3.4 Water Resources

A drainage study was completed for the Gateway Summit and The Fairways proposals. For The Fairways, this study is based on the residential development site plan that is currently being reviewed. Stormwater runoff is collected from areas where the cover type has changed, particularly to impervious surfaces, and conveyed to a series of detention and water quality basins. The goal of this program is to meet the criteria of the New York State DEC GP-02-01 and the New York City Rules and Regulations. A total of 11 basins are proposed to meet this goal, as described in Appendix K.

For the Gateway Summit proposal, a study of existing and proposed stormwater drainage conditions has been prepared for the construction of the proposed subdivision road, as described below and in the Stormwater Management Plan and Stormwater Pollution Prevention Plan report (see Appendix L). Consideration is then given to potential buildout of the site based on the two alternative plans provided. A total of 30 stormwater detention and water quality basins are proposed to maintain pre-development rates of run-off from the site, and to ensure the maintenance of water quality. The drainage analysis concludes that with the proposed basins there would be no increase in the rates of off-site stormwater runoff resulting from the construction of the road. Water quality features have been incorporated into the project plans to minimize water quality impacts to on site receiving waters as well as downstream areas. The conceptual site plans included with this document for individual parcels also include stormwater management, and calculations for each conceptual plan are included as part of the Stormwater Pollution Prevention Plan in Appendix L.

3.4.1 Existing Surface Water Resources

3.4.1.1 Surface Water Drainage

There is one perennial stream located in the project area. It originates in DEC Wetland LC-26 (located north of the site), flows through Wetland LC-27 and discharges via the riparian corridor to two culverts under Route 6 at the southern property boundary (photo 9 in Appendix M). The stream ultimately discharges to a tributary of the Middle Branch Reservoir. This watercourse is classified by the DEC as a Class C watercourse. No Article 15 permit is required for the crossing of this brook.

In addition to the overflow from Wetlands LC-26 and LC-27, the local watershed includes portions of the Centennial Golf Club, the Kelly Ridge area, the eastern slopes of Mount Pisgah and the western slope of the hill in the southeast corner of the property.

As described in Section 3.2, Wetlands, there are two regulated wetlands on-site. Wetland LC-27, which is approximately 30 acres in size, makes up about one-third of The Fairways parcel. The majority of the wetland is submerged marsh as the result of a beaver dam at the south end of the wetland. Water depth averages from one to three feet. A town-regulated wetland, approximately 1.5 acres in size, was delineated on proposed Lot 8 of the Gateway Summit parcel.

No activities are proposed that would impact the site wetlands. The applicant proposes to cross the watercourse in order to access the rear portions of the property.

3.4.1.2 Existing Runoff Conditions, Various Storm Events

Stormwater in the project area is largely controlled by natural topography, soils and vegetation. Stormwater generally flows to the eastern boundary of the site and exits the site through the existing watercourse. The former Town Highway building site is served by a very basic drainage system. A pipe leads from the building and takes runoff from the building and the parking area to an outlet at the stream. Site drainage ultimately flows to the Middle Branch Reservoir, approximately 2,000 feet south of the project area. Existing conditions drainage maps have been developed for each of the sites, and are shown in Figures 3.4-1 and 3.4-2.

Methodology

A detailed analysis of pre-development and post-development drainage conditions was conducted by Putnam Engineering, P.L.L.C., and is provided in Appendices D and E, Stormwater Management Plan and Stormwater Pollution Prevention Plan. The drainage analysis software program used is based upon the Soil Conservation Service Technical Release 55 (SCS TR-55) "Urban Hydrology for Small Watersheds", methodology. The analysis included 2, 10, 25, and 100 year storm events. The analysis is basin specific and is based upon current and proposed land cover, soil types, weighted run-off coefficients, theoretical flow paths and rain events. The given parameters were then used in a computer model which developed hydrographs for pre- and post-development conditions.

For The Fairways project, which is on a slope that drains entirely from west to east, the design point is the location where the existing watercourse between Wetlands LC-26 and LC-27 connects with LC-27 in the northeast portion of the site (Figure 3.4-1). All runoff from this site flows through Wetland LC-27.

For the Gateway Summit proposal, which is on a slope that drains generally from northwest to southeast, the design points are located at the base of this slope (Figure 3.4-2). For Drainage Area 1, the design point is the outlet of the site watercourse into two culverts under Route 6. For Drainage Areas 2 and 3, the design point is located at the old railroad right-of-way at the base of Mount Pisgah. The stormwater analysis (Appendix L) examines the potential impacts of the road construction, as well as several different scenarios for build-out of the property with commercial and senior residence buildings. The drainage for all of the proposed parcels is calculated on a lot-by-lot basis as part of the site planning for each parcel. Each individual parcel is required to have its own stormwater management. The site plans provided include stormwater management facilities as required for each proposal, and represent real site plan options for development of these individual parcels.

On-site stormwater drainage is contributed to by three subdrainage areas, all of which include areas that are primarily on-site. The total area of the entire drainage basin is approximately 130.58 acres.

Using the above described methodology, peak flow volumes were developed for existing conditions and various storm events and are summarized in Table 3.4-1.

