3.J.2.3 Potential Thermal Impacts on Receiving Waters

Stormwater BMPs are designed to remove pollutants from stormwater runoff and use the peak discharge control method for controlling the impacts of stormwater runoff; however, they may increase runoff temperature thus adversely affecting receiving cold water streams and the habitats of cold water fish species, such as trout. According to the *EPA Stormwater Best Management Practice Design Guide: Volume 1 Design Considerations*, summer in-stream temperatures have been shown to increase significantly (5 to 12°F) in urban streams because of direct solar radiation, lack of riparian buffer, runoff from heat absorbing pavement, and discharges from stormwater ponds.

Degraded riparian buffers reduce water quality values, reduce wildlife and fish populations, and cause serious property damage (bank erosion). Removal of riparian vegetation results in increased water temperatures and decreased dissolved oxygen. The loss of shade exposes soils to drying out by wind and sunlight and reduces the water storage capacity of the riparian area. Loss of riparian vegetation causes streambank erosion. Eroding banks contribute to sedimentation and lead to a wide shallow stream with little habitat value. These factors result in significant reductions in aquatic stream life.

The addition of impervious surfaces can increase stream temperature. Impervious surfaces absorb solar radiation, which raises their temperature and when a storm event occurs, some of the heat is transferred to the water falling on these surfaces. The heated runoff eventually flows into streams and raises their temperature. Impervious surfaces also reduce infiltration thus decreasing baseflows, which have a cooling effect on stream temperature since groundwater is usually maintained at a relatively constant temperature.

Discharges from stormwater management ponds can increase stream temperature. Permanent pools can act as a heat sink between storm events during hot weather. The water can be significantly warmer than naturally occurring baseflow in the receiving waters. The heated discharge eventually flows into streams and raises their temperature.

3.J.2.4 Wetland and Surface Waters Impacts

There are two areas of wetland disturbance proposed. The first location is where the proposed Road "A" crosses the existing twin 30-inch corrugated metal pipe (CMP) culverts between USACE jurisdictional wetlands F/G and H/J. A portion of Road "A" will disturb USACE jurisdictional wetlands F/G and H/J. Replacement of the twin culverts cannot be avoided, since the culverts were determined to be in fair conditions. The twin 30-inch CMP culverts will be replaced with twin 30-inch high-density polyethylene (HPDE) culverts. Approximately 254 square feet (0.006± ac) of wetland F/G and 15 square feet (0.001± ac) of wetland H/J will be disturbed during the replacement of the existing twin 30-inch CMP culverts, associated grading, and utility construction. Replacement of the twin culverts will not result in any stream disturbance.

The final location is north of the southern property line where the emergency access road (Road "E") will connect to the adjacent Shamrock Hills subdivision. A portion of the emergency access road will disturb USACE jurisdictional wetland B/E. Approximately 1,660 square feet (0.038± acres) of the 100 foot Town wetland buffer will be disturbed for the installation of the emergency access road, culvert, and associated grading.

3.J.2.5 Green Infrastructure Planning Practices

Green infrastructure planning includes measures for preservation of natural features of the site. Green infrastructure techniques utilize the natural features of the site and promote runoff reduction. These techniques were incorporated into the planning, design and layout of the Proposed Action which include conservation of natural areas; preservation of naturally vegetated buffers; reduction in the amount of clearing and grading; provision of open space and its design; tree conservation and new tree plantings; rooftop and overland flow disconnection; vegetated open channels; and volume reduction through alternative practices.

Conservation of Natural Areas - Important natural areas and features were identified. These areas and features include the wetlands, streams, wetland buffer areas, areas containing steep slopes, and portions of the forested areas. The majority of these areas will remain undisturbed, which will preserve the pre-development hydrology, aid in reducing stormwater runoff and pollutant load, and promote soil stabilization.

Preservation of Naturally Vegetated Buffers - A 100 foot buffer has been established around the NYSDEC, USACE Federal, and Town regulated wetlands in accordance with the NYSDEC and Town regulations. The buffers cover approximately 26.53 acres of the site. The majority of the buffer area will remain undisturbed, which will improve water quality, lower the velocity of discharged stormwater, promote soil stabilization, provide filtration and infiltration of stormwater runoff into the underlying soils, and provide thermal reductions.

Reduction in the Amount of Clearing and Grading - Clearing and grading activities will be kept to the minimum amount needed for construction of the development. The site will be constructed in phases. By phasing construction, the amount of land disturbance occurring at a single time will be limited, allow for one phase to be stabilized prior to moving onto the next, and avoid mass grading of the site. Undisturbed vegetated areas will aid in reducing stormwater runoff and pollutant load and promote soil stabilization.

Provision of Open Space and its Design - A minimum of 50 percent of the gross site areas is required by the Town Code to be preserved as open space. As previously discussed, important natural areas and features were identified. These areas and features include the wetlands, streams, wetland buffer areas, areas containing steep slopes, and portion of the forested areas. The proposed layout is designed to reduce the overall amount of impervious coverage, clearing, and grading thus preserving more open space. Undisturbed open space will preserve the pre-development hydrology, aid in reducing stormwater runoff and pollutant load, and promote soil stabilization. The total proposed open space area is approximately 73.72 acres, or 51 percent of the site.

3.J.2.6 Runoff Reduction Techniques

Runoff reduction is best achieved through the reduction of the effective impervious surface area of the subcatchment and minimizing the amount of disturbed area. Green infrastructure techniques allow for reductions in the calculated runoff from contributing areas and the required water quality volume by using the natural features of the site and practices that promote runoff reduction.

Tree Conservation and New Tree Plantings - As previously discussed, portions of the forested areas will be preserved. Additional trees and landscaping are incorporated throughout the development. The stormwater management ponds are landscaped with a variety of plantings, including emergents and woody shrubs, to maximize the biological uptake of pollutants. Preserving the existing trees and adding additional ones will aid in reducing stormwater runoff, promote evapotranspiration, increase nutrient uptake, and provide shading and thermal reductions.

Rooftop and Overland Flow Disconnection - Roof top runoff will be directed to vegetated areas (i.e., grassed or landscaped areas) prior to flowing into the stormwater drainage system. Grass swales will also be used to convey stormwater runoff. Vegetated areas will improve water quality, lower the velocity of discharged stormwater, provide filtration and infiltration of stormwater runoff into the underlying soils, and provide thermal reductions.

Vegetated Open Channels - Grass swales are incorporated into the stormwater management design in order to convey stormwater runoff to either the closed pipe network or to the proposed stormwater management facilities. Grass swales will improve water quality, lower the velocity of discharged stormwater, provide filtration and infiltration of stormwater runoff into the underlying soils, and provide thermal reductions.

Volume Reduction through Alternative Practices - Alternative practices, such as rain gardens, green roofs, stormwater planters, cisterns, and permeable paving, were evaluated to determine the feasibility of incorporation into the stormwater management design. The Proposed Action is a cluster development and the homes are clustered closer together in order to preserve more of the property as open space. As a result, there is less opportunity to use these alternative practices. Therefore, standard stormwater management practices were used and these alternative practices were not incorporated.

3.J.2.7 Stormwater Management Ponds

The proposed stormwater management ponds are all wet ponds. The stormwater management ponds have been sized accordingly to provide the required water quality volume for its contributing drainage area as well as provide the required water quantity controls. The sizes of the ponds have been minimized to the greatest extent feasible in order to minimize the amount of clearing and grading. The stormwater management ponds are located outside of the 100 foot NYSDEC adjacent area and 100 foot Town wetland buffers in order to take advantage of the natural, undisturbed land which will aid in reducing the velocity, amount, and temperature of the discharged stormwater prior to flowing into the onsite wetlands and streams.

The outlet control structure has a staged drawdown design. The smaller orifices are located near the bottom of the structure, while the larger slots are located near the top of the structure. The smaller orifices will restrict the outflow at the beginning of storms when the effluent temperature is highest. This will allow the incoming water to cool as it mixes with the water already in the stormwater pond. The staged drawdown design aids in providing thermal mitigation.

The permanent pool depths of the stormwater management ponds vary based upon the type of pond. The depths were chosen in accordance with the *NYS Stormwater Management Design Manual*,

latest edition, as well as prevent thermal stratification from occurring. By preventing prevent thermal stratification, this will minimize short-circuiting and maintain aerobic bottom waters which will maximize pollutant uptake and minimize potential release of nutrients to receiving waters.

The stormwater management ponds are landscaped with a variety of plantings including emergents and woody shrubs, with each type of planting corresponding to the water depth. An extended aquatic bench will maximize the biological uptake of pollutants. The plant types for the stormwater management pond are summarized in *Table 3.J-4* below.

Table 3.J-4: Stormwater Management Pond Plant Types

Botanical Name	Common Name	Type
Acorus calmus	Sweet Flag	Herbaceous
Amelanchier canadensis	Serviceberry	Deciduous Shrub
Calamagrotis canadensis	Sweet Flag	Emergent
Ilex verticillata	Winterberry	Deciduous Shrub
Iris versicolor	Blue Flag Iris	Emergent
Liquidambar styraciflua	Sweetgum	Deciduous Tree
Panicum virgatum	Switch Grass	Perimeter Plant
Peltandra virginica	Arrow Rum	Emergent
Pontederia cordata	Pickerelweed	Emergent
Potamogeton nodosus	Long Leaved Pond Weed	Rooted Submerged Aquatic
Scirpus cyperinus	Wool Grass	Emergent
Valisheria americana	Wild Celery	Submergent
Viburnum dentatum	Arrowwood Viburnum	Deciduous Shrub

The stormwater management pond landscaping is shown on Sheet L-1 "Stormwater Landscaping Plan" of the project plans in Appendix D.

3.J.2.8 Bioretention Areas

Bioretention is practice that uses the chemical, biological and physical properties of plants, microbes and soils for removal of pollutants from stormwater runoff. Unlike various other practices that control only peak discharge, bioretention can be designed to mimic the pre-existing hydrologic conditions by treating the associated runoff volumes. Bioretention facilities provide opportunities for runoff infiltration, filtration, storage, and for water uptake by vegetation. Bioretention facilities can be distributed across a development which can help in controlling runoff close to the source where it is generated.

The bioretention areas are landscaped with a variety of plants, which help reduce water quantities through evapotranspiration, remove pollutants and nutrients, and their root systems increase water percolation. The plant types for the bioretention areas are summarized in *Table 3.J-5* below.

Table 3.J-5: Bioretention Area Plant Types

Botanical Name	Common Name	Type
Ilex verticillata	Winterberry	Deciduous Shrub
Liquidambar styraciflua	Sweetgum	Deciduous Tree
Nyssa sylvatica	Blackgum	Deciduous Tree
Viburnum dentatum	Arrowwood Viburnum	Deciduous Shrub

The bioretention area landscaping is shown on Sheet L-1 "Stormwater Landscaping Plan" of the project plans in Appendix D.

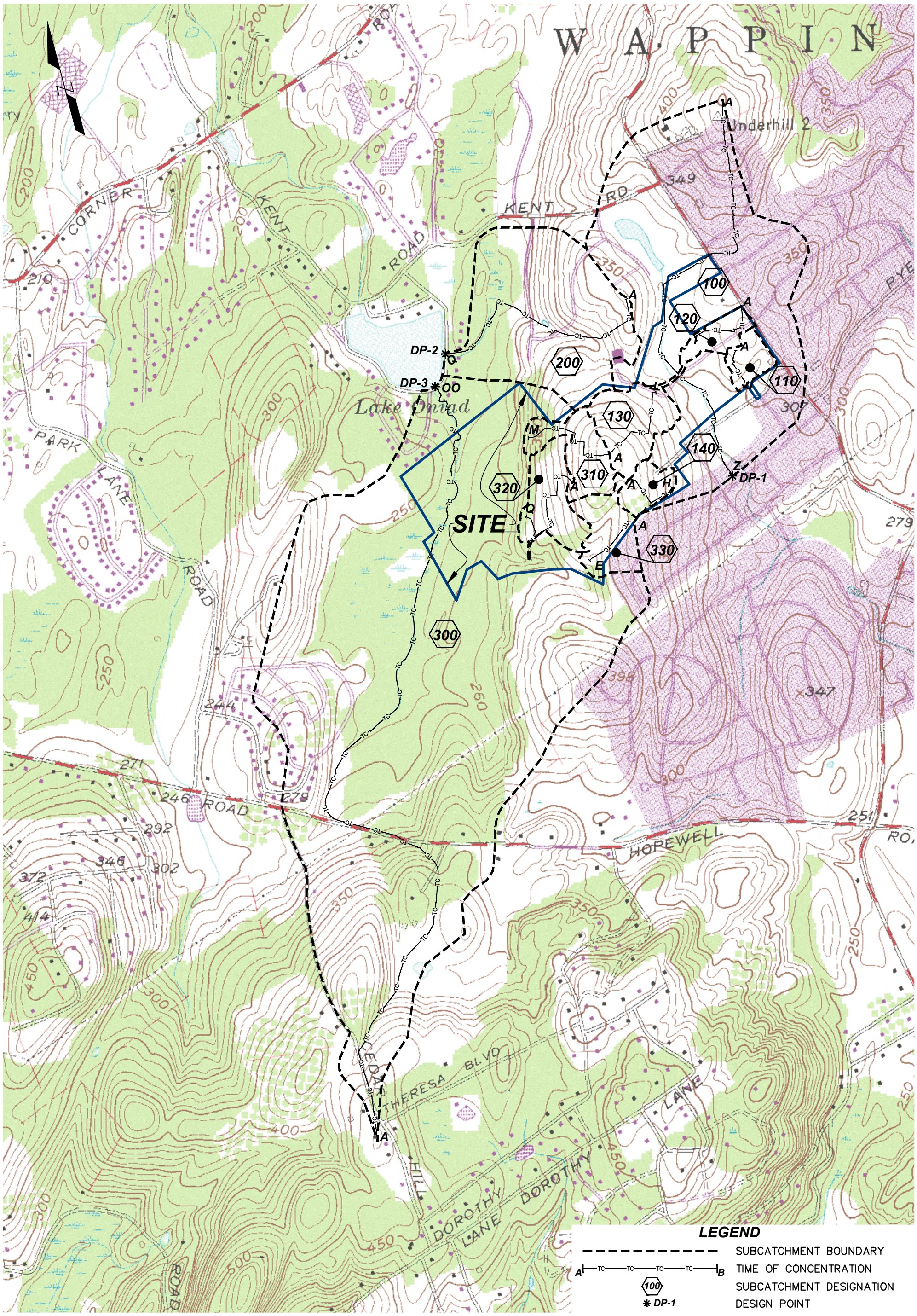
3.J.2.9 Use of Subsurface Detention/Infiltration

Subsurface detention/infiltration can be used for commercial, municipal, industrial, recreational, and residential applications including installation under parking lots and commercial roadways. The layout and design of the site does not provide opportunities to incorporate subsurface detention/infiltration. Therefore, the use of above ground stormwater management practices was preferred over subsurface detention/ infiltration. The above ground stormwater management practices have been incorporated into the site layout and design in order to add visual interest to the site, as well as provide stormwater runoff treatment.

3.J.2.10 Water Quality Volumes

The post-development watershed boundaries are shown in *Figure 3.J-5 through Figure 3.J-7*. *Figure 3.J-5* and *Figure 3.J-6* depicts the overall post-development watershed using the US Geological Survey (USGS) 7.5 minute topographic maps to provide offsite topographic information and aerial imagery from the NYS Geographic Information System (GIS) Clearing House to provide offsite ground coverage. *Figure 3.J-7* depicts the onsite proposed topography and ground coverage.

Stormwater runoff from developed land is recognized as a significant contributor of pollution that can adversely affect the quality of the receiving waters. Treatment of stormwater runoff is important, since most runoff related water quality contaminants are transported during the initial stages of storm events. The proposed water quality controls have been sized based on the 90% rule methodology as described in the *NYS Stormwater Management Design Manual*, latest revision. The water quality volumes for each of the post-development subcatchments are summarized in *Table 3.J-6* below.



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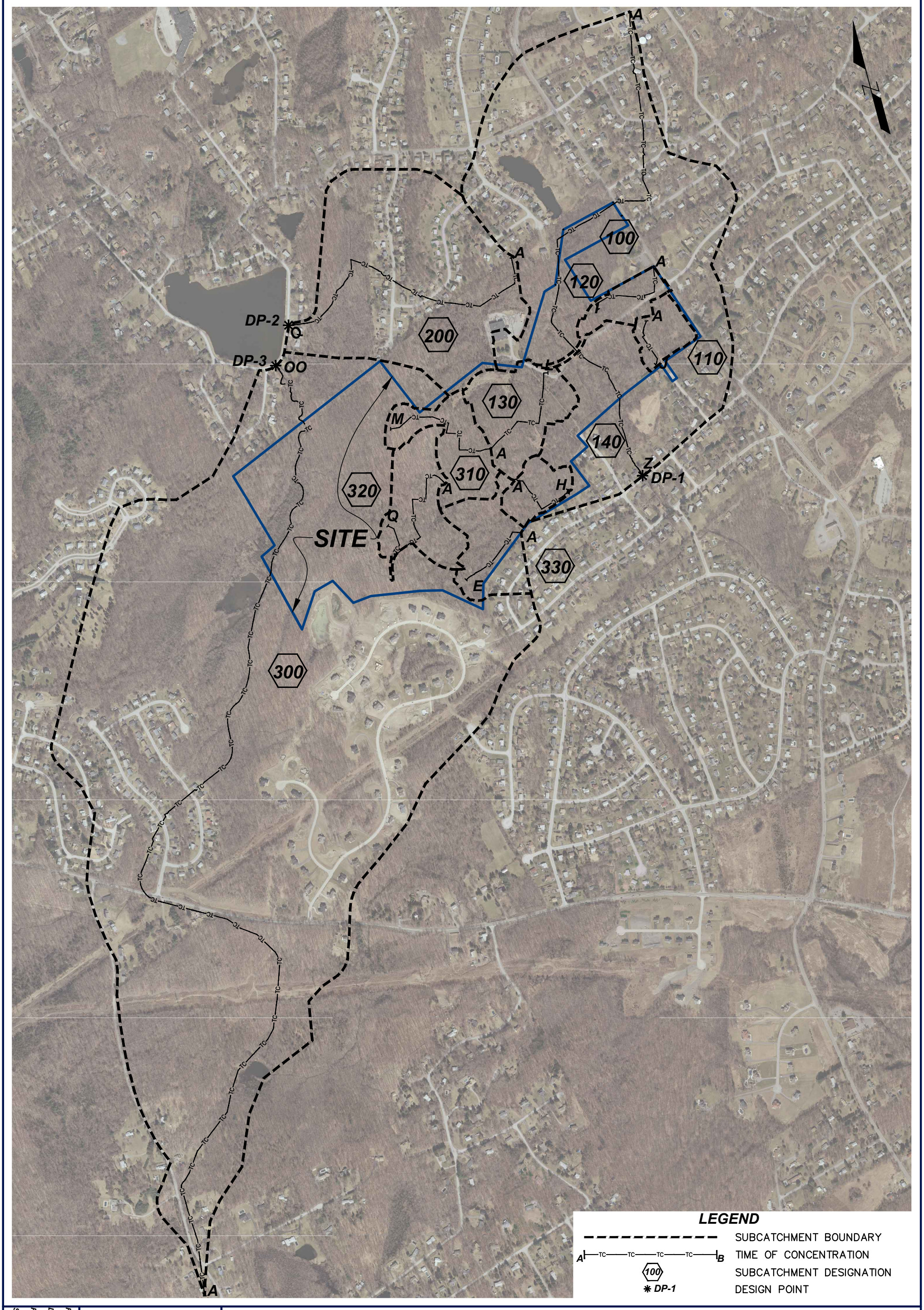
POVALL ENGINEERING, PLLC

HILLTOP VILLAGE AT WAPPINGER

POST-DEVELOPMENT WATERSHED DELINEATION MAP I

FIGURE 3.J-5
DATE: 02/2012
PAGE 353
SCALE: 1"=1,000'



