Onondaga County Department of Transportation

Traffic Signal Optimization Project
(Hosman Road)
(Future Coordinated Corridor)

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CHAPTER I

INTRODUCTION

Outdated traffic signal timings account for a significant amount of traffic delay on urban and suburban roadways across the country. Periodically updating traffic signal equipment and timings based on new technology and current traffic volumes can provide significant benefits at a relatively low cost, alleviate the need for additional infrastructure, and reduce time spent in traffic, fuel consumption, and emissions. This report summarizes the results of a Traffic Signal Timing Optimization study conducted at various county-owned and controlled intersections along the Hosman Road (CR 71) corridor located in Onondaga County, New York.

A. Study Area

The study area intersections for this report include the following, as shown on Figure 1:

- Hosman Road/Townline Road
- Hosman Road/New York Air National Guard Main Gate
- Hosman Road/Thompson Road
- Hosman Road/Kinne Street

B. Purpose and Methodology

The purpose of this study was to update intersection signal timings in order to maximize intersection capacity, reduce driver delays, reduce vehicle emissions, and improve the overall efficiency of traffic operations for the motoring public.

In order to accomplish this task, traffic count data, signal timing parameters, and intersection geometry was provided by the Syracuse Metropolitan Transportation Council (SMTC) and the Onondaga County Department of Transportation (OCDOT) to evaluate the current performance of the intersections. Adjustments in signal timings, off-sets, detection, and other parameters were made to improve intersection performance. Once adjustments were identified, changes to the field equipment could be made to implement improvements. Some adjustments, like converting from a leading protected left turn arrow to a lagging arrow will be easily noticed, while others, such as vehicle detection modifications or minor changes in the green time allocation, may not be realized by drivers.

Traffic simulation models of each intersection were developed using the Synchro 7 program. Existing traffic operations were documented and summarized and then optimization of the signals was performed. The changes in the signal timing parameters and the resulting performance changes were then documented to identify the net benefits for the actions.

PROJECT LOCATION

TRAFFIC SIGNAL OPTIMIZATION
ONONDAGA COUNTY
SYRACUSE, NEW YORK

CREIGHTON MANNING ENGINEERING, LLP

PROJECT: 09-094d	DATE: 6/10	FIGURE: 1

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CHAPTER II

ANALYSIS

Traffic volume data, signal timings, intersection sketches, and photos of the study area intersections were gathered from data provided by the OCDOT and the SMTC. This information was used to create existing condition models of each intersection, which were then analyzed to determine their existing performance criteria. With the existing levels of service (LOS) established as the baseline condition, the signal was then optimized. The LOS definitions and a glossary of terms are included in Appendix A.

To maximize the efficiency and performance of each intersection, the traffic volumes for each peak hour were evaluated using a variety of cycle lengths and timing splits. In some cases, the optimized cycle lengths resulted in each signal phase operating at its maximum green time during each cycle of the peak hour. Given that traffic volumes will vary throughout the course of the peak hour, consideration was given to adjusting the cycle length to longer cycles, allowing the signal more flexibility to alter timings as traffic conditions warrant. For example, during low levels of traffic, the controller can reduce the cycle length and serve different approaches quicker. This is particularly useful during off-peak periods. During higher levels of traffic, most notably during peak hours, the cycle length can increase to provide longer green times on approaches that have higher volumes of traffic.

The four study area intersections on Hosman Road were also evaluated to determine how the implementation of a traffic signal coordination plan would impact traffic progression through the corridor. Two coordination scenarios were evaluated due to the distance between the two external study area intersections and the two centralized study area intersections. The semi-coordinated condition assumes coordination at only the Air National Guard Main Gate and Thompson Road intersections while the full coordinated condition assumes that all four study area intersections would be coordinated.

Changes to the existing timings, detection, or parameters such as minimums, maximums, recalls, clearance intervals, and vehicle extensions, are presented in this chapter along with the resulting intersection performance. Changes to these parameters are based on the Onondaga County Department of Transportation's *Traffic Signal Timing Standards* and the *Traffic Signal Timing Manual*, published by the Institute of Transportation Engineers (ITE), 2009. Appendix B includes detailed sketches, photos, controller settings, signal timings/splits, and level of service reports for each intersection.