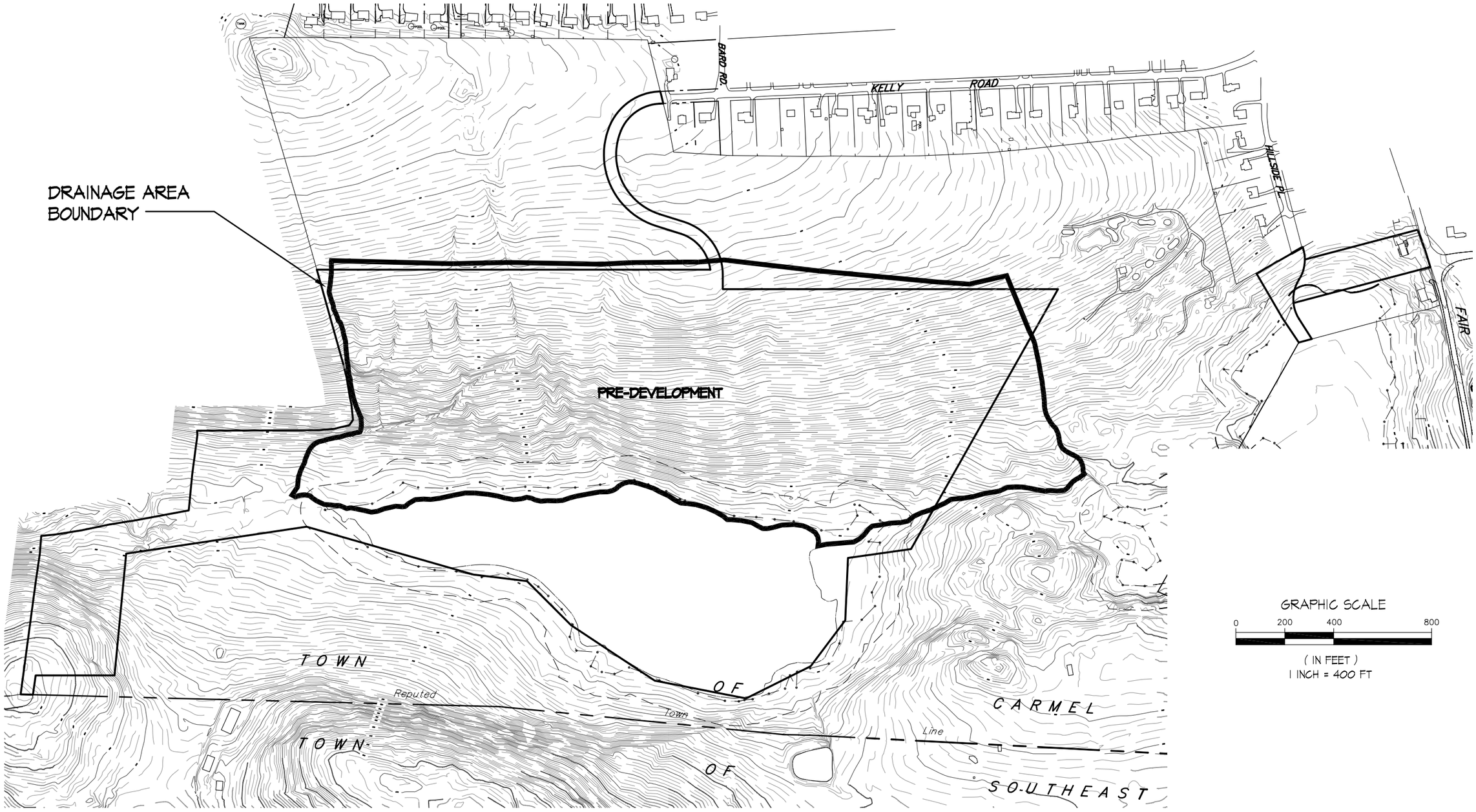
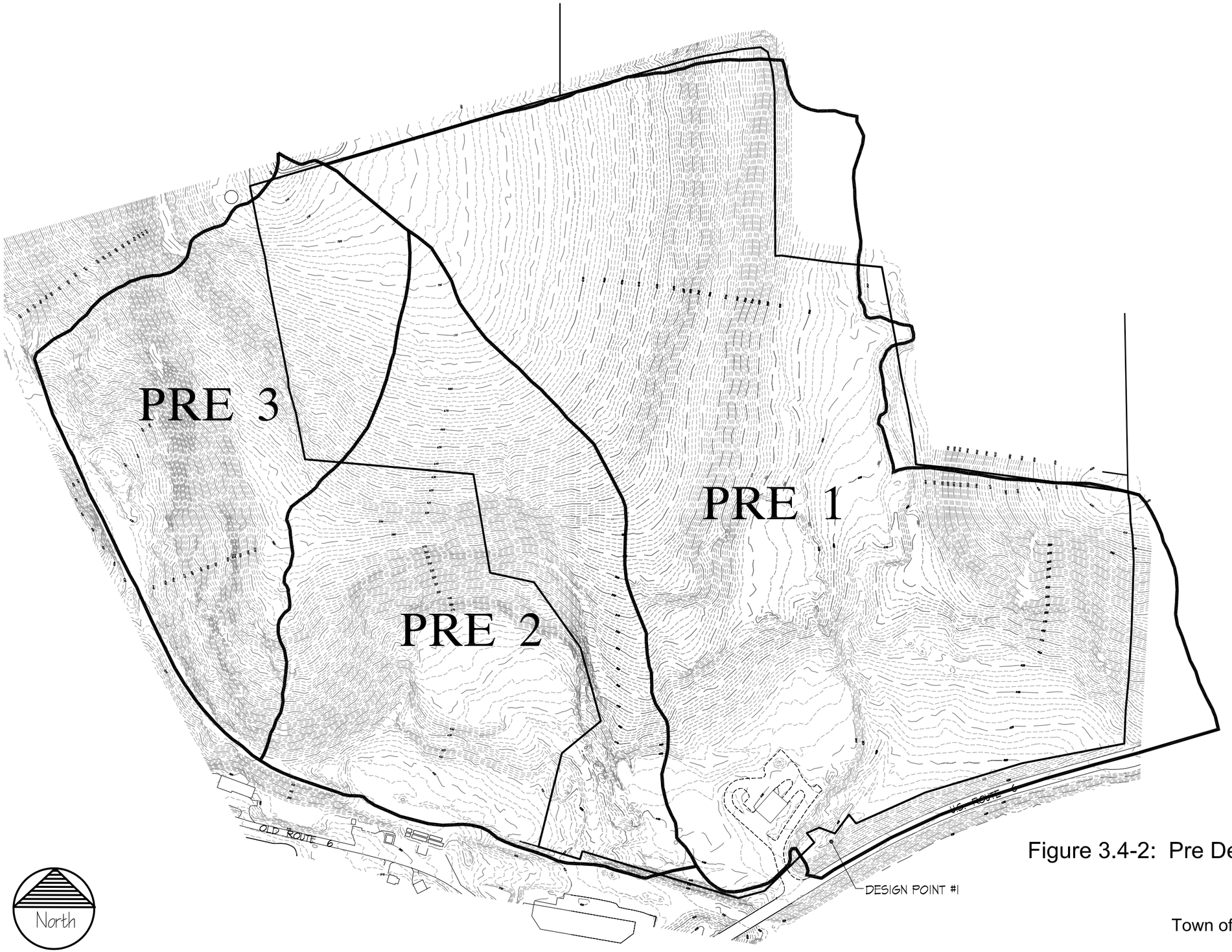


Figure 3.4-1: Pre Development Drainage Areas - The Fairways

Gateway Summit/The Fairways
Town of Carmel, Putnam County, New York
Source: Putnam Engineering, PLLC
Scale: 1 inch = 300 feet

File: 02136 Fig 3.4-1 03/16/04



GRAPHIC SCALE
0 150 300 600
(IN FEET)
1 INCH = 300 FT

North

Figure 3.4-2: Pre Development Drainage Areas - Gateway Summit

Gateway Summit/The Fairways
Town of Carmel, Putnam County, New York
Source: Putnam Engineering, PLLC
Scale: 1 inch = 300 feet

File: 02136 Fig 3.4-2 03/16/04

Table 3.4-1 Design Point Discharges - Existing Conditions				
Design Point	2 Year Storm Flow	10 Year Storm Flow	25 Year Storm Flow	100 Year Storm Flow
Fairways @ LC-27	31	73	105	156
Gateway Summit @ DP#1	43	90	125	181
Gateway Summit @ DP#2	9	27	41	65
Gateway Summit @ DP#3	10	26	37	43
Storm Flows given in cfs (cubic feet per second) *Source: Putnam Engineering, P.L.L.C.*				

3.4.1.3 NYCDEP Watercourses

In addition to the perennial stream located on the project site described above, other site watercourses as flagged by the New York City Department of Environmental Preservation (NYCDEP) are regulated under Section 18-39 of the Watershed Rules and Regulations. Under these regulations, construction of impervious surfaces for roads or driveway accesses within 100 feet of a perennial stream or 50 feet of an intermittent watercourse is prohibited. During the months of October and November 2004, approximately twelve site visits to the Gateway Summit and Fairways properties were conducted by NYCDEP personnel. Extensive soil testing was completed and NYCDEP identified and flagged regulated watercourses on both properties. All watercourse locations were surveyed and survey maps were submitted to NYCDEP for verification. The applicant received signed confirmation on December 22, 2004, by NYCDEP of the watercourse plans for both Gateway Summit and The Fairways.

