### Bay Street & Sanford Street Glens Falls, NY

### INTERSECTION SAFETY STUDY



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prepared for:



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### EXECUTIVE SUMMARY

CHA conducted a study to evaluate the accident history and identify measures to improve safety at the Bay Street and Sanford Street intersection, located in Glens Falls, New York. The tasks performed for this traffic study included the following:

- 1. Review of accident data for a 5-year period to determine the most frequent types of accidents and common contributing factors in those accidents.
- 2. Collection of traffic data by means of field visit including manual turning movement counts, geometric measurements and signal timing and phasing.
- 3. Analysis of collected traffic data.
- 4. Development of measures to improve traffic and safety conditions at this intersection.

Bay Street and Sanford Street intersect at a four-way intersection operating under traffic signal control. Each approach consists of a shared left/ through/right turn lane with parking permitted on both sides of all approaches. Bay Street and Sanford Street are essentially straight and level. Pedestrians are accommodated through a sidewalk on the both sides of Bay Street and Sanford Street with a utility strip separating the concrete curb from the sidewalk. Pedestrian signals exist to accommodate crossings on all approaches. There are no separate bicyclist accommodations. Bus stops exist on both the Bay Street north and south approaches. There is street lighting and overhead utilities that run along the south side of Sanford Street and the west side of Bay Street. The posted speed limits of Bay Street and Sanford Street are 30 mph. Approximately 145 ft. south of this intersection, Hunter Street intersects Bay Street at an unsignalized "T" intersection.

The accident analysis was performed for the Bay Street and Sanford Street intersection using accident data provided by the City of Glens Falls Police Department. The analysis includes crashes for a five year period that occurred from April 24, 2008 through April 24, 2013. Detailed accident summary sheet, collision diagram, and detailed accident history are included in Appendix A.

There were 25 accidents at the Bay Street and Sanford Street intersection over the last five years. Based on the data, 16 of these accidents occurred within the last three year period. There were 9 (36%) injury, 13 (52%) property damage only, and 3 (12%) non-reportable or unknown accidents. There were no fatalities. There were 5 accidents (20%) that occurred at the Bay Street and Hunter Street intersection. The two predominate types of accidents were angle vehicle crashes and rear-end crashes, although there was no identifiable pattern associated with the rear-end accidents. See Section 2.0C for a complete discussion of the accident history.

A capacity analysis was performed for the PM peak period which shows that the intersection is operating at an overall LOS B with all approaches operating at LOS A or B. See Sections 2.0D and 2.0E for a complete discussion of the traffic volumes and capacity analysis.

Based upon a site visit and a review of the existing geometrics, operations and accident history, several observations and potential contributing factors were identified and are discussed in Section 2.0B. Among the observations are limited visibility of the traffic signals for the Sanford Street approaches and close spacing and limited visibility for Hunter Street. Although the accident data did not indicate a safety issue associated with pedestrians, some of the pedestrian signals were not functioning according

to the intended operation and the pedestrian signal at the northwest corner of the intersection was missing at the time of this study due to an accident that occurred in April 2013.

Improvements have been identified for the City of Glens Falls' consideration to improve safety at this intersection. Detailed descriptions of the recommended improvements are provided in Section 3.0 of this report. These improvements include removing vegetation, modifying the pedestrian signals, modifying the vehicular signals, removing or delineating the parking spaces and providing access management.

A brief description of these improvements is as follows:

### Vegetation

Trees, bushes and overgrown vegetation limit visibility at the northeast corner of the Bay Street and Hunter Street intersection and along Sanford Street on the north side of the westbound approach. Lines of sight should be maintained by trimming and removing as necessary, the trees, bushes and overgrown vegetation.

### Pedestrian Signals

While the accident data did not indicate a safety issue, the pedestrian signals at the southwest and southeast corners are not functioning according to the intended operation. The pushbuttons at the southwest corner operate the opposite approach than designated by placement and signage (e.g. button to cross Bay Street south leg operates Sanford Street west leg and the button to cross the Sanford Street west leg operates the Bay Street south leg) and there is no accommodation to cross the Bay Street south leg from the southeast corner, since the pedestrian button at the southeast corner of the intersection is missing due to an accident that occurred in April 2013. The pushbuttons, signs and pedestrian signals at the southeast and southwest corners should be corrected and the signal at the northwest corner installed to accommodate pedestrian crossings through the intersection.

### Vehicular Signals

Sections 2.0B and 3.0 provide a detailed discussion of the placement, layout and visibility of the vehicular traffic signals. Given the longitudinal positioning and the mounting height over the pavement, the visibility of the signals may be a contributing factor in the accidents at this intersection.

### Adjust Signal Head Position

The signals controlling the westbound approach should be lowered at least 2.5 to 3 feet. The signals controlling the eastbound approach should be lowered at least 1.5 to 2 feet. Determination of the need for lowering the mast arm, installing new or providing signal brackets to effectively lower the signals should be assessed. A detailed evaluation of the signals and the structural capacity of the supports will be necessary prior to implementing this measure. This evaluation could be approached by having a structural engineer review and evaluate the design shop drawings of the mast arm poles that were installed and/or work with the pole manufacturer to determine the ability of the poles to accept loading revisions based on their design load.

### Install backplates

Backplates with retroreflective borders is a low cost safety treatment that can be added to the existing traffic signal indication. A signal head equipped with a backplate with a retroreflective border enhances the visibility of the illuminated signal faces, in both daytime and nighttime conditions, which has the potential to reduce unintentional red-light running crashes. Prior to implementing this measure, the structural capacity of the supports will need to be evaluated. An average estimated cost for a backplate with yellow retroreflective border is \$120 to \$150 per backplate.

### Access Management

Five of the 25 accidents over the 5 year period occurred at the Bay Street and Hunter Street intersection. Long term, evaluation of permitting only right turns in and right turns out of Hunter Street and restricting left turn movements could be considered. This evaluation would need to consider the impact the diverted left turn movements would have to the adjacent intersections.