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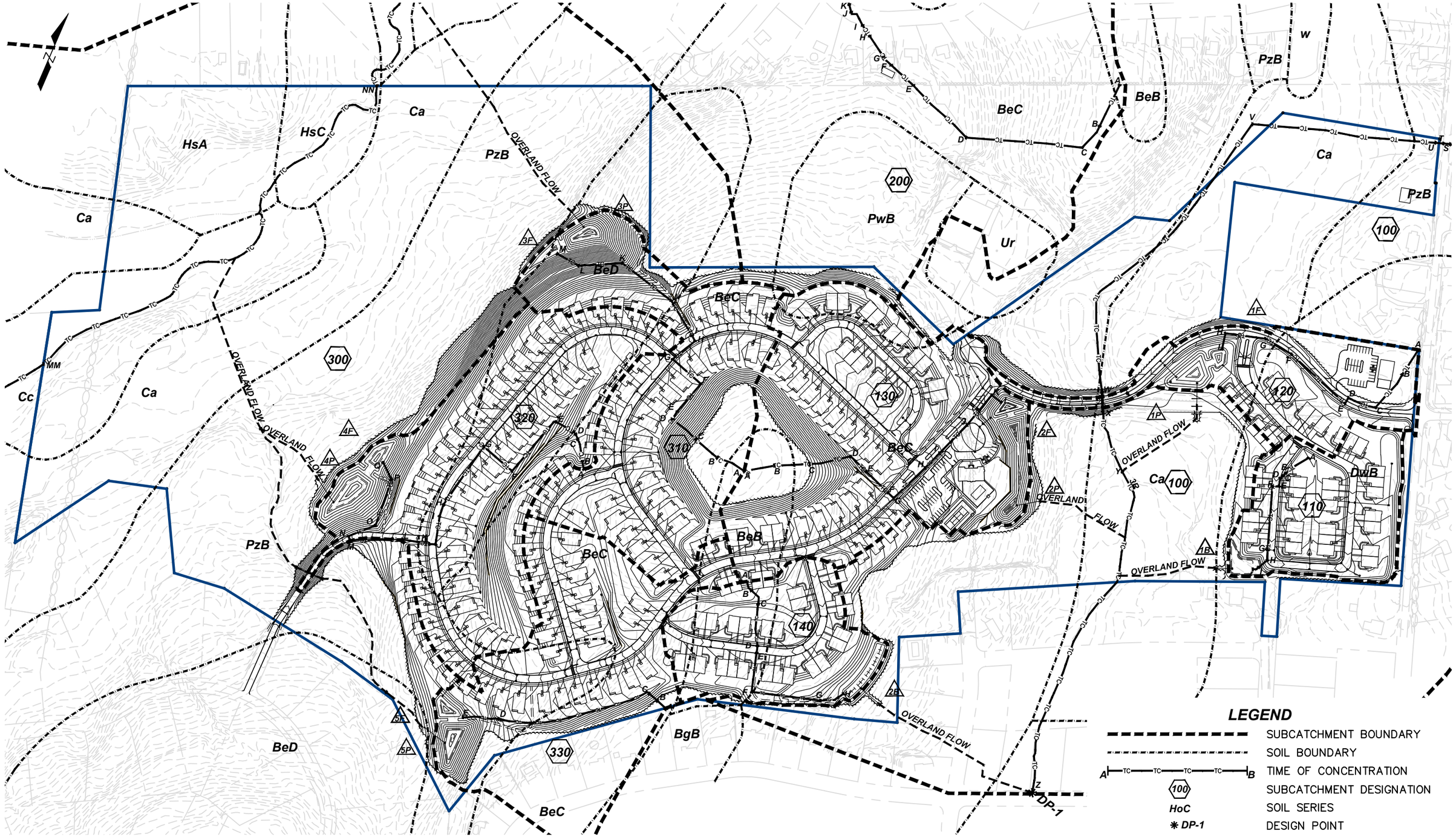
POVALL ENGINEERING, PLLC

HILLTOP VILLAGE AT WAPPINGER

POST-DEVELOPMENT WATERSHED DELINEATION MAP II

FIGURE 3.J-6
DATE: 02/2012
PAGE 354
SCALE: 1"=800'



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POVALL ENGINEERING, PLLC

HILLTOP VILLAGE AT WAPPINGER

POST-DEVELOPMENT WATERSHED DELINEATION MAP III

FIGURE 3.J-7

DATE: 02/2012

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SCALE: 1"=300'

Table 3.J-6: Required Water Quality Volumes

Subcatchment	Site Area (ac)	Impervious Cover (ac)	WQ_v (cf)
100	152.042	28.974	134,478
110	5.267	2.346	9,483
120	6.091	2.607	10,586
130	15.344	5.832	24,020
140	5.791	2.158	8,911
200	69.243	14.546	66,098
300	425.055	31.653	339,449
310	12.596	3.534	15,216
320	14.053	4.928	20,515
330	12.383	1.696	9,889

The locations of the subcatchments are shown in *Figure 3.J-7*. The proposed stormwater management system(s) has/have been sized accordingly to take the use of green infrastructure practices and to provide the required WQ_v for its contributing drainage area. Stormwater management will not be provided for Subcatchments 100, 200, and 300, since these subcatchments contain offsite areas, will not be disturbed, and are not directed to any of the proposed stormwater management systems.

3.J.2.11 Runoff Reduction Techniques

The runoff reduction volumes (RRv) for each of the green infrastructure techniques and/or standard stormwater management practices with RRv capacity that were used are summarized in *Table 3.J-7* below.

Table 3.J-7: Runoff Reduction Volume Methods

Subcatchment	Techniques/ Practices	RRv Reduction Method	Reduction Amount
130 & 310	Vegetated Swale	Contributing Area	10% of WQ_v (HSG C & D soils)
110, 120, 130, 140, 310, 320, & 330	Tree Plantings	Contributing Area	100 sf of impervious area/tree
110	Bioretention Practice	Standard SMP with RRv capacity	80% of WQ_v (HSG A & B soils)
120	Bioretention Practice	Standard SMP with RRv capacity	40% of WQ_v (HSG C & D soils)

The reduction amounts have been applied to the stormwater management system water quality volumes provided in *Table 3.J-6*. The new water quality volumes are summarized in *Table 3.J-8* below.

Table 3.J-8: New Stormwater Management System Water Quality Volumes

Stormwater Management System	Location	Treating Subcatchments	New WQ_v (cf)
Bioretention Area 1B	east of T82	110	1,496
Micropool Ext. Det. Pond 1P	west of T93	120	9,767
Micropool Ext. Det. Pond 2P	east of club house	130	22,905
Bioretention Area 2B	east of T36–T39	140	5,103
Micropool Ext. Det. Pond 3P	west of S92–S95	310	14,726
Micropool Ext. Det. Pond 4P	west of S105–S109	320	19,984
Micropool Ext. Det. Pond 5P	south of S117–S119	330	13,225

The proposed stormwater management systems have been sized accordingly to provide the required water quality volume for its contributing drainage area as well as meet any additional water quality volume requirements that cannot be addressed by applying the green infrastructure techniques and standard stormwater management practices with runoff reduction volume (RRv) capacity. Detailed design calculations have been provided in Appendix F in the SWPPP provided in *Appendix C.3*.

3.J.2.12 Water Quantity Controls

The proposed water quantity controls have been designed and sized to provide channel protection, overbank flood control, and extreme flood protection, where:

- Channel Protection Volume requirements are designed to protect stream channels from erosion. This is accomplished by providing 24-hour extended detention of the 1-year 24-hour storm event.

- Overbank Flood Control Volume requirements are designed to prevent flow events that exceed the bankfull capacity of a channel, and therefore must spill over into the floodplain. This requires storage to assure that the post-development 10-year 24-hour peak discharge rates do not exceed pre-development rates.

- Extreme Flood Protection Volume requirements are designed to:

    1. Prevent the increased risk of flood damage from large storm events.

    2. Maintain the boundaries of pre-development 100 year floodplain.

    3. Protect the physical integrity of the stormwater management practices. This requires storage to assure that the post-development 100-year 24-hour peak discharge rates do not exceed pre-development rates.

The proposed water quantity controls have been designed and sized to provide channel protection, overbank flood control, and extreme flood protection. A summary of the required and provided water quantity controls is summarized in *Table 3.J-9* below.

Table 3.J-9: Water Quantity Controls

Water Quantity Parameter	Required (cf)	Provided (cf)
Channel Protection Volume		
Pond 1	16,284	16,646
Pond 2	44,684	44,871
Pond 3	31,279	31,451
Pond 4	23,642	23,750
Pond 5	26,541	26,575
Overbank Flood Protection Volume	298,737	306,021
Extreme Flood Protection Volume	552,565	497,418

3.J.2.13 Post-Development Development Watersheds

The same Design Points and Quantitative Method of Analysis as pre-development were used to analyze the post-development watersheds. The post-development peak discharge rates are summarized in *Table 3.J-10* below.

Table 3.J-10: Post-Development Peak Discharge Rates

DP	1-year Event (cfs)	10-year Event (cfs)	25-year Event (cfs)	100-year Event (cfs)
1	63.22	203.28	275.55	428.72
2	26.02	79.81	107.01	163.12
3	51.73	200.41	281.74	455.01

Refer to Appendix H of the SWPPP provided in *Appendix C.3* for the complete post-development analysis.

3.J.2.14 Comparison of Peak Discharge Rates

The pre- and post-development peak discharge rates are summarized in *Table 3.J-11* below.

Table 3.J-11: Pre- & Post-Development Peak Discharge Rates

DP	Pre (cfs)	Post (cfs)	Diff (cfs)
1-yr event			
1	63.93	63.22	-0.71
2	27.49	26.02	-1.47
3	54.38	51.73	-2.65
10-yr event			
1	203.40	203.28	-0.12
2	84.33	79.81	-4.52
3	208.74	200.41	-8.33
25-yr event			
1	274.14	275.55	+1.41
2	113.07	107.01	-6.06
3	292.90	281.74	-11.16
100-yr event			
1	421.13	428.72	+7.59
2	172.35	163.12	-9.23
3	473.88	455.01	-18.87

Comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development generally will not be increased. The post-development peak rate of runoff is greater than the pre-development peak rate of runoff at Design Point 1 for the 25- and 100-year storm events. Given the large size of the overall watershed the slight increase is negligible. Therefore, the proposed development will not adversely impact the downstream or adjacent properties, receiving water bodies or courses, or wetlands. The results of the computer modeling used to analyze the pre- and post-development watershed conditions are presented in Appendix G and Appendix H, respectively of the SWPPP (see *Appendix C.3*).

3.J.3 Mitigation Measures

3.J.3.1 Avoidance and Minimization of Impacts

To avoid and minimize impacts to downstream wetlands, watercourses, and/or water bodies the following were incorporated:

- Erosion and Sediment Control measures were designed in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision, to minimize sedimentation impacts on the water quality of streams and wetlands, and to protect wetland functions and values.

- Standard stormwater Best Management Practices (BMPs) were designed in accordance with the *New York State Stormwater Management Design Manual*, latest revision, to minimize stormwater runoff to streams and wetlands to protect aquatic functions and values.

- Stormwater management facilities were designed to provide the level of treatment necessary to ensure that stormwater discharges will not result in degradation of the physical, chemical or biological integrity of the receiving waters.

- Pollution prevention controls (a.k.a. good housekeeping practices) were designed to maintain a clean and orderly work environment as well as control the possible exposure of harmful substances and materials to stormwater runoff.

- Application of green infrastructure practices, which incorporates non-structural and natural approaches to reduce the effects on watersheds by conserving natural areas, reducing impervious cover, and better integrating stormwater treatment.

- Establishment of a 100 foot buffer around the regulated wetlands in accordance with NYSDEC Chapter X Part 664 "Freshwater Wetlands Maps and Classification" and Town of Wappinger Town Code Chapter 137 "Freshwater Wetland, Waterbody and Watercourse Protection".

Temporary erosion and sediment control measures will be implemented during construction to minimize soil erosion and control sediment transport offsite. Permanent erosion and sediment control measures will be implemented after construction to control the quality and quantity of stormwater runoff from the developed parcel. The proposed stormwater management facilities will treat the stormwater runoff generated from the proposed development prior to discharging in a controlled manner to the wetlands and the two streams. Therefore, no adverse impacts to any onsite wetlands and watercourses or offsite downstream wetlands, watercourses and/or water bodies are anticipated as a result of the development.

In addition, alternatives to winter deicing and traction materials; fertilizers, and pesticides are discussed below.

Winter Deicing and Traction Materials

"Salt contributes to the corrosion of vehicles and infrastructure and can damage water bodies, groundwater, and roadside vegetation. These issues have led to the investigation and use of other chemicals as substitutes for and supplements to salt. Alternative deicing chemicals include magnesium chloride, potassium acetate, calcium chloride, calcium magnesium acetate (CMA), potassium chloride, and beet juice derivative."[80]

The alternative deicing chemicals are usually more expensive than salt; however, their use may be warranted in some instance, such as near endangered or threatened species habitats or in areas where the source water already has elevated levels of sodium or chloride.[81] A comparison of the winter deicing and traction materials is provided in *Table 3.J-12*.

[80] "Managing Highway Deicing to Prevent Contamination of Drinking Water", Source Water Protection Practices Bulletin, EPA
[81] Ibid.

Table 3.J-12: Comparison of Winter Deicing and Traction Materials

Chemical	Effective Temperature	Environmental Impacts
Sodium Chloride (Road Salt)	above 20ºF	Increased chloride levels in surface and ground waters and can cause health problems
Calcium Chloride	below 0ºF	Less harmful to vegetation, but corrosive to concrete and metal.
Calcium Magnesium Acetate (CMA)	above 23ºF	Low toxicity to plants and microbes, but can potentially low dissolved oxygen concentrations in soils and receiving waters. (Many communities have used CMA with no apparent adverse environmental effects.
Magnesium Chloride	as low as -13ºF	Safer for vegetation, but can increase flaking of concrete.
Potassium Acetate*	below 22ºF	Low toxicity, but can potentially low dissolved oxygen concentrations in receiving waters.
Potassium Chloride*	above 12ºF	Chloride impact
Beet Juice Derivative	Effective at lower temperatures when used to treat salt	Biodegradable and are safer for roadside vegetation

Source: "Managing Highway Deicing to Prevent Contamination of Drinking Water", Source Water Protection Practices Bulletin, EPA
* "Road Salts & Deiciers" Green Venture http://water.greenventure.ca/road-salts-deicers

Fertilizers

Home lawn fertilizer applications are primarily based on the application of nitrogen; phosphorus in most cases is applied according to the predetermined ratio of nitrogen to phosphorus in the fertilizer.[82] "Nitrogen is easily dissolved in water. When too much nitrogen is available for lawns to consume and excessive water is present, nitrogen can move into water resources." This situation can be easily avoided by the following:[83]

- Do not apply more than 1 pound of nitrogen to 1,000 square feet of lawn per application.
- Consider using slow-release forms of nitrogen.
- Keep fertilizers off impervious surfaces. Sweep fertilizer particles from driveways and sidewalks back onto the lawn area. This will prevent them from moving downstream with rain water.
- The overall nitrogen applied can also be reduced by approximately 1 pound of N per 1,000 square feet when you return clippings to the turf.

[82] "Phosphorus and Home Lawns" Turfgrass Science http://www.turf.msu.edu/phosphorus-and-home-lawns
[83] "Fertilizing Home Lawns to Protect Water Quality" Turfgrass Science http://www.turf.msu.edu/fertilizing-home-lawns-to-protect-water-quality/

It is common for homeowners to apply phosphorus as a casual complement for nitrogen.[84] Phosphorus applied to lawns is quickly bound to soil particles after the fertilizer has been adequately watered into the lawn. The following can be done to reduce the amount of phosphorus entering water resources: [85]

- Perform soil testing to determine if phosphorus applications are necessary.
- Keep fertilizers off impervious surfaces. Sweep fertilizer particles from driveways and sidewalks back onto the lawn area. This will prevent them from moving downstream with rain water.
- Use phosphorus free fertilizers when soils levels for lawns are adequate.

Other alternatives to commercial fertilizers include grass clippings, blood meal, alfalfa pellets, compost, and bone meal. Grass clippings can provide 30 percent of nitrogen needed by the lawn as they break down. Blood meal is powdered dried cattle blood and contains 10 percent nitrogen. It is applied in the same manner as chemical fertilizers. Alfalfa pellets are rich in nitrogen and also contain trace elements of phosphorus and potassium. Vegetable compost is easy to make using leaf and grass clippings in a back yard composter. Bone meal is powdered cattle bones and is rich in phosphorus. It can be used in combination with blood meal and is also applied in the same manner as chemical fertilizers.[86]

Pesticides

Pesticides are toxic substances that may pose a health risk to your family, pets and wildlife if they are overused or carelessly applied. Insect and weed problems can be controlled naturally by doing the following:[87]

- Reconsider your definition of "weed". Plants, such as clover and dandelion can be attractive and useful additions, since they can provide your lawn with nutrients. Regular mowing will keep these plants from taking over your lawn.
- Routine chemical aren't necessary. You can stop chemical programs and still have a beautiful lawn. There may be an increase in weeds initially; however, eventually the healthy grass will crowd them out.
- Your best defense is your mower. Taller grass (mowed to approximately 3") will help prevent weeds by shading them out. Your mower blade should be sharp or you can damage grass blades.
- Eliminate weeds before they spread. Look for weed seedlings every time you mow and persistently eliminate them to prevent spreading. Pull them out by the hand using a week

[84] "Phosphorus and Home Lawns" Turfgrass Science http://www.turf.msu.edu/phosphorus-and-home-lawns
[85] Ibid.
[86] "Lawn Fertilizer Alternatives" http://www.gardenguides.com/108153-lawn-fertilizer-alternatives.html
[87] "Pesticide Alternatives" http://www.greenscapes.org/Page-143.html

fork, making sure to remove the whole plant and taproot. To treat reoccurring weeds, use a vinegar-based herbicide.

- Overseed to crowd out weeds. Overseeding a thin lawn will thicken it up and crowd out weeds. Spring or fall is the best time to overseed.

- Encourage natural predators. Put up bird feeders and bat houses to attract natural predators of insects.

- Seek professional help if insect problems persist. Seek advice from a respected garden center or landscape specialist and follow their instructions on selecting insecticides for specific pest problems. Follow their recommendations for using organic controls such as insecticidal soaps, beneficial nematodes and/or milky spore powder.

"Pesticides (insecticides, herbicides, and fungicides) are considered "household hazardous waste". Due to their toxicity and potential to pollute water resources, it is illegal to dispose of unwanted pesticides with the trash and you must take them to a Household Hazardous Waste collection event."[88]

3.J.3.2 Stormwater Management Plan

The goals of the Stormwater Management Plan are to:

1. Analyze the peak rate of runoff under pre- and post-development conditions.
2. Maintain the pre-development rate of runoff in order to minimize impacts to adjacent or downstream properties.
3. Minimize the impact of the quality of runoff exiting the site.

These objectives will be met by applying Best Management Practices (BMPs). Stormwater runoff from the proposed development will be collected and conveyed to the proposed stormwater management facilities via the closed pipe network system or grass swales. The proposed stormwater management facilities have been designed in accordance with the *NYS Stormwater Management Design Manual*, latest revision. The stormwater management facilities have been designed to provide both water quality and quantity controls. The stormwater runoff will be detained, treated, and released at a rate equal to or less than that which existed prior to development of the project site.

3.J.3.3 Better Site Design

The Better Site Design Practices have been incorporated into the *NYS Stormwater Management Design Manual*, latest edition. The Better Site Design Practices are broken into two categories and are called Green Infrastructure Planning and Green Infrastructure Techniques Acceptable for Runoff Reduction. Various green infrastructure planning and runoff reduction techniques have been incorporated into the Proposed Action.

[88] "Pesticide Alternatives" http://www.greenscapes.org/Page-143.html

3.J.3.4 Stormwater Management Practices

Additional stormwater BMPs that are acceptable options for phosphorus removal, according to the *New York State Stormwater Management Design Manual*, include:

- Stormwater wetlands (i.e., shallow wetlands, extended detention shallow wetlands, pond/wetland systems, and pocket wetlands);
- Stormwater infiltration systems (i.e., infiltration trenches, infiltration basins, dry wells, and underground infiltration systems); and
- Stormwater filtering systems (i.e., surface sand filters, underground sand filters, perimeter sand filters, organic (peat) filters, and bioretention).

The proposed stormwater management practices include a combination of stormwater management ponds and bioretention areas in accordance with the *New York State Stormwater Management Design Manual*.

Stormwater Management Ponds

The proposed stormwater management ponds are all wet ponds. The stormwater management ponds have been sized accordingly to provide the required water quality volume for its contributing drainage area as well as provide the required water quantity controls. The sizes of the ponds have been minimized to the greatest extent feasible in order to minimize the amount of clearing and grading. The stormwater management ponds are located outside of the 100 foot NYSDEC adjacent area and 100 foot Town wetland buffers in order to take advantage of the natural, undisturbed land which will aid in reducing the velocity, amount, and temperature of the discharged stormwater prior to flowing into the onsite wetlands and streams.

