

**ML Hawk Realty, LLC**

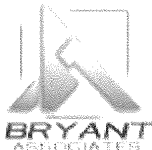
**The Preserve at Rolling Greens**

**Ten Rod Road (Route 102)  
North Kingstown, Rhode Island**

**TRAFFIC IMPACT ANALYSIS**



(Proposed The Preserve at Rolling Greens Driveway Location)



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## **1.0 INTRODUCTION**

### **1.1 Purpose of Study**

This traffic study was prepared at the request of ML Hawk Realty, LLC in connection with its study of the proposed development of The Preserve at Rolling Greens on Ten Rod Road (R.I. Route 102) in North Kingstown, Rhode Island. For the benefit of the boards and the citizens of North Kingstown, the traffic impacts of the proposed development have been evaluated. The study analyzes traffic use attributable to the proposed development of the site and discusses transportation impacts in the vicinity of the site.

### **1.2 Description of Project**

The project site is located on Ten Rod Road, as shown in Figure 1. The proposed development includes the construction of 10 single-family homes, 36 duplexes (72 units), 10 live/work units (consisting of 1,200 square feet of office space on the bottom floor and an apartment above), and 47,100 square feet of retail space. The existing Rolling Greens Golf Course and Oatley's Restaurant will remain open. Access to the parcel will be provided through two driveways on Ten Rod Road, one driveway at the existing signalized intersection of Ten Rod Road and South County Trail (R.I. Route 2) and an entrance-only driveway across from Plain Road. Several existing driveways will be closed as part of this project.

## **2.0 EXISTING CONDITIONS**

### **2.1 Study Area**

The project will primarily utilize Ten Rod Road for access to and from the site. Ten Rod Road is classified as an Urban Principal Arterial, as presented in Technical Paper 155, Rhode Island Statewide Planning Program, Department of Administration, 2005. By definition, an arterial highway emphasizes a high level of mobility for through traffic while providing access to local roadways.

The intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway is a four-way signalized intersection. Ten Rod Road at its intersection with South County Trail is a three-lane, two-way bituminous roadway. The eastbound approach of Ten Rod Road at the intersection consists of a 17-foot travel lane and a 3-foot shoulder that widens at the intersection. The westbound approach of Ten Rod Road consists of two 12-foot travel lanes and a 6-foot shoulder. The left lane is a shared lane for left turns and through movements, although almost all vehicles using this lane make a left turn. The right lane is a shared lane for through movements and right turns. The speed limit is posted at 40 mph in the eastbound direction and 45 mph in the westbound direction. There is curb on both sides of the roadway at the intersection. There are utility poles located on the south side of the roadway. South County Trail at its intersection with Ten Rod Road is a two-lane, two-way bituminous roadway, approximately 43 feet in width, with 12-foot travel lanes, an 8-foot western shoulder, a 7-foot eastern shoulder, and a 4-foot striped median. Right-turning vehicles from South County Trail northbound use a 17-foot wide channelized right turn lane



Figure 1

**Location Map**

ML Hawk Realty, LLC  
The Preserve at Rolling Greens  
Ten Rod Road  
North Kingstown, Rhode Island

that has a free movement onto Ten Rod Road eastbound. There are utility poles located on the east side of the roadway. The Oatley's Restaurant driveway is a two-lane, two-way bituminous roadway, approximately 28 feet in width. Land use in the area is commercial and residential.

The intersection of Ten Rod Road and Plain Road is a three-way unsignalized intersection. Ten Rod Road at its intersection with Plain Road is a four-lane, two-way bituminous roadway, approximately 52 feet in width, with 12-foot and 10-foot westbound travel lanes, 11-foot and 10-foot eastbound travel lanes, a 5-foot northern shoulder, and a 4-foot southern shoulder. There is no curb or sidewalk. There are utility poles located on the south side of the roadway. Plain Road at its intersection with Ten Rod Road is a two-lane, two-way bituminous roadway, approximately 29 feet in width. There are utility poles located on the east side of the roadway.

The intersection of Ten Rod Road and the existing Rolling Greens Golf Course driveway is a three-way unsignalized intersection. Ten Rod Road at its intersection with the existing Rolling Greens Golf Course driveway is a four-lane, two-way bituminous roadway, approximately 52 feet in width, with 12-foot and 10-foot westbound travel lanes, 11-foot and 10-foot eastbound travel lanes, a 5-foot northern shoulder, and a 4-foot southern shoulder. There is no curb or sidewalk. There are utility poles located on the south side of the roadway. The existing Rolling Greens Golf Course driveway is unpaved and is approximately 38 feet in width.