### 1.0 INTRODUCTION

CHA conducted a study to evaluate and recommend measures to improve safety at the Bay Street and Sanford Street intersection located in Glens Falls, New York. The study was initiated by a request from the Glens Falls Police Department to the Adirondack/ Glens Falls Transportation Council (AGFTC) to evaluate safety concerns at this intersection, which has been the location of several accidents over the last few years. To address the concerns, AGFTC retained CHA to perform an analysis of existing traffic and safety conditions at this intersection and to develop engineering solutions that will result in improvements of the safety for all users, while minimizing impacts to the local community. Tasks performed for this traffic study included the following:

- 1. Review of accident data for a 5-year period to determine the most frequent types of accidents and common contributing factors in those accidents.
- 2. Collection of traffic data by means of site visit including manual turning movement counts, geometric measurements and signal timing and phasing.
- 3. Analysis of collected traffic data.
- 4. Development of alternatives to improve traffic and safety conditions at this intersection.

### 2.0 EXISTING CONDITIONS

### A. SITE AREA

Bay Street [CR 7] and Sanford Street are classified as Urban Minor Arterials. Bay Street is a north-south roadway that intersects at Glen Street (US Route 9) at its southern end and extends northerly beyond Douglas Street where it becomes Bay Road. It is generally a two-lane roadway that widens at various intersections to accommodate turn lanes.

Sanford Street is an east-west roadway that intersects with Quaker Road (State Route (SR) 254) at its easterly end and at Glen Street (US Route 9) at its westerly end. It is generally a two-lane roadway that widens at select intersections to accommodate turn lanes. Sanford Street provides access to the old Sanford Street School, now occupied by BOCES, which is located at the corner of Sanford Street and Ash Avenue, west of the Sanford Street and Bay Street intersection. Sanford Street is a well-traveled pedestrian route through the City to the Glens Falls High School, Glens Falls Middle School, and Jackson Heights Elementary Schools.

The Bay Street and Sanford Street intersection is located in a highly urbanized setting. Land use of the area within the intersection includes commercial establishments consisting of Bay Optical of Glens Falls on the northwest corner, a strip building on the southwest corner consisting of multiple uses including Bellaggio Pizza and Bellissima Salon, Global Tech & Media, Inc. on the north east corner and Main Moon Chinese Restaurant on the southeast corner. Beyond the intersection along Bay Street, both to the north and south, the land use is commercial and along Sanford Street, to the east and west the land use is residential. The intersection is shown in the following Google aerial image below.



Figure 1: Bay Street and Sanford Street



Bay Street and Sanford Street are essentially straight and level. The two streets are nearly perpendicular but there is a slight horizontal curve on Sanford Street just west of the intersection.

Bay Street and Sanford Street intersect at a four-way intersection operating under traffic signal control. Each approach consists of a shared left/ through/right turn lane with parking permitted on both sides of all approaches. Parking areas on Bay Street are highlighted with a single white edge line but individual spaces are not designated within these areas. On street parking is also permitted on both sides of Sanford Street although no parking areas are defined with pavement markings. Pedestrians are accommodated through a sidewalk on the both sides of Bay Street and Sanford Street with a utility strip separating the concrete curb from the sidewalk. There are no separate bicyclist accommodations.

Each approach is controlled by a pair of standard 3-section vehicular signal heads vertically mounted on mast arms. The mast arm poles are located on the northeast and southwest corners of the intersection and are angled diagonally through the intersection. The existing operation of the signals consists of two phases (Bay Street north/south and Sanford Street east/west). The north/south phase was observed to be approximately 35 seconds with the east/west phase observed to be approximately 18 seconds for a total cycle length of 65 seconds. Each phase included approximately 4 seconds yellow and 2 seconds all red. The signal is not part of a coordinated system. No Turn on Red signs are mounted on the mast arms for each of the approaches to the intersection. See Photo 1.

Photo 1: On Bay Street looking south at Sanford Street



The height of the signals, from the top of pavement to the bottom of the signal head housing was measured in the field. The signals that control the northbound and westbound approaches were at 20.5 ft. and 20.9 ft. The signals that control the southbound and eastbound approaches were approximately 19.5 ft. and 20 ft.

Pedestrian signals exist on each of the corners, consisting of one-section pedestrian signal heads with

the upraised hand and walking person symbol overlaid Photo 2: Pedestal pole on southeast corner upon each other. No countdown timers exist at this intersection. The pedestrian signal heads, buttons and signs are mounted on the mast arm at the northeast and southwest corners. At the southeast corner, the pedestrian signals, pushbuttons and signs for crossing the south leg of Bay Street and the east leg of Sanford Street are both mounted on the same pedestal pole. At the time of this study, the pedestrian signal at the northwest corner, which would have consisted of the pedestrian signals, pushbuttons and signs for crossing the north leg of Bay Street and the west leg of Sanford Street, both mounted on



the same pedestal pole, was missing due to a recent accident that occurred which demolished the Bay Optical sign and the pedestrian signals.

In addition, some of the existing pedestrian push buttons were not operating the intended approach as noted below:

### Southwest corner pedestrian signal

- Pushbutton to cross the Bay Street south leg operates the Sanford Street west leg crossing.
- Pushbutton to cross the Sanford Street west leg operates the Bay Street south leg crossing.

### Southeast corner pedestrian signal

Pushbutton to cross the Bay Street south leg operates the Sanford Street west leg crossing. Hence, there is no accommodation for pedestrians to cross the Bay Street south leg from the southeast corner of the intersection.

Double yellow centerline and white lane line pavement markings along with the stop bars and crosswalk markings exist on Bay Street. A double yellow centerline pavement marking exists for a minimal distance along Sanford Street on both the east and west legs of the intersection with no other pavement markings beyond that, aside from the stop bar and crosswalk lines.