A. Hosman Road/Townline Road

This four-leg intersection operates under traffic signal control with a 78-second maximum cycle length. The eastbound Hosman Road approach provides an exclusive left-turn lane and a shared through/right-turn lane with presence detection on both lanes and a minimum recall on the through movement. The westbound Hosman Road approach provides an exclusive left-turn lane, a through lane, and a separate right-turn lane with presence detection on the left-turn and through lanes and a minimum recall on the through movement. The southbound Townline Road approach provides an exclusive left-turn lane and a shared through/right-turn lane with presence detection on both lanes and no recall. The northbound Townline Road approach provides an exclusive left-turn lane, a through lane, and a separate right-turn lane with presence detection on all lanes and no recall. The northbound and southbound phases are allowed to skip if no vehicles are detected since no recall has been set. No sidewalks, crosswalks, or pedestrian controls are provided. The posted speed limit on Hosman Road is 45 mph and 55 mph on Townline Road. Table II.A.1 summarizes the detailed levels of service for existing and proposed conditions.

Table II.A.1 – Hosman Road/Townline Road LOS Summary

Intersection		Control	AM Peak Hour			PM Peak Hour		
			Existing	Proposed		Existing	Proposed	
				Semi-Coordinated	Fully Coordinated		Semi-Coordinated	Fully Coordinated
Hosman Rd/Townline Rd		S						
Hosman Road EB	L		B (17)	B (15)	B (15)	B (16)	B (17)	B (17)
	TR		C (32)	C (25)	C (29)	C (21)	C (22)	C (22)
Hosman Road WB	L		B (14)	B (14)	A (7)	B (12)	B (11)	A (7)
	T		B (14)	B (14)	A (7)	B (16)	B (16)	B (10)
	R		A (7)	A (8)	B (19.0)	A (8)	A (8)	A (4)
Townline Road NB	L		C (22)	C (20)	C (23)	B (17)	C (20)	C (26)
	TTR		C (28)	C (25)	C (29)	C (28)	C (28)	D (41)
Townline Road SB	L		C (25)	C (22)	C (21)	B (18)	B (18)	C (27)
	TR		C (23)	B (20)	C (23)	C (25)	C (23)	D (35)
Overall			C (25)	C (21)	C (23)	B (18)	B (18)	C (21)

Key: NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
X (Y) = Level of Service (Delay, seconds per vehicle)

The intersection currently operates at LOS C or better during the AM and PM peak hours. After optimization of the traffic signal, the intersection will continue to operate at good overall levels of service.

To improve operations, the yellow/all-red clearance, the minimum greens, and vehicle extension were modified. The signal was optimized using Synchro which resulted in two different improvement scenarios. The proposed semi-coordinated scenario resulted in a 70-second cycle length during the AM peak hour and a 90-second cycle length during the PM peak hour. The proposed fully coordinated scenario resulted in an 80-second cycle length during the AM peak hour and a 100-second cycle length during the PM peak hour. The AM and PM peak hour cycle lengths were adjusted to minimize vehicle delays, minimize the volume to capacity (v/c) ratio, and to coordinate the timings with adjacent signals for the second scenario. During the peak hours, the intersection will operate at the maximum cycle

length during the higher percentiles of traffic, and shorter cycle lengths during lower percentiles of traffic.

Review of the level of service summary indicates that full coordination of the corridor does not provide a large benefit to overall delay at the Hosman Road/Townline Road intersection since it is located approximately 0.7 miles away from the closest signalized intersection in the corridor. Therefore, the OCDOT should consider whether or not the implementation of coordination at this intersection is a priority for the Hosman Road corridor. Table II.A.2 summarizes the suggested changes in the signal timing parameters.

Table II.A.2 – Hosman Road/Townline Road Parameter Summary

Parameter	Existing	Proposed
Detection	NB, SB, EB, WB	No change
Recall	Min EB/WB throughs	No change
Minimum Green	8-sec EB/WB lefts and NB/SB; 10-sec EB/WB throughs	5-sec lefts; 10-sec throughs
Yellow/All Red:	3/2-sec	4.5/1.0-sec for 45-50 mph speed
Vehicle Extension	4-sec	1.5-sec all approaches[1]
Cycle Length	78-sec	Semi-Coordination: 70-sec AM; 90-sec PM Full Coordination: 80-sec AM; 100-sec PM