The intersection of Ten Rod Road, Lang Drive, and Autumn Drive is currently a four-way unsignalized intersection, which is stop-controlled on Lang Drive and Autumn Drive. Ten Rod Road at its intersection with Lang Drive is a four-lane, two-way bituminous roadway, approximately 51 feet in width, with 11-foot inside travel lanes, 10-foot outside travel lanes, a 4-foot northern shoulder, and a 5-foot southern shoulder. There is no curb or sidewalk. There are utility poles located on the south side of the roadway. Lang Drive at its intersection with Ten Rod Road is a two-lane, two-way bituminous roadway, approximately 25 feet in width. There are utility poles located on the west side of the roadway. Autumn Drive at its intersection with Ten Rod Road is a two-lane, two-way bituminous roadway, approximately 26 feet in width. There are utility poles located on the west side of the roadway up to the Mountain Laurel entrance.

## **2.2 Data Collection**

Traffic turning movement counts were conducted at the intersections of Ten Rod Road, South County Trail and the Oatley's Restaurant driveway; Ten Rod Road, Plain Road, and the existing Rolling Greens Golf Course driveway; and Ten Rod Road, Lang Drive, and Autumn Drive between the hours of 6:00 and 10:00 A.M. and 2:00 and 6:00 P.M. on Tuesday, July 13, 2010. In addition, traffic turning movement counts were conducted at these intersections between the hours of 10:00 A.M. and 2:00 P.M. on Saturday, July 17, 2010. The traffic count data is shown in Appendix A.

The calculated A.M. peak hour for all of the study intersections is 7:30 – 8:30. The P.M. peak hour for all of the study intersections is 4:45 – 5:45. The Saturday midday peak hour for all of the study intersections is 12:00 – 1:00.

Pertinent field observations including existing stopping sight distance, location of existing utilities, posted speed limits, traffic control devices, etc. were made on July 20, 2010. Accident data (Appendix D) for the period January 1, 2007, through July 9, 2010, was obtained from the North Kingstown Police Department. In addition, traffic speed data (shown in Appendix E) using radar was acquired on Ten Rod Road in the vicinity of the site on July 23, 2010.

### **3.0 TRAFFIC FORECASTS**

#### **3.1 Traffic Volumes**

Existing traffic volumes for the study area were developed from traffic data obtained by Automated Counts & Traffic Surveys, Inc. (A.C.T.S).

The total 24-hour two-way traffic volume (expanded from the 8-hour traffic counts using Rhode Island Department of Transportation (RIDOT) expansion factors) on Ten Rod Road in the vicinity of the site is approximately 25,600 vehicles per day. The A.M. peak hour for the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway, as indicated in Section 2.2, occurred between 7:30 and 8:30, with two-way traffic volumes on Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway of 2,022 vehicles, 1,362 vehicles, and 65 vehicles, respectively. The P.M. peak hour was measured between 4:45 and 5:45, and the two-way traffic volumes were 2,351 vehicles on Ten Rod Road, 1,715 vehicles on South County Trail, and 43 vehicles on the Oatley's Restaurant driveway. The Saturday midday peak hour occurred between 12:00 and 1:00, with two-way traffic volumes on Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway of 2,009 vehicles, 1,234 vehicles, and 83 vehicles, respectively.

The A.M. peak hour for the intersections of Ten Rod Road with Plain Road and the existing Rolling Greens Golf Course driveway, as indicated in Section 2.2, occurred between 7:30 and 8:30, with two-way traffic volumes on Ten Rod Road, Plain Road, and the existing Rolling Greens Golf Course driveway of 2,140 vehicles, 57 vehicles, and 35 vehicles, respectively. The P.M. peak hour was measured between 4:45 and 5:45, and the two-way traffic volumes were 2,404 vehicles on Ten Rod Road, 44 vehicles on Plain Road, and 5 vehicles on the existing Rolling Greens Golf Course driveway. The Saturday midday peak hour occurred between 12:00 and 1:00, with two-way traffic volumes on Ten Rod Road, Plain Road, and the existing Rolling Greens Golf Course driveway of 2,073 vehicles, 66 vehicles, and 19 vehicles, respectively.

The A.M. peak hour for the intersection of Ten Rod Road, Lang Drive, and Autumn Drive, as indicated in Section 2.2, occurred between 7:30 and 8:30, with two-way traffic volumes on Ten Rod Road, Lang Drive, and Autumn Drive of 2,253 vehicles, 50 vehicles, and 80 vehicles, respectively. The P.M. peak hour was measured between 4:45 and 5:45, and the two-way traffic volumes were 2,517 vehicles on Ten Rod Road, 78 vehicles on Lang Drive, and 86 vehicles on Autumn Drive. The Saturday midday peak hour for the intersection of Ten Rod Road, Lang Drive, and Autumn Drive occurred between 12:00 and 1:00, with two-way traffic volumes on Ten Rod Road, Lang Drive, and Autumn Drive of 2,191 vehicles, 68 vehicles, and 76 vehicles, respectively.