A bus stop exists on both the Bay Street north and south approaches. There is street lighting and overhead utilities that run along the south side of Sanford Street and the west side of Bay Street. The posted speed limits of Bay Street and Sanford Street are 30 mph.

Hunter Street intersects Bay Street approximately 145 feet south of the Bay Street and Sanford Street intersection. See Photo 3. Hunter Street is a two-lane east-west roadway that is Stop controlled and intersects Bay Street forming an unsignalized "T" intersection. See Photo 4. The Hunter Street westbound approach consists of a shared left/ right turn lane. Pedestrians are accommodated through a sidewalk on both sides of Hunter Street with a grassed utility strip separating the concrete curb from the sidewalk. There are no separate bicyclist accommodations. There are no pavement markings on Hunter Street. Overgrown brush and vegetation on the northeast corner of the intersection limit the intersection sight distance.

Photo 3: On Bay Street looking north (Hunter St. on Right)





### B. SITE OBSERVATIONS / POTENTIAL FACTORS

The following is a summary of some observations from the field visits:

- Pedestrian pushbuttons are not operating as intended. The pedestrian signal at the northwest corner is missing, the pushbuttons at the southwest corner operate the opposite approach than designated by placement and signage (e.g. button to cross Bay Street south leg operates Sanford Street west leg), and there is no accommodation to cross the Bay Street south leg from the southeast corner, since the pedestrian button at the southeast corner controls the Sanford Street west leg crossing. See Section 2.0A.
- Visibility of the signals and signage for vehicles at the Sanford Street eastbound and westbound approach stop lines is limited due to the height and longitudinal placement of the signals.

Photo 6: On Hunter St. at stop bar and sign looking north



- Visibility of the signal and overhead signage is impeded for Sanford Street westbound vehicles due to the tree canopy overhanging the Sanford Street westbound approach. See Photo 7.
- Visibility of southbound vehicles, pedestrians and bicyclists on Bay Street is impeded for the Hunter Street vehicles due to the northbound queue at Sanford Street, on-street parking



Photo 7: On Sanford Street looking westbound



and overgrown bushes at the northwest corner of the Hunter Street and Bay Street intersection. See Photos 2 and 6.

- Vehicles use the parking lanes on the Bay Street north and south approaches to overtake the leading vehicles waiting to turn left at the intersection.
- The unmarked eastbound and westbound approach lanes are wide enough to allow vehicles to overtake other vehicles stopped and turning left on these approaches. As a result, drivers may overtake the leading vehicles waiting to travel through or turn left at the intersection. See Photo 1 above.

- Bicyclists ride both on the sidewalk and on the roadway.
- Parking within the immediate vicinity of the intersection was not observed during the field visits. However, on-street parking provided close to the intersection would impede sight distance. The parallel parking maneuvers increases potential for collisions between vehicles parking and those following who might need to suddenly stop as well as for those parked vehicles entering traffic which may force vehicles to stop abruptly.
- The close spacing of Hunter Street to the Bay Street and Sanford Street intersection and the volumes southbound on Bay Street has the potential to increase accidents due to the turning maneuvers into and out of this Hunter Street intersection.

### C. ACCIDENT HISTORY

An accident analysis was performed for the Bay Street and Sanford Street intersection using accident data provided by the City of Glens Falls Police Department. The analysis includes crashes for a five year period that occurred from April 24, 2008 through April 24, 2013. Table 1 summarizes the accident history at the study area intersection. In addition, a detailed accident summary sheet and a collision diagram are included in Appendix A.

There were 25 accidents at the Bay Street and Sanford Street intersection over the last five years. Based on the data, 16 of these accidents occurred within the last three year period. There were 9 (36%) injury, 13 (52%) property damage only, and 3 (12%) non-reportable or unknown accidents. There were no fatalities.

Table 1. Types of collisions		
Type of Collision	Number	Percentage
Rear-End	8	32%
Right Angle	9	36%
Left Turn	2	8%
Sideswipe	3	12%
Overtaking	1	4%
Pedestrian/Bicyclist	2	8%
Total	25	100%

Table 1: Types of Collisions

The data also shows the following:

- Eighty percent (80%) of the accidents occurred in daylight which suggests that night-time visibility is not the primary contributing factor of the crash history.
- Seventeen accidents (68%) occurred with dry pavement conditions, with the remaining 8 accidents (32%) occurring with wet (5), snow/ice (2), slush (1) conditions.
- Five accidents (20%) occurred at the Hunter Street intersection.
- There was no distinct pattern of the rear-end accidents as 5 occurred at the Bay and Sanford Street intersection (2 on each of the northbound and southbound approaches and 1 on the westbound approach) and 3 occurred at the Bay Street and Hunter Street intersection (2 on the Bay Street southbound and 1 on the northbound approaches).
- The two bicyclist accidents involved a westbound vehicle from Sanford Street and Hunter Street and a southbound bicyclist traveling against traffic.
- One of the right angle accidents involved alcohol.

• The predominate type of angle accidents involved eastbound vehicles with either the north- or southbound Bay Street vehicles.

The intersection accident rate was calculated and compared to the statewide average for intersections on state roads with similar geometry and traffic control. The accident rate for the subject intersection (not including the 5 Hunter Street accidents) is approximately 0.80 accidents per million entering vehicles (acc/MEV) as compared to the statewide average of 0.34 acc/MEV. It is noted that the statewide average is calculated for state roadways only and that since the Bay Street and Sanford Street are county and local roads, respectively, the characteristics may be slightly different. In addition, accident rates are typically reported for a 3-year rather than a 5-year period.

### D. TRAFFIC VOLUMES

The New York State Department of Transportation (NYSDOT) Traffic Volume Data Viewer was used to obtain the Average Annual Daily Traffic Volume (AADT) data for Bay Street and Sanford Street. Table 2 below summarizes the 2010 AADT. Figure 2 below shows hourly volumes approaching the intersection. See Appendix B for the Traffic Hourly Data Report.