B. Hosman Road/New York Air National Guard Main Gate

This three-leg intersection operates under traffic signal control with a 59-second maximum cycle length. The eastbound Hosman Road approach provides an exclusive left-turn lane and a through lane with presence detection provided on the left-turn lane and maximum recall on the through movement. The westbound Hosman Road approach provides a through lane and a separate right-turn lane with no detection and maximum recall on the through movement. The southbound Air National Guard Main Gate approach provides separate left and right-turn lanes with presence detection and no recall. The southbound phase is allowed to skip if no vehicles are detected since no recall has been set. No sidewalks, crosswalks, or pedestrian controls are provided. The posted speed limit on Hosman Road is 45 mph while the Air National Guard Main Gate approach is not posted. Table II.B.1 summarizes the detailed levels of service for existing and proposed conditions.

[1] Max allowable headway = 3 sec, detection zone = 65 feet, approach speed = 45-50 mph.

Table II.B.1 – Hosman Road/National Guard Main Gate LOS Summary

Intersection		Control	AM Peak Hour			PM Peak Hour		
			Existing	Proposed		Existing	Proposed	
				Semi-Coordinated	Fully Coordinated		Semi-Coordinated	Fully Coordinated
Hosman Rd/Nat. Guard Gate		S						
Hosman Road EB	L		A (2)	A (3)	A (3)	A (9)	C (27)	D (38)
	T		A (3)	A (4)	A (4)	A (6)	A (7)	B (10)
Hosman Road WB	T		A (7)	A (4)	A (8)	F (122)	C (22)	C (23)
	R		A (3)	A (1)	A (4)	A (3)	A (3)	A (3)
Nat. Guard Gate SB	L		C (26)	C (34)	C (34)	C (26)	D (50)	D (50)
	R		B (18)	C (28)	C (28)	B (12)	C (28)	C (28)
Overall			A (5)	A (4)	A (6)	E (59)	C (22)	C (24)

Key: NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
X (Y) = Level of Service (Delay, seconds per vehicle)

The intersection currently operates at good levels of service with low delays during the AM peak hour. During the PM peak hour, this intersection operates at an overall LOS E with considerable delay due to the westbound through movement. With the addition of point detection and minimum recall on the eastbound/westbound approaches, no recall on the southbound approach, a longer cycle length, and traffic signal coordination, overall delay will be reduced. The eastbound protected left-turn phase was also changed to a lagging phase as per the OCDOT standards for a three-leg intersection. It is noted that this intersection will operate at an overall LOS A/C during the AM and PM peak hours with all movements operating at LOS D or better.

To improve operations, point detection was added to eastbound and westbound Hosman Road through lanes, traffic signal coordination was provided, and the yellow/all-red clearance, minimum greens, and vehicle extension were modified. The signal was optimized using Synchro which resulted in an 80-second cycle length during the AM peak hour and a 100-second cycle length during the PM peak hour. Review of the actuated green times indicated that each approach will generally operate at the maximum allowable split for all levels of traffic. Table II.B.2 summarizes the suggested changes in the signal timing parameters.

Table II.B.2 – Hosman Road/National Guard Main Gate Parameter Summary

Parameter	Existing	Proposed
Detection	EB lefts; SB	Point detection added to EB/WB throughs
Recall	Max EB/WB throughs	Min EB/WB throughs
Minimum Green	10-sec EB/WB; 8-sec EB left; 12-sec SB	5-sec lefts; 10-sec throughs
Yellow/All Red:	3/2-sec	4.5/1.5-sec for 30-50 mph speed
Vehicle Extension	4-sec	1.5-sec EB left[2]; 3.5-sec SB[3]; 3.1-sec EB/WB throughs[4]
Cycle Length	59-sec	80-sec AM; 100-sec PM

[2] Max allowable headway = 3 sec, detection zone = 65 feet, approach speed = 45-50 mph.
[3] Max allowable headway = 3 sec, detection zone = 30 feet, approach speed = 30 mph.
[4] Max allowable headway = 3 sec, detection zone = 6 feet (placed 200 feet from the intersection), approach speed = 45-50 mph.

