PROGRESS REPORT 2
PRELIMINARY TRAFFIC EVALUATION

MITIGATION IMPROVEMENTS FOR
RIDGE HILL DEVELOPMENT
CITY OF YONKERS
WESTCHESTER COUNTY, NEW YORK

PREPARED FOR: RIDGE HILL INTERMUNICIPAL INTERSECTION
IMPROVEMENT COMMITTEE
VILLAGE OF HASTINGS-ON-HUDSON
VILLAGE OF ARDSLEY
TOWN OF GREENBURGH

MICHAEL MARIS ASSOCIATES, INC.
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RIDGE HILL DEVELOPMENT
City of Yonkers, Westchester County, New York

Prepared for: Ridge Hill Intermunicipal Intersection Improvement Committee
Village of Hastings-on-Hudson
Village of Ardsley
Town of Greenburgh

Project No. 08-989
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MICHAEL MARIS ASSOCIATES, INC.
SECTION A

INTRODUCTION
SECTION A
INTRODUCTION

A-1 PURPOSE OF STUDY

The Ridge Hill Inter-Municipal Intersection Improvement Committee (the Committee), consisting of representatives of the Villages of Ardsley and Hastings-on-Hudson and the Town of Greenburgh, was formed in order to evaluate the traffic impacts of the Ridge Hill development on a number of Study Locations within the Villages and the Town and to determine what improvements will be implemented (the Project). The work is being performed in two phases, with the First Phase consisting of traffic analyses intended to identify potential improvements and preparation of conceptual plans intended to identify the feasibility and construction costs of the recommended improvements. The Second Phase, consisting of the preparation of all construction documents, will commence upon approval of the First Phase findings by the Committee and its direction regarding which improvements will be implemented.

Michael Maris Associates, Inc. (MMA) and Nelson & Pope (N&P) were retained by the Committee to perform the analyses needed to complete the First Phase of the Project. MMA performed a Traffic Evaluation and presented its preliminary findings in a Progress Report, dated March 2009, which was presented to the Committee on March 19, 2009. The preliminary analyses identified the Study Locations that would need roadway and/or signal improvements and the Committee directed that future analyses focus on the Study Locations that will require improvements. Subsequently, MMA finalized the traffic analyses and worked with N&P to prepare the conceptual improvement plans.

This Progress Report was prepared to provide an update of the traffic findings and present the conceptual improvements plans and anticipated construction costs. It is noted that, in order to
ease review of this report, the pertinent data and findings presented in the first Progress Report have been repeated herein, with updates where the final analyses indicated a need for revision.

A-2 STUDY LOCATIONS

An initial assessment of the Ridge Hill development indicated that the following intersections and roadway segments could be significant impacted by the Ridge Hill traffic generations. Therefore, these Study Locations were selected by the Committee as requiring detailed analyses as part of the Traffic Evaluation:

- Jackson Avenue and Route 9A
- Jackson Avenue and South Sprain Road
- Jackson Avenue "S" Curve Between Sprain Road and the Park
- Jackson Avenue and St. Andrews Way
- Jackson Avenue and North Sprain Road
- Jackson Avenue and Southbound Sprain Brook Parkway Ramps
- Jackson Avenue and Northbound Sprain Brook Parkway Ramp
- Route 9A and Ashford Avenue
- Route 9A and Ramps to/from North on the NYS Thruway
- Sprain Road and Ardsley Road/Ashford Avenue
- Route 9A and Lawrence Street
- Route 9A Section Between Ridge Road/Bridge Street and Heatherdell Road

A-3 STUDY METHODOLOGY

Following are brief summaries of the tasks performed by MMA and N&P during the preparation of the Traffic Evaluation and the feasibility assessment of the recommended roadway and/or signal improvements:
1. Manual turning movement traffic counts were undertaken during the peak weekday morning and evening commuter periods, as well as the peak Saturday period.

2. Field observations were performed in order to observe current traffic flow and to collect information regarding roadway/intersection geometry and traffic controls.

3. Traffic accident data was obtained from the Greenburgh Police Department and reviewed to identify any unusual contributing factors.

4. The traffic count data was summarized in order to identify the peak traffic hours. The peak-hour volumes were compared to available traffic data to verify their accuracy.

5. The future traffic volumes were estimated by increasing the counted volumes by an annual growth rate and by adding the traffic generations of the Ridge Hill development.

6. Capacity analyses were performed assessing the existing and future traffic volumes to the intersection capacities.

7. Where the analyses indicated unacceptable traffic flow, reasonable roadway and/or signal improvements were identified to reduce the delays.

8. A Progress Report was prepared summarizing the preliminary traffic findings. The Progress Report was presented to the Committee and direction was received regarding further analyses.

9. The traffic analyses were finalized and, where appropriate, alternate improvements were identified.
10. Aerial and field surveys were performed in order to obtain detailed information regarding the roadway geometry, topography, and existing right-of-way.

11. Conceptual improvement plans were prepared showing the existing roadway geometry and proposed improvements. Alternative concept plans were prepared for those locations identified by the traffic analyses.