The traffic anticipated to be generated by the development was added to the turning movement count volumes for use in determining levels of service (LOS).

### 3.2 Vehicle Trip Generation

To evaluate the traffic impacts of the proposed development, it is necessary to determine the amount of traffic expected to be generated by the proposed improvements. The trip generation calculations are based on data compiled in Trip Generation (8<sup>th</sup> edition), an informational report published by the Institute of Transportation Engineers (ITE). Trip Generation is a tool for planners, transportation professionals, zoning boards, and others who are interested in estimating the number of vehicle trips generated by a proposed development or land use. This document is based on more than 4,800 trip generation studies submitted to the Institute by public agencies, developers, consulting firms, and associations.

The number of trips anticipated to be generated by the addition of 10 single-family homes was estimated using ITE Trip Generation Land Use Code 210, Single-Family Detached Housing, which sets forth trips generated at facilities similar to the proposed development. The number of trips anticipated to be generated by the addition of 72 duplex units was estimated using ITE Trip Generation Land Use Code 230, Residential Condominium/ Townhouse, which sets forth trips generated at facilities similar to the proposed development. The number of trips anticipated to be generated by the addition of 10 live/work units was estimated using ITE Trip Generation Land Use Code 220, Apartment, and Land Use Code 710, General Office Building, which sets forth trips generated at facilities similar to the proposed development. The number of trips anticipated to be generated by the construction of 47,100 square feet of retail space was estimated using ITE Trip Generation Land Use Code 814, Specialty Retail Center. This Land Use Code, however, does not include information for the A.M. or Saturday midday peak hours. ITE Trip Generation Land Use Code 820, Shopping Center, therefore was used to estimate the trips generated during the A.M. and Saturday midday peak hours, since this is the one that is most closely related to the use of the proposed improvements.

The volumes anticipated to be generated by the proposed development during the A.M., P.M., and Saturday midday peak hours can be found in Table No. 1.

It is important to note that trip generation analysis yields the number of vehicle trips that a site is expected to generate at its driveways. Many land uses, including retail space, do not generate vehicle trips that are all new to the roadway system. A portion of their trips are intermediate stops from vehicle trips already “passing by” on adjacent roads. Thus, when distributing the forecasted trips (based on the trip generation rates) to the adjacent streets, a reduction is made to account for those trips already there that will be attracted to the proposed development. Data from ITE indicates that pass-by trips for customers of shopping centers range from 8% to 89% during the P.M. peak period and from 10% to 56% during the Saturday midday peak period. A conservative estimate of 40% was used in this analysis during the A.M. and P.M. peak hours and 30% during the Saturday midday peak hour.

**Table No. 1**  
**Trip Generation Summary**  
**Total New Trips**

| Time Period                  | Direction | 10<br>Single-<br>Family<br>Homes | 72<br>Duplex<br>Units | 10 Live/<br>Work<br>Units | 47,100 SF<br>of Retail<br>Space | Pass-by<br>Trips | Total<br>New<br>Trips |
|------------------------------|-----------|----------------------------------|-----------------------|---------------------------|---------------------------------|------------------|-----------------------|
| A.M. Peak Hour               | Enter     | 2                                | 7                     | 18                        | 29                              | 12               | 44                    |
|                              | Exit      | 6                                | 33                    | 6                         | 18                              | 7                | 56                    |
| P.M. Peak Hour               | Enter     | 8                                | 31                    | 7                         | 59                              | 24               | 81                    |
|                              | Exit      | 5                                | 15                    | 17                        | 76                              | 30               | 83                    |
| Saturday Midday<br>Peak Hour | Enter     | 5                                | 18                    | 6                         | 120                             | 36               | 113                   |
|                              | Exit      | 4                                | 16                    | 6                         | 110                             | 33               | 103                   |

The distribution of the anticipated new vehicle trips by direction was based upon the existing trip patterns observed in the traffic count data. These trips were added to the existing volumes that were counted for analysis of the build conditions. The trip generation calculations and the distribution of the traffic anticipated to be generated by the proposed development are shown in Appendix B.

#### 4.0 CAPACITY ANALYSIS

##### 4.1 General

Capacity analyses in this report focus on the peak hours of traffic volume because they represent the most critical periods for operations and have the highest capacity requirements. If traffic operates at acceptable levels of service during the peak hours, then it will operate at acceptable levels during the remaining hours of the day.