The outlet control structure has a staged drawdown design. The smaller orifices are located near the bottom of the structure, while the larger slots are located near the top of the structure. The smaller orifices will restrict the outflow at the beginning of storms when the effluent temperature is highest. This will allow the incoming water to cool as it mixes with the water already in the stormwater pond. The staged drawdown design aids in providing thermal mitigation.

The permanent pool depths of the stormwater management ponds vary based upon the type of pond. The depths were chosen in accordance with the *NYS Stormwater Management Design Manual*, latest edition, as well as prevent thermal stratification from occurring. By preventing prevent thermal stratification, this will minimize short-circuiting and maintain aerobic bottom waters which will maximize pollutant uptake and minimize potential release of nutrients to receiving waters.

The stormwater management ponds are landscaped with a variety of plantings including emergents and woody shrubs, with each type of planting corresponding to the water depth. An extended aquatic bench will maximize the biological uptake of pollutants.

Bioretention Areas

Bioretention is practice that uses the chemical, biological and physical properties of plants, microbes and soils for removal of pollutants from stormwater runoff. Unlike various other practices that control only peak discharge, bioretention can be designed to mimic the pre-existing hydrologic

conditions by treating the associated runoff volumes. Bioretention facilities provide opportunities for runoff infiltration, filtration, storage, and for water uptake by vegetation. Bioretention facilities can be distributed across a development which can help in controlling runoff close to the source where it is generated.

The bioretention areas are landscaped with a variety of plants, which help reduce water quantities through evapotranspiration, remove pollutants and nutrients, and their root systems increase water percolation. The bioretention areas are located outside of the 100 foot NYSDEC adjacent area and 100 foot Town wetland buffers in order to take advantage of the natural, undisturbed land which will aid in reducing the velocity, amount, and temperature of the discharged stormwater prior to flowing into the onsite wetlands and streams.

3.J.3.5 Construction Sequencing Schedule and Phasing Plan

A construction sequencing schedule and phasing plan have been developed in order to reduce the overall disturbance and ensure that previously disturbed areas are re-established prior to construction in another portion of the site.

The proposed total disturbance is 71.58 acres. The proposed project will be completed in phases. The Applicant is requesting written approval from the Town of Wappinger, which is a MS4, to disturb more than five (5) acres of soil at any one time. The Applicant is proposing to disturb more than five (5) acres of soil in order to obtain the necessary fill material to construct necessary sections of the Proposed Action while balancing onsite earthwork. This will eliminate the need to import/export material onto or from the parcel

Installation of the drainage and stormwater management facilities will be constructed in phases. The stormwater management facilities (e.g., stormwater ponds and bioretention areas) will be used as temporary sediment basins during construction. The stormwater management facilities shall be finalized after completion of the discharging drainage system and each contributing drainage area has been stabilized. Erosion and sediment control details have been provided in *Appendix D*. An erosion and sediment control plan will be developed for each phase in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision.

3.J.3.6 Erosion and Sediment Control

The SWPPP and project plans identify both temporary and permanent erosion and sediment control measures, which have been designed in accordance the *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision. Temporary erosion and sediment control measures will be implemented during construction to minimize soil erosion and control sediment transport off-site. Permanent erosion and sediment control measures will be implemented after construction to control the quality and quantity of stormwater runoff from the developed site.

Temporary erosion and sediment control measures to be utilized during construction generally include:

- **Stabilized Construction Entrance** - Prior to construction, stabilized construction entrances shall be installed to reduce the tracking of sediment onto public roadways. Construction traffic shall enter and exit the site at the stabilized construction entrance. The

entrance shall be maintained in good condition, which will control tracking of sediment onto public rights-of-way or streets. When necessary, the placement of additional aggregate atop the filter fabric shall be done to assure the minimum thickness is maintained. All sediments and soils spilled, dropped, or washed onto the public rights-of-way must be removed immediately. Periodic inspection and needed maintenance shall be provided after each substantial rainfall event.

- **Dust Control** - Water trucks shall be used, as needed, during construction to reduce dust generated on the site. Dust control must be provided by the general contractor to a degree that is acceptable to the owner/operator, and in compliance with the applicable local and state dust control requirements.

- **Temporary Soil Stockpile** - Materials, such as topsoil, shall be temporarily stockpiled (if necessary) on the site during the construction process. Stockpiles shall be located in an area away from storm drainage, water bodies and/or courses, and shall be properly protected from erosion by a surrounding silt fence barrier or hay bales when located on paved areas.

- **Silt Fencing** - Prior to the initiation of and during construction activities, silt fencing shall be established along the perimeter of all areas to be disturbed as a result of the construction which lie up gradient of water courses or adjacent properties. These barriers may extend into non-impact areas to ensure adequate protection of adjacent lands. Clearing and grubbing shall be performed only as necessary for the installation of the sediment control barrier. To ensure effectiveness of the silt fencing, daily inspections and inspections immediately after significant storm events shall be performed by site personnel. Maintenance of the fence shall be performed as needed.

- **Temporary Seeding** - Within seven days after construction activity ceases on any particular area of the site, all disturbed areas where there will not be construction for longer than 14 days shall be temporarily seeded and mulched to minimize erosion and sediment loss.

- **Stone Inlet Protection Barrier** - Concrete blocks surrounded by wire mesh and crushed stone shall be placed around both existing catch basins and proposed catch basins, once installed, to keep sediment from entering the storm sewer system. During construction, crushed stone shall be replaced as necessary to ensure proper function of the structure.

- **Stone Check Dams** - Stone check dams shall be installed within drainage ditches to reduce the velocity of stormwater runoff, promote settling of sediment, and reduce sediment transport offsite. The stone check dams shall be inspected at least every seven calendar days. Damage shall be repaired upon discovery. If significant erosion has occurred between structures, a liner of stone or other suitable material shall be installed in that portion of the channel. Sediment accumulated behind the stone check dams shall be removed, as needed, to allow the channel to drain through the stone check dam and prevent large flows from carrying sediment over or around the dam. Stones shall be replaced, as needed, to maintain the design cross section of the structures.

- **Temporary Sediment Basin** - Temporary sediment basins shall be constructed to intercept sediment laden runoff, reduce the amount of sediment leaving the disturbed areas, and

protect drainage ways, properties, and rights-of-way. Projects that have proposed stormwater ponds can be used as temporary sediment basins during construction. Temporary sediment basins shall be inspected at least every seven calendar. All damages caused by soil erosion and construction equipment shall be repaired upon discovery. Accumulated sediment shall be removed from the sediment basin/trap when it reaches 50 percent of the design capacity and shall not exceed 50 percent. Sediment shall not be placed downstream from the embankment, adjacent to a stream, or floodplain.

- **Erosion Control Blanket** - Erosion control blankets shall be installed on all slopes exceeding 3:1. Erosion control blankets will provide temporary erosion protection, rapid vegetative establishment, and long-term erosion resistance to shear stresses associated with high runoff flow velocities associated with steep slopes.

- **Dewatering** - Dewatering, if required, shall not be discharged directly into wetlands, water courses, water bodies, and storm sewer systems. Proper methods and devices shall be utilized to the extent permitted by law, such as pumping water into temporary sediment basins, providing surge protection at the inlet and outlet of pumps, floating the intake of the pump, or other methods to minimize and retain the suspended solids.

Permanent erosion and sediment control measures to be utilized after construction generally include the following:

- **Establishment of Permanent Vegetation** - Disturbed areas that are not covered by impervious surfaces shall be seeded in accordance with the accompanying plans. The type of seed, mulch, and maintenance measures shall be followed. All areas at final grade shall be seeded and mulched within seven (7) days after completion of the major construction activity. All seeded areas shall be protected with mulch and/or hay. Final site stabilization is achieved when all soil-disturbing activities at the site has been completed and a uniform, perennial vegetative cover with a density of 80 percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

- **Final Seeding and Planting** - Final seeding and planting shall be installed as shown on the accompanying plans. Final seeding and planting will help minimize erosion and sediment loss.

- **Rock Outlet Protection** - Rock outlet protection shall be installed at the locations as shown on the accompanying plans. The installation of rock outlet protection will reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving water course or water body.

- **Stone Check Dams** - Stone check dams shall remain or be installed at the locations as indicated on the accompanying plans. The stone check dams indicated to remain shall be inspected and any damage shall be repaired upon discovery. Any significant erosion between structures shall be repaired and any accumulated sediment shall be removed. Existing stones shall be replaced as needed.

Erosion and sediment control details have been provided in *Appendix D*. An erosion and sediment control plan will be developed for each phase in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision.

3.J.3.7 Pollution Prevention Controls

Good housekeeping practices are designed to maintain a clean and orderly work environment. Good housekeeping measures shall be maintained throughout the construction process by those parties involved with the direct care and development of the site. The following measures should be implemented to control the possible exposure of harmful substances and materials to stormwater runoff:

1. Material resulting from the clearing and grubbing operation shall be stockpiled away from storm drainage, water bodies and/or watercourses and surrounded with adequate erosion and sediment control measures. Soil stockpile locations shall be exposed no longer than 14 days before seeding.

2. Equipment maintenance areas shall be protected from stormwater flows and shall be supplied with appropriate waste receptacles for spent chemicals, solvents, oils, greases, gasoline, and any pollutants that might contaminate the surrounding habitat and/or water supply. Equipment wash-down zones shall be located within areas draining to sediment control devices.

3. The use of detergents for large-scale (i.e., vehicles, buildings, pavement surfaces, etc.) washing is prohibited.

4. Material storage locations and facilities (i.e., covered storage areas, storage sheds, etc.) shall be located onsite and shall be stored according to the manufacturer's standards in a dedicated staging area. Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Runoff containing such materials must be collected, removed from the site, treated and disposed at an approved solid waste or chemical disposal facility.

5. Hazardous spills shall be immediately contained to prevent pollutants from entering the surrounding habitat and/or water supply. Spill Kits shall be provided on-site and shall be displayed in a prominent location for ease of access and use. Spills greater than five (5) gallons shall be reported to the NYSDEC Response Unit at 1-800-457-7362. In addition, a record of the incident(s) and/or notifications shall be documented and attached to the SWPPP.

6. Portable sanitary waste facilities shall be provided onsite for workers and shall be properly maintained.

7. Dumpsters and/or debris containers shall be located onsite and shall be of adequate size to manage respective materials. Regular collection and disposal of wastes shall occur as required.

8. Temporary concrete washout facilities should be located a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking. A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. When temporary concrete washout facilities are no longer required for the work, the hardened concrete shall be removed and disposed of. Materials used to construct the temporary concrete washout facilities shall be removed and disposed of. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and/or repaired, seeded, and mulched for final stabilization.

9. Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the Health Department. Water used for construction that does not originate from an approved public supply must not discharge from the site. It can be retained in the ponds until it infiltrates and evaporates.

3.J.3.8 Construction Inspection and Maintenance

To ensure the stability and effectiveness of all protective measures and practices during construction, all erosion and sediment control measures employed shall be inspected by the Qualified Professional at least every seven (7) calendar days. The contractor's and/or subcontractor's trained individual(s) shall perform daily inspections of all erosion and sediment control measures at the beginning and end of the day. The trained individual(s) shall immediately correct any deficiencies noted during their inspection or during the Qualified Professional's inspections.

For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the frequency of the inspections can be reduced. However, NYSDEC and Town must be notified prior to reducing the frequency of the inspections. If approved, the Qualified Professional shall conduct a site inspection at least once every 30 calendar days.

For construction sites where soil disturbances of greater than five (5) acres have been authorized by the NYSDEC or the Town, the Qualified Professional shall conduct at least two (2) site inspections every seven (7) calendar days to ensure the stability and effectiveness of all protective measures and practices during construction for as long as greater than five (5) acres of soil remain disturbed. The two (2) site inspections shall be separated by a minimum of two (2) full calendar days. In areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) calendar days from the date the soil disturbance activity ceased.

All inspections shall be performed in accordance with this SWPPP, accompanying project plans, latest revision of *New York State Standards and Specifications for Erosion and Sediment Control,* and procedures outlined in Appendix G of the latest revision of the *New York State Stormwater Management Design Manual.* Inspection reports shall be prepared in accordance with this SWPPP, accompanying project plans, and NYSDEC SPDES General Permit GP-0-10-001. Inspection reports shall identify

and document the maintenance of the erosion and sediment control measures. A sample inspection report has been provided in Appendix D of the SWPPP (see *Appendix C.3*).

3.J.3.9 Post-Construction Inspection and Maintenance

Post-construction inspections and maintenance will be performed by the HOA. In accordance with the Town of Wappinger Town Code, a formal maintenance agreement for the stormwater management facilities shall be executed and binding on all subsequent land owners. The formal maintenance agreement shall be recorded in the office of the Dutchess County Clerk as a deed restriction on the property. The Applicant shall work with the Town Attorney and Town Engineer to develop the formal maintenance agreement

Inspection and maintenance procedures for the various site components and stormwater management facilities shall be performed in accordance with the accompanying project plans and this SWPPP. A summary of the general site inspection and maintenance parameters is provided in *Table 3.J-13* below. A summary of the stormwater management practice inspection and maintenance parameters are provided in *Table 3.J-14* and *Table 3.J-15* below.

Table 3.J-13: General Site Post-Construction Inspection and Maintenance Table

Maintenance Item	Frequency	Description of Inspection Parameters	Description of Remedy Procedures
Site Structures	Annual & After Major Storms	-Accumulated sediment in catch basin sumps -Accumulated debris and litter -Damage or fatigue of storm structures or associated components -Accumulation of pollutants, including oils or grease, in catch basin sumps	-Remove -Remove -Replace and/or repair, as necessary -Remove pollutants from catch basins. Replace and/or repair pollutant source.
Pavement	Biannual/ Annual	-Accumulated sediment in paved areas -Accumulated debris and litter	-Remove (sweep min. 2 times/year) -Remove
Embankments	Annual	-Differential settlement of embankments -Embankment erosion -Animal burrows -Cracking, bulging, or sliding of embankment	-Stabilize and restore to original specs - Stabilize and restore to original specs -Remove - Stabilize and restore to original specs
Grass and Landscaped areas	Annual	-Vegetation: 80% coverage + less than 15% invasive plant species -Unauthorized plantings -Undesirable vegetative growth -Accumulated debris and litter	-Restore original specs -Remove -Mow a min. of 3 times/year. May increase for aesthetic reasons. -Remove
Winter Maintenance	Monthly	-Accumulation of snow and ice on catch basins, inlet and outlet structures, and end sections -Stock piled snow near inlets and outlets -Remaining deicing materials	-Remove -Remove -Remove in early spring by sweeping
Swales	Monthly	-Erosion of side slopes -Formation of rills or gullies -Excess grass growth -Undesirable vegetative growth -Accumulated debris, litter, or sediment -Residual deicing materials (sand)	-Stabilize and restore to original specs -Repair and restore to original specs -Mow -Remove -Remove -Remove & replace any damaged vegetation

Table 3.J-14: Stormwater Pond Post-Construction Inspection and Maintenance Table

Maintenance Item	Frequency	Description of Inspection Parameters	Description of Remedy Procedures
Pond Embankment	Annual	-Vegetation: 80% coverage + less than 15% invasive plant species -Embankment erosion -Animal burrows -Unauthorized plantings -Cracking, bulging, or sliding of embankment -Function of pond drain -Seeps and leaks of downstream face -Rip-rap failure -Vertical alignment of top of embankment "as-built" -Spillway weir erosion and debris	- Restore original specs -Stabilize & restore to original specs -Remove -Remove -Stabilize & restore to original specs -Clean as necessary -Stabilize & repair any breach -Restore rip-rap cover as necessary -Add/remove material & stabilize to original specs -Clean debris and add rip-rap as necessary
Outlet Structures	Annual & After Major Storm Events	-Trees and shrubs around inlets, outlets, and end sections -Rip-rap failure -Accumulated debris and sediment	-Remove -Restore rip-rap cover as necessary -Remove
Permanent Pool	Monthly	-Undesirable vegetative growth -Floating or floatable debris -Visible pollution -Shoreline problem	-Remove -Remove -Remove -Stabilize and restore to original specs
Sediment Forebay	Monthly	-Accumulated sediment -Accumulated debris and trash	-Remove every 5 to 6 years or when 50% of total forebay capacity is lost -Remove

Table 3.J-14: Stormwater Pond Post-Construction Inspection and Maintenance Table (continued)

Maintenance Item	Frequency	Description of Inspection Parameters	Description of Remedy Procedures
Other Pond Areas	Monthly	-Vegetation: 80% coverage + less than 15% invasive plant species -Undesirable vegetative growth -Undesirable woody vegetation -Standing water/wet spots -Sediment and/or trash accumulation	-Restore to original specs -Remove -Remove -Add/remove fill as necessary to restore pond base elevations -Remove
Wetland Plantings	Monthly	-Survival of desired wetland plants -Plants: 80% coverage + less than 15% invasive plant species after 2nd growing season -Distribution of plants per landscaping plan -Any evidence of undesirable invasive species -Maintenance of aquatic water depths plant species -Choking of plants due to excessive sediment depths -Eutrophication level of the pond/ wetland area	-Re-plant wetland species as necessary -Restore as necessary -Re-distribute as necessary -Remove -Clean outlets to restore appropriate water levels -Remove pond sediment as necessary -Restore eutrophication level as necessary
Miscellaneous	Monthly	-Any encroachment into the pond area -Complaints from residents -Pond aesthetics (graffiti, lack of grass cover, etc.) -Signs of hydrocarbon build-up -Any possible public hazards	-Remove/remedy as needed -Note complaint and discuss with owner and engineer as necessary -Remove any graffiti and scarify, seed and mulch as necessary -Remove -Notify Town and discuss with owner and Town as necessary

Table 3.J-15: Bioretention Post-Construction Inspection and Maintenance Table

Maintenance Item	Frequency	Description of Inspection Parameters	Description of Remedy Procedures
Bioretention Areas	Monthly	-Embankment erosion -Accumulated debris and litter -Dumped yard wastes -Standing water	-Stabilize and restore to original specs -Remove -Remove - Remove and replace filter media meeting original specifications
Filter Bed	Annual	-Filter bed blocked or filled in	-Remove and replace filter media meeting original specifications
Outlet Structures	Annual & After Major Storm Events	-Catch basins and associated components in poor condition -Embankment erosion -Accumulated debris and sediment -Rip-rap failure	-Repair and/or replace -Stabilize and restore to original specs -Remove - Replace rip-rap as necessary
Vegetation	Monthly	-Vegetation: 80% coverage + 15% invasive species -Undesirable vegetation growth -Unauthorized plantings	-Restore to original specs as per planting plan -Remove -Remove

3.J.3.10 Measures to Ensure No Downstream Adverse Impacts

Temporary erosion and sediment control measures will be implemented during construction to minimize soil erosion and control sediment transport off-site. Permanent erosion and sediment control measures will be implemented after construction to control the quality and quantity of stormwater runoff from the Proposed Action. The proposed stormwater management facilities will treat the stormwater runoff generated from the proposed development prior to discharging in a controlled manner to the two onsite streams located within the onsite wetlands. Erosion and sediment control measures provided in SWPPP and project plans are provided in *Appendix C.3* and *Appendix D* respectively.

Post-construction inspection and maintenance procedures have been developed for the various site components and stormwater management facilities. When properly maintained, no adverse impacts to any onsite wetlands and watercourses or offsite downstream wetlands, watercourses, water bodies, drainage facilities, and properties are anticipated as a result of the Proposed Action.

3.K Vehicular and Pedestrian Circulation

This section describes the proposed project's location within the local and regional road network, identifies the existing traffic volumes along study area roadways, and evaluates the existing intersection operations in the project vicinity. This section also includes an estimate of the project's trip generation and describes potential impacts to area roadways and intersection operations. Mitigation measures, where necessary, are provided to reduce the significance of potential project-related impacts to the traffic network.

3.K.1 Existing Conditions

The Proposed Action will be provided direct access from All Angels Hill Road. A description of the existing conditions of the Proposed Action's surrounding road network is as follows:

- **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.

