Kingston	5:12 PM					6:57 PM							8:57 PM				11:10 PM	
Providence	5:30 PM	5:54 PM			6:58 PM	7:19 PM			8:05 PM			8:58 PM	9:16 PM		10:04 PM		11:29 PM	
Route 128	6:07 PM	6:29 PM			7:24 PM	7:54 PM			8:32 PM			9:26 PM	9:50 PM		10:33 PM		12:01 AM	
Boston Back Bay	6:23 PM	6:40 PM			7:35 PM	8:06 PM			8:45 PM			9:38 PM	10:02 PM		10:43 PM		12:14 AM	
Boston	6:30 PM	6:46 PM			7:40 PM	8:12 PM			8:50 PM			9:45 PM	10:10 PM		10:50 PM		12:20 AM	
MNR 1532 - 3:34 MNR 1536 - 4:34 MNR 3538 - 4:55 MNR 1538 - 5:13 THRU THRU MNR 1548 - 6:31 MNR 1656 - 6:52 MNR 1560 - 7:32 MNR 1568 - 8:02 MNR 1574 - 9:00 MNR 1576 - 9:18 MNR 1582 - 10:06																		

Appendix 6 - Public Comments





Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

Date	Name	Chapter	Section	Page	Comment	Response
4/29/2021	Kate Rattan	1	Key Findings	8	The purpose of commuter rail is to fill in the gaps left by national rail service (OS, NL, Mystic and Westerly - this statement is potentially misleading. Also, the passage fails to note the importance of the lack of bus transit in Niantic. SEAT Route 3 is both indirect and provides only 2 hour service. Estuary TD Route 643 does not reach Niantic, but stops in the interchange on Route 161.	This passage summarizes that service at a Niantic station stop would be limited due to NEC rail traffic. Also, transit access is addressed later on in the report. The Niantic Station Study incorporates the recommendation of the 2015 SEAT bus study, which says that even in a System Expansion scenario (Plan C), 2-hour frequency is still recommended for the Niantic SEAT run.
4/12/2021	Kate Rattan	1	Conclusion	8	SCCOG requests a comprehensive SOGR plan and white paper on service optimization for SLE as well as identifying opportunities for greater provision of transit.	CTDOT will work with SCCOG regarding this request.
4/12/2021	Kate Rattan	2	Assumptions	11	Clarify which of the existing SLE station meets this parking requirement currently. For those stations which fail to meet the requirement of "dedicated parking" what type of shared parking has contributed to their overall parking management?	For parking capacity, 200 is a target value, not a hard minimum. It provides a good basis for siting a station and is based on the assumption that if a station is viable, that 200 spaces will eventually be required. In addition to Branford, Old Saybrook, and New London, Guilford and Madison may not have exactly 200 spaces, but they are close. Clinton will add parking when the north lot is opened. This was clarified in the assumptions section.
4/29/2021	Kate Rattan	2	Assumptions	11	It is reasonable to assume new stations will meet this criteria but the plan should be clear about the limitations of the currently available stations. For example, DOT has provided insufficient parking in New London. for rail users.	See above response.



Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

4/12/2021	Kate Rattan	2	Assumptions	11	Amtrak requests capacity analysis: Amtrak spent significant public funding on the NEC futures study. What did that study indicate regarding the capacity on the NEC line between New Haven and New London. Whereas they proposed a bypass, surely they have adequate data to address this question. Capacity analysis was done for this study, why are you mentioning the need for capacity analysis and not the outcome of that analysis.	The corridor capacity analysis was a prerequisite to the study. Amtrak requires this when any new station is being scoped on a rail corridor that they own. A corridor capacity analysis was therefore completed as part of the Niantic Station Study. A summary of the findings are included in the report. Detailed findings are included in Appendix 5.
4/12/2021	Kate Rattan	3	Natural Diversity Database (NDDB)	14	These orchids grow in mixed-deciduous or mixed-deciduous/coniferous forests that are generally in second- or third-growth successional stages. None of the sites identified fit that description.	While this species may not be located directly on the conceptual sites, IPaC mapping shows that they exist within the project study area.
4/29/2021	Kate Rattan	3	Median Housing Value	15	What is the housing value benchmark that this is being compared to Niantic? Is this a consistent benchmark among all of the SLE stations or rail stations more generally, commuter rail stations generally, or CT rail stations? This section should be better synthesized.	Housing value was included in the existing conditions study to provide background for the study area. It is not necessarily a deciding factor in siting a rail station within the context of the SLE corridor, therefore, comparison to other stations was not provided.
4/12/2021	Kate Rattan	3	Median Household Income	16	Again, this demographic data has not been synthesised, it must be compared to a benchmark to be valuable information.	Language was added in the report to synthesize this section.



Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

4/12/2021	Kate Rattan	3	Environmental Justice Communities	16	TIP21-24 provides a different accounting of Low income and Minority populations showing only the block group north west of route 156/161 intersection is low income and none qualified as having a higher percentage of minorities than the region as a whole. % of area > % of region ACS 5 year 2018. SCCOG data indicates that there is reduced concern in the study area compared to the analysis included here.	For this feasibility study, methodology approved and used by the CTDOT in past Environmental Impact Analyses was applied. This combined methodology uses thresholds for income and percent minority population (specifically defined as non-white) to determine who is part of an EJ community. Using methodology other than what was used for this study, and geography other than the project study area will indeed yield slightly different results, but will ultimately not change the outcome of this study.
4/12/2021	Kate Rattan	3	Transit Dependent Populations	17	It is inappropriate to make this statement without clarifying several aspects. A) Seat does not service much of the study area at all. B) In the RT161 corridor that is serviced by SEAT 2 hour headways prevent utilization for all but the transit captives. C) SCCOG data show no block groups within EL or Waterford as having below average income compared to the region which leads me to question the supposition that due to the low income suffered by EL they would prefer bus transit. Bus and Rail are also not interchangeable, Rail provides mobility and bus provides access. The methodology of this assessment, first creating an average household size, and then comparing it to income may be yielding invalid results because of the high number of age restricted units in EL. Disaggregating and then aggregating the data may be reducing validity.	Language was amended in this section of the report to address the comments raised.



Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

4/12/2021	Kate Rattan	3	Zero-Vehicle Households	18	It appears that your data has not corrected for the women's prison.	Language was added to the report to account for the women's prison.
4/29/2021	Kate Rattan	4	Employment Density	20	Job density should have been analysed regionally, your study indicates that commuter rail stations are regional assets. this map obfuscates the job centers just to the north of the I-95. Concentrations of jobs in New London and Groton further support the plan's supposition that the existing station in New London is a better location than Niantic.	While the employment density map does not show regional employment characteristics, the commuting patterns section shows where people are commuting to, which is largely Groton, Old Lyme, and Waterford. Per your comment, additional language was added to this section to give consideration to those job centers outside of the study area, as well as to better connect it to the Commuting Patterns section.
4/12/2021	Kate Rattan	4	Employment Density	20	Costco opened in 2020, new senior living facilities in Niantic also opened in this period	This point was added to the text. The graph is based on the most up-to-date LEHD data which goes to 2018.
4/12/2021	Kate Rattan	4	Residential Occupancy Rates	22	The relation of owner occupancy to rail mode is poorly communicated here. Many of the homes in Niantic were constructed as summer homes and may be vacant due to inadequate heating during the winter. This data looks suspect as someone who is looking to buy in this market - with the perspective that there is little on the market. The homes in this area are typically older, smaller, not updated and generally at the higher end of the \$/sqft for the region.	This comment was added as a caveat to the graphics. The comment also reinforces that Niantic is a quiet coastal community without sufficient density over the course of the year (many of the homes are only occupied during the summer) to support a rail station in this location.



Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

4/29/2021	Kate Rattan	4	Key Findings	24	This finding points to the reality that SCCOG has consistently pointed to which is that we are New Haven is not a dominant work destination in this region.	According to LEHD data, most workers in the study area are staying close to the study area, particularly to the north and east of the catchment boundary. Additionally, very few workers within the study area are commuting west, and very few workers originating west of the study area are traveling east to the catchment boundary for work
4/12/2021	Kate Rattan	5	Background Information	26	The definition of existing and extended service parameters is not made clear in the text	Existing Service scenario keeps SLE schedule the same, adding a stop in Niantic. Extended service scenario extends all SLE trains from New Haven to New London, adding a stop in Niantic. For extended service scenario, Old Saybrook would no longer be a terminus for any SLE train.
4/12/2021	Kate Rattan	5	Background Information	26	Why was 2019 not used?	2017 was used because it was the most conservative recent schedule to use to evaluate the potential for a new station in Niantic when SLE ridership was highest and operations were most reliable.
4/29/2021	Kate Rattan	5	Option 2 - Key Findings	28	It is not clear what Type B speeds means. Is this relating to the cars or engine being able to meet the max 100 mph speed safely? Due to existing curves/slow zones what is the max speed necessary on this line?	This has been clarified in the text. The following is the definition per the Corridor Capacity Analysis Appendix: The Amtrak TTSIs prescribe four sets of passenger-train speeds, for Train Types A, B, C and D. Each train type has its own set of maximum operating speeds over each segment and track of the Northeast Corridor. Type B is for specified types of modern train equipment. Most if not all of the Amtrak regional trains qualify for and operate per Type B. The SLE trains fall into either Type C or



Feasibility Study: Shore Line East Station Stop in Niantic, Connecticut
Public Comments DRAFT Summary

						D, which at many locations requires SLE trains to operate slower than Type B trains.
4/12/2021	Kate Rattan	5	Option 2 - Comments	28	This key finding should be in the executive summary.	This point is currently in the executive summary. Has been revised it to make it clearer.