##### 4.2 Intersections

The intersection capacity analysis was prepared using the Highway Capacity Manual, 2000 edition, published by the Transportation Research Board. The analysis utilizes the concept of Level of Service. The term “level of service” is defined as a qualitative measure describing operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. There are six levels of service utilized for the analysis. They are given letter designations from A to F, with Level of Service A representing the most favorable operating conditions and Level of Service F the least. The level of service criteria for unsignalized intersections are shown in Table No. 2.

The computer software, Synchro 7, was utilized to perform the capacity analysis for the unsignalized and signalized intersections. Multi-lane roundabout capacity analysis was performed using the computer software VISSIM.



**Table No. 2**  
**Level of Service Criteria for Unsignalized and Signalized Intersections**  
**Source: Highway Capacity Manual, 2000**

| Level Of Service | Average Total Delay (Sec./Veh) |                         |
|------------------|--------------------------------|-------------------------|
|                  | Unsignalized Intersection      | Signalized Intersection |
| A                | ≤10                            | ≤10                     |
| B                | >10 and ≤15                    | >10 and ≤20             |
| C                | >15 and ≤25                    | >20 and ≤35             |
| D                | >25 and ≤35                    | >35 and ≤55             |
| E                | >35 and ≤50                    | >55 and ≤80             |
| F                | >50                            | >80                     |

A conservative build-out year of 2015 was used. The existing traffic counts were expanded using an annual growth rate of 1.23%, which was obtained from Statewide Planning.

#### 4.2.1 Unsignalized Intersection Capacity Analysis

Although the intersection of Ten Rod Road, Lang Drive, and Autumn Drive is unsignalized as of August 2010, the installation of a traffic signal at this intersection is currently under construction and will be completed by the end of 2010. The proposed left turn lanes at this intersection, which will be constructed under a separate contract, will be completed by the 2015 study date. Therefore, this intersection was analyzed as signalized with left turn lanes on both approaches of Ten Rod Road under no-build and build conditions.

Unsignalized intersection capacity analysis for the intersections of Ten Rod Road and Plain Road and Ten Rod Road and the existing Rolling Greens Golf Course driveway was undertaken using the A.M., P.M., and Saturday midday peak hour traffic volumes under no-build conditions. Unsignalized intersection capacity analysis for the intersection of Ten Rod Road, Plain Road, and the proposed The Preserve at Rolling Greens entrance-only driveway was undertaken using the A.M., P.M., and Saturday midday peak hour traffic volumes under build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 3, 4, and 5 for the A.M., P.M., and Saturday midday peak hour, respectively.

**Table No. 3**  
**A.M. Peak Hour - Level of Service Summary**  
**Unsignalized Intersections**

| Intersection/<br>Critical Movement  | Level of Service |            |
|---|------------------|------------|
|   | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/Existing Rolling Greens Golf Course Driveway</i>                              |                  |            |
| Eastbound Approach  | A (0.1)          | N/A        |
| Southbound Approach   | E (44.6)         | N/A        |
| <i>Ten Rod Road/Plain Road</i>  |                  |            |
| Westbound Approach  | A (0.7)          | N/A        |
| Northbound Approach   | C (18.3)         | N/A        |
| <i>Ten Rod Road/Plain Road/Proposed The Preserve at Rolling Greens Entrance-Only Driveway</i> |                  |            |
| Eastbound Approach  | N/A              | A (0.1)    |
| Westbound Approach  | N/A              | A (1.0)    |
| Northbound Approach   | N/A              | C (20.6)   |

**Table No. 4**  
**P.M. Peak Hour - Level of Service Summary**  
**Unsignalized Intersections**

| Intersection/<br>Critical Movement  | Level of Service |            |
|---|------------------|------------|
|   | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/Existing Rolling Greens Golf Course Driveway</i>                              |                  |            |
| Eastbound Approach  | A (0.0)          | N/A        |
| Southbound Approach   | B (14.0)         | N/A        |
| <i>Ten Rod Road/Plain Road</i>  |                  |            |
| Westbound Approach  | A (0.6)          | N/A        |
| Northbound Approach   | B (14.7)         | N/A        |
| <i>Ten Rod Road/Plain Road/Proposed The Preserve at Rolling Greens Entrance-Only Driveway</i> |                  |            |
| Eastbound Approach  | N/A              | A (0.0)    |
| Westbound Approach  | N/A              | A (0.8)    |
| Northbound Approach   | N/A              | C (15.1)   |

