Appendix C.4

Traffic Impact Study

TRAFFIC IMPACT STUDY

HILLTOP VILLAGE AT WAPPINGER

PROPOSED RESIDENTIAL DEVELOPMENT

Town of Wappinger, Dutchess County, New York

Prepared for

TOLL BROTHERS, INC.

Horsham, Pennsylvania

POVALL ENGINEERING, PLLC

Hopewell Junction, New York

Prepared by

TRC ENGINEERS, INC.

Hawthorne, New York

June 29, 2011(Revised: January 25, 2012)

TRC Project No. 176817

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SECTION 1 – EXECUTIVE SUMMARY

1.0 Project Description

Toll Brothers, Inc. proposes to construct Hilltop Village at Wappinger, a 225-unit Senior Housing Development with primary access to All Angels Hill Road (CR 94) in the Town of Wappinger, Dutchess County, New York (see Figure 1). Access to and from the site will be provided via a new road utilizing an existing driveway entrance that serves Flavormatic Industries, Inc. – an existing commercial site adjacent to the Project - and is located opposite Hilltop Drive. An emergency access will be provided via Shamrock Road, accessible from Old Hopewell Road. The location and layout of the project is shown in the Proposed Site Plan, prepared by Povall Engineering, PLLC, a site/civil engineering firm retained by Toll Brothers. Their Site Plan is included in this study in Appendix A.

1.1 Purpose

TRC Engineers, Inc. (TRC) has been retained by Povall Engineering, PLLC to analyze the traffic impact associated with the project and to identify necessary roadway improvements, if required, to mitigate any adverse impact. In a supplemental analysis, TRC has evaluated the potential impacts assuming the implementation of proposed – but not yet scheduled - future improvements to the adjacent County road system. Information regarding those improvements was provided by the County's Traffic Engineer. Improvements along Meyers Corners Road (CR 93) were identified in the CR 93 Corridor Study, prepared by Wilbur Smith Associates for the Poughkeepsie-Dutchess County Transportation Council. The improvements along Old Hopewell Road (CR 28) were identified in the CR 28 Corridor Study; they are part of a Federal-Aid Project scheduled for inclusion in a 2014 Transportation Improvement Plan (TIP). It should be noted that the TIP is only the first step in processing a transportation related improvement; there are no construction plans for those improvements and it is not certain when (or if) they will be implemented. Therefore, the supplemental analysis has been added in order to provide the Town with a "broad-brush" estimate of potential future traffic conditions once those proposed future roadway improvements are completed. For

analysis purposes, a Design Year of 2015 has been utilized for the proposed Hilltop Village development.

1.2 Findings

Based on field observations and the detailed analysis undertaken during the preparation of this Traffic Impact Study, the following findings are presented:

- The site will be provided very good regional and local access due to its proximity to State Routes 376 and 82, and to County Routes 94, 28, 93, and 104.
- Based on conservative projections, it is anticipated that the senior housing development will generate approximately 17 entering vehicles and 32 exiting vehicles during the weekday AM Peak Hour and 37 entering vehicles and 24 exiting vehicles during the PM Peak Hour.
- Access to/from the proposed Project will be provided via a Town Road (the conversion of an existing driveway) with a full-movement unsignalized intersection at All Angels Hill Road. The existing driveway is currently providing access to Flavormatic Industries. An emergency access will be provided via Shamrock Road, accessible from Old Hopewell Road.
- A conservative annual growth factor of 2% was applied to the existing traffic volumes, to account for traffic associated with background growth as well as traffic associated with any other unknown potential nearby developments.
- Level of Service analyses were performed for the key study locations for the Existing, 2015 No-Build (without the Project) and 2015 Build conditions (with the Project). Table 1 summarizes the results of the capacity analyses conducted for each intersection included in this study. Average delay, expressed in seconds per vehicle, is listed below each Level of Service. Detailed Level of Service summaries for each intersection are provided in Section 4 of this Report:

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Site Location
Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

Project No. 176817
Not To Scale
June 2011

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Figure 1

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TABLE 1						
OVERALL LEVEL OF SERVICE SUMMARY TABLE						
	Existing		**2015 No-Build**		**2015 Build**	
Intersection	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
New York State Route 376 & New Hackensack Road (CR 104)	D 35.8	D 38.9	D 37.2	D 43.0	D 37.2	D 43.1
All Angels Hill Road (CR 94) & New Hackensack Road (CR 104)	D 52.0	E 61.8	D 54.3	E 67.4	D 54.4	E 68.1
All Angels Hill Road (CR 94) & Widmer Road	b 12.0	b 13.7	b 12.5	b 14.7	b 12.6	b 15.0
All Angels Hill Road (CR 94) & Myers Corners Road (CR 93)	C 25.8	C 29.3	C 27.9	C 32.6	C 28.2	C 33.1
Myers Corners Road (CR 93) & Kent Road	d 25.1	d 25.1	d 30.5	d 30.6	d 30.9	d 31.1
All Angels Hill Road (CR 94) & Kent Road/Cider Mill Loop	c 15.1	b 14.3	c 16.7	c 15.3	c 17.0	c 15.6
All Angels Hill Road (CR 94) & Hilltop Drive/Site Driveway	b 11.5	b 14.6	b 12.0	c 15.7	b 14.6	c 16.3
All Angels Hill Road (CR 94) & Pye Lane	b 14.7	c 15.4	c 15.6	c 16.4	c 16.0	c 17.0
All Angels Hill Road (CR 94) & Brown Road	b 14.0	c 20.3	c 15.3	c 24.6	c 15.8	d 26.3
All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)	C 21.3	C 27.2	C 25.2	D 40.1	C 27.0	D 43.9
Old Hopewell Road (CR 28) & Balfour Drive	b 14.8	c 21.0	c 15.8	c 23.3	c 15.9	c 23.4
Old Hopewell Road (CR 28) & Cedar Hill Road	c 16.4	c 23.2	c 18.4	d 28.4	c 18.5	d 28.7
All Angels Hill Road (CR 94) & State Route 82	A 9.9	B 14.3	B 10.1	C 27.1	B 10.3	C 29.7

Notes: *Levels of Service for Signalized intersections are represented by upper case letters with average delay in seconds provided below, and is provided for the overall intersection.
*Levels of Service for Unsignalized intersections are represented by lower case letters with average delay in seconds provided below, and is provided for the worst-case minor street approach.

1.3 Conclusions

Based on the analysis contained in this report, it is the considered professional opinion of TRC Engineers that the traffic generated by the proposed Project will have a negligible impact on operating conditions at the key study intersections as seen by the minimal changes in delay and Levels of Service from the 2015 No-Build to the 2015 Build condition. Therefore, no mitigation is necessary at these intersections.

SECTION 2 – SITE DEVELOPMENT ALTERNATIVES

The total site consists of approximately 150 acres and is currently zoned for Conservation Office Park (COP) and Single-Family Residences (R-40). It should be noted that if there was to be a development built under the existing zoning criteria, it would generate a significant amount of traffic in the vicinity of the site. Povall Engineering has established an alternative "as-of-right" development that would be possible for the site based on the zoning of the property. There were three variations of the as-of-right development – conventional, average density and conservation – but each produced the same building areas and therefore the same trip generation. Using the base building type and areas, TRC prepared a trip generation analyses to determine the number of trips that would be generated by the land use components of any one of the alternative development variations.

The following Table summarizes a comparison of the number of trips that would be generated by the site assuming that it is developed based on land uses allowed under existing zoning vs. site development based on the proposed zoning.

TABLE 2
TRIP GENERATION COMPARISON - AS-OF-RIGHT VS. PROPOSED ZONING
Hilltop Village - Town of Wappinger, New York

Development Scenario	Land Use (Code)	Size	Unit	Peak AM Hour			Peak PM Hour		
				Enter	Exit	Total	Enter	Exit	Total
GENERATED TRIPS[1] AS-OF-RIGHT USES									
Conventional, Average Density or Conservation	General Office Space (710)	530,000	SF	627	85	712	114	558	672
	Warehousing (150)	42,000	SF	40	11	51	9	25	34
	Single-Family Housing (210)	13	DU	5	14	19	11	6	17
	TOTAL					**782**			**723**
GENERATED TRIPS[1] PROPOSED USE									
Proposed	Senior Adult Housing Detached (251)	225	DU	17	32	49	37	24	61
	TOTAL					**49**			**61**

[1] Generated trips based on rates and information contained in the Institute of Transportation Engineers' (ITE) publication "Trip Generation" (Eighth Edition).

As illustrated in the table above, the proposed Hilltop Village at Wappinger Senior Housing Development will generate significantly less traffic to the Town and surrounding roadways and

communities than would the as-of-right alternatives.

SECTION 3– TRAFFIC CONDITIONS AND PROJECTIONS

3.0 Study Methodology

TRC Engineers, Inc. (TRC) has analyzed the traffic impact associated with building a 225-unit senior housing development on All Angels Hill Road (CR 94) in the Town of Wappinger using the generally accepted, industry standard traffic engineering techniques. In a supplemental analysis, TRC has evaluated the potential impacts assuming the implementation of future roadway and intersection improvements as provided by the County Traffic Engineer.

Background traffic volumes were collected by representatives of TRC in the vicinity of the proposed Project at key intersections as required in the Scoping Document. The existing traffic counts were projected to the year 2015 utilizing a growth rate of two percent (2.0%) compounded annually, as recommended by the Dutchess County Planning Department. If available, traffic to be generated by other planned or on-going developments in the same study area also was to be included in the background growth. It should be noted that the Town's Planning Consultant, Frederick P. Clark Associates, (FPC), has confirmed that there is one development that is expected to be either approved or under construction that would generate additional traffic in the same vicinity and time frame as that associated with the proposed Hilltop Village Development.

The combination of existing and background traffic resulted in the 2015 No-Build traffic volumes. Next, the site-generated traffic for the proposed Project was added to the 2015 No-Build traffic volumes, resulting in the 2015 Build traffic volumes. TRC conducted detailed capacity and Level of Service analyses of the key study location to identify operational characteristics of the Peak Hour traffic demand and, if poor Levels of Service were identified, mitigation was proposed. This impact was quantified based on a comparison of Peak Hour traffic – 2015 No-Build to 2015 Build conditions.

3.1 Description of Roadway Network in the Vicinity of Project Site

Roadways adjacent to or in the vicinity of the site include State Route 376, State Route 82, New Hackensack Road (CR 104), All Angels Hill Road (CR 94), Myers Corners Road (CR 93), Old Hopewell Road (CR 28), Widmer Road, Kent Road, Cider Mill Loop, Hilltop Drive, the access to Flavormatic Industries (Proposed Site Access), Pye Lane, Brown Road, Balfour Drive, and Cedar Hill Road. The following is a description of those roadways:

New York State Route 376 (NY 376) – New York State Route 376 is under the jurisdiction of the New York State Department of Transportation. NY 376 is approximately 14 miles in length and is located entirely within Dutchess County, New York. NY 376 travels north/south through the towns of East Fishkill, Wappinger, and Poughkeepsie. The northern terminus is at the intersection of US 44/NY 55 in Arlington, a hamlet in the town of Poughkeepsie, and the southern terminus is at the intersection of NY 52 in East Fishkill. In the vicinity of the site, NY 376 has a north-south alignment, one travel lane in each direction and a speed limit of 40 miles per hour (mph).

New York State Route 82 (NY 82) – New York State Route 82 is under the jurisdiction of the New York State Department of Transportation. NY 82 is approximately 60 miles in length and is located in Dutchess and Columbia Counties. The northern terminus is at the intersection of NY 9H in Livingston, and the southern terminus is at the intersection of NY 52 in Fishkill. In the vicinity of the site, NY 82 has a northeast-southwest alignment, one travel lane in each direction and a speed limit of 45 mph.

New Hackensack Road (*Dutchess County Road CR 104)* – New Hackensack Road (CR 104) is under the jurisdiction of Dutchess County. County Road 104 is approximately 3 miles in length and originates at US Route 9 and continues northeast to NY 376/CR 94 in the Town of Wappinger. In the vicinity of the site, New Hackensack Road has an east-west alignment and a posted speed limit of 40 mph.

All Angels Hill Road (CR 94) - All Angels Hill Road (CR 94) is under the jurisdiction of Dutchess County. All Angels Hill Road is approximately 5 miles in length and travels

north/south through localities known as Swartoutville, Myers Corner, and New Hackensack in the Town on Wappinger. The northern terminus is at the intersection of NY 376 and the southern terminus is at the intersection of NY 82. In the vicinity of the site, All Angels Hill Road has a north-south alignment, one travel lane in each direction and a speed limit of 40 mph.

Meyers Corners Road (*CR 93)* – Meyers Corners Road is under the jurisdiction of Dutchess County. On its western end, CR 93 intersects Route 9D and extends eastward as Middlebush Road to US Route 9. East of Route 9, CR 93 is known as Myers Corners Road, continuing through its intersection with All Angels Hill Road (CR 94), coming to an end at NY 376. In the vicinity of the site, Meyers Corners Road has an east-west alignment, one travel lane in each direction and a posted speed limit of 40 mph to the west of All Angels Hill Road and 35 mph to the east of All Angels Hill Road.

Old Hopewell Road (CR 28) - Old Hopewell Road is under the jurisdiction of Dutchess County. Beginning on its western end at the New Hamburg railroad station (Metro North Hudson Line), CR 28 – as New Hamburg Road travels east through the hamlets of New Hamburg and Hughsonville to its intersection with Route 9D. CR 28 continues west as Old Hopewell Road intersecting Route 9 and CR 94, coming to its eastern end at Route 82. In the vicinity of the site, Old Hopewell Road has an east-west alignment, one travel lane in each direction and a posted speed limit of 40 mph.

Widmer Road – Widmer Road is under the jurisdiction of the Town of Wappinger. The western end of Widmer Road is at New Hackensack Road (CR 104), and it continues northeast to All Angels Hill Road (CR 94) in the Town of Wappinger. In the vicinity of the site, Widmer Road generally has an east-west alignment, one travel lane in each direction, and a posted speed limit of 40 mph.

Kent Road – Kent Road is approximately one mile in length and is under the jurisdiction of the Town of Wappinger. The northern end of Kent Road is at Myers Corners Road (CR 93), and it continues south and east to All Angels Hill Road (CR 94) in the Town of Wappinger.

In the vicinity of Meyers Corners Road, Kent Road has a north-south alignment, one travel lane in each direction, and a posted speed limit of 30 mph. In the vicinity of All Angels Hill Road (CR 94), Kent Road has an east-west alignment, one travel lane in each direction, a posted speed limit of 30 mph, and is aligned opposite Cider Mill Loop.

Cider Mill Loop – Cider Mill Loop is approximately ½ mile in length and is under the jurisdiction of the Town of Wappinger. Cider Mill Loop begins and ends at All Angels Hill Road (CR 94) in the Town of Wappinger. This roadway provides access to a residential community. Cider Mill Loop has an east-west alignment, one travel lane in each direction and a posted speed limit of 30 mph.

Hilltop Drive – Hilltop Drive is approximately ½ mile in length and is under the jurisdiction of the Town of Wappinger. Hilltop Drive is aligned opposite the Flavormatic Industries driveway at All Angels Hill Road (CR 94) and travels west through a residential neighborhood. It ends at Pye Lane in the Town of Wappinger. Hilltop Drive has an east-west alignment, one travel lane in each direction, and a posted speed limit of 30 mph.

Proposed Site Access (Flavormatic Industries Driveway) – The driveway that serves Flavormatic Industries is approximately ¼ mile in length and is privately owned. That driveway is aligned opposite Hilltop Drive at All Angels Hill Road (CR 94) and has one travel lane in each direction. This driveway will be rebuilt to Town standards and will become a Town Road. It will serve as part of the primary access to the project site.

Pye Lane – Pye Lane is approximately one mile in length and is under the jurisdiction of the Town of Wappinger. The western end of Pye Lane is at All Angels Hill Road (CR 94) and it continues east to Montfort Road in the Town of Wappinger. This roadway provides access to/from a large number of residential homes and neighborhoods. In the vicinity of the site, Pye Lane has an east-west alignment, one travel lane in each direction, and a posted speed limit of 30 mph.

Brown Road – Brown Road is approximately 1¼ mile in length and is under the jurisdiction of the Town of Wappinger. The western end of Brown Road is at All Angels Hill Road (CR 94) and it continues east to Lake Walton Road in the Town of East Fishkill. This roadway accommodates local traffic and provides access to/from residential homes and neighborhoods. In the vicinity of the site, Brown Road has an east-west alignment, one travel lane in each direction, and a posted speed limit of 30 mph.

Balfour Drive – Balfour Drive is under the jurisdiction of the Town of Wappinger. Balfour Drive originates at Old Hopewell Road (CR 28) and continues north through a residential community in the Town of Wappinger. This roadway accommodates local traffic and provides access to/from residential homes and neighborhoods. Balfour Drive is aligned opposite Meadowood Lane. Balfour Drive has a north-south alignment, one travel lane in each direction, and a posted speed limit of 30 mph.

Cedar Hill Road – Cedar Hill Road is under the jurisdiction of the Town of Wappinger. Cedar Hill Road originates at Old Hopewell Road (CR 28) and continues south providing access to/from residential homes in the Town of Wappinger. Cedar Hill Road has a north-south alignment, one travel lane in each direction, and a posted speed limit of 30 mph.

Figure 2 illustrates the posted speed limits, full paved width, and shoulder widths along the roadways. Pavement of the roadway network is in generally good condition. There is no on-street parking permitted along NY 376, All Angels Hill Road, New Hackensack Road, Widmer Road, Myers Corners Road, Brown Road, Old Hopewell Road, and NY 82, in vicinity of the study area. There are signs posted within the study area restricting parking on public highways between midnight and 8 AM from November 1st to April 1st.

3.2 Study Locations

Based on a review of the existing roadway network, traffic operating conditions and existing traffic volumes, and as required by the Scoping Document, the following study locations were identified.

1. State Route 376 and New Hackensack Road (CR 104)

2. All Angels Hill Road (CR 94) and New Hackensack Road (CR 104)
3. All Angels Hill Road (CR 94) and Widmer Road
4. All Angels Hill Road (CR 94) and Myers Corners Road (CR 93)
5. Myers Corners Road (CR 93) and Kent Road
6. All Angels Hill Road (CR 94) and Kent Road/Cider Mill Loop
7. All Angels Hill Road (CR 94) and Hilltop Drive/Site Access Road
8. All Angels Hill Road (CR 94) and Pye Lane
9. All Angels Hill Road (CR 94) and Brown Road
10. All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28)
11. Old Hopewell Road (CR 28) and Balfour Drive
12. Old Hopewell Road (CR 28) and Cedar Hill Road
13. All Angels Hill Road (CR 94) and State Route 82

Figure 3 illustrates the study locations and the traffic control devices used at the various study locations. Appendix B contains the Traffic Signal Timing Permits that were obtained from either the State or County. Appendix C contains the signal timings as observed in the field by a TRC representative.

3.3 Existing Traffic Volumes

Background traffic volumes were collected by representatives of TRC on the adjacent roadways at the key study locations. TRC conducted manual turning movement counts on Tuesday, May 11, 2010, Thursday, February 10, 2011 and Tuesday, February 22, 2011. The counts were recorded in 15-minute intervals during AM and PM peak periods – weekdays in the morning from 6:30 to 9:30 AM and in the late afternoon/early evening from 3:30 to 6:30 PM. In addition to the manual traffic counts, field measurements were made to determine roadway geometry, lane widths, traffic control and signal phasing/timings, etc. The manual traffic count data is contained in Appendix D.

In analyzing the traffic impact on the adjacent roadway network associated with the proposed Project, it is essential to determine those hours during which the Project would have its greatest impact. In general, the Project's land uses will generate their highest

volumes during the AM and PM Peak Weekday Hours. Therefore, these peak periods were analyzed. Based on the hourly volumes distilled from the recent traffic counts, the Peak Hours were determined to be as follows:

- AM Peak Hour – 7:30 to 8:30 AM
- PM Peak Hour – 4:30 to 5:30 PM

During these hours, the combination of existing traffic along the roadways adjacent to the site and traffic to be generated by the proposed project will generally be at the highest for the day. The Existing traffic volumes for the Peak AM Hour and Peak PM Hour of the Adjacent Street are illustrated in Figure 4.

3.4 2015 No-Build Traffic Volumes and Other Area Developments

For analysis purposes, 2015 was used as the year in which the Project would be built and occupied. To account for general background traffic growth, the existing traffic volumes were increased to reflect probable conditions in 2015 by applying a standard growth rate of 2% per year compounded annually, as suggested by the Dutchess County Planning Department. Accounting for background traffic growth simply acknowledges the fact that the study area, and generally the Town and region, will grow in certain aspects that will contribute to increased traffic activity.

TRC contacted the Town of Wappinger's Planning Consultant, Frederick P. Clark Associates (FPCA), to determine if there were any proposed developments in the vicinity of the Project, and if their associated traffic should be included in the 2015 projected volumes. FPCA identified one proposed development; the Cerebral Palsy Community Residence Development. This development consists of a one story 13,543 square-foot building that would accommodate 14 residential units, 1 live-in caretaker unit, and 20 parking spaces. This development is to be located along Myers Corners Road between Kent Road and Schnabl Court. Based on the nature of this land use, it is anticipated that this special residential development would not generate a significant amount of peak hour traffic; the minimal amount of traffic that is generated would be accounted for in the background traffic growth.

The 2015 No-Build traffic volumes are shown in Figure 5 for the Peak AM and Peak PM analysis periods.

3.5 Project-Generated Traffic Volumes

The purpose of this Traffic Study was to identify the impact of the proposed development on the adjacent roadway network. Having established traffic conditions in 2015 without completion of the development (i.e., the 2015 No-Build conditions), the next step was to determine the hourly traffic volumes to be generated by the development.

The Site Plan for the Hilltop Village at Wappinger, prepared by Povall Engineering, illustrates a total of 132 detached senior housing units and 93 attached senior housing units. The site-generated traffic volumes for the proposed Hilltop Village at Wappinger residential development were based on the Institute of Transportation Engineers' (ITE) publication titled, "Trip Generation", Eighth Edition.

Site-generated traffic volumes were computed based on the combined total of 225 detached senior housing units by applying the formulas developed by ITE for Land Use Code 251, "Senior Adult Housing-Detached". The single land use type was chosen since it results in slightly higher volumes when compared to Land Use Code 252, "Senior Adult Housing-Attached" and therefore, calculating the site-generated trips for all units based on this Code provides a more conservative analysis. It is anticipated that the site will generate approximately 17 entering vehicles and 32 exiting vehicles during the weekday AM Peak Hour and 37 entering vehicles and 24 exiting vehicles during the weekday PM Peak Hour.

The trip generation characteristics of the Project are summarized in Table 3 below.

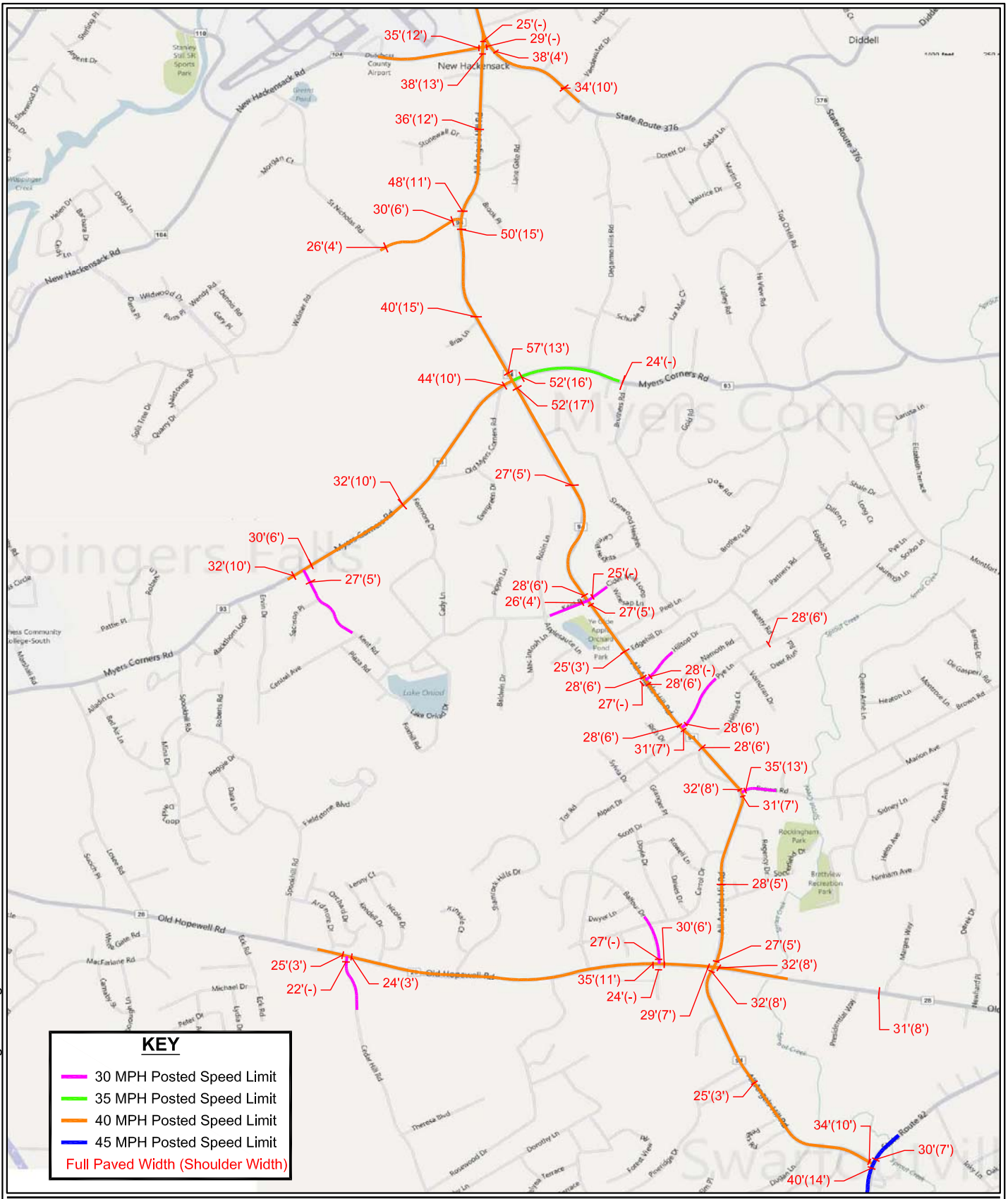
TABLE 3						
PROJECT GENERATED TRAFFIC VOLUMES						
			Peak Hour			
			AM		PM	
Land Use	ITE Code	Size	Enter	Exit	Enter	Exit
Senior Adult Housing-Detached	251	225 dwelling units	17	32	37	24

3.6 Assignment of Site-Generated Traffic

The arrival and departure trip distributions for the site were determined based on the existing roadway traffic patterns exhibited on the adjacent roadway network, and as exemplified by the recent turning movement counts. Figures 6 and 7 illustrate the arrival and departure distribution patterns applied to traffic estimated to be generated by the Project site for the AM and PM Peak Hours.

3.7 2015 Build Traffic Volumes

The Project generated traffic volumes illustrated in Table 3 for the Senior Adult Housing use were distributed to the roadway system in accordance with the arrival and departure distributions discussed in Section 3.6. The resulting Project-generated traffic volumes for the peak hours are illustrated in Figure 8. The Project-generated traffic volumes were then combined with the 2015 No-Build traffic volumes resulting in the 2015 Build traffic volumes. The 2015 Build traffic volumes are shown in Figure 9. Level of Service and Capacity analyses for the 2015 Build traffic volumes were computed to determine the intersections' ability to operate under future conditions.



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Roadway Posted Speed Limits & Measured Widths

Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

Project No. 176817
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June 2011

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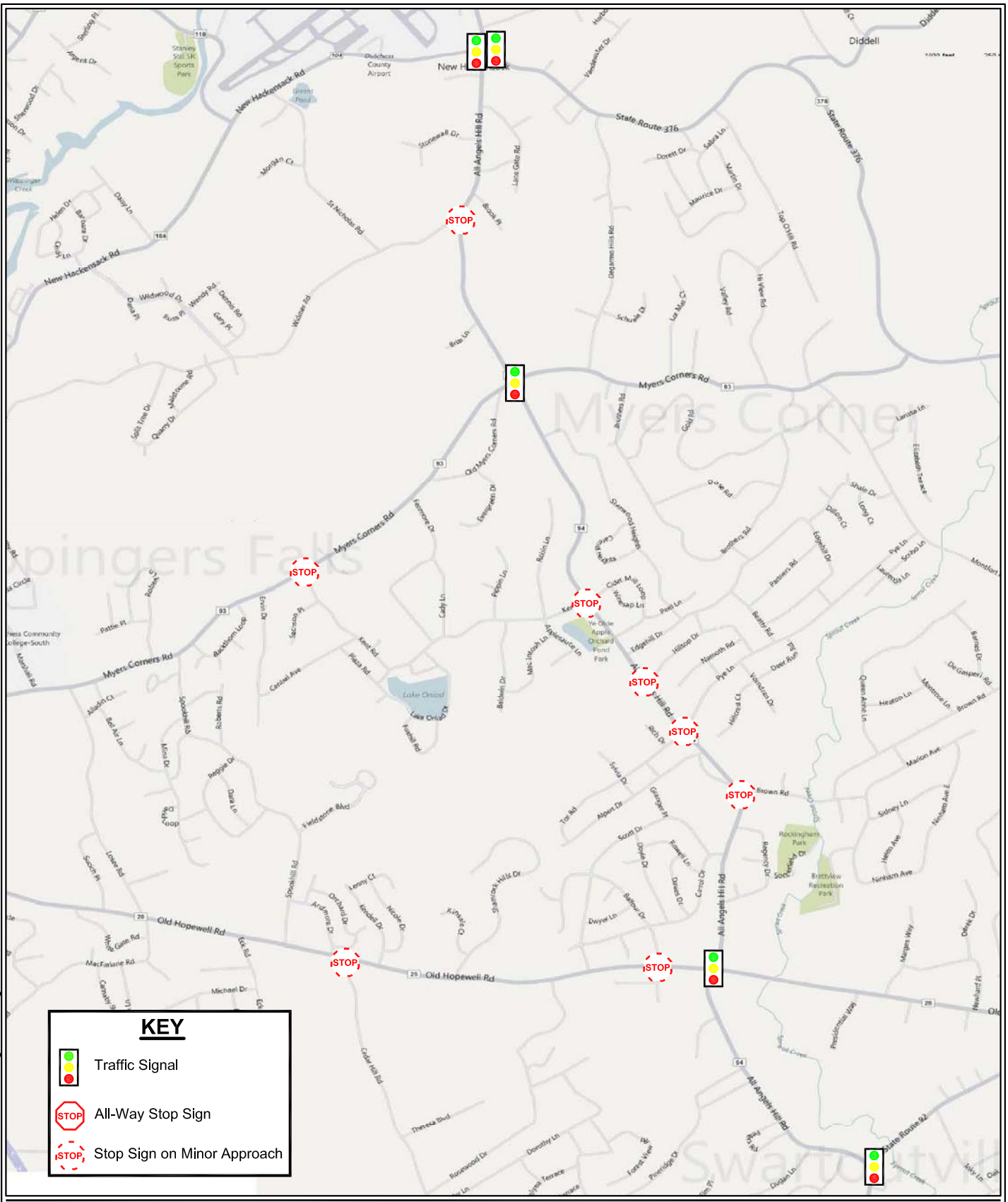
Figure 2



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Study Locations & Traffic Control
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Figure 3

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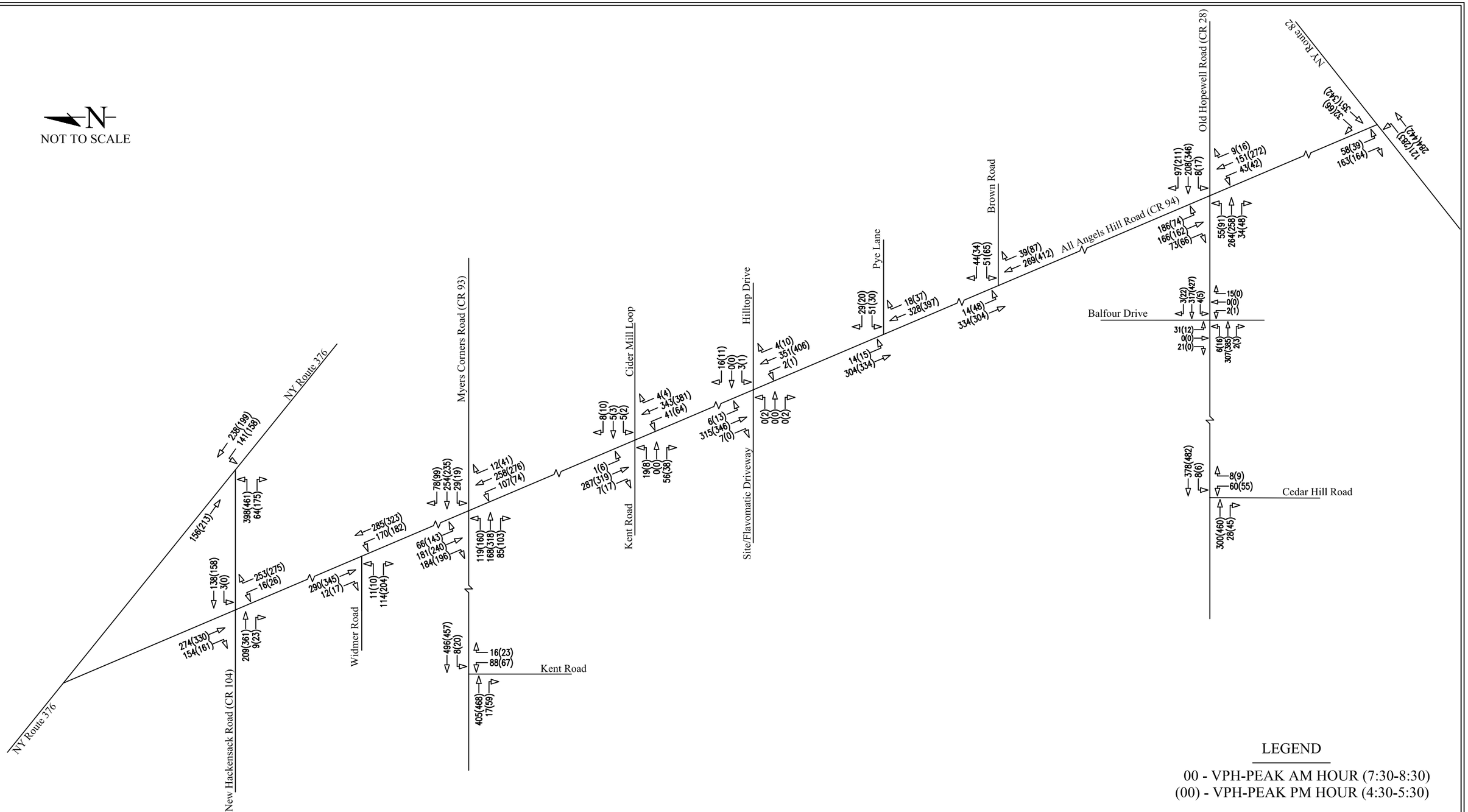