C. Hosman Road/Thompson Road

This four-leg intersection operates under traffic signal control with a 108-second maximum cycle length. The eastbound Hosman Road approach provides an exclusive left-turn lane, a through lane, and a separate right-turn lane with presence detection on the left-turn and through lanes and a minimum recall on the through movement. The westbound Hosman Road approach provides an exclusive left-turn lane and a shared through/right-turn lane with presence detection on both lanes and a minimum recall on the through movement. The northbound Thompson Road approach provides a shared left-turn/through lane and a separate right-turn lane with presence detection on both lanes and no recall. The southbound Thompson Road approach provides a single lane for shared travel movements with presence detection and no recall. The northbound and southbound phases are allowed to skip if no vehicles are detected since no recall has been set. No sidewalks, crosswalks, or pedestrian controls are provided. The posted speed limit on Hosman Road is 45 mph and 40 mph on Thompson Road. Table II.C.1 summarizes the detailed levels of service for existing and proposed conditions.

Table II.C.1 – Hosman Road/Thompson Road LOS Summary

Intersection		Control	AM Peak Hour			PM Peak Hour		
			Existing	Proposed		Existing	Proposed	
				Semi-Coordinated	Fully Coordinated		Semi-Coordinated	Fully Coordinated
Hosman Rd/Thompson Rd		S						
Hosman Road EB	L		C (22)	B (13)	B (11)	C (22)	B (15)	B (16)
	T		C (31)	B (19)	B (17)	C (34)	C (30)	C (29)
	R		C (25)	B (20)	B (13)	C (27)	B (16)	B (20)
Hosman Road WB	L		C (21)	B (12)	A (9)	B (20)	C (24)	C (24)
	TR		E (58)	C (29)	C (22)	C (23)	C (28)	C (22)
Thompson Road NB	LT		C (33)	D (43)	D (43)	F (100)	D (55)	D (54)
	R		B (11)	B (11)	B (11)	B (11)	A (9)	A (9)
Thompson Road SB	LTR		B (19)	B (18)	B (18)	D (44)	C (23)	C (23)
Overall			C (32)	C (23)	B (20)	D (38)	C (27)	C (26)

Key: NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
X (Y) = Level of Service (Delay, seconds per vehicle)

During the AM peak hour, the intersection operates at LOS C or better, with the exception of the westbound shared through/right-turn movement which operates at LOS E. During the PM peak hour, this intersection operates at LOS D or better, with the exception of the northbound shared left-turn/through movement which operates at LOS F. With the addition of minimum recall on the eastbound/ westbound approaches, no recall on the northbound/southbound approaches, and traffic signal coordination, this intersection will improve to an overall LOS B/C during the AM and PM peak hours with all movements operating at LOS D or better.

To improve operations, the yellow/all-red clearance, the minimum greens, and vehicle extension were modified. The signal was optimized using Synchro which resulted in an 80-second cycle length during the AM peak hour and a 100-second cycle length during the PM peak hour. Review of the actuated green times indicated that each approach will generally operate at the maximum allowable split for all levels of traffic. Table II.C.2 summarizes the suggested changes in the signal timing parameters.

Table II.C.2 – Hosman Road/Thompson Road Parameter Summary

Parameter	Existing	Proposed
Detection	NB, SB, EB, WB	No change
Recall	Min EB/WB throughs	No change
Minimum Green	8-sec EB lefts; 10-sec NB/SB/WB lefts; 12-sec EB/WB throughs	5-sec lefts; 10-sec throughs
Yellow/All Red:	4/2-sec	4.0/1.5-sec for 40-50 mph speed
Vehicle Extension	4-sec	1.5-sec NB/SB/EB/WB[5]
Cycle Length	108-sec	80-sec AM; 100-sec PM

D. Hosman Road/Kinne Street

This four-leg intersection operates under signal control with a 104-second maximum cycle length. The eastbound and westbound approaches of Hosman Road provide an exclusive left-turn lane and a shared through/right turn lane with a minimum recall on the eastbound through movement, a maximum on the westbound through movement, and presence detection on all lanes with the exception of the westbound through lane. The northbound approach of Kinne Street provides an exclusive left-turn lane and a shared through/right-turn lane, with presence detection and no recall on both lanes. The southbound approach of Kinne Street provides a single lane for shared travel movements with presence detection and no recall. The northbound and southbound phases are allowed to skip if no vehicles are detected since no recall has been set. No sidewalks, crosswalks, or pedestrian controls are provided. The posted speed limit on Hosman Road is 45 mph and 30 mph on Kinne Street. Table II.D.1 summarizes the detailed levels of service for existing and proposed conditions.