**Table No. 5**  
**Saturday Midday Peak Hour - Level of Service Summary**  
**Unsignalized Intersections**

| Intersection/<br>Critical Movement  | Level of Service |            |
|---|------------------|------------|
|   | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/Existing Rolling Greens Golf Course Driveway</i>                              |                  |            |
| Eastbound Approach  | A (0.0)          | N/A        |
| Southbound Approach   | E (38.9)         | N/A        |
| <i>Ten Rod Road/Plain Road</i>  |                  |            |
| Westbound Approach  | A (0.7)          | N/A        |
| Northbound Approach   | C (18.0)         | N/A        |
| <i>Ten Rod Road/Plain Road/Proposed The Preserve at Rolling Greens Entrance-Only Driveway</i> |                  |            |
| Eastbound Approach  | N/A              | A (0.0)    |
| Westbound Approach  | N/A              | A (1.1)    |
| Northbound Approach   | N/A              | C (22.4)   |

The unsignalized intersection capacity analysis shows that the Plain Road approach of the intersection of Ten Rod Road, Plain Road, and the proposed The Preserve at Rolling Greens entrance-only driveway will operate at an acceptable level of service during the A.M., P.M., and Saturday midday peak hours. Ten Rod Road will operate at excellent levels of service during the A.M., P.M., and Saturday midday peak hours.

#### 4.2.2 Signalized Intersection Capacity Analysis

As of August 2010, the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway is signalized, however, the final design of a roundabout at this intersection has been authorized by RIDOT. Therefore, this intersection was analyzed with a traffic signal and with a roundabout under no-build and build conditions.

Signalized intersection capacity analysis for the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway was undertaken using the A.M., P.M., and Saturday midday peak hour traffic volumes under no-build conditions. Signalized intersection capacity analysis for the intersection of Ten Rod Road, South County Trail, and the Preserve at Rolling Greens driveway was undertaken using the A.M., P.M., and Saturday midday peak hour traffic volumes under build conditions. Signalized intersection capacity analysis for the intersection of Ten Rod Road, Lang Drive, and Autumn Drive was undertaken using the A.M., P.M., and Saturday midday peak hour traffic volumes under no-build and build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 6, 7, and 8 for the A.M., P.M., and Saturday midday peak hour, respectively.

**Table No. 6**  
**A.M. Peak Hour - Level of Service Summary**  
**Signalized Intersections**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley's Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | C (32.2)         | N/A        |
| Eastbound Approach   | C (27.5)         | N/A        |
| Westbound Approach   | D (35.2)         | N/A        |
| Northbound Approach  | C (33.5)         | N/A        |
| Southbound Approach  | D (36.0)         | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | D (49.7)   |
| Eastbound Approach   | N/A              | C (32.1)   |
| Westbound Approach   | N/A              | E (63.3)   |
| Northbound Approach  | N/A              | C (33.0)   |
| Southbound Approach  | N/A              | D (46.3)   |
| <i>Ten Rod Road/Lang Drive/Autumn Drive</i>  |                  |            |
| Overall Intersection   | A (8.6)          | A (8.6)    |
| Eastbound Approach   | A (9.0)          | A (9.1)    |
| Westbound Approach   | A (7.4)          | A (7.4)    |
| Northbound Approach  | A (9.4)          | A (9.6)    |
| Southbound Approach  | C (20.4)         | C (21.0)   |

**Table No. 7**  
**P.M. Peak Hour - Level of Service Summary**  
**Signalized Intersections**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley's Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | B (18.7)         | N/A        |
| Eastbound Approach   | C (25.8)         | N/A        |
| Westbound Approach   | B (15.4)         | N/A        |
| Northbound Approach  | D (35.7)         | N/A        |
| Southbound Approach  | C (26.4)         | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | C (31.4)   |
| Eastbound Approach   | N/A              | C (30.9)   |
| Westbound Approach   | N/A              | C (29.5)   |
| Northbound Approach  | N/A              | D (35.2)   |
| Southbound Approach  | N/A              | D (44.0)   |
| <i>Ten Rod Road/Lang Drive/Autumn Drive</i>  |                  |            |
| Overall Intersection   | A (9.1)          | A (9.2)    |
| Eastbound Approach   | B (11.0)         | B (11.1)   |
| Westbound Approach   | A (7.1)          | A (7.2)    |
| Northbound Approach  | B (13.1)         | B (13.3)   |
| Southbound Approach  | C (21.7)         | C (22.3)   |