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Existing Traffic Volumes
Hilltop Village at Wappinger
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Figure 4

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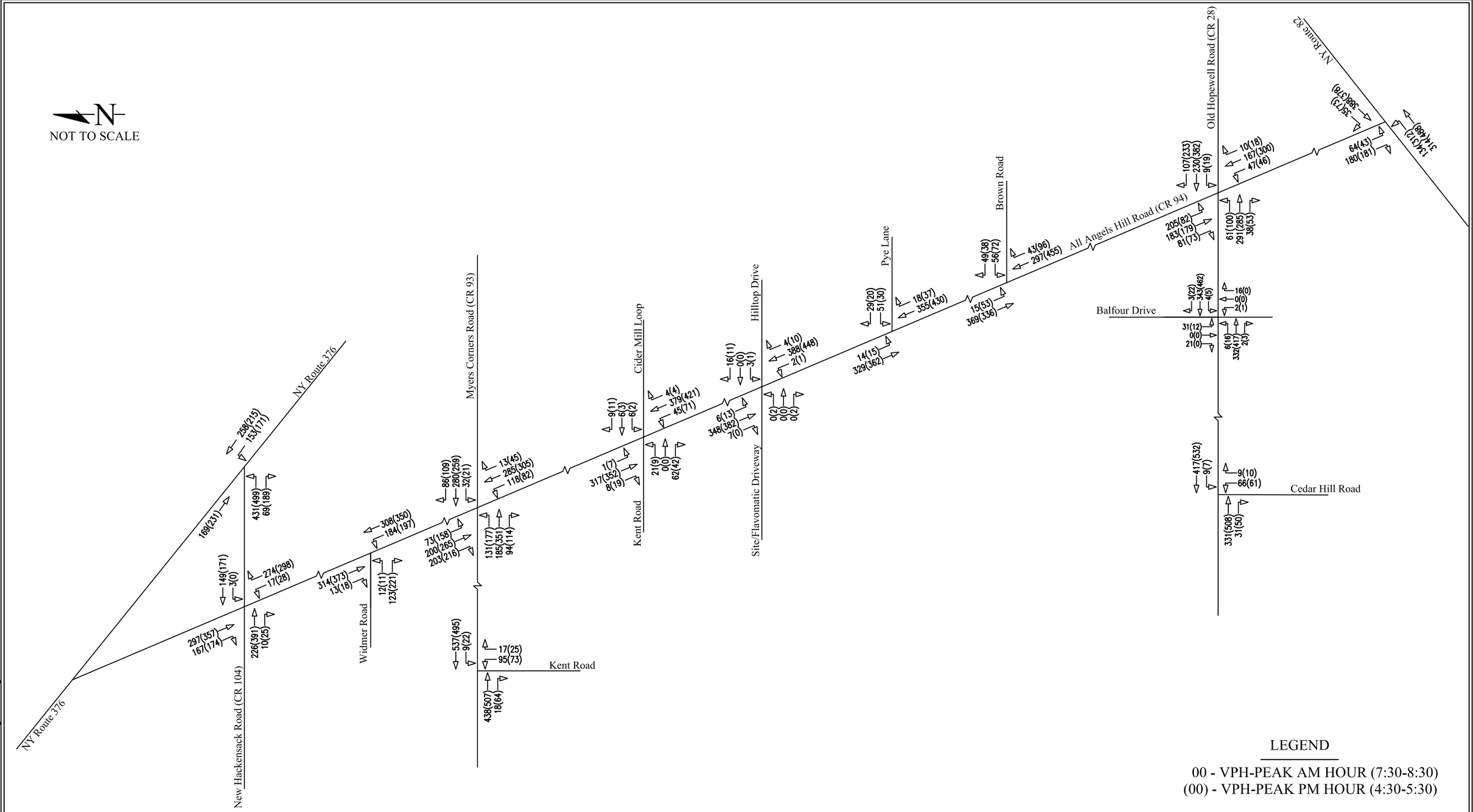

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2015 No-Build Traffic Volumes
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Figure 5

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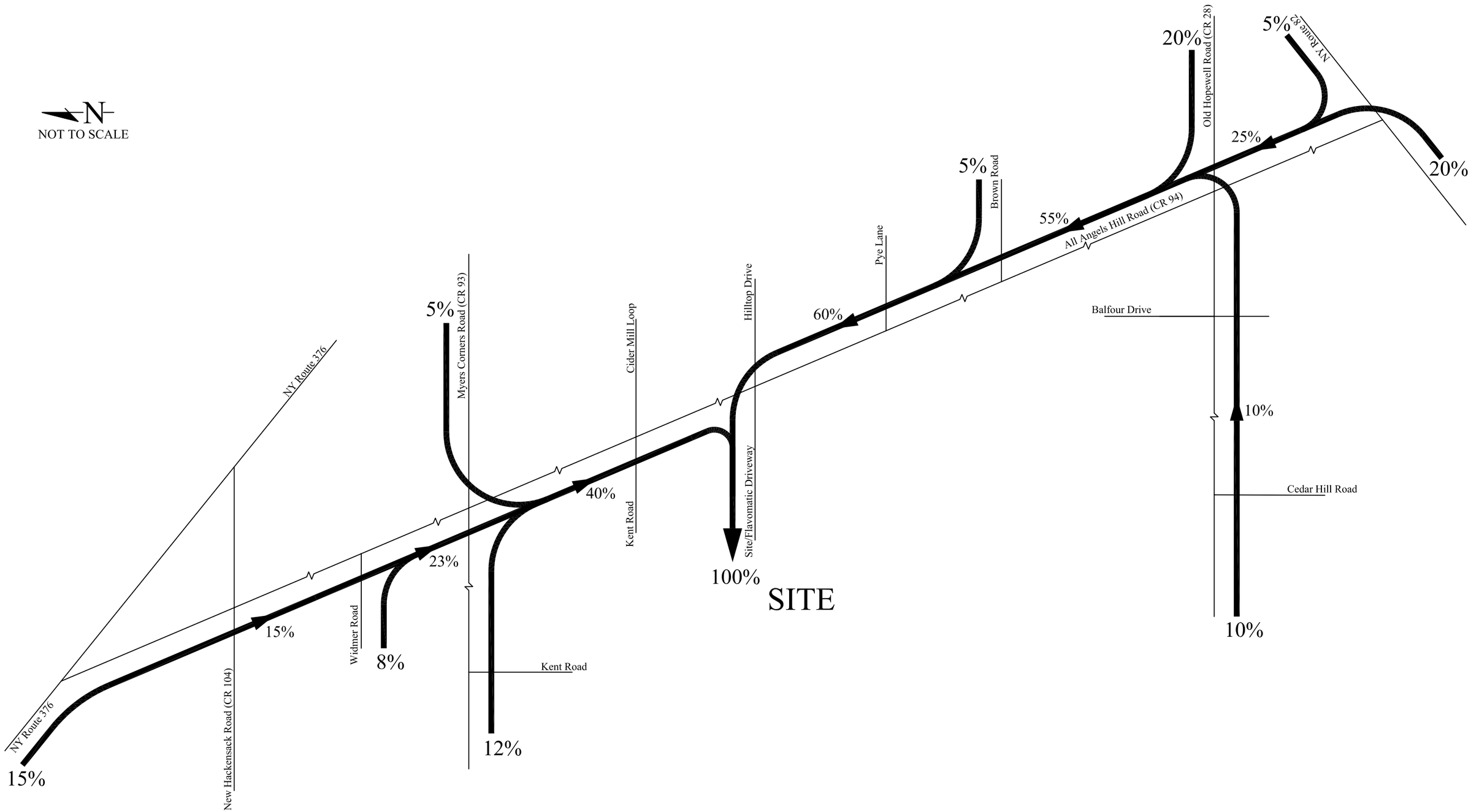

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Arrival Distribution Pattern
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 6

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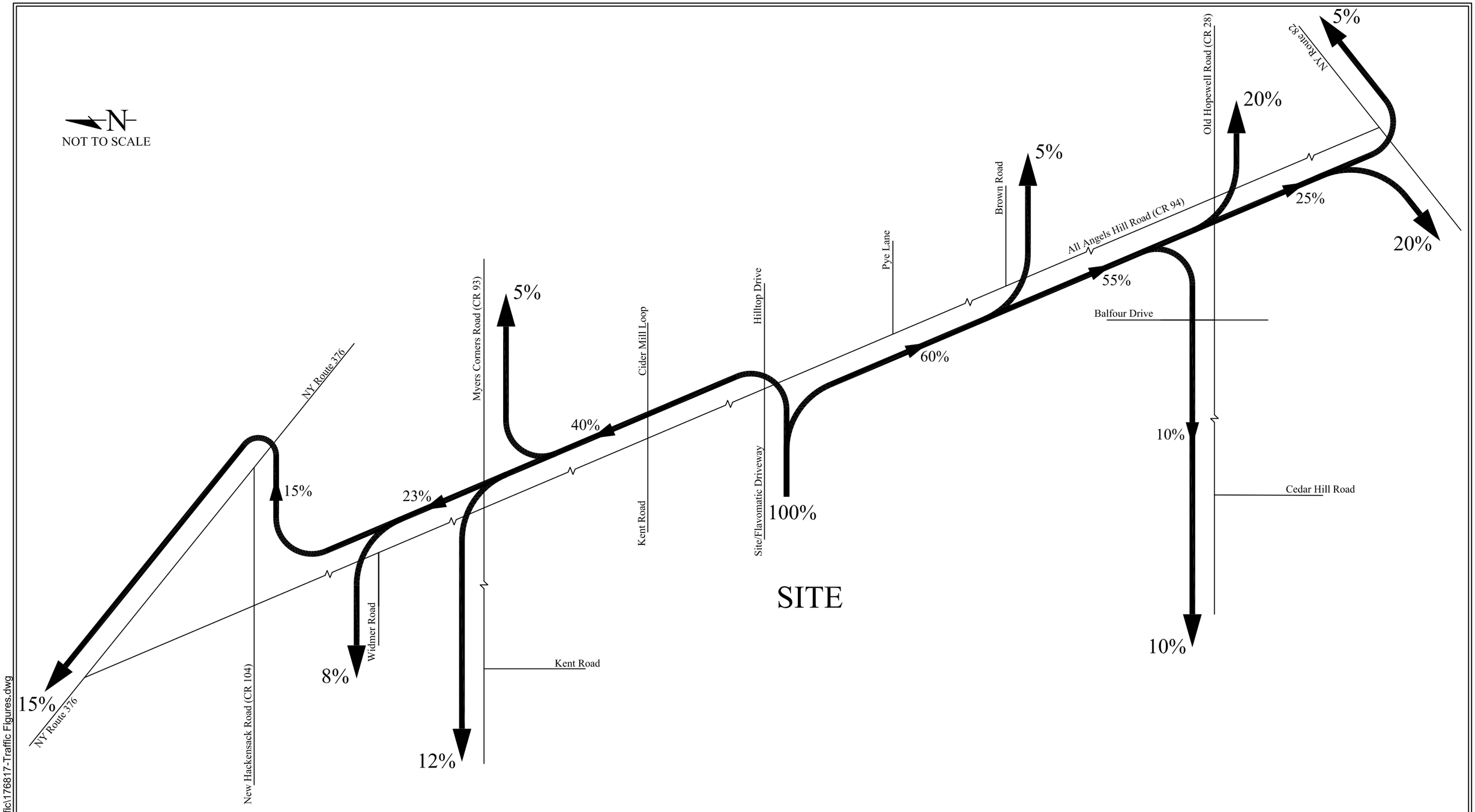

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Departure Distribution Pattern
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 7

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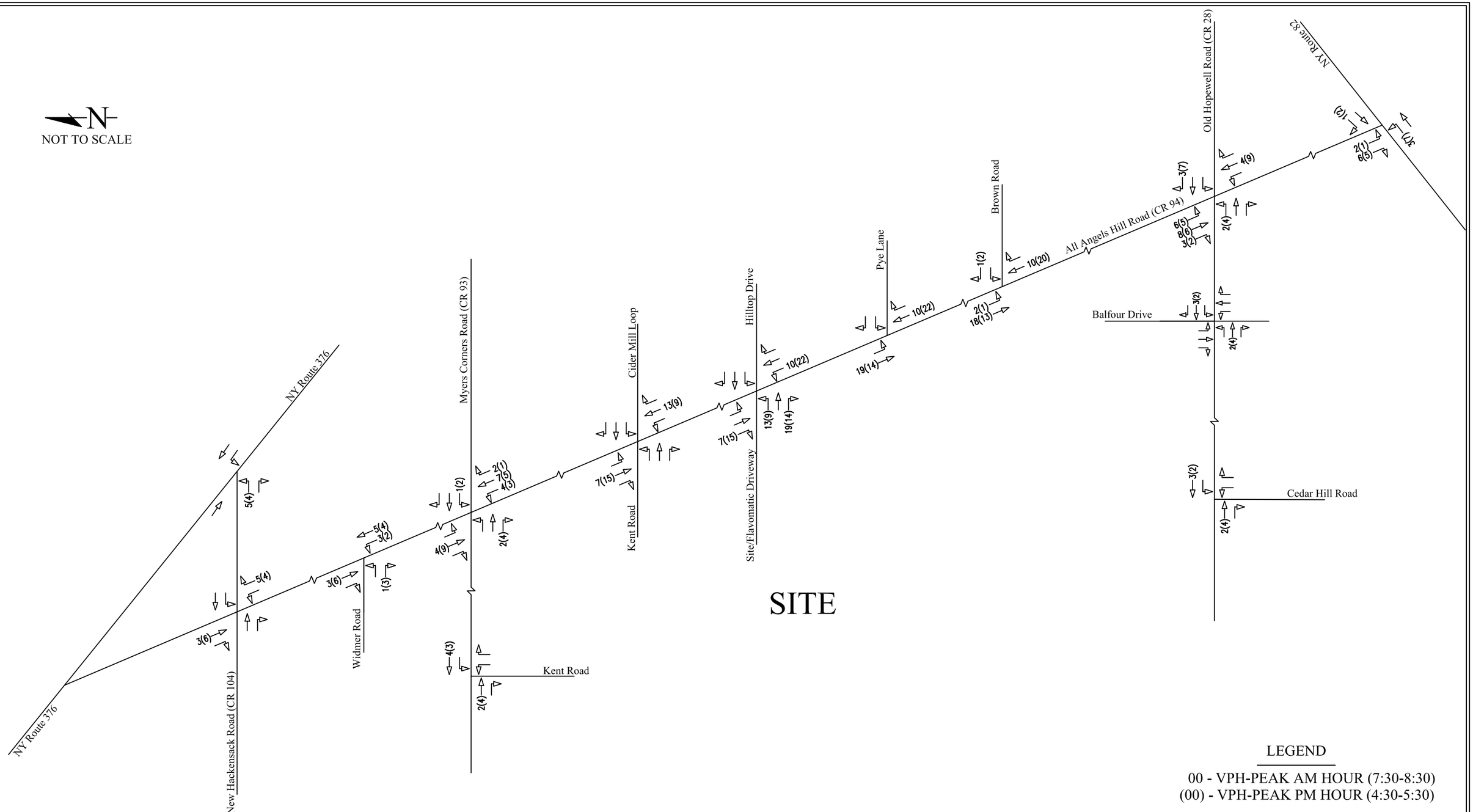

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Site-Generated Traffic Volumes
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 8

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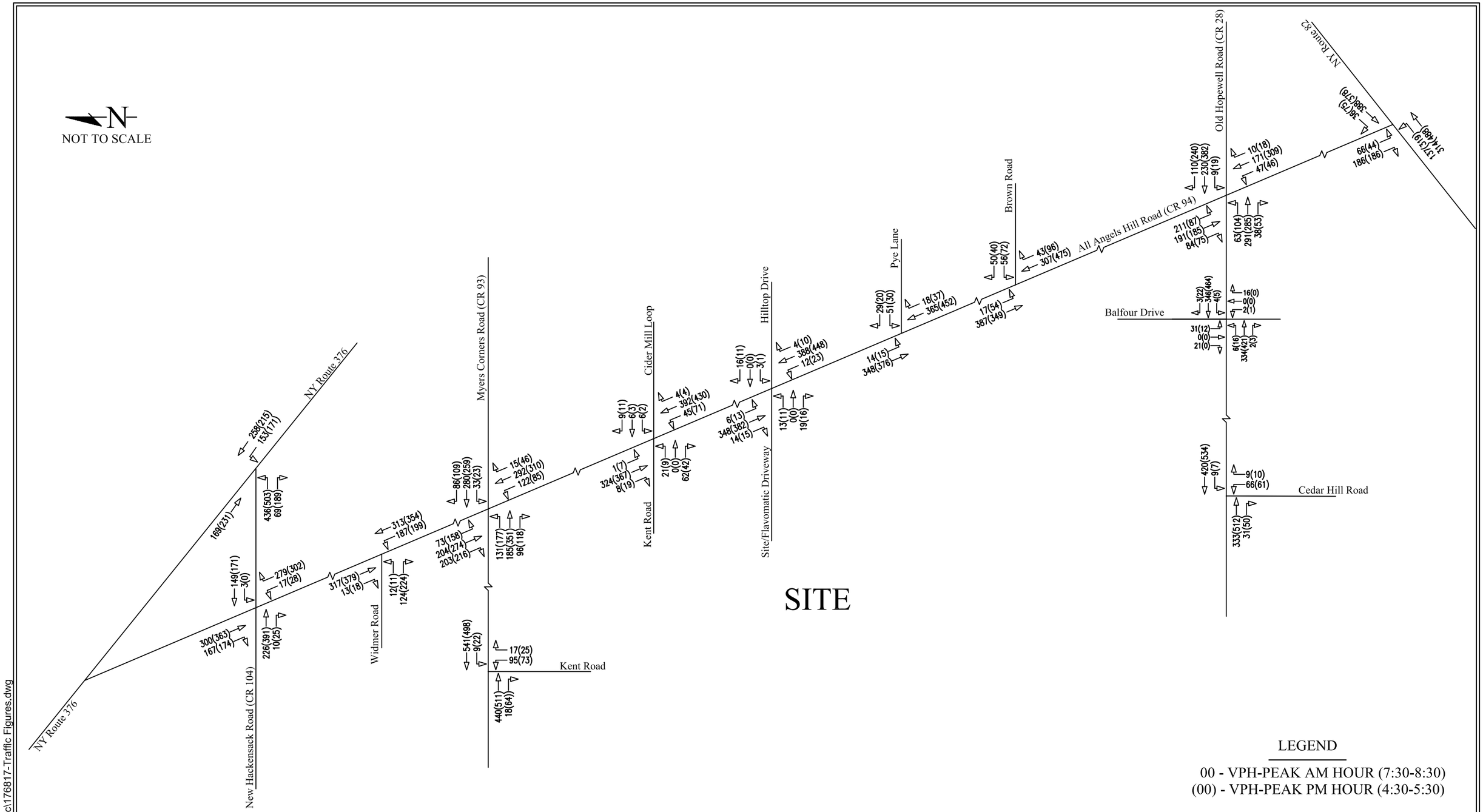

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2015 Build Traffic Volumes
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 9

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SECTION 4 – LEVEL OF SERVICE ANALYSIS

4.0 Description

The Transportation Research Board – a nationally recognized transportation resource agency - described the generally accepted capacity analysis methodology in their 2000 Highway Capacity Manual. In general, the term "Level of Service" is used to describe a "qualitative" measure of capacity based on certain "quantitative" calculations related to physical conditions, traffic volume demand and type of traffic control. The definition of Level of Service as presented in the 2000 Highway Capacity Manual is contained in Appendix E of this Report and is briefly described below.

> *Levels of Service are determined by measuring or calculating the average delay time for vehicles traveling along a roadway or through intersections. Delay can be caused by a variety of conditions, such as traffic control devices (stop signs and traffic signals), parking maneuvers adjacent to travel lanes and, at times, high volumes of traffic. Short delays are indicative of very good travel conditions, while very long delays generally reflect conditions considered to be unacceptable to most drivers.*

The 2000 Highway Capacity Manual provides a method of reporting average delay by establishing a rating system that assigns a range of delay times to a graduated series of service levels. There are six service levels labeled “A” through “F”, with levels A, B, C and D generally representative of delay times acceptable to most drivers under typical travel conditions. Levels E and F reflect the higher delay time ranges and can be regarded as approximations of the limits of acceptable delay, especially if found to occur over long periods of time. However, for short time periods, such as the busiest 15 minutes just after 5:00 PM, at an exit driveway from an office building, longer delays are expected and generally considered acceptable.

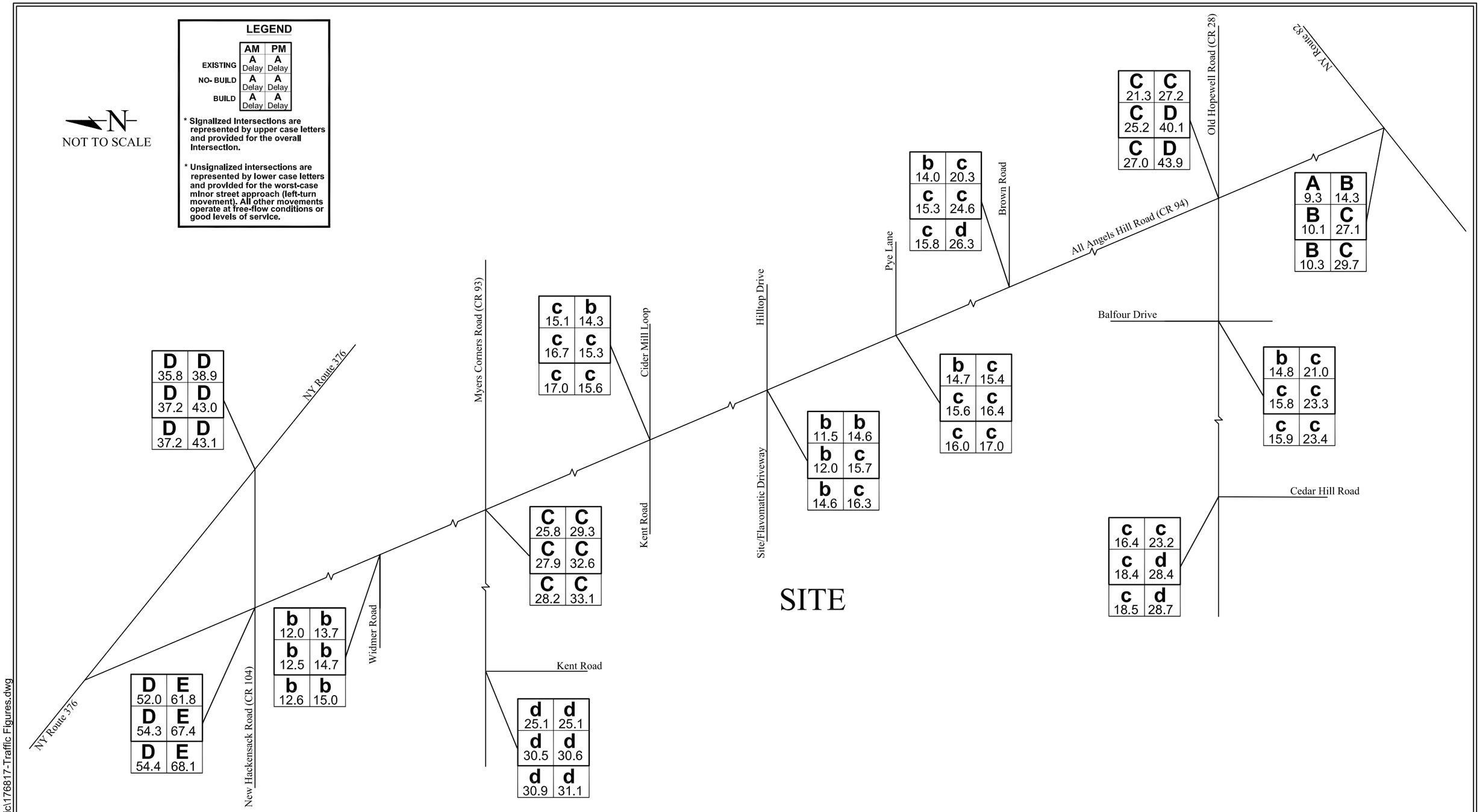
The ability of the roadway network to accommodate the projected traffic volume demand was measured by examining the ability of key intersections to accommodate such demand. Level of Service analyses were performed for the key study locations using Synchro Studio 7.0 Software developed by TrafficWare. This software implements the methods of the 2000 Highway Capacity Manual to evaluate signalized and unsignalized intersection capacity analyses. Year

2011 Existing, 2015 No Build and 2015 Build analyses were undertaken for the AM and PM Peak Hours. The analysis worksheets for this intersection are contained in Appendix F. Appendix G contains detailed capacity analysis result tables that identify the v/c ratio, delay and Level of Service for all lane groups and movements. Figure 10 illustrates the Existing, 2015 No-Build, and Build overall Levels of Service at each study location. The following sections provide the intersection and analysis details.

4.1 Location 1 – New York State Route 376 & New Hackensack Road (CR 104)

4.1.1 Existing Geometry

The intersection of the New York State Route 376 (NY 376) and New Hackensack Road (CR 104) is a three-legged, signalized intersection. NY 376 forms the northbound and southbound approaches and New Hackensack Road (CR 104) forms the eastbound approach. The northbound approach consists of a left-turn and a through lane and the southbound approach consists of a through lane. The eastbound approach consists of a shared left-turn/right-turn lane. It should be noted that the signal timing and phasing for this intersection is grouped with the adjacent intersection to the west, that of All Angels Hill Road (CR 94) and New Hackensack Road (CR 104), due to their proximity. The following diagram illustrates the lane configuration at this intersection.



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Overall Levels of Service Results
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 10

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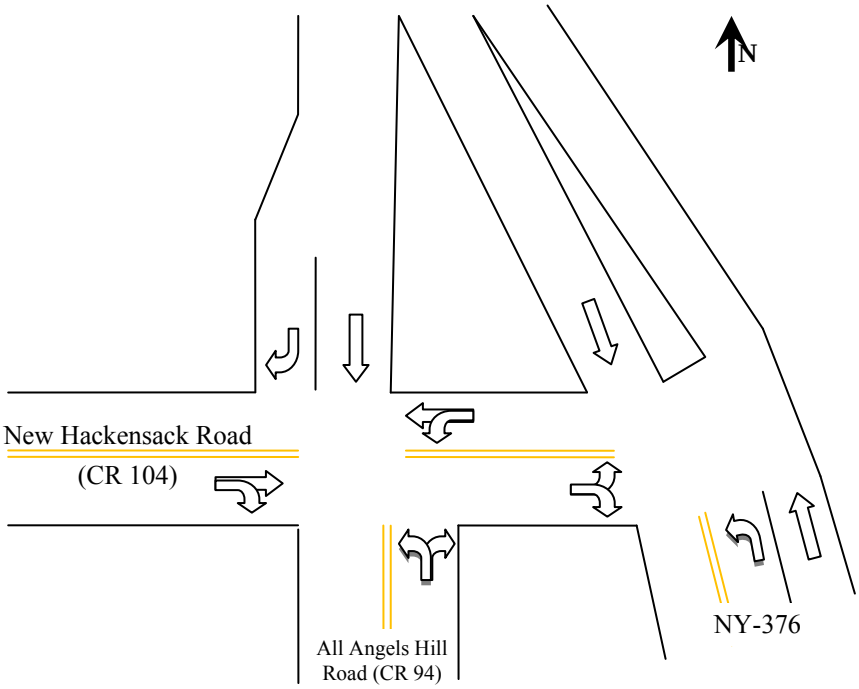


4.1.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of State Route 376 and New Hackensack Road (CR 104) for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following table:

TABLE 4								
SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE NEW HACKENSACK ROAD (CR 104) & NYS ROUTE 376								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
NEW HACKENSACK ROAD (CR 104)								
EB	L/R	10.9	B	11.6	B	11.8	B	**0.2**
NYS ROUTE 376								
NB	L	87.6	F	94.1	F	94.2	F	**0.1**
	T	39.3	D	39.7	D	39.6	D	**-0.1**
	OVERALL	57.2	E	59.9	E	59.9	E	**-**
SB	T	57.3	E	57.6	E	57.5	E	**-0.1**
INTERSECTION		**35.8**	**D**	**37.2**	**D**	**37.2**	**D**	**-**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY

NEW HACKENSACK ROAD (CR 104)								
EB	L/R	17.3	B	21.9	C	22.3	C	**0.4**
NYS ROUTE 376								
NB	L	99.2	F	111.1	F	111.3	F	**0.2**
	T	37.6	D	37.8	D	37.7	D	**-0.1**
	OVERALL	64.9	E	70.2	E	70.3	E	**0.1**
SB	T	59.6	E	60.3	E	60.0	E	**-0.3**
INTERSECTION		**38.9**	**D**	**43.0**	**D**	**43.1**	**D**	**0.1**

As can be seen in the above Table, lengthy delays will be experienced on the northbound and southbound NY 376 approaches with or without the proposed Project during the Peak AM and PM Hours. This is attributed to the relative long cycle length necessary to accommodate the phasing and timing of the two combined intersections: NY 376 and New Hackensack Road, and All Angels Hill Road and New Hackensack Road. Although the longer cycle length is necessary to increase intersection capacity and allow the two adjacent intersections to operate jointly, it also decreases the ratio of effective green time to cycle length for certain movements and therefore increases the delay times of those movements.

It should be noted that the change in No Build to Build delay time for any individual movement does not increase more than one second. As shown in the Table below, the highest percentage increase in traffic volumes from the projected 2015 No-Build Traffic Volumes due to the site generated traffic at this intersection, during either the Peak AM or Peak PM Hour is less than half of 1.0%.

TABLE 5
NO-BUILD AND BUILD TRAFFIC VOLUME COMPARISON AT NEW HACKENSACK ROAD (CR 104) & NEW YORK STATE ROUTE 376 (NY 376)

	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	1080	1305
2015 Build	1085	1309
Net Increase	5	4
Percentage	**0.46%**	**0.31%**

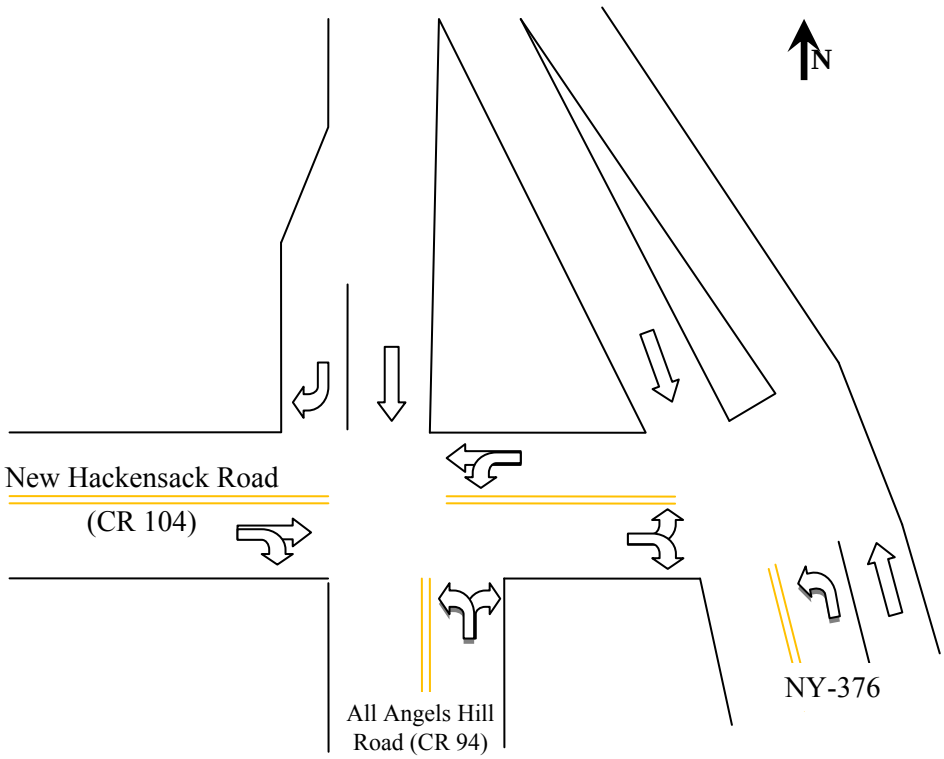
This volume increase does not significantly impact this intersection; therefore, the

project related impact may be characterized as minimal and in fact much less than that of the No-Build traffic volumes. No improvements are proposed for this intersection in order to mitigate project-related impacts. It should be noted that these Levels of Service reflect conditions during the peak hours, representing a worst-case scenario when traffic volumes are greatest. At all other non-Peak Hour times this intersection will operate at better-quality Levels of Service.

4.2 Location 2 - All Angels Hill Road (CR 94) & New Hackensack Road (CR 104)

4.2.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 93) and New Hackensack Road (CR 104) is a four-legged, signalized intersection. All Angels Hill Road (CR 93) forms the northbound and southbound approaches and New Hackensack Road (CR 104) forms the eastbound and westbound approaches. The northbound approach consists of a shared left-turn/right-turn lane and the southbound approach consists of a through lane and a right-turn lane. The eastbound approach consists of a shared through/right-turn lane and the westbound approach consists of a shared left-turn/through lane. It should be noted that the signal timing and phasing for this intersection is grouped with the adjacent intersection to the east, the intersection of NY 376 and New Hackensack Road (CR 104), due to the proximity of the two intersections. The following diagram illustrates the lane configuration at this intersection.