In addition to the perennial stream, watercourses on the Gateway Summit parcel that meet these criteria are located within the delineated Town wetland on proposed Lots 7 and 8, as shown on Figure 3.4-2a. On The Fairways site, these watercourses are centrally located on the parcel and drain to the NYSDEC wetland at the base of the slope (Figure 3.4-2b).

3.4.1.4 Existing Surface Water Quality

The watercourse which flows through the site is not designated on the New York State Department of Environmental Conservation (NYS DEC) surface water quality maps (6 NYCRR Part 864). Thus it is designated as Class D by the NYS DEC. According to the NYS DEC, tributaries of the Middle Branch Reservoir in the vicinity of the project area have a water quality classification of “C”. Pursuant to this designation, no State permits would be required to cross the watercourse as proposed.

3.4.2 Future Surface Water Conditions / Drainage Analysis

3.4.2.1 Future Run-off Conditions

The Fairways

A site specific drainage analysis of the proposed Fairways project was conducted using the following parameters. The proposal is for the construction of 150 residences (Figure 3.4-3).

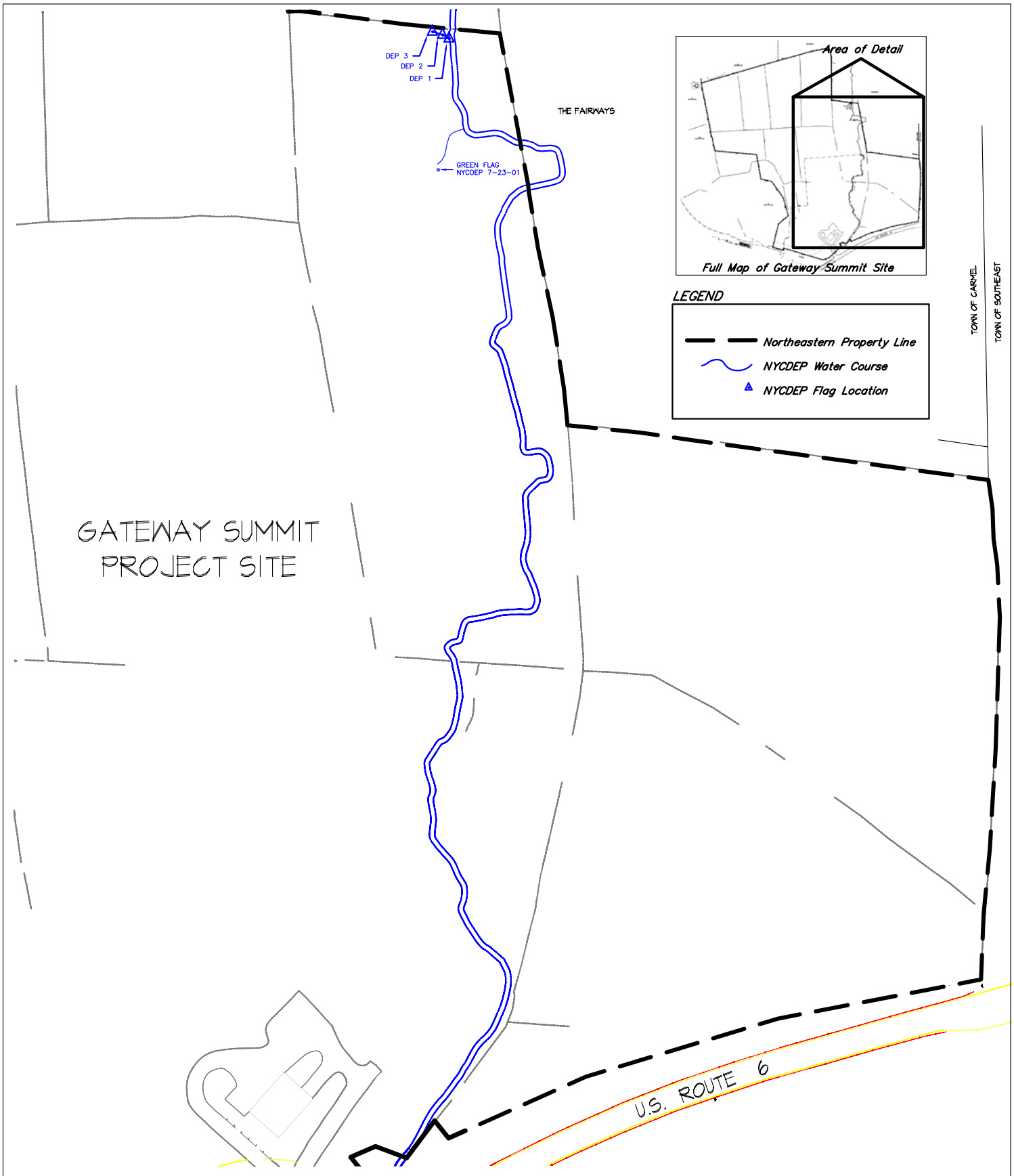


Figure 3.4-2a: Location of NYCDEP Watercourses
Gateway Summit
Town of Carmel, Putnam County, New York
Source: Putnam Engineering PLLC, 12/04
Scale: 1 inch = 200 feet

File: 02136 12/21/04
JS:\02136\12-20-04\watercourse\Fig 3.4-2a NYSDEP Watercourses.dwg