Table 2: Traffic	volumes					
Stroot	From To		AADT		AM Peak	PM Peak
Sireet		NB/ EB <sup>1</sup>	SB/ WB <sup>1</sup>	Total	Hour	Hour
Bay Street	Washington St. to Sanford St	5022	5375	10397	683	897
Bay Street	Sanford St. to City Line	4845	5461	10306	615	857
Sanford Street	Bay Street to Ridge Street	1816	1865	3681	258	337

<sup>1</sup> northbound (NB) and southbound (SB) directions for Bay Street and eastbound (EB) and westbound (WB) directions for Sanford Street.

The Traffic Volume Report provided vehicle classification and speed data for Bay Street for the roadway segment of Sanford Street to the City Line. NYSDOT used an automatic traffic recorder (ATR) device, placed just north of Hope Avenue to collect the data. Vehicle classification data showed that approximately 4% of the daily traffic on this segment of Bay Street was heavy vehicles, comprised as 3% traveling north and 5% traveling south. The speed data showed that the 85<sup>th</sup> percentile speed was 35.9 mph in the north direction and 36.8 mph in the south direction with a 50<sup>th</sup> percentile speed of approximately 31.5 mph for each of the directions.

Three signalized intersections exist on Bay Street between Washington Street and Sanford Street (at Washington Street, Grand Street, Sanford Street). No signalized intersections exist on Bay Street north of Sanford Street to the City line. North of the City line, there is one midblock crossing, to accommodate the Warren County Bikeway, and a signalized intersection at NYS Route 254. The data indicates that motorists travel at a slightly higher 85<sup>th</sup> percentile speed in the southbound direction than the northbound direction. This suggests that the motorists are traveling at a slightly higher speed in the roadway segment where there is uninterrupted flow and a slightly lower speed in the roadway segment where there is interrupted flow due to the signals. Bay Street is posted 30 mph so the results of the speed study are consistent with expected 50<sup>th</sup> and 85<sup>th</sup> percentile speeds for this posted speed limit and the character of this area of Bay Street.

Figure 2: AADT Hourly Traffic Volumes



Intersection turning movement traffic counts were conducted at the Bay Street and Sanford Street and Hunter Street intersections on July 30, 2013 during the weekday PM peak period from 4:00 pm to 6:00 pm. Traffic counts were recorded at 15-minute increments. Pedestrian counts were also recorded at the intersections concurrently with the vehicle counts. The PM peak hour occurred from 4:30 pm to 5:30 pm. See Figure 3 below for the PM peak period volumes. The traffic volumes are included in Appendix B.



### Figure 3: PM Peak Hour Volumes



The volumes show the following:

- The two-way PM peak period volume on Bay Street is approximately 820 vehicles, which is more than twice the two-way PM peak period volume on Sanford Street (375 vehicles).
- Approximately 60% of the traffic entering Hunter Street is from the north (turning left).
- Approximately 85% of the traffic exiting Hunter Street is to the north (turning right).
- The primary pedestrian movement during the PM peak period was from the south (17 pedestrians).

### E. LEVEL OF SERVICE AND CAPACITY ANALYSIS

Intersection capacity analyses were conducted for the intersection using methodology outlined in the Highway Capacity Manual 2000 (HCM 2000) published by the Transportation Research Board. Level of service (LOS) criteria are measured in average delay per vehicle (seconds), and range from LOS A to LOS F. LOS range from A to F with LOS A considered excellent with very little vehicle delay while level of service F generally represents conditions with long vehicle delays. Table 3 identifies the levels of service and associated delay ranges for each type of traffic control.

Capacity analyses were performed for the 2013 Existing PM peak period conditions. Summaries of these analyses are shown in Table 4. See Appendix B for the LOS analyses. The analyses show that the intersection operates at overall LOS B with each approach operating at LOS A or B. No geometric improvements are necessary to accommodate the operations at this intersection.

SHOT LOS
Signalized
Control Delay per Vehicle (second)
≤ 10
> 10-20
> 20-35
> 35-55
> 55-80
> 80

### Table 3: HCM Intersection LOS

### Table 4: LOS Summary – PM peak period

Intersection & Approach	Lane	2013 I	Existing
intersection & Approach	Group	LOS	Delay
Bay Street and Sanford Street			
Eastbound	LTR	В	19.4
Westbound	LTR	В	19.7
Northbound	LTR	А	9.6
Southbound	LTR	А	9.6
Overall		В	12.8



### 3.0 IMPROVEMENT INITIATIVES

Based on a review of the existing traffic conditions and accident analysis, several improvements have been identified as discussed below.

### Vegetation

While most of the intersection and surrounding area is open (Photo 1), there are a few locations where trees and vegetation have become overgrown impairing visibility. At the northeast corner of the Bay Street and Hunter Street intersection, there is a bush and some overgrown vegetation that limits visibility (Photo 6) to pedestrians and bicyclists riding on the sidewalk.

Likewise, the trees along the north side of the Sanford Street westbound approach have canopies that are overhanging the roadway and impacting the view of the traffic signal. The overhead No Right Turn on Red sign is not visible due to the canopy from these trees (Photo 7). Trees and brush should be trimmed and removed as necessary to maintain adequate lines of sight.

### Pedestrian Signals

While the accident data did not indicate a pedestrian/bicycle safety issue, the pedestrian signals are not functioning according to the intended operation. In addition, the pedestrian signal at the northwest corner of the intersection is missing due to an accident that occurred in April 2013. As discussed in Section 2.0B, the pedestrian signals at the southwest and the southeast are not functioning correctly. The pushbuttons, signs and pedestrian signals at the northeast corner (Photo 8) are functioning correctly.



Photo 8: Signal Pole at northeast corner

The pushbuttons, signs and pedestrian signals at the southeast and southwest corners should be corrected so that the buttons activate the correct signals, and the damaged/missing signals at the northwest corner should be re-installed to accommodate pedestrian crossings through the intersection.