12. Preliminary construction cost estimates were performed for each of the conceptual improvement plans.
SECTION B

EXISTING AND FUTURE TRAFFIC VOLUMES
SECTION B

EXISTING AND FUTURE TRAFFIC VOLUMES

B-1 DATA COLLECTION

Traffic data was collected in order to assess the existing and future traffic conditions, as well as identify the required roadway improvements:

1. Manual turning-movement traffic counts were performed at each Study Location during the peak morning and evening commuter periods when traffic in the area is generally at its highest, as well as during the peak Saturday midday period. The weekday traffic counts were performed from 6:30 AM to 9:30 AM and 3:00 to 7:00 PM on Thursday, May 29, 2008, Tuesday, June 3, 2008, Thursday, September 11, 2008 and on Wednesday, September 24, 2008, while the Saturday traffic counts were performed from 11:30 AM to 2:30 PM on June 14, 2008.

2. Field observations were undertaken at the same time in order to collect data regarding the existing roadway and intersection geometry, lane utilization, traffic controls and any other information that might impact the intersection capacity.

3. Traffic accident data was obtained from the Greenburgh Police Department for the three-year period of January 1, 2005 through August 25, 2008.

B-2 EXISTING TRAFFIC VOLUMES

The traffic counts were summarized in order to identify the peak-hour traffic volumes during each of the count periods. The results of the summary indicate that the Peak AM Highway
Hour occurred between 7:45 and 8:45 AM, the Peak PM Highway Hour occurred from 5:00 to 6:00 PM and the Peak Saturday Hour occurred between 12:00 and 1:00 PM. The Year 2008 Existing Traffic Volumes during each of the peak hours are presented on Exhibits No. 1 through 3 in Appendix A of this report.

B-3 YEAR 2028 PROJECTED TRAFFIC VOLUMES

It was decided that the Traffic Evaluation should assess the existing and the future traffic volumes for the Design Year 2028. The Year 2028 traffic volumes will include general traffic growth in the area and the trip generations of the various relatively small developments in the area (No-build Traffic Volumes), as well as the trip generations of the Ridge Hill development (Build Traffic Volumes).

1. No-Build Traffic Volumes

The existing Year 2008 traffic volumes were increased by an annual growth rate of 2.0 percent (40 percent overall) in order to reflect the background traffic growth in the area. While a 2.0 percent annual growth rate is relatively high for long term traffic projections, it was used in this study in order to reflect the generations of the smaller developments and in order to be a little conservative. The resulting Year 2028 No-build Traffic Volumes are shown on Exhibit Nos. 4 through 6.

2. Ridge Hill Generations

The trip generations of the Ridge Hill development were estimated and added to the traffic projections. The amount of traffic to be generated by any proposed development is estimated based on data published by the Institute of Transportation Engineers (ITE) in its
informational report entitled *Trip Generation, 8th Edition*, which is the result of surveys of various land use developments throughout the United States. The ITE data was used to estimate the traffic generations of the Ridge Hill development.

Presented in Exhibit No. 7 are the estimated Ridge Hill trip generations during the three peak hours analyzed. As shown in the Exhibit, Ridge Hill is expected to generate 1,338 new trips during the Peak AM Highway Hour (821 entering/517 exiting), 4,067 new trips during the Peak PM Highway Hour (1,919 entering/2,148 exiting), and 5,103 new trips during the Peak Saturday Shopper Hour (2,676 entering/2,427 exiting).

The distribution of the Ridge Hill traffic on the surrounding roadways was determined based on an assessment of population densities, travel times to/from the development, and a review of the existing roadway system and traffic patterns. The resulting Arrival and Departure Distributions are presented graphically on Exhibits No. 8 and 9.

3. **Build Traffic Volumes**

The Ridge Hill generations were distributed to the roadway network in accordance with the Arrival and Departure Distributions and added to the Year 2028 No-build Traffic Volumes, resulting in the 2028 Build Traffic Volumes. The traffic volume projections and distributions are presented in tabular form on Exhibits No. 10 through 12 and the Year 2028 Build Traffic Volumes are presented on Exhibits No. 13 through 15.
SECTION C

CAPACITY ANALYSES AND FINDINGS
SECTION C
CAPACITY ANALYSES AND FINDINGS

C-1 DESCRIPTION OF CAPACITY ANALYSES

Capacity analyses were performed in order to assess traffic conditions at the Study Locations. The methodology and terminology used in the Capacity Analyses are described in the "Highway Capacity Manual 2000" published by the Transportation Research Board, which establishes a system by which intersections and roadways are analyzed for their ability to serve traffic volumes.

1. Signalized Intersection Analyses

For signalized intersections, Level of Service is defined in terms of delay and are stated in terms of the Average Control Delay per vehicle for the peak 15-minute period within the hour analyzed. Delay is dependent on a number of factors, including number of lanes, turning volumes, truck volumes, Green to Cycle Length Ratio, and Volume to Capacity ratio for each approach. The criteria for the Level of Service designations are given in the following Table:

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Description</th>
<th>Average Delay Per Vehicle (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Free Flow</td>
<td>10.0 or Less</td>
</tr>
<tr>
<td>B</td>
<td>Mostly Free Flow</td>
<td>10.1 to 20.0</td>
</tr>
<tr>
<td>C</td>
<td>Somewhat Restricted</td>
<td>20.1 to 35.0</td>
</tr>
<tr>
<td>D</td>
<td>Some Short Delays</td>
<td>35.1 to 55.0</td>
</tr>
<tr>
<td>E</td>
<td>At Capacity</td>
<td>55.1 to 80.0</td>
</tr>
<tr>
<td>F</td>
<td>Congestion</td>
<td>80.1 or Greater</td>
</tr>
</tbody>
</table>
2. **Unsignalized Intersection Analyses**