4.2.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and New Hackensack Road (CR 104) for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 6								
SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & NEW HACKENSACK ROAD (CR 104)								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
NEW HACKENSACK ROAD (CR 104)								
EB	T/R	52.8	D	54.4	D	54.5	D	**0.1**
WB	L/T	18.5	B	22.2	C	22.2	C	**-**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/R	47.2	D	48.0	D	48.1	D	**0.1**
SB	T	69.7	E	73.7	E	73.9	E	**0.2**
	R	58.6	E	59.4	E	59.3	E	**-0.1**
	OVERALL	65.7	E	68.6	E	68.7	E	**0.1**
INTERSECTION		**52.0**	**D**	**54.3**	**D**	**54.4**	**D**	**0.1**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
NEW HACKENSACK ROAD (CR 104)								
EB	T/R	72.6	E	83.3	F	83.5	F	**0.2**
WB	L/T	24.5	C	27.5	C	27.9	C	**0.4**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/R	49.1	D	50.6	D	50.8	D	**0.2**
SB	T	80.6	F	87.9	F	89.7	F	**1.8**
	R	58	E	58.4	E	58.3	E	**-0.1**
	OVERALL	73.2	E	78.2	E	79.6	E	**1.4**
INTERSECTION		**61.8**	**E**	**67.4**	**E**	**68.1**	**E**	**0.7**

As can be seen in the above Table, lengthy delays will be experienced on the eastbound and southbound approaches with or without the proposed project during the Peak AM and PM Hours. This is attributed to the relative long cycle length necessary to accommodate the phasing and timing of the two combined

intersections. Although the longer cycle length is necessary to increase intersection capacity and allow the two adjacent intersections to operate jointly, it also decreases the ratio of effective green time to cycle length for certain movements and therefore increases the delay times of those movements.

It should be noted that the change in No Build to Build delay time for any individual movement does not increase more than two seconds. As shown in the Table below, the highest percentage increase in traffic volumes from the projected 2015 No-Build Traffic Volumes due to the site generated traffic at this intersection, during either the Peak AM or Peak PM Hour is less than 1.0%.

TABLE 7
NO-BUILD AND BUILD TRAFFIC VOLUME COMPARISON AT ALL ANGELS HILL ROAD (CR 94) & NEW HACKENSACK ROAD (CR 104)

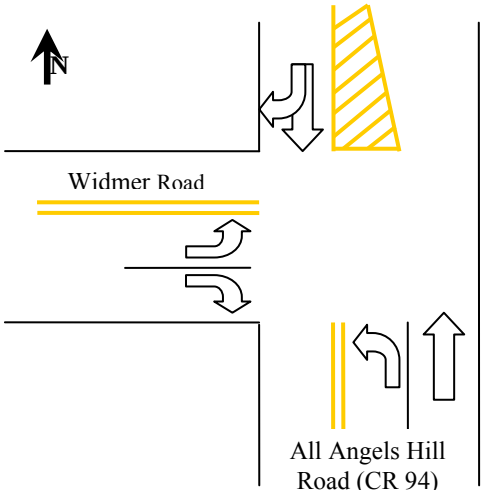
	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	1143	1444
2015 Build	1151	1454
Net Increase	8	10
Percentage	**0.70%**	**0.69%**

This volume increase does not significantly impact this intersection; therefore, the project related impact may be characterized as minimal and much less than that of the No-Build traffic volumes. No improvements are proposed for this intersection in order to mitigate project-related impacts. It should be noted that these Levels of Service reflect conditions during the peak hours, representing a worst-case scenario when traffic volumes are greatest. At all other non-Peak Hour times this intersection will operate at better-quality Levels of Service.

4.3 Location 3 - All Angels Hill Road (CR 94) & Widmer Road

4.3.1 Existing Geometry

The intersection of All Angels Hill Road (CR 94) and Widmer Road is a three-legged, stop sign controlled intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches to this intersection and feature free flowing traffic. Widmer Road forms the eastbound approach of this intersection and is currently controlled by a stop sign. The All Angels Hill Road northbound approach has a left-turn lane and a through lane, the All Angels Hill Road southbound approach to this intersection has a shared through/right-turn lane. The Widmer Road eastbound approach has to this intersection has a left-turn lane and a right-turn lane. The following diagram illustrates the lane configuration at this intersection.



4.3.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Widmer Road for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

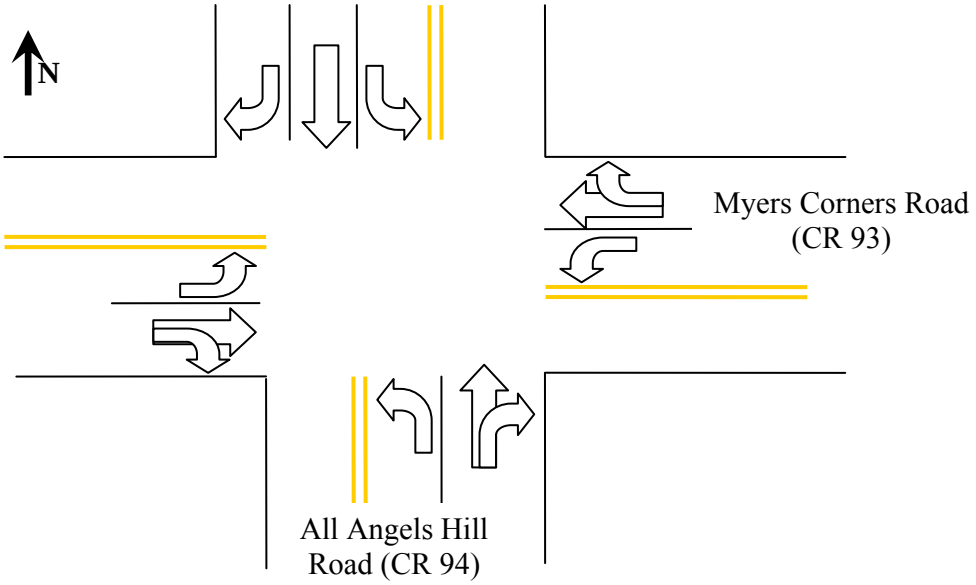
TABLE 8								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & WIDMER ROAD								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
WIDMER ROAD								
EB	L	12.0	b	12.5	b	12.6	b	**0.1**
ALL ANGELS HILL ROAD (CR 94)								
NB	L	3.2	a	3.2	a	3.2	a	**-**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
WIDMER ROAD								
EB	L	13.7	b	14.7	b	15.0	b	**0.3**
ALL ANGELS HILL ROAD (CR 94)								
NB	L	3.1	a	3.2	a	3.2	a	**-**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.4 Location 4 - All Angels Hill Road (CR 94) & Myers Corners Road (CR 93)

4.4.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 94) and Myers Corners Road (CR 93) is a four-legged, signalized intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches and Myers Corners Road (CR 93) forms the eastbound and westbound approaches. The northbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane and the southbound approach consist of a left-turn lane, a through lane and a right-turn lane. The eastbound and westbound approaches each consists of a left-turn lane and a shared through/right-turn lane. The following diagram illustrates the lane configuration at this intersection.



4.4.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Myers Corners Road (CR 93) for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 9

SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE
ALL ANGELS HILL ROAD (CR 94) & MEYERS CORNERS ROAD (CR 93)

PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
MEYERS CORNERS ROAD (CR 93)								
EB	L	14.3	B	15.5	B	15.7	B	**0.2**
	T/R	19.9	B	20.7	C	21.0	C	**0.3**
	OVERALL	18.1	B	19.0	B	19.3	B	**0.3**
WB	L	19.2	B	19.8	B	20.0	B	**0.2**
	T/R	29.9	C	31.9	C	32.2	C	**0.3**
	OVERALL	29.0	C	30.9	C	31.2	C	**0.3**
ALL ANGELS HILL ROAD (CR 94)								
NB	L	19.0	B	20.6	C	20.5	C	**-0.1**
	T/R	31.1	C	34.8	C	35.1	D	**0.3**
	OVERALL	27.6	C	30.7	C	30.9	C	**0.2**
SB	L	23.3	C	25.2	C	25.3	C	**0.1**
	T	30.8	C	33.5	C	33.8	C	**0.3**
	R	27.5	C	29.4	C	29.4	C	**-**
	OVERALL	28.2	C	30.5	C	30.7	C	**0.2**
INTERSECTION		**25.8**	**C**	**27.9**	**C**	**28.2**	**C**	**0.3**

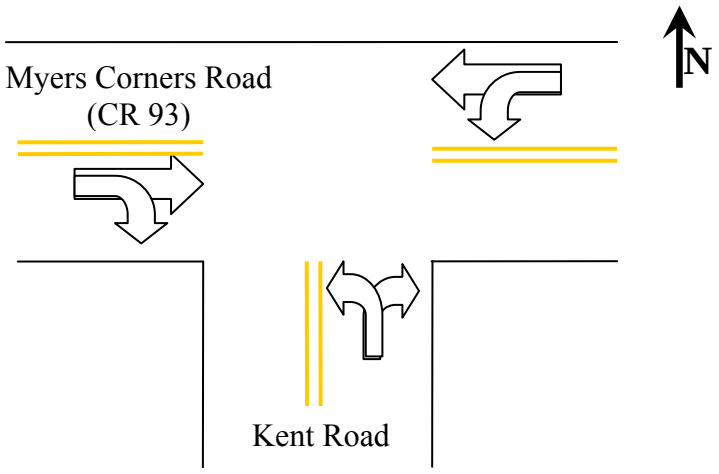
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
MEYERS CORNERS ROAD (CR 93)								
EB	L	18.0	B	20.5	C	21.2	C	**0.7**
	T/R	26.4	C	29.9	C	32.9	C	**3.0**
	OVERALL	24.1	C	27.3	C	29.7	C	**2.4**
WB	L	23.6	C	25.5	C	25.2	C	**-0.3**
	T/R	34.7	C	39.7	D	41.0	D	**1.3**
	OVERALL	34.0	C	39.0	D	40.0	D	**1.0**
ALL ANGELS HILL ROAD (CR 94)								
NB	L	24.2	C	25.6	C	24.9	C	**-0.7**
	T/R	40.8	D	45.4	D	44.1	D	**-1.3**
	OVERALL	37.7	D	41.6	D	40.5	D	**-1.1**
SB	L	21.5	C	24.1	C	23.3	C	**-0.8**
	T	29.1	C	30.9	C	30.4	C	**-0.5**
	R	25.6	C	26.9	C	26.3	C	**-0.6**
	OVERALL	26.0	C	27.9	C	27.3	C	**-0.6**
INTERSECTION		**29.3**	**C**	**32.6**	**C**	**33.1**	**C**	**0.5**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.5 Location 5 - Myers Corners Road (CR 93) & Kent Road

4.5.1 Existing Geometry

The intersection of Myers Corners Road (CR 93) and Kent Road is a three-legged, stop sign controlled intersection. Kent Road forms the northbound approach to this intersection and is currently controlled by a stop sign. Myers Corners Road (CR 93) forms the eastbound and westbound approaches of this intersection and feature free flowing traffic. The Kent Road northbound approach has a shared left-turn/right-turn lane. The Myers Corners Road eastbound approach of this intersection has a shared through/right-turn lane and the westbound approach has a shared left-turn/through lane. The following diagram illustrates the lane configuration at this intersection.



4.5.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of Myers Corners Road (CR 93) and Kent Road for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 10								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE MEYERS CORNERS ROAD (CR 93) & KENT ROAD								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
MEYERS CORNERS ROAD (CR 93)								
EB	T/R	0.0	a	0.0	a	0.0	a	-
WB	L/T	0.2	a	0.3	a	0.3	a	-
KENT ROAD								
NB	L/R	25.1	d	30.5	d	30.9	d	**0.4**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
MEYERS CORNERS ROAD (CR 93)								
EB	T/R	0.0	a	0.0	a	0.0	a	-
WB	L/T	0.6	a	0.7	a	0.7	a	-
KENT ROAD								
NB	L/R	25.1	d	30.6	d	31.1	d	**0.5**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

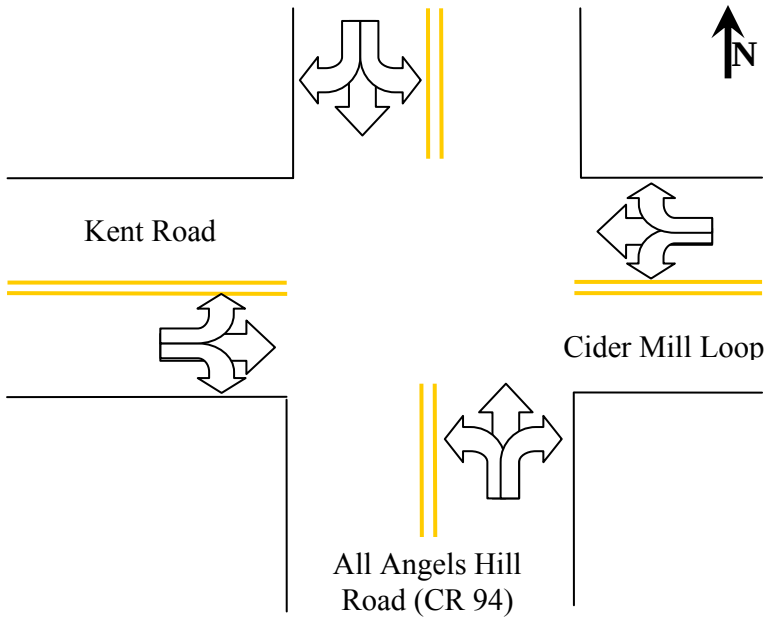
Note that this intersection was the subject of a County sponsored study and was identified as a candidate for future improvements. Those improvements are

discussed in more detail in Section 6 of this Study.

4.6 Location 6 - All Angels Hill Road (CR 94) & Kent Road/Cider Mill Loop

4.6.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 94) and Kent Road/Cider Mill Loop is a four-legged, two-way stop controlled intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches and feature free-flowing conditions. Kent Road forms the eastbound approach, and Cider Mill Loop forms the westbound approach. The eastbound and westbound approaches are stop-controlled. All approaches of this intersection have one lane and allow full movement. The following diagram illustrates the lane configuration at this intersection.



4.6.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Kent Road/Cider Mill Loop for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 11								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & KENT ROAD/CIDER MILL LOOP								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
KENT ROAD								
EB	L/T/R	13.1	b	14.2	b	14.5	b	**0.3**
CIDER MILL LOOP								
WB	L/T/R	15.1	c	16.7	c	17.0	c	**0.3**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	1.2	a	1.2	a	1.2	a	**-**
SB	L/T/R	0.0	a	0.0	a	0.0	a	**-**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
KENT ROAD								
EB	L/T/R	12.9	b	13.9	b	14.2	b	**0.3**
CIDER MILL LOOP								
WB	L/T/R	14.3	b	15.3	c	15.6	c	**0.3**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	1.7	a	1.8	a	1.9	a	**0.1**
SB	L/T/R	0.2	a	0.2	a	0.2	a	**-**

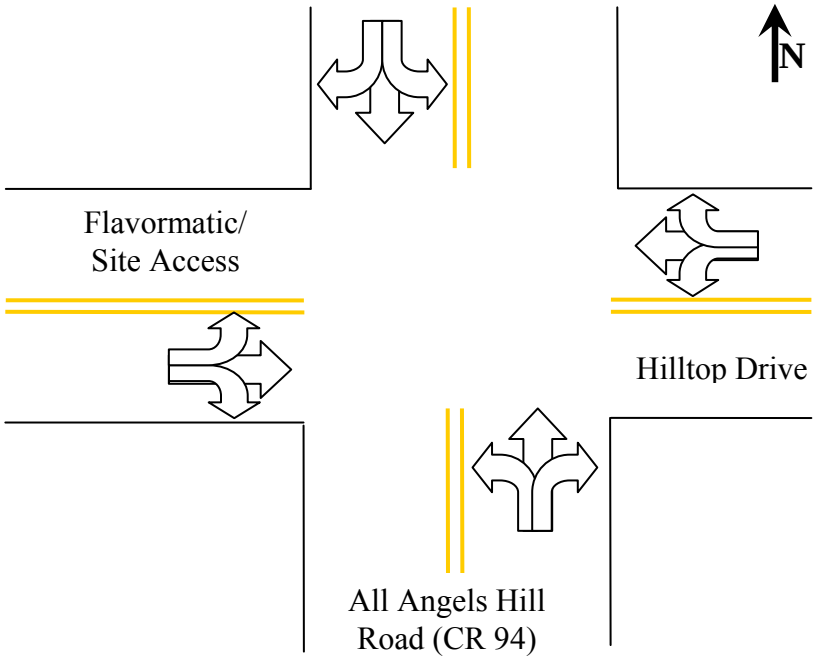
As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.7 Location 7 - All Angels Hill Road (CR 94) & Hilltop Drive/Site Driveway

4.7.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 94) and Hilltop Drive/Site Driveway is a four-legged, two-way stop controlled intersection. All Angels Hill

Road (CR 94) forms the northbound and southbound approaches and feature free-flowing conditions. The Site Driveway forms the eastbound approach, and Hilltop Drive forms the westbound approach. The eastbound and westbound approaches are stop-controlled. All approaches to this intersection have one lane and allow full movement. It should be noted that the eastbound approach will serve as the primary access point to the proposed site. The following diagram illustrates the lane configuration at this intersection.



4.7.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Hilltop Drive/Site Driveway for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

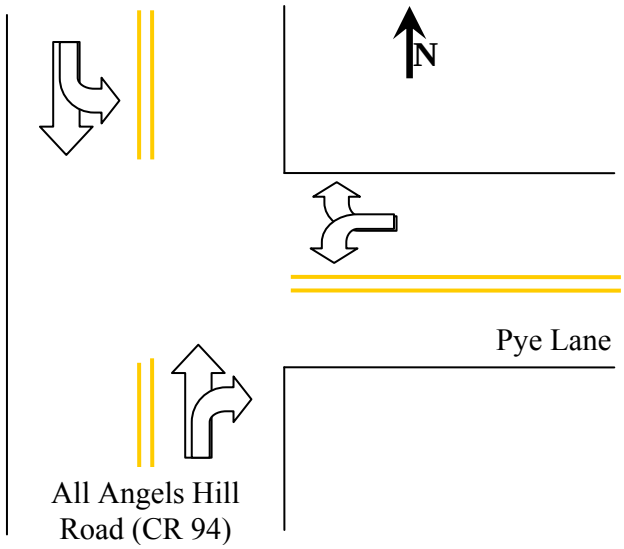
TABLE 12								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & SITE DRIVEWAY/HILLTOP DRIVE								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
SITE DRIVEWAY								
EB	L/T/R	0.0	a	0.0	a	14.6	b	**14.6**
HILLTOP DRIVE								
WB	L/T/R	11.5	b	12.0	b	12.3	b	**0.3**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	0.1	a	0.1	a	0.4	a	**0.3**
SB	L/T/R	0.2	a	0.2	a	0.2	a	**-**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
SITE DRIVEWAY								
EB	L/T/R	14.6	b	15.7	c	16.3	c	**0.6**
HILLTOP DRIVE								
WB	L/T/R	11.6	b	12.2	b	12.4	b	**0.2**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	0.0	a	0.0	a	0.6	a	**0.6**
SB	L/T/R	0.4	a	0.4	a	0.4	a	**-**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.8 Location 8 - All Angels Hill Road (CR 94) & Pye Lane

4.8.1 Existing Geometry

The existing intersection of All Angels Hill Road (CR 94) and Pye Lane is a three-legged, unsignalized, stop-controlled intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches to this intersection and feature free-flowing conditions. Pye Lane forms the westbound leg of this intersection. The northbound approach of All Angels Hill Road consists of a shared through/right-turn lane and the southbound approach consists of a shared left-turn/through lane. The westbound approach of Pye Lane is stop controlled and allows only left-turn and right-turn movements from a single lane. The following diagram illustrates the lane configuration at this intersection.



4.8.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Pye Lane for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

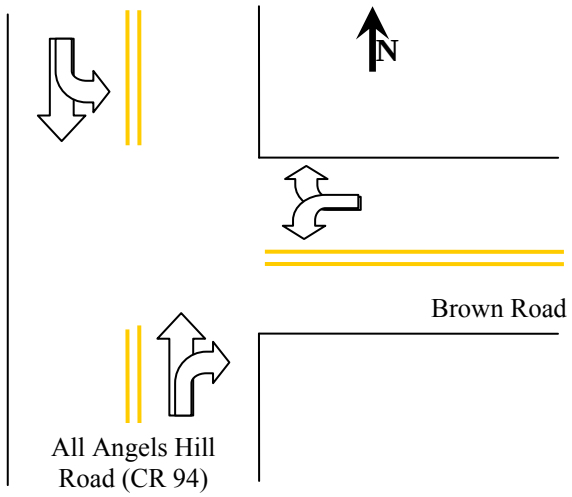
TABLE 13								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & PYE LANE								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
PYE LANE								
WB	L/R	14.7	b	15.6	c	16.0	c	**0.4**
ALL ANGELS HILL ROAD (CR 94)								
NB	T/R	0.0	a	0.0	a	0.0	a	-
SB	L/T	0.5	a	0.5	a	0.5	a	-
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
PYE LANE								
WB	L/R	15.4	c	16.4	c	17.0	c	**0.6**
ALL ANGELS HILL ROAD (CR 94)								
NB	T/R	0.0	a	0.0	a	0.0	a	-
SB	L/T	0.5	a	0.5	a	0.5	a	-

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.9 Location 9 - All Angels Hill Road (CR 94) & Brown Road

4.9.1 Existing Geometry

The existing intersection of All Angels Hill Road (CR 94) and Brown Road is a three-legged, unsignalized, stop-controlled intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches to this intersection and feature free-flowing conditions. Brown Road forms the westbound leg of this intersection and is under stop control. The northbound approach of All Angels Hill Road consists of a shared through/right-turn lane and the southbound approach consists of a shared left-turn/through lane. The westbound approach of Brown Road allows only left-turn and right-turn movements. The following diagram illustrates the lane configuration at this intersection.



4.9.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Brown Road for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 14								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & BROWN ROAD								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
BROWN ROAD								
WB	L/R	14.0	b	15.3	c	15.8	c	**0.5**
ALL ANGELS HILL ROAD (CR 94)								
NB	T/R	0.0	a	0.0	a	0.0	a	**-**
SB	L/T	0.4	a	0.5	a	0.5	a	**-**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
BROWN ROAD								
WB	L/R	20.3	c	24.6	c	26.3	d	**1.7**
ALL ANGELS HILL ROAD (CR 94)								
NB	T/R	0.0	a	0.0	a	0.0	a	**-**
SB	L/T	1.7	a	1.8	a	1.8	a	**-**

As illustrated in the Table above, this intersection will continue to operate at acceptable Levels of Service with or without the project during the Peak AM and PM Hours. However, a Level of Service change at this intersection is noted due to an increase in delay on the westbound approach during the Peak PM Hour.

As defined by the 2000 Highway Capacity Manual an intersection with a Level of Service "c" has an average control delay of 15.1 to 25.0 seconds per vehicle and is described as operating with average delays on minor turning movements. The analysis of the 2015 No-Build condition during the Peak PM Hour yields a Level of Service "c" with a delay time of 24.6 seconds per vehicle. The analysis of the 2015 Build condition during the Peak PM Hour yields a Level of Service "d" with a delay time of 26.3 seconds per vehicle. The delay time for the Build condition would increase from the No-Build condition by 1.7 seconds per vehicle. In the Build condition, which incorporates the addition of project-generated traffic, the delay time just exceeds the upper limit of the Level of Service "c" by 1.3 seconds

per vehicle. By comparison, the impact of the Build traffic volumes may be characterized as minimal and much less than that of the No-Build traffic volumes. As shown in the Table below, the highest percentage increase in traffic volumes from the projected 2015 No-Build Traffic Volumes due to the site generated traffic at this intersection, during either the Peak AM or Peak PM Hour, is less than 4.0%.

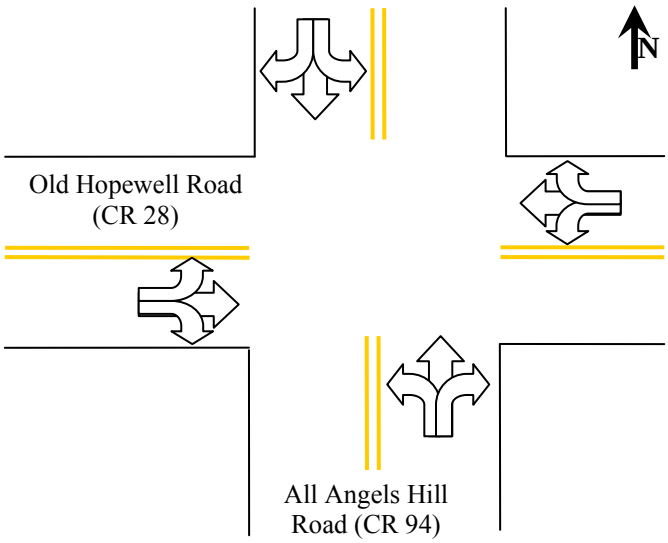
TABLE 15		
NO-BUILD AND BUILD TRAFFIC VOLUME COMPARISON AT ALL ANGELS HILL ROAD (CR 94) & BROWN ROAD		
	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	829	1050
2015 Build	860	1086
Net Increase	31	36
Percentage	**3.74%**	**3.43%**

This minimal volume increase does not significantly impact this intersection and therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.10 Location 10 - All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)

4.10.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28) is a four-legged, signalized intersection. All Angels Hill Road (CR 94) forms the northbound and southbound approaches; Old Hopewell Road (CR 28) forms the eastbound and westbound approaches. All approaches of this intersection have one lane and allow full movement. The following diagram illustrates the lane configuration at this intersection.



4.10.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28) for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

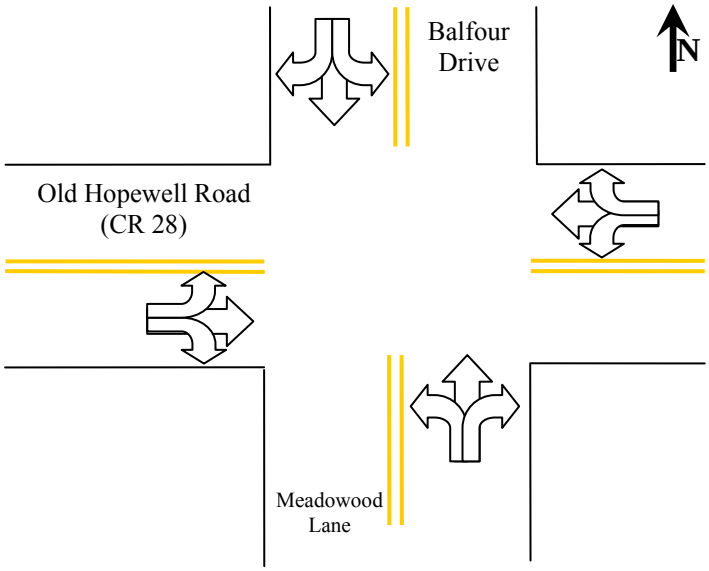
TABLE 16								
SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & OLD HOPEWELL ROAD (CR 28)								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	L/T/R	19.2	B	20.7	C	20.9	C	**0.2**
WB	L/T/R	17.3	B	18.1	B	18.2	B	**0.1**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	15.6	B	16.1	B	16.3	B	**0.2**
SB	L/T/R	28.8	C	38.4	D	43.3	D	**4.9**
INTERSECTION		**21.3**	**C**	**25.2**	**C**	**27.0**	**C**	**1.8**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	L/T/R	34.6	C	66.3	E	77.6	E	**11.3**
WB	L/T/R	31.8	C	44.4	D	46.8	D	**2.4**
ALL ANGELS HILL ROAD (CR 94)								
NB	L/T/R	18.1	B	19.3	B	19.5	B	**0.2**
SB	L/T/R	18.7	B	20.6	C	21.7	C	**1.1**
INTERSECTION		**27.2**	**C**	**40.1**	**D**	**43.9**	**D**	**3.8**

As illustrated in the Table above, this intersection will continue to operate at acceptable overall levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts. Note that this intersection was the subject of a County sponsored study and was identified as a candidate for future improvements. Those improvements and the resulting future Levels of Service are discussed in more detail in Section 6 of this Study.

4.11 Location 11 - Old Hopewell Road (CR 28) & Balfour Drive/Meadowood Lane

4.11.1 Existing Geometry

The intersection of the Old Hopewell Road (CR 28) and Balfour Drive/Meadowood Lane is a four-legged, two-way stop controlled intersection. Meadowood Lane forms the northbound approach, Balfour Drive forms the southbound approach, and Old Hopewell Road (CR 28) forms the eastbound and westbound approaches. The northbound and southbound approaches are stop-controlled. All approaches of this intersection have one lane and allow full movement. The following diagram illustrates the lane configuration at this intersection.



4.11.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of Old Hopewell Road (CR 28) and Balfour Drive for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

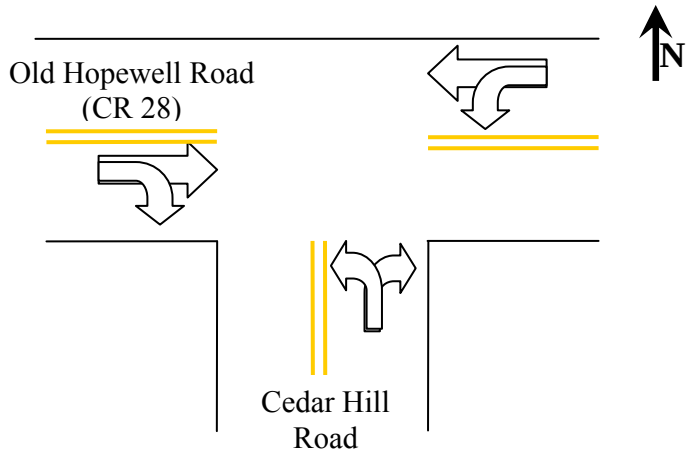
TABLE 17								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE OLD HOPEWELL ROAD (CR 28) & MEADOWOOD LANE/BALFOUR DRIVE								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	L/T/R	0.2	a	0.2	a	0.2	a	-
WB	L/T/R	0.1	a	0.1	a	0.1	a	-
MEADOWOOD LANE								
NB	L/T/R	11.0	b	11.2	b	11.3	b	**0.1**
BALFOUR DRIVE								
SB	L/T/R	14.8	b	15.8	c	15.9	c	**0.1**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	L/T/R	0.5	a	0.5	a	0.5	a	-
WB	L/T/R	0.1	a	0.1	a	0.1	a	-
MEADOWOOD LANE								
NB	L/T/R	20.2	c	22.3	c	22.4	c	**0.1**
BALFOUR DRIVE								
SB	L/T/R	21.0	c	23.3	c	23.4	c	**0.1**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.12 Location 12 - Old Hopewell Road (CR 28) & Cedar Hill Road

4.12.1 Existing Geometry

The intersection of Old Hopewell Road (CR 28) and Cedar Hill Road is a three-legged, stop sign controlled intersection. Cedar Hill Road forms the northbound approach to this intersection and is currently controlled by a stop sign. Old Hopewell Road (CR 28) forms the eastbound and westbound approaches of this intersection and feature free flowing traffic. Cedar Hill Road northbound approach has a shared left-turn/right-turn lane. The Old Hopewell Road eastbound approach of this intersection has a shared through/right-turn lane and the westbound approach has a shared left-turn/through lane. The following diagram illustrates the lane configuration at this intersection.



4.12.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of Old Hopewell Road (CR 28) and Cedar Hill Road for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 18								
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE OLD HOPEWELL ROAD (CR 28) & CEDAR HILL ROAD								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	T/R	0.0	a	0.0	a	0.0	a	-
WB	L/T	0.2	a	0.3	a	0.3	a	-
CEDAR HILL ROAD								
NB	L/R	16.4	c	18.4	c	18.5	c	**0.1**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
OLD HOPEWELL ROAD (CR 28)								
EB	T/R	0.0	a	0.0	a	0.0	a	-
WB	L/T	0.2	a	0.2	a	0.2	a	-
CEDAR HILL ROAD								
NB	L/R	23.2	c	28.4	d	28.7	d	**0.3**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts. Note that this intersection was the subject of a County sponsored study and was identified as a candidate for future improvements. Those improvements and the resulting future Levels of Service are discussed in more detail in Section 6 of this Study.

4.13 Location 13 - All Angels Hill Road (CR 94) & New York State Route 82 (NY-82)

4.13.1 Existing Geometry

The intersection of the All Angels Hill Road (CR 94) and New York State Route 82 (NY 82) is a three-legged, signalized intersection. All Angels Hill Road forms the southbound approach to this intersection. New York State Route 82 forms the eastbound and westbound approaches of this intersection. The All Angels Hill Road southbound approach has a shared left-turn/right-turn lane. The NY 82 eastbound approach of this intersection has a shared left-turn/through lane and the westbound approach has a shared through/right-turn lane. The following diagram illustrates the lane configuration at this intersection.

4.13.2 Capacity Analysis and Level of Service Results

Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and State Route 82 for the Existing, 2015 No-Build, and 2015 Build traffic volumes. The results of these analyses are shown in the following Table:

TABLE 19								
SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE ALL ANGELS HILL ROAD (CR 94) & NYS ROUTE 82								
PEAK AM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
ALL ANGELS HILL ROAD (CR 94)								
EB	L/R	13.3	B	18.3	B	19.0	B	**0.7**
NYS ROUTE 82								
NB	L/T	9.1	A	8.8	A	9.0	A	**0.2**
SB	T/R	7.2	A	6.5	A	6.5	A	**-**
INTERSECTION		**9.3**	**A**	**10.1**	**B**	**10.3**	**B**	**0.2**
PEAK PM HOUR								
APPROACH		**EXISTING**		**NO BUILD**		**BUILD**		**NO BUILD-BUILD DELAY CHANGE**
		DELAY	LOS	DELAY	LOS	DELAY	LOS	Δ DELAY
ALL ANGELS HILL ROAD (CR 94)								
EB	L/R	32.1	C	32.5	C	32.6	C	**0.1**
NYS ROUTE 82								
NB	L/T	15.3	B	38.6	D	43.4	D	**4.8**
SB	T/R	3.7	A	3.9	A	3.9	A	**-**
INTERSECTION		**14.3**	**B**	**27.1**	**C**	**29.7**	**C**	**2.6**

As illustrated in the Table above, this intersection will continue to operate at acceptable levels with or without the project during each peak hour. The traffic associated with the project will not have an adverse impact on this intersection as the overall Levels of Service will remain the same between the No-Build and Build conditions during both the AM and PM Peak Hours. Therefore, no improvements are proposed for this intersection in order to mitigate project-related impacts.

4.14 Overall Level of Service Summary

The Levels of Service summarized in the Tables in Section 4 of this report reflect conditions during peak hours, representing a worst-case scenario when combined background and site generated traffic volumes are at their highest levels. At all other non-peak times, all studied intersections will operate at better Levels of Service. In reviewing those Tables, it is noted that most of the intersections (10 out of 13) currently operate with relatively short delay times, and will continue to operate as well even with the addition of future traffic volumes. Three intersections currently operate at slightly worse Levels of Service, but will not be adversely impacted by site generated traffic.