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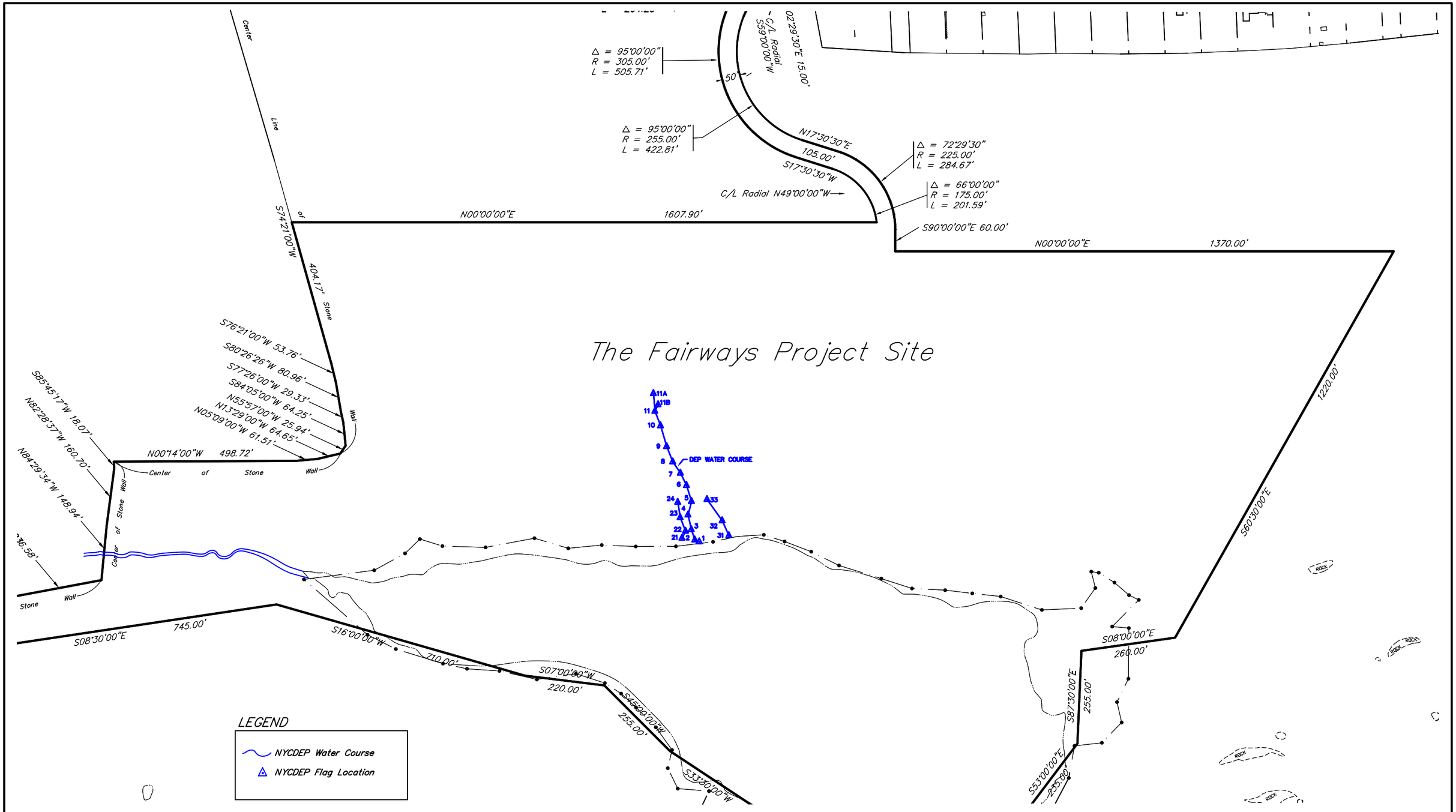

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JS:\02136\12-20-04\Fairways Watercourses\Fig 3.4-2b Location of NYSDEP Watercourses.dwg

Figure 3.4-2b: Location of NYCDEP Watercourses

The Fairways
Town of Carmel, Putnam County, New York
Source: Putnam Engineering PLLC, 12/04
Scale: 1 inch = 250 feet

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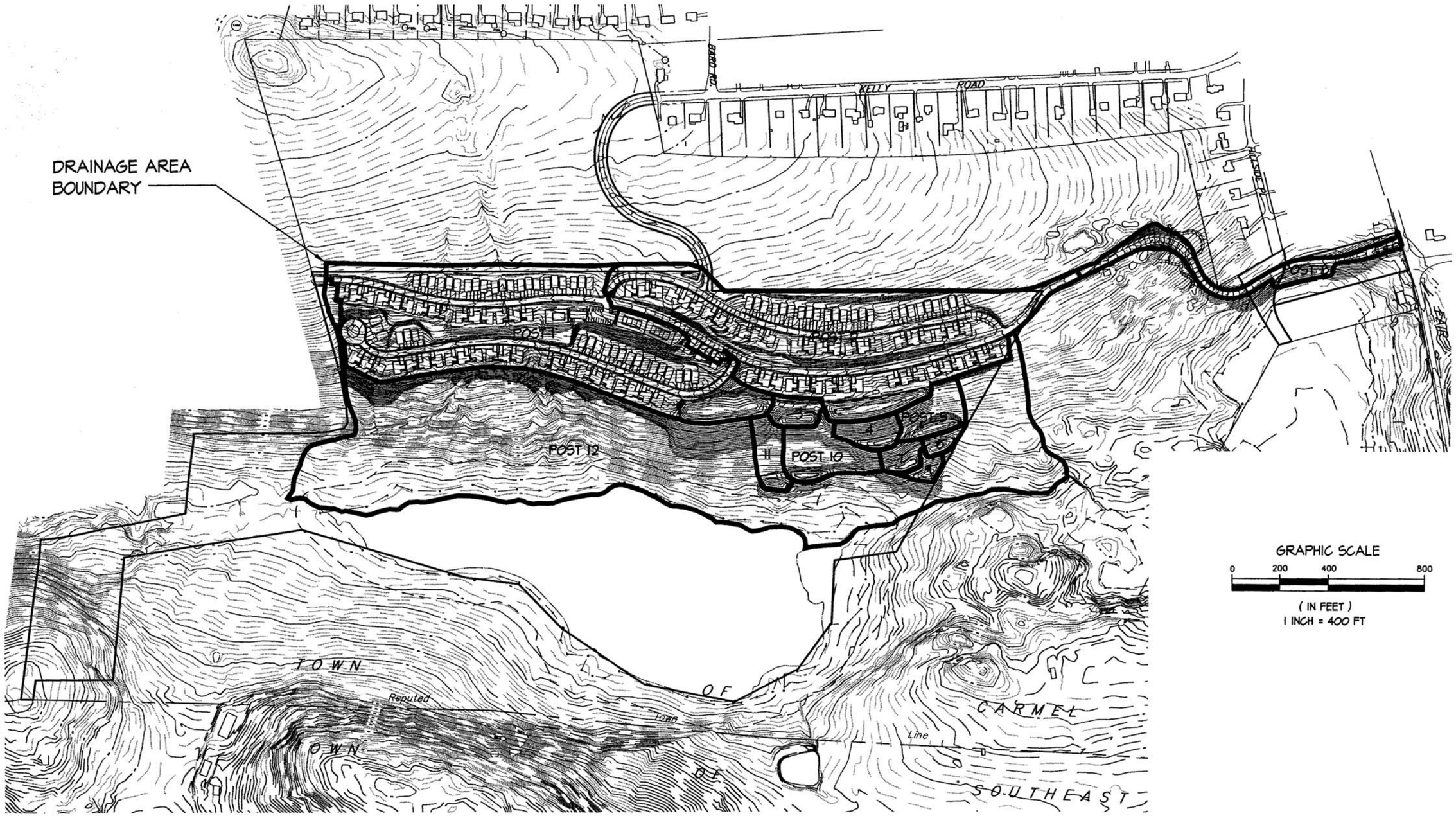

File 02136 Fig 3.4-1 03/16/04

Figure 3.4-3 Post Development Drainage Areas
- The Fairways
Gateway Summit/The Fairways
Town of Carmel, Putnam County, New York
Source: Putnam Engineering
Scale: 1 inch - 300 feet

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These residences are attached in groups of three units, each with its own driveway. The development will also include a clubhouse, pool, tennis courts and additional parking to accommodate 14 vehicles. Access is off Fair Street, with an emergency only access to Kelly Ridge Road; a total of 8,320 linear feet of road will be constructed.

The change in site cover characteristics on 41 acres of this 100.2 acre parcel from second growth woodlands to developed landscape and impervious surfaces will result in an increase in runoff rate and volume from the site to the design point. If not mitigated, this increase could impact stream characteristics, wetland hydrology and water quality in downstream receiving waters. In conformance with the New York City Rules and Regulations and NYSDEC GP-02-01, the applicant has prepared a stormwater management and pollution prevention plan, as described below.