Table II.D.1 – Hosman Road/Kinne Street LOS Summary

Intersection		Control	AM Peak Hour			PM Peak Hour		
			Existing	Proposed		Existing	Proposed	
				Semi-Coordinated	Fully Coordinated		Semi-Coordinated	Fully Coordinated
Hosman Rd/Kinne St		S						
Hosman Road EB	L		B (18)	B (16)	A (10)	A (10)	A (5)	A (4)
	TR		B (20)	B (11)	B (11)	F (192)	D (47)	C (33)
Hosman Road WB	L		A (10)	A (6)	A (6)	B (17)	C (20)	B (20)
	TR		F (98)	C (32)	D (38)	B (16)	A (8)	A (8)
Kinne Street NB	L		C (27)	D (43)	D (36)	C (21)	C (34)	D (38)
	TR		C (21)	C (24)	C (22)	B (18)	C (29)	C (31)
Kinne Street SB	LTR		D (38)	D (35)	C (33)	D (35)	D (41)	D (43)
	Overall		E (59)	C (27)	C (29)	F (118)	D (36)	C (29)

Key: NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
X (Y.Y) = Level of Service (Delay, seconds per vehicle)

During the AM peak hour, the intersection operates at an overall LOS E with all movements operating at LOS D or better, with the exception of the westbound shared through/right-turn movement which operates at LOS F with over one and a half minutes of delay. During the PM peak hour, this intersection operates at an overall LOS F with considerable delay due to the eastbound Hosman Road

[5] Max allowable headway = 3 sec, detection zone = 65 feet, approach speed = 40-50 mph.

approach which operates at LOS F with over three minutes of delay. With the addition of a presence loop on the westbound approach, minimum recall on the eastbound/westbound approaches, and no recall on the northbound/southbound approaches, drivers on Kinne Street will be served more frequently when gaps appear in the Hosman Road traffic and overall delay will be reduced.

To optimize the signal, detection was added to the westbound Hosman Road shared through/right-turn lane and the yellow/all-red clearance, the minimum greens, and vehicle extension were modified. The signal was optimized using Synchro which resulted in two different improvement scenarios. The proposed semi-coordinated scenario resulted in a 90-second cycle length during the AM peak hour and a 100-second cycle length during the PM peak hour. The proposed fully coordinated scenario resulted in an 80-second cycle length during the AM peak hour and a 100-second cycle length during the PM peak hour. The AM and PM peak hour cycle lengths were adjusted to minimize vehicle delays, minimize the v/c ratio, and to coordinate the timings with adjacent signals for the second scenario. During the peak hours, the intersection will operate at the maximum cycle length during the higher percentiles of traffic, and shorter cycle lengths during lower percentiles of traffic.

Review of the level of service summary indicates that full coordination of the corridor does not provide a large benefit to overall delay at the Hosman Road/Kinne Street intersection since it is located approximately 0.85 miles away from the closest signalized intersection in the corridor. Therefore, the OCDOT should consider whether or not the implementation of coordination at this intersection is a priority for the Hosman Road corridor. Table II.D.2 summarizes the suggested changes in the signal timing parameters.

Table II.D.2 – Hosman Road/Kinne Street Parameter Summary

Parameter	Existing	Proposed
Detection	NB, SB, EB/WB lefts, EB through	Presence added to WB through
Recall	None NB/SB; Min EB; Max WB	None NB/SB; Min EB/WB throughs
Minimum Green	8-sec lefts; 35-sec EB/WB; 10-sec NB/SB	5-sec lefts; 10-sec throughs
Yellow/All Red:	4/2-sec	4.0/1.5-sec for 35-50 mph speed
Vehicle Extension	4-sec	1.5-sec all approaches[6]
Cycle Length	104-sec	Semi-Coordinated: 90-sec AM; 100-sec PM Coordinated: 80-sec AM; 100-sec PM

E. Corridor Evaluation Summary

Measures of effectiveness (MOEs) serve as performance measures for evaluating the Hosman Road corridor. The MOEs can include delays, fuel consumption, average speed, emissions, travel time, and the "performance index" (PI) from the traffic simulation

[6] Max allowable headway = 3 sec, detection zone = 65 feet, approach speed = 30-50 mph.

model. The PI represents a combination of the delays, stops, and queuing penalty. A lower PI indicates better overall operations. The corridor was evaluated for the proposed semi and full coordination conditions. The semi-coordinated condition assumes coordination only at the Air National Guard Main Gate and Thompson Road intersections while the full coordinated condition assumes that all four study area intersections will be coordinated. Table II.E.1 summarizes the MOEs for Hosman Road for both conditions.