**Table No. 8**  
**Saturday Midday Peak Hour - Level of Service Summary**  
**Signalized Intersections**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley's Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | C (23.0)         | N/A        |
| Eastbound Approach   | C (26.2)         | N/A        |
| Westbound Approach   | C (20.3)         | N/A        |
| Northbound Approach  | D (35.3)         | N/A        |
| Southbound Approach  | C (31.8)         | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | D (41.3)   |
| Eastbound Approach   | N/A              | D (35.3)   |
| Westbound Approach   | N/A              | D (41.8)   |
| Northbound Approach  | N/A              | D (37.1)   |
| Southbound Approach  | N/A              | E (55.5)   |
| <i>Ten Rod Road/Lang Drive/Autumn Drive</i>  |                  |            |
| Overall Intersection   | A (9.8)          | A (9.9)    |
| Eastbound Approach   | B (10.2)         | B (10.4)   |
| Westbound Approach   | A (9.0)          | A (9.2)    |
| Northbound Approach  | B (10.1)         | B (10.2)   |
| Southbound Approach  | B (18.7)         | B (19.1)   |

The signalized intersection capacity analysis shows that the overall intersection level of service of Ten Rod Road, South County Trail, and the proposed The Preserve at Rolling Greens driveway will change, from LOS C to LOS D, during the A.M. and Saturday midday peak hours, and from LOS B to LOS C, during the P.M. peak hour. All of the approaches of this intersection will operate at acceptable levels of service, with the exception of the westbound approach, which will operate at LOS E during the A.M. peak hour, and the southbound approach, which will operate at LOS E during the Saturday midday peak hour. The signalized intersection capacity analysis shows that there will be no change in the overall intersection level of service at the intersection of Ten Rod Road, Lang Drive, and Autumn Drive during the A.M., P.M., and Saturday midday peak hours.

Due to the fact that a roundabout is currently under design for the intersection of Ten Rod Road, South County Trail, and the Oatley's driveway, mitigation to the existing signal timings was not performed to try to improve the levels of service. If the roundabout is not installed, the signal timings should be modified, which will result in improved levels of service.

#### 4.2.3 Roundabout Capacity Analysis

Capacity analysis for the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway was undertaken with the installation of a partial dual-lane roundabout using the A.M., P.M., and Saturday midday peak hour traffic volumes under no-build conditions. Capacity analysis for the intersection of Ten Rod Road, South County Trail, and the Preserve at Rolling Greens driveway was undertaken with the installation of a partial dual-lane roundabout using the

A.M., P.M., and Saturday midday peak hour traffic volumes under build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 9, 10, and 11 for the A.M., P.M., and Saturday midday peak hour, respectively.

Since the intersection of Ten Rod Road, South County Trail, and the Oatley’s driveway is currently signalized, the thresholds for signalized intersections were utilized to describe the levels of service.

**Table No. 9  
A.M. Peak Hour - Level of Service Summary  
Roundabout**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley’s Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | A (9.3)          | N/A        |
| Eastbound Approach   | C (31.4)         | N/A        |
| Westbound Approach   | A (1.8)          | N/A        |
| Northbound Approach  | A (0.2)          | N/A        |
| Southbound Approach  | A (0.0)          | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | B (11.1)   |
| Eastbound Approach   | N/A              | D (39.5)   |
| Westbound Approach   | N/A              | A (2.1)    |
| Northbound Approach  | N/A              | A (0.3)    |
| Southbound Approach  | N/A              | A (0.0)    |

**Table No. 10  
P.M. Peak Hour - Level of Service Summary  
Roundabout**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley’s Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | A (2.7)          | N/A        |
| Eastbound Approach   | B (11.9)         | N/A        |
| Westbound Approach   | A (2.2)          | N/A        |
| Northbound Approach  | A (0.3)          | N/A        |
| Southbound Approach  | A (0.0)          | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | A (3.5)    |
| Eastbound Approach   | N/A              | B (16.3)   |
| Westbound Approach   | N/A              | A (2.9)    |
| Northbound Approach  | N/A              | A (0.4)    |
| Southbound Approach  | N/A              | A (0.6)    |

**Table No. 11  
Saturday Midday Peak Hour - Level of Service Summary  
Roundabout**

| Intersection/<br>Critical Movement   | Level of Service |            |
|--|------------------|------------|
|  | 2015 No-Build    | 2015 Build |
| <i>Ten Rod Road/South County Trail/Oatley's Restaurant Driveway</i>                      |                  |            |
| Overall Intersection   | A (8.1)          | N/A        |
| Eastbound Approach   | C (27.9)         | N/A        |
| Westbound Approach   | A (2.3)          | N/A        |
| Northbound Approach  | A (0.4)          | N/A        |
| Southbound Approach  | A (0.0)          | N/A        |
| <i>Ten Rod Road/South County Trail /Proposed The Preserve at Rolling Greens Driveway</i> |                  |            |
| Overall Intersection   | N/A              | B (14.4)   |
| Eastbound Approach   | N/A              | E (55.1)   |
| Westbound Approach   | N/A              | A (3.4)    |
| Northbound Approach  | N/A              | A (0.9)    |
| Southbound Approach  | N/A              | A (0.2)    |