The capacity Analyses for unsignalized intersections are based on the gap acceptance model, which relies on three basic elements: the size and distribution of gaps in the major traffic stream; the usefulness of these gaps to the minor stream drivers; and the relative priority of the various traffic streams at the intersection. The criteria for the Level of Service designations are given in the following Table:

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Expected Delay to Minor Street Traffic</th>
<th>Average Total Delay (Sec./Veh.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Little or No Delay</td>
<td>10.0 or Less</td>
</tr>
<tr>
<td>b</td>
<td>Short Traffic Delays</td>
<td>10.1 to 15.0</td>
</tr>
<tr>
<td>c</td>
<td>Average Traffic Delays</td>
<td>15.1 to 25.0</td>
</tr>
<tr>
<td>d</td>
<td>Long Traffic Delays</td>
<td>25.1 to 35.0</td>
</tr>
<tr>
<td>e</td>
<td>Very Long Traffic Delays</td>
<td>35.1 to 50.0</td>
</tr>
<tr>
<td>f</td>
<td>Demand Exceeds Capacity</td>
<td>50.1 or Greater</td>
</tr>
</tbody>
</table>

**C-2 FINDINGS**

In order to accurately define the future traffic conditions at the Study Locations, three sets of capacity analyses were performed. One set compared the intersection capacities to the 2008 Existing Traffic Volumes, the second the intersection capacities to the 2028 No-build Traffic Volumes, and the third the intersection capacities to the 2028 Build Traffic Volumes. The results of the capacity analyses are summarized in Exhibits No. 16 through 18 and the overall intersection Levels of Service and improvements are presented on Exhibit No. 19.

Presented in the following pages are brief summaries of the intersection geometries and traffic controls, the findings of the capacity analyses, the recommended improvements and concept plans, and the preliminary construction cost estimates.
1. Jackson Avenue/Ravensdale Road and Route 9A

a. Intersection Geometry

Route 9A (Saw Mill River Road) forms the north and south legs, Jackson Avenue the east leg and Ravensdale Road the west leg of this four-way intersection. All approaches to the intersection consist of one lane permitting all movements and the intersection is controlled by a traffic signal.

b. Year 2008 Existing Traffic Conditions

Capacity analyses with the Year 2008 Existing Traffic Volumes show that traffic through the intersection experiences very long delays and operates at unacceptable Level of Service “F” during the peak hours analyzed.

The accident data shows that a total of 39 accidents occurred at this intersection during the three-year period. An average of 13 accidents per year is considered to be a high number and the accidents likely reflect aggressive driving due to the poor Levels of Service.

c. Year 2028 No-Build Traffic Conditions

Capacity analyses with the Year 2028 No-build Traffic Volumes show that, without any improvements, traffic through the intersection will continue to experience long delays and operate at unacceptable Level of Service “F” during the peak hours.
d. **Year 2028 Build Traffic Conditions**

Capacity analyses with the Year 2028 Build Traffic Volumes and no improvements show that the intersection will continue to operate at unacceptable Levels of Service “F”.

e. **Planned Improvements**

This intersection has been known to experience delays and was analyzed in detail by the various studies performed in conjunction with the Ridge Hill development. As a result, Ridge Hill has agreed to widen all approaches to add exclusive left-turn lanes and to upgrade the existing traffic signal. Construction plans for these improvements have been prepared and are being reviewed by the New York State Department of Transportation (NYSDOT), which has jurisdiction of Route 9A.

f. **Additional Recommended Improvements**

Capacity analyses show that the Ridge Hill improvements will not be sufficient and that the northbound approach will require additional widening to add an exclusive right-turn lane.

The improvements by the Ridge Hill development, as well as the additional right-turn lane, are shown on Conceptual Plan CP-6 in Appendix C of this report. While the left-turn lanes will be constructed and paid for by the Ridge Hill development, the northbound right-turn lane will require a substantial retaining wall and its construction is estimated to cost about $680,000. It is noted that the cost estimate includes right-of-way acquisition for the right-turn lane. However, preliminary discussions have been held with the property owner for the contribution of the right-of-way as a mitigation measure.
Capacity analyses with the Year 2028 Build Traffic Volumes and the planned and recommended improvements show that the long delays will be reduced and that traffic through the intersection will operate at acceptable Level of Service “C” during the Peak AM and PM Highway Hours and at acceptable Level of Service “D” during the Peak Saturday Hour.

2. **Jackson Avenue and South Sprain Road**

   a. **Intersection Geometry**

   Jackson Avenue forms the east and west legs and South Sprain Road the south leg of this T-type intersection. The northbound approach consists of one left turn lane and one right turn lane, the eastbound approach of one through/right-turn lane and the westbound approach of one left-turn lane and one through lane. The intersection is controlled by a traffic signal.

   b. **Year 2008 Existing Traffic Conditions**

   Capacity analyses with the Year 2008 Existing Traffic Volumes show that the intersection operates at acceptable Level of Service “B” during the Peak AM Highway Hour and at acceptable Level of Service “C” during the Peak PM Highway and the Peak Saturday Hours.

   c. **Year 2028 No-Build Traffic Conditions**

   Capacity analyses with the Year 2028 No-build Traffic Volumes show that the intersection will operate at acceptable Level of Service “C” during the Peak AM Highway
Hour, but will experience some delays and operate at Level of Service "E" (at capacity) during the Peak PM Highway Hour and at unacceptable Level of Service “F” during the Peak Saturday Hour.

d. **Year 2028 Build Traffic Conditions**

Capacity analyses with the Year 2028 Build Traffic Volumes indicate that, without any improvements, the intersection will operate at acceptable Level of Service “D” during the Peak AM Highway Hour, but at unacceptable Level of Service “F” during the Peak PM Highway and the Peak Saturday Hours.

e. **Recommended Improvements**

It is recommended that an exclusive right-turn lane be added to the eastbound approach and an additional left-turn lane be added to the northbound approach. Also, a portion of Jackson Avenue west of the intersection will need widening to two lanes in order to receive the northbound double left-turn movement and the traffic signal will need modifications.