- **Myers 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 No. 2 of the Traffic Impact Study in *Appendix C.4* illustrates the speed limits and pavement widths for the above roadways. The pavement of the roadway network is in generally good condition. There is no on-street parking permitted along NY Route 376, All Angels Hill Road, New Hackensack Road, Widmer Road, Myers Corner Road, Brown Road, Old Hopewell Road and NY Route 82 in the vicinity of the Study Area. There are signs posted within the Study Area restricting parkig on public highways between midnight and 8:00 AM from November 1 to April1.

The traffic signal timing permit and signal timings are provided in the Traffic Impact Study in *Appendix C.4*.

3.K.1.1 Peak Hour

Background traffic volumes were collected at key study locations on the roadways adjacent to the property. Manual turning movement counts were conducted 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 analyzing the traffic impact on the adjacent roadway network associated with the proposed Project, it was 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

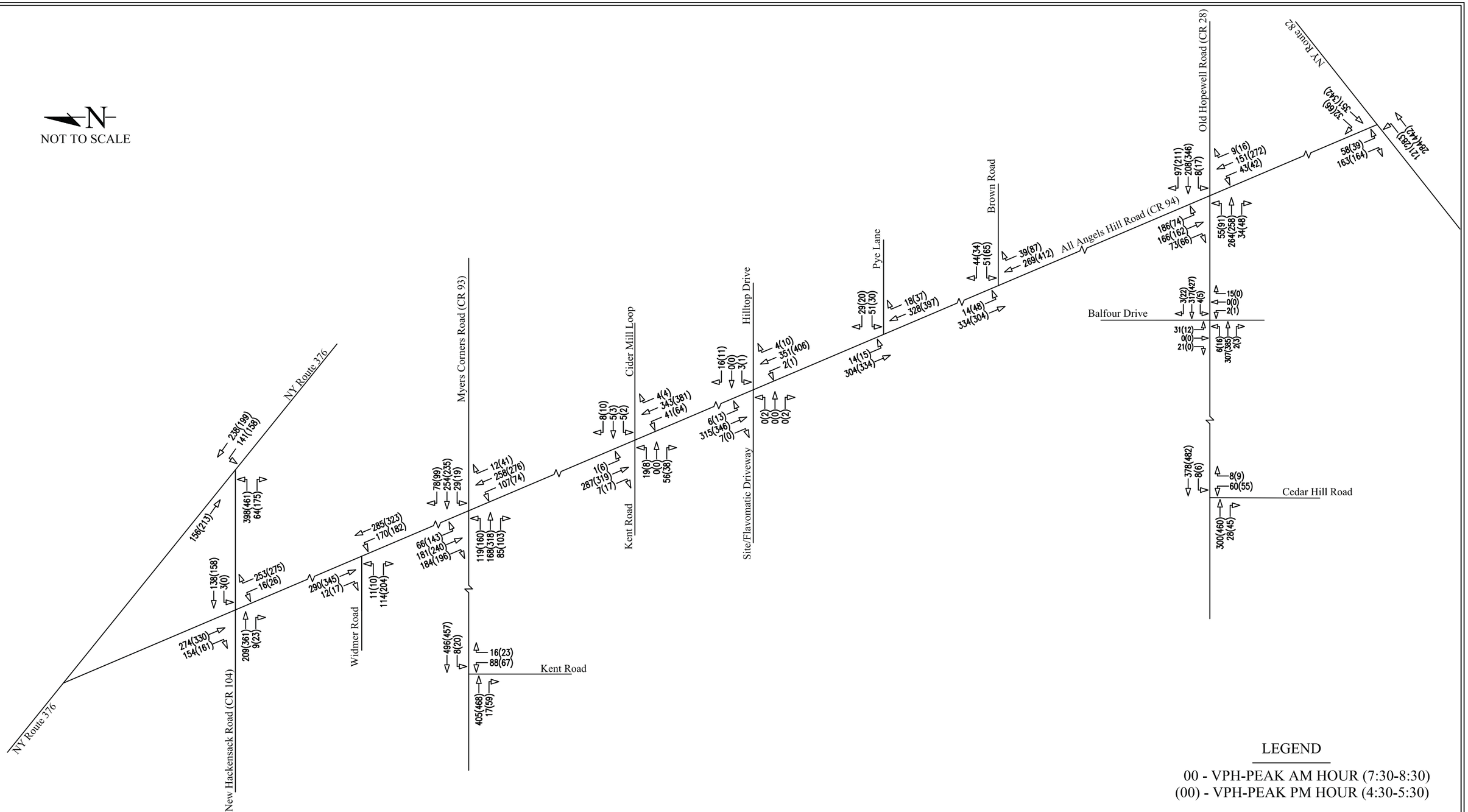
During these hours, the combination of existing traffic along the roadways adjacent to the site and traffic to be generated by the proposed project will generally be at the highest for the day. The ability of the roadway network to accommodate the projected traffic volume demand was measured by examining the ability of key intersections to accommodate such demand. Level of Service analyses was performed for the key study locations using Synchro Studio 7.0 software. 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.

3.K.1.2 2015 No-Build Traffic Volumes

For analysis purposes, the year 2015 was used to represent the year that the Project was built and occupied by. The 2011 existing traffic volumes were projected to reflect probable conditions in 2015 by applying a standard growth rate of 2% per year compounded annually. In addition, traffic from other pending or proposed development in the area were estimated and/or obtained from the studies prepared for those developments. These other development traffic volumes are shown in the Traffic Impact Study in *Appendix C.4*. The other development traffic volumes were combined with the 2015 Projected Traffic Volumes to obtain the 2015 No-Build Traffic Volumes, which are also shown in the Traffic Impact Study in *Appendix C.4*. The existing traffic volumes for the Peak AM and Peak PM analysis periods are shown in *Figure 3.K-1*. The 2015 No-Build traffic volumes for the Peak AM and Peak PM analysis periods are shown in *Figure 3.K-2*.

3.K.1.3 Other Area Developments

The Town of Wappinger's Planning Consultant, Frederick P. Clark Associates, was contacted to determine if there were any proposed developments within the vicinity of the project, and if their associated traffic should be included in the 2015 projected volumes. One proposed development, the Cerebral Palsy Community Residence Development, was identified. 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.



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Existing Traffic Volumes
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Town of Wappinger, Dutchess County, New York

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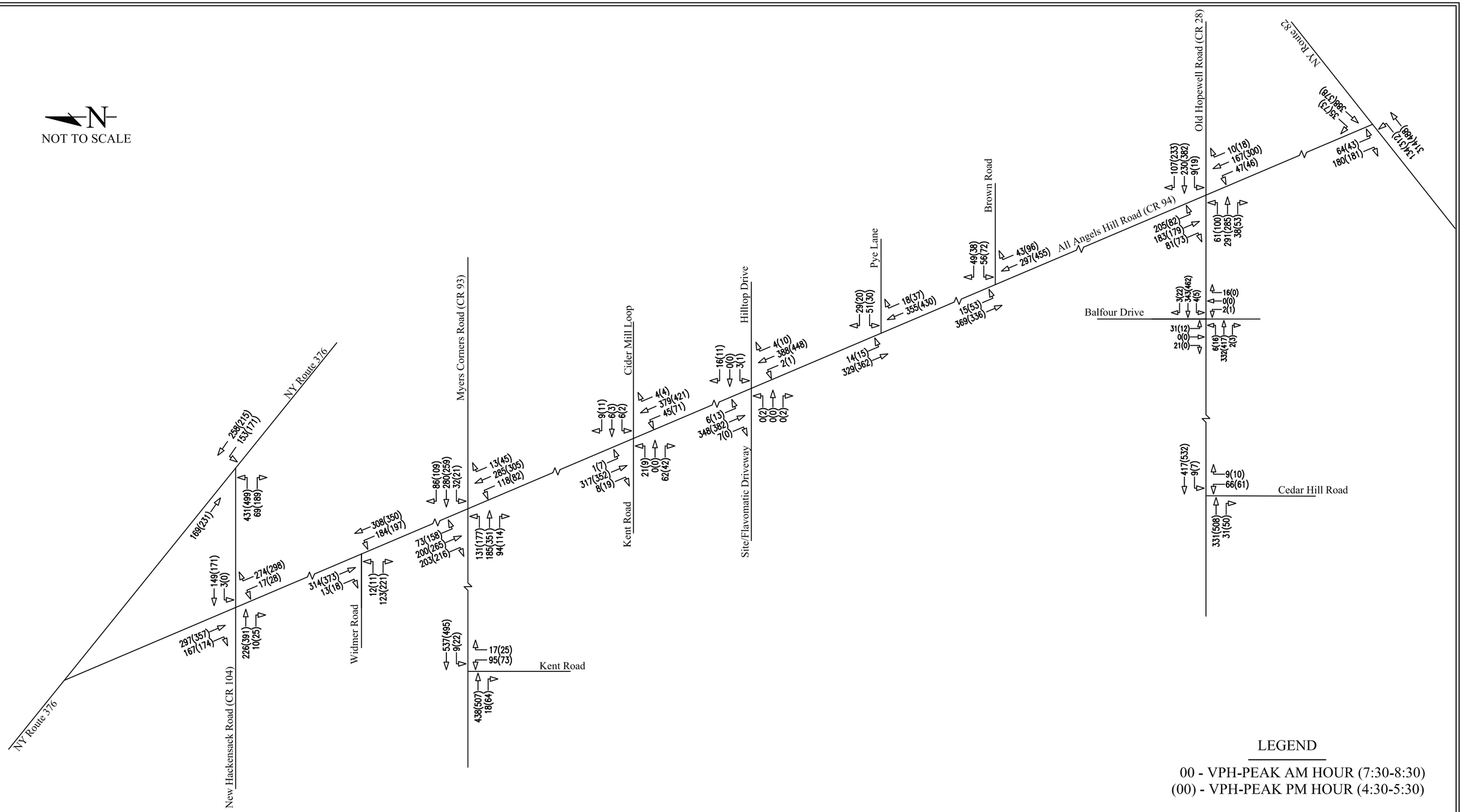

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2015 No-Build Traffic Volumes
Hilltop Village at Wappinger
Town of Wappinger, Dutchess County, New York

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3.K.1.4 Project Generated Traffic Volumes

The site-generated traffic volumes for the Proposed Action were based on the Institute of Transportation Engineers' (ITE) publication "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.K-1*. The Project generated traffic volumes for the peak hours are shown in *Figure 3.K-3*.

Table 3.K-1: Project Generated Traffic Volumes

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

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.

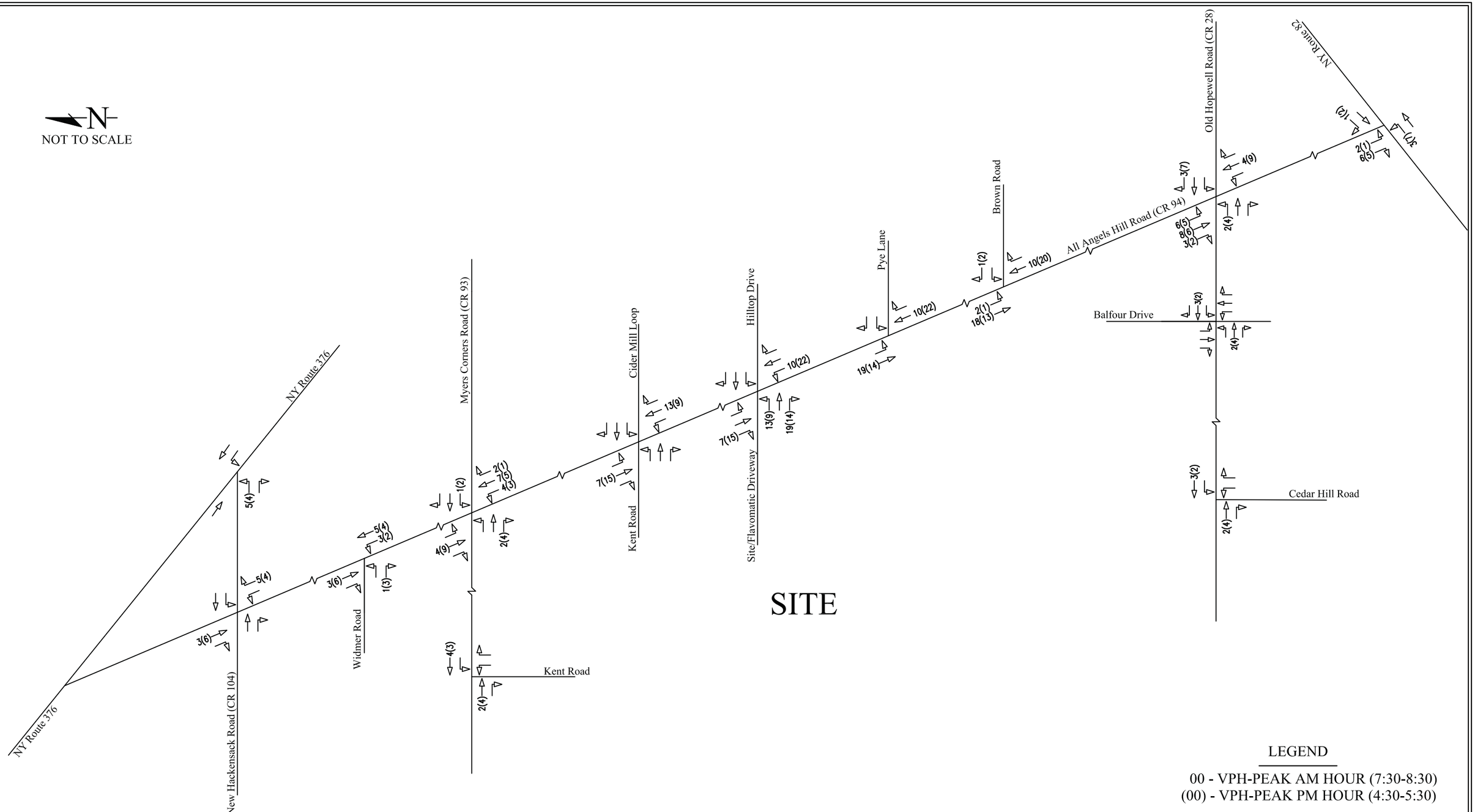
3.K.1.5 2015 Build Traffic Volumes

The Project Generated Traffic Volumes were distributed to the roadway system in accordance with the arrival and departure distributions. The Project Generated Traffic Volumes were then combined with the 2015 No-Build Traffic Volumes to obtain the 2015 Build Traffic Volumes. The 2015 Build traffic volumes for the peak hours are shown in *Figure 3.-K-4*.

3.K.1.6 Level of Service Analysis

Description of Analysis Procedures

To determine existing and future traffic operating conditions at the study area intersections, capacity analyses were performed. The following is a brief description of the analysis method utilized in this report:



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

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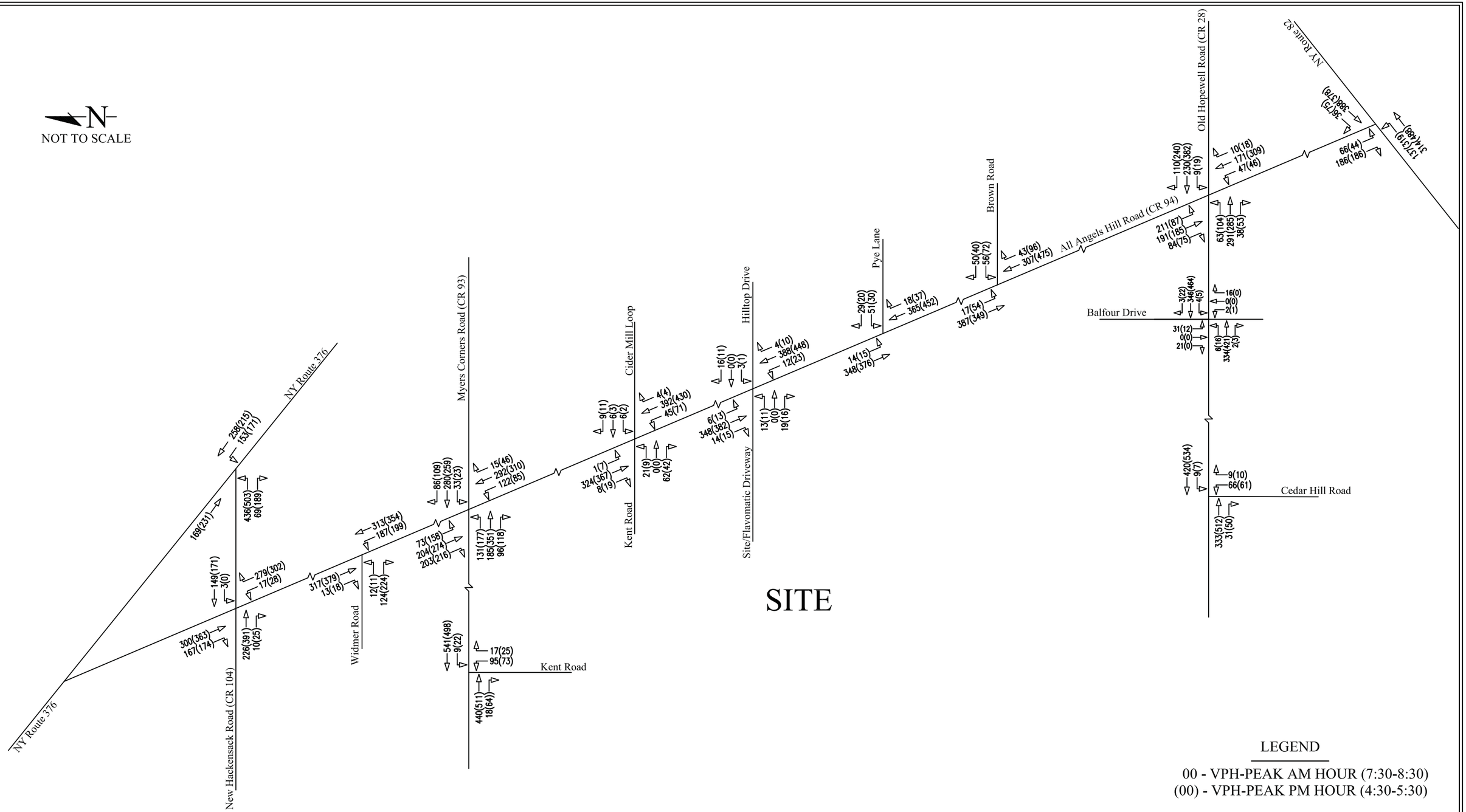

LEGEND

00 - VPH-PEAK AM HOUR (7:30-8:30)
(00) - VPH-PEAK PM HOUR (4:30-5:30)

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

Figure: 3.K-4
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Signalized Intersection Capacity Analysis

The capacity analysis for a signalized intersection was performed pursuant to the procedures described in the 2000 Highway Capacity Manual, published by the Transportation Research Board. The terminology used in identifying traffic flow conditions is Levels of Service. A Level of Service "A" represents the best condition and a Level of Service "F" represents the worst condition. A Level of Service "C" is generally used as a design standard while a Level of Service "D" is acceptable during peak periods. A Level of Service "E" represents an operation near capacity. To identify an intersection's Level of Service, the average amount of vehicle delay is computed for each approach to the intersection as well as for the overall intersection.

Unsignalized Intersection Capacity Analysis

The unsignalized intersection capacity analysis method utilized in this report was also performed in accordance with the procedures described in the 2000 Highway Capacity Manual. The procedure is based on total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. The average total delay for any particular critical movement is a function of the service rate or capacity of the approach and the degree of saturation. To identify the Level of Service, the average amount of vehicle delay is computed for each critical movement to the intersection.

Capacity Analysis of Key Intersections

Utilizing the procedures outlined in the 2000 Highway Capacity Manual, as outline above, capacity analyses were conducted at each of the key intersections to determine Levels of Service and operating conditions. Below, *Table 3.K-2* provides a summary of the Levels of Service and a description of each intersection.