Given the analyses results reported above, it is the considered professional opinion of TRC Engineers that since the traffic impacts associated with the completion of the Hilltop Village at Wappinger Senior Housing Development will have no significant impacts on the operating conditions of the adjacent roadways and intersection during the Peak Hours, no improvements to the roadways and intersections in the study area are needed in order to mitigate project-related impacts. In fact, the impacts of the Build traffic volumes would be less than that of the traffic increases associated with the future No-Build condition during these limited time frames.

SECTION 5 – QUEUE LENGTH EVALUATION

In addition to Level of Service analysis, evaluating queue lengths is another approach to measure traffic performance at a signalized intersection. A queue, as noted by the 2000 Highway Capacity Manual (HCM), forms when demand exceeds capacity at an approach to a signalized intersection at the start of an effective green period. Queue lengths are dependent on arrival patterns, service patterns, and system capacity. Queue analysis assumes a constant arrival rate and a "first in, first out" approach. The service pattern is dependent on the phase of the traffic signal. When a leg of an intersection has a red phase the service rate is zero – meaning that no cars are being serviced. When a green phase is presented and a queue exists, the service rate equals the saturation flow rate. However, if a queue does not exist the service rate is equal to the arrival flow rate – meaning that vehicles will be serviced as they approach the intersection.

Queue lengths can be estimated for planning purposes. However, in real-life situations arrival rates and services rates are constantly changing. Queuing is caused by service areas, such as toll booths or work zones, congestion or the arrival of vehicles on an approach during a red phase which prevents some vehicles from clearing the intersection during the next available green phase.

For the subject Project, the methodology to compute the queue length was based on the Institute of Transportation Engineers' (ITE) publication titled, "Transportation and Traffic Engineering Handbook", Second Edition. The methodology entails determining the maximum probable queue length approximated by the larger result of two formulas:

1) $n = q\mathrm{R}$
2) $n = q(\mathrm{R}/2 + d)$

In these formulas, n represents the average queue length (number of vehicles), q represents approach flow (veh/sec), R represents amount of red time (sec) and d represents average individual delay. Input parameters include vehicle volume, cycle length of signal, g/c ratio and delay time.

Queue analyses were conducted to identify the traffic impacts associated with the project and ensure that adequate storage capacity will be provided by the existing geometry. Appendix H contains storage lengths, if available, and queue lengths for all lane groups and movements under Existing, No-Build, and Build conditions. Queuing analyses were conducted for signalized study intersections with exclusive turning movements for the 2015 Build conditions during the AM and PM Peak Hours of the Adjacent Street. The results of the analyses for the critical turning movements are outlined in the following Table:

TABLE 20

COMPARISON OF NO-BUILD AND BUILD MAXIMUM QUEUE LENGTHS

	Storage Lane		Max Queue Length			
			AM Peak Hour		PM Peak Hour	
Roadway	**Movement**	**Length (feet)**	**No-Build (feet)**	**Build (feet)**	**No-Build (feet)**	**Build (feet)**
RT 376/CR 94	EB Left	250	275	275	350	350
CR 94/CR 104	SB Right	200	250	250	250	250
CR 94/CR 93	EB Left	300	75	75	125	125
	WB Left	100	25	25	25	25
	NB Left	200	75	75	75	75
	SB Left	200	50	50	125	125
	SB Right	200	175	175	175	175

The No-Build and Build maximum queue lengths were compared and the results of this comparison were examined to determine if the traffic generated by the proposed Project would have a significant impact on the queue lengths. The Table above shows that Project generated traffic would not change the calculated maximum queue lengths at key signalized intersections where there are exclusive storage lanes for turning traffic.

SECTION 6 – SUPPLEMENTAL ANALYSIS

6.0 Purpose

In the following supplemental analysis, TRC has evaluated the potential traffic impacts assuming the implementation of proposed future improvements as outlined by the County Traffic Engineer. Improvements along Meyers Corners Road (CR 93) were suggested in the CR 93 Corridor Study, prepared by Wilbur Smith Associates for the Poughkeepsie-Dutchess County Transportation Council, and the improvements along Old Hopewell Road (CR 28) were identified in the CR 28 Corridor Study.

It should be noted that the funding and timeline of the CR 93 improvements have not been established and there are no formal plans for the implementation of these potential short and long range improvements. The improvements along CR 28 are Federal-Aid Projects scheduled for implementation in 2014. TRC did not analyze the improvements along CR 93 due to the uncertainty of their implementation, as indicated by the County Engineer. However, at a time more immediate to the implementation of these improvements the County or other developers will provide further analysis regarding the impact of these improvements. Therefore, this supplemental analysis of only key CR 28 intersections has been added in order to provide the Town with a "broad-brush" estimate of likely potential future traffic conditions assuming implementation of the proposed future roadway improvements. For analysis purposes, a Design Year of 2015 has been utilized for the proposed Hilltop Village development.

6.1 Programmed Roadway Improvements

Based on information provided by the County Traffic Engineer and recent corridor studies there are several roadway improvements under consideration that are intended to benefit traffic conditions on roadways in the study area. The following is a brief summary of improvements being considered:

CR 93 Corridor Study

- At the intersection of All Angels Hill Road (CR 94) and Myers Corners Road (CR 93) it is proposed that this signalized intersection be converted to a roundabout. The Myers Corners Road (CR 93) eastbound approach and the All Angels Hill Road (CR 94) northbound approach would consist of 2 lanes. In addition, the westbound and southbound right-turning traffic would have a yield-controlled slip lane to bypass the roundabout.
- As a short-term improvement, at the intersection of Myers Corners Road (CR 93) and Kent Road it is proposed that Kent Road be re-striped/widened to accommodate an exclusive left-turn lane and a shared through/right turn lane. As a long-term solution, it is also proposed that a nearby southbound approach (Quakers Road) be realigned opposite Kent Road, thus creating a 4-legged intersection and Myers Corners Road (CR 93) eastbound would be re-striped/widened to accommodate an exclusive left-turn lane and a shared through/right turn lane. In addition to the realignments, it is also proposed that this new intersection be signal controlled.

CR 28 Corridor Study

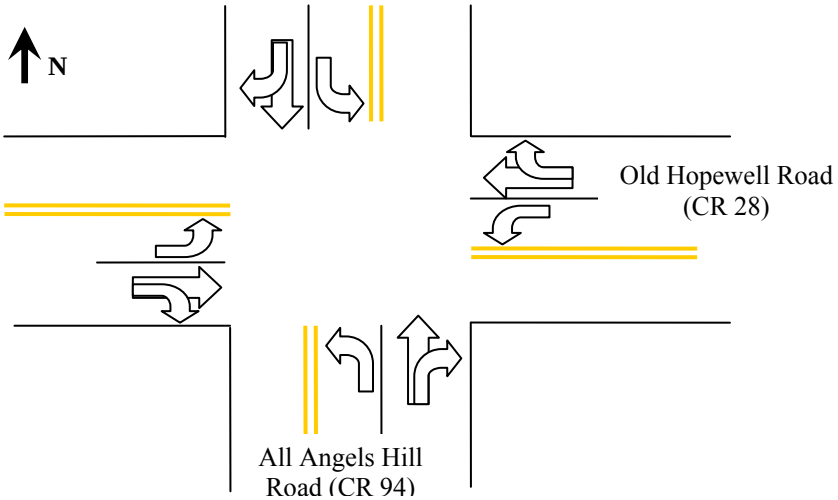
- At the intersection of Old Hopewell Road (CR 28) and All Angels Hill Road (CR 94) it is proposed that left-turn lanes be added to all legs of the intersection, the northbound approach would be realigned to accommodate a higher design speed, and that a fully-actuated traffic signal will be installed. It should be noted that additional improvements will be made to the linear section of CR 28. These improvements include pavement rehabilitation, the addition of paved 4-foot shoulders, consistent lane widths of 12 feet, a consistent clear zone of 4 feet, and the reduction of vertical curves to improve stopping sight distance.
- At the intersection of Old Hopewell Road (CR 28) and Cedar Hill Road it is proposed that Old Hopewell Road (CR 28) be widened to accommodate an exclusive westbound left-turn lane. In addition, it is proposed that the operational control at this intersection be changed from stop-controlled to semi-actuated signalization.

6.2 Capacity Analysis and Level of Service Results

The same capacity analysis methodology used for the proposed development program was applied in the Supplemental Analysis, but now accounting for the described geometric and operational improvements. The detailed analysis worksheets are contained in Appendix D.

6.2.1 All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)

The following diagram illustrates the lane configuration at this intersection with the above-noted future improvements.



Capacity analyses were conducted for the intersection of All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28) for the 2015 Build traffic volumes with and without the proposed future improvements. The results of these analyses are shown in the following Table:

TABLE 21

SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE
ALL ANGELS HILL ROAD (CR 94) & OLD HOPEWELL ROAD (CR 28)

PEAK AM HOUR

APPROACH		BUILD WITHOUT IMPROVEMENTS		BUILD WITH IMPROVEMENTS	
		DELAY	LOS	DELAY	LOS
OLD HOPEWELL ROAD (CR 28)					
EB	L/T/R	20.9	C		
	L			8.8	A
	T/R			11.5	B
	OVERALL	20.9	C	11.1	B
WB	L/T/R	18.2	B		
	L			8.0	A
	T/R			12.5	B
	OVERALL	18.2	B	12.4	B
ALL ANGELS HILL ROAD (CR 94)					
NB	L/T/R	16.3	B		
	L			8.3	A
	T/R			9.0	A
	OVERALL	16.3	B	8.9	A
SB	L/T/R	43.3	D		
	L			12.0	B
	T/R			10.1	B
	OVERALL	43.3	D	10.9	B
INTERSECTION		**27.0**	**C**	**11.0**	**B**

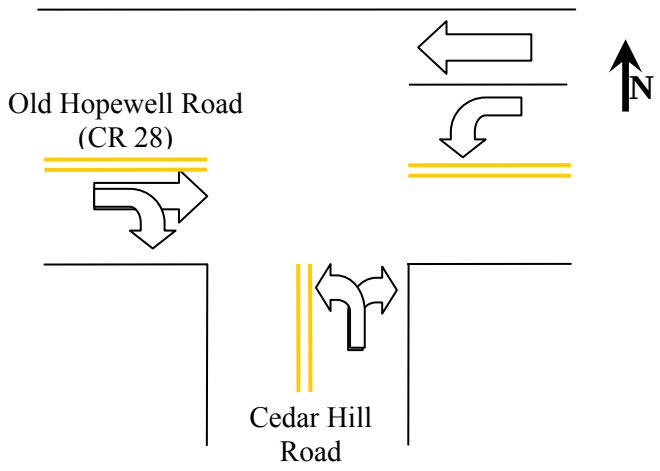
PEAK PM HOUR

APPROACH		BUILD WITHOUT IMPROVEMENTS		BUILD WITH IMPROVEMENTS	
		DELAY	LOS	DELAY	LOS
OLD HOPEWELL ROAD (CR 28)					
EB	L/T/R	77.6	E		
	L			12.4	B
	T/R			9.0	A
	OVERALL	77.6	E	9.8	A
WB	L/T/R	46.8	D		
	L			7.1	A
	T/R			18.0	B
	OVERALL	46.8	D	17.7	B
ALL ANGELS HILL ROAD (CR 94)					
NB	L/T/R	19.5	B		
	L			13.2	B
	T/R			18.7	B
	OVERALL	19.5	B	18.1	B
SB	L/T/R	21.7	C		
	L			15.1	B
	T/R			16.0	B
	OVERALL	21.7	C	15.8	B
INTERSECTION		**43.9**	**D**	**15.5**	**B**

As illustrated in the Table above, this intersection will operate at significantly better Levels of Service assuming the implementation of the proposed future improvements.

6.2.2 Old Hopewell Road (CR 28) & Cedar Hill Road

The following diagram illustrates the lane configuration at this intersection with the above-noted future improvements.



Capacity analyses were conducted for the intersection of Old Hopewell Road (CR 28) and Cedar Hill Road for the 2015 Build traffic volumes with and without the proposed future improvements. The results of these analyses are shown in the following Table:

TABLE 22					
SIGNALIZED INTERSECTION LEVEL OF SERVICE SUMMARY TABLE OLD HOPEWELL ROAD (CR 28) & CEDAR HILL ROAD					
PEAK AM HOUR					
APPROACH		**BUILD WITHOUT IMPROVEMENTS**		**BUILD WITH IMPROVEMENTS**	
		DELAY	LOS	DELAY	LOS
OLD HOPEWELL ROAD (CR 28)					
EB	T/R	0.0	a	4.0	A
WB	L/T	0.3	a		
	L			2.6	A
	T			4.3	A
	OVERALL	0.3	a	4.3	A
CEDAR HILL ROAD					
NB	L/R	18.5	c	18.6	B
INTERSECTION				**5.4**	**A**
PEAK PM HOUR					
APPROACH		**BUILD WITHOUT IMPROVEMENTS**		**BUILD WITH IMPROVEMENTS**	
		DELAY	LOS	DELAY	LOS
OLD HOPEWELL ROAD (CR 28)					
EB	T/R	0.0	a	4.8	A
WB	L/T	0.2	a		
	L			2.4	A
	T			4.6	A
	OVERALL	0.2	a	4.6	A
CEDAR HILL ROAD					
NB	L/R	28.7	d	20.0	C
INTERSECTION				**5.6**	**A**

As illustrated in the Table above, this intersection will operate at significantly better Levels of Service assuming the implementation of the proposed future improvements.

SECTION 7 – ACCESS SIGHT DISTANCE ANALYSIS

Sight Distance Analyses were performed for the proposed site driveway utilizing the sight distance criteria as established by the Dutchess County Department of Public Works (DCDPW) and the American Association of State Highway and Transportation Officials (AASHTO). TRC's sight distance analyses are described and summarized below.

A driver's ability to see ahead is of the utmost importance in the safe and efficient operation of a vehicle on a roadway. Vehicular conflicts at an intersection can be greatly reduced through the provision of proper sight distances. Two Types of sight distance are considered when constructing a new intersection: intersection sight distance and stopping sight distance.

Two aspects of **Intersection Sight Distance (ISD)** are taken into consideration to avoid conflicts at an intersection. The first aspect of intersection sight distance is the distance desired to allow drivers on the mainline to perceive the presence of potentially conflicting vehicles entering or crossing the roadway from the minor approach. This distance should permit sufficient time for the driver to either stop or adjust their speed to avoid colliding in the intersection. The second aspect of intersection sight distance allows drivers of stopped vehicles a sufficient view of the intersecting roadway to decide when to enter or to cross the intersecting roadway. The ISD is a recommended distance and is considered "desirable".

Stopping Sight Distance (SSD) allows the driver of the vehicle traveling at or near the posted speed limit to stop before reaching a stationary object. The stopping sight distance takes into account the brake reaction distance – the distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied – and the braking distance – the distance needed to stop the vehicle from the instant the brake application begins. The SSD is the minimum distance needed to avoid conflicts and is considered "required".

There are four key sight distance sightlines that are considered in an intersection's design as illustrated in Figure 11. These four key sightlines are described as follows:

Sightline 1 – The distance for a vehicle performing a left-turn maneuver exiting the Driveway looking to the right for approaching vehicles.

Sightline 2 – The distance for a vehicle performing a left- or right-turn maneuver exiting the Driveway looking to the left for approaching vehicles.

Sightline 3 – The stopping (rear end) sight distance for a vehicle on the main roadway turning left into the Driveway to be seen by a vehicle approaching from the same direction or the stopping sight distance for a vehicle on the main roadway traveling in the far lane to see a vehicle turning left exiting the Driveway.

Sightline 4 – The sight distance for a vehicle on the main roadway turning left into the Driveway, looking at vehicles approaching from the opposite direction.

According to the applied standards, the desirable setback distance from the edge of the traveled way or pavement is 14.5 feet when measuring for sightline distances. The posted speed limit along All Angels Hill Road is 40 mph. TRC conducted a Speed Study on Monday, November 12, 2011 of vehicles traveling northbound and southbound along All Angels Hill Road in the vicinity of the site driveway. Based on the data collected, the observed 85th percentile operational speed is 49 mph. The desirable and required sightline intersection sight distances were determined based on the 85th percentile operational speed along All Angels Hill Road utilizing 50 mph while the stopping sight distance was based upon the posted speed limit. The following Table illustrates the provided and desirable/required sightline distances at the site driveway.

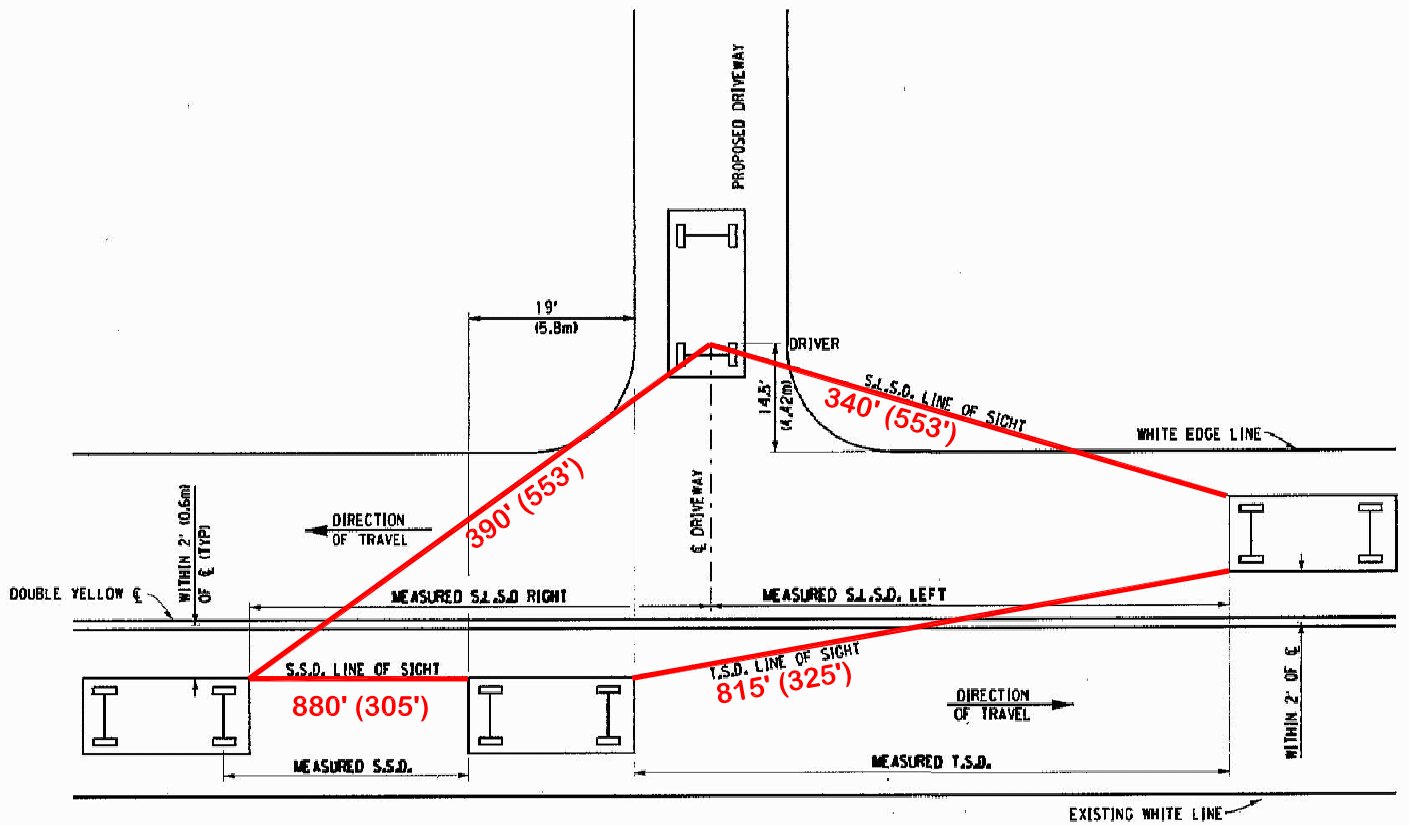
TABLE 23

SIGHTLINE DISTANCES (FEET)
INTERSECTION OF ALL ANGELS HILL ROAD (CR 94) & SITE ACCESS

Stop Line Sight Distances (SLSD) (Type: ISD)	Sightline 1	Provided	340’
		Desirable	553’
Stop Line Sight Distances (SLSD) (Type: ISD)	Sightline 2	Provided	390’
		Desirable	553’
Stopping Sight Distance (SSD) (Type: SSD)	Sightline 3	Provided	880’
		Required	305’
Turning Sight Distance (TSD) (Type: SSD)	Sightline 4	Provided	815’
		Required	325’

As illustrated in the table above, the provided SSDs exceed the required distances. However the sight distances available for vehicles exiting the driveway are less than the desirable values because currently they are obstructed by vegetation along the edge of the roadway. These sight line distances could be dramatically improved by the clearing of the vegetation. It should be noted that this vegetation is located along frontage of lots included in the proposed Project and therefore would be cleared as part of this development. Maintaining clear zones along the roadway both north and south of the access drive would allow the sight distance requirements to be exceeded, and those values are illustrated in Figure 12.

SIGHT DISTANCE MEASUREMENTS DETAIL
(NOT TO SCALE)



NOTES:

1. STOP LINE SIGHT DISTANCES (S.L.S.D.) AND TURNING SIGHT DISTANCE (T.S.D.) ARE MEASURED 42" (1.0m) ABOVE FINISHED DRIVEWAY SURFACE AND ROAD PAVEMENT SURFACE.

2. STOPPING SIGHT DISTANCE (S.S.D.) IS MEASURED FROM 42" (1.0m) ABOVE PAVEMENT (EYE HEIGHT) TO 24" ABOVE PAVEMENT (BRAKE LIGHT ELEVATION).

3. MINIMUM SIGHT DISTANCE MEASUREMENTS SHALL BE IN ACCORDANCE WITH THE "SIGHT DISTANCE REQUIREMENTS TABLE", FIG. 2.

KEY

X'(Y') Available (County Requirement)

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Driveway Sight Distances
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

Project No. 176817
Not to Scale
June 2011

Figure 11

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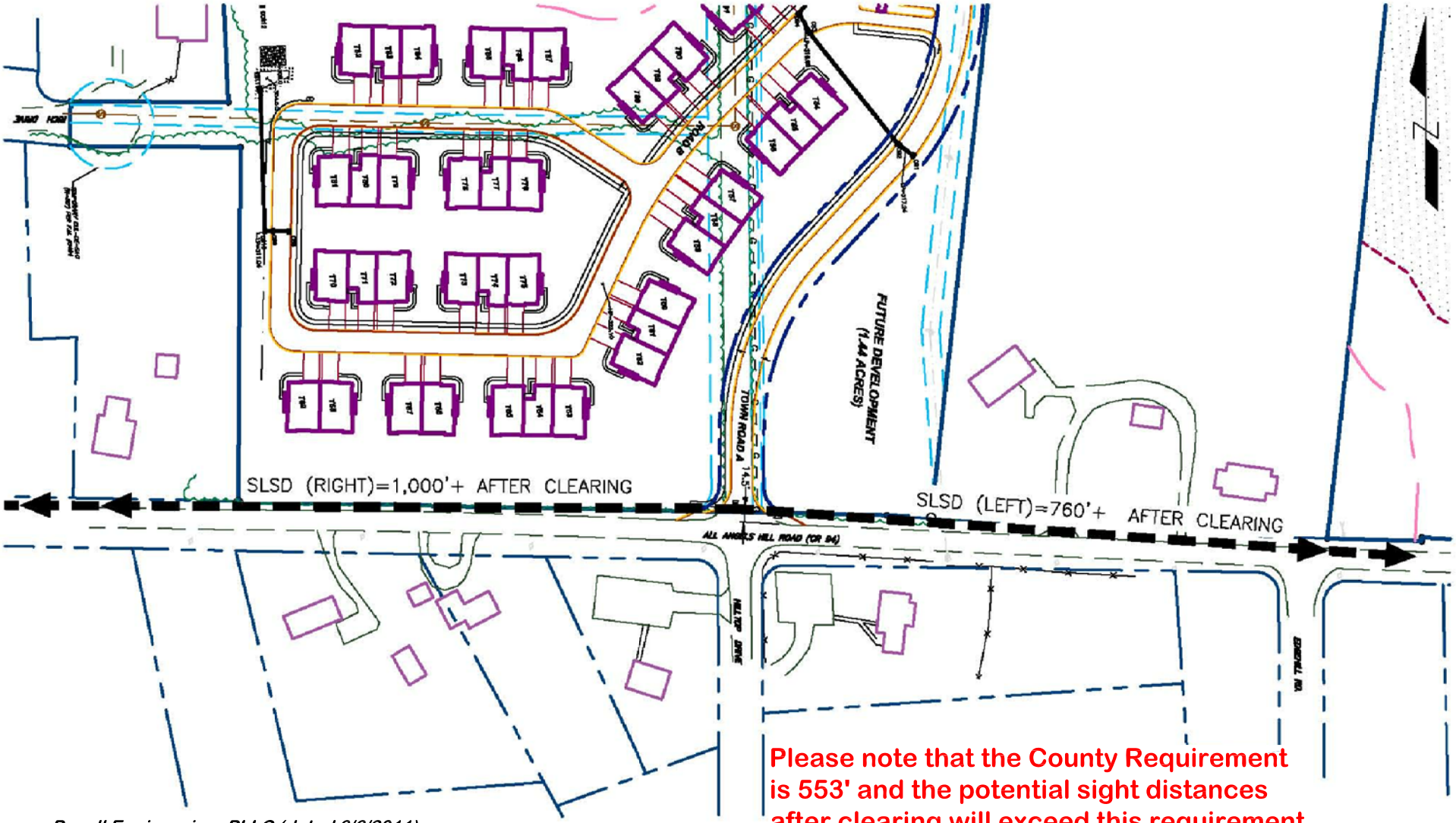

Source: Povall Engineering, PLLC (dated 6/6/2011)

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Potential Driveway Sight Distances
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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Figure 12

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SECTION 8 – ACCIDENT ANALYSIS

8.0 Methodology

A key method of evaluating the suitability of the adjacent roadway network to carry existing and projected traffic flows safely is to examine its accident history. TRC obtained accident records for the adjacent roadway network in order to identify any chronic safety issues, evaluate conditions that may have contributed to such issues and formulate possible improvements that could increase levels of safety. Figure 13 illustrates the study area. Copies of the 2008 – 2010 accident reports are contained in Appendix I.

Accident data for each of the study intersections was obtained from the New York State Department of Transportation (NYSDOT) Records Access Office. TRC obtained accident reports for the most recent complete three years (i.e. 2008 – 2010) at and within a reasonable distance (±500 feet - approximately ±0.1 miles) of the study intersections. In addition, TRC requested accident reports for the roadway links between study intersections. It should be noted that no accident reports for the roadway links between study intersections were received. Figure 14 illustrates the total number of yearly accidents at each study location.

As illustrated in Figure 14, the number of accidents in the area has remained generally consistent over the three-year period. The highest concentrations of accidents within the study area have occurred at the following intersections:

- All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28)
- All Angels Hill Road (CR 94) and Myers Corners Road (CR 93)
- All Angels Hill Road (CR 94) and New Hackensack Road (CR 104)
- All Angels Hill Road (CR 94) and New York State Route 82 (NY 82)

It is noted that the frequency of accidents at these locations is not considered unusual for similar suburban intersections with signal control and the levels of Average Daily Traffic.

Having obtained the relevant accident reports, the next step was to compare the accident history for this study area to Average State Accident Rates for similar roadways and intersections in

New York as published on the New York State Department of Transportation's (NYSDOT) website. These Accident Rates are based upon the number of annual accidents per Million Entering Vehicles (MEV) of that intersection. The Accident Rates are then categorized based on the cross-section geometry of the roadway.

The accident rate is based on the following equation: Rate = A/MEV, where A is the number of accidents and MEV is the number of vehicles (in millions) entering the intersection in the same time frame. MEV was calculated by multiplying the ADT in vehicles per day by 1,095 days. The recorded accidents were then divided by this MEV yielding the accident rate. Utilizing the Accident Reports obtained as well as the Automatic Traffic Recorder (ATR) information from NYSDOT a comparison can be made between the recent accident history and the Statewide Averages. The following Table shows the comparison of the intersection accident rate and the Average Rural State Accident Rates for the intersection based on the existing geometric configuration.

TABLE 24

ACCIDENT RATE COMPARISON

Intersection	Years	Number of Accidents	Average Daily Traffic (vehicles)	Intersection Accident Rate	NYSDOT Average Accident Rate*
All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)	3	18	17,258	0.95	0.43
All Angels Hill Road (CR 94) & Myers Corners Road (CR 93)	3	6	20,542	0.27	0.43
All Angels Hill Road (CR 94) & New Hackensack Road (CR 104)	3	8	14,213	0.51	0.43
All Angels Hill Road (CR 94) & New York State Route 82 (NY-82)	3	10	13,887	0.66	0.20

*Rates are for "rural" locations. The State also provides rates for "urban" conditions, which account for higher traffic volumes, significant levels of pedestrian and transit activity, and on-street parking. Such "urban" conditions are not exhibited by these study locations.

8.1 Results

The accidents on these sections of All Angels Hill Road, Myers Corners Road, New Hackensack Road, New York State Route 82, and Old Hopewell Road were mainly property damage only accidents. There were no fatal accidents at any of the intersections and a limited number of accidents involved injuries. There was one accident involving a pedestrian at the intersection of All Angels Hill Road and New Hackensack Road and one accident involving bicyclists at the

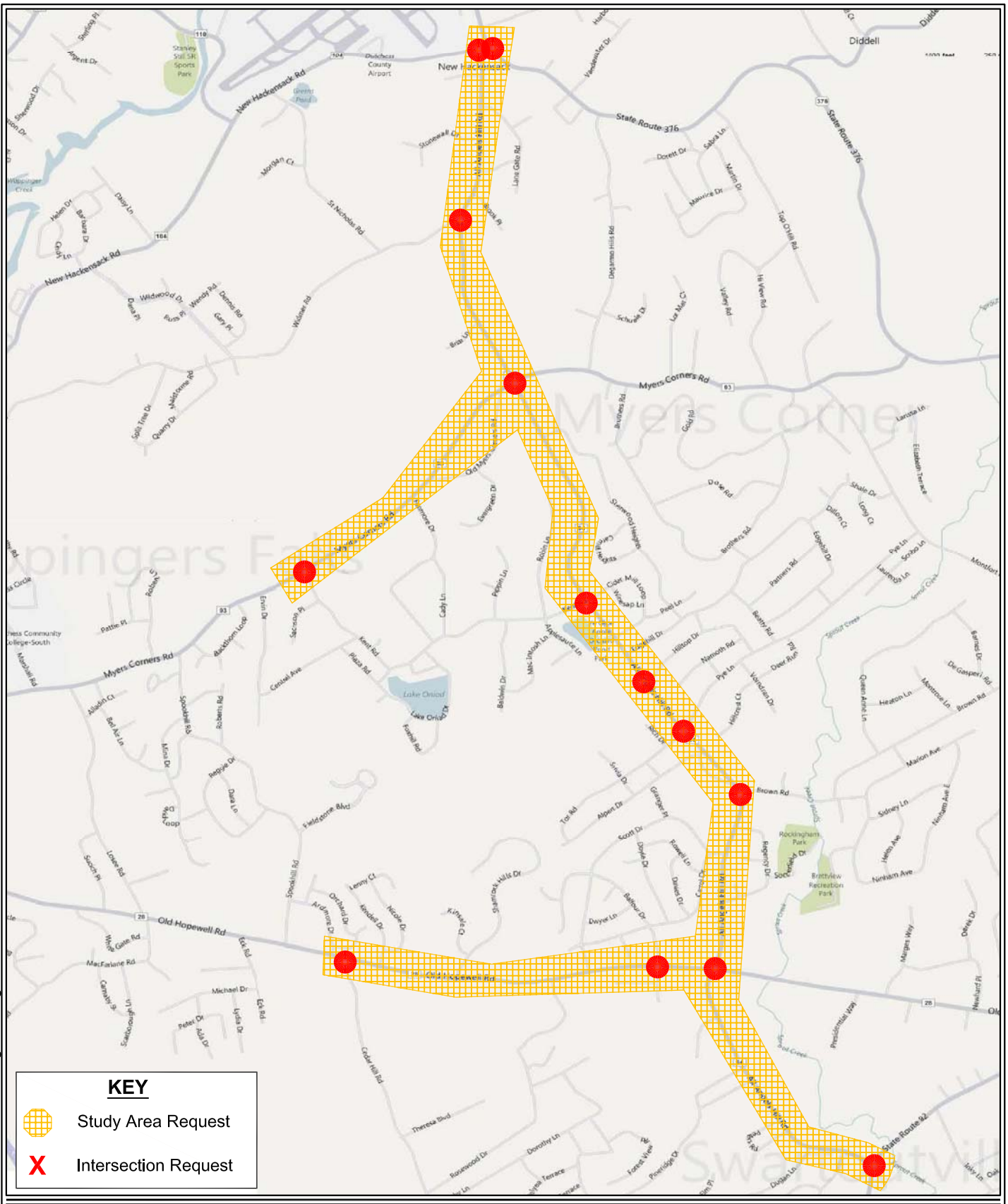
intersection of Myers Corners Road and Kent Road. However due to the infrequency and different location of occurrence of these accidents it can be concluded that there is no particular pattern or apparent factor that contributed to these accidents.

Based upon the review of the accident data, it can be concluded that the intersection of All Angels Hill Road and Myers Corners Road is a relatively safe location. The intersections of All Angels Hill Road and Old Hopewell Road, New Hackensack Road, and New York State Route 82 have rates higher than the statewide averages. However, upon review of the detailed accident reports, it has been determined that the types and frequencies of accidents at those signalized intersections are relatively typical, and do not represent significant safety deficiencies. Although the Project will add traffic to roadways within the study area, the addition of traffic at the higher accident frequency intersections noted above will be minimal – less than a 2% increase – spread throughout the Peak Hour.

TABLE NO. 25
PROJECT GENERATED TRAFFIC VOLUME INCREASE & PERCENT INCREASE

Intersection	AM Peak Hour		PM Peak Hour	
	Net Increase	***% Increase***	***Net Increase***	***% Increase***
All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)	26	1.82%	33	1.86%
All Angels Hill Road (CR 94) & New Hackensack Road (CR 104)	8	0.70%	10	0.69%
All Angels Hill Road (CR 94) & New York State Route 82 (NY-82)	12	1.08%	15	1.02%

Therefore, it can be further concluded that the projected amount of traffic to be generated by the Project will not significantly impact the accident history at the key study locations.