Centennial Golf Course Drainage Redirection

The United States Bankruptcy Court, Southern District of New York, entered a stipulation dated April 2001 in which it ordered the engineering and installation of an enhanced drainage system on the Centennial Golf Course property. This system will correct a pre-existing condition in which water drainage from retention basin overflow pipe outlets onto Lot 1, the Trustee's property. The drainage system will be enhanced by tying together the outlets of existing drainage locations and piping the discharge. Pipes will be extended from the golf course through Lot 1 property via an easement agreement. Both the NYCDEP and the NYSDEC were consulted conceptually regarding this drainage enhancement prior to an agreement being finalized. As part of the approval process, the applicant will be submitting specific engineering plans for this pipe installation to the Town of Carmel, NYCDEP, and NYSDEC. Figure 3.4-4 shows the location of the proposed system.

Gateway Summit

Construction and use of the proposed subdivision road is not expected to substantially alter the water quantity or quality of the existing surface water flow at the site. Following construction, surface water running off of the areas where perviousness has changed will be diverted to the proposed storm drain system in the subdivision road, then enter a series of water quality and detention basins prior to discharge to the watercourse flowing under Route 6. The associated basins for both segments of the road have been designed to capture and treat the 2-year, 24-hour storm, as required by the New York City Regulations. The Middle Branch Reservoir is considered by DEP to be phosphorus restricted, thus first flush treatment must accommodate the 2-year storm. A total of 11 basins are proposed to capture and treat runoff from the road.

Included with the analysis are a number of scenarios for future development of the individual parcels. Final design of the stormwater pollution prevention plan for the subdivision and future individual site plans are subject to New York City DEP review and approval. It is the applicant's opinion that the stormwater management for the subdivision road, and for the individual conceptual site plans as described in Appendix L, meet the DEP's criteria for stormwater quantity and quality management. The post-development plan showing the most likely use of the individual parcels is presented as Figure 3.4-5. A total of 30 basins are provided to capture and treat the stormwater runoff from the most likely building scenario.

It is proposed to cross the existing watercourse on-site in order to provide access to the rear of the parcel. The stream will enter a box culvert at the northern side of the road at the property