Table 3.K-2: Level of Service Summary

Intersection	Existing		2015 No-Build		2015 Build	
	AM	PM	AM	PM	AM	PM
	LOS Delay v/c ratio	LOS Delay v/c ratio	LOS Delay v/c ratio	LOS Delay v/c ratio	LOS Delay v/c ratio	LOS Delay v/c ratio
New York State Route 376 & New Hackensack Road (CR 104)	D 35.8 0.51	D 38.9 0.68	D 37.2 0.55	D 43.0 0.73	D 37.2 0.55	D 43.1 0.74
All Angels Hill Road (CR 94) & New Hackensack Road (CR 104)	D 52.0 0.49	E 61.8 0.66	D 54.3 0.53	E 67.4 0.71	D 54.4 0.53	E 68.1 0.72
All Angels Hill Road (CR 94) & Widmer Road	b 12.0 0.17	b 13.7 0.33	b 12.5 0.19	b 14.7 0.38	b 12.6 0.19	b 15.0 0.39
All Angels Hill Road (CR 94) & Myers Corners Road (CR 93)	C 25.8 0.64	C 29.3 0.71	C 27.9 0.68	C 32.6 0.77	C 28.2 0.68	C 33.1 0.79
Myers Corners Road (CR 93) & Kent Road	d 25.1 0.39	d 25.1 0.35	d 30.5 0.47	d 30.6 0.44	d 30.9 0.47	d 31.1 0.44
All Angels Hill Road (CR 94) & Kent Road/Cider Mill Loop	c 15.1 0.16	b 14.3 0.04	c 16.7 0.07	c 15.3 0.05	c 17.0 0.07	c 15.6 0.05
All Angels Hill Road (CR 94) & Hilltop Drive/Site Driveway	b 11.5 0.04	b 14.6 0.01	b 12.0 0.04	c 15.7 0.01	b 14.6 0.09	c 16.3 0.08
All Angels Hill Road (CR 94) & Pye Lane	b 14.7 0.19	c 15.4 0.14	c 15.6 0.20	c 16.4 0.15	c 16.0 0.21	c 17.0 0.15
All Angels Hill Road (CR 94) & Brown Road	b 14.0 0.21	c 20.3 0.32	c 15.3 0.25	c 24.6 0.40	c 15.8 0.26	d 26.3 0.42
All Angels Hill Road (CR 94) & Old Hopewell Road (CR 28)	C 21.3 0.67	C 27.2 0.69	C 25.2 0.76	D 40.1 0.81	C 27.0 0.78	D 43.9 0.84
Old Hopewell Road (CR 28) & Balfour Drive	b 14.8 0.13	c 21.0 0.05	c 15.8 0.14	c 23.3 0.06	c 15.9 0.15	c 23.4 0.06
Old Hopewell Road (CR 28) & Cedar Hill Road	c 16.4 0.19	c 23.2 0.26	c 18.4 0.23	d 28.4 0.34	c 18.5 0.23	d 28.7 0.34
All Angels Hill Road (CR 94) & State Route 82	A 9.9 0.50	B 14.3 0.77	B 10.1 0.54	C 27.1 0.89	B 10.3 0.56	C 29.7 0.90

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.

Appendix G of the Traffic Impact Study, provided in *Appendix C.4*, contains detailed capacity analysis results tables that identify the V/C ratio, delay and Level of Service for all individual lane groups and movements.

Data was compiled at each key intersection from onsite measurements. The following are descriptions of the conditions utilized for the capacity analysis and a summary of the result:

1. **All Angels Hill Road and Myers Corners Road** - The intersection of the All Angels Hill Road (CR 94) and Myers Corners Road (CR 93) is a four-legged, signalized intersection (Location 4 in the Traffic Impact Analysis). 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 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.

2. **All Angels Hill Road and Kent Road/Cider Mill Loop** - 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 (Location 6 in the Traffic Impact Study). 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 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.

3. **All Angels Hill Road and Hilltop Drive** - The intersection of the All Angels Hill Road (CR 94) and Hilltop Drive/Site Driveway is a four-legged, two-way stop controlled intersection (Location 7 in the Traffic Impact Study). 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 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. **All Angels Hill Road and Brown Road** - The existing intersection of All Angels Hill Road (CR 94) and Brown Road is a three-legged, unsignalized, stop-controlled intersection (Location 9 in the Traffic Impact Study). 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.

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 3.K-3* 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 3.K-3: No Build and Build Traffic Volume Comparison Report at CR 94 & Brown Road

	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	829	1,050
2015 Build	860	1,086
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.

5. **All Angels Hill Road and Old Hopewell Road** - The intersection of the All Angels Hill Road (CR 94) and Old Hopewell Road (CR 28) is a four-legged, signalized intersection (Location 10 in the Traffic Impact Study). 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 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.

6. **All Angels Hill Road and NY Route 82** - The intersection of the All Angels Hill Road (CR 94) and New York State Route 82 (NY 82) is a three-legged, signalized intersection (Location 13 in the Traffic Impact Study). 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 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.

7. **All Angels Hill Road and New Hackensack Road** - The intersection of the All Angels Hill Road (CR 93) and New Hackensack Road (CR 104) is a four-legged, signalized intersection (Location 2 in the Traffic Impact Study). 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. As shown in the *Table 3.K-4* 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 3.K-4: No Build and Build Traffic Volume Comparison Report at CR 94 & CR 104

	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	1,143	1,444
2015 Build	1,151	1,454
Net Increase	8	10
Percentage	**0.70%**	**0.69%**

Lengthy delays will be experienced on the eastbound and westbound approaches with or without the proposed project during the Peak AM and PM Hours. This is attributed to the relatively long cycle length 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.

This volume increase does not significantly impact this intersection; therefore, the project related impact may be characterized as minimal. 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.

8. **All Angels Hill Road and Route 376** - The intersection of the New York State Route 376 (NY 376) and New Hackensack Road (CR 104) is a three-legged, signalized intersection (Location 1 in the Traffic Impact Study). 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. As shown in the *Table 3.K-5* 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 3.K-5: No Build and Build Traffic Volume Comparison Report at CR 94 & NY 376

	AM Peak Hour Traffic Volume	PM Peak Hour Traffic Volumes
2015 No-Build	1,080	1,305
2015 Build	1,085	1,309
Net Increase	5	4
Percentage	**0.46%**	**0.31%**

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 relatively long cycle length 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.

This volume increase does not significantly impact this intersection; therefore, the project related impact may be characterized as minimal. 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.

9. **Old Hopewell Road and Balfour Drive** - The intersection of the Old Hopewell Road (CR 28) and Balfour Drive/Meadowood Lane is a four-legged, two-way stop controlled intersection (Location 11 in the Traffic Impact Study). 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 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.

10. **Old Hopewell Road and Cedar Hill Road** - The intersection of Old Hopewell Road (CR 28) and Cedar Hill Road is a three-legged, stop sign controlled intersection (Location 12 in the Traffic Impact Study). 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 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.

11. **Myers Corners Road and Kent Road** - The intersection of Myers Corners Road (CR 93) and Kent Road is a three-legged, stop sign controlled intersection (Location 5 in the

Traffic Impact Study). 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 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.

12. **All Angels Hill Road and Widmer Road** - The intersection of All Angels Hill Road (CR 94) and Widmer Road is a three-legged, stop sign controlled intersection (Location 3 in the Traffic Impact Study). 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 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.

13. **All Angels Hill Road and Pye Lane** - The existing intersection of All Angels Hill Road (CR 94) and Pye Lane is a three-legged, unsignalized, stop-controlled intersection (Location 8 in the Traffic Impact Study). 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 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.

3.K.1.7 Queue Analysis

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. 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 below in *Table 3.K-6*.

Table 3.K-6: Comparison of No-Build & Build Maximum Queue Lengths

Roadway	Storage Lane		Max Queue Length			
			AM Peak Hour		PM Peak Hour	
	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. Storage/Queue tables for each lane group/movement are contained in Appendix I of the Traffic Impact Study.

3.K.1.8 Sight Distance Analysis

Sight Distance Analyses were performed for the proposed site entrance road 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). The 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 stopping sight distance 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. 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. A Speed Study was conducted of vehicles traveling northbound and southbound along All Angels Hill Road in the vicinity of the Site driveway which indicated an 85th percentile speed of 49 mph. The desirable and required intersection sightline distances were determined based on the 85th percentile speed along All Angels Hill Road of 49 mph (thus 50 mph was utilized). The stopping sight distance was based upon the posted speed limit. *Table 3.K-7* illustrates the provided and desirable/required sightline distances at the site driveway.

Table 3.K-7: Sightline Distances Intersection of 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 stopping and turning sight distances exceed the required distances. However, the stop line 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 the frontage on the project property. Therefore, this vegetation will be cleared as part of this development. Maintaining clear zones along the roadway both north and south of the access drive would allow the desirable stop line sight distance requirements to be exceeded, and those values are illustrated in *Figure 3.K-5*.

3.K.1.9 Accident History

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. Accident records were obtained 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. Copies of the 2008 – 2010 accident reports are contained in the Traffic Impact Study in *Appendix C.4*. The areas that data were collected are depicted in *Figure 3.K-6*.

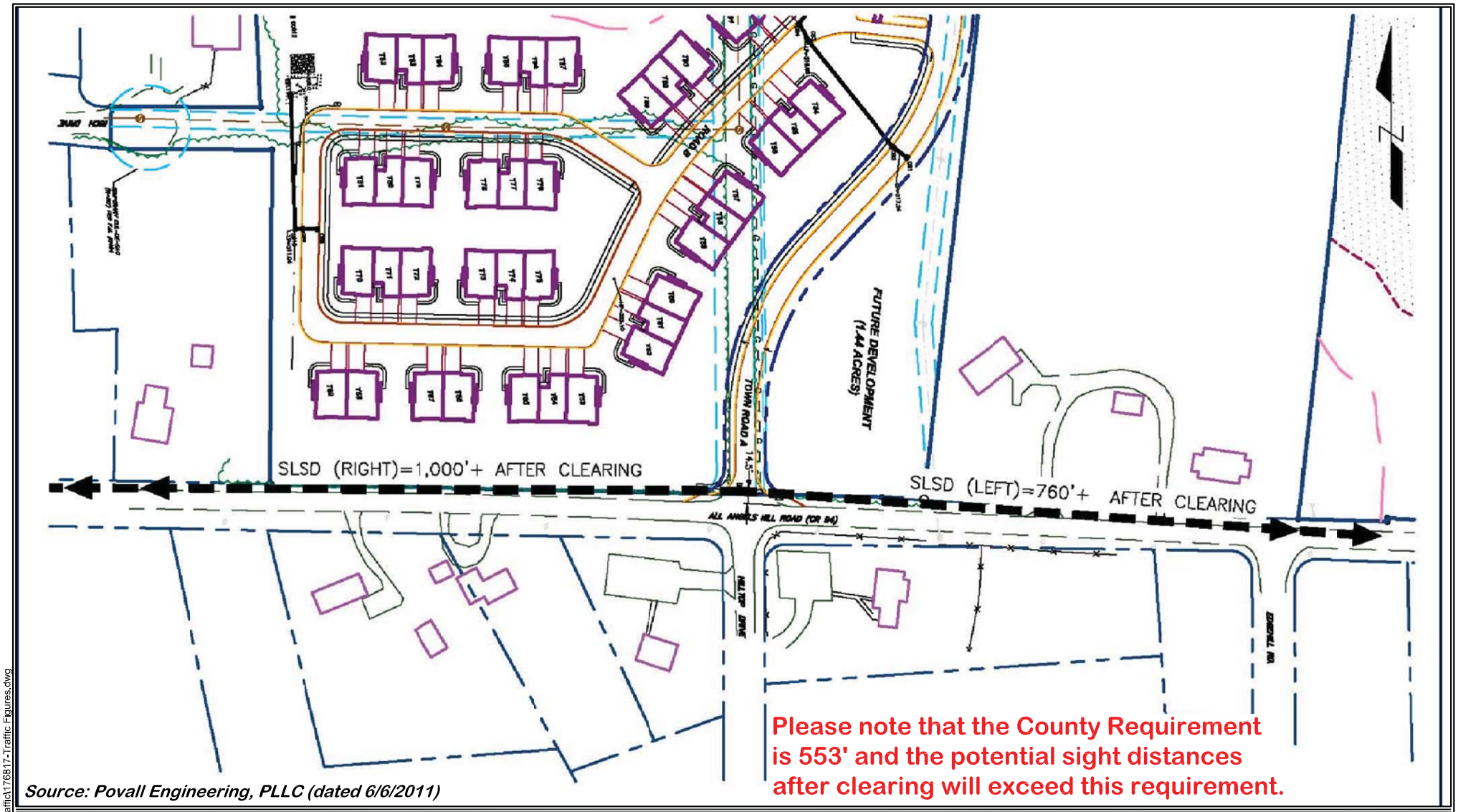
Accident data for each of the study intersections was obtained from the New York State Department of Transportation (NYSDOT) Records Access Office. Accident data for the roadway links between the study intersections was requested but no accident reports for the roadway links were received, all of the accident reports received were at or near the intersections. 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 were obtained. *Figure 3.K-7* illustrates the total number of yearly accidents at each study location.

As illustrated in *Figure 3.K-7*, 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. *Table 3.K-8* shows the comparison of the intersection accident rate and the Average Rural State Accident Rates for the intersection based on the existing geometric configuration.



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

Figure: 3.K-5
Date: 02/2012
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Scale: Not to Scale

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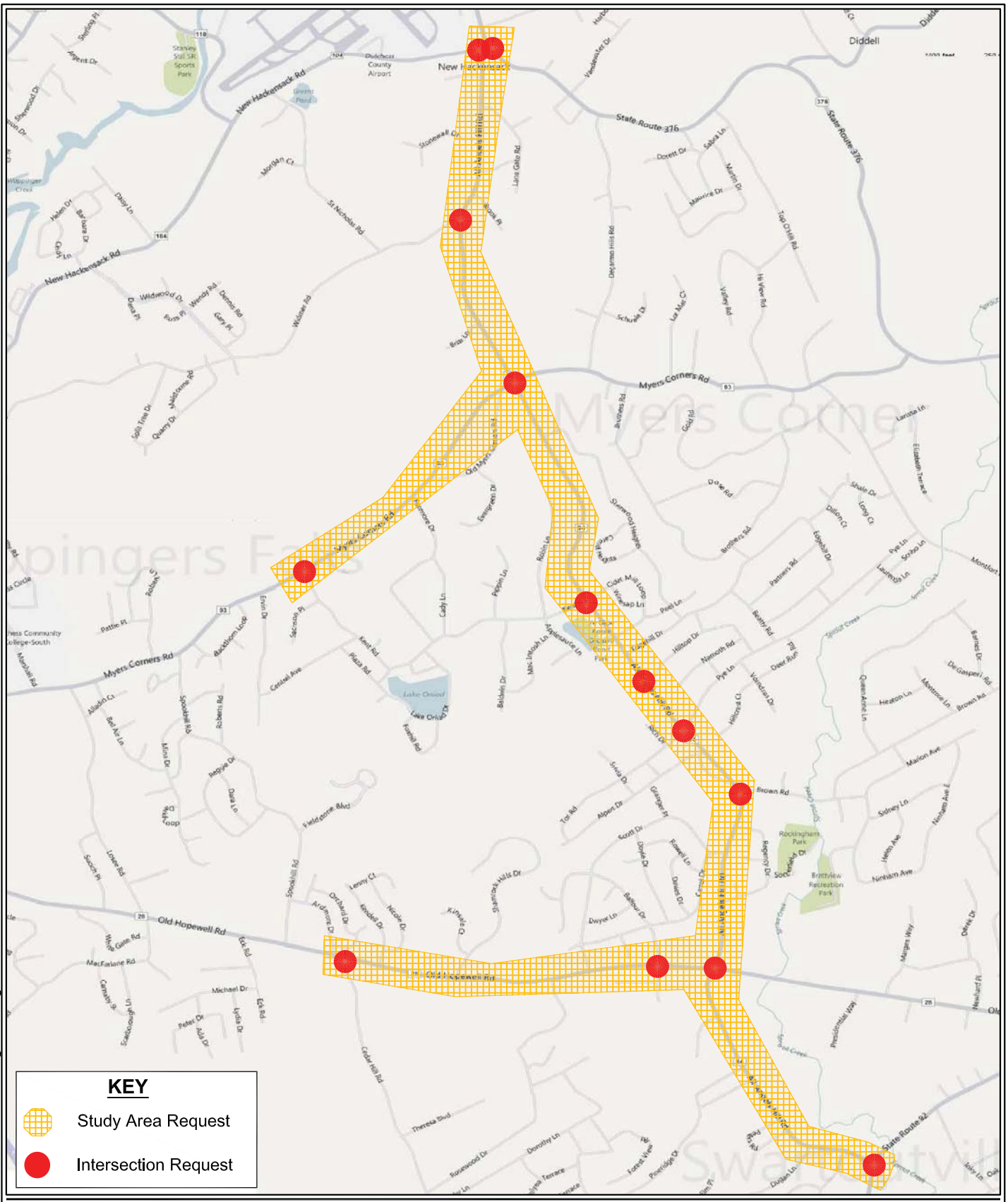

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Accident Analysis Study Area

Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

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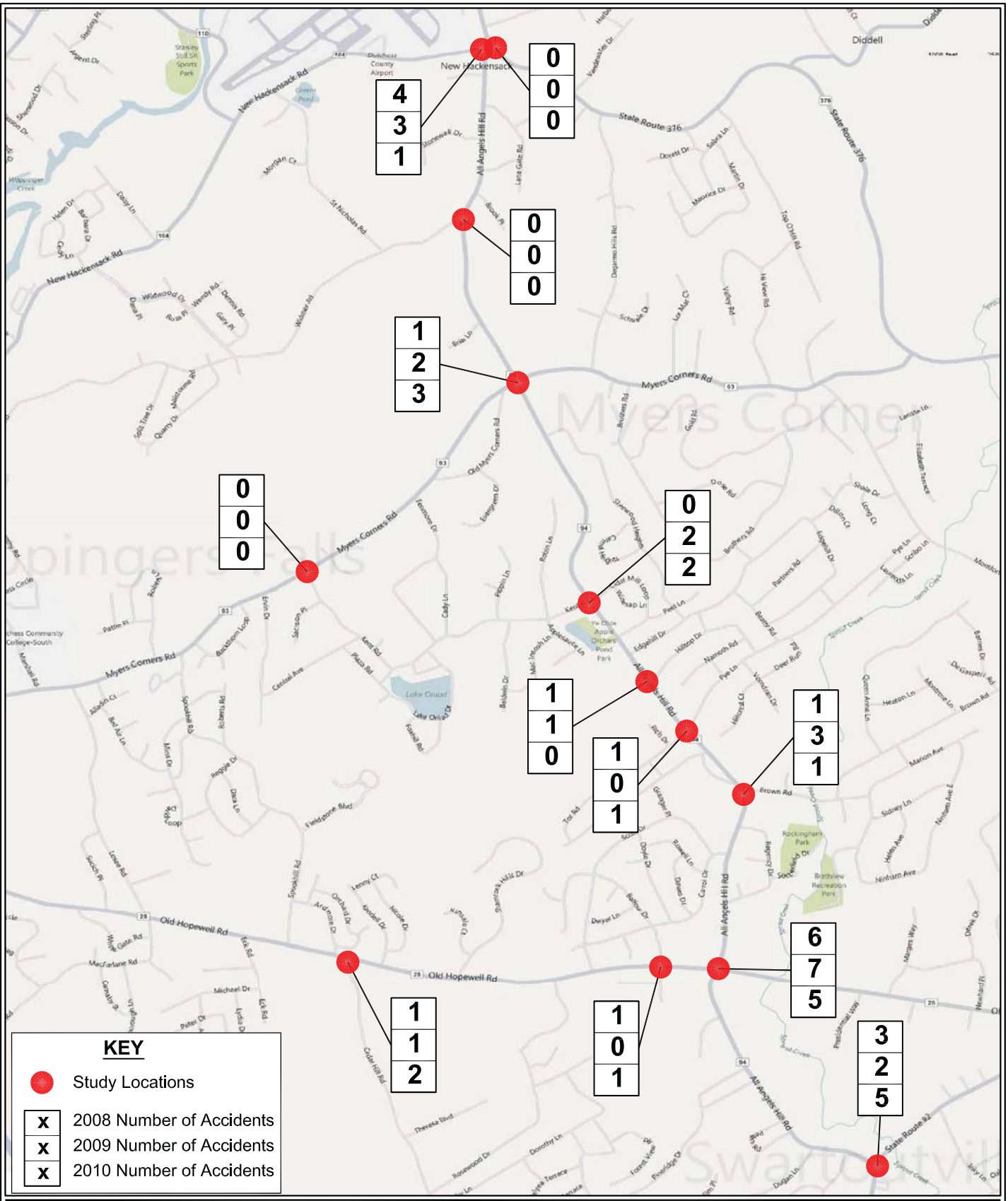

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Study Location Yearly Accident Data
Hilltop Village at Wappinger
Wappinger, Dutchess County, New York

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Table 3.K-8: 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.					

3.K.2 Potential Impacts

3.K.2.1 Study Intersections

The impact findings for each of the study intersections are outlined below.