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Accident Analysis Study Area
Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

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Figure 13

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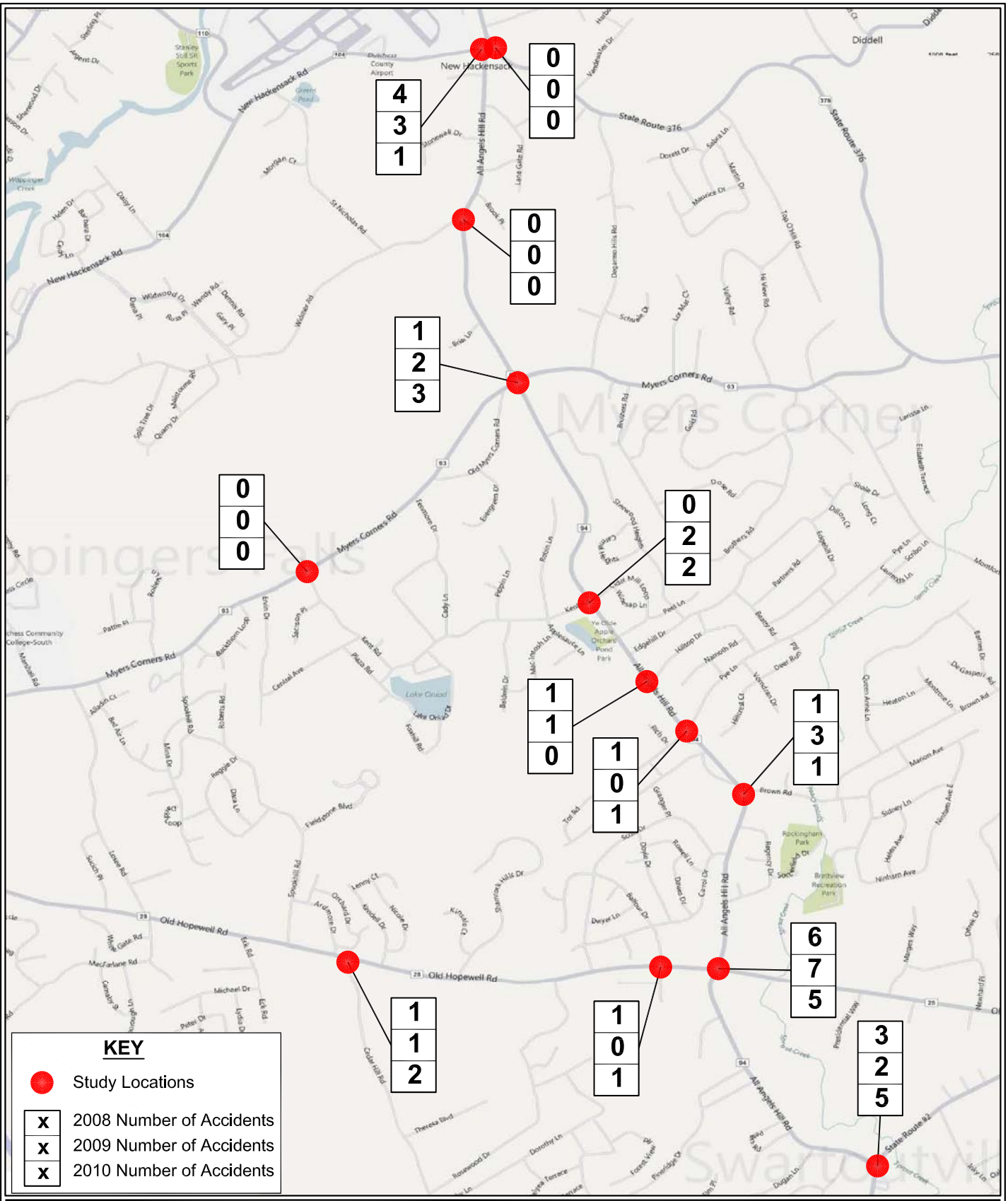

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Study Location Yearly Accident Data
Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

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Figure 14

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SECTION 9 – CONSTRUCTION TRAFFIC EVALUATION

Construction related traffic will arrive to and depart from the site using All Angels Hill Road. Construction traffic typically has two components; first, there will be heavy equipment used for various building operations such as excavation and fill work as well as the large trucks delivering materials to the site, and second, the vehicles driven by the construction crews.

Given the extent and type of building and site construction planned for the proposed Hilltop Village at Wappinger Senior Housing Development, heavy equipment will be brought up to the site once at the beginning of its associated phase, left on-site for the duration of that work then removed from the site when its phase is completed. Building material will be brought to the site in large truck-loads thereby limiting the number of trips along All Angels Hill Road. The number and types of vehicles would vary depending on the construction phase – cement trucks during the laying of concrete foundations, flatbed trucks carrying assorted material for walls, flooring and roofing, dump trucks loaded with asphalt during paving operations etc. These activities do represent an increase in truck trips over that currently traveling on All Angels Hill Road; however, the impact on the adjacent community will be temporary – when construction is completed, heavy truck activity will return to pre-construction levels.

The number of workers on-site also will vary depending on the type of work underway. Many workers will carpool and some building trades will send a number of workers to the site in a single van or equipment truck. For the site infrastructure portion, it is estimated that there would be eight to ten workers per day. There will be approximately three deliveries per day during this period. There will be more construction workers during the home construction phase.

For all construction phases, work hours will conform to all applicable local ordinances. Typical construction hours for work and deliveries will eb from 7:00 AM through 6:00 PM, Monday through Friday and from 8:00 AM through 5:00 PM on Saturday.

SECTION 10 – OTHER ACCESS CONSIDERATIONS

The purpose of this section is to analyze the impacts of the proposed Project providing access to the site via two full-movement driveways. The first proposed driveway would be located along All Angels Hill Road, as previously mentioned, and the additional driveway would be located along Shamrock Road and accessible via Old Hopewell Road. This scenario assumes that the emergency access would be used as a primary access. The Shamrock Road access would be gated and accessible only to residents residing at the proposed Project. The purpose of gating this access is to prevent traffic from cutting through the site when traveling to/from Old Hopewell Road and All Angels Hill Road.

All project traffic volumes have been based upon the previously developed traffic volumes in Section 3.5, with adjustment made for the arrival and departure distribution patterns to allow site-generated traffic from the south to access the site via the Shamrock Road access. Capacity analyses were conducted at the impacted intersections to identify potential traffic impacts associated with the addition of the Shamrock Access. The analyses were performed for the Build condition utilizing Synchro Studio 7.0 developed by TrafficWare.

It is the opinion of TRC that the minor distribution adjustments due to the Shamrock Road access would not be deemed significant and that the impacted intersections would operate at similar Levels of Service to the Build Levels of Services identified in Section 4.

SECTION 11 – CONCLUSIONS

Based upon the analysis undertaken in association with this Traffic Impact Study, it is the considered professional opinion of TRC Engineer that the traffic impacts associated with the completion of the Hilltop Village at Wappinger Senior Housing Development will have no significant impacts on the operating conditions of the adjacent roadways and intersection during the Peak Hours. The impacts of the Build traffic volumes would in fact be much less than that of the No-Build traffic volumes during these limited time frames. These Levels of Service reflect conditions during peak hours representing a worst-case scenario when traffic volumes are greatest; at all other non-Peak Hour times all intersection will operate at better Levels of Service. Therefore, no improvements are proposed for the intersections in the study area in order to mitigate project-related impacts.

Respectfully submitted,

TRC Engineers

Stephan A. Maffia, P.E.
Project Manager

Samira C. Fowler
Engineer

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Figures

Figure 1 – Site Location

Figure 2 – Roadway Posted Speed Limits

Figure 3 – Study Locations & Traffic Control

Figure 4 – Existing Traffic Volumes

Figure 5 – 2015 No-Build Traffic Volumes

Figure 6 – Arrival Distribution Pattern

Figure 7 – Departure Distribution Pattern

Figure 8 – Site-Generated Traffic Volumes

Figure 9 – 2015 Build Traffic Volumes

Figure 10 – Overall Level of Service Results

Figure 11 – Driveway Sight Distances

Figure 12 – Potential Driveway Sight Distances

Figure 13 – Accident Analysis Study Area

Figure 14 – Study Location Yearly Accident Data

Appendices

Appendix A – Proposed Site Plan

Appendix B – Timing Permits for Signalized Intersections

Appendix C – Observed Signal Timings at Signalized Intersections

Appendix D – Manual Count Data

Appendix E– Level of Service Standards

Appendix F – Capacity Analysis Worksheets

Appendix G –Detailed Capacity Analysis Result Tables

Appendix H – Queue Analysis Result Tables

Appendix I – Accident Data

APPENDIX A

Proposed Site Plan

PREPARED BY:

POVALL ENGINEERING, PLLC

HILLTOP VILLAGE AT WAPPINGER

SITE DEVELOPMENT PLAN

FIGURE 1.B-2

DATE: 12/2011

SCALE: 1"=350'

APPENDIX B

Timing Permits For Signalized Intersections

Intersection

Route 376 and New Hackensack Road (CR 104) and All Angels Hill Road (CR 94)

TE-26X

STATE OF NEW YORK - DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING & SAFETY DIVISION
TRAFFIC CONTROL SPECIFICATIONS

STUDY :
CONTRACT :
PIN :
FILE :

D - 129 / 129.1
SIGNAL NO(S)

DUTCHESS
COUNTY

INTERSECTION RTE. 376 @ ALL ANGELS / NEW HACKENSACK RD.

☐ CITY ☐ VILLAGE ☒ TOWN OF WAPPINGERS

Department Order filed _____ as Section 2013.29 Subdivision (f)

Prior specifications hereby superseded ☐ None ☒ January 17, 1991

Purpose : UPDATE OPERATIONS .

These specifications will be effective upon the ☐ Installation ☒ Modification of the necessary traffic control device(s) required by and conforming to the State Manual of Uniform Traffic Control Devices

I. This Signal shall

A. Operate in accordance with the Table of Operations and / of Change intervals as shown on page(s) 2 as a :

- ☐ Pretimed Signal
- ☐ Semi-traffic actuated signal
- ☒ Full-traffic actuated signal
- ☐ Pedestrian actuated signal
- ☐ Other _____

B.
- ☒ Display vehicular indications
- ☐ Display pedestrian indications
- ☒ Be equipped with vehicle detectors
- ☐ Be equipped with Pedestrian pushbuttons

as shown in the ☒ schematic ☐ scaled drawing on page 3

C. Be equipped with ☐ Pre-emption ☐ Interconnection and / or Coordination

Which are described as follows :

cc:
- (1) ☒ Main Office
- (1) ☒ Region 8 Traffic Engineer
- (2) ☒ ED MARSH
- (1) ☒ RES. 82

Date	Signature	Title
	W.D.F.	RTE

Installation Date 11/3/01

Modification Date _____

D -'129 / 129.1
SIGNAL NO(S)

DUTCHESS
COUNTY

DATE

TABLE OF OPERATION

PHASES	FACES							
	1 + 2	3	4 + 5	6 + 7	8 + 9	10 + 11	12 + 13	14 + 15
Ø 1	RED	←	RED	RED	RED	RED	RED	GREEN
Ø 1 FIRST CLEAR	RED	←	RED	RED	RED	RED	RED	GREEN
Ø 1 SECOND CLEAR	RED	←	RED	RED	RED	RED	RED	GREEN
Ø 1 THIRD CLEAR	RED	←	RED	RED	RED	RED	RED	YELLOW
Ø 1 FORTH CLEAR	RED	←	RED	RED	RED	RED	RED	RED
Ø 2	GREEN	←	RED	RED	GREEN	RED	RED	RED
Ø 2 FIRST CLEAR	YELLOW	←	RED	RED	YELLOW	RED	RED	RED
Ø 2 SECOND CLEAR	RED	←	RED	RED	RED	RED	RED	RED
Ø 5	RED	←	GREEN	RED	RED	RED	RED	RED
Ø 5 FIRST CLEAR	RED	←	YELLOW	RED	RED	RED	RED	RED
Ø 5 SECOND CLEAR	RED	←	RED	RED	RED	RED	RED	RED
Ø 3	RED	←	RED	RED	GREEN	GREEN	RED	RED
Ø 3 FIRST CLEAR	RED	←	RED	RED	YELLOW	YELLOW	RED	RED
Ø 3 SECOND CLEAR	RED	←	RED	RED	RED	RED	RED	RED
Ø 4	RED	←	RED	RED	RED	RED	GREEN	RED
Ø 4 FIRST CLEAR	RED	←	RED	RED	RED	RED	YELLOW	RED
Ø 4 SECOND CLEAR	RED	←	RED	RED	RED	RED	RED	RED
Ø 7	RED	←	RED	GREEN	RED	RED	RED	RED
Ø 7 FIRST CLEAR	RED	←	RED	GREEN	RED	RED	RED	RED
Ø 7 SECOND CLEAR	RED	←	RED	GREEN	RED	RED	RED	RED
Ø 7. THIRD CLEAR	RED	←	RED	YELLOW	RED	RED	RED	RED
Ø 7 FOURTH CLEAR	RED	←	RED	RED	RED	RED	RED	RED

FLASHING OPERATION	YELLOW	DARK	YELLOW	RED	~~YELLOW~~ RED	RED	RED	RED

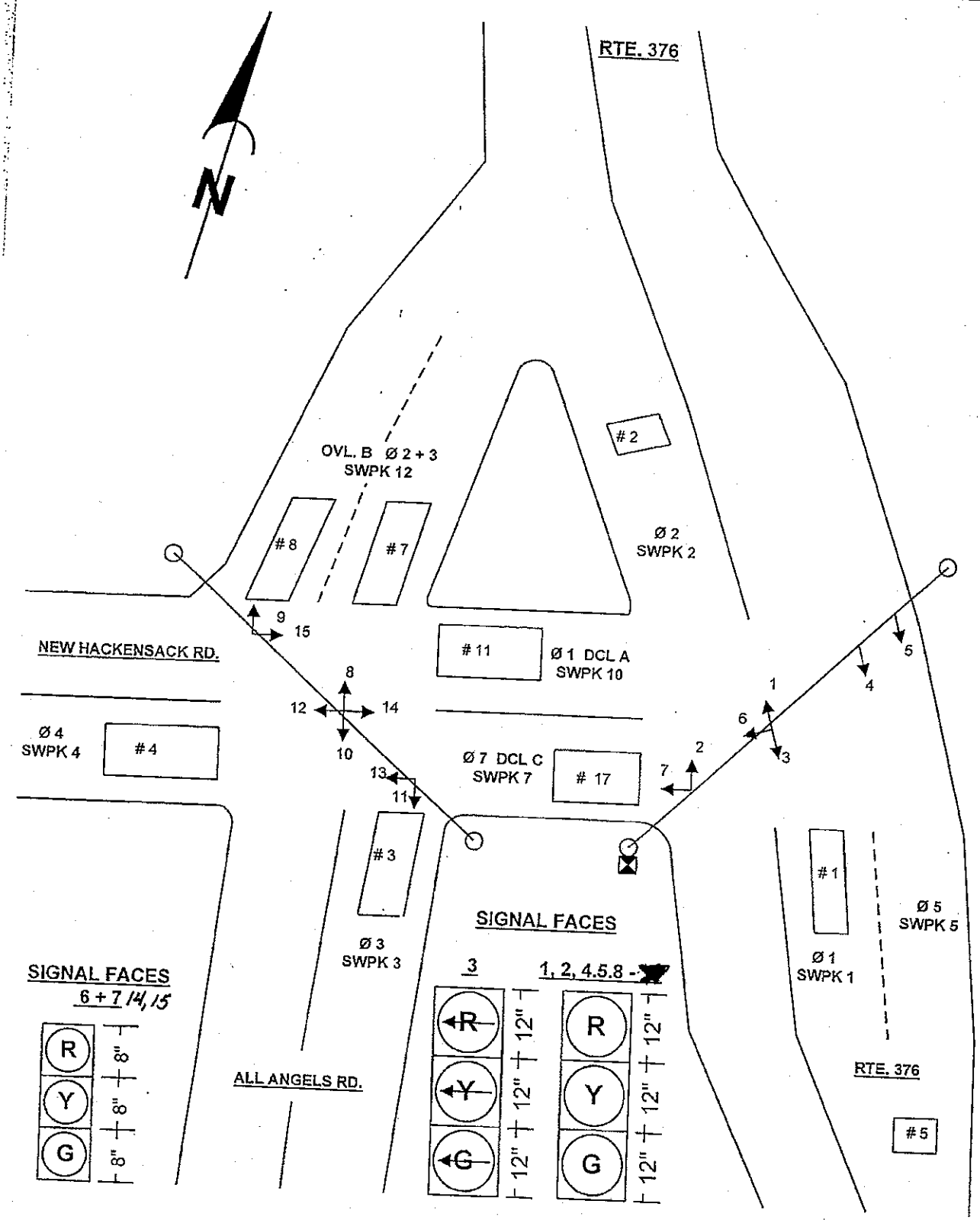
STATE OF NEW YORK - DEPARTMENT OF TRANSPORTATION
TRAFFIC AND SAFETY DIVISION
TRAFFIC CONTROL SIGNAL SPECIFICATIONS (CONTINUED)

STUDY:
CONTRACT:
PIN:
FILE:

D - 129 + 129.1
SIGNAL NO(S)

DUTCHESS
COUNTY

DATE



TE-261 (5/94)

MODEL 179 PHASE TIMING TABLE/FEATURSE SIGNAL OPERATION SPECIFICATION

STUDY :
CONTRACT :
PIN :
FILE :

SIGNAL # 129 COUNTY # DUTCHESS DATE

(NOTE: USE DECIMAL - EDIT KEY "E" FOR EDITING ALL LOCATIONS ON THIS PAGE)

PHASE TIMING DATA / TIMER INTERVALS

INTERVAL	PHASE / INT. #	Rte 376 N/B L T F1	Rte. 376 S / B F2	AllAngles Road F3	Hackensack Rd F4	Rte. 376 N / B F5	F6	Ph 3 + 4 DCL F7	F8
MEMORY / RECALL	00	000	000	000	000	000		000	
WALK	01								
PEDESTRIAN CLEARANCE	02								
INITIAL	03	005	005	005	005	005		005	
VARIABLE INITIAL	04								
VARIABLE INITIAL LIMIT	05								
TIME BEFORE REDUCTION	06								
TIME TO REDUCE	07								
MAXIMUM GAP	08	02.0	02.0	02.0	02.0	02.0		02.0	
MINIMUM GAP	09								
GAP CLOCK	10	USED WITH DAA ONLY				USED WITH DBB ONLY			
MAXIMUM GREEN 1	11	020	040	045	045	040		045	
MAXIMUM GREEN 2	12								
MAXIMUM GREEN 3	13								
RECALL GREEN	14	010	030	030	030	030		020	
YELLOW CLEARANCE	15	04.0	04.0	04.0	04.0	04.0		04.0	
RED CLEARANCE	16		01.0	01.0	01.0	01.0		01.0	
THIRD CLEARANCE	17	04.0						04.0	
FOURTH CLEARANCE	18	01.0						01.0	
INTERVALS	19 - 28	RESERVED FOR				FUTURE USE			
REDUCE BY	29	USED WITH DAA ONLY				USED WITH DBB ONLY			
EVERY	30	USED WITH DAA ONLY				USED WITH DBB ONLY			
CARS WAITING	31	USED WITH DAA ONLY				USED WITH DBB ONLY			

MEMORY / RECALL CODES: (MAY BE COMBINED)

MEMORY OFF	= 000
MEMORY ON	= 001
MINIMUN RECALL	= 002
RECALL GREEN	= 004
PED RECALL	= 008
RECALL TO MAX	= 016

NOTES :

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 10:55:18
++

TE 262-0 (11/95) MISCELLANEOUS PROGRAMMABLE DATA

TIMING/RANGE	FUNCTION	LOC.	TIME
IN SECONDS	STARTUP CLEARANCE TIMER A	2100	003
IN SECONDS	STARTUP CLEARANCE TIMER B	2101	
IN MINUTES	DETECTOR ANALYSIS TIME	2102	045
000 = GREEN GATING 001 = UNCONDITIONAL	UNCONDITIONAL DELAY/EXTENSION	2103	
IN SECONDS / 004-012	ALL RED STARTUP TIMER	2104	004
ENABLE = 000 DISABLE = 170	ACLINE FATAL ERROR SWITCH	2110	
ENABLE = 102 DISABLE = 000	DIAGNOSTIC MESSAGE CIRCULAR BUFFER (USED WITH GUARD)	2111	
001 - 255	MAXIMUM RANDOM INPUT INTERVAL	2115	
001 - 040	MAX NO OF PERMITTED DETECTORS	2116	
ENABLE = 099 DISABLE = 000	RANDOM INPUTS SWITCH WORD	2117	

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:00:00
++

TE 262-1 (11/95) MISCELLANEOUS PROGRAMMABLE DATA

DELAY TIMES - (DELAY TIME IN TENTHS OF SECONDS)

DETECTOR # 1	2140	03.0	DETECTOR #15	214E	
DETECTOR # 2	2141		DETECTOR #16	214F	
DETECTOR # 3	2142	03.0	DETECTOR #17	2150	03.0
DETECTOR # 4	2143	03.0	DETECTOR #18	2151	
DETECTOR # 5	2144		DETECTOR #19	2152	
DETECTOR # 6	2145		DETECTOR #20	2153	
DETECTOR # 7	2146	03.0	DETECTOR #21	2154	
DETECTOR # 8	2147	06.0	DETECTOR #22	2155	
DETECTOR # 9	2148		DETECTOR #23	2156	
DETECTOR #10	2149		DETECTOR #24	2157	
DETECTOR #11	214A	05.0	DETECTOR #25	2158	
DETECTOR #12	214B		DETECTOR #26	2159	
DETECTOR #13	214C		DETECTOR #27	215A	
DETECTOR #14	214D		DETECTOR #28	215B	

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:00:49
++

TE 262-2 (11/95) MISCELLANEOUS PROGRAMMABLE DATA (CONT.)

PRE-EMPTION - IN SECONDS	PREMPT A		PREMPT B		PREMPT C	
	LOC.	TIME	LOC.	TIME	LOC.	TIME
TIME BEFORE PRE-EMPTION	2180	___	2183	___	2186	___
EXTENSION TIME	2181	___	2184	___	2187	___
GUARANTEED GREEN TIME BEFORE	2182	002	2185	002	2188	002
CALL SELECT GREEN BEFORE					2189	___

TIMING/RANGE	MISCELLANEOUS FUNCTION	LOC.	TIME
IN SECONDS	PHASE SELECTION - GUARANTEED GREEN TIME	218A	002
IN SECONDS	EXCLUSIVE PED. WALK INTERVAL	218B	___
IN SECONDS	EXCLUSIVE PED. CLEARANCE INTERVAL	218C	___
IN SECONDS	@ OFFSET HOLD - SAFETY OVERRIDE	218D	___
IN SECONDS	@ OFFSET HOLD - EXTENSION	218E	050
IN SECONDS	PREEMPT C PED CLR MAX SAFETY TIMER	218F	___

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:00:57
++

TE 262-3 (11/95) MISCELLANEOUS PROGRAMMABLE DATA

TAPS EDIT PROTECT CODE		21DE	___
NO PROTECT	= 000		
TRAFFIC COUNTS	= 001		
PATTERN PHASING	= 002		
PATTERN TIMING	= 004		
TIMECLOCK TABLES	= 008		
SIGNAL PROGRAMMABLE FEATURES	= 016		
SIGNAL TIMING FEATURES AND FAILURE ALARMS	= 032		
EDIT ACCESS CODE - MUST BE CODED IN ORDER TO EDIT ALL OTHER PROG. FEATURES LOCATIONS		21DF	xxx
* * * MAY NOT BE IMPLEMENTED BY DESKTOP * * *			

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:01:05
++

TE 262-3A (11/95) MASTER TIMECLOCK PROGRAMMABLE DATA

001-012 001-012 001=FIRST 002=SECOND 003=THIRD 004=FOURTH 005=LAST OR FIFTH	BEGIN DAYLIGHT SAVINGS TIME MONTH END DAYLIGHT SAVINGS TIME MONTH BEGIN DAYLIGHT SAVINGS TIME WEEK OF MONTH END DAYLIGHT SAVINGS TIME WEEK OF MONTH	21EC 21ED 21EE 21EF	004 010 001 005
001 - 012 001 - 031 000 - 099 000 - 023 000 - 059 000 - 059 001 - 007 001 - 053 (READ ONLY)	*Use "C8" and "C9" commands to display	*MONTH OF YEAR *DAY OF MONTH *YEAR *HOUR OF DAY *MINUTE OF HOUR *SECOND OF MINUTE DAY OF WEEK WEEK OF YEAR	21F0 21F1 21F2 21F3 21F4 21F5 21F6 21F7	xxx xxx xxx xxx xxx xxx xxx xxx
001 = To portable card 002 = From portable card	TRANSFER MASTER CLOCK		21F8	xxx

* * * 21F0-21F8 NOT IMPLEMENTED. USE CLOCK DOWNLOAD FUNCTION. * * *

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150

DATE: 01/30/01 TIME: 11:01:13

++

TE 262-F (11/95)

FAILURE ALARM DATA

ALARM LOCATIONS			ALARM LOCATIONS			ALARM CODES
ALARM 00	F00	___	ALARM 16	F16	___	099=RTCA ERROR
ALARM 01	F01	___	ALARM 17	F17	___	098=EXCL. PED SWITCH ERROR
ALARM 02	F02	___	ALARM 18	F18	___	097=COMM. ERROR
ALARM 03	F03	___	ALARM 19	F19	___	083=TIMECLOCK ERROR
ALARM 04	F04	___	ALARM 20	F20	___	082=AC LINE ERROR
ALARM 05	F05	___	ALARM 21	F21	___	079=COORDINATION CONSISTANCY ERROR
ALARM 06	F06	___	ALARM 22	F22	___	0xx=HIGH OCC.
ALARM 07	F07	___	ALARM 23	F23	___	1xx=LOW OCC.
ALARM 08	F08	___	ALARM 24	F24	___	2xx=DETECTOR OVERRIDE
ALARM 09	F09	___	ALARM 25	F25	___	
ALARM 10	F10	___	ALARM 26	F26	___	
ALARM 11	F11	___	ALARM 27	F27	___	
ALARM 12	F12	___	ALARM 28	F28	___	
ALARM 13	F13	___	ALARM 29	F29	___	
ALARM 14	F14	___	ALARM 30	F30	___	
ALARM 15	F15	___	ALARM 31	F31	___	

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:11:18
++

TE 262-4 (11/95)

PROGRAMMABLE FEATURES

FUNCTION	PHASE WORD 8	4	2	1	8	4	2	1	LOC.	CODE
VEHICLE PHASES PERMITTED	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2200	EE
PEDESTRIAN PHASES PERMITTED	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2201	—
	SP	SP	SP	SP	SP	SP	SP	SP		
STARTUP A OUTPUT	3G	3Y	3R	2G	2Y	2R	1G	1R	2202	31
STARTUP A OUTPUT	6G	6Y	6R	5G	5Y	5R	4G	4R	2203	11
STARTUP A OUTPUT	9G	9Y	9R	8G	8Y	8R	7G	7R	2204	01
STARTUP A OUTPUT	12G	12Y	12R	11G	11Y	11R	10G	10R	2205	81
STARTUP A OUTPUT	-	-	-	-	7Y	1Y	10Y	4Y	2206	—
STARTUP A OUTPUT	14G	14Y	14R	13G	13Y	13R	-	-	2207	—
STARTUP B OUTPUT	3G	3Y	3R	2G	2Y	2R	1G	1R	2208	—
STARTUP B OUTPUT	6G	6Y	6R	5G	5Y	5R	4G	4R	2209	—
STARTUP B OUTPUT	9G	9Y	9R	8G	8Y	8R	7G	7R	220A	—
STARTUP B OUTPUT	12G	12Y	12R	11G	11Y	11R	10G	10R	220B	—
STARTUP B OUTPUT	-	-	-	-	7Y	1Y	10Y	4Y	220C	—
STARTUP B OUTPUT	14G	14Y	14R	13G	13Y	13R	-	-	220D	—
STARTUP PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	220E	60

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:12:26
++

TE 262-4A (11/95) PROGRAMMABLE FEATURES MISCELLANEOUS CONTROL WORDS

MISCELLANEOUS FUNCTIONS	(@ = NOT IMPLEMENTED BY TAPS)	LOC.	CODE
@ MANUAL CONTROL MODIFIER	ADVANCE = 01 HOLD = 02 EXCLUSIVE PED = 04	2210	—
@ REST POINT	BEFORE GAP = 00 AFTER GAP = 01	2211	—
DUAL RING MODIFIER	QUAD LEFT TURN OPERATION = 00 SPECIAL 6 PHASE SEQUENTIAL = 01	2212	—
CLEAR TABLE SELECTOR WORD	SIGNAL OPERATION FEATURES = 01 DAY PROGRAM = 02 YEAR PROGRAMMING TABLES = 04 PATTERN TIMING = 08 PATTERN PHASING = 10 TRAFFIC COUNT = 20 DIAGNOSTIC ERROR DATA = 40	2213	xx

* * * CLEAR TABLES FUNCTION NOT IMPLEMENTED BY DESKTOP. * * *

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:18:31
++

TE 262-5 (11/95) DETECTOR INPUT WORDS

INPUT NUMBER	LOC.	FUNC CODE	INPUT NUMBER	LOC.	FUNC CODE
INPUT # 1	2214	18	INPUT #16	2223	
INPUT # 2	2215	28	INPUT #17	2224	78
INPUT # 3	2216	~~38~~	INPUT #18	2225	—
INPUT # 4	2217	48	INPUT #19	2226	—
INPUT # 5	2218	58	INPUT #20	2227	—
INPUT # 6	2219		INPUT #21	2228	—
INPUT # 7	221A	38	INPUT #22	2229	—
INPUT # 8	221B	38	INPUT #23	222A	—
INPUT # 9	221C	—	INPUT #24	222B	—
INPUT #10	221D	—	INPUT #25	222C	—
INPUT #11	221E	18	INPUT #26	222D	—
INPUT #12	221F		INPUT #27	222E	—
INPUT #13	2220	38	INPUT #28	222F	—
INPUT #14	2221	—			
INPUT #15	2222	—			

INPUT FUNC CODES

PED BUTTON	= X2
CALLING DET	= X4
NORMAL DET	= X8
EX PED	= 02
PREEMPT C	= 21
PREEMPT B	= 41
PREEMPT A	= 81
ϕ SLCT OMT A	= B1
ϕ SLCT OMT B	= B2
ϕ SLCT OMT C	= B4
ϕ SLCT OMT D	= B8
CYCLE 1	= C8
CYCLE 2	= C9
CYCLE 3	= CA
SYNC	= CB
OFFSET 1	= CC
OFFSET 2	= CD
OFFSET 3	= CE
FREE	= CF

Loop #3 broken

Det. Input #13 used with MicroWave

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:20:41
++

TE 262-6 (11/95) INPUT CONTROL WORDS (CONT.)