Table II.E.1 – Measures of Effectiveness on Hosman Road

Measure of Effectiveness	AM Peak Hour			PM Peak Hour		
	Existing	Proposed		Existing	Proposed	
		Semi-Coordinated	Fully Coordinated		Semi-Coordinated	Fully Coordinated
Total Delay (Hours)	38	20 (-47%)	17 (-55%)	81	28 (-67%)	24 (-72%)
Performance Index	44.5	26.0	23.4	88.2	35.0	30.4
Fuel Consumed (gal)	135	121 (-10%)	120 (-11%)	192	152 (-21%)	146 (-24%)
Overall Speed (mph)						
EB	33	37 (+11%)	38 (+13%)	19	32 (+41%)	34 (+44%)
WB	22	32 (+31%)	33 (+33%)	22	34 (+35%)	35 (+37%)
Travel Time (seconds)						
EB	273	238 (-13%)	227 (-17%)	400	272 (-32%)	259 (-35%)
WB	310	229 (-26%)	218 (-30%)	344	233 (-33%)	221 (-36%)

Overall, Table II.E.1 shows that the MOEs along Hosman Road will improve for the proposed semi-coordinated and fully coordinated conditions. Total delay through the corridor will be reduced by over half and speeds will improve from 4 to 15-mph based on peak hour, approach, and coordination condition. However, a review of the MOEs indicates that full coordination will result in only slightly better operating conditions for the corridor. As with most long segments between intersections, organized platoons of traffic tend to disperse increasing the distance and headways between vehicles. This often minimizes the gains made with signal coordination, hence the minimal improvement in full coordination versus semi-coordination scenarios. The OCDOT should review the cost of implementing coordination at the Kinne Street and Thompson Road intersections with the overall corridor wide benefits it would provide.

F. Optimization Summary

The recommendations discussed in the preceding sections are intended to develop consistency in the operations of each signal, improve responsiveness, and increase efficiency. The addition of detection on all approaches enables a signal to respond to changing traffic conditions, which increases the capacity of the intersection. Once vehicle detection is installed, recall settings in the signal controller can be used to create a minimum operating condition that the signal must serve. Beyond that, the controller can respond to the current demand.

Another key component of the recommendations is updating the vehicle extension times to accurately reflect the existing or proposed detection. The vehicle extension adds time to an approach that has already served the initial platoon of traffic with the minimum green, but continues to see additional vehicles arriving on the approach. The traffic signal

will not start to “gap out” (i.e. end the current phase) until the vehicle has left the detection zone.

Many of the intersections included in this analysis currently have presence detection (long vehicle detection loops, typically 60 to 70 feet) and a 3 or 4 second vehicle extension time. Depending on the speed of approaching vehicles, this combination of presence detection and a 3 to 4 second vehicle extension will result in the continued extension of the green phase for a dwindling amount of vehicles, which increases the delay for drivers on conflicting approaches waiting for straggling vehicles to pass through the intersection. Therefore, for presence detection, this report generally recommends that the vehicle extension time be reduced to 1.5 to 3.5 seconds to allow the signal to serve all approaches more efficiently and reduce overall delay at the intersection.

In contrast, point detection uses a small detection zone; typically a 6-foot detector loop placed 100 to 200 feet from the intersection, and has a much shorter period of detection as a vehicle passes over it. Point detection requires longer vehicle extensions, since the detector has less time to detect a vehicle approaching the intersection. Therefore this report generally recommends using a 3.5-second vehicle extension time for point detection to allow the signal to serve all approaches more efficiently and reduce overall delay at the intersection.

The following tables provide the traffic signal coordination plans for the AM and PM peak hours for the proposed semi and full coordination conditions.