1. **All Angels Hill Road and Myers Corners Road** – 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.

2. **All Angels Hill Road and Kent Road/Cider Mill Loop** – 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.

3. **All Angels Hill Road and Hilltop Drive** – 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.

4. **All Angels Hill Road and Brown Road** – The traffic associated with the project will not have an adverse impact, since the minimal volume increase does not significantly impact this intersection.

5. **All Angels Hill Road and Old Hopewell Road** – 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.

6. **All Angels Hill Road and NY Route 82** – 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.

7. **All Angels Hill Road and New Hackensack Road** – The volume increase does not significantly impact this intersection; therefore, the project related impact may be characterized as minimal. 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.

8. **All Angels Hill Road and Route 376** – The volume increase does not significantly impact this intersection; therefore, the project related impact may be characterized as minimal. 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.

9. **Old Hopewell Road and Balfour Drive** – 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.

10. **Old Hopewell Road and Cedar Hill Road** – 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.

11. **Myers Corners Road and Kent Road** – 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.

12. **All Angels Hill Road and Widmer Road** – 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.

13. **All Angels Hill Road and Pye Lane** – 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.

3.K.2.2 Other Area Developments

As previously discussed, there is one development (The Cerebral Palsy Community Residence 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 Action. Based on the nature of this land use, it is anticipated that this development would not generate a significant amount of peak hour traffic; the minimal amount of traffic that is generated was accounted for in the background traffic growth.

3.K.2.3 Road Maintenance

Road "A" will be built to Town of Wappinger Highway Specifications and dedicated to the Town; therefore, it will be a public road and maintained by the Town. The remaining roads within the development will be private and maintained by the Homeowner's Association with no burden on the Town.

3.K.2.4 Pedestrian Access, Safety, and Circulation

Sidewalks will be provided on one side of the roadways internal to the site to minimize impervious surfaces. Given the restricted access to the community, traffic will be limited. This will allow for pedestrians to safely cross the roads to access sidewalks. Thus, sidewalks are not needed on both sides of the road.

3.K.2.5 Future Development Area

The future use of the Future Development Area is currently unknown; however, it could be assumed that it will be used as a Town Senior Center. A Senior Center of 2,994 square feet is possible for this Site. Such development is not projected to have significant traffic, particularly during the roadway peak hours. The Institute of Transportation Engineers (ITE) accounts for these trips for these types of facilities in the trip generation for this type of development. Thus, any additional peak hour trips have been accounted for in the background traffic growth utilized and site-generated traffic in the analysis. Therefore, the Future Development Area will not have any impact on traffic operations on the roadway network.

3.K.3 Mitigation Measures

3.K.3.1 Study Intersections

The Proposed Action will have no significant impacts on the operating conditions of the adjacent roadways and intersections during the Peak Hours. The impacts of the Build traffic volumes would in fact be much less than that of the as-of-right traffic. 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.

3.K.3.2 Construction Traffic

Construction vehicle access to the property will be from All Angels Hill Road. The existing access road will allow construction vehicle movements onto the property and unit sites. The construction entrance pad will be installed at the proposed access point adjacent to Flavormatic. The following general guidelines for pad construction will be followed:

- Stone size will be 2" or a reclaimed or recycled concrete equivalent;
- Pad will be no less than 50 feet long and 10 feet wide and will be no less than 6"deep;

- A filter cloth will be placed over the entire area prior to placing of stone;
- All surface water flowing or diverted toward the construction entrance will be piped across the entrance;
- The entrance will be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment;
- All sediment spilled, dropped, washed, or tracked onto public rights-of-way will be removed immediately;
- Vehicle wheels will be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it will be done on an area stabilized with stone and that drains into an approved sediment-trapping device. Periodic inspection and needed maintenance of the pads will be provided after each rain event.

During construction, erosion and sediment will be controlled through the implementation of various erosion and sediment control methods in accordance with *New York State Standards and Specifications for Erosion and Sediment Control*, latest revision and the Stormwater Pollution Prevention Plan. Refer to *Appendix C.3* and *Appendix D* for additional information related to erosion and sediment control.

3.K.3.3 Construction Vehicles and Employees

All construction traffic and activities will comply with the Town code. As discussed in *Section 2.D*, construction activities and deliveries will typically occur during the normal business hours of 7:00 am to 6:00 pm Monday through Friday and 8:00 am to 5:00 pm on Saturday, except in the event of an emergency requiring immediate construction or demolition. All construction traffic will use the existing driveway entrance and will likely use both directions of All Angels Hill Road (CR 94). The proposed emergency access drive will not be used for any vehicular traffic related to the construction of the site and will remain dedicated only for emergency vehicle traffic.

Efforts will be made to reduce the number of construction vehicle trips to and from the site by keeping vehicles onsite as much as possible. Given the extent and type of building and site construction planned for the Proposed Action, heavy equipment will be delivered to the site once at the beginning of its associated phase, left on-site for the duration of that work, then potentially 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. Any large deliveries will be made during off-peak periods.

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. During the Site Infrastructure Construction Phase, there will be approximately 8-10 workers per day. During this time, there will be approximately three deliveries per day. There will be more construction workers during the Home Construction Phase.

3.K.3.4 Fugitive Dust Control

Fugitive dust will be controlled during construction with the use of moveable water tanks that will remain on site for this purpose. Construction operations will be scheduled in order to minimize the amount of disturbed areas at any one time during the course of work and will generally occur between 7:00am and 6:00 pm Monday through Friday and 8:00 am to 5:00 pm on Saturday. Truck traffic will access the site from All Angels Hill Road on the proposed access road/existing commercial driveway. Truck traffic is not anticipated along the frontage of All Angels Hill Road interior within the property. Existing vegetation will be preserved where possible; and temporary soil stabilization practices, such as mulching, seeding, and spraying (water), will be utilized to control dust.

3.K.3.5 Maintenance of Construction Equipment

Construction equipment will be maintained and operated properly to minimize pollution to air resources. All construction equipment and natural material stockpiles will be maintained in a staging area on site. The staging area will be located on the interior of the site on level ground to minimize erosion.

3.L Air Quality and Noise

This section discusses the existing air quality and noise within the project site and surrounding area. This section also discusses the air quality and noise that will be experienced during construction. The potential impacts as a result of the Proposed Action are identified and mitigation measures, if any, are provided.

3.L.1 Air Quality

3.L.1.1 Existing Conditions

The surrounding area is primarily comprised of residential properties. Typical outdoor air pollutants generated from the average residential use include carbon monoxide, nitrogen oxides and volatile organic compounds (VOC). These substances are most commonly associated with vehicular emissions, but can be emitted from heat sources like furnaces and HVAC systems. In general, on residential properties in Wappinger, pollutants are released by vehicles and residences when:

- Fuel is burned in the internal combustion engine and the air /gasoline residuals are emitted through the tailpipe or oil/natural gas, propane is burned for heating/cooking, and

- Heat causes fuel to evaporate from under the hood of a vehicle and throughout the fuel system.

Currently the property emits no airborne pollutants, since it is undeveloped and vegetated with several natural habitat types. There are no sensitive receptors located adjacent to the property that may be impacted by construction or occupation of the property since the proposed use is residential and surrounding uses are generally residential except for Flavormatic which is an adjacent commercial use.

3.L.1.2 Potential Impacts

The *Town of Wappinger Zoning Ordinance* has no identifiable criteria with regard to air quality; however, there are general industry air quality preservation standards set forth both on state and federal levels. As part of the SEQR process, the Proposed Action is required to meet or exceed all state, federal and municipal air quality regulations. The short term (construction) and long term air quality potential impacts are discussed below.

Short Term (Construction)
During construction, the air quality may be affected by construction activities. Air pollutants of concern include fugitive dust and vehicle emissions.

Long Term
After construction, the Proposed Action will generate the same typical outdoor air pollutants currently generated from the surrounding residential uses. The typical outdoor air pollutants generated include carbon monoxide, nitrogen oxides and volatile organic compounds (VOC). These substances are most commonly associated with vehicular emissions, but can be emitted from heat sources like furnaces and HVAC systems. Expected pollutant sources are limited to vehicle emissions, both passenger car and occasional trucks, and discharges from homes HVAC units.

The Traffic Impact Study in *Appendix C.4* considered maximum build-out potentials for the project site and indicated that no significant, unmitigated delays or Level of Service (LOS) drops resulted from the increased volume generated by the proposed development which indicates a minimum number of vehicles and pollutants from the proposed development.

3.L.1.3 Mitigation Measures

The short term (construction) and long term air quality mitigation measures are discussed below.

Short Term (Construction)
The potential construction related air quality impacts will be temporary. Fugitive dust will be controlled during construction with the use of moveable water tanks that will remain on site for this purpose. Construction operations and deliveries will be scheduled in order to minimize the amount of disturbed areas at any one time during the course of work and will generally occur between 7:00 am to 6:00 pm Monday through Friday and 8:00 am to 5:00 pm on Saturday. Truck traffic will access the site from All Angels Hill Road on the proposed access road/existing commercial driveway. Truck traffic is not anticipated along the frontage of All Angels Hill Road interior within the property. Existing vegetation will be preserved where possible; and temporary soil stabilization practices, such as mulching, seeding, and spraying (water), will be utilized to control dust.

The heavy-duty vehicle, including diesel trucks, idling time shall be minimized to five minutes[89], which will reduce air pollution and fuel use. The contactor shall be responsible to ensure all construction equipment is properly tuned and maintained prior to and for the duration of onsite operations. Efforts will be made to reduce the number of construction vehicle trips to and from the site by keeping vehicles onsite as much as possible. Given the extent and type of building and site construction planned for the Proposed Action, heavy equipment will be delivered to the site once at the beginning of its associated phase, left on-site for the duration of that work, then potentially 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.

Long Term

After construction, the Proposed Action will generate the same typical outdoor air pollutants currently generated from the surrounding residential uses. Truck idling is not anticipated to occur for more than five minutes at a time, since the anticipated truck traffic will be limited to delivery trucks and garbage collection vehicles. Therefore, no mitigation measures are necessary.

3.L.2 Noise

3.L.2.1 Existing Conditions

Typical noise sources in the surrounding area include traffic sounds from passenger vehicles, larger commercial vehicles, and school buses along All Angles Hill Road (CR 94); and nature sounds (e.g., wind, birds, and a running stream). Only ambient noise levels are currently produced at the site, since it is undeveloped.

3.L.2.2 Potential Impacts

The National Ambient Air Quality Standard (NAAQS) was utilized as a comparison for purposes of evaluating if the Proposed Action poses a threat to ambient air quality levels. The short term (construction) and long term noise potential impacts are discussed below.

Short Term (Construction)

As discussed in *Section 2.D.8*, short-term noise impacts will occur from construction equipment and earth-moving activities during construction of the proposed development. It is not possible to predict the exact magnitude of this impact on ambient noise levels in adjacent residential areas due to the variability in many of the factors needed to make such an assessment. These factors include the number and types of construction equipment, construction methods, and scheduling of construction work.

Construction equipment typically generates noise levels when measured 50 feet from the source that range from 70 decibels (dBA) to over 95 dBA[90]. These levels can be compared to a shouting voice at six feet (70 dBA) or to a lawn mower at three feet (95 dBA). Since noise from stationary sources attenuates at a rate of 6 dB per doubling of distance, a 90 dBA noise level at 50 feet from the source

[89] New York State Environmental Conservation Law (ECL) prohibits heavy-duty vehicles, including diesel trucks and buses, from idling for more than five minutes at a time.

[90] *Assessing and Mitigating Noise Impacts*, New York State Department of Environmental Conservation, revised February 2, 2001.

would be reduced to 84 dBA at 100 feet, 78 dBA at 200 feet, and so forth. The noise level at receptors within the surrounding area will vary depending on the specific areas in which construction is taking place.

Geotechnical investigations were performed by The Chazen Companies in July 2004, the depth to rock ranges from 13 to 32 feet below the existing grade. Based upon these investigations, rock removal is not expected; therefore, blasting, chipping, or stone crushing is not anticipated to occur. However, should rock be encountered, the type of rock will be evaluated to determine if mechanical means (i.e., chipping or excavation) can be used to remove the rock. The ability to rip or excavate rock is determined by the type of excavator capable of removing it without blasting (i.e. dozer D8 or Hoe CAT235 or comparable). Blasting operations will only be resorted to if necessary. Additional information regarding the geotechnical investigation is provided in *Section 3.A.1.2*.

Long Term

Noise levels resulting from the Proposed Action are not expected to adversely impact the surrounding community. Noise levels generated by the proposed development will be compatible with existing noise levels and types in the area. In addition, there are no sensitive receptors located adjacent to the property that may be impacted by construction or occupation of the property, since the proposed use is residential and surrounding uses are generally residential except for Flavormatic which is an adjacent commercial use.

3.L.2.3 Mitigation Measures

The short term (construction) and long term noise mitigation measures are discussed below.

Short Term (Construction)

All construction traffic and activities will comply with the Town code. As discussed in *Section 2.D*, construction activities will typically occur during the normal business hours of 7:00 am to 6:00 pm Monday through Friday and 8:00 am to 5:00 pm Saturday, except in the event of an emergency requiring immediate construction or demolition. Efforts will be made to reduce the number of construction vehicle trips to and from the site by keeping vehicles onsite as much as possible. Given the extent and type of building and site construction planned for the Proposed Action, heavy equipment will be delivered to the site once at the beginning of its associated phase, left on-site for the duration of that work, then potentially 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 Proposed Action will leave approximately 51 percent of the site undeveloped, the majority of which will be open space and wooded or wetland areas, which will help to attenuate noise from construction and shield adjacent areas from potential impacts. The construction of the development will occur in phases therefore development will generally be limited to one portion of the site at a time. To reduce the potential impact of noise on adjacent residences, all construction vehicles and equipment will be well maintained and operated in an efficient manner. In particular, the mufflers on all construction equipment will be fully functional and well maintained by the construction contractor. Mufflers will reduce the frequency of sound on machinery that pulses, such as diesel engines and compressed air machinery.

Long Term

Occupancy of the site is not expected to cause any significant noise impacts that would affect the surrounding community. A combination of landscaping, existing trees, and variations in topography will serve to attenuate noise generated on the property once it is occupied. However, as the surrounding area is primarily comprised of residential uses, noise levels generated by the proposed development will be compatible with existing noise levels and types in the area. Traffic on and off the site is not expected to generate significant noise levels above current noise generated by traffic in the area. Therefore, no mitigation measures are necessary.

3.L.3 Blasting Alternatives

Should rock be encountered, the type of rock will be evaluated to determine if mechanical means (i.e., chipping or excavation) can be used to remove the rock. The ability to rip or excavate rock is determined by the type of excavator capable of removing it without blasting (i.e. dozer D8 or Hoe CAT235 or comparable). Blasting operations will only be resorted to if necessary.

As discussed earlier, according to the SCS Soil Survey for Dutchess County, the depth to bedrock varies across the property and ranges from zero to >60 inches. Most of the development will occur in Bernardston silt loam soils. As shown in *Table 3.A-1* and *Figure 3.A-2*, the depth to bedrock for these soils is greater than 60 inches. Geotechnical investigations were performed in July 2004, as documented in the Chazen *Site Due Diligence* (see *Appendix C.8*), and showed that the depth to bedrock ranged from 13 to 32 feet below existing grade. Based upon this information, blasting will not be necessary.

3.M Infrastructure and Energy, Utilities and Services

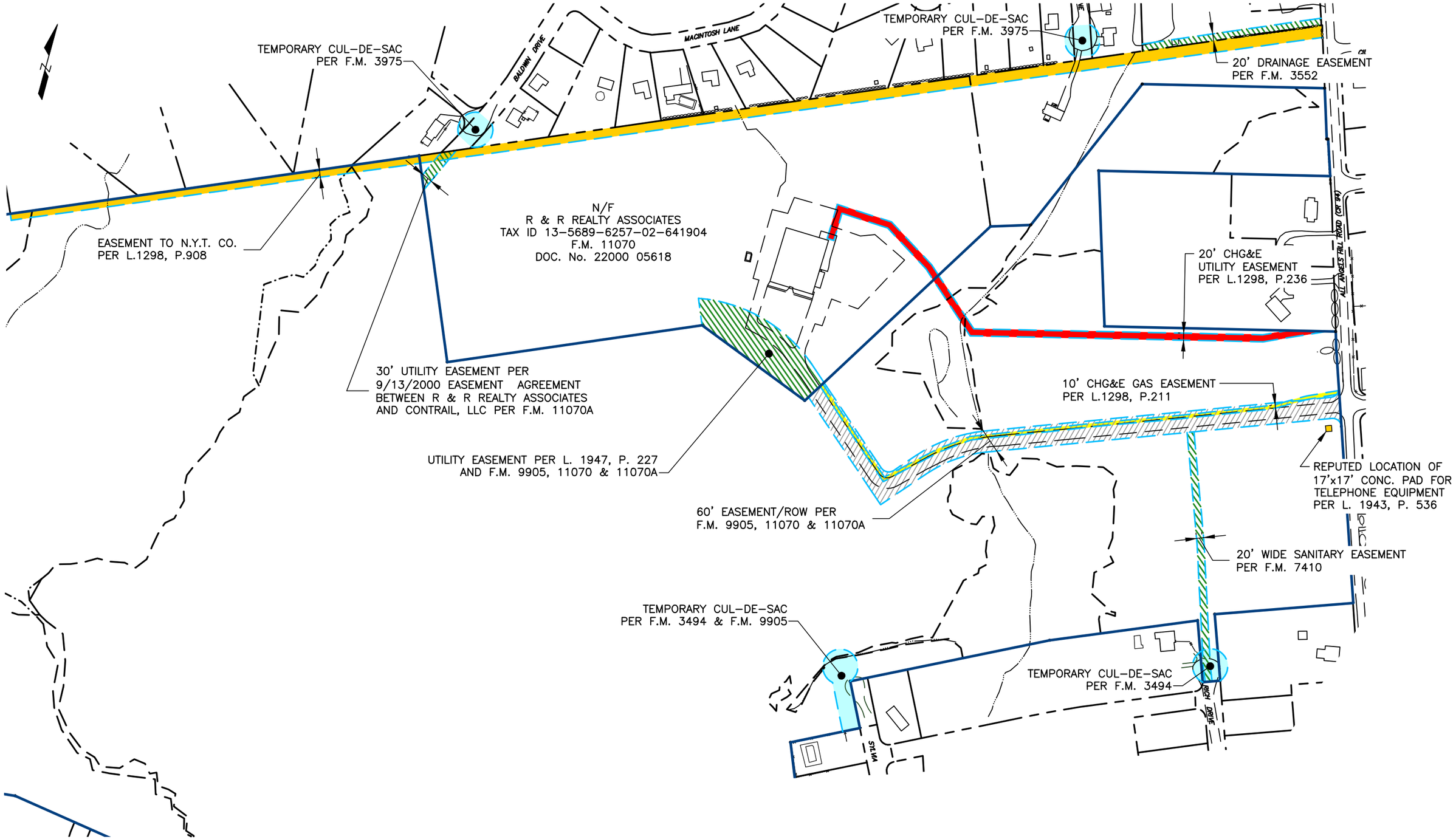
This section describes the existing wastewater, water, and other utilities and services on the project site and within the surrounding area. This section also describes the existing infrastructure and capacity, projected water use, wastewater generation, and waste generation. The potential impacts are identified and mitigation measures, where necessary, are provided.

3.M.1 Existing Conditions

3.M.1.1 Easement and Restrictions

As discussed in *Section 3.G.1.4*, a title search was performed on the property. Several easements and restrictions were revealed. The existing easements that provided locations and widths are shown in *Figure 3.M-1*. The existing easements are summarized in below:

- 10 foot wide Central Hudson Gas and Electric easement (L.1298 P.211) for the existing gas line, which runs parallel to the existing driveway and provides gas service to the R&R Realty Associates property.
- 20 foot wide Central Hudson Gas and Electric easement (L.1298 P.236) for the existing overhead power line, which runs parallel to the northern property line abutting the Community Baptist Church parcel and provides electrical service to the R&R Realty Associates property.