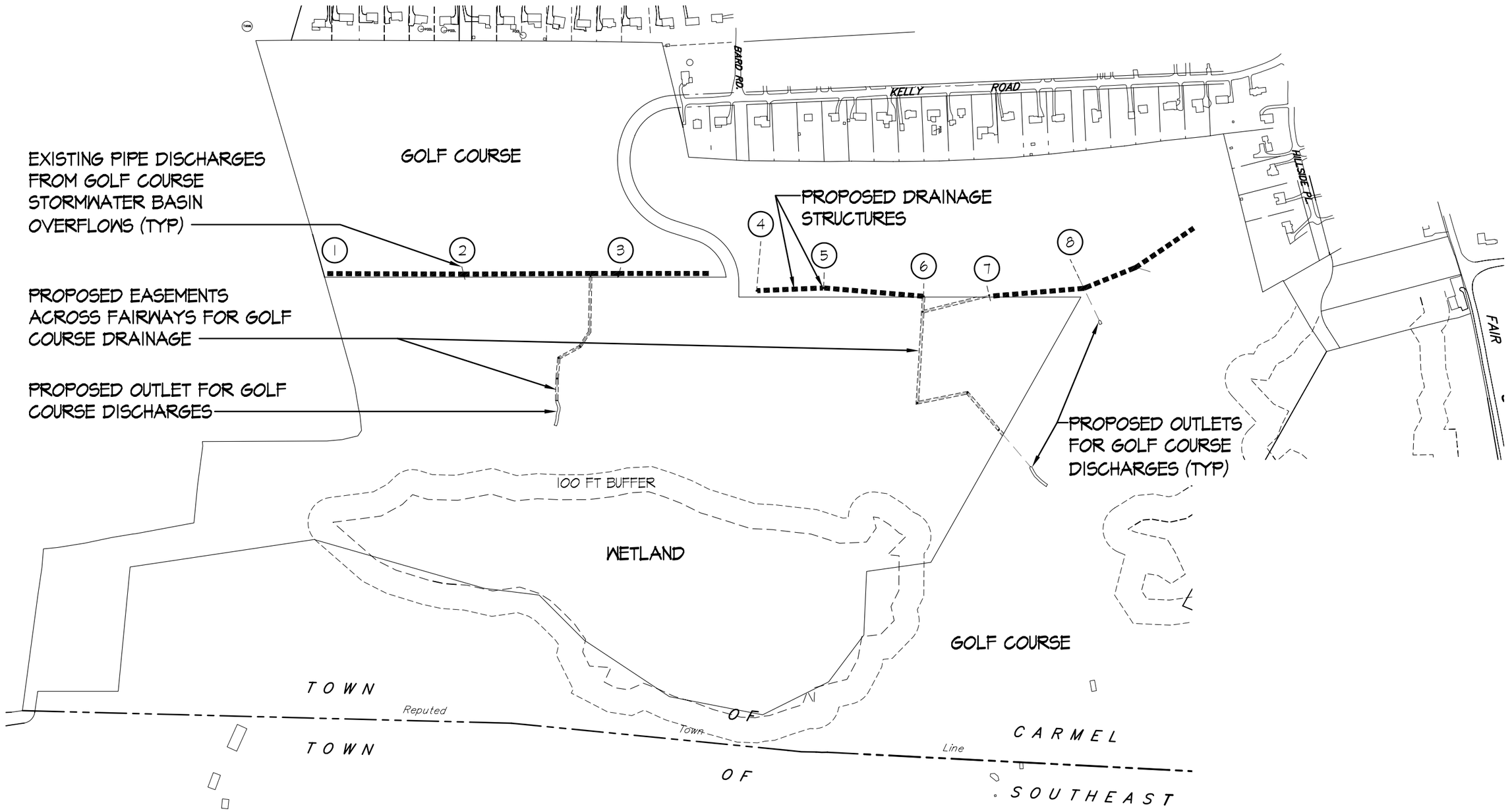

Figure 3.4-4: Drainage Diversion Plan -The Fairways

Gateway Summit/The Fairways

Town of Carmel, Putnam County, New York

Source: Putnam Engineering, P.L.L.C.-Revised 09/29/2004

Scale: 1 inch = 400 feet

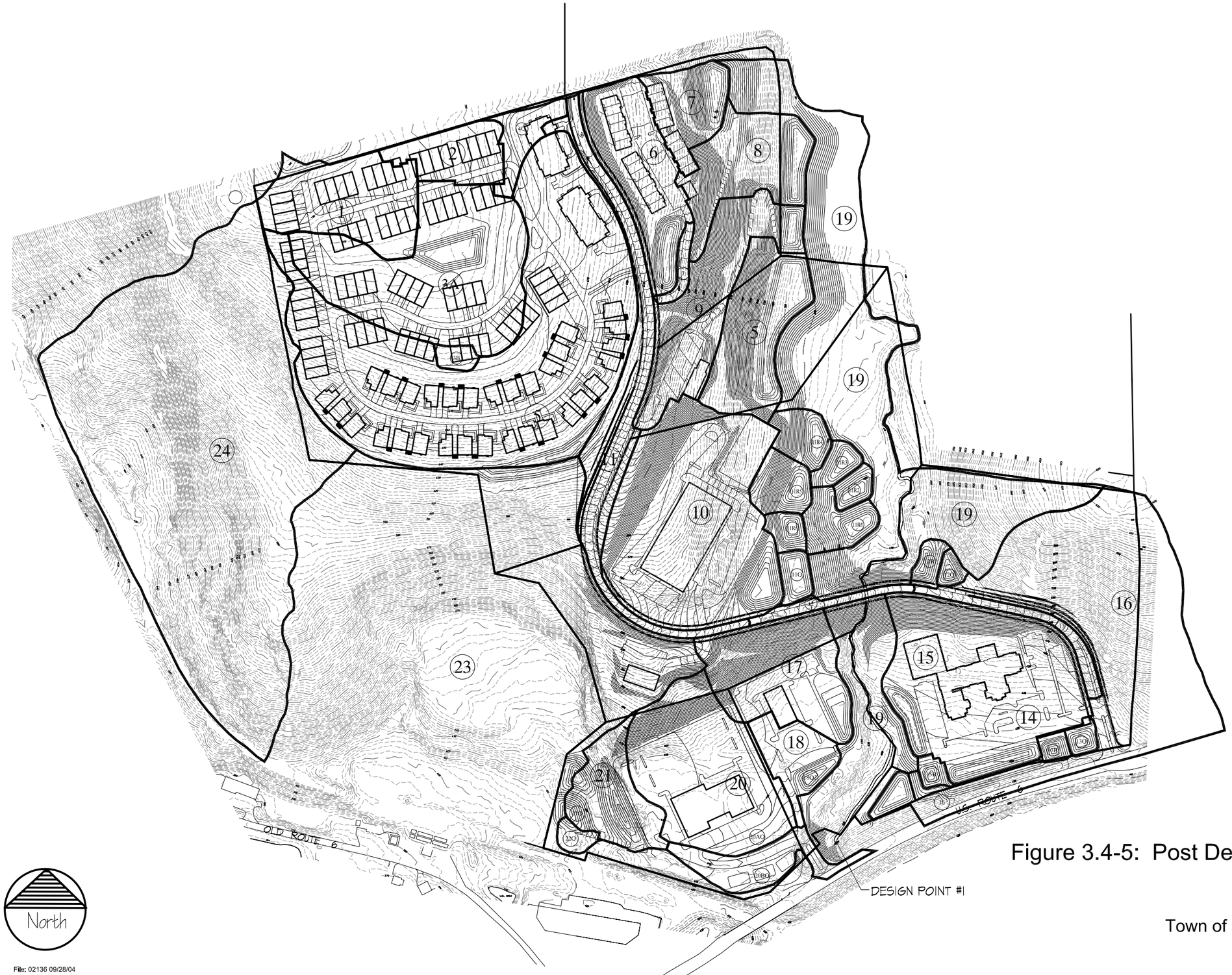

Figure 3.4-5: Post Development Drainage Areas - Gateway Summit

Gateway Summit/The Fairways

Town of Carmel, Putnam County, New York

Source: Putnam Engineering, PLLC

Scale: 1 inch = 300 feet

File: 02136 09/28/04

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line of Parcels 8 and 9, and discharge between Parcels 1 and 2. It would then return to its original channel to the existing pipes under Route 6. This crossing will require approval from the Town of Carmel for buffer encroachments and piping of the stream. It is likely that this crossing will also require approval from the Army Corps of Engineers.

3.4.2.2 Drainage Analysis

Since these two sites would be altered from existing conditions with the addition of pavement, vegetation clearing and stormwater structures, stormwater drainage would also be altered. The total project area, when combined between the Gateway Summit property and The Fairways projects, totals more than 188 acres. It is expected that approximately 103.6 acres would be disturbed at full build out for the two projects. The applicant has prepared stormwater management and pollution prevention plans to mitigate the potential impacts of changes to the cover characteristics and the potential increase in pollutant loadings that may result from the increase of impervious surfaces on the site.

Following construction, drainage patterns and runoff rates will be changed to the identified design points. Post-development drainage would generally flow in the same direction as existing drainage patterns, toward the Route 6 culverts at the Gateway Summit and to Wetland LC-27 on The Fairways. Detention of stormwater would ensure that pre-development stormwater quality and flow rates would be maintained. As shown on Figure 3.4-5, a total of 12 basins are proposed to capture and treat stormwater runoff from the subdivision road at the Gateway and meet the requirements of the New York City DEP.

For the purpose of this DGEIS, the applicant analyzed a "maximum" build out scenario for the Gateway Summit (Figure 3.4-5). Following build-out of the site, runoff will be directed to 30 water quality and detention ponds dispersed throughout the site. The Fairways project will be directed to 11 ponds for capture and treatment prior to discharge to the State wetland.

Post-development flow rates have been determined for a variety of storm events and compared to pre-development rates, as indicated in the table below.

Table 3.4-2
Design Point Discharges - Existing vs. Proposed Conditions

Design Point	2 Year Storm Flow (Existing/ Proposed)	10 Year Storm Flow (Existing/ Proposed)	25 Year Storm Flow (Existing/ Proposed)	100 Year Storm Flow (Existing/ Proposed)
Fairways @ LC-27	31/14	73/38	105/54	156/101
Gateway Summit @ DP#1	43/14	90/34	125/88	181/191
Gateway Summit @ DP#2	9/9	27/24	41/35	65/54
Gateway Summit @ DP#3	10/7	26/19	37/28	57/43

Storm Flows given in cfs (cubic feet per second)
Source: Putnam Engineering, P.L.L.C.

As indicated by the table, there would be a net decrease in the rate of stormwater run-off for all storm events at the study point after construction of the development with the exception of the 100 year storm at Design Point 1. Volumes, however, would increase slightly, due to the addition of impervious surfaces and soils disturbance. The program would moderate flows to

the drainage system under Route 6, and provide runoff to the Middle Branch reservoir at a reduced rate but over a longer period of time. This would allow for more time for treatment of pollutant loading before discharge to the tributary, and provide extended periods of baseflow during dry periods.

For the purposes of this DGEIS, additional alternative site configurations were analyzed as described in Section 4.0 Alternatives. Water quality and quantity impacts associated with these alternatives are expected to be similar in scale to the proposed action, and can be mitigated by using similar BMP's and low impact development techniques as described below.

3.4.2.3 Future Wetland Conditions

No wetlands are proposed to be filled or disturbed for the project, with the exception of the stream crossing for the road at the Gateway. A proposed pedestrian bridge will span the water-course between Lots 1 and 2, and will require minor temporary disturbance of the stream buffer for the installation of pilings to support the bridge. All activities on The Fairways parcel will be a minimum of 100 feet from delineated wetland areas except for a portion of the site access road off Fair Street, which is within 100 feet of Wetland LC-26. This encroachment also includes the construction of a stormwater management basin to capture runoff from this section of the road.