### Vehicular Traffic Signals

The traffic signals that control the Sanford Street eastbound and westbound approaches exceed the maximum standard for mounting heights of signal faces, as noted in Section 4D.15 of the MUTCD and NYS Supplement. In accordance with these documents, vehicular signal faces located over any portion

of a highway that can be used by motor vehicles shall be at least 15 feet above the pavement and not more than 19 feet. All of the existing vehicular signal faces exceed this maximum mounting height with the signals ranging in height from 19.5 feet to 20.9 feet (from top of pavement to bottom of signal housing). Since all of the signals exceed the maximum height to the bottom of the signal housing, several of the signals also exceed the maximum top of signal head mounting height.

Visibility of the signals, given the longitudinal positioning and the mounting height over the pavement, may be a contributing factor in the accidents at this intersection.

### Adjust Signal Head Positions

The signals controlling the westbound approach should be lowered at least 2.5 to 3 feet. The signals controlling the eastbound approach should be lowered at least 1.5 to 2 feet. Determination of the appropriate method to lower the signal heads, including the use of new signal brackets, lowering the mast arm, or installing new signals should be assessed. A detailed engineering evaluation, including an assessment of the structural capacity of the supports, impact on utilities, and visibility of the signal heads will be necessary prior to implementing this measure. This evaluation could be approached by having a structural engineer review and evaluate the design shop drawings of the mast arm poles that were installed and/or work with the pole manufacturer to determine the ability of the poles to accept loading revisions based on their design load.

### Install backplates

Backplates with retroreflective borders is a low cost safety treatment that can be added to the existing traffic signal indication. A signal head equipped with a backplate with a retroreflective border enhances the visibility of the illuminated face of the signals, in both daytime and nighttime conditions, which has the potential to reduce unintentional red-light running crashes. Prior to implementing this measure, the structural capacity of the supports will need to be evaluated.





### Access Management

Five of the 25 accidents over the 5 year period occurred at the Bay Street and Hunter Street intersection. Long term, evaluation of permitting only right turns in and right turns out of Hunter Street and restricting left turn movements could be considered. This evaluation would need to consider the impact the diverted left turn movements would have to the adjacent intersections.

### 4.0 CONCLUSION

This report summarizes the results of an accident analysis for the Bay Street and Sanford Street intersection and identifies several improvements that can be implemented to improve safety and bring existing vehicular and pedestrian signal in compliance with the MUTCD and NYS Supplement.

Tasks performed for this traffic study included the following:

- 1. Review of accident data for a 5-year period to determine the most frequent types of accidents and common contributing factors in those accidents.
- 2. Collection of traffic data by means of site visit including manual turning movement counts, geometric measurements and signal timing and phasing.
- 3. Analysis of collected traffic data.
- 4. Development of alternatives to improve traffic and safety conditions at this intersection.

An accident analysis was performed for the Bay Street and Sanford Street intersection using accident data provided by the City of Glens Falls Police Department. The analysis includes crashes over a five year period that occurred from April 24, 2008 through April 24, 2013. Detailed accident summary sheets and a collision diagram are included in Appendix A. A summary of the data showed that there were 20 accidents at the Bay Street and Sanford Street intersection and 5 accidents at the Bay Street and Hunter Street intersection over the last five years. Based on the data, 16 of these accidents occurred within the last three year period. There were 9 (36%) injury, 13 (52%) property damage only, and 3 (12%) non-reportable or unknown accidents. There were no fatalities.

Based on the accident analysis, the intersection crash rate is more than two times higher than the statewide average for similar intersections. The analysis shows that the two primary accident patterns at the intersection were rear end accidents and angle accidents between the eastbound approach and either the north- or southbound approaches. Although 32% of the accidents were rear- end accidents, there was no pattern associated with these types of accidents.

While the accident data did not indicate a pedestrian/bicycle safety issue, the pedestrian signals at the southwest and southeast corners are not functioning according to the intended operation and the pedestrian signal at the northwest corner of the intersection is missing due to an accident that occurred in April 2013. The pushbuttons, signs and pedestrian signals at the southeast and southwest corners should be corrected and the signal at the northwest corner installed to accommodate pedestrian crossings through the intersection.

Average Annual Daily Traffic Volume (AADT) data were obtained from the New York State Department of Transportation (NYSDOT) Traffic Volume Data Viewer and turning movement counts were performed for the PM peak period (4 pm to 6 pm) on July 30, 2013. Based upon the existing traffic volumes and capacity analysis, there is sufficient capacity and acceptable operations at this intersection such that no geometric improvements are necessary. The capacity analyses performed for the 2013 Existing PM peak period conditions show that the intersection operates at overall LOS B with each approach operating at LOS A or B. The traffic volume data is included in Appendix B. Several measures have been identified for the City of Glens Falls' consideration to improve safety at this intersection including:

- Removing vegetation along the east side of Bay Street between Hunter Street and Sanford Street and trim the trees along the north side of the Sanford Street eastbound approach between Stoddard Avenue and Bay Street.
- Modifying the pedestrian signals at the southwest and southeast corners and install the pedestrian signal at the northwest corner.
- Lower the signal heads to comply with MUTCD standards.
- Install signal backplates (subject to confirmation of design loads).
- Providing access management.