FUNCTION									LOC.	CODE
INPUT JUMPING/SWITCHING NOTE: ANY INPUT FUNCTION CODE CAN BE USED AS A SECONDARY FUNCTION CODE.	SECONDARY FUNCTION - INPUT #1								223C	—
	SECONDARY FUNCTION - INPUT #2								223D	$\overline{74}$
	SECONDARY FUNCTION - INPUT #3								223E	74
	SECONDARY FUNCTION - INPUT #4								223F	—
	SECONDARY FUNCTION - INPUT #5								2240	$\overline{74}$
	SECONDARY FUNCTION - INPUT #6								2241	74
	SECONDARY FUNCTION - INPUT #7								2242	
	SECONDARY FUNCTION - INPUT #8								2243	
INPUT #1 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2244	—
INPUT #2 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2245	$\overline{FF}$
INPUT #3 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2246	FF
INPUT #4 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2247	—
INPUT #5 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2248	$\overline{FF}$
INPUT #6 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2249	FF
INPUT #7 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	224A	
INPUT #8 - SECOND PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	224B	
DETECTOR ANALYSIS										
LOW OCCUPANCY OVERRIDE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	224C	—
HIGH OCCUPANCY OVERRIDE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	224D	—
MISCELLANEOUS (@ = NOT IMPLEMENTED)										
@ OFFSET HOLD-PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	224E	—

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:23:18
++

TE 262-7 (10/96) OUTPUT CONTROL WORDS
COMBINE FUNCTION (X) AND SPECIFIER (Y) TO FORM CODE WORD (XY)

FUNCTION (X)	SPECIFIER (Y)	SWITCH PACK	LOC.	CODE
0 = PHASE	1-8 = PHASE			
1 = PED ***	1 (9) = PEDA 4 (C) = PEDD 2 (A) = PEDB 5 (D) = PEDE 3 (B) = PEDC 6 (E) = PEDF	SP1 SP2 SP3 SP4	2270 2271 2272 2273	01 02 03 04
2 = OVERLAP	1 = OVLA 4 = OVLD 2 = OVLB 5 = OVLE 3 = OVLC 6 = OVLF	SP5 SP6 SP7 SP8	2274 2275 2276 2277	05 $\overline{43}$ —
4 = DOUBLE CLR	1 = DCA 2 = DCB 3 = DCC 4 = DCD 5 = DCE 6 = DCF	SP9* SP10	2278 2279	— $\overline{41}$
6 = DC/OVL	1 = DC/OVLA 2 = DC/OVLB	SP11**	227A	
C = MASTER OUTPUTS (R/Y/G)	0 = UNUSED/OFF2/OFF3 C = CYC1/CYC2/CYC3 F = FREE/SYNC/OFF1	SP12 SP13 SP14	227B 227C 227D	$\overline{22}$ — —

NOTES: * SP9 (YELLOW) Outputs Aux Output by Timeclock
** SP11 (YELLOW) Outputs Blue Light
*** Choose value in () for solid yellow output during DON'T WALK

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:25:12
++

TE 262-7A (11/95)

OVERLAPS

FUNCTION	PHASE WORD 8	4	2	1	8	4	2	1	LOC.	CODE
OVERLAP A GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	227E	
OVERLAP B GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	227F	$\overline{48}$
OVERLAP C GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2280	
OVERLAP D GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2281	—
OVERLAP E GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2282	—
OVERLAP F GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2283	—
OVERLAP A CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2284	—
OVERLAP B CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2285	$\overline{48}$
OVERLAP C CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2286	
OVERLAP D CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2287	—
OVERLAP E CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2288	—
OVERLAP F CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2289	—
DC/OVL A DBL. CLEAR PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228A	—
DC/OVL B DBL. CLEAR PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228B	—
DC/OVL A OVL GREEN PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228C	—
DC/OVL B OVL GREEN PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228D	—
DC/OVL A CLEARANCE PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228E	—
DC/OVL B CLEARANCE PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228F	—

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:26:24
++

TE 262-8 (11/95)

OUTPUT CONTROL WORDS

FUNCTION	PHASE WORD 8	4	2	1	8	4	2	1	LOC.	CODE
PEDESTRIAN										
PEDESTRIAN A PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2290	—
PEDESTRIAN B PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2291	—
PEDESTRIAN C PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2292	—
PEDESTRIAN D PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2293	—
PEDESTRIAN E PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2294	—
PEDESTRIAN F PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2295	—
FLASHING WALK PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2296	—
PEDESTRIAN PHASE REST N WALK	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2297	—
EXTENDED PED CLEARANCE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2298	—
DOUBLE CLEARANCE										
DOUBLE CLEARANCE A PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2299	80
DOUBLE CLEARANCE B PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	229A	—
DOUBLE CLEARANCE C PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	229B	02
DOUBLE CLEARANCE D PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	229C	—
DOUBLE CLEARANCE E PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	229D	—
DOUBLE CLEARANCE F PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	229E	—

TE 262-13 (5/94)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # _____
PAGE 18 OF 20

SIGNAL # 129 COUNTY # Dutchess DATE 4/5/01

SWITCH PACK	FUNCTION	INDICATIONS	FACE	TERMINAL WIRING BOARD		FACE	TERMINAL WIRING BOARD	
				TERMINAL	WIRE COLOR CODE		TERMINAL	WIRE COLOR CODE
1	Ø1	←	3	SP 1 R	15/c black		SP 1 R	
		⊖		SP 1 Y	blue/black		SP 1 Y	
		←		SP 1 G	blue		SP 1 G	
		Ground Wire		Grnd Bus	black/white		Grnd Bus	
2	Ø2	red	1	SP 2 R	15/c red	2	SP 2 R	10/c red
		amber		SP 2 Y	yellow		SP 2 Y	yellow
		green		SP 2 G	green		SP 2 G	green
		Ground Wire		Grnd Bus	white		Grnd Bus	white
3	Ø3	red	* 10 & 11	SP 3 R	19/c red/black		SP 3 R	
		amber		SP 3 Y	yellow/black		SP 3 Y	
		green		SP 3 G	green/black		SP 3 G	
		Ground Wire		Grnd Bus	white/black		Grnd Bus	
4	Ø4	red	* 12 & 13	SP 4 R	19/c red/white		SP 4 R	
		amber		SP 4 Y	blue		SP 4 Y	
		green		SP 4 G	black		SP 4 G	
		Ground Wire		Grnd Bus	white/red		Grnd Bus	
5	Ø5	red	4	SP 5 R	5/c red	5	SP 5 R	5/c red
		amber		SP 5 Y	yellow		SP 5 Y	yellow
		green		SP 5 G	green		SP 5 G	green
		Ground Wire		Grnd Bus	white		Grnd Bus	white
6				SP 6 R			SP 6 R	
				SP 6 Y			SP 6 Y	
				SP 6 G			SP 6 G	
		Ground Wire		Grnd Bus			Grnd Bus	
7	Ø7 DCL. C	red	6	SP 7 R	15/c red/black	7	SP 7 R	10/c red/black
		amber		SP 7 Y	yellow/black		SP 7 Y	yellow/black
		green		SP 7 G	green/black		SP 7 G	green/black
		Ground Wire		Grnd Bus	white/black		Grnd Bus	white/black
8				SP 8 R			SP 8 R	
				SP 8 Y			SP 8 Y	
				SP 8 G			SP 8 G	
		Ground Wire		Grnd Bus			Grnd Bus	
9				SP 9 R			SP 9 R	
				SP 9 Y			SP 9 Y	
				SP 9 G			SP 9 G	
		Ground Wire		Grnd Bus			Grnd Bus	
10	Ø1 DCL. A	red	* 14 & 15	SP 10 R	19/c red/green		SP 10 R	
		amber		SP 10 Y	yellow/red		SP 10 Y	
		green		SP 10 G	green/white		SP 10 G	
		Ground Wire		Grnd Bus	blue/red		Grnd Bus	
11				SP 11 R			SP 11 R	
				SP 11 Y			SP 11 Y	
				SP 11 G			SP 11 G	
		Ground Wire		Grnd Bus			Grnd Bus	
12	Ø2 +Ø3	red	* 8 & 9	SP 12 R	19/c red		SP 12 R	
		amber		SP 12 Y	yellow		SP 12 Y	
		green		SP 12 G	green		SP 12 G	
		Ground Wire		Grnd Bus	white		Grnd Bus	
13				SP 13 R			SP 13 R	
				SP 13 Y			SP 13 Y	
				SP 13 G			SP 13 G	
		Ground Wire		Grnd Bus			Grnd Bus	
14				SP 14 R			SP 14 R	
				SP 14 Y			SP 14 Y	
				SP 14 G			SP14 G	
		Ground Wire		Grnd Bus			Grnd Bus	

* = HEADS 8,9,10,11,12,13,14,15 ..... 19 COND. RUNS TO AUX. CABINET FOR SPLICES

TE 262-14 (5/94)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # _____
PAGE 19 OF 20

SIGNAL # D - 129 / 129.1 COUNTY # DUTCHESS DATE _____

Conflict / Current Monitor Programming

Diodes to be Cut			CONFLICT MONITOR YELLOW JUMPERS TO BE INSTALLED	CURRENT MONITOR DIODES TO BE CUT
SP.1 - SP. 5				SP. 6 , 8 , 9 ,11, 13 + 14
SP. 1 - SP. 10				
SP. 2 - SP. 5				
SP. 2 - SP.12				
SP. 3 - SP. 7				
SP. 3 - SP.12				
SP. 4 - SP. 7				
SP. 5 - SP. 10				
SP. 5 - SP. 12				
SP. 7 - SP. 12				

NOTE : _____

TE 262-15 (5/94)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # _____
PAGE 20 OF 20

SIGNAL # D - 129 / 129.1 COUNTY # DUTCHESS DATE _____

TABLE OF INPUT WIRING

TERM. NUMBER	FUNCTION	DET. NO	DET. TYPE	DET. AN OVER	REMARKS
1A, 1B	Ø 1	1	PRES. LOOP		
2A, 2B	Ø 2	2	POINT LOOP		
3A, 3B	Ø 3	3	PRES. LOOP		
4A, 4B	Ø 4	4	PRES. LOOP		
5A, 5B	Ø 5	5	POINT LOOP		
6A, 6B					
7A, 7B	Ø 3	7	PRES. LOOP		
8A, 8B	Ø 3	8	PRES. LOOP		
9A, 9B					
10A, 10B					
11A, 11B	Ø 1	11	PRES. LOOP		
12A, 12B					
13A, 13B					
14A, 14B					
15A, 15B					
16A, 16B					
17A, 17B	Ø 7	17	PRES. LOOP		
18A, 18B					
19A, 19B					
20A, 20B					
21A, 21B					
22A, 22B					
23A, 23B					
24A, 24B					
25A, 25B					
26A, 26B					
27A, 27B					
28A, 28B					

CCS = 82A Signal # = 129 Rte = 376 Rte Seq # = 150
DATE: 01/30/01 TIME: 11:28:02
++

TE 264-2 (11/95)

TABLE OF WEEK PROGRAMS

WEEK #		001	002	003	004	005	006	007	008	009	010
DAY	CODE	d01	d02	d03	d04	d05	d06	d07	d08	d09	d10
SUN	1	001	___	___	___	___	___	___	___	___	___
MON	2	001	___	___	___	___	___	___	___	___	___
TUES	3	001	___	___	___	___	___	___	___	___	___
WED	4	001	___	___	___	___	___	___	___	___	___
THUR	5	001	___	___	___	___	___	___	___	___	___
FRI	6	001	___	___	___	___	___	___	___	___	___
SAT	7	001	___	___	___	___	___	___	___	___	___

Intersection

All Angels Hill Road (CR 94) and Myers Corners Road (CR 93)

CCS = 82D Signal # = TSP37 Rte = ALLA Rte Seq # = 001
DATE: 08/07/98 TIME: 08:18:09
++

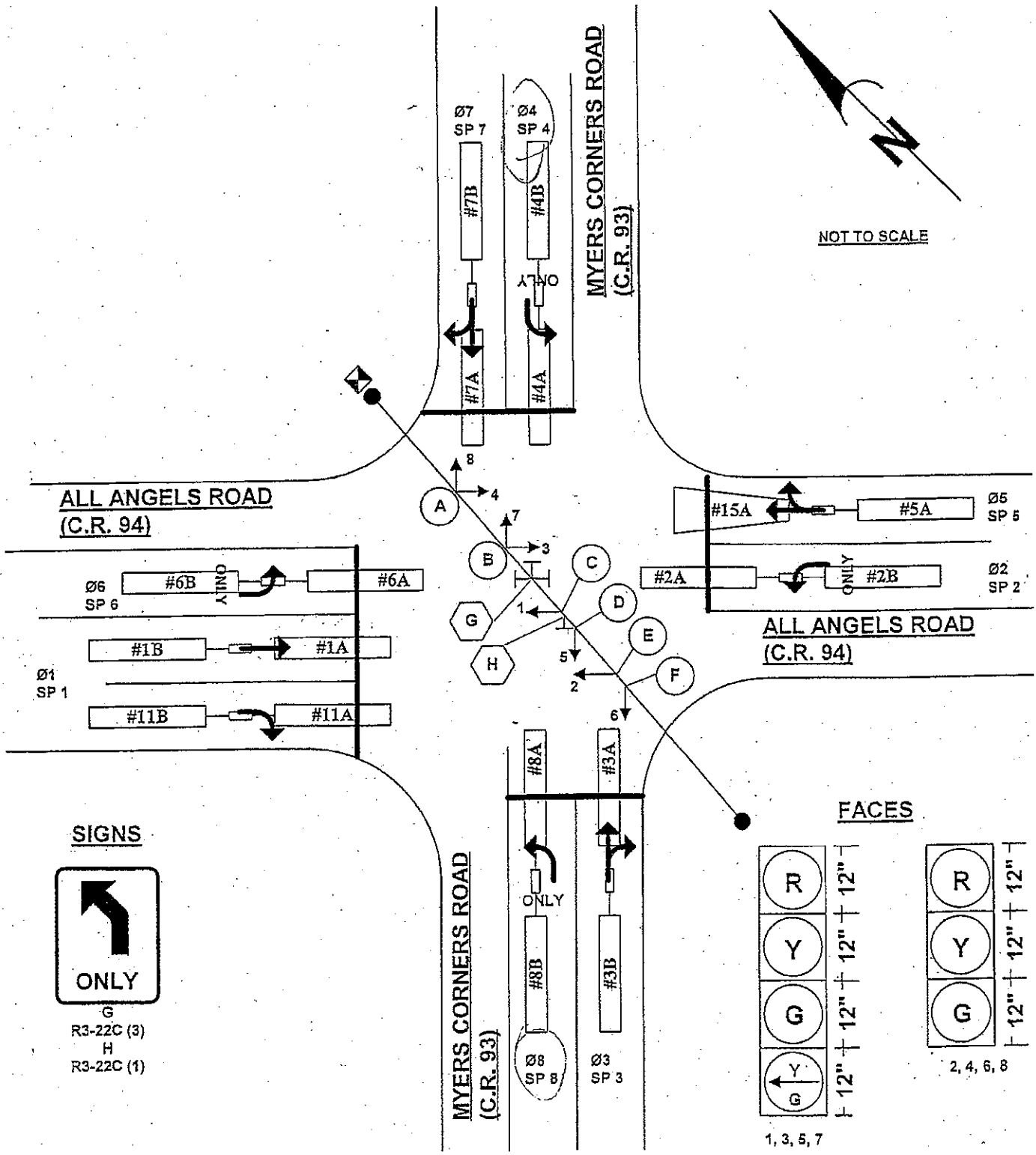
TE 261 (11/95) PHASE TIMING DATA/TIMER INTERVALS

INTERVAL	PHASE/ INT. #	F1	F2	F3	F4	F5	F6	F7	F8
MEMORY/RECALL	00	003	000	000	000	003	000	000	000
WALK	01	___	___	___	___	___	___	___	___
PEDESTRIAN CLEARANCE	02	___	___	___	___	___	___	___	___
INITIAL	03	010	002	002	002	010	002	002	002
VARIABLE INITIAL	04	__._	__._	__._	__._	__._	__._	__._	__._
VARIABLE INIT. LIMIT	05	050	050	050	050	050	050	050	050
TIME BEFOR REDUCTION	06	___	___	___	___	___	___	___	___
TIME TO REDUCE	07	___	___	___	___	___	___	___	___
MAXIMUM GAP	08	03.0	03.0	03.0	03.0	03.0	03.0	03.0	03.0
MINIMUM GAP	09	__._	__._	__._	__._	__._	__._	__._	__._
GAP CLOCK	10	USED	WITH	DAA	ONLY	USED	WITH	DBB	ONLY
MAXIMUM GREEN 1	11	030	015	030	015	015	030	030	015
MAXIMUM GREEN 2	12	___	___	___	___	___	___	___	___
MAXIMUM GREEN 3	13	___	___	___	___	___	___	___	___
RECALL GREEN	14	020	010	020	010	010	020	020	010
YELLOW CLEARANCE	15	05.0	05.0	05.0	05.0	05.0	05.0	05.0	05.0
RED CLEARANCE	16	01.0	01.0	01.0	01.0	01.0	01.0	01.0	01.0
THIRD CLEARANCE	17	__._	__._	__._	__._	__._	__._	__._	__._
FOURTH CLEARANCE	18	__._	__._	__._	__._	__._	__._	__._	__._
		F1	F2	F3	F4	F5	F6	F7	F8

SIGNAL IMPROVEMENTS
D 257300
PIN 8755.34.121

TRAFFIC CONTROL SIGNAL SPECIFICATIONS (CONTINUED)

37 SIGNAL NO(S) | DUTCHESS COUNTY | DATE | PAGE ____ OF ____ PAGES



TRAFFIC CONTROL SIGNAL SPECIFICATIONS (CONTINUED)

37 — SIGNAL NO(S)
DUTCHESS — COUNTY
DATE
PAGE _____ OF _____ PAGES

TABLE OF OPERATION

PHASES	FACES							
	1	2	3	4	5	6	7	8
Ø1 + Ø5	GREEN	GREEN	GREEN	GREEN	RED	RED	RED	RED
Ø1 + Ø6	GREEN/←	GREEN	RED	RED	RED	RED	RED	RED
Ø2 + Ø5	RED	RED	GREEN/←	GREEN	RED	RED	RED	RED
Ø2 + Ø6	RED/←	RED	RED/←	RED	RED	RED	RED	RED
Ø3 + Ø7	RED	RED	RED	RED	GREEN	GREEN	GREEN	GREEN
Ø3 + Ø8	RED	RED	RED	RED	GREEN/←	GREEN	RED	RED
Ø4 + Ø7	RED	RED	RED	RED	RED	RED	GREEN/←	GREEN
Ø4 + Ø8	RED	RED	RED	RED	RED/←	RED	RED/←	RED
FLASHING OPERATION	YELLOW	YELLOW	YELLOW	YELLOW	RED	RED	RED	RED

TABLE OF CLEARANCES

TO	FROM			
GREEN	GREEN	GREEN/ ←	RED/ ←	RED
	GREEN	GREEN/ ⊂←	RED/ ⊂←	RED
	GREEN	GREEN	RED	RED
GREEN/ ←	GREEN		RED/ ←	RED
	GREEN		RED/ ←	RED
RED/ ←	YELLOW	YELLOW/ ←		RED
	RED	RED/ ←		RED
RED	YELLOW	YELLOW/ ⊂←	RED/ ⊂←	RED
	RED	RED	RED	RED

← - GREEN ARROW
⊂← - YELLOW ARROW

CCS = 82D Signal # = TSP37 Rte = ALLA Rte Seq # = 001
Description: ALL ANGELS ROAD AT MYERS CORNERS ROAD

DATE: 08/07/98 TIME: 08:22:53

CTY 93/94

++

*** Phase Notes ***

Phase 1: CR 94 THRU ALL ANGELS HILL
Phase 2: CR 94 LT ALL ANGELS HILL
Phase 3: CR 93 THRU MYERS CORNERS RD
Phase 4: CR 93 LT MYERS CORNERS RD
Phase 5: CR 94 THRU ALL ANGELS HILL
Phase 6: CR 94 LT ALL ANGELS HILL
Phase 7: CR 93 THRU MYERS CORNERS RD
Phase 8: CR 93 RT MYERS CORNERS RD

* * * * * *

DRAFT

AUG 07 1998

Inspection 8/12/98
Ground Test 2 Volts
Carl T. Cirelli

ENTERED
CJP

Intersection

All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28)

Signal #: 3

Location: CR 28 (Old Hopewell Road) at CR 94 (All Angels Road)

Description: 2 phase, pre-timed, span wire installation

PHASE TIMING DATA / TIMING INTERVALS									
INTERVAL	PHASE / INT. #	F1	F2	F3	F4	F5	F6	F7	F8
MEMORY/RECALL	00	004		004					
WALK	01								
PED. CLEARANCE	02								
INITIAL	03	010		010					
VARIABLE INITIAL	04								
VARIABLE INIT. LIMIT	05								
TIME BEFORE REDUCT.	06								
TIME TO REDUCE.	07								
MAXIMUM GAP	08	05.0		05.0					
MINIMUM GAP	09								
GAP CLOCK	10								
MAXIMUM GREEN 1	11	030		030					
MAXIMUM GREEN 2	12								
MAXIMUM GREEN 3	13								
RECALL GREEN	14	030		030					
YELLOW CLEARANCE	15	04.0		04.0					
RED CLEARANCE	16	02.0		02.0					
THIRD CLEARANCE	17								
FOURTH CLEARANCE	18								
		F1	F2	F3	F4	F5	F6	F7	F8

In the absence of access to controller data green times and phasing are estimates based upon direct observation.

Intersection

All Angels Hill Road (CR 94) and Route 82

-26X

STATE OF NEW YORK - DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING & SAFETY DIVISION
TRAFFIC CONTROL SPECIFICATIONS

Study :
Contract : D256460
PIN:
File : 13.29.82

D207 — SIGNAL NO(S)

DUTCHESS — COUNTY

INTERSECTION ROUTE 82 AT ALL ANGELS ROAD

☐ CITY ☐ VILLAGE ☒ TOWN OF WAPPINGER

Department Order filed _____ as Section 2013.29 Subdivision (m)

Prior specifications hereby superseded ☒ None ☐ _____

Purpose : INSTALLATION UNDER CONTRACT D 256460

These specifications will be effective upon the ☒ Installation ☐ Modification of the necessary traffic control device(s) reguired by and conforming to the State Manual of Uniform Traffic Control Devices

I. This Signal shall

A. Operate in accordance with the Table of Operations and / of Change intervals as shown on page(s) 2 as a :

☐ Pretimed Signal
☐ Semi-traffic actuated signal
☒ Full-traffic actuated signal
☐ Pedestrian actuated signal
☐ Other _____

FINAL COPY

B. ☒ Display vehicular indications
☐ Display pedestrian indications
☒ Be equipped with vehicle detectors
☐ Be equipped with Pedestrian pushbuttons

as shown in the ☒ schematic ☐ scaled drawing on page 3

C. Be equipped with ☐ pre-emption ☐ interconnection and / or coordination which are described as follows

Date	Signature	Title
3/20/96	Wm. D. FITZPATRICK	RTE

Installation Date March 20, 1996

Modification Date _____

cc:
(2) ☒ Main Office
(1) ☒ Region 8 Traffic Engineer
(1) ☒ R. GRIEMSMANN,
(3) ☒ F. HAALCK

D207	DUTCHESS		PAGE 2 OF 20 PAGES
SIGNAL NO(S)	COUNTY	DATE	

TABLE OF OPERATION

PHASES	FACES					
	1	2	3	4	5	6
Ø1	GREEN	GREEN	RED	RED	RED	RED
Ø5	RED	RED	GREEN	GREEN	RED	RED
Ø6	RED/←	RED	RED	RED	RED	RED/→
Ø1 + Ø5	GREEN	GREEN	GREEN	GREEN	RED	RED
Ø1 + Ø6	GREEN/←	GREEN	RED	RED	RED	RED/→
Ø3	RED	RED	RED	RED	GREEN	GREEN/→

FLASHING OPERATION	YELLOW	YELLOW	YELLOW	YELLOW	RED	RED

TABLE OF CLEARANCES

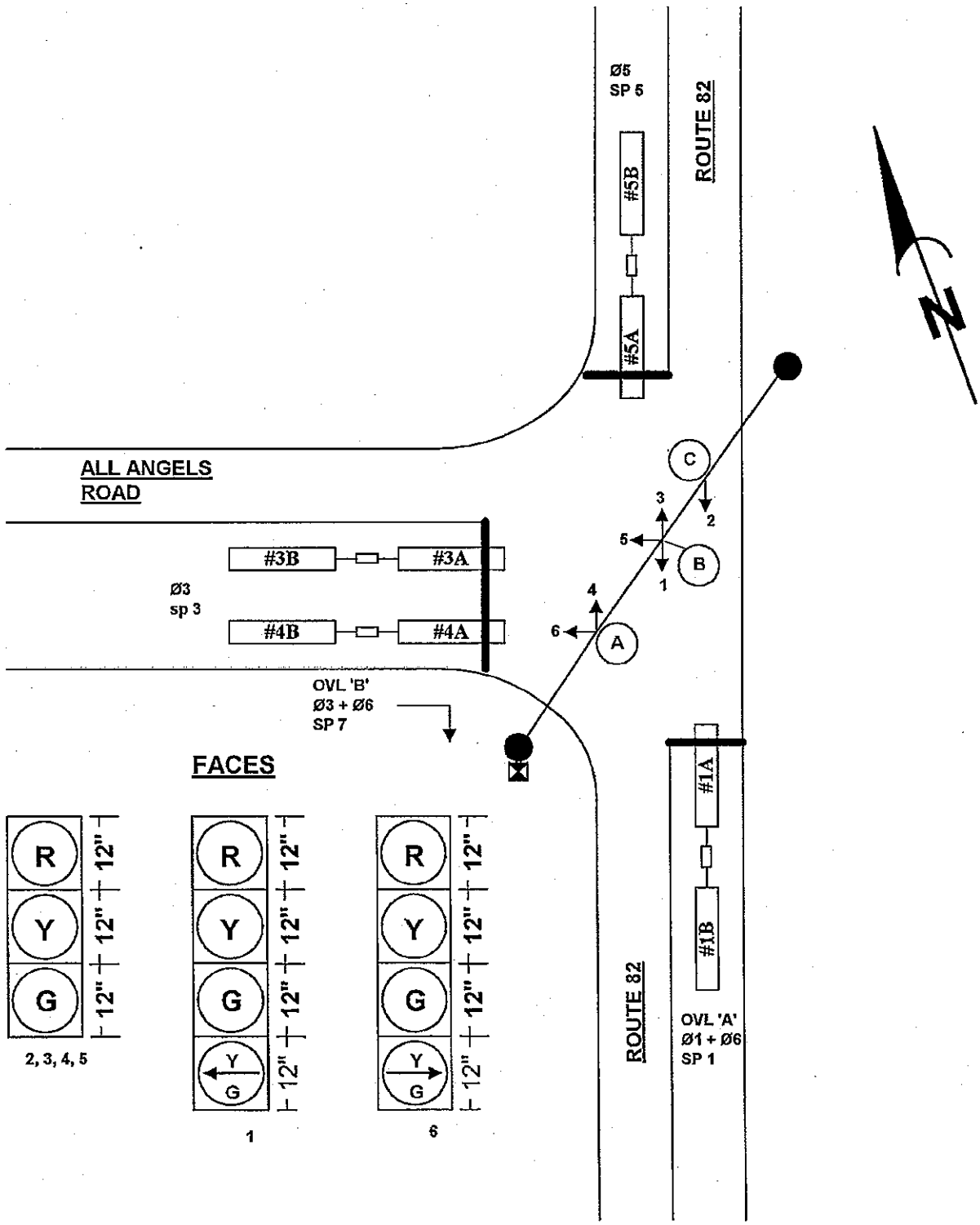
TO	FROM				
	GREEN	GREEN/←	GREEN/→	RED/→	RED
GREEN	GREEN	GREEN/←			RED
	GREEN	GREEN			RED
GREEN/←	GREEN				
	GREEN				
GREEN/→				RED/→	RED
				RED/→	RED
RED/ →					RED
					RED
RED	YELLOW	YELLOW/←	YELLOW/→	RED/→	RED
	RED	RED	RED	RED	RED

← - GREEN ARROW
← - YELLOW ARROW

STATE OF NEW YORK - DEPARTMENT OF TRANSPORTATION
TRAFFIC AND SAFETY DIVISION
TRAFFIC CONTROL SIGNAL SPECIFICATIONS (CONTINUED)

STUDY:
CONTRACT: D 256460
PIN:
FILE: 13.29.82

D207	DUTCHESS		PAGE 3 OF 20 PAGES
SIGNAL NO(S)	COUNTY	DATE	



TS-26X

MODEL 179 PHASE TIMING TABLE/FEATURSE
SIGNAL OPERATION SPECIFICATION

Contract : D256460
PIN:
File : 13.29.82

SIGNAL # D207 COUNTY # DUTCHESS DATE Mar. 20, 1996

(NOTE: USE DECIMAL - EDIT KEY "E" FOR EDITING ALL LOCATIONS ON THIS PAGE)

PHASE TIMING DATA / TIMER INTERVALS

INTERVAL	PHASE / INT. #	RTE. 82 N.B.		ALL ANGELS		RTE. 82 S.B.	RTE. 82 N.B./L.T.		
		F1	F2	F3	F4	F5	F6	F7	F8
MEMORY / RECALL	00	003		000		003	000		
WALK	01								
PEDESTRIAN CLEARANCE	02								
INITIAL	03	010		003		010	003		
VARIABLE INITIAL	04								
VARIABLE INITIAL LIMIT	05								
TIME BEFORE REDUCTION	06								
TIME TO REDUCE	07								
MAXIMUM GAP	08	02.0		02.0		02.0	01.0		
MINIMUM GAP	09								
GAP CLOCK	10	USED WITH DAA ONLY				USED WITH DBB ONLY			
MAXIMUM GREEN 1	11	040		030		040	015		
MAXIMUM GREEN 2	12								
MAXIMUM GREEN 3	13								
RECALL GREEN	14	030		020		030	010		
YELLOW CLEARANCE	15	04.0		04.0		04.0	04.0		
RED CLEARANCE	16	01.0		01.0		01.0	01.0		
THIRD CLEARANCE	17								
FOURTH CLEARANCE	18								
INTERVALS	19 - 28	RESERVED FOR				FUTURE USE			
REDUCE BY	29	USED WITH DAA ONLY				USED WITH DBB ONLY			
EVERY	30	USED WITH DAA ONLY				USED WITH DBB ONLY			
CARS WAITING	31	USED WITH DAA ONLY				USED WITH DBB ONLY			

MEMORY / RECALL CODES: (MAY BE COMBINED)

MEMORY OFF	= 000
MEMORY ON	= 001
MINIMUN RECALL	= 002
RECALL GREEN	= 004
PED RECALL	= 008
RECALL TO MAX	= 016

NOTES :

CGS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-0 (11/95) MISCELLANEOUS PROGRAMMABLE DATA

TIMING/RANGE	FUNCTION	LOC.	TIME
IN SECONDS	STARTUP CLEARANCE TIMER A	2100	002
IN SECONDS	STARTUP CLEARANCE TIMER B	2101	___
IN MINUTES	DETECTOR ANALYSIS TIME	2102	034
000 = GREEN GATING 001 = UNCONDITIONAL	UNCONDITIONAL DELAY/EXTENSION	2103	___
IN SECONDS / 004-012	ALL RED STARTUP TIMER	2104	004
ENABLE = 000 DISABLE = 170	ACLINE FATAL ERROR SWITCH	2110	___
ENABLE = 102 DISABLE = 000	DIAGNOSTIC MESSAGE CIRCULAR BUFFER (USED WITH GUARD)	2111	___
001 - 255	MAXIMUM RANDOM INPUT INTERVAL	2115	___
001 - 040	MAX NO OF PERMITTED DETECTORS	2116	___
ENABLE = 099 DISABLE = 000	RANDOM INPUTS SWITCH WORD	2117	___

CCS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-1 (11/95) MISCELLANEOUS PROGRAMMABLE DATA

DELAY TIMES - (DELAY TIME IN TENTHS OF SECONDS)

DETECTOR # 1	2140	__._	DETECTOR #15	214E	__._
DETECTOR # 2	2141	05.0	DETECTOR #16	214F	__._
DETECTOR # 3	2142	02.0	DETECTOR #17	2150	__._
DETECTOR # 4	2143	05.0	DETECTOR #18'	2151	__._
DETECTOR # 5	2144	__._	DETECTOR #19	2152	__._
DETECTOR # 6	2145	__._	DETECTOR #20	2153	__._
DETECTOR # 7	2146	__._	DETECTOR #21	2154	__._
DETECTOR # 8	2147	__._	DETECTOR #22	2155	__._
DETECTOR # 9	2148	__._	DETECTOR #23	2156	__._
DETECTOR #10	2149	__._	DETECTOR #24	2157	__._
DETECTOR #11	214A	__._	DETECTOR #25	2158	__._
DETECTOR #12	214B	__._	DETECTOR #26	2159	__._
DETECTOR #13	214C	__._	DETECTOR #27	215A	__._
DETECTOR #14	214D	__._	DETECTOR #28	215B	__._

CCS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-4 (11/95)

PROGRAMMABLE FEATURES

FUNCTION	PHASE WORD 8	4	2	1	8	4	2	1	LOC.	CODE
VEHICLE PHASES PERMITTED	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2200	B8
PEDESTRIAN PHASES PERMITTED	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2201	__
	SP	SP	SP	SP	SP	SP	SP	SP		
STARTUP A OUTPUT	3G	3Y	3R	2G	2Y	2R	1G	1R	2202	22
STARTUP A OUTPUT	6G	6Y	6R	5G	5Y	5R	4G	4R	2203	30
STARTUP A OUTPUT	9G	9Y	9R	8G	8Y	8R	7G	7R	2204	01
STARTUP A OUTPUT	12G	12Y	12R	11G	11Y	11R	10G	10R	2205	__
STARTUP A OUTPUT	-	-	-	-	7Y	1Y	10Y	4Y	2206	__
STARTUP A OUTPUT	14G	14Y	14R	13G	13Y	13R	-	-	2207	__
STARTUP B OUTPUT	3G	3Y	3R	2G	2Y	2R	1G	1R	2208	__
STARTUP B OUTPUT	6G	6Y	6R	5G	5Y	5R	4G	4R	2209	__
STARTUP B OUTPUT	9G	9Y	9R	8G	8Y	8R	7G	7R	220A	__
STARTUP B OUTPUT	12G	12Y	12R	11G	11Y	11R	10G	10R	220B	__
STARTUP B OUTPUT	-	-	-	-	7Y	1Y	10Y	4Y	220C	__
STARTUP B OUTPUT	14G	14Y	14R	13G	13Y	13R	-	-	220D	__
STARTUP PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	220E	A0

CGS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-5 (11/95) DETECTOR INPUT WORDS

INPUT NUMBER	LOC.	FUNC CODE	INPUT NUMBER	LOC.	FUNC CODE
INPUT # 1	2214	18	INPUT #16	2223	__
INPUT # 2	2215	68	INPUT #17	2224	__
INPUT # 3	2216	38	INPUT #18	2225	__
INPUT # 4	2217	38	INPUT #19	2226	__
INPUT # 5	2218	58	INPUT #20	2227	__
INPUT # 6	2219	__	INPUT #21	2228	__
INPUT # 7	221A	__	INPUT #22	2229	__
INPUT # 8	221B	__	INPUT #23	222A	__
INPUT # 9	221C	__	INPUT #24	222B	__
INPUT #10	221D	__	INPUT #25	222C	__
INPUT #11	221E	__	INPUT #26	222D	__
INPUT #12	221F	__	INPUT #27	222E	__
INPUT #13	2220	__	INPUT #28	222F	__
INPUT #14	2221	__			
INPUT #15	2222	__			

INPUT FUNC CODES

PED BUTTON	= X2
CALLING DET	= X4
NORMAL DET	= X8
EX PED	= 02
PREEMPT C	= 21
PREEMPT B	= 41
PREEMPT A	= 81
ϕ SLCT OMT A	= B1
ϕ SLCT OMT B	= B2
ϕ SLCT OMT C	= B4
ϕ SLCT OMT D	= B8
CYCLE 1	= C8
CYCLE 2	= C9
CYCLE 3	= CA
SYNC	= CB
OFFSET 1	= CC
OFFSET 2	= CD
OFFSET 3	= CE
FREE	= CF

CCS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-7 (11/95) OUTPUT CONTROL WORDS

COMBINE FUNCTION (X) AND SPECIFIER (Y) TO FORM CODE WORD (XY)

FUNCTION (X)	SPECIFIER (Y)	SWITCH PACK	LOC.	CODE
0 = PHASE	1-8 = PHASE			
		SP1	2270	21
1 = PED	1 = PEDA 4 = PEDD	SP2	2271	03
	2 = PEDB 5 = PEDE	SP3	2272	__
	3 = PEDC 6 = PEDF	SP4	2273	__
2 = OVERLAP	1 = OVLA 4 = OVLD	SP5	2274	05
	2 = OVLB 5 = OVLE	SP6	2275	06
	3 = OVLC 6 = OVLF	SP7	2276	22
		SP8	2277	__
4 = DOUBLE CLR	1 = DCA 2 = DCB	SP9*	2278	__
	3 = DCC 4 = DCD	SP10	2279	__
	5 = DCE 6 = DCF			
6 = DC/OVL	1 = DC/OVLA 2 = DC/OVLB	SP11**	227A	__
		SP12	227B	__
C = MASTER	0 = UNUSED/OFF2/OFF3	SP13	227C	__
OUTPUTS	C = CYC1/CYC2/CYC3	SP14	227D	__
(R/Y/G)	F = FREE/SYNC/OFF1			

NOTES: * SP9 (YELLOW) Outputs Aux Output by Timeclock

** SP11 (YELLOW) Outputs Blue Light

CGS = 82A Signal # = 207 Rte = 82 Rte Seq # = 100

++

TE 262-7A (11/95)