The recommended improvements are shown on Conceptual Plan CP-2 in Appendix C. Due to the need to widen Jackson Avenue in addition to South Sprain Road, the recommended improvements are estimated to cost approximately $1,100,000, which excludes any right-of-way costs.

Capacity analyses with the Year 2028 Build Traffic Volumes and the recommended improvement show that the delays would be reduced and that the intersection will operate at acceptable Level of Service “B” during the Peak AM Highway Hour, at
acceptable Level of Service “C” during the Peak PM Highway Hour, and at acceptable
Level of Service “D” during the Peak Saturday Hour.

3. **Jackson Avenue and “S” Curve Between Sprain Road and the Park**

a. **Roadway Alignment**

This section of Jackson Avenue has vertical and horizontal curves that are not designed
to safely accommodate the current travel speeds on the roadway. For example, the
curve located at the junction of Old Jackson Avenue and Jackson Avenue meets
acceptable design criteria for a maximum speed of 29 miles per hour (mph), whereas
vehicles on the roadway travel at higher speeds, especially during off-peak hours.

b. **Recommended Improvements**

The hazardous conditions could be reduced by alignment improvements to increase the
roadway vertical and horizontal radii and meet higher design speed criteria. Three
alternative roadway alignment improvements, which depend on the right-of-way
availability, have been identified:

- Alternative A, shown on Conceptual Plan CP-3A in Appendix C, would meet or
  exceed the minimum criteria for a 40 mph design speed and is estimated to cost
  about $910,000, which includes the right-of-way costs.

- Alternative B, shown on Conceptual Plan CP-3B in Appendix C, would also meet or
  exceed the minimum criteria for a 40 mph design speed and is estimated to cost
  about $725,000, which includes right-of-way costs.
• Alternative C (Conceptual Plan CP-3C in Appendix C) would meet or exceed the minimum criteria for a 35 mph design speed and is estimated to cost about $710,000, which also includes right-of-way costs.

4. Jackson Avenue and St. Andrews Way

a. Intersection Geometry

Jackson Avenue forms the east and west legs and St. Andrews Way the north leg of a T-type intersection that is located within the section of Jackson Avenue that requires alignment improvements. All approaches to the intersection consist of one lane and the intersection is controlled by a “Stop” sign facing St. Andrews Way.

b. Year 2008 Existing Traffic Conditions

Capacity analyses with Year 2008 Existing Traffic Volumes show that the southbound approach that is under “Stop” control operates at acceptable Level of Service “c” during the Peak AM and PM Highway Hours, but will experience some delays and operate and at Level of Service “e” during the Peak Saturday Hour.

c. Year 2028 No-Build Traffic Conditions

Capacity analyses with Year 2028 No-build Traffic Volumes show that the controlled southbound approach will continue to operate at the existing Level of Service “c” during the Peak AM Highway Hour, but will experience some delays and operate at Level of Service “e” during the Peak PM Highway Hour and at unacceptable Level of Service “f” during the Peak Saturday Hour.
d. Year 2028 Build Traffic Conditions

Capacity analyses with Year 2028 Build Traffic Volumes show that all movements through the intersection will continue to operate at the No-build Levels of Service.

e. Recommended Improvements

Analyses show that a traffic signal installation would eliminate the projected delays at this intersection. However, a Signal Warrant Analysis must be performed prior to the signal design and installation in order to verify that the traffic volumes will meet the applicable MUTCD signal warrant criteria. Based on recent experience, it is estimated that the signal installation will cost approximately $150,000.

Capacity analyses with the Year 2028 Build Traffic Volumes and the signal installation indicate that the intersection will operate at acceptable Level of Service “A” during the Peak AM Highway Hour, at acceptable Level of Service “B” during the Peak PM Highway Hour, and at acceptable Level of Service “C” during the Peak Saturday Hour.

5. Jackson Ave. & North Sprain Road

a. Intersection Geometry

Jackson Avenue forms the east and west legs and North Sprain Road the north leg of this Y-type intersection and traffic is controlled by “Stop” signs facing North Sprain Road. A triangular channelization island exists in the middle of the intersection and separates the North Sprain Road movements oriented to/from the east from those oriented to/from the west on Jackson Avenue. While this type of channelization
generally increases roadway capacity and reduces traffic delays, it also creates three closely-spaced intersections, resulting in more conflict points within a short distance, as well as restricting sight visibility due to the roadway angles.