PREPARED BY:

POVALL ENGINEERING, PLLC

LEGEND

CHG & E GAS EASEMENT	UTILITY EASEMENT	COMMUNICATION EASEMENT & UTILITY EASEMENT CROSSING
COMMUNICATION EASEMENT	RIGHT OF WAY EASEMENT	GAS EASEMENT & RIGHT OF WAY EASEMENT CROSSING
CHG & E UTILITY EASEMENT	TEMPORARY CUL-DE-SAC EASEMENT	TEMPORARY CUL-DE-SAC EASEMENT & UTILITY EASEMENT CROSSING

HILLTOP VILLAGE AT WAPPINGER

EXISTING EASEMENTS

FIGURE 3.M-1
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SCALE: N.T.S.

- 20 foot wide New York Telephone Company easement (L.1298 P.908) for communication lines, which runs parallel to the northern property line.

- 17 foot by 17 foot New York Telephone Company concrete pad easement (L.1943 P.536) for telephone equipment, which is adjacent to the existing driveway and All Angels Hill Road.

- 60 foot easement/ROW (L.1947 P.227 and FM#9905, 11070, and 11070A) for the existing driveway, which provides access to the R&R Realty Associates property.

- 20 foot wide sanitary sewer easement (FM#7410) for the exiting sanitary sewer line, which runs parallel to All Angels Hill Road.

- 30 foot utility easement agreement (FM#11070A) on the R&R Realty Associates property to allow the Proposed Action to connect to utilities on Baldwin Drive.

- A temporary 50 foot cul-de-sac (FM#3494) to allow Rich Drive to dead end, until future connection to the Contrail, LLC property.

- A temporary 50 foot cul-de-sac (FM#3494 and 9905) to allow Sylvia Drive to dead end, until future connection to the Contrail, LLC property.

Additional easements and restrictions that did not provide locations and/or widths that were not shown in *Figure 3.M-1* are summarized below:

- Contract guaranteeing a minimum income with Wappingers Electric Corporation for line extension (L.452 P.160).

- Granted to Wappingers Electric Company the right, privilege, and authority to construct, reconstruct, relocate, operate, repair, maintain, and removal of its electric lines (L.445 P.393).

- 150 foot wide Central Hudson Gas and Electric easement (L.650 P.188) for the existing gas line, which is now located within the Shamrock Hills Subdivision.

- Granted to U.S. Cablevision Corp. an easement (L.1317 P.24) to construct, maintain, and repair CATV facilities. Location and width of easement not provided.

Some of the exiting easements will have to be amended and/or dissolved. Amending and/or dissolving the existing easements will be coordinated with their corresponding utility companies. Utility easements will be established, where necessary. The proposed amended and/or dissolved existing easements and the locations of any proposed easements will be shown on the final site plans as part of the FEIS.

3.M.1.2 Sanitary Sewage

The property is located within the United Wappinger Sewer District (UWSD). The sanitary sewer collection and conveyance system will be designed to collect the wastewater generated from the site.

Wastewater generated from the residential development will be conveyed to either the Rockingham pump station or the Shamrock Hills pump station.

According to the September 27, 2010 letter from Morris Associates to the Town of Wappinger Planning Board (see *Appendix B.1*), the "Hilltop Village at Wappinger" site straddles a drainage divide and the sewage flows in the 1994 Plan and Report for the Wappinger Sewers to be Upgraded and Connected to the Tri-Muni System, prepared by Paggi & Martin, were assigned accordingly with the eastern part of the site draining to the Rockingham pump station and the western part of the site draining to the Shamrock Hills pump station (discharging west to the Spook Hill trunk line). Morris Associates determined the maximum sewage flows to the Rockingham pump station and Spook Hill trunk line using the same factors and assumptions presented in the original report and a theoretical maximum build-out of the site. The maximum sewage flow allocations are as follows:

Discharging east to Rockingham pump station	25,092 gpd
Discharging west to Spook Hill trunk line	51,400 gpd

The sanitary sewage flows conveyed to the Rockingham pump station and Shamrock Hills pump station will not exceed the maximum allowed sewage flows.

3.M.1.3 Water Supply

The property is located within the United Wappinger Water District (UWWD). The project will require water service for both domestic and fire protection purposes. A double connection to the existing water system is proposed to meet both requirements. The proposed water main will connect to the existing water line stub in the Shamrock Hills subdivision and the existing water line located beneath Rich Drive in the cul-de-sac. The proposed water distribution system will be designed to serve all of the residential homes and club house. Individual water services from the main to each of the residential homes and club house building will be provided through individual service lines.

3.M.1.4 Gas, Telephone, and Electrical Supply

Map review and utility investigations indicate that electric and natural gas utilities are available adjacent to, and are sized to accommodate the proposed residential development. Gas, telephone, and electrical supplies are available to the site from along All Angels Hill Road. Verizon Telephone, Central Hudson Gas & Electric (CHG&E), and Cablevision service the project area and generate income from serving customers including potential new residents in a development. In order to grow their businesses, it is essential that each company possess sufficient resources to supply the project.

3.M.1.5 Solid Waste Management

The residents of the Town of Wappinger may employ a private carrier, such as Royal Carting, as their garbage collector (who may in turn subcontract to other private companies). They provide weekly pick-up for municipal solid waste, and separate weekly pick-up for recyclables, which generally include glass, newspaper, aluminum, tin and #1 and #2 plastic. For bulk pick up (i.e., refrigerator, couch, etc.), residents are required to buy permits from the Town Clerk which allow residents to bring these items to the Town of Wappinger Recycle Center on Wednesdays and

Saturdays from 9 am to 12 pm for disposal. Designated recyclables can be disposed of at the Dutchess County Materials Recovery Facility in Poughkeepsie, New York.

Burnable solid waste can be disposed of at the Dutchess County Resource Recovery Agency (DCRRA) in Poughkeepsie, New York. This facility incinerates solid waste and uses it to generate steam and electricity for consumers in the community. The Department of Environmental Conservation has categorized the ash by-product with a "Beneficial Use Designation". It is non-hazardous and is used as a cover at the Sullivan County landfill.[91] Non-burnable waste items are disposed of at a variety of outlets, depending on the particular item. Disposal sites change depending on the markets and waste volumes. The Sullivan County Landfill in Monticello, New York is also utilized.

3.M.2 Potential Impacts

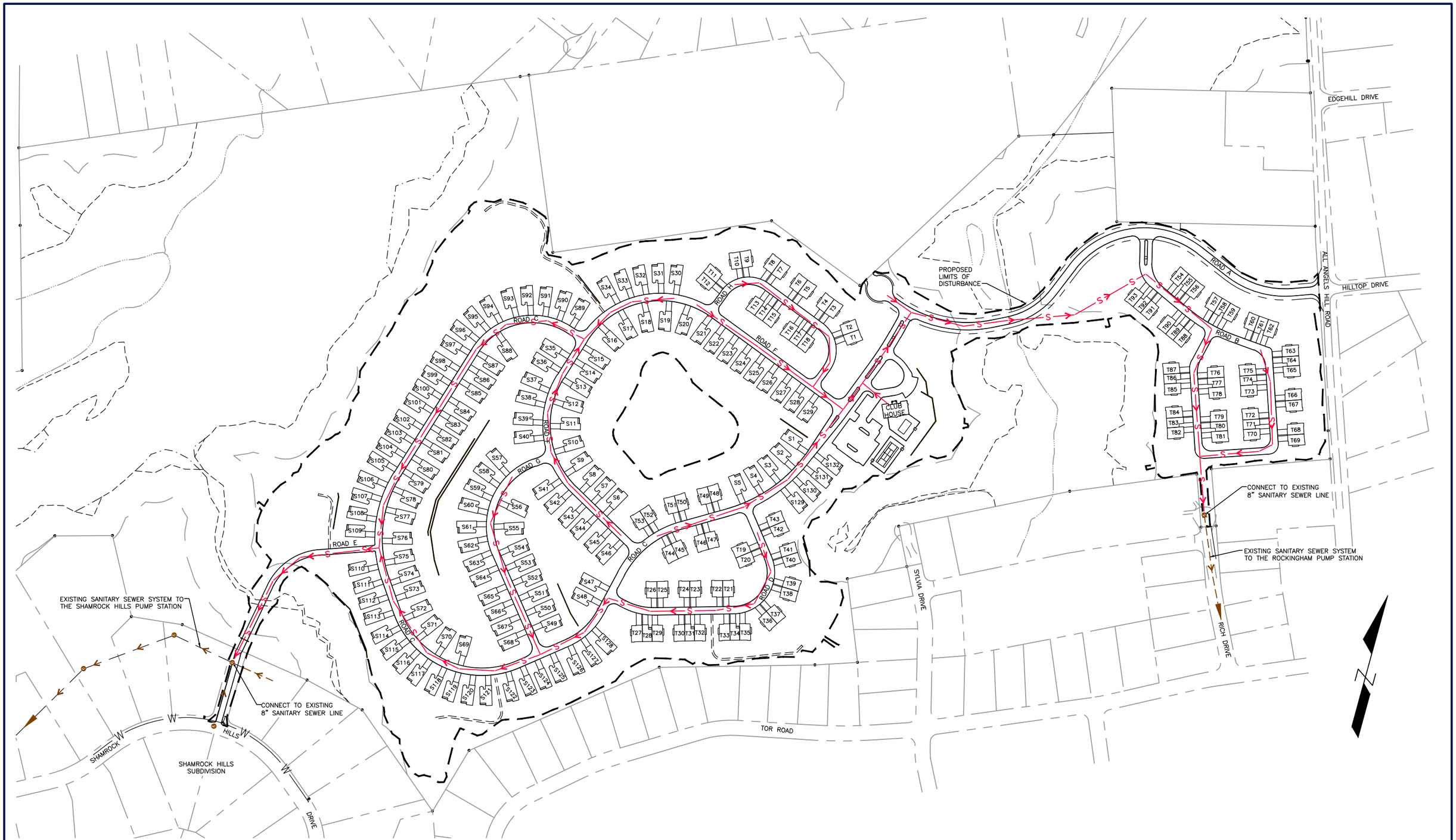
3.M.2.1 Sanitary Sewage

The sanitary sewer collection and conveyance system (*Figure 3.M-2*) will be designed to collect the wastewater generated from the site, which will be conveyed to either the Rockingham pump station or the Shamrock Hills pump station. The wastewater generated from the eastern part of the residential development will be conveyed via gravity to an existing manhole on Rich Drive (*Figure 3.M-3*). The wastewater will continue via gravity from the existing manhole to the Rockingham pump station.

The wastewater generated from the western part of the residential development will be conveyed via gravity to an existing manhole located on the emergency access road off of Shamrock Hills Drive (*Figure 3.M-4*). The wastewater will continue via gravity from the existing manhole to the existing pump station within the Shamrock Hills subdivision, which will pump the wastewater to an existing manhole in the Kendell Farms neighborhood. From there the wastewater will flow via gravity to the Kendell Farms pump station, which will pump the wastewater to an existing manhole on Admore Drive and then continue via gravity to the Spook Hill trunk line.

The sanitary sewer collection system will consist of 8-inch SDR 35 PVC gravity main and precast concrete sanitary manholes. Each building will have a sanitary sewer lateral that will connect to the gravity main. Sanitary sewer manholes will generally be provided at all changes of direction, both vertical and horizontal, and spaced not more than 400 feet apart. The gravity main will be designed to provide the minimum self-cleansing velocity of at least 2.0 feet per second (fps).

[91] Modern landfill technology requires that solid waste be covered with a series of layers of various materials designed to secure solid waste and minimize the effects of rainwater leaching through it. One such approved layer is the ash from the DCRRA facility.



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HILLTOP VILLAGE AT WAPPINGER

SANITARY SEWER SYSTEM LAYOUT

FIGURE 3.M-2

DATE: 02/2012

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SCALE: 1"=300'

EX. PUMP STATION

EX. PUMP STATION

R&R REALTY ASSOCIATES

TIE-IN LOCATION

10"

10"

10"

10"

10"

10"

16"

EX. ROCKINGHAM PUMP STATION

N

LEGEND

———	ROCKINGHAM FARMS SEWER DISTRICT LIMITS
- - - - -	EXISTING SANITARY SEWER LINE
	EXISTING SANITARY SEWER MANHOLES
	WASTEWATER FLOW PATH FROM SITE
	UNITS CONVEYED TO ROCKINGHAM PS

NOTES:

1. THE LOCATIONS OF THE EXISTING SANITARY SEWER LINES AND MANHOLES ARE APPROXIMATE AND BASED UPON THE FOLLOWING MAPS:
   A. "ROCKINGHAM FARMS SEWER DISTRICT" PREPARED BY PAGGI & MARTIN ENGINEERING LAST REVISED JULY 7, 1996.
   B. "ROCKINGHAM FARMS SECTION I" PREPARED BY HERBERT L. KARTIGNER, PE, LS LAST REVISED JUNE 22, 1966.
2. THE SEWER DISTRICT BOUNDARY WAS REVISED BASED UPON SEWER DISTRICT INFORMATION PROVIDED ON DUTCHESS COUNTY PARCEL ACCESS.
3. THE ROCKINGHAM PUMP STATION CONVEYS THE WASTEWATER TO THE SPOOK HILL TRUNK LINE.

FIGURE 3.M-3
DATE: 02/2012
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SCALE: 1"=800'

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POVALL ENGINEERING, PLLC

HILLTOP VILLAGE AT WAPPINGER

UNITED WAPPINGER SEWER DISTRICT

NOTES:

1. THE LOCATION OF THE EXISTING SANITARY SEWER LINES, FORCE MAIN AND MANHOLES ARE APPROXIMATE.
2. THIS MAP WAS DEVELOPED BASED UPON A FIGURE ENTITLED "SHAMROCK HILLS SUBDIVISION OFFSITE SEWER SYSTEMS" PREPARED BY POVALL ENGINEERING, PLLC LAST REVISED MAY 17, 2006.

PREPARED BY:

POVALL ENGINEERING, PLLC

LEGEND

- EXISTING FORCE MAIN
- EXISTING SANITARY SEWER LINE
- EXISTING SANITARY SEWER MANHOLES
- WASTEWATER FLOW PATH FROM SITE
- UNITS CONVEYED TO SHAMROCK HILLS PS

HILLTOP VILLAGE AT WAPPINGER

SHAMROCK HILLS AND KENDALL FARMS PUMP STATIONS

FIGURE 3.M-4

DATE: 02/2012

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SCALE: 1"=600'

Anticipated Wastewater Generation

The proposed age restricted community will generate domestic type wastewater flows. The Town of Wappinger has specific average daily flow rates for the single family homes and the townhomes, which will be used in lieu of the NYSDEC unit flow rates. The anticipated wastewater generation rate for the club housed will be determined by using the unit flow rates in the New York State Department of Environmental Conservation (NYSDEC) *Design Standards for Wastewater Treatment Works*, 1988. The anticipated wastewater generation from each of the uses on the site is summarized in *Table 3.M-1* below.

Table 3.M-1: Anticipated Wastewater Generation

Use Type	Size	Unit	Flow Rate per Unit (gpd)	Wastewater Generation (gpd)
Single Family Homes	132	homes	320(1)	42,240
Townhomes	93	homes	200(2)	18,600
Club House	3,762	Sq. ft.	0.08(3)	301
			Total	**61,141**

(1) The average daily use for a single family home with no more than four-bedrooms per residential unit in accordance with the Town of Wappinger's practices (Chapter 236-6 of the Town Code).
(2) The average daily use for a two-bedroom apartment/unit in accordance with the Town of Wappinger's practices (Chapter 236-6 of the Town Code).
(3) Water saving plumbing fixtures will be used and the NYSDEC *Design Standards for Wastewater Treatment Works* permits a 20 percent reduction in the hydraulic loading rate. The values shown have already been reduced by 20 percent.

For a two-bedroom home/apartment, the NYSDEC uses a flow rate of 240 gpd/unit. The wastewater generated from the 225 units would be 54,000 gpd as compared to 60,840 gpd using the Town of Wappinger's standards. The Town of Wappinger's standards results in a more conservative design flow.

The wastewater generated from the club house, 19 single family homes, and 68 townhomes will be conveyed to the Rockingham pump station. Therefore, the wastewater design flow to the Rockingham pump station is **19,981 gpd**. The wastewater generated from the remaining 113 single family homes and 25 townhomes will be conveyed to the Shamrock Hills pump station. Therefore, the wastewater design flow to the Shamrock Hills pump station is **41,160 gpd**.

Existing Pump Stations and Collection System Evaluations

The Rockingham pump station, Shamrock Hills pump station, Kendall Farms pump station, and the Orchard Drive/Ardmore Road collection system were reviewed to confirm if the existing pump stations and collection system are able to handle the additional sewage flow from the Proposed Action. The results of the analysis are discussed below.

Rockingham Pump Station Evaluation
The Rockingham pump station was reviewed to determine if the pump station could handle the additional sewage flow from the Proposed Action. The anticipated wastewater generation to be conveyed from the Proposed Action to the Rockingham pump station is 19,981 gpd. This flow is less than the maximum allowed sewage flow of 25,092 gpd, as documented in *Section 3.M.1*.

Shamrock Hills Pump Station Evaluation
The Shamrock Hills pump station was reviewed to determine if the pump station could handle the additional sewage flow from the Proposed Action. Based upon the analysis, the existing twin Smith & Loveless 15 HP Model 4B2X pumps can handle the additional flow with minor modifications to the pump station floats. The pump running time will be increased by 6 minutes. Refer to the Sanitary Sewer System Engineering Report in *Appendix C.5* for additional information.

Kendell Farms Pump Station Evaluation
The Kendell Farms pump station was reviewed to determine if the pump station could handle the additional sewage flow from the Proposed Action. Based upon the above analysis, the existing pumps in the Shamrock Hills pump station will not have to be replaced as a result of the wastewater flow from the Hilltop Village at Wappinger project. The Shamrock Hills pump station flow rate/cycle will not impact the Kendell Farms pump station pumping flow, since the flow will remain unchanged. However, the increase of the Shamrock Hills pump station pumping cycles will cause the Kendell Farms pump station to cycle more often. Refer to the Sanitary Sewer System Engineering Report in *Appendix C.5* for additional information.

Orchard Drive/Ardmore Road Collection System Evaluation
The Kendell Farms pump station discharges to the existing collection system within the Orchard Drive/Ardmore Road development. The collection system will also be unaffected, since the Kendell Farms pump station was unaffected by the Hilltop Village at Wappinger project. Refer to the Sanitary Sewer System Engineering Report in *Appendix C.5* for additional information.

Wetland and Stream Potential Impacts

Sections of the existing sanitary sewer system will be removed and/or abandoned in place. The removal and/or abandonment will not impact the wetlands or streams. However, there are two areas of wetland disturbance proposed. The first location is where the proposed Road "A" crosses the existing twin 30-inch corrugated metal pipe (CMP) culverts between ACOE jurisdictional wetlands F/G and H/J. The proposed disturbance to ACOE jurisdictional wetlands F/G and H/J is related to the road grading. The proposed sanitary sewer system is located within the roadway and will not disturb additional wetlands or the stream. There is approximately 8.5 feet of separation from the top of the replaced culverts to the bottom of the roadway pavement section to allow for the proposed utility construction. Therefore, there will not be any additional wetland disturbance or any stream dredging and/or disturbance as a result of the utility construction.

The final location is north of the southern property line where the emergency access road (Road "E") will connect to the adjacent Shamrock Hills subdivision. A portion of the emergency access road will disturb ACOE jurisdictional wetland B/E. Approximately 1,660 square feet (0.038± acres) of the 100 foot Town wetland buffer will be disturbed for the installation of the emergency access road, culvert, and associated grading. The proposed sanitary sewer system is located within the roadway. There is approximately 11.5 feet of separation from the top of the proposed culvert to the bottom of the roadway pavement section to allow for the proposed utility construction. Therefore, there will not be any additional wetland disturbance as a result of the utility construction.

Future Development Area Potential Impacts

The sanitary sewer collection and conveyance system for the Future Development Area will convey the wastewater to the collection system discharging to the Rockingham pump station. The preliminary anticipated wastewater generation for a potential 3,000 square foot senior center was determined by using the unit flow rates in the New York State Department of Environmental Conservation (NYSDEC) *Design Standards for Wastewater Treatment Works*, 1988. The anticipated wastewater generation was determined to be **240 gpd**.

The maximum allowable wastewater flow to the Rockingham pump station is 25,092 gpd. The total anticipated wastewater generation for both the Proposed Action and the Future Development parcel would be 20,221 gpd, which is less than the maximum allowable wastewater flow to the Rockingham pump station. Therefore, there are no anticipated impacts to the Rockingham pump station as a result of the Future Development Area.