OVERLAPS

FUNCTION	PHASE WORD 8	4	2	1	8	4	2	1	LOC.	CODE
OVERLAP A GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	227E	90
OVERLAP B GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	227F	18
OVERLAP C GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2280	__
OVERLAP D GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2281	__
OVERLAP E GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2282	__
OVERLAP F GREEN PHASE WORD	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2283	__
OVERLAP A CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2284	90
OVERLAP B CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2285	08
OVERLAP C CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2286	__
OVERLAP D CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2287	__
OVERLAP E CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2288	__
OVERLAP F CLEARANCE PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	2289	__
DC/OVL A DBL. CLEAR PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228A	__
DC/OVL B DBL. CLEAR PHASE	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228B	__
DC/OVL A OVL GREEN PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228C	__
DC/OVL B OVL GREEN PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228D	__
DC/OVL A CLEARANCE PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228E	__
DC/OVL B CLEARANCE PHASES	ϕ 1	ϕ 2	ϕ 5	ϕ 6	ϕ 3	ϕ 4	ϕ 7	ϕ 8	228F	__

TE 262-12 (7/91)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # 13.29.82
PAGE 18 OF 20

SIGNAL # D207 COUNTY # DUT. DATE _____

D256460

SWITCH PACK	FUNCTION	INDICATIONS	FACE	TERMINAL WIRING BOARD		FACE	TERMINAL WIRING BOARD	
				TERMINAL	WIRE COLOR CODE		TERMINAL	WIRE COLOR CODE
1	OVL 'A' Ø1+Ø6	RED	1	SP 1 R	14 / 19C - B - R	2	SP 1 R	14 / 5C - C - R
		YELLOW		SP 1 Y	- O		SP 1 Y	- O
		GREEN		SP 1 G	- G		SP 1 G	- G
		Ground Wire		Grnd Bus	- W		Grnd Bus	- W
2				SP 2 R			SP 2 R	
				SP 2 Y			SP 2 Y	
				SP 2 G			SP 2 G	
		Ground Wire		Grnd Bus			Grnd Bus	
3	Ø3	RED	5	SP 3 R	14 / 19C - B - B/R	6	SP 3 R	14 / 15C - A - R/B
		YELLOW		SP 3 Y	- O/R		SP 3 Y	- O/B
		GREEN		SP 3 G	- BL/R		SP 3 G	- G/B
		Ground Wire		Grnd Bus	- W/R		Grnd Bus	- W/B
4				SP 4 R			SP 4 R	
				SP 4 Y			SP 4 Y	
				SP 4 G			SP 4 G	
		Ground Wire		Grnd Bus			Grnd Bus	
5	Ø5	RED	3	SP 5 R	14 / 19C - B - R/W	4	SP 5 R	14 / 15C - A - R
		YELLOW		SP 5 Y	- BL/W		SP 5 Y	- O
		GREEN		SP 5 G	- G/W		SP 5 G	- G
		Ground Wire		Grnd Bus	- B/W		Grnd Bus	- W
6	Ø6	----------	1	SP 6 R	----------		SP 6 R	
		⊖		SP 6 Y	14 / 19C - B - O/B		SP 6 Y	
		←		SP 6 G	- G/B		SP 6 G	
		Ground Wire		Grnd Bus	- W/B		Grnd Bus	
7	OVL 'B' Ø6+Ø3	----------	6	SP 7 R	----------		SP 7 R	
		⊖		SP 7 Y	14 / 15C - A - BL/W		SP 7 Y	
		→		SP 7 G	- G/W		SP 7 G	
		Ground Wire		Grnd Bus	- B/W		Grnd Bus	
8				SP 8 R			SP 8 R	
				SP 8 Y			SP 8 Y	
				SP 8 G			SP 8 G	
		Ground Wire		Grnd Bus			Grnd Bus	
9				SP 9 R			SP 9 R	
				SP 9 Y			SP 9 Y	
				SP 9 G			SP 9 G	
		Ground Wire		Grnd Bus			Grnd Bus	
10				SP 10 R			SP 10 R	
				SP 10 Y			SP 10 Y	
				SP 10 G			SP 10 G	
		Ground Wire		Grnd Bus			Grnd Bus	
11				SP 11 R			SP 11 R	
				SP 11 Y			SP 11 Y	
				SP 11 G			SP 11 G	
		Ground Wire		Grnd Bus			Grnd Bus	
12				SP 12 R			SP 12 R	
				SP 12 Y			SP 12 Y	
				SP 12 G			SP 12 G	
		Ground Wire		Grnd Bus			Grnd Bus	
13				SP 13 R			SP 13 R	
				SP 13 Y			SP 13 Y	
				SP 13 G			SP 13 G	
		Ground Wire		Grnd Bus			Grnd Bus	
14				SP 14 R			SP 14 R	
				SP 14 Y			SP 14 Y	
				SP 14 G			SP14 G	
		Ground Wire		Grnd Bus			Grnd Bus	

TE 262-13 (7/91)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # 13.29.82
PAGE 19 OF 20

SIGNAL # D207 COUNTY # DUTCHESS DATE _____

D 256460

CONFLICT/CURRENT MONITOR
PROGRAMMING

CONFLICT MONITOR DIODES TO BE CUT			CONFLICT MONITOR YELLOW JUMPERS TO BE INSTALLED	CURRENT MONITOR DIODES TO BE CUT
SP1 - SP5				2, 4, 6 - 14
SP1 - SP6				
SP1 - SP7				
SP3 - SP7				
SP6 - SP7				

NOTES: _____

TE 262-14 (7/91)

MODEL 179 SIGNAL OPERATION
PROGRAMMABLE FEATURES
SIGNAL OPERATION SPECIFICATION

TAPS _____
STUDY # _____
FILE # 13.29.82
PAGE 20 OF 20

SIGNAL # D207 COUNTY # DUT. DATE _____

D256460

TABLE OF INPUT WIRING

TERM NUMBER	FUNCTION	DET. NO.	DET. TYPE	DET. AN OVER	REMARKS
** 1A, 1B	Ø1	1A, 1B	LOOP		PRESENCE
** 2A, 2B	Ø6	1A, 1B	LOOP		PRESENCE
3A, 3B	Ø3	3A, 3B	LOOP		PRESENCE
4A, 4B	Ø3	4A, 4B	LOOP		PRESENCE
5A, 5B	Ø5	5A, 5B	LOOP		PRESENCE
6A, 6B					
7A, 7B					
8A, 8B					
9A, 9B					
10A, 10B					
11A, 11B					
12A, 12B					
13A, 13B					
14A, 14B					
15A, 15B					
16A, 16B					
17A, 17B					
18A, 18B					
19A, 19B					
20A, 20B					
21A, 21B					
22A, 22B					
23A, 23B					
24A, 24B					
25A, 25B					
26A, 26B					
27A, 27B					
28A, 28B					

**** JUMP ACROSS TERMINALS 1A, 1B AND 2A, 2B**

APPENDIX C

Observed Signal Timings at Signalized Intersections

Intersection

Route 376 and New Hackensack Road (CR 104) and All Angels Hill Road (CR 94)

INTERSECTION: Rt 376 @ New Hackensack

PHASE	MOVEMENTS	GREEN	YELLOW	RED
	C	29 25 20 26 25 20 14 21	4 4 4 4 4	
	B	8 8 7 8 8 8.		
		~~50~~ 14 15 13 14 20	4 4 4	
	A	45 91 61 60	4 4	1

Day, Date & Time: Thursday 2/10/11 8:15AM

Cycle Length: 2 min 6 sec

1 min 52 sec

2 min 7 sec

Pencil 6:30 PM

North: ↑

INTERSECTION: ~~[illegible]~~ @ New Hackensack @ All Angels

PHASE	MOVEMENTS	GREEN	YELLOW	RED
1	New Hackensack (C)	25 27 27 27 30	4 4 4	1
2	All Angels (B)	15 50 33 35	4	1
4	(A)	34 31 23 35	4 4	
3		15 35 25 35 40	4 4	

Day, Date & Time: Thursday 2/10/11 9:45AM

Cycle Length: 2 min 2 Sec

1 min 32 Sec.

North: ~~(N)~~ ↑

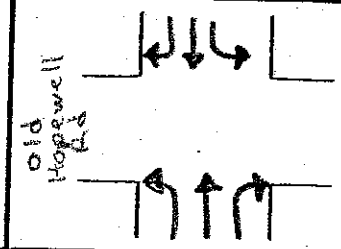
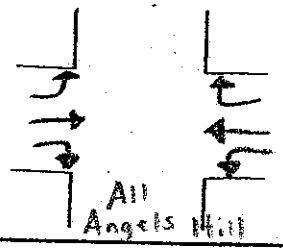
Peak 6:48PM Cycle 2 min 32 sec.

Intersection

All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28)

176817

INTERSECTION: All Angels Hill Rd @ Old Hopewell Rd

PHASE	MOVEMENTS	GREEN	YELLOW	RED
		30 30	4 4	1
		40 40	4 4	1

Day, Date & Time: Tuesday 5/11/10 11:20 AM

Cycle Length: 1 min 20 sec North: N

Intersection

All Angels Hill Road (CR 94) and Route 82

176817

INTERSECTION: Rt. 94 (All Angels Hill) @ Rt. 82

PHASE	MOVEMENTS	GREEN	YELLOW	RED
1	Rt. 94	45 88 30 64	5 5	1
3	Rt. 82	10 6 13 12 7	5 5 5	1
2	Rt. 94	6 6 3 3		

Day, Date & Time: Tuesday 5/11/10 10:50 AM

Cycle Length: 62 Sec, 49 Sec,

North: N

Intersection

All Angels Hill Road (CR 94) and Myers Corners Road (CR 93)

INTERSECTION: All Angels Hill Rd @ Myers Corner Rd

PHASE	MOVEMENTS	GREEN	YELLOW	RED
1	Myers Corner; Myers Corner	20 14 11 10	5 5 5 5	
2	All Angels; All Angels	8 10 10 22	5 5 5 5	
3		4	5	
3 or 4		20 14	5 5	

Day, Date & Time: Monday 12/12/11 12:30 PM

Cycle Length: Varies

North: ↑

APPENDIX D

Manual Count Data

AM Counts (6:30 AM – 9:30 AM)

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/16/2011

INTERSECTION: All Angels Road (CR 94) & Myers Corner Road (CR 93)
COUNT DATE: Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
6:30 AM - 6:45 AM	13	30	0	12	26	4	5	39	8	12	28	33
6:45 AM - 7:00 AM	13	17	10	23	21	4	6	60	9	7	32	80
7:00 AM - 7:15 AM	26	37	14	15	42	1	3	50	6	11	27	55
7:15 AM - 7:30 AM	24	42	8	13	57	4	5	58	9	10	34	55
7:30 AM - 7:45 AM	22	46	5	25	70	4	8	72	15	25	49	44
7:45 AM - 8:00 AM	32	47	28	48	96	5	7	77	26	8	51	57
8:00 AM - 8:15 AM	43	32	33	15	60	2	6	68	16	16	35	36
8:15 AM - 8:30 AM	22	33	9	19	52	1	8	52	21	17	46	47
8:30 AM - 8:45 AM	30	39	7	13	76	5	11	50	20	13	49	43
8:45 AM - 9:00 AM	35	36	10	21	64	4	3	64	12	13	44	48
9:00 AM - 9:15 AM	18	29	6	15	36	10	6	62	16	14	44	35
9:15 AM - 9:30 AM	11	37	7	18	36	3	4	65	10	13	34	43

All Angels Road (CR 94) & Kent Road/Cider Mill Loop
Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
6:30 AM - 6:45 AM	0	2	0	0	44	2	0	1	2	0	34	0
6:45 AM - 7:00 AM	0	18	0	3	52	0	0	4	0	0	41	0
7:00 AM - 7:15 AM	9	17	18	0	70	3	0	0	2	0	68	4
7:15 AM - 7:30 AM	3	1	8	6	78	2	0	1	2	0	61	2
7:30 AM - 7:45 AM	7	0	14	9	100	3	1	3	2	0	65	4
7:45 AM - 8:00 AM	7	0	6	15	111	1	4	1	2	0	75	2
8:00 AM - 8:15 AM	2	0	25	7	114	0	0	0	2	1	97	1
8:15 AM - 8:30 AM	3	0	11	10	66	0	0	1	2	0	50	0
8:30 AM - 8:45 AM	0	0	11	6	84	0	2	0	4	0	64	0
8:45 AM - 9:00 AM	3	1	8	6	81	0	0	0	1	1	47	1
9:00 AM - 9:15 AM	0	0	10	8	69	1	0	0	1	0	58	1
9:15 AM - 9:30 AM	2	0	8	2	37	0	0	0	0	0	44	1

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N
REVISED:	2/16/2011

INTERSECTION: All Angels Road (CR 94) & Hilltop Drive/Site Driveway
COUNT DATE: Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
6:30 AM - 6:45 AM	0	0	0	0	42	0	1	1	2	0	33	0
6:45 AM - 7:00 AM	0	0	0	0	50	0	1	0	4	0	38	0
7:00 AM - 7:15 AM	0	0	0	0	63	0	2	0	6	0	49	2
7:15 AM - 7:30 AM	0	0	2	0	77	0	3	0	3	0	60	0
7:30 AM - 7:45 AM	0	0	0	0	107	0	1	0	4	2	80	0
7:45 AM - 8:00 AM	0	0	0	0	126	0	0	0	5	1	99	3
8:00 AM - 8:15 AM	0	0	0	1	72	1	0	0	5	1	84	4
8:15 AM - 8:30 AM	0	0	0	1	62	3	2	0	2	2	70	0
8:30 AM - 8:45 AM	0	0	0	1	102	0	1	0	2	0	96	0
8:45 AM - 9:00 AM	0	0	0	1	69	3	3	0	9	4	53	0
9:00 AM - 9:15 AM	0	0	0	0	47	1	1	0	5	7	54	1
9:15 AM - 9:30 AM	0	0	0	0	65	0	0	0	3	1	53	1

All Angels Road (CR 94) & Brown Road
Tuesday, May 11, 2010

TIME	1 NB T	2 NB R	3 WB L	4 WB R	5 SB L	6 SB T
6:30 AM - 6:45 AM	12	1	2	7	0	78
6:45 AM - 7:00 AM	14	2	3	8	7	76
7:00 AM - 7:15 AM	17	3	7	6	3	39
7:15 AM - 7:30 AM	45	6	4	10	6	70
7:30 AM - 7:45 AM	78	18	12	14	3	72
7:45 AM - 8:00 AM	79	7	14	10	6	85
8:00 AM - 8:15 AM	60	8	7	9	3	90
8:15 AM - 8:30 AM	52	6	18	11	2	87
8:30 AM - 8:45 AM	64	1	7	9	5	86
8:45 AM - 9:00 AM	47	9	10	8	2	69
9:00 AM - 9:15 AM	52	6	15	4	1	59
9:15 AM - 9:30 AM	49	3	14	5	4	56

All Angels Road (CR 94) & Old Hopewell Road (CR 28)
Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
6:30 AM - 6:45 AM	7	46	2	12	32	3	1	47	17	19	24	16
6:45 AM - 7:00 AM	6	45	4	9	31	3	0	58	14	23	30	21
7:00 AM - 7:15 AM	10	55	7	11	38	5	2	50	11	28	37	27
7:15 AM - 7:30 AM	9	60	10	11	41	6	1	62	19	29	38	15
7:30 AM - 7:45 AM	20	81	9	14	35	3	1	72	24	46	34	15
7:45 AM - 8:00 AM	16	68	12	10	33	3	3	61	28	54	48	21
8:00 AM - 8:15 AM	13	70	7	7	38	1	1	54	18	40	43	16
8:15 AM - 8:30 AM	6	70	6	12	45	2	3	61	27	46	41	21
8:30 AM - 8:45 AM	7	47	15	9	24	0	3	47	16	40	44	8
8:45 AM - 9:00 AM	10	54	12	11	20	2	1	59	17	31	35	14
9:00 AM - 9:15 AM	8	40	6	9	33	1	3	60	20	28	31	14
9:15 AM - 9:30 AM	8	39	3	11	24	1	9	51	9	14	36	19

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/16/2011

INTERSECTION:	All Angels Road (CR 94) & NY Route 82						Old Hopewell Road (CR 28) & Balfour Drive												Old Hopewell Road (CR 28) & Cedar Hill Road					
COUNT DATE:	Tuesday, May 11, 2010						Thursday, February 17, 2011												Tuesday, May 11, 2010					
	1	2	3	4	5	6	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
TIME	EB L	EB T	WB T	WB R	SB L	SB R	EB L	EB T	EB R	NB L	NB T	NB R	WB L	WB T	WB R	SB L	SB T	SB R	EB T	EB R	NB L	NB R	WB L	WB T
6:30 AM - 6:45 AM	18	25	23	5	9	24	2	42	1	0	0	0	0	56	1	5	0	3	51	8	9	1	1	90
6:45 AM - 7:00 AM	9	36	57	9	8	39	2	76	0	0	0	0	0	53	0	6	0	1	58	14	8	1	2	85
7:00 AM - 7:15 AM	16	44	62	6	11	41	0	59	1	1	0	2	0	67	1	6	0	5	80	8	24	3	1	131
7:15 AM - 7:30 AM	23	49	64	4	10	32	1	48	0	0	0	5	1	84	4	8	0	9	56	3	18	5	1	97
7:30 AM - 7:45 AM	24	83	79	2	20	39	2	81	0	1	0	4	0	81	0	13	0	7	84	7	14	0	3	117
7:45 AM - 8:00 AM	37	69	91	9	15	45	0	70	2	0	0	6	1	89	1	6	0	8	67	9	10	2	1	80
8:00 AM - 8:15 AM	32	61	81	7	8	42	3	61	0	1	0	4	2	58	0	6	0	3	84	9	19	5	2	114
8:15 AM - 8:30 AM	28	71	100	14	15	37	1	70	0	0	0	1	1	48	2	6	0	3	65	3	17	1	2	67
8:30 AM - 8:45 AM	25	52	95	7	21	33	1	71	0	1	0	0	1	45	0	4	0	7	63	10	16	0	2	71
8:45 AM - 9:00 AM	29	71	92	6	17	52	0	53	0	1	0	3	1	67	2	5	0	2	64	7	12	1	1	98
9:00 AM - 9:15 AM	44	54	85	7	10	38	4	47	1	1	0	0	0	68	2	2	0	3	47	7	8	3	0	89
9:15 AM - 9:30 AM	25	64	88	8	13	31	1	52	0	0	0	1	1	59	4	3	0	2	61	7	15	0	2	84

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/16/2011

INTERSECTION:	All Angels Road (CR 94) & New Hackensack Road (CR 104)									New Hackensack Road (CR 104) & Route 376					
COUNT DATE:	Thursday, February 10, 2011									Thursday, February 10, 2011					
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
TIME	EB T	EB R	NB L	NB R	WB L	WB T	SB L	SB T	SB R	EB L	EB R	NB L	NB T	SB T	SB R
6:30 AM - 6:45 AM	61	3	2	22	0	17	0	62	30	37	7	18	22	20	0
6:45 AM - 7:00 AM	56	2	3	38	0	12	0	80	24	56	9	17	26	20	0
7:00 AM - 7:15 AM	70	3	1	54	0	16	0	42	32	74	20	17	24	18	0
7:15 AM - 7:30 AM	64	0	3	72	0	19	0	47	35	79	12	20	48	38	0
7:30 AM - 7:45 AM	50	2	4	65	1	37	0	69	35	97	19	33	66	43	0
7:45 AM - 8:00 AM	58	3	5	71	1	33	0	67	38	110	11	42	72	34	0
8:00 AM - 8:15 AM	73	3	4	60	1	27	0	61	27	97	19	31	54	36	0
8:15 AM - 8:30 AM	60	1	3	72	0	36	0	77	54	79	10	35	46	43	0
8:30 AM - 8:45 AM	57	1	6	73	0	39	0	77	47	109	20	29	52	26	0
8:45 AM - 9:00 AM	66	5	5	47	0	28	0	53	34	75	22	38	57	47	0
9:00 AM - 9:15 AM	61	6	5	42	5	26	0	52	28	76	19	31	43	47	0
9:15 AM - 9:30 AM	61	1	9	49	2	34	0	59	49	61	19	36	48	26	0

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/16/2011

INTERSECTION:	Myers Corner Road (CR 93) & Kent Road						All Angels Road (CR 94) & Widmer Road						All Angels Road (CR 94) & Pye Lane					
COUNT DATE:	Thursday, February 10, 2011						Thursday, February 10, 2011						Thursday, February 10, 2011					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
TIME	EB T	EB R	NB L	NB R	WB L	WB T	EB L	EB R	NB L	NB T	SB T	SB R	NB T	NB R	WB L	WB R	SB L	SB T
6:30 AM - 6:45 AM	35	2	7	1	0	76	2	20	21	34	51	2	47	0	5	3	1	43
6:45 AM - 7:00 AM	49	7	24	1	0	160	1	43	23	27	70	2	49	3	9	3	3	51
7:00 AM - 7:15 AM	89	3	33	1	0	118	1	33	36	59	50	0	43	4	10	3	2	55
7:15 AM - 7:30 AM	89	7	9	0	3	69	3	20	33	72	52	1	72	3	9	12	5	58
7:30 AM - 7:45 AM	117	7	19	3	0	109	3	27	44	78	65	1	89	2	17	8	6	61
7:45 AM - 8:00 AM	153	2	33	10	5	151	3	27	40	69	86	8	99	4	14	7	0	81
8:00 AM - 8:15 AM	107	4	15	0	3	131	1	26	46	62	62	1	61	6	12	7	5	77
8:15 AM - 8:30 AM	68	4	21	3	0	90	4	34	40	76	77	2	64	6	8	7	3	68
8:30 AM - 8:45 AM	80	5	18	0	0	103	1	27	44	79	81	3	65	4	7	6	2	83
8:45 AM - 9:00 AM	82	6	15	2	1	123	1	16	32	45	57	1	61	3	6	6	2	43
9:00 AM - 9:15 AM	80	11	18	2	2	90	1	25	29	39	64	1	36	2	4	5	2	55
9:15 AM - 9:30 AM	57	3	12	0	0	91	1	18	16	32	39	3	59	4	11	9	1	52

PM Counts (3:30 PM – 6:30 PM)

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/22/2011

INTERSECTION: All Angels Road (CR 94) & Myers Corner Road (CR 93)
COUNT DATE: Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
3:30 PM - 3:45 PM	52	69	18	22	61	7	2	60	23	22	64	52
3:45 PM - 4:00 PM	37	69	28	14	39	6	1	50	19	20	68	64
4:00 PM - 4:15 PM	51	100	12	11	55	5	7	73	23	23	66	56
4:15 PM - 4:30 PM	41	74	21	27	42	6	8	72	19	27	73	53
4:30 PM - 4:45 PM	38	89	58	20	66	13	1	58	21	23	60	50
4:45 PM - 5:00 PM	41	84	22	21	69	9	5	51	21	37	81	45
5:00 PM - 5:15 PM	46	74	17	13	71	8	6	59	27	46	61	51
5:15 PM - 5:30 PM	70	81	16	20	70	11	7	67	30	37	69	50
5:30 PM - 5:45 PM	40	68	24	28	87	8	8	65	23	36	73	36
5:45 PM - 6:00 PM	53	99	37	23	67	7	10	53	21	28	80	26
6:00 PM - 6:15 PM	27	86	22	29	62	10	8	63	24	25	49	37
6:15 PM - 6:30 PM	27	79	21	23	55	12	7	49	22	19	63	47

All Angels Road (CR 94) & Kent Road/Cider Mill Loop
Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
3:30 PM - 3:45 PM	0	4	2	4	63	1	2	0	9	15	64	2
3:45 PM - 4:00 PM	0	0	4	2	83	5	0	1	3	8	74	1
4:00 PM - 4:15 PM	2	0	24	8	73	0	1	3	0	3	75	5
4:15 PM - 4:30 PM	4	1	17	17	73	0	2	1	0	3	87	4
4:30 PM - 4:45 PM	3	0	6	19	91	2	0	0	1	1	80	2
4:45 PM - 5:00 PM	2	0	12	14	96	0	1	0	1	0	90	7
5:00 PM - 5:15 PM	2	0	15	18	111	1	1	2	5	3	57	3
5:15 PM - 5:30 PM	1	0	5	13	83	1	0	1	3	2	59	5
5:30 PM - 5:45 PM	3	3	6	11	87	0	2	2	2	5	92	1
5:45 PM - 6:00 PM	3	1	16	19	99	0	0	1	2	3	116	7
6:00 PM - 6:15 PM	6	0	12	21	92	1	2	1	1	2	79	3
6:15 PM - 6:30 PM	2	1	13	13	59	0	0	2	1	1	77	2

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N
REVISED:	2/22/2011

INTERSECTION: All Angels Road (CR 94) & Hilltop Drive/Site Driveway
COUNT DATE: Tuesday, May 11, 2010

TIME	1 EB L	2 EB T	3 EB R	4 NB L	5 NB T	6 NB R	7 WB L	8 WB T	9 WB R	10 SB L	11 SB T	12 SB R
3:30 PM - 3:45 PM	0	0	1	0	92	5	1	0	0	3	87	0
3:45 PM - 4:00 PM	0	0	0	0	62	3	0	0	4	2	93	0
4:00 PM - 4:15 PM	0	0	0	0	82	2	3	0	5	5	85	0
4:15 PM - 4:30 PM	0	0	0	0	83	0	2	0	4	8	102	0
4:30 PM - 4:45 PM	2	0	0	0	114	0	0	0	2	1	88	0
4:45 PM - 5:00 PM	0	0	2	0	112	4	0	0	5	5	94	0
5:00 PM - 5:15 PM	0	0	0	1	93	5	1	0	1	3	75	0
5:15 PM - 5:30 PM	0	0	0	0	118	1	0	0	3	4	89	0
5:30 PM - 5:45 PM	0	0	0	1	116	1	1	0	2	0	101	1
5:45 PM - 6:00 PM	0	0	3	0	108	3	3	0	2	2	117	1
6:00 PM - 6:15 PM	0	0	0	0	98	1	1	0	3	2	75	0
6:15 PM - 6:30 PM	0	0	0	0	96	1	0	0	4	6	65	0

All Angels Road (CR 94) & Brown Road
Tuesday, May 11, 2010

TIME	1 NB T	2 NB R	3 WB L	4 WB R	5 SB L	6 SB T
3:30 PM - 3:45 PM	62	15	16	6	9	58
3:45 PM - 4:00 PM	68	10	9	2	9	77
4:00 PM - 4:15 PM	75	19	17	5	7	75
4:15 PM - 4:30 PM	77	19	6	8	12	67
4:30 PM - 4:45 PM	107	18	12	8	10	84
4:45 PM - 5:00 PM	102	26	17	9	14	67
5:00 PM - 5:15 PM	106	20	12	10	10	78
5:15 PM - 5:30 PM	97	23	24	7	14	75
5:30 PM - 5:45 PM	99	24	10	8	7	85
5:45 PM - 6:00 PM	101	27	14	8	26	96
6:00 PM - 6:15 PM	96	17	13	8	13	76
6:15 PM - 6:30 PM	84	17	12	4	6	64

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N
REVISED:	2/22/2011

INTERSECTION:	All Angels Road (CR 94) & Old Hopewell Road (CR 28)												All Angels Road (CR 94) & NY Route 82					
COUNT DATE:	Tuesday, May 11, 2010												Tuesday, May 11, 2010					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
TIME	EB L	EB T	EB R	NB L	NB T	NB R	WB L	WB T	WB R	SB L	SB T	SB R	EB L	EB T	WB T	WB R	SB L	SB R
3:30 PM - 3:45 PM	15	51	5	6	34	2	0	63	42	26	36	15	47	83	59	12	7	27
3:45 PM - 4:00 PM	15	53	9	9	37	1	1	65	30	26	23	8	34	83	44	16	8	31
4:00 PM - 4:15 PM	31	61	11	13	43	4	1	85	41	39	41	29	53	68	67	9	11	23
4:15 PM - 4:30 PM	8	84	7	15	52	3	4	71	31	26	32	16	31	64	46	9	8	16
4:30 PM - 4:45 PM	19	66	9	12	56	1	3	91	51	22	47	17	81	142	102	21	12	50
4:45 PM - 5:00 PM	28	44	8	11	65	3	5	118	54	24	30	17	54	113	73	15	8	33
5:00 PM - 5:15 PM	20	82	15	9	71	6	9	86	48	17	39	13	78	105	77	23	10	41
5:15 PM - 5:30 PM	24	66	16	10	80	6	0	95	58	11	46	19	70	82	90	7	9	40
5:30 PM - 5:45 PM	16	74	11	12	67	2	3	91	56	25	47	28	42	78	56	14	18	37
5:45 PM - 6:00 PM	31	70	16	11	38	2	3	66	57	23	44	18	51	89	73	14	8	50
6:00 PM - 6:15 PM	15	57	5	6	46	6	4	90	50	29	32	16	49	91	82	13	8	35
6:15 PM - 6:30 PM	24	46	10	12	41	2	2	80	46	21	38	18	46	99	94	10	7	33

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N'
REVISED:	2/22/2011

INTERSECTION:	Old Hopewell Road (CR 28) & Balfour Drive												Old Hopewell Road (CR 28) & Cedar Hill Road					
COUNT DATE:	Thursday, February 17, 2011												Tuesday, May 11, 2010					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
TIME	EB L	EB T	EB R	NB L	NB T	NB R	WB L	WB T	WB R	SB L	SB T	SB	EB T	EB R	NB L	NB R	WB L	WB T
3:30 PM - 3:45 PM	4	68	0	0	0	0	3	66	6	6	0	2	108	16	26	3	2	103
3:45 PM - 4:00 PM	2	83	0	0	0	1	0	87	2	4	0	2	70	10	7	2	1	80
4:00 PM - 4:15 PM	4	85	2	0	0	1	1	90	3	2	0	3	100	18	8	2	0	118
4:15 PM - 4:30 PM	3	68	2	1	0	1	1	85	7	4	0	4	109	14	8	0	3	101
4:30 PM - 4:45 PM	8	77	1	0	0	2	1	95	4	2	0	4	112	14	15	4	0	114
4:45 PM - 5:00 PM	4	66	1	0	0	2	1	88	6	6	0	0	108	11	11	1	1	121
5:00 PM - 5:15 PM	1	130	0	0	0	0	2	101	7	2	0	2	118	11	14	2	0	107
5:15 PM - 5:30 PM	3	97	1	1	0	0	1	98	5	2	0	1	122	9	15	2	5	140
5:30 PM - 5:45 PM	3	85	0	1	0	1	1	96	8	2	0	1	97	5	10	0	7	110
5:45 PM - 6:00 PM	3	75	2	0	0	1	0	84	8	2	0	3	127	15	15	1	1	104
6:00 PM - 6:15 PM	4	74	0	1	0	1	0	83	9	2	0	2	99	13	31	4	3	122
6:15 PM - 6:30 PM	3	98	1	1	0	1	3	74	5	2	0	4	73	14	18	3	5	78

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N
REVISED:	2/22/2011

INTERSECTION:	All Angels Road (CR 94) & New Hackensack Road (CR 104)									New Hackensack Road (CR 104) & Route 376					
COUNT DATE:	Thursday, February 10, 2011									Thursday, February 10, 2011					
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
TIME	EB T	EB R	NB L	NB R	WB L	WB T	SB L	SB T	SB R	EB L	EB R	NB L	NB T	SB T	SB R
3:30 PM - 3:45 PM	85	8	0	57	2	30	0	82	45	85	33	37	45	34	0
3:45 PM - 4:00 PM	96	3	3	78	0	46	0	90	55	113	52	41	46	57	0
4:00 PM - 4:15 PM	95	7	7	62	1	39	0	86	54	100	40	35	27	55	0
4:15 PM - 4:30 PM	111	3	2	69	2	30	0	79	49	105	40	40	60	49	0
4:30 PM - 4:45 PM	110	6	6	75	0	41	0	82	44	105	41	40	64	46	0
4:45 PM - 5:00 PM	103	3	7	74	0	39	0	66	39	122	43	37	39	59	0
5:00 PM - 5:15 PM	85	6	10	92	0	39	0	85	56	125	42	40	41	39	0
5:15 PM - 5:30 PM	116	8	3	75	0	34	0	97	22	109	49	41	55	69	0
5:30 PM - 5:45 PM	84	4	4	69	2	36	0	91	35	120	41	40	37	59	0
5:45 PM - 6:00 PM	77	8	6	63	0	28	0	65	48	100	51	28	55	47	0
6:00 PM - 6:15 PM	63	2	3	80	0	47	0	59	28	100	44	39	48	45	0
6:15 PM - 6:30 PM	80	3	2	56	0	38	0	67	29	107	50	43	36	33	0

TRC

TRAFFIC COUNT	
JOB NO.:	176817 - T
PROJECT:	Hilltop
LOCATION:	Wappinger, N
REVISED:	2/22/2011

INTERSECTION:	Myers Corner Road (CR 93) & Kent Road						All Angels Road (CR 94) & Widmer Road						All Angels Road (CR 94) & Pye Lane					
COUNT DATE:	Thursday, February 10, 2011						Thursday, February 10, 2011						Thursday, February 10, 2011					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
TIME	EB T	EB R	NB L	NB R	WB L	WB T	EB L	EB R	NB L	NB T	SB T	SB R	NB T	NB R	WB L	WB R	SB L	SB T
3:30 PM - 3:45 PM	124	23	24	2	1	136	0	64	42	60	85	5	76	11	4	4	5	94
3:45 PM - 4:00 PM	151	21	20	6	4	104	2	56	29	80	84	3	80	11	4	3	10	68
4:00 PM - 4:15 PM	110	23	15	1	2	173	5	44	38	62	74	6	65	10	7	5	2	87
4:15 PM - 4:30 PM	132	26	14	4	5	146	3	44	41	71	96	3	71	8	10	3	6	70
4:30 PM - 4:45 PM	127	10	18	3	3	124	1	46	40	74	87	6	83	7	6	6	3	95
4:45 PM - 5:00 PM	106	10	17	5	5	103	4	65	44	96	67	2	88	9	5	5	4	75
5:00 PM - 5:15 PM	106	19	17	8	5	123	1	35	45	82	73	3	79	5	8	6	2	74
5:15 PM - 5:30 PM	99	20	15	7	7	107	4	58	53	86	118	6	116	16	11	3	6	106
5:30 PM - 5:45 PM	89	27	11	6	1	111	4	59	46	71	98	8	93	7	8	6	7	83
5:45 PM - 6:00 PM	99	20	16	17	4	90	3	54	43	71	69	7	105	14	12	3	6	76
6:00 PM - 6:15 PM	105	16	16	20	2	101	2	46	40	70	53	4	87	8	7	4	5	67
6:15 PM - 6:30 PM	103	21	15	15	4	80	3	47	40	63	54	3	87	13	1	3	8	64

APPENDIX E

Level of Service Standards

1. LEVEL OF SERVICE

CONCEPT

The 2000 Highway Capacity Manual, published by the Transportation Research Board of the U.S. Government, established a system by which highway facilities are examined for their adequacy to handle traffic volumes. The terminology "Level of Service" is used to provide a "qualitative" evaluation based on certain "quantitative" calculations which are related to empirical values.