Construction and grading of water quality basins on the Gateway Summit parcel are within 100 feet of the Town-regulated wetland. This encroachment is unavoidable due to the slopes of the area and the volume requirements that must be met to satisfy the DEP's water quality criteria. Existing wetland functions would not be adversely impacted by the project.

3.4.2.4 Future Surface Water Quality

Adding pavement and impervious surfaces to the project area has the potential to increase pollutant contributions to local water resources, such as sand, silt, salts, oil and grease. The addition of pavement and stormwater collection systems also has the potential to increase the rate of stormwater flow from the site. These potential impacts are being avoided or mitigated by structural stormwater controls and Best Management Practices, which are discussed in further detail below.

The applicant proposes use of a variety of construction and maintenance techniques reflecting the latest best practices in order to limit impacts of stormwater runoff. No fertilizers containing phosphorous would be utilized in order to limit pollutants from the project to the maximum extent possible. Use of rain barrels and rain gardens around senior buildings are proposed to remove pollutants and attenuate stormwater runoff, including treating stormwater from roof gutters. Rain gardens may include bioretention elements such as grass buffer strips, sand beds, ponding areas, planting soils and vegetative plantings to remove pollutants and reduce runoff velocity. Additionally, as described above, use of pervious pavers for driveways and parking areas are proposed to reduce the amount of runoff from these areas.

The result of these combined measures would be a more sensitive development related to natural resources and groundwater protection. The proposed stormwater management system has been designed to accommodate runoff from development utilizing a conventional stormwa-ter management approach and therefore represents a conservatively sized system for treating the amount of runoff that would result from the proposed project design, which will incorporate Low Impact Development (LID) measures. Use of LID techniques such as pervious pavers and

reduced disturbance areas would result in lower amounts of runoff and smaller required detention areas. With the use of these measures, there would be potential for redesigning proposed detention basins to further minimize areas of disturbance. For both the Gateway Summit and The Fairways projects, interior roads accessing proposed lots (not the main subdivision road) are proposed to be only 18 feet wide, and would be designed without curbs, where possible, to allow stormwater to deconcentrate.

A total of 314 parking spaces are proposed for The Fairways project consisting of 150 two-car garages and 14 off-street parking spaces. As described above, driveways and off-street parking areas would be paved with pervious pavers to limit the effects of stormwater runoff. This provides an average of approximately 2.1 spaces per dwelling unit, and affords an additional level of environmental protection consistent with the latest Best Management Practices and recommendations of the Town of Carmel Comprehensive Plan. Once grading and site plans are finalized and approved by the Town of Carmel, the applicant will submit a Notice of Intent (NOI) to the New York State Department of Environmental Conservation for a SPDES General Permit for Stormwater Discharges from Construction Activities. The applicant will then continue the process of applying for DEP approval of the Stormwater Pollution Prevention Plan. Final design of the stormwater pollution prevention plan for the subdivision and future individual site plans are subject to New York City DEP review and approval.

According to NYCDEP definitions, the first flush within a phosphorus restricted basin is defined as the amount of runoff generated by a two-year, 24 hour storm for all areas where the perviousness has changed due to site activities. First flush capture results in the settlement of suspended solids and moderation of water temperature, thus improving the quality of stormwater exiting the site.

Phosphorus from fertilizer runs off lawns via stormwater and can enter surface waters and ground water, both of which can reach lakes. Using phosphorus-free lawn fertilizers is one step that can be taken to protect water quality. The project sponsor therefore proposes that fertilizers used at Gateway Summit and The Fairways will be phosphorus-free. Practices to minimize the amounts of salt applied to roads during winter months will also be employed.

In addition, sumps would be provided on all stormwater catch basins throughout the development. These sumps are designed to trap sand, grit and a portion of suspended solids contained in stormwater from paved areas of the site.

The stormwater drainage structures associated with the road will become the responsibility of the Town following the proposed dedication of the new Town road. The long-term maintenance of drainage structures on the individual lots would become the responsibility of the future owner/project manager, and would include annual inspections to ensure proper operation and good equipment condition. In addition, periodic removal of accumulated sediment in catch basins pipes and in first flush and detention basins would be necessary.

The individual site plans for the Gateway Summit project included with this EIS incorporate stormwater management plans designed to meet the criteria of the General Permit and the DEP regulations. Each plan shows provision of stormwater quality and quantity basins. Calculations for the sizing of the basins for each conceptual plan are provided in Appendix L.

3.4.2.5 Pollutant Loading Analysis

In conformance with the New York State General Permit for Stormwater Discharges, and the New York City Watershed Rules and Regulations, the applicant has prepared a stormwater pollutant analysis based on the Coefficient Method, loading rates taken from DEC's "Reduning the Impacts of Stormwater Runoff from New Development", along with values suggested by the Terrene Institute (1994). Final design of the stormwater pollution prevention plan for the subdivision and individual site plans are subject to New York City DEP review and approval. The analysis considered the existing pollutant loading from an undeveloped tract of northeast woodlands, compared to the post construction condition. The results of this analysis are tabulated in Appendices K and L, Stormwater Pollution Prevention Plan, and in Table 3.4-3 below.

Table 3.4-3
Pollutant Loading Comparisons at Design Points - Existing vs. Proposed Conditions

Design Point	Total Phosphorus	Total Nitrogen	BOD	TSS
Fairways @ LC-27				
Pre-development (lb/yr)	6.2	150.1	374.2	8,106.8
Post-development (lb/yr)	5.9	108.7	364.2	5,015.2
Net change (lb/yr)	-0.3	-42.4	-10	-3,091.6
Gateway Summit @ DP#1				
Pre-development (lb/yr)	12.1	207.1	901.1	14,218.2
Post-development (lb/yr)	14.3	211.8	1,215	5,393.1
Net change (lb/yr)	2.2	4.7	313.9	-8,825.1
Gateway Summit @ DP#2				
Pre-development (lb/yr)	3.4	80.5	201.3	4,361.5
Post-development (lb/yr)	3.1	73.8	301.5	3,223.7
Net change (lb/yr)	-0.2	-6.7	100.2	-1,137.8
Gateway Summit @ DP#3				
Pre-development (lb/yr)	2.5	60.2	150.4	3,529.1
Post-development (lb/yr)	1.9	46.7	123.5	2,480.4
Net change (lb/yr)	-0.6	-13.5	-27	-1,048.7

Source: Putnam Engineering, P.L.L.C.