The accident data shows that a total of 72 accidents occurred at this intersection during the three-year period. This number of accidents is considered to be very high and likely reflects the close proximity of the intersections and the poor sight visibility.

b. **Year 2008 Existing Traffic Conditions**

Capacity analyses with Year 2008 Existing Traffic Volumes show that the southbound North Sprain Road left turns, that are under “Stop” sign control, experiences delays and operates at Level of Service “e” during the Peak AM and PM Highway Hours and at unacceptable Level of Service “f” during the Peak Saturday Hour.

c. **Year 2028 No-Build Traffic Conditions**

Capacity analyses with Year 2028 No-build Traffic Volumes show that, without any improvements, the controlled southbound left turns will experience very long delays and will operate at unacceptable Level of Service “f” during all peak hours analyzed.

d. **Year 2028 Build Traffic Conditions**

Capacity analyses with Year 2028 Build Traffic Volumes indicate that without any improvements the intersection will continue to operate at the No-build conditions and operate at unacceptable Level of Service “f” during all peak hours.
e. **Recommended Improvements**

It is recommended that the intersection be reconstructed to eliminate the triangular island and that North Sprain Road be re-aligned to meet Jackson Avenue at a typical T-type intersection, and that a traffic signal be installed to control traffic. With the intersection reconstruction, the eastbound approach would consist of one through lane and one left-turn lane, the westbound approach of one through lane and one right-turn lane, and the southbound approach of one right-turn lane and one left-turn lane.

These improvements, which are shown on Conceptual Plan CP-5 in Appendix C, are estimated to cost approximately $650,000 (no right-of-way acquisition is anticipated). It is again noted that a Signal Warrant Study must be performed prior to the installation.

Capacity analyses with the Year 2028 Build Traffic Volumes and the improvements show that the intersection will operate at acceptable Level of Service “B” during the Peak AM Highway Hour, at acceptable Level of Service “C” during the Peak PM Highway Hour, and at acceptable Level of Service “D” during the Peak Saturday Hour.

6. **Jackson Avenue and Southbound Sprain Brook Parkway Ramps**

a. **Intersection Geometry**

Jackson Avenue forms the east and west legs and the southbound Sprain Brook Parkway on/off ramps the north and south legs of the intersection. The westbound approach to the intersection consists of one left-turn lane and one through lane and the eastbound approach one through lane and one through/right-turn lane. The southbound Sprain Brook Parkway off-ramp approach consists of one through/right-turn lane and
one left-turn lane. The south leg of the intersection is the Parkway on-ramp and serves traffic away from the intersection only. The intersection is controlled by a traffic signal.

b. Year 2008 Existing Traffic Conditions

Capacity analyses with the 2008 Existing Traffic Volumes show that the intersection operates at acceptable Level of Service “B” during the Peak AM Highway Hour, at Level of Service “E” (at capacity) during the Peak PM Highway Hour, and at unacceptable Level of Service “F” during the Peak Saturday Hour.

c. Year 2028 No-Build Traffic Conditions

Capacity analyses with Year 2028 No-build Traffic Volumes show that, without any improvements, the intersection will experience congestion and operate at Level of Service “E” (at capacity) during the Peak AM Highway Hour and at unacceptable Level of Service “F” during the Peak PM Highway and the Peak Saturday Hours.

d. Year 2028 Build Traffic Conditions

Capacity analyses with the Year 2028 Build Traffic Volumes and no improvements show that the intersection will continue to experience congestion and will operate at No-build Levels of Service.

e. Recommended Improvements

The southbound left turn movement on the Sprain Brook Parkway off-ramp is projected to serve a high amount of traffic and it is recommended that the off-ramp approach be
widened to an additional left-turn lane and that the signal timing be modified to provide more green time to the east/west approaches.

Capacity analyses with the Year 2028 Build Traffic Volumes and the recommended improvements show that the intersection will operate at acceptable Level of Service “C” during the Peak AM Highway Hour and at acceptable Level of Service “D” during the Peak PM Highway and the Peak Saturday Hours.

Due to the involvement of Parkway ramps, the recommended improvements for this location will require extensive review. Therefore, per the Committee’s direction, these findings were summarized in a separate letter report to be submitted to NYSDOT and no further analyses will be performed at this time for this location.

7. **Jackson Avenue and Northbound Sprain Brook Parkway Off-Ramp**

   a. **Intersection Geometry**

   Jackson Avenue forms the east and west legs and the northbound Sprain Brook Parkway off-ramp the south leg of this intersection. The eastbound and westbound approaches to the intersection consist of two lanes permitting only through traffic and the northbound Sprain Brook Parkway off-ramp approach consists of one left-turn/right-turn lane and one right-turn lane.

   The Grassy Sprain Road intersection with Jackson Avenue is located just east of the Parkway off-ramp and, due to their close proximity, the two intersections are controlled by one multi-phase traffic signal that allots one phase to the two Grassy Sprain Road approaches.
b. **Year 2008 Existing Traffic Conditions**

Capacity analyses with the Year 2008 Existing Traffic Volumes show that the intersection operates at acceptable Level of Service “C” during the Peak AM Highway Hour, but will experience some delays and operate at Level of Service “E” (at capacity) during the Peak PM Highway and the Peak Saturday Hours. It is noted that the HCS software does not provide a methodology to analyze an intersection with more than four legs. Therefore, in order for the analyses to reflect the time allotted to the Grassy Sprain Road approaches, a separate “pedestrian phase” was added.