### APPENDIX A ACCIDENT DATA



SUMMARY OF ACCIDENT HISTORY										
DIN	0114 D 1 14		April 24, 20	08 - April 24	l, 2013					
PIN Droject Nome:	CHA Project N	No. 25857				Route No. or Street Name:	-	Bay Street		
Coupty	AGFIC Salety	Study				At Intersection with / or Retu	000	Conford Stroot		
City						At Intersection with? or betw	-	Saliiolu Stieet		
Date	April 24, 2008 to	April 24 2013				CHA Project No		25857		
Buto	<u>, , p</u>	, ipin 2 1, 2010		-	20007					
Accident Summary Sheet										
Severity	No. of Accidents	% of Accident	Туре	No. of Accidents	% of Accident	Direction	No. of Accidents	% of Accident		
Fatal	0	0%	Rear-End	8	32%	North	5	26%		
Injury	9	36%	Left Turn	2	8%	South	4	21%		
Property Damage Only	13	52%	Right Angle	9	36%	East	0	0%		
Non-Reportable	1	4%	Sideswipe	3	12%	West	1	5%		
Unknown	2	8%	Head-on	0	0%	North & West	4	21%		
lotal	25	100%	Overtaking	1	4%	North & East	3	16%		
			Pedestrian/Bicyclist	2	8%	South & West	2	11%		
			Apimal	0	0%		0	0%		
			Other	0	0%	Total	10	100%		
			Total	25	100%	Total	17	100%		
			Total	23	100%					
Year	No. of Accidents	% of Accident	Time of Day	No. of Accidents	% of Accident	Time of Year	No. of Accidents	% of Accident		
2008	3	12%	12 AM - 6 AM	0	0%	Winter (Dec Feb.)	8	32%		
2009	3	12%	6 AM - 10 AM	3	12%	Spring (Mar May)	5	20%		
2010	7	28%	10 AM- 4 PM	7	28%	Summer (lune - Aug.)	6	24%		
2011	2	10%	4 DM 7 DM	,	26%	Fall (Sopt Nov.)	0 4	24%		
2011	3	12%		9	30%	raii (Sept NOV.)	0	24%		
2012	/	28%	7 PM - 12 AM	6	24%					
2013	2	8%	Unknown	0	0%					
Total	25	100%	Total	25	100%	Total	25	100%		
					·					
Weather	No. of Accidents	% of Accident	Pavement	No. of Accidents	% of Accident	Light Conditions	No. of Accidents	% of Accident		
Clear	14	56%	Dry	17	68%	Daylight	20	80%		
Cloudy	7	28%	Wet	5	20%	Dawn	0	0%		
Rain	3	12%	Muddy	0	0%	Dusk	1	4%		
Snow	1	1%	Snow/Ice	2	8%	Dark Road - Lighted	4	16%		
Sloot/Hail/Froozing Pain		9%	Slush	1	49/	Dark Road Uplighted	-	0%		
Sieet/Hail/Heezing Kaili	0	0%	Siusii	1	4 %	Dark Koau - Unlighteu	0	0%		
Fog/smog/smoke	0	0%	Flooded	0	0%	Unknown	0	0%		
Unknown	0	0%	Other/Unknown	0	0%					
Total	25	100%	Total	25	100%	Total	25	100%		
Roadway Characteristics	No. of	% of Accident	Day of Week	No. of	% of Accident	Age of Driver	No. of	% of Accident		
Straight and Level	Accidents 25	100%	Monday	Accidents 7	28%	16-25	Accidents	21%		
Straight and Grade	0	0%	Tuesday	4	16%	26-55	13	54%		
Staright at Hillcrest	0	0%	Wednesday	6	24%	>55	6	25%		
Curve and Level	0	0%	Thursday	2	8%	Total	24	100%		
Curve and Grade	0	0%	Friday	3	12%					
Curve at Hillcrest	0	0%	Saturday	2	8%					
Surve at Hillerest	0	076	c l		070					
Tetel			Sunday	1	4%					
lotai	25	100%	Total	25	100%					