Intersection Capacity, Delay and resultant Levels of Service are dependent upon a number of factors, including the following:

- Area Type
- Intersection geometrics
- Traffic volumes
- Parking conditions
- Pedestrian activity
- Vehicle Mix
- Bus Stop location and activity
- Peak Hour Factor
- Traffic Signal operation, if applicable

Ramp and weaving area Densities and resultant Levels of Service are dependent upon a number of factors, including the following:

- Number of lanes
- Configuration of weaving area
- Length of acceleration/deceleration lanes
- Vehicle speeds
- Traffic volumes
- Vehicle Mix
- Peak Hour Factor

FACTORS

SIGNALIZED INTERSECTIONS

Level of Service for Signalized Intersections is defined in terms of Delay, which is a measure of driver discomfort, frustration, fuel consumption, and loss of travel time. Specifically, Level of Service criteria are stated in terms of the Average Control Delay per vehicle for the peak 15-minute period within the hour analyzed.

Delay is a complex measure and is dependent upon a number of variables, including:

- Cycle length
- Ratio of Green time to Cycle length (G/C)

- Ratio of Volume to Capacity (V/C) for lane group or approach
- Traffic signal progression

UNSIGNALIZED INTERSECTIONS

Level of Service for Unsignalized Intersections is also defined in terms of Delay. The amount of Delay is based upon the availability of "gaps" in the mainline traffic stream and the acceptance of these gaps by motorists waiting on the side street to enter the main street traffic flow.

RAMP AND RAMP JUNCTIONS

Level of Service for ramp freeway junctions and the ramp proper are defined in terms of Density (passenger cars per mile per lane). Density is related to the traffic flow in the area of influence.

WEAVING AREAS

Level of Service for weaving areas is defined in terms of Density (passenger cars per mile per lane). Density is based on the ratio of weaving vehicles to non-weaving vehicles and on vehicle speeds in the weaving area of influence

CRITERIA

The criteria for the various Level of Service designations are as follows:

	SIGNALIZED	**UNSIGNALIZED**
LEVEL OF SERVICE	**Average Control Delay per Vehicle (Seconds)**	**Average Control Delay per Vehicle (Seconds)**
A	10.0 or less	10.0 or less
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	80.1 or greater	50.1 or greater

Level of Service	Ramp-Freeway Junction	Ramp Proper	Weaving Areas	
	Maximum Density pc/mi/ln	Density Range pc/mi/ln	Maximum Density pc/mi/ln	
			Freeway Weaving Area	Multi-lane + C-D Weaving Area
A	≤10	≤11	≤10	≤12
B	>10 - 20	>11 – 18	>10 - 20	>12 - 24
C	>20 - 28	>18 – 26	> 20 - 28	>24 - 32
D	>28 - 35	>26 – 35	>28 - 35	>32 - 36
E	>35	>35 – 45	>35 - 43	>36 - 40
F	Demand exceeds capacity	>45	>43	>40

DESCRIPTION

The following is a brief description of each of the six Level of Service designations as defined by the Highway Capacity Manual:

SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE A

Average Control Delay - 10.0 secs. or less

Describes operations with very low delay. Occurs when progression is extremely favorable and most vehicles arrive during the Green Phase and do not stop at all. Short cycle lengths may also contribute to low delay.

LEVEL OF SERVICE B

Average Control Delay - 10.1 to 20.0 secs.

Generally occurs with good progression and/or short cycle lengths. More vehicles stop than for Level of Service A, causing higher levels of average delay.

LEVEL OF SERVICE C

Average Control Delay - 20.1 to 35.0 secs.

Higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this Level of Service. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.

LEVEL OF SERVICE D

Average Control Delay - 35.1 to 55.0 secs.

The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high Volume/Capacity (V/C) Ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LEVEL OF SERVICE E

Average Control Delay - 55.1 to 80.0 secs.

The limit of acceptable delay.

Higher delay values generally indicate poor progression, long cycle lengths, and high V/C Ratios. Individual cycle failures are frequent occurrences.

LEVEL OF SERVICE F

Average Control Delay - in excess of 80.0 secs.

Unacceptable to most drivers.

Occurs with oversaturation, i.e., arrival flow rates exceed the capacity of the intersection. May also occur at high V/C Ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.

UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE A
Average Control Delay - 10.0 secs. or less
Operations with little or no delay to minor turning movements.

LEVEL OF SERVICE B
Average Control Delay - 10.1 to 15.0 secs.
Operations with short delays on minor turning movements.

LEVEL OF SERVICE C
Average Control Delay - 15.1 to 25.0 secs.
Operations with average delays on minor turning movements.

LEVEL OF SERVICE D
Average Control Delay - 25.1 to 35.0 secs.
Operations with some delays on minor turning movements.

LEVEL OF SERVICE E
Average Control Delay - 35.1 to 50.0 secs.
Operations with long delays on minor turning movements.

LEVEL OF SERVICE F
Average Control Delay - In excess of 50.0 secs.
Operations where demand exceeds capacity. Very long delays with queuing may be experienced on the minor street approach.

RAMPS AND RAMP JUNCTIONS

LEVEL OF SERVICE A

Maximum Density - 10 pc/mi/ln

Unrestricted operations with no noticeable turbulence in the ramp influence area.

LEVEL OF SERVICE B

Maximum Density - 20 pc/mi/ln

Minimal levels of turbulence exist and speeds of vehicles in the influence area begin to decline.

LEVEL OF SERVICE C

Maximum Density - 28 pc/mi/ln

Level of turbulence becomes noticeable as average speed within the influence area declines. Driving conditions are still relatively comfortable at this level.

LEVEL OF SERVICE D

Maximum Density - 35 pc/mi/ln

Turbulence levels become intrusive. Queues may form on some high volume on-ramps but freeway operation remains stable.

LEVEL OF SERVICE E

Maximum Density - >35 pc/mi/ln

Conditions approaching and reaching capacity. Speeds are reduced and turbulence of merging/diverging vehicles becomes intrusive to all vehicles in the influence area. Flow levels approach capacity limits and minor changes in demand can cause ramp and freeway queues to occur.

LEVEL OF SERVICE F

Maximum Density – Demand flow exceeds limits

Unstable, or breakdown, operation. Approaching demand flows exceed the discharge capacity of the downstream freeway or ramp. Queues are visibly formed on the freeway and on-ramps and will continue to grow as long as the approaching demand exceeds the discharge capacity.

APPENDIX F

Capacity Analysis Worksheets

HCM Signalized Intersection Capacity Analysis

Existing AM Peak Hour

HCM Signalized Intersection Capacity Analysis
2: Old Hopewell Road (CR 93) & CR 94

3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	264	34	8	208	97	43	151	9	186	166	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.96			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.98	
Satd. Flow (prot)		1824			1783			1832			1781	
Flt Permitted		0.90			0.99			0.86			0.77	
Satd. Flow (perm)		1651			1763			1587			1398	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	287	37	9	226	105	47	164	10	202	180	79
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	384	0	0	340	0	0	221	0	0	461	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			30.0			30.0	
Effective Green, g (s)		30.0			30.0			30.0			30.0	
Actuated g/C Ratio		0.42			0.42			0.42			0.42	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		688			735			661			583	
v/s Ratio Prot												
v/s Ratio Perm		c0.23			0.19			0.14			c0.33	
v/c Ratio		0.56			0.46			0.33			0.79	
Uniform Delay, d1		16.0			15.2			14.2			18.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.3			2.1			1.4			10.5	
Delay (s)		19.2			17.3			15.6			28.8	
Level of Service		B			B			B			C	
Approach Delay (s)		19.2			17.3			15.6			28.8	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Old Hopewell Road (CR 93) & Balfour Drive

3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	307	2	4	317	3	2	0	15	31	0	21
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	334	2	4	345	3	2	0	16	34	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					956							
pX, platoon unblocked												
vC, conflicting volume	348			336			726	704	335	719	704	346
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348			336			726	704	335	719	704	346
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	98	90	100	97
cM capacity (veh/h)	1211			1223			327	358	707	333	358	697

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	342	352	18	57
Volume Left	7	4	2	34
Volume Right	2	3	16	23
cSH	1211	1223	622	422
Volume to Capacity	0.01	0.00	0.03	0.13
Queue Length 95th (ft)	0	0	2	11
Control Delay (s)	0.2	0.1	11.0	14.8
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.1	11.0	14.8
Approach LOS			B	B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: CR 94 & NY Route 82

AM Existing
3/22/2011

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	58	163	121	284	351	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.90			1.00	0.99	
Flt Protected	0.99			0.99	1.00	
Satd. Flow (prot)	1656			1835	1842	
Flt Permitted	0.99			0.77	1.00	
Satd. Flow (perm)	1656			1438	1842	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	177	132	309	382	35
RTOR Reduction (vph)	106	0	0	0	2	0
Lane Group Flow (vph)	134	0	0	441	415	0
Turn Type			pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	11.6			22.3	22.3	
Effective Green, g (s)	11.6			22.3	22.3	
Actuated g/C Ratio	0.26			0.51	0.51	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	438			730	936	
v/s Ratio Prot	c0.08				0.23	
v/s Ratio Perm				c0.31		
v/c Ratio	0.31			0.60	0.44	
Uniform Delay, d1	12.9			7.7	6.9	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.4			1.4	0.3	
Delay (s)	13.3			9.1	7.2	
Level of Service	B			A	A	
Approach Delay (s)	13.3			9.1	7.2	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	43.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
9: All Angels Hill Road (CR 94) & Widmer Road

3/17/2011

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Volume (veh/h)	170	285	290	12	11	114
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	185	310	315	13	12	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	328				1001	322
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	328				1001	322
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	85				95	83
cM capacity (veh/h)	1231				229	719

Direction, Lane #	NB 1	NB 2	SB 1	NE 1
Volume Total	185	310	328	136
Volume Left	185	0	0	12
Volume Right	0	0	13	124
cSH	1231	1700	1700	789
Volume to Capacity	0.15	0.18	0.19	0.17
Queue Length 95th (ft)	13	0	0	15
Control Delay (s)	8.4	0.0	0.0	12.0
Lane LOS	A			B
Approach Delay (s)	3.2		0.0	12.0
Approach LOS				B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: New Hackensack Road (CR 104) & All Angels Hill Road (CR 94)

AM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	209	9	3	138	0	16	0	253	0	274	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	5.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frt		0.99			1.00			0.87			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		1852			1861			1621			1863	1583
Flt Permitted		1.00			1.00			0.97			1.00	1.00
Satd. Flow (perm)		1852			1861			1576			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	227	10	3	150	0	17	0	275	0	298	167
RTOR Reduction (vph)	0	1	0	0	0	0	0	200	0	0	0	0
Lane Group Flow (vph)	0	236	0	0	153	0	0	92	0	0	298	167
Turn Type				Split			custom					Prot
Protected Phases		1		2	2						3	3
Permitted Phases							4	4				
Actuated Green, G (s)		45.0			20.0			45.0			34.5	34.5
Effective Green, g (s)		45.0			20.0			45.0			34.5	34.5
Actuated g/C Ratio		0.27			0.12			0.27			0.21	0.21
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		507			226			431			391	332
v/s Ratio Prot		c0.13			c0.08						c0.16	0.11
v/s Ratio Perm								c0.06				
v/c Ratio		0.47			0.68			0.21			0.76	0.50
Uniform Delay, d1		49.7			69.2			46.1			61.1	57.4
Progression Factor		1.00			0.11			1.00			1.00	1.00
Incremental Delay, d2		3.1			10.7			1.1			8.5	1.2
Delay (s)		52.8			18.5			47.2			69.7	58.6
Level of Service		D			B			D			E	E
Approach Delay (s)		52.8			18.5			47.2			65.7	
Approach LOS		D			B			D			E	

Intersection Summary			
HCM Average Control Delay	52.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	164.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: New Hackensack Road (CR104) & Route 376

AM Existing
3/17/2011

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	398	64	141	238	156	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.98		1.00	1.00	1.00	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1752		1770	1863	1863	
Flt Permitted	0.96		0.95	1.00	1.00	
Satd. Flow (perm)	1752		1770	1863	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	433	70	153	259	170	0
RTOR Reduction (vph)	3	0	0	0	0	0
Lane Group Flow (vph)	500	0	153	259	170	0
Turn Type			Prot			
Protected Phases	1 4		2	2 3	3	
Permitted Phases						
Actuated Green, G (s)	95.0		20.0	59.5	34.5	
Effective Green, g (s)	95.0		20.0	59.5	34.5	
Actuated g/C Ratio	0.58		0.12	0.36	0.21	
Clearance Time (s)			5.0		5.0	
Vehicle Extension (s)			3.0		3.0	
Lane Grp Cap (vph)	1012		215	674	391	
v/s Ratio Prot	c0.29		c0.09	0.14	c0.09	
v/s Ratio Perm						
v/c Ratio	0.49		0.71	0.38	0.43	
Uniform Delay, d1	20.5		69.5	38.9	56.5	
Progression Factor	0.46		1.00	1.00	1.00	
Incremental Delay, d2	1.6		18.1	0.4	0.8	
Delay (s)	10.9		87.6	39.3	57.3	
Level of Service	B		F	D	E	
Approach Delay (s)	10.9			57.2	57.3	
Approach LOS	B			E	E	

Intersection Summary			
HCM Average Control Delay	35.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	164.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Myers Corners Road (CR 93) & All Angels Hill Road (CR 94)

3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	168	85	29	254	78	107	258	12	66	181	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.96		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1769		1770	1797		1770	1850		1770	1863	1583
Flt Permitted	0.29	1.00		0.59	1.00		0.46	1.00		0.49	1.00	1.00
Satd. Flow (perm)	537	1769		1100	1797		861	1850		905	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	129	183	92	32	276	85	116	280	13	72	197	200
RTOR Reduction (vph)	0	11	0	0	8	0	0	1	0	0	0	158
Lane Group Flow (vph)	129	264	0	32	353	0	116	292	0	72	197	42
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	40.6	31.9		28.6	24.9		31.0	21.3		24.0	17.8	17.8
Effective Green, g (s)	40.6	31.9		28.6	24.9		31.0	21.3		24.0	17.8	17.8
Actuated g/C Ratio	0.48	0.37		0.34	0.29		0.36	0.25		0.28	0.21	0.21
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	411	663		399	526		417	463		318	390	331
v/s Ratio Prot	c0.04	c0.15		0.00	c0.20		c0.03	c0.16		0.02	0.11	
v/s Ratio Perm	0.11			0.02			0.07			0.05		0.03
v/c Ratio	0.31	0.40		0.08	0.67		0.28	0.63		0.23	0.51	0.13
Uniform Delay, d1	13.9	19.5		19.1	26.5		18.6	28.4		22.9	29.8	27.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.4		0.1	3.4		0.4	2.7		0.4	1.0	0.2
Delay (s)	14.3	19.9		19.2	29.9		19.0	31.1		23.3	30.8	27.5
Level of Service	B	B		B	C		B	C		C	C	C
Approach Delay (s)		18.1			29.0			27.6			28.2	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	85.1	Sum of lost time (s)	28.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Kent Road & Myers Corners Road (CR 93)

3/17/2011

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	405	17	8	496	88	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	440	18	9	539	96	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			459		1006	449
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			459		1006	449
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		64	97
cM capacity (veh/h)			1102		265	610

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	459	548	113
Volume Left	0	9	96
Volume Right	18	0	17
cSH	1700	1102	290
Volume to Capacity	0.27	0.01	0.39
Queue Length 95th (ft)	0	1	44
Control Delay (s)	0.0	0.2	25.1
Lane LOS		A	D
Approach Delay (s)	0.0	0.2	25.1
Approach LOS			D

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
19: Kent Road & CR 94

3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	0	56	5	5	8	41	343	4	1	287	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	0	61	5	5	9	45	373	4	1	312	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	793	784	316	843	786	375	320			377		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	793	784	316	843	786	375	320			377		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	92	98	98	99	96			100		
cM capacity (veh/h)	290	313	725	252	312	671	1240			1181		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	82	20	422	321
Volume Left	21	5	45	1
Volume Right	61	9	4	8
cSH	525	377	1240	1181
Volume to Capacity	0.16	0.05	0.04	0.00
Queue Length 95th (ft)	14	4	3	0
Control Delay (s)	13.1	15.1	1.2	0.0
Lane LOS	B	C	A	A
Approach Delay (s)	13.1	15.1	1.2	0.0
Approach LOS	B	C		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
22: Site Driveway & CR 94

3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	3	0	16	2	351	4	6	315	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	3	0	17	2	382	4	7	342	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	765	749	346	747	751	384	350			386		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	765	749	346	747	751	384	350			386		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	99	100	97	100			99		
cM capacity (veh/h)	310	338	697	327	337	664	1209			1173		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	21	388	357
Volume Left	0	3	2	7
Volume Right	0	17	4	8
cSH	1700	571	1209	1173
Volume to Capacity	0.00	0.04	0.00	0.01
Queue Length 95th (ft)	0	3	0	0
Control Delay (s)	0.0	11.5	0.1	0.2
Lane LOS	A	B	A	A
Approach Delay (s)	0.0	11.5	0.1	0.2
Approach LOS	A	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: Pye Lane & All Angels Hill Road (CR 94)

3/17/2011

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	51	29	14	304	328	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	32	15	330	357	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	727	366	376			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	727	366	376			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	95	99			
cM capacity (veh/h)	386	679	1182			

Direction, Lane #	WB 1	SE 1	NW 1
Volume Total	87	346	376
Volume Left	55	15	0
Volume Right	32	0	20
cSH	457	1182	1700
Volume to Capacity	0.19	0.01	0.22
Queue Length 95th (ft)	17	1	0
Control Delay (s)	14.7	0.5	0.0
Lane LOS	B	A	
Approach Delay (s)	14.7	0.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
28: Brown Road & CR 94

3/17/2011

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Volume (veh/h)	51	44	269	39	14	334
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	48	292	42	15	363
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	707	314			335	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	707	314			335	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	93			99	
cM capacity (veh/h)	397	727			1225	

Direction, Lane #	WB 1	NB 1	SE 1
Volume Total	103	335	378
Volume Left	55	0	15
Volume Right	48	42	0
cSH	502	1700	1225
Volume to Capacity	0.21	0.20	0.01
Queue Length 95th (ft)	19	0	1
Control Delay (s)	14.0	0.0	0.4
Lane LOS	B		A
Approach Delay (s)	14.0	0.0	0.4
Approach LOS	B		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
30: Old Hopewell Road (CR 93) & Cedar Hill Road

3/17/2011

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	300	28	8	378	60	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	326	30	9	411	65	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			357		770	341
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			357		770	341
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		82	99
cM capacity (veh/h)			1202		366	701

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	357	420	74
Volume Left	0	9	65
Volume Right	30	0	9
cSH	1700	1202	388
Volume to Capacity	0.21	0.01	0.19
Queue Length 95th (ft)	0	1	17
Control Delay (s)	0.0	0.2	16.4
Lane LOS		A	C
Approach Delay (s)	0.0	0.2	16.4
Approach LOS			C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

Existing PM Peak Hour

HCM Signalized Intersection Capacity Analysis
2: Old Hopewell Road (CR 93) & CR 94

176817- PM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	91	258	48	17	346	211	42	272	16	74	162	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			0.99			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		1812			1768			1839			1786	
Flt Permitted		0.67			0.98			0.92			0.84	
Satd. Flow (perm)		1224			1738			1701			1511	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	280	52	18	376	229	46	296	17	80	176	72
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	431	0	0	623	0	0	359	0	0	328	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			30.0			30.0	
Effective Green, g (s)		30.0			30.0			30.0			30.0	
Actuated g/C Ratio		0.42			0.42			0.42			0.42	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		510			724			709			630	
v/s Ratio Prot												
v/s Ratio Perm		0.35			c0.36			0.21			c0.22	
v/c Ratio		0.85			0.86			0.51			0.52	
Uniform Delay, d1		18.9			19.1			15.5			15.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		15.7			12.7			2.6			3.1	
Delay (s)		34.6			31.8			18.1			18.7	
Level of Service		C			C			B			B	
Approach Delay (s)		34.6			31.8			18.1			18.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	27.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Old Hopewell Road (CR 93) & Balfour Drive

176817- PM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	385	3	5	427	22	1	0	0	12	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	418	3	5	464	24	1	0	0	13	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					956							
pX, platoon unblocked	0.92						0.92	0.92		0.92	0.92	0.92
vC, conflicting volume	488			422			942	954	420	942	943	476
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	402			422			894	907	420	894	896	389
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			100	100	100	95	100	100
cM capacity (veh/h)	1066			1137			237	249	633	237	252	608

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	439	493	1	13
Volume Left	17	5	1	13
Volume Right	3	24	0	0
cSH	1066	1137	237	237
Volume to Capacity	0.02	0.00	0.00	0.05
Queue Length 95th (ft)	1	0	0	4
Control Delay (s)	0.5	0.1	20.2	21.0
Lane LOS	A	A	C	C
Approach Delay (s)	0.5	0.1	20.2	21.0
Approach LOS			C	C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: CR 94 & NY Route 82

176817- PM Existing
3/22/2011

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	39	164	283	442	342	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.89			1.00	0.98	
Flt Protected	0.99			0.98	1.00	
Satd. Flow (prot)	1644			1827	1822	
Flt Permitted	0.99			0.66	1.00	
Satd. Flow (perm)	1644			1238	1822	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	178	308	480	372	72
RTOR Reduction (vph)	154	0	0	0	3	0
Lane Group Flow (vph)	66	0	0	788	441	0
Turn Type			pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	10.8			60.0	60.0	
Effective Green, g (s)	10.8			60.0	60.0	
Actuated g/C Ratio	0.13			0.74	0.74	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	220			919	1353	
v/s Ratio Prot	c0.04				0.24	
v/s Ratio Perm				c0.64		
v/c Ratio	0.30			0.86	0.33	
Uniform Delay, d1	31.6			7.4	3.5	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.8			8.0	0.1	
Delay (s)	32.4			15.3	3.7	
Level of Service	C			B	A	
Approach Delay (s)	32.4			15.3	3.7	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	80.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
9: All Angels Hill Road (CR 94) & Widmer Road

176817- PM Existing
3/17/2011

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Volume (veh/h)	182	323	345	17	10	204
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	198	351	375	18	11	222
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	393				1131	384
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	393				1131	384
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	83				94	67
cM capacity (veh/h)	1165				187	663

Direction, Lane #	NB 1	NB 2	SB 1	NE 1
Volume Total	198	351	393	233
Volume Left	198	0	0	11
Volume Right	0	0	18	222
cSH	1165	1700	1700	696
Volume to Capacity	0.17	0.21	0.23	0.33
Queue Length 95th (ft)	15	0	0	37
Control Delay (s)	8.7	0.0	0.0	13.7
Lane LOS	A			B
Approach Delay (s)	3.1		0.0	13.7
Approach LOS				B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: New Hackensack Road (CR 104) & All Angels Hill Road (CR 94)

176817- PM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	361	23	0	158	0	26	0	275	0	330	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	5.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frt		0.99			1.00			0.88			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		1848			1863			1626			1863	1583
Flt Permitted		1.00			1.00			1.00			1.00	1.00
Satd. Flow (perm)		1848			1863			1626			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	392	25	0	172	0	28	0	299	0	359	175
RTOR Reduction (vph)	0	1	0	0	0	0	0	218	0	0	0	0
Lane Group Flow (vph)	0	416	0	0	172	0	0	109	0	0	359	175
Turn Type				Split			Split					Prot
Protected Phases		1		2	2		4	4			3	3
Permitted Phases												
Actuated Green, G (s)		45.0			20.0			45.0			36.9	36.9
Effective Green, g (s)		45.0			20.0			45.0			36.9	36.9
Actuated g/C Ratio		0.27			0.12			0.27			0.22	0.22
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		498			223			438			412	350
v/s Ratio Prot		c0.22			c0.09			c0.07			c0.19	0.11
v/s Ratio Perm												
v/c Ratio		0.83			0.77			0.25			0.87	0.50
Uniform Delay, d1		57.4			71.2			47.7			62.7	56.9
Progression Factor		1.00			0.16			1.00			1.00	1.00
Incremental Delay, d2		15.1			13.4			1.3			17.9	1.1
Delay (s)		72.6			24.5			49.1			80.6	58.0
Level of Service		E			C			D			F	E
Approach Delay (s)		72.6			24.5			49.1			73.2	
Approach LOS		E			C			D			E	

Intersection Summary			
HCM Average Control Delay	61.8	HCM Level of Service	E
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	166.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
12: New Hackensack Road (CR104) & Route 376

176817- PM Existing
3/17/2011

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	461	175	158	199	213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	1.00	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1731		1770	1863	1863	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1731		1770	1863	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	501	190	172	216	232	0
RTOR Reduction (vph)	8	0	0	0	0	0
Lane Group Flow (vph)	683	0	172	216	232	0
Turn Type			Prot			
Protected Phases	1 4		2	2 3	3	
Permitted Phases						
Actuated Green, G (s)	95.0		20.0	61.9	36.9	
Effective Green, g (s)	95.0		20.0	61.9	36.9	
Actuated g/C Ratio	0.57		0.12	0.37	0.22	
Clearance Time (s)			5.0		5.0	
Vehicle Extension (s)			3.0		3.0	
Lane Grp Cap (vph)	985		212	691	412	
v/s Ratio Prot	c0.39		c0.10	0.12	c0.12	
v/s Ratio Perm						
v/c Ratio	0.69		0.81	0.31	0.56	
Uniform Delay, d1	25.6		71.6	37.4	57.8	
Progression Factor	0.56		1.00	1.00	1.00	
Incremental Delay, d2	2.9		27.6	0.3	1.8	
Delay (s)	17.3		99.2	37.6	59.6	
Level of Service	B		F	D	E	
Approach Delay (s)	17.3			64.9	59.6	
Approach LOS	B			E	E	

Intersection Summary			
HCM Average Control Delay	38.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	166.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	318	103	19	235	99	74	276	41	143	240	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1794		1770	1780		1770	1826		1770	1863	1583
Flt Permitted	0.27	1.00		0.42	1.00		0.56	1.00		0.25	1.00	1.00
Satd. Flow (perm)	507	1794		783	1780		1049	1826		463	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	346	112	21	255	108	80	300	45	155	261	213
RTOR Reduction (vph)	0	7	0	0	11	0	0	5	0	0	0	151
Lane Group Flow (vph)	174	451	0	21	352	0	80	340	0	155	261	62
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	45.4	38.0		30.5	28.1		30.9	24.2		39.5	28.5	28.5
Effective Green, g (s)	45.4	38.0		30.5	28.1		30.9	24.2		39.5	28.5	28.5
Actuated g/C Ratio	0.47	0.39		0.31	0.29		0.32	0.25		0.40	0.29	0.29
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	395	698		269	512		382	453		335	544	462
v/s Ratio Prot	c0.06	c0.25		0.00	0.20		0.01	c0.19		c0.05	0.14	
v/s Ratio Perm	0.15			0.02			0.05			0.14		0.04
v/c Ratio	0.44	0.65		0.08	0.69		0.21	0.75		0.46	0.48	0.13
Uniform Delay, d1	17.2	24.3		23.4	30.8		23.9	33.9		20.4	28.4	25.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	2.1		0.1	3.8		0.3	6.9		1.0	0.7	0.1
Delay (s)	18.0	26.4		23.6	34.7		24.2	40.8		21.5	29.1	25.6
Level of Service	B	C		C	C		C	D		C	C	C
Approach Delay (s)		24.1			34.0			37.7			26.0	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	97.6	Sum of lost time (s)	27.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	468	59	20	457	67	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	509	64	22	497	73	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			573		1081	541
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			573		1081	541
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		69	95
cM capacity (veh/h)			1000		236	541

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	573	518	98
Volume Left	0	22	73
Volume Right	64	0	25
cSH	1700	1000	276
Volume to Capacity	0.34	0.02	0.35
Queue Length 95th (ft)	0	2	39
Control Delay (s)	0.0	0.6	25.1
Lane LOS		A	D
Approach Delay (s)	0.0	0.6	25.1
Approach LOS			D

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
19: Kent Road & CR 94

176817- PM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	38	2	3	10	64	381	4	6	319	17
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	0	41	2	3	11	70	414	4	7	347	18
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	937	927	356	966	934	416	365			418		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	937	927	356	966	934	416	365			418		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	94	99	99	98	94			99		
cM capacity (veh/h)	227	251	688	209	249	636	1193			1141		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	50	16	488	372
Volume Left	9	2	70	7
Volume Right	41	11	4	18
cSH	508	402	1193	1141
Volume to Capacity	0.10	0.04	0.06	0.01
Queue Length 95th (ft)	8	3	5	0
Control Delay (s)	12.9	14.3	1.7	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	12.9	14.3	1.7	0.2
Approach LOS	B	B		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
22: Site Driveway & CR 94

176817- PM Existing
3/17/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	0	2	1	0	11	1	406	10	13	346	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	0	2	1	0	12	1	441	11	14	376	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	865	859	376	855	853	447	376			452		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	865	859	376	855	853	447	376			452		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	100	100	100	98	100			99		
cM capacity (veh/h)	266	290	670	274	292	612	1182			1108		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	13	453	390
Volume Left	2	1	1	14
Volume Right	2	12	11	0
cSH	381	555	1182	1108
Volume to Capacity	0.01	0.02	0.00	0.01
Queue Length 95th (ft)	1	2	0	1
Control Delay (s)	14.6	11.6	0.0	0.4
Lane LOS	B	B	A	A
Approach Delay (s)	14.6	11.6	0.0	0.4
Approach LOS	B	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: Pye Lane & All Angels Hill Road (CR 94)

176817- PM Existing
3/17/2011

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	30	20	15	334	397	37
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	22	16	363	432	40
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	847	452	472			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	847	452	472			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	96	99			
cM capacity (veh/h)	327	608	1090			

Direction, Lane #	WB 1	SE 1	NW 1
Volume Total	54	379	472
Volume Left	33	16	0
Volume Right	22	0	40
cSH	401	1090	1700
Volume to Capacity	0.14	0.01	0.28
Queue Length 95th (ft)	12	1	0
Control Delay (s)	15.4	0.5	0.0
Lane LOS	C	A	
Approach Delay (s)	15.4	0.5	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
28: Brown Road & CR 94

176817- PM Existing
3/17/2011

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Volume (veh/h)	65	34	412	87	48	304
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	37	448	95	52	330
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	930	495			542	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	930	495			542	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	94			95	
cM capacity (veh/h)	282	574			1026	

Direction, Lane #	WB 1	NB 1	SE 1
Volume Total	108	542	383
Volume Left	71	0	52
Volume Right	37	95	0
cSH	341	1700	1026
Volume to Capacity	0.32	0.32	0.05
Queue Length 95th (ft)	33	0	4
Control Delay (s)	20.3	0.0	1.7
Lane LOS	C		A
Approach Delay (s)	20.3	0.0	1.7
Approach LOS	C		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
30: Old Hopewell Road (CR 93) & Cedar Hill Road

176817- PM Existing
3/17/2011

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	460	45	6	482	55	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	500	49	7	524	60	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			549		1061	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			549		1061	524
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		76	98
cM capacity (veh/h)			1021		246	553

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	549	530	70
Volume Left	0	7	60
Volume Right	49	0	10
cSH	1700	1021	267
Volume to Capacity	0.32	0.01	0.26
Queue Length 95th (ft)	0	0	25
Control Delay (s)	0.0	0.2	23.2
Lane LOS		A	C
Approach Delay (s)	0.0	0.2	23.2
Approach LOS			C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

No-Build AM Peak Hour

HCM Signalized Intersection Capacity Analysis
2: Old Hopewell Road (CR 93) & CR 94

AM No-Build (No Adj. Devs)
3/22/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	291	38	9	230	107	47	167	10	205	183	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.96			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.98	
Satd. Flow (prot)		1824			1783			1832			1780	
Flt Permitted		0.89			0.99			0.85			0.75	
Satd. Flow (perm)		1641			1761			1566			1370	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	316	41	10	250	116	51	182	11	223	199	88
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	423	0	0	376	0	0	244	0	0	510	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.0			30.0			30.0			30.0	
Effective Green, g (s)		30.0			30.0			30.0			30.0	
Actuated g/C Ratio		0.42			0.42			0.42			0.42	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		684			734			653			571	
v/s Ratio Prot												
v/s Ratio Perm		c0.26			0.21			0.16			c0.37	
v/c Ratio		0.62			0.51			0.37			0.89	
Uniform Delay, d1		16.5			15.6			14.5			19.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.2			2.5			1.6			18.9	
Delay (s)		20.7			18.1			16.1			38.4	
Level of Service		C			B			B			D	
Approach Delay (s)		20.7			18.1			16.1			38.4	
Approach LOS		C			B			B			D	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	108.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Old Hopewell Road (CR 93) & Balfour Drive

AM No-Build (No Adj. Devs)
3/22/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	332	2	4	343	3	2	0	16	31	0	21
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	361	2	4	373	3	2	0	17	34	0	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					956							
pX, platoon unblocked												
vC, conflicting volume	376			363			781	760	362	776	759	374
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	376			363			781	760	362	776	759	374
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	97	89	100	97
cM capacity (veh/h)	1182			1196			299	333	683	305	333	672

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	370	380	20	57
Volume Left	7	4	2	34
Volume Right	2	3	17	23
cSH	1182	1196	598	391
Volume to Capacity	0.01	0.00	0.03	0.14
Queue Length 95th (ft)	0	0	3	13
Control Delay (s)	0.2	0.1	11.2	15.8
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	0.1	11.2	15.8
Approach LOS			B	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: CR 94 & NY Route 82

AM No-Build (No Adj. Devs)
3/22/2011

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	64	180	134	314	388	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.90			1.00	0.99	
Flt Protected	0.99			0.99	1.00	
Satd. Flow (prot)	1656			1835	1842	
Flt Permitted	0.99			0.75	1.00	
Satd. Flow (perm)	1656			1396	1842	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	70	196	146	341	422	38
RTOR Reduction (vph)	110	0	0	0	2	0
Lane Group Flow (vph)	156	0	0	487	458	0
Turn Type			pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	13.2			32.0	32.0	
Effective Green, g (s)	13.2			32.0	32.0	
Actuated g/C Ratio	0.24			0.58	0.58	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	396			809	1068	
v/s Ratio Prot	c0.09				0.25	
v/s Ratio Perm				c0.35		
v/c Ratio	0.40			0.60	0.43	
Uniform Delay, d1	17.6			7.5	6.5	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.7			1.3	0.3	
Delay (s)	18.3			8.8	6.8	
Level of Service	B			A	A	
Approach Delay (s)	18.3			8.8	6.8	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	55.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			