The accident data shows that a total of 57 accidents occurred at this intersection during the three-year period. This number of accidents is high and likely reflects the close proximity of the two intersections, as well as aggressive driving during busy periods.

c. **Year 2028 No-Build Traffic Conditions**

Capacity analyses with Year 2028 No-build Traffic Volumes show that the intersection will operate at acceptable Level of Service “D” during the Peak AM Highway Hour, but will operate at Level of Service “E” (at capacity) during the Peak PM Highway Hour and at unacceptable Level of Service “F” during the Peak Saturday Hour.

d. **Year 2028 Build Traffic Conditions**

Capacity analyses with the Year 2028 Build Traffic Volumes show that this intersection will continue to operate at acceptable Level of Service “D” during the Peak AM Highway Hour, but will operate at unacceptable Level of Service “F” during the Peak PM Highway and the Peak Saturday Hours.
e. **Recommended Improvements**

The northbound right-turn movement on the Sprain Brook Parkway off-ramp is projected to serve a high amount of traffic and it is recommended that the ramp be widened to provide a double right-turn lane and one left-turn lane. In addition, the westbound traffic oriented to northbound Sprain Brook Parkway is will be high and will pass through this signalized intersection. To serve this traffic, it is recommended that a lane be added to westbound Jackson Avenue commencing at a point east of Grassy Sprain Road and terminating at the northbound Sprain Brook Parkway on-ramp. The traffic signal and its timing should also be modified.

Capacity analyses with the recommended improvements show that they would eliminate the delays and that the intersection will operate at acceptable Level of Service “C” during the Peak AM Highway Hour and at acceptable Level of Service “D” during the Peak PM Highway and the Peak Saturday Hours.

Due to the involvement of Parkway ramps, these recommended improvements will also require extensive review. Therefore, per the Committee's direction, these findings were also summarized in the letter report for NYSDOT and no further analyses will be performed at this time for this location.

8. **Route 9A and Ashford Avenue**

a. **Intersection Geometry**

Route 9A forms the north and south legs, Ashford Avenue the east and west legs, and a driveway to a parking lot the northwest (fifth) leg to the intersection. The northbound
and southbound approaches consist of one left-turn lane, one through lane, and one-right turn lane, the westbound approach consists of a channelized right-turn lane, a through lane, and a left-turn lane and the eastbound approach consists of a left-turn lane and a through/right lane that widens at the intersection to provide a short right-turn lane. The parking lot driveway approach is one-lane wide that permits all movements and the intersection is controlled by a traffic signal.

b. **Year 2008 Existing Traffic Conditions**

This intersection is known to experience long delays and operate at poor Levels of Service. Capacity analyses with the counted Year 2008 Existing Traffic Volumes verify that traffic experiences delays and show that the overall intersection operates at Level of Service "E" (at capacity) during the peak hours analyzed and that several movements operate at unacceptable Level of Service "F".

c. **Year 2028 No-Build Traffic Conditions**

Capacity analyses with the Year 2028 No-build Traffic Volumes show that, without any improvements the delays will be longer and that the intersection will operate at unacceptable Level of Service "F" during the peak hours.

d. **Year 2028 Build Traffic Conditions**

Capacity analyses with the Year 2028 Build Traffic Volumes and no improvements show that the long delays will continue and that the intersection will operate at unacceptable Level of Service "F" during the peak hours.
e. **Recommended Improvements**

Three alternative improvement concepts were identified for this location, all of which would reduce traffic delays. However, the right-of-way requirement and impact on the abutting development would be substantially different depending on the alternative. Following are brief descriptions of the Alternatives:

- Implementation of Alternative A, shown on the Conceptual Plan CP-1A in Appendix C, would generally maintain the existing intersection alignment, but would require widening to provide one additional through lane on the eastbound, westbound, and southbound approaches to the intersection, as well as appropriate signal modifications. The plan also shows the relocation of the parking lot egress away from the intersection in order to provide more signal green time to the major approaches. It is noted that, due to the substantial development abutting the roadways, it will be necessary to reduce some of the geometric design criteria. Capacity analyses with the Year 2028 Build Traffic Volumes and the improvements show that they would reduce the delays and that the intersection will operate at Level of Service "D" during all three peak hours.

- Implementation of Alternative B, shown on the Conceptual Plans CP-1B and CP-1C in Appendix C, would replace the intersection with a rotary. The rotary shown on the plans would meet general design guidelines, but will also require right-of-way and will impact the abutting parking and development. Rotaries, which do not require traffic signal controls, have proven to increase roadway capacities and improve traffic flow. However, they generally work better in low traffic areas and this may not be an acceptable alternative to NYSDOT.
Alternative C, shown on the Conceptual Plan CP-1E in Appendix C, would maintain a typical intersection, but would relocate the intersection to the east and would substantially change the alignment of Route 9A. In addition to increasing the intersection capacity, this Alternative would have the added benefits of eliminating the existing "S" curve on Route 9A and providing greater separation between the intersection and the NYS Thruway overpass. However, it would have a very significant impact on the abutting development east of the intersection and will require substantial right-of-way acquisition and elimination of at least one business. Capacity analyses with the Year 2028 Build Traffic Volumes and this alternative show that it would also reduce the delays and that the intersection will operate at acceptable Level of Service "D" during all peak hours.

Preliminary construction cost estimates indicate that Alternative A will cost approximately $1,850,000, which includes the right-of-way costs assuming that no businesses would be eliminated. Similar cost estimates indicate that construction of the rotary (Alternative B) will cost about $2,400,000, which also includes the right-of-way costs, again assuming that no businesses would be eliminated. No cost estimate has yet been made for Alternative C since the feasibility of the required land acquisition is not known at this time.