The pollutant loading calculations do not take into account additional stormwater adjuncts that can be used to improve the stormwater efficiencies attributed to the water quality basins. Post-development pollutant loadings were calculated using pollutant removal factors attributed to Designs 1 and 3, identified on Page 2.13 of “Controlling Urban Runoff,” published by the Metropolitan Washington Council of Governments in 1987. The removal rates for the pollutants of concern are as follows:

Table 3.4-4 Pollutant Removal Rates for BMP's		
Design 1		
Pollutant	Percent Removal	NYCDEP Accepted Removal
Total Phosphorus	20-40%	20%
Total Nitrogen	20-40%	20%
Biological Oxygen Demand (BOD)	20-40%	20%
Total Suspended Solids (TSS)	60-80%	60%
Design 3		
Pollutant	Percent Removal	NYCDEP Accepted Removal
Total Phoshorus	60-80%	60%
Total Nitrogen	40-60%	40%
Biological Oxygen Demand (BOD)	40-60%	40%
Total Suspended Solids (TSS)	80-100%	80%
Source: Controlling Urban Runoff, Metropolitan Washington Council of Governments, 1987		

3.4.2.6 Construction Stormwater Management

Stormwater drainage from the site during construction will be strictly managed to avoid any off-site impacts. A Stormwater Pollution Prevention Plan has been developed for the site and is included in Appendices K and L. The Plan includes a site specific erosion and sediment control plan (See Sheets C-103 and C-1200). A key aspect in the maintenance of stormwater quality and the control of soil erosion is the proper sequencing of construction. The proposed road will be constructed in approximately three phases, with no more than five acres of the site remaining unstabilized at any time. All structural sediment and erosion control features will be installed prior to grading and earthwork. A construction sequencing plan is discussed in the Stormwater Pollution Prevention Plan.

Structural sediment and erosion control features include: the construction of temporary swales, earthen dikes and sedimentation basins. These features are shown on the Erosion Control Plan Drawings, Sheets C-103 and C-1200, provided at the rear of this document. The permanent stormwater detention basin will also be utilized to ensure the maintenance of water quality exiting the site. At the conclusion of construction, the temporary sedimentation basin will be cleaned and all sediment properly disposed of. Further discussion of construction sediment controls is found in the Stormwater Management Plan.

3.4.2.7 Aquifer Recharge

There are no current proposals for use of groundwater resources for either potable or irrigation water supply. All water will be provided by connection to the Town of Carmel municipal system. However, the Planning Board has requested an analysis of groundwater recharge conditions on this site as part of the scoping for the DGEIS.

The primary source of groundwater is precipitation which infiltrates through the surface of the ground and percolates into the water table. The majority of rainfall is "lost" to surface water runoff and evapotranspiration. Depending on the physical characteristics of the recharge area, between 15 and 40 percent of the annual precipitation can recharge the aquifer.

Evaluation of groundwater recharge with respect to a specific project or land use is usually done by evaluation of projected water demand and the ability of the local watershed to recharge the aquifer. Generally, the groundwater table in an unconfined aquifer will loosely follow the surface topography of the land. Groundwater would be expected to flow from drainage boundaries, such as ridges, toward points topographically lower in the watershed. Groundwater in storage and recharge "collected" within the natural drainage basin area would be available to replenish or recharge the aquifer. Due in part to the anisotropic (irregular) nature of the bedrock aquifer, however, only a portion of total basin recharge could transmit water to any given pumping area. The rate of aquifer recharge would also depend on other specific hydrogeological conditions present at each location. For example, heavily faulted and fractured bedrock zones are capable of transmitting larger quantities of water to recharge the bedrock aquifer than are less fractured zones.

The Gateway Summit and Fairways properties are part of a ridge and valley system that is surrounded by an extensive system of faults and fractures. The major fractures, if tapped successfully, will potentially pick up recharge from a large area of eastern/central Putnam County. The faults and fractures which form the valleys surrounding these properties extend for miles and intercept additional fractures well beyond the property. Since precipitation falling anywhere within this area naturally drains towards the valleys from the highlands, the typical 40 percent of precipitation that becomes groundwater through recharge is potentially available to wells tapping these interconnected fractures. The table below provides an estimate of the amount of water available for recharge for only the Gateway Summit and The Fairways parcels.

Table 3.4-4
Recharge Calculations

Acres	188
Square Feet	8,189,280
Rainfall (annual, in inches)	44
Rainfall (feet)	3.6
Cubic feet of precipitation per year	29,481,408
Gallons of precipitation per year	220,520,932
Amount lost to evapotranspiration and runoff (60%)	132,312,559
Amount, in gallons, available for recharge per year	88,208,373
Amount, in gallons, available for recharge per day	241,666
Amount, in gallons, available for recharge per minute	167.8

The primary limitation to the availability of all of the water in the system of fractures is the resistance to flow within the fractures. Since the bedrock fractures form planar channels which contain groundwater, groundwater can be drawn from considerable distances. However, the width of the fractures can vary considerably, ranging from several feet to places where the fracture walls are in contact with each other, limiting groundwater flow. Additionally, rock type variability can cause portions of the fracture to fill with clay-like materials which can further limit the groundwater transmissivity of the fracture. Groundwater moves from high water levels to low water levels. Therefore, this quantitative analysis of the recharge potential for the Gateway and Fairways parcels is only an estimate, since the recharge area for the property must take into account an area that is considerably larger than the local watershed itself.

Using a typical recharge rate of 40 percent (the percentage of precipitation available to recharge groundwater) results in about 0.8 gallons of recharge per minute per acre available at the site. Since the area recharged and contributory to the system of fractures near the property appears to cover thousands of acres, thousands of gallons per minute are potentially available to wells tapping the fractures in the vicinity of the Gateway Summit and Fairways properties.

It is noted that all surrounding water users in the area are connected to the Carmel municipal water system. No nearby uses depend on groundwater for potable or other water.

3.4.3 Future Groundwater Conditions

There are no plans to use groundwater at this site. Water will be delivered from the Town of Carmel's municipal system. The potential use of this resource by future owners of the individual lots will be disclosed and reviewed during the individual site plan reviews. It is recognized that there will be some reduction in overall groundwater recharge from the immediate site following full build out, due to the increased area of impervious surface. It is expected that this will be mitigated to some extent by the storage and infiltration within the proposed water quality and detention basins. As noted above, all surrounding properties are also connected to the municipal water system, so no impacts to groundwater use for this or adjacent properties is anticipated.

The New York City Watershed Regulations include restrictions and prohibitions for the storage and use of toxic or noxious materials within the watershed, and particularly within regulated setbacks to wetlands and watercourses. Sections 18-31 through 18-34 of the Watershed Regulations identify prohibitions or restrictions for the discharge or storage of hazardous or pathogenic materials, radioactive materials, hazardous waste and petroleum products. New York State and Federal regulations would also apply to the future storage or discharge of these materials on this property. It is not proposed to use or store any such materials relative to this specific application. The specific uses currently envisioned for this property include office space, light industrial, senior housing, retail, warehouse, and restaurant. Future requirements of individual lot owners will be disclosed and reviewed during the site plan review process.

Likewise, the application of herbicides or pesticides on the right of way for the new road is not proposed, except as may be initiated by the Town Highway Department and in compliance with applicable Town and State regulations.

3.4.4 Mitigation

The implementation of individual site plans for future subdivided lots are projected to not significantly adversely impact upon water quality as long as the principals of stormwater management outlined herein are adhered to. All individual site plans will provide for the pre-treatment and management of stormwater discharges such that nutrient loading and post-development flows meet the criteria of the New York State DEC and the New York City DEP. The applicant shall demonstrate to the satisfaction of the planning board and town engineer such adherence prior to final approval of any site plans. The planning board is expected to condition any future site plan approval on receipt of applicable permits or approvals from the Putnam County Department of Health and the New York City Department of Environmental Protection. Assuming that these plans meet the requirements of these agencies, no adverse impacts would be expected to occur on water resources, and no further SEQRA review would be required for individual site plans relative to this subject area.