TE 213 (Equiva	alent)				DET	ALS OF		JENT HI	STORY	FOR LO	CATION	
County: Warren		III	ż		Route N	o. or Street	t Name:				Case No:	
Town:		ĺ			Bay Stre	et.					File:	
City: Glens Fa	lls				At Inters	ection with.	/ or Betwee	in:			By: AGFTC	
Village of:					Sanford	Street					Date: 6/4/2013	
Time Period				suc								
From: To:	040	1/24/08	ven. Severit	<	ter ter	ou e Ae	ł	Apparent				
No. of Months:		09	ð (NR, PD	рн с , о́	sdwa	swbe face itibr	ethe	Contributing				
ID No. Date	Ϊ	me	NJ, FA	E IbiJ	ens Sos	Ros Sur	эW	Factors	Type	Direction	Description	Location
1 04/24/	13 11	:49	2 PDO	-	٢	٢	+	6	RE	z, z	MV 1 struck MV 2	Bay / Hunter
2 4/8/1:	3 16	:12	2 INJ	٢	٢	1	1	2	RA	N,N	MV1 struck MV2	Bay / Sanford
3 12/8/1	2 9:	26	2 PDO	-	1	2	2	7	LT	SW, SE	MV 1 entered path of MV 2 and was struck by MV 2.	Bay / Hunter
4 11/16/1	12 12	:36	2 UNK	-	٢	1	1	18, 7	от	NE, NE	MV 1 entered path of MV 2 and was struck by MV 2.	Bay / Sanford
5 11/09/1	12 10	:29	2 PDO	-	٢	1	1	7,4	LT	W, N	MV 1 struck MV 2 as MV 2 was turning left in front of MV 1	Bay / Sanford
6 07/17/1	12 15	:13	2 UNK	-	-	1	1	13, 13	SS	N, N	MV 1 struck MV 2 in the parking lane	Bay / Sanford
7 07/16/1	12 17	:45	2 INJ	-	٢	1	1	7, 42	RA	S, W	MV 1 failed to yield ROW to MV 2	Bay / Hunter
8 04/17/1	12 20	10	Z INJ	4	1	1	2	4,9	RE	W,W	MV 1 struck MV 2	Bay / Sanford
9 03/16/1	12 13	:25	2 INJ	1	-	2	3	2,17	RA	NW, SW	Driver of MV 1 intoxicated, ran red light, struck MV 2, MV 2 struck building.	Bay / Sanford
10 11/09/1	11 19	:18	2 PDO	4	٢	1	1	17	RA	E, N	MV 1 failed to yield ROW to MV 2; MV 1 struck MV 2	Bay / Sanford
11 10/29/1	11 17	:32	2 PDO	3	1	1	2	17, 4	RA	N, W	MV 1 disregarded traffic device and collided with MV 2	Bay / Sanford
12 01/24/1	11 8:	51	2 PDO	1	-	5	1	17	RA	E,N	MV 1 skidded through red light and struck MV 2	Bay / Sanford
13 11/04/1	10 15	:36	2 PDO	-	-	2	З	6	RE	s, s	MV 1 struck MV 2 from behind as MV 2 was attempting LT	Bay / Sanford
14 08/24/1	10 15	:19	2 INJ	-	-	1	1	6	RE	S, S	MV 1 struck MV 2	Bay / Hunter
15 07/19/1	10 14	:52	3 PDO	1	1	1	2	6	RE	S,S,S	MV 1 struck MV 2, forcing MV 2 to strike MV 3 while MV 3 waiting to make LT	Bay / Hunter
16 04/12/1	10 14	:51	2 PDO	1	-	1	1	6	RE	N, N	MV 1 struck MV 2 from behind	Bay / Sanford
17 02/24/1	10 11	:10	2 INJ	-	-	4	4	4, 66	RE	N,N	MV 1 struck MV 2 from behind	Bay / Sanford
18 02/03/1	10 14	:37	3 PDO	1	-	2	1	4	RE	S, S	MV 1struck MV 2 from behind, forcing MV 2 to strike MV 3	Bay / Sanford
19 01/17/1	10 13	:52	Z INJ	1	1	1	2	17, 4	RA	NE, S	MV 2 failed to obey red light and struck MV 1	Bay / Sanford
20 12/23/(	12 12	:40	2 NR	1	-	1	2	13	SS	S,SW	MV 1 was struck by MV 2 while MV 1 attempted to pass MV 2 on right	Bay / Sanford
21 08/25/(	98:	42	2 PDO	-	-	1	1	14	RA	SE, N	MV 1 was truck by MV 2 (bicyclist)	Bay / Sanford
22 02/09/(	15 15	:44	2 INJ	1	-	2	1	17	RA	E, S	MV 1 struck MV 2	Bay / Sanford
23 12/24/(	38 22	:16	2 PDO	4	-	4	з	17, 66	RA	N, W	MV 1 ran red light, struck MV 2	Bay / Sanford
24 10/20/(	38 20	1:41	2 PDO	4	-	1	2	13	SS	S, S	MV 1 was struck by MV 2 while MV 1 attempted to pass MV 2 on right	Bay / Sanford
25 08/21/(	38 16	:52	2 INJ	1	-	1	2	17	RA	S, W	MV 1 ran red light, struck MV 2	Bay / Sanford
26												
27										-		
28										-		
29	_											
30												
31	_											

DETAILS OF ACCIDENT HISTORY FOR LOCATION

unk - unknown nr = non reportable

Accident Type Legend

RA - Right Angle RE - Rear End LT - Left Turn OT - Overtaking SS - Sideswipe

Contributing Factors Legend

2=atochol 4 = Driver Inattention 7 = Failure to Yield Right-of Way 9 = Follwing Too Closely 13= passing or lane usage improper 17 = Traffic Control Disregarded 18 = Turning Improperly

19 = Unsafe Speed 20 = Unsafe Lane Changing 42 = Brakes defective 66 = Pavement Slippery

### APPENDIX B

SHORT						REPORT										
General Information						Site Information										
Analyst Agency or C Date Perforn Time Period	o. CHA ned 8/6/2013 PM peak	peri	iod					Interse Area Jurisd Analys	ntersection Bay St. / Sanford St. Area Type All other areas Jurisdiction City of Glens Falls Analysis Year 2013							
Volume and	I Timing Inpu	t														
				E	В			WB	1		NB	í _	_		SB	
Number of L		_			ГН 1	RT		TH	RT			F	<u>x</u> T		TH	RT
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Parking/Hou	r									1						
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			EB				WB			NB				SB		
Adjusted Flow Rate			198		98				217		435				451	
Lane Group Capacity				525				522			932				960	
v/c Ratio				0.38			1	0.42	1	1	0.47			1	0.47	
Green Ratio				0.28				0.28			0.54			ĺ	0.54	
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New York State Department of Transportation Traffic Count Hourly Report

Page 1 of 2

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New York State Department of Transportation

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### New York State Department of Transportation Classification Count Average Weekday Data Report

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### TRAFFIC FLOW BY DIRECTION



North		Sout	h		
		PEAK	HOUR DATA		
DIRECTION North	HOUR 13	COUNT 441	2-WAY <b>A.M.</b>	HOUR 12	COUNT 780
South	15	506	P.M.	13	925

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\* INCLUDING THOSE HAULING TRAILERS

FUNCTIONAL CLASS CODES:

- RURAL URBAN SYSTEM
- 01 02 02 06 07 08
- 11 PRINCIPAL ARTERIAL-INTERSTATE 12 PRINCIPAL ARTERIAL-EXPRESSWAY 14 PRINCIPAL ARTERIAL-OTHER 16 MINOR ARTERIAL 17 MAJOR COLLECTOR 17 MINOR COLLECTOR 18 LOOAD QUITER

  - 19 LOCAL SYSTEM

### SOURCE: NYSDOT DATA SERVICES BUREAU

								Nev	/ York S Speed (	state De Count A	partmer verage \	nt of Tra Neekda	nsportati y Report	uo							Pa Date: 12	ge 1 of 2 2/09/2010
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File Name : GREEN Site Code : 12111111 Start Date : 7/30/2013 Page No : 1