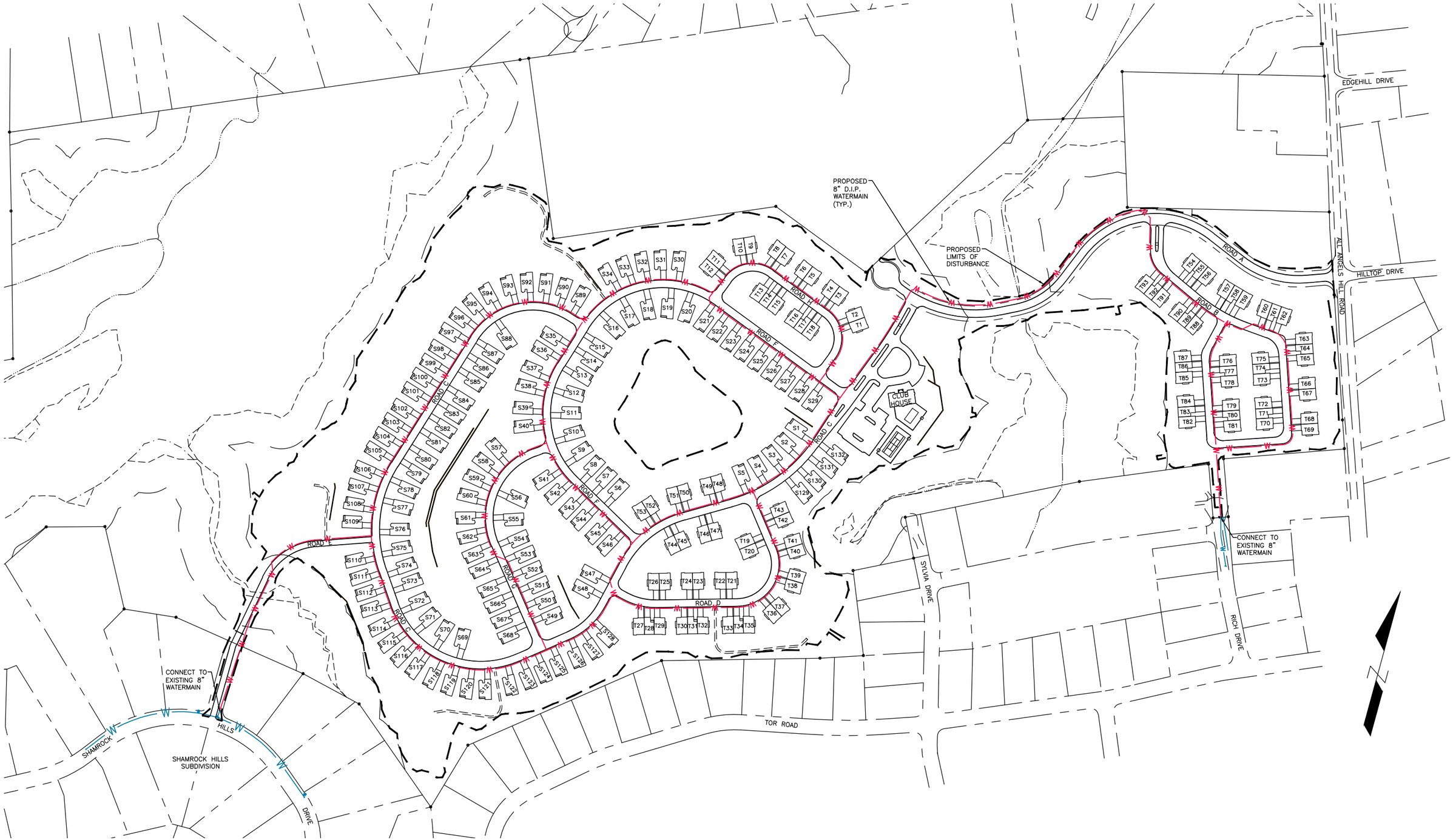
3.M.2.2 Water Supply

The project will require water service for both domestic and fire protection purposes. The project is proposed to connect to the existing Town water system at two (2) locations to meet both requirements. The proposed water main will connect to the existing water line tee in the Shamrock Hills subdivision to the west and the existing water line located beneath Rich Drive to the east. The proposed water distribution system will be designed to serve all of the residential homes and community center. Water service from the main to each of the residential homes and community center building will be provided through individual service line connections.

The proposed water distribution system (*Figure 3.M-5*) will be designed to serve all of the residential homes and community center. The water main will be an 8-inch Class 52, cement-lined ductile iron pipe complying with the American Water Works Association (AWWA) Standards C151 and C104. The water main will generally be in or along roadways or parking areas. A ten foot horizontal separation distance and an 18-inch vertical separation distance will be provided between sanitary sewer and stormwater lines. All water distribution and service lines will be installed at a minimum of five feet below finished grade to provide for frost protection.

Water service from the main to each of the single family homes, townhomes, and club house building will be provided through individual service lines. The service lines for the single family homes and townhomes will be ¾ to 1 inch Type K copper or HDPE SDR-9 with a corporation stop at the main and a curb stop near the pavement line. The water service and fire suppression lines for the community center will be a 1-½ inch Type K copper or HDPE SDR-9 and 6-inch Class 52 cement-lined ductile iron pipe, respectively, with valves placed near the pavement line.

Isolation valves will be placed at not more than 800-foot intervals along the water mains. Hydrant spacing will be dependent on the final site design; however, hydrant spacing will be between 350 and 600-feet. Placement and spacing of the hydrants will be in accordance with ISO standards and *Ten States Standards for Water*.



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HILLTOP VILLAGE AT WAPPINGER

POTABLE WATER SYSTEM LAYOUT

FIGURE 3.M-5

DATE: 02/2012

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SCALE: 1"=300'

Anticipated Water Demand

The proposed residential development will require water service for both domestic and fire protection purposes. The Town of Wappinger has specific average daily flow rates for the single family homes and the townhomes, which will be used in lieu of the NYSDEC unit flow rates. The anticipated water demand for the club house and swimming pool will be determined by using the unit flow rates in the New York State Department of Environmental Conservation (NYSDEC) *Design Standards for Wastewater Treatment Works*, 1988. The anticipated water demand from each of the uses on the site is summarized in *Table 3.M-2* below.

Table 3.M-2: Anticipated Water Demand

Use Type	Size	Unit	Flow Rate per Unit (gpd)	Wastewater Generation (gpd)
Single Family Homes	132	homes	320(1)	42,240
Townhomes	93	homes	200(2)	18,600
Club House	3,762	sq. ft.	0.08(3)	301
Swimming Pool (1,071 sf)(4)	71	swimmers	10(5)	710
			Total	**61,851**

(1) The average daily use for a single family home with no more than four-bedrooms per residential unit in accordance with the Town of Wappinger's practices (Chapter 236-6 of the Town Code).
(2) The average daily use for a two-bedroom apartment/unit in accordance with the Town of Wappinger's practices (Chapter 236-6 of the Town Code).
(3) Water saving plumbing fixtures will be used and the NYSDEC *Design Standards for Wastewater Treatment Works* permits a 20 percent reduction in the hydraulic loading rate. The values shown have already been reduced by 20 percent.
(4) Number of swimmers/bathers is estimated on the basis of 15 sf of pool water surface area per patron as recommended in NYS Sanitary Code Subpart 6-1.
(5) NYSDEC *Design Standards for Wastewater Treatment Works* hydraulic loading rate without water saving plumbing fixture reduction.

Fire Suppression Needs

The residential development is in the Town of Wappinger New Hackensack Fire District. A network of fire hydrants will be provided within the development to provide fire suppression needs. The fire hydrants will also be used for water line flushing, when necessary.

The hydrant pressures at Rich Drive and at the easement between Shamrock Hills Drive and Maxwell Place were reviewed by CAMO Pollution Control, Inc. The hydrant pressure at Rich Drive was 83 psi. The hydrant pressure at the easement between Shamrock Hills Drive and Maxwell Place is 46 psi.

The needed fire flows used by Insurance Services Office (ISO) for one- and two-family dwellings not exceeding two stories in height is summarized in *Table 3.M-3* below.

Table 3.M-3: ISO Needed Fire Flow for Residential Dwellings

Distance Between Buildings	Needed Fire Flow (gpm)
More than 100'	500
31-100'	750
11-30'	1,000
10' or less	1,500

Using *Table 3.M-3* and the various separation distances between the buildings, the needed fire flow ranges were determined for the single family homes and townhomes. The needed fire flow range for the single family homes is 750 to 1,000 gpm and for the townhomes is 750 to 1,500 gpm. For design purposes, the needed fire flow for:

Single Family Homes = **1,000 gpm**.
Townhomes = **1,500 gpm**.

The needed fire flow for the club house was determined by using the ISO needed fire flow formula. The needed fire flow for the club house was determined to be **1,000 gpm**.

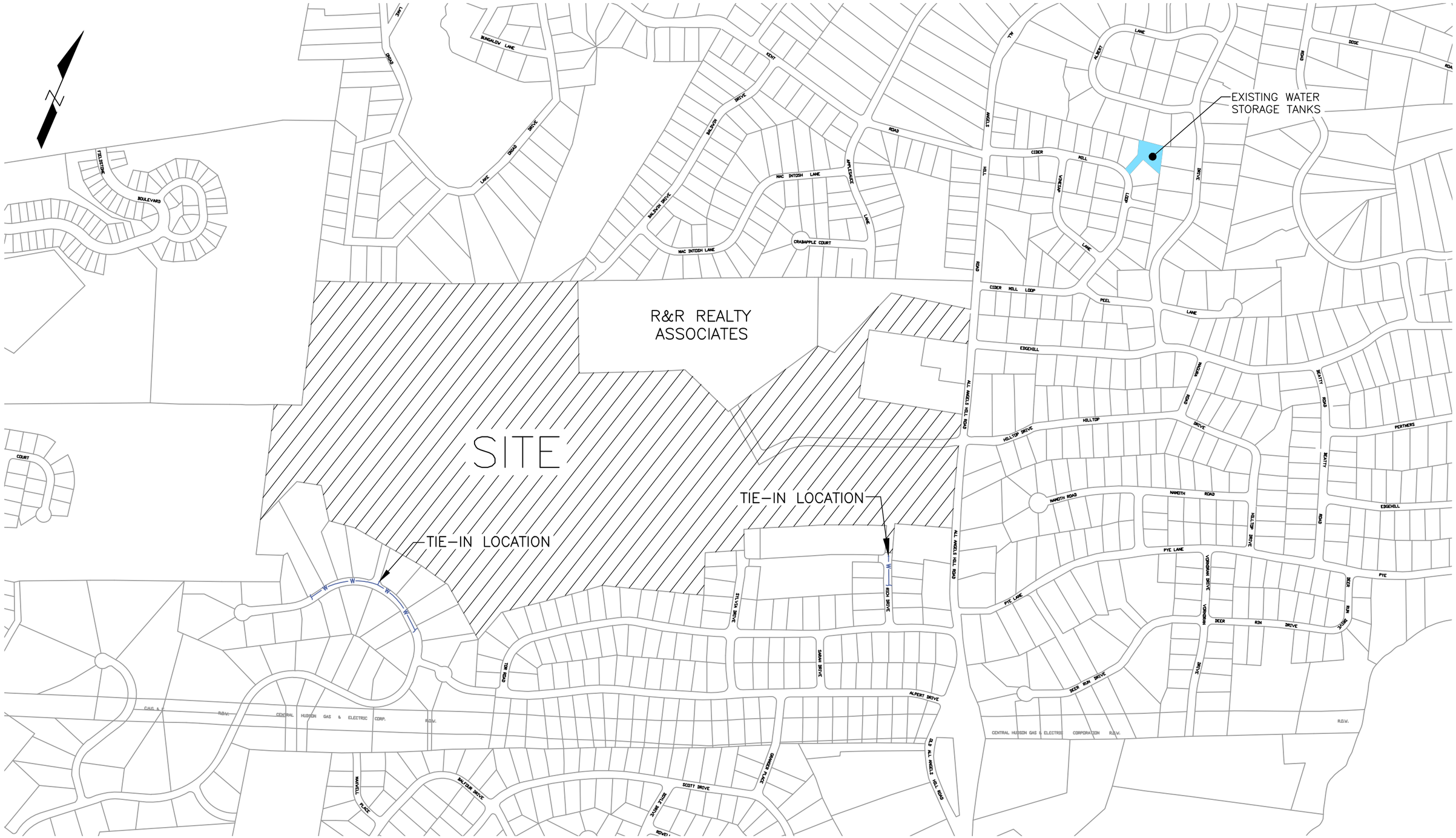
The proposed project is in the New Hackensack Fire District. Based upon a discussion with Rick Anderson of this facility, New Hackensack Fire District owns the following pieces of Fire Apparatus:

- Three Class A Pumpers which all have 1,500 gallons per minute (gpm) pumps and 1,000 gallons water tanks.
- One Water Tankers with 2,000 gallons of water and 350 gpm pumps on each.
- One Heavy Duty Rescue Truck.
- Two Utility Trucks with a 150 gallon water tank and a 150 pounds per square inch (psi) pump.
- Three four-wheel drive trucks.

Based upon a discussion with Rick Anderson, the New Hackensack Fire District would have no difficulty providing fire protection to the proposed development. In addition, hydrants will also be provided throughout the development for fire protection.

Distribution System Analysis

The proposed water distribution system "floats" off of the storage tank located off of Cider Mill Loop Road (see *Figure 3.M-6*) in the eastern portion of the Town of Wappinger. The static pressure for each of the units was analyzed when the water elevation within the storage tanks at the overflow level and at the normal minimum working level. Based upon the analysis the normal working pressure ranges from 35 to 67 psi. The anticipated minimum static pressure within the proposed development complies with the minimum recommended working pressure. Although typical plumbing and appurtenances are capable of accommodating 100 psi pressures, individual pressure reduction valves will be specified for all homes where pressure at the meter will be in excess of 80 psi. Refer to the Water Supply System Engineering Report in *Appendix C.6* for additional information.



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LEGEND

W W EXISTING WATER LINE

EXISTING WATER STORAGE TANKS

HILLTOP VILLAGE AT WAPPINGER

CIDER MILL LOOP ROAD
EXISTING WATER STORAGE TANKS

FIGURE 3.M-6

DATE: 02/2012

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SCALE: 1"=600'

Wetland and Stream Potential Impacts

There are two areas of wetland disturbance proposed. The first location is where the proposed Road "A" crosses the existing twin 30-inch corrugated metal pipe (CMP) culverts between ACOE jurisdictional wetlands F/G and H/J. The proposed disturbance to ACOE jurisdictional wetlands F/G and H/J is related to the road grading. The proposed water main is located within the roadway grading. There is approximately 8.5 feet of separation from the top of the replaced culverts to the bottom of the roadway pavement section to allow for the proposed utility construction. Therefore, there will not be any additional wetland disturbance or any stream dredging and/or disturbance as a result of the utility construction.

The final location is north of the southern property line where the emergency access road (Road "E") will connect to the adjacent Shamrock Hills subdivision. A portion of the emergency access road will disturb ACOE jurisdictional wetland B/E. Approximately 1,660 square feet (0.038± acres) of the 100 foot Town wetland buffer will be disturbed for the installation of the emergency access road, culvert, and associated grading. A portion of the proposed water main is located along the roadway; however, this disturbance has been already taken into consideration. Therefore, there will not be any additional wetland disturbance as a result of the utility construction.

Future Development Area Potential Impacts

The proposed building in the Future Development Area will require water service for both domestic and fire protection purposes. The anticipated water demand for a potential 3,000 square foot building was determined by using the unit flow rates in the New York State Department of Environmental Conservation (NYSDEC) *Design Standards for Wastewater Treatment Works*, 1988. The anticipated water demand was determined to be **240 gpd**. The proposed building will connect to the water main installed as part of the Proposed Action. There are no wetlands or streams located on the Future Development Parcel; therefore, there are no anticipated impacts to any wetlands or streams.

3.M.2.3 Gas, Telephone, and Electrical Supply

The Proposed Action will require gas, telephone, and electrical services, resulting in an increase in the demand for these services, as with all development. The existing utilities within the vicinity of the project will have to be extended in order to provide service to the Proposed Action. In addition, the some of the existing utility easements will be affected.

According to the September 2002 *New York State $mart^SM Low-Income Energy Affordable Program Evaluation and Status Report*, the average residential household electricity demand is 5,900 kwh per residence per year.[92] According to Dennis Van Wagenen of Central Hudson, the current average residential household electricity demand is approximately 6,107 kwh per residence per year. On average, it is therefore estimated that the Proposed Action will require approximately 1.4 million kwh of electricity per year. There are no anticipated impacts on available capacity as a result of the proposed Action.

[92] *New York State $mart^SM Low-Income Energy Affordable Program Evaluation and Status Report*, September 2002.

3.M.2.4 Solid Waste Management

The Proposed Action is anticipated to generate 450 residents, assuming two people per residential unit. The NYSDEC estimates that residential solid waste production is approximately 2.4 pounds per person per day.[93] On average, it is therefore estimated that the Proposed Action will generate a maximum of approximately 1,080 pounds of solid waste per day and 7,560 pounds (3.78 tons) per week, or approximately 197 tons of solid waste per year.

The proposed club house is 3,762 square feet. In order to calculate the estimated solid waste generated by this space, a median generation rate 1.2 pounds per day per person was used.[94] It is estimated that the Proposed Action will generate an additional 270 pounds of waste per day and 1,890 pounds (0.95 tons) per week, or approximately 49 tons of solid waste per year. Therefore, the Proposed Action would generate a total of approximately 4.73 tons of solid waste per week (246 tons per year).

It is anticipated that the residents of the Proposed Action will employ a private carrier, as Royal Carting, for solid waste disposal and recycling. They provide weekly pick-up for solid waste and recyclables. There are no anticipated impacts on the available capacity as a result of the Proposed Action.

3.M.3 Mitigation Measures

3.M.3.1 Sanitary Sewage

The Shamrock Hills existing pump station, with minor float modifications, has sufficient capacity to service the proposed 225 unit age restricted residential development. The Kendell Farms pump station will cycle more often as a result of the increased cycling of the Shamrock Hills pump station. The Orchard Drive/Ardmore Road collection system will be unaffected by the proposed 225 unit age restricted residential development. Therefore, no further mitigation measures are required.

3.M.3.2 Water Supply

The existing water system has sufficient capacity to service the 225 unit age restricted residential development. Based upon the analysis the normal working pressure ranges from 35 to 67 psi, which complies with the minimum recommended working pressure. Individual pressure reduction valves are not anticipated. Based upon a discussion with Rick Anderson, the New Hackensack Fire District would have no difficulty providing fire protection to the proposed development.

As part of the site plan approval process, an analysis of the existing water system will be performed to determine if any infrastructure upgrades will be necessary. Once the analysis has been completed, additional mitigation measures, if any, will be provided.

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[93] William R. Troutman Associates, *NYSDEC Comprehensive Solid Waste Study: Dutchess County. Final Report (CSWP-21)*
[94] As per NYSDEC estimate of 1.2 lbs of solid waste production per person per day.

3.M.3.3 Gas, Telephone, and Electrical Supply

Central Hudson Gas and Electric Corporation has adequate capacity to provide the Proposed Action with sufficient electric and natural gas service. There are telephone poles and lines along All Angels Hill Road that will be extended into the Proposed Action. All utilities (i.e., gas, telephone, and electric) will be placed underground. Amended easements and/or new easement will be established in coordination with the utility companies.

All dwelling units will be built in conformance with the energy conservation regulations of the New York State Energy Conservation Construction Codes.[95] Energy conservation measures that will be used include the following: 90+% Efficient Furnaces; 13 Seer Air Conditioning Condensors; Programmable Thermostats; Multiple Heating and Cooling Zones; Energy Star Qualified Water Heaters; Energy Star Qualified Appliances; High-Performance Low-E Windows; and Insulated Exterior Doors and Garage Doors.

Alternatives for heating individual dwelling units are liquefied petroleum, gas, or as appropriate, passive or active solar designs. Some dwellings may supplement heating requirements with wood, corn, coal, or pellet burning stoves depending on individual homeowner preferences.

3.M.3.4 Solid Waste Management

It is anticipated that the Homeowner's Association (HOA) will contract directly with private haulers for waste and recyclable pickup. Recycling is mandatory in Dutchess County and would be required within the Proposed Action. This will serve to reduce the amount of solid waste requiring disposal. These materials include paper, cardboard, glass, plastics, and metal. Leaf and grass clipping composting can also reduce the amount of solid waste generated.

[95] 9 NYCRR 7810-7816.