Table II.F.1 – Semi-Coordination Data Table (AM Peak Hour)

AM Peak Hour – 80 Second Cycle Length (7:00 to 9:00 AM)									
Intersection	Splits								Offset
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	
Townline Rd (70 sec cycle)	11	27	11	21	11	27	16	16	NA
Air National Guard Main Gate	11	56				67	13		66
Thompson Rd	11	38	11	20	16	33		31	0
Kinne St (90 sec cycle)	11	52	11	16	11	52		27	NA

Table II.F.2 – Semi-Coordination Data Table (PM Peak Hour)

PM Peak Hour – 100 Second Cycle Length (4:00 to 6:00 PM)									
Intersection	Splits								Offset
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	
Townline Rd (90 sec cycle)	11	38	11	30	20	29	16	25	NA
Air National Guard Main Gate	11	62				73	27		79
Thompson Rd	11	35	12	42	17	29		54	0
Kinne St (100 sec cycle)	11	62	11	16	11	62		27	NA

Table II.F.3 – Full Coordination Data Table (AM Peak Hour)

AM Peak Hour – 80 Second Cycle Length (7:00 to 9:00 AM)									
Intersection	Splits								Offset
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	
Townline Rd	11	34	11	24	12	33	19	16	48
Air National Guard Main Gate	11	56				67	13		2
Thompson Rd	11	38	11	20	16	33		31	0
Kinne St	11	42	11	16	11	42		27	72

Table II.F.4 – Full Coordination Data Table (PM Peak Hour)

PM Peak Hour – 100 Second Cycle Length (4:00 to 6:00 PM)									
Intersection	Splits								Offset
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	
Townline Rd	11	45	13	31	23	33	17	27	63
Air National Guard Main Gate	11	62				73	27		80
Thompson Rd	11	35	12	42	17	29		54	0
Kinne St	11	62	11	16	11	62		27	50

CHAPTER IV

CONCLUSIONS

Based on the results of this Traffic Signal Timing Optimization study, the following recommendations are offered for the study area intersections:

- Hosman Road/Townline Road: This intersection currently operates at acceptable levels of service during the AM and PM peak hours. However it is recommended that the timing parameters be adjusted as shown in Table II.A.2 to minimize vehicle delays, minimize the v/c ratio, and coordinate the timings with adjacent signals for the coordinated condition. These changes will result in continued acceptable operating conditions.

- Hosman Road/New York Air National Guard Main Gate: The intersection currently operates at good levels of service with low delays during the AM peak hour. However, during the PM peak hour, several movements operate at LOS F, with long delays. Overall delay during the PM peak hour can be reduced with the addition of an overlapping westbound right-turn phase, point detection and minimum recall on the eastbound/ westbound approaches, a longer cycle length, and traffic signal coordination. The eastbound protected left-turn phase was also changed to a lagging phase as per the OCDOT standards for a three-leg intersection and it is recommended that the timing parameters be adjusted to that shown in Table II.B.2

- Hosman Road/Thompson Road: This intersection operates at an overall LOS C/D during the AM and PM peak hours with the westbound shared through/right-turn movement operating at LOS E during the AM peak hour and the northbound shared left-turn/through movement operating at LOS F. This intersection will improve to an overall LOS B/C during the AM and PM peak hours with all movements operating at LOS D or better with traffic signal optimization and coordination. It is also recommended that the timing parameters be adjusted to that shown in Table II.C.2

- Hosman Road/Kinne Street: This intersection currently operates at an overall LOS E/F during the AM and PM peak hours. Overall delay will be reduced with the addition of a presence loop on the westbound approach, minimum recall on the eastbound/westbound approaches, and no recall on the northbound/southbound approaches. It is recommended that the timing parameters be adjusted as shown in Table II.D.2 to minimize vehicle delays, minimize the v/c ratio, and coordinate the timings with adjacent signals for the coordinated condition. These changes will result in acceptable operating conditions.

  The Townline Road and Kinne Street intersections will generally operate under similar improved conditions with signal optimization only under the semi-coordinated scenario and with optimization and coordination with the remaining intersections in the corridor. The overall corridor improvements will be similar in both the semi and fully coordinated conditions. However, it will be more difficult to achieve the results of the full coordination given the distance between the Townline Road and Kinne

Street intersections to the Air National Guard and Thompson Road intersections. The County should review these results and the priority of coordination in this area.

Overall, most intersections can achieve better levels of service and reduced delays with the addition of vehicle detection, updated signal timings, modified controller parameters, and implementing a traffic signal coordination plan. In some instances, these improvements will reduce delays on most movements, although some movements may still operate at the LOS E/F range. Additional physical improvements may be necessary to further reduce delays and congestion.

These recommendations are made solely on the basis of the information provided. Other engineering factors, such as sight distances, accident history, presumed detector locations, and previous experiences at these intersections need to be considered in the implementation or modification of these recommendations.