The roundabout capacity analysis shows that the intersection of Ten Rod Road, South County Trail, and the proposed The Preserve at Rolling Greens driveway will operate at LOS B during the A.M. and Saturday midday peak hours and LOS A during the P.M. peak hour. All of the approaches of the roundabout will operate at acceptable levels of service during the A.M., P.M., and Saturday midday peak hours, with the exception of the eastbound approach, which will operate at LOS E during the Saturday midday peak hour. The delay for this approach will be 55.1 seconds per vehicle, which is only 0.1 seconds per vehicle above the threshold for LOS D.

**5.0 SAFETY ANALYSIS**

**5.1 Geometrics**

The geometric configurations of the intersections affected by traffic generated by the proposed development were examined with regard to safe stopping sight distance using principles presented in A Policy on Geometric Design of Highways and Streets, 2004, of the American Association of State Highway and Transportation Officials (AASHTO). AASHTO provides recommendations for necessary sight distance at intersections.

A conservative design speed of 45 mph was utilized for the eastbound direction of Ten Rod Road in the vicinity of the proposed site based on an observed 85<sup>th</sup> percentile speed of 43.4 mph (see Appendix E). The minimum safe stopping distance for roadways with a design speed of 45 mph is 360 feet, as required by AASHTO, Exhibit 3-1, Stopping Sight Distance, P. 112. The existing sight distance from the west to the proposed unsignalized site driveway at Plain Road is unrestricted from the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway, which is in excess of the minimum safe stopping distance.

A conservative design speed of 55 mph was utilized for the westbound direction of Ten Rod Road in the vicinity of the proposed site based on an observed 85<sup>th</sup> percentile speed of 53 mph (see Appendix E). The minimum safe stopping distance for roadways with a design speed of 55 mph is 495 feet, as required by AASHTO, Exhibit 3-1, Stopping Sight Distance, P. 112. The existing sight distance from the east to the proposed unsignalized site driveway at Plain Road is 360 feet. It is recommended that trees and bushes within the sight line be trimmed/removed to increase the sight distance from the east. Once a preliminary site plan has been developed, the limits of the trimming/removal will be determined.

## 5.2 Accident History

Accident data for the study area was obtained from the North Kingstown Police Department for the period from January 1, 2007 to July 9, 2010. A summary of the data received is contained in Appendix D. There were forty-three accidents at the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway, as shown in Table No. 12. These accidents included eighteen rear end accidents, twelve angle accidents, two head-on collisions, one sideswipe, and one broadside at the traffic signal. The high number of rear end accidents that occurred at this intersection is typical for a signalized intersection. There were also seven rear end accidents, one rollover, and one vehicle that lost control and left the roadway on the free channelized right turn from South County Trail northbound to Ten Rod Road eastbound. The channelized right turn lane is a free movement, however, operators that are unfamiliar with the area tend to yield or stop to wait for a break in traffic on Ten Rod Road, resulting in the high number of rear end accidents. Six accidents occurred on wet, snowy, or slushy pavement and sixteen accidents resulted in injuries. The installation of a roundabout will greatly reduce the number and severity of the accidents at this intersection.

The eleven accidents at the intersection of Ten Rod Road and the eastern Oatley's Restaurant driveway included six angle accidents, four broadsides, and one sideswipe. Two accidents occurred on wet pavement and seven accidents resulted in injuries.

There were two accidents on Ten Rod Road between South County Trail and Plain Road. Both of these accidents involved trees falling on vehicles, one accident occurred on icy pavement, and one accident resulted in an injury.

The three accidents at the intersection of Ten Rod Road and Plain Road included three rear end accidents, they all occurred on dry pavement, and two accidents resulted in injuries.

There was one accident at the intersection of Ten Rod Road and the Rolling Greens Golf Course driveway. This accident was a rear end accident, it occurred on dry pavement, and there were no injuries reported.

The ten accidents on Ten Rod Road between Plain Road and Lang Drive/Autumn Drive included three rear end accidents, three vehicles that lost control and left the roadway, two sideswipes, one angle accident, and one vehicle that struck a deer. Three of these accidents occurred on wet or snowy pavement and four accidents resulted in injuries.