AGFTC SAFETY STUDY PM 4 TO 6 Groups Printed- PASSENGER CARS - SU TRUCKS & BUSES - MU TRUCKS

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		Ę	om Nort	Ę			Fr	om East				Fre	om Sout	Ч			Ę	om West			
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds /	App. Total	Right	Thru	Left	Peds ,	App. Total	Right	Thru	Left	Peds /	vpp. Total	Int. Total
04:00 PM	6	76	5	-	91	4	36	2	-	46	4	80	12	-	97	12	14	7	0	33	267
04:15 PM	10	100	7	-	118	10	32	5	0	47	ო	73	œ	7	86	7	20	9	0	33	284
04:30 PM	10	91	9	e	110	6	39	7	0	55	S	06	14	с	112	7	30	7	0	44	321
04:45 PM	6	71	11	0	91	3	30	4	0	37	9	90	11	2	109	5	26	10	0	41	278
Total	38	338	29	5	410	26	137	21	-	185	18	333	45	80	404	31	06	30	0	151	1150
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Total	36	353	21	8	418	28	110	17	4	159	32	269	34	17	352	32	94	20	2	151	1080
Grand Total	74	691	50	13	828	54	247	38	5	344	50	602	79	25	756	63	184	50	2	302	2230
Apprch %	8.9	83.5	9	1.6		15.7	71.8	11	1.5		6.6	79.6	10.4	3.3		20.9	60.9	16.6	1.7		
Total %	3.3	31	2.2	0.6	37.1	2.4	11.1	1.7	0.2	15.4	2.2	27	3.5	1.1	33.9	2.8	8.3	2.2	0.2	13.5	
PASSENGER CARS	74	683	49	13	819	54	246	38	S	343	50	598	78	25	751	63	183	50	S	301	2214
% PASSENGER CARS	100	98.8	98	100	98.9	100	99.6	100	100	99.7	100	99.3	98.7	100	99.3	100	99.5	100	100	99.7	99.3
SU TRUCKS & BUSES	0	8	-	0	ი	0	-	0	0	-	0	ო	-	0	4	0	-	0	0	-	15
% SU TRUCKS & BUSES	0	1.2	2	0	1.1	0	0.4	0	0	0.3	0	0.5	1.3	0	0.5	0	0.5	0	0	0.3	0.7
MU TRUCKS	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	0	0	0	0	-
% MU TRUCKS	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0	0

File Name : GREEN Site Code : 12111111 Start Date : 7/30/2013 Page No : 2

AGFTC SAFETY STUDY PM 4 TO 6





AGFTC SAFETY STUDY PM 4 TO 6

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File Name	Site Code	Start Date	Page No	

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		-	4:30 PM
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File Name : GREEN Site Code : 12111111 Start Date : 7/30/2013 Page No : 4

AGFTC SAFETY STUDY PM 4 TO 6



File Name : BLUE Site Code : 11111222 Start Date : 7/30/2013 Page No : 1

AGFTC SAFTEY STUDY PM 4 TO 6 Groups Printed- PASSENGER CARS - SU TRUCKS & BUSES - MU TRUCKS

	Int. Total	24	20	23	20	87	26	20	133			132	99.2	-	0.8	0	0
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	Right	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Start Time	04:00 PM	04:15 PM	04:30 PM	04:45 PM	Total	05:00 PM	05:15 PM	Grand Total	Apprch %	Total %	PASSENGER CARS	% PASSENGER CARS	SU TRUCKS & BUSES	% SU TRUCKS & BUSES	<b>MU TRUCKS</b>	% MU TRUCKS

File Name : BLUE Site Code : 11111222 Start Date : 7/30/2013 Page No : 2

AGFTC SAFTEY STUDY PM 4 TO 6



File Name : BLUE Site Code : 11111222 Start Date : 7/30/2013 Page No : 3



AGFTC SAFTEY STUDY PM 4 TO 6

		l t	om Nort				Ľ	om East				Fro	m Sout	_			Fre	om West			
Start Time	Right	Thru	Left	Peds A	pp. Total	Right	Thru	Left	Peds Ap	p. Total	Right	Thru	Left	Peds A	pp. Total	Right	Thru	Left	Peds A	pp. Total	nt. Total
Peak Hour Analys	is From 0.	4:00 PM	to 05:15	PM - Peak	< 1 of 1																]
Peak Hour for Ent	tire Interse	sction Be	gins at 0 <sup>2</sup>	4:15 PM																	
04:15 PM	0	0	С	0	S	6	0	e	0	12	e	0	0	0	e	0	0	0	0	0	20
04:30 PM	0	0	9	-	7	S	0	0	0	2	4	0	-	4	6	0	0	0	7	7	23
04:45 PM	0	0	9	4	10	5	0	-	0	9	2	0	0	7	4	0	0	0	0	0	20
05:00 PM	0	0	8	3	11	6	0	0	0	6	3	0	0	3	9	0	0	0	0	0	26
Total Volume	0	0	25	8	33	28	0	4	0	32	12	0	-	<b>б</b>	22	0	0	0	7	7	89
% App. Total	0	0	75.8	24.2		87.5	0	12.5	0		54.5	0	4.5	40.9		0	0	0	100		
ЪНF	000.	000.	.781	.500	.750	.778	000.	.333	.000	.667	.750	.000	.250	.563	.611	000.	000.	000.	.250	.250	.856
PASSENGER CARS	0	0	24	8	32	28	0	4	0	32	12	0	-	<b>б</b>	22	0	0	0	7	7	88
% PASSENGER CARS	0	0	96.0	100	97.0	100	0	100	0	100	100	0	100	100	100	0	0	0	100	100	98.9
SU TRUCKS & BUSES	0	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
% SU TRUCKS & BUSES	0	0	4.0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1
MU TRUCKS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% MU TRUCKS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

File Name : BLUE Site Code : 11111222 Start Date : 7/30/2013 Page No : 4

AGFTC SAFTEY STUDY PM 4 TO 6