9. **Route 9A and New York State Thruway Interchange**

a. **Existing Interchange Conditions**

A partial interchange between the New York Thruway and Route 9A has been provided a short distance south of the Route 9A and Ashford Avenue intersection. The Thruway ramps only serve traffic to and from the south and all traffic oriented to the north must
use the Ashford Avenue interchange with the Saw Mill River Parkway, which places an additional burden on the congested intersection of Route 9A and Ashford Avenue. Provision of ramps to and from the north will provide an opportunity for traffic to avoid portions of Ashford Avenue and reduce the traffic volumes at its busy intersection with Route 9A.

b. Recommended Improvements

Conceptual Plan CP-4 in Appendix C shows potential locations for the additional ramps. The southbound off-ramp would intersect with Route 9A just east of the Elm Street intersection and would require acquisition of right-of-way and a small building located between the Thruway and Elm Street. The northbound on-ramp is shown at a point between Fuller Avenue and the commercial development on the north side of Route 9A. Additional traffic counts and analyses are underway in order to better define the potential traffic diversions to the interchange and the resulting benefits of constructing the additional ramps.

Excluding right-of-way acquisition costs, construction of the southbound off-ramp is estimated to cost about $2,200,000 and construction of the on-ramp, which will require a large box culvert, is estimated to cost about $2,000,000.

10. Sprain Road and Ardsley Road/Ashford Avenue

a. Intersection Geometry

Sprain Road forms the north and south legs, Ashford Avenue the west leg and Ardsley Road the east leg of this intersection. All approaches to the intersection consist of one
lane and the intersection is controlled by "Stop" signs facing Sprain Road. The Ardsley Road leg of the intersection has a severe down grade that requires a substantial "S" curve in order to make the grade to the top from the hill. The grade change greatly restricts the sight visibility of traffic on the southbound approach that must enter the intersection in order to observe westbound vehicles traveling down the hill.

b. Year 2008 Existing Traffic Conditions

Capacity analyses with Year 2008 Existing Traffic Volumes show that the northbound left turns on Sprain Road experience delays and operate at unacceptable Level of Service "f" during the peak hours.

The accident data shows that a total of 42 accidents occurred at this intersection during the three-year period. This is a high number of accidents for the amount of traffic through the intersection and likely reflects the poor sight visibility on the southbound approach and the severe downgrade on the westbound approach.

c. Year 2028 No-Build Traffic Conditions

Capacity analyses with Year 2028 No-build Traffic Volumes show that, without any improvements, the northbound left turns will continue to experience the delays and operate at unacceptable Level of Service "f" during the peak hours.

d. Year 2028 Build Traffic Conditions

Capacity analyses with Year 2028 Build Traffic Volumes and no improvements show that the intersection will continue to experience delays.
e. **Recommended Improvements**

Installation of a traffic signal, along with widening of the roadway, would eliminate the delays. However, a traffic signal would have a very negative impact on the westbound traffic that is traveling down the steep grade, when it would need to stop for a red signal, especially during inclement weather and icy conditions.

While a traffic signal control does not appear to be feasible, consideration should be given to eliminating the visibility problem on the southbound approach by restricting travel on the north leg of the intersection to permit only northbound traffic from this intersection up to the Cross Road intersection. Southbound traffic could then be directed to turn right at Cross Road to access Ashford Avenue. Conceptual Improvement Plan CP-7 in Appendix C shows the signing that would be required to implement this traffic restriction. The costs for the signing will be minimal.

Additional traffic counts and analyses are underway in order to identify the impacts of the traffic diversions on the alternative route.

11. **Route 9A and Lawrence Street**

a. **Intersection Geometry**

Route 9A forms the north and south legs, Lawrence Street the west leg and a driveway to a parking lot the east leg of this intersection. All approaches consist of one lane that permits all movements and the intersection is controlled by a traffic signal.
b. Year 2008 Existing Traffic Conditions

Capacity analyses with the Year 2008 Existing Traffic Volumes indicate that the intersection operates at acceptable Level of Service “B” during the Peak AM and Peak PM Highway Hours and at acceptable Level of Service “A” during the Peak Saturday Hour.

c. Year 2028 No-Build Traffic Conditions

Capacity analyses with the Year 2028 No-build Traffic Volumes show that the intersection will operate at acceptable Level of Service “B” during the Peak AM Highway Hour, at acceptable Level of Service “C” during the Peak PM Highway Hour, and at acceptable Level of Service “B” during the Peak Saturday Hour.

d. Year 2028 Build Traffic Conditions

Capacity analyses with the Year 2028 Build Traffic Volumes show that the intersection will continue to operate at the acceptable No-build Levels of Service.

12. Route 9A from Ridge Road/Bridge Street to Heatherdell Road

This section of Route 9A experiences traffic delays primarily because of the congestion at the Ashford Avenue intersection, as well as numerous driveways serving the abutting development and the curb parking. Implementation of the improvements to the Ashford Avenue intersection will help reduce the delays through this section. While it is not likely that the numerous driveways can be eliminated, consideration should be given to provision of off-street parking and elimination of the curb spaces in order to reduce vehicle conflicts.
Three roadway intersections also exist within the limits, including the Ridge Road/Bridge Street intersection, the Center Street intersection, and the Heatherdell Road intersections. Projections and analyses were performed for each of these locations in order to determine whether intersection improvements should be implemented.

a. Route 9A and Ridge Road/Bridge Street

- Route 9A forms the north and south legs, Bridge Street the west leg, and Ridge Road the east leg of this off-set intersection. All approaches to the intersection consist of one lane that permits all movements and the intersection is controlled by “Stop” signs facing the east and west legs.