**Table No. 12**  
**Summary of Accidents**  
**Source: North Kingstown Police Department**

| Accident Location   | January 1, 2007 to July 9, 2010 |
|---|---------------------------------|
| <i>Intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant Driveway</i> | 43                              |
| <i>Intersection of Ten Rod Road and the Eastern Oatley's Restaurant Driveway</i>              | 11                              |
| <i>Ten Rod Road between South County Trail and Plain Road</i>                                 | 2                               |
| <i>Intersection of Ten Rod Road and Plain Road</i>  | 3                               |
| <i>Intersection of Ten Rod Road and the Rolling Greens Golf Course Driveway</i>               | 1                               |
| <i>Ten Rod Road between Plain Road and Lang Drive/Autumn Drive</i>                            | 10                              |
| <i>Intersection of Ten Rod Road, Lang Drive, and Autumn Drive</i>                             | 21                              |
| TOTAL   | 91                              |

There were twenty-one accidents at the intersection of Ten Rod Road, Lang Drive, and Autumn Drive. These accidents included eleven rear end accidents, six angle accidents, one broadside, one head-on collision, one vehicle that lost control and left the roadway, and one vehicle that struck a deer. Five accidents occurred on wet or sandy pavement and eight accidents resulted in injuries. The installation of a traffic signal will likely reduce the severity of accidents at this intersection and may reduce the number of accidents as well.

Considering the high volume of traffic and the high speed limit on Ten Rod Road, the number of accidents that occurred over this three-year plus period does not indicate the presence of unusual conditions that might be worsened by the addition of the traffic generated by the development. RIDOT is designing and constructing improvements to the intersection of Ten Rod Road, South County Trail, and the Oatley's Restaurant driveway and the intersection of Ten Rod Road, Lang Drive, and Autumn Drive, respectively.

### 5.3 Site Circulation

Once a preliminary site plan has been developed, it will be reviewed with regard to layout and vehicular/pedestrian circulation. The proposed site will be designed to accommodate the safe movement of emergency vehicles to and from the development.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

This traffic impact analysis was conducted to evaluate the impacts on surrounding roadways and intersections due to the proposed The Preserve at Rolling Greens on Ten Rod Road in North Kingstown, Rhode Island. The unsignalized intersection capacity analysis shows that the Plain Road approach of the intersection of Ten Rod Road, Plain Road, and the proposed The Preserve at Rolling Greens entrance-only driveway will operate at an acceptable level of service during the A.M., P.M., and Saturday midday peak hours. Ten Rod Road will operate at excellent levels of service during the A.M., P.M., and Saturday midday peak hours.

The signalized intersection capacity analysis shows that the overall intersection level of service of Ten Rod Road, South County Trail, and the proposed The Preserve at Rolling Greens driveway will change, from LOS C to LOS D, during the A.M. and Saturday midday peak hours, and from LOS B to LOS C, during the P.M. peak hour. All of the approaches of this intersection will operate at acceptable levels of service, with the exception of the westbound approach, which will operate at LOS E during the A.M. peak hour, and the southbound approach, which will operate at LOS E during the Saturday midday peak hour. Due to the fact that a roundabout is currently under design for the intersection of Ten Rod Road, South County Trail, and the Oatley's driveway, mitigation to the existing signal timings was not performed to try to improve the levels of service. If the roundabout is not installed, the signal timings should be modified, which will result in improved levels of service. The signalized intersection capacity analysis shows that there will be no change in the overall intersection level of service at the intersection of Ten Rod Road, Lang Drive, and Autumn Drive during the A.M., P.M., and Saturday midday peak hours.

The roundabout capacity analysis shows that the intersection of Ten Rod Road, South County Trail, and the proposed The Preserve at Rolling Greens driveway will operate at LOS B during the A.M. and Saturday midday peak hours and LOS A during the P.M. peak hour. All of the approaches of the roundabout will operate at acceptable levels of service during the A.M., P.M., and Saturday midday peak hours, with the exception of the eastbound approach, which will operate at LOS E, with a delay of 55.1 seconds per vehicle, during the Saturday midday peak hour, which is only 0.1 seconds per vehicle above the threshold for LOS D.

The geometric configuration of the existing roadways is such that adequate safe stopping sight distances exist for traffic passing and/or utilizing the site, with the exception of the proposed unsignalized driveway at Plain Road. It is recommended that trees and bushes within the sight line be trimmed/removed to increase the sight distance from the east. There are no existing unsafe conditions in the vicinity of the development that might be worsened by the addition of the anticipated traffic.

Based upon the analyses, traffic operations on the surrounding roadways and intersections will experience minimal change with the addition of the traffic generated by the proposed improvements. No reduction in safety will occur due to the development as proposed and due to the removal of several driveways, there will be a reduction in conflict points, which will actually improve safety in the area.