- Capacity analyses with Year 2008 Existing Traffic Volumes show that the minor street approaches that are under “Stop” sign control operate at acceptable Level of Service “d” during the Peak AM Highway Hour, but at unacceptable Level of Service “f” during the Peak PM Highway and the Peak Saturday Hours.

- Capacity analyses with Year 2028 No-build Traffic Volumes show that, without any improvements, the minor street approaches will operate at unacceptable Level of Service “f” during all peak hours.

- Capacity analyses with Year 2028 Build Traffic Volumes and no improvements show that the minor street approaches will continue to operate at unacceptable Level of Service “f” during the peak hours.

- Installation of a traffic signal would eliminate the delays and capacity analyses with the Year 2028 Build Traffic Volumes and a traffic signal show that the delays would
be reduced and that the intersection would operate at acceptable Level of Service “B” during the Peak AM Highway Hour and at acceptable Level of Service “C” during the Peak PM Highway and the Peak Saturday Hours. It is again noted that a Signal Warrant Study must be performed prior to the signal installation. In addition, progression analyses must be performed to insure that the signal could be coordinated with the Ashford Avenue signal, which is located in close proximity. The traffic signal installation is estimated to cost about $150,000.

b. Route 9A and Center Street

- Route 9A forms the north and south legs, Center Street the east leg, and a parking lot driveway the west leg of the intersection. All approaches to the intersection consist of one lane that permits all movements and the intersection is controlled by “Stop” signs facing the east and west legs.

- Capacity analyses with Year 2008 Existing Traffic Volumes show that the minor street approaches that are under “Stop” sign control will operate at Level of Service “e” during the Peak AM and PM Highway Hours and at unacceptable Level of Service “f” during the Peak Saturday Hour.

- Capacity analyses with Year 2028 No-build Traffic Volumes show that, without any improvements, the minor street approaches will operate at unacceptable Level of Service “f” during all peak hours.

- Capacity analyses with Year 2028 Build Traffic Volumes and no improvements show that the minor street approaches will continue to operate at unacceptable Level of Service “f” during the peak hours.
Installation of a traffic signal would eliminate the delays. However, traffic signals exist at Ashford Avenue and Heatherdell Road and a third signal in close proximity could cause progression delays. Therefore, it is recommended that all left turns be restricted and that only right turns be permitted to and from Center Street and the parking lot driveway. It is noted that drivers wishing to turn left at Center Street can use Heatherdell Road and access Route 9A at the signalized intersection and that drivers using the driveway have an alternate access available.

Capacity analyses with the Year 2028 Build Traffic Volumes and the left-turn restrictions show that the right-turn movements would operate at Level of Service “d” during the Peak AM Highway Hour, at Level of Service “c” during the Peak PM Highway Hour and at Level of Service “e” during the Peak Saturday Hour.

c. Route 9A and Heatherdell Road

Route 9A forms the north and south legs and Heatherdell Road the northeast leg of this “Y” type intersection. All approaches to the intersection consist of one lane and the intersection is controlled by a traffic signal.

Capacity analyses with Year 2008 Existing Traffic Volumes show that the intersection operates at acceptable Level of Service “B” during all peak hours.

Capacity analyses with Year 2028 No-build Traffic Volumes show that the intersection will operate at acceptable Level of Service “C” during the Peak AM Highway Hour, at Level of Service “B” during the Peak PM Highway Hour and at Level of Service “C” during the Peak Saturday Hour.
Capacity analyses with Year 2028 Build Traffic Volumes show that the intersection will continue to operate at No-build Levels of Service.

C-3 **CONSTRUCTION COST SUMMARY**

Following is a list of the Study Locations, along with the estimated construction costs for the recommended improvements:

<table>
<thead>
<tr>
<th>Study Location</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson Avenue and Route 9A</td>
<td>$680,000</td>
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<tr>
<td>Jackson Avenue and South Sprain Road</td>
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<td>Jackson Avenue &quot;S&quot; Curve Between Sprain Road and the Park</td>
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<td>Alternative A</td>
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<tr>
<td>Alternative B</td>
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<tr>
<td>Alternative C</td>
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<td>Jackson Avenue and St. Andrews Way</td>
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<td>Jackson Avenue and North Sprain Road</td>
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<td>Jackson Avenue and Southbound Sprain Brook Parkway Ramps</td>
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<tr>
<td>Jackson Avenue and Northbound Sprain Brook Parkway Ramp</td>
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<td>Route 9A and Ashford Avenue</td>
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<tr>
<td>Alternative C</td>
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<tr>
<td>Southbound Off-Ramp</td>
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<tr>
<td>Northbound On-Ramp</td>
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<td>Route 9A and Lawrence Street</td>
<td>No Improvements</td>
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<td>Route 9A Section</td>
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<tr>
<td>Between Ridge Road/Bridge Street and Heatherdell Road</td>
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C-4 CONCLUSION

In conclusion, the detailed analyses performed as part of this traffic study and presented therein show that several Study Locations currently experience traffic delays and congestion and that most will experience congestion by the Design Year 2028. The roadway and/or signal improvements identified herein, when implemented, would reduce the delays and provide generally acceptable Levels of Service.

Respectfully Submitted,
MICHAEL MARIS ASSOCIATES, INC.

Michael Maris
President

John Maris
Vice President