2.0 NATURAL ENVIRONMENTAL RESOURCES

2.1 Soils and Topography

2.1.1 Existing Conditions

Soils

The subject site was most recently used as a golf course and as a result, surface soils have been altered and redistributed to form the contours and elevations associated with this most recent use. Soil conditions on the site are inventoried through review of the Soil Survey of Suffolk County, prepared by the US Department of Agriculture in 1975[1]. This is a useful source of soils information that identifies soil types resulting from natural deposition and modification, as well as man-induced alterations associated with land use. The Soil Survey indicates that the following six soil types underlie the subject property (see **Figure 2-1**):

- CpA - Carver and Plymouth sands, 0-3% slopes; occupies 21.12 acres/18.5% of site
- CpC - Carver and Plymouth sands, 3-15% slopes; occupies 10.04 acres/8.8% of site
- CuB - Cut and Fill Land, gently sloping; occupies 0.91 acres/0.8% of site
- De - Deerfield sand; occupies 0.68 acres/0.6% of site
- RdA - Riverhead sandy loam, 0-3% slopes; occupies 52.26 acres/45.7% of site
- RhB - Riverhead and Haven soils, graded, 0-8% slopes; occupies 29.32 acres/25.6% of site

The characteristics of these soil types are identified as follows:

Carver and Plymouth sands, 0-3% slopes (CpA) - These soils are mainly on outwash plains; however, they are also on some flatter hilltops and intervening draws on moraines. A small part of this mapping unit is slightly undulating. The hazard of erosion is slight on the soils in this unit. These soils are droughty natural fertility is low. These soils are not well suited to the crops commonly grown in the county. Because these soils tend to be droughty, lawns and shrub plantings are difficult to establish and maintain. Almost all of this unit has been left in woodland or in brush. Many areas previously cleared for farming are now idle. Most areas in the western part of the county and near the shores of the eastern part of the country are used for housing developments.

Carver and Plymouth sands, 3-15% slopes (CpC) - These soils are mainly on rolling moraines; however, they are also on the side slopes of many drainage channels on the outwash plains. Individual areas of this mapping unit are large on the rolling topography of the Ronkonkoma Moraine, and in these areas, slopes are complex. On the outwash plain, this unit is in long, narrow

[1] Updated/digitized maps used for figures from Soil Survey Geographic Database for Suffolk County, New York (SSURGO); USDA Natural Resources Conservation Service; 2010; updated September 24, 2015; the Suffolk County Soil Survey (**Warner, 1975)** provides soil descriptions/constraints.

strips parallel to drainageways. The hazard of erosion is slight to moderate on the soils in this unit. These soils are droughty, and natural fertility is low. In some places, slop is a limitation to use. These soils are not well suited to crops commonly grown in the county. These sandy soils severely limit installation and maintenance of lawns and landscaping shrubs. Almost all of these soils are in woodland.

Cut and Fill Land, gently sloping (CuB) - This unit is made up of level to gently sloping areas that have been cut and filled for nonfarm uses. Slopes arrange from 1 to 8 percent, and because of final grading around houses and other buildings, slopes generally are complex. The areas generally are large but some areas are about 5 acres in size. This land has few, if any, limitations to use as building sites.

Deerfield sand (De)- This soil is between areas of somewhat poorly drained soils and well drained or excessively drained soils at slightly higher elevations. Slopes are 3 percent or less and are slightly concave in places. Except for some areas along the south shore, most areas of this soil are small. The hazard of erosion is slight. This soil is fairly well suited to crops commonly grown in the county. It is seasonally too wet or too dry in the root zone. Natural fertility is low. Small areas of Deerfield sand have been cleared for farming. Generally, this soil has been left in woodland with adjoining areas of wetter soils; however, many areas in the southwestern part of the county have been filled and are used as sites for housing developments. In some places, slab-type construction has been used without filling.

Riverhead sandy loam, 0-3% slopes (RdA) - This soil has the profile described as representative of the series. It generally is on outwash plains, and the areas are large and uniform. Where this soil occurs on outwash plans, it generally has slope characteristics of this landform. Slopes are undulating in places. A few small, irregular areas are on moraines. The hazard of erosion is slight on this Riverhead soil. This soil is limited only by moderate droughtiness in the moderately coarse textured solum. It tends to develop a plowpan if it is intensively farmed. This soil is well suited to crops commonly grown in the county, and it is used extensively for that purpose.

Riverhead and Haven Soils, graded, 0-8% slopes (RhB) - This mapping unit consists of areas of Riverhead sandy loam, of Haven loam, or of both. The areas have been altered by grading operations for housing developments, shopping centers, industrial parks, and similar nonfarm uses. In the western part of the county, the areas of this mapping unit are very large, and large acreages are used as sites for housing developments. These soils are suited to most grasses and shrubs generally used for lawns and landscaping. In places very deeply cut or filled areas are slightly droughty and need supplemental irrigation. The response of plants to application of lime and fertilizer is food. The practice generally is to build on the soils immediately after grading; therefore, the number of existing buildings on areas of the soils in this unit is the main factor in determining their future uses.

Table 2-1 provides a listing of those factors of each soil type that may present limitations on site development, as well as those soil features that should be considered when developing the site. It is noted that 98.6% of the site is overlain by four soil types (CpA, CpC, RdA and RhB) which display generally slight to moderate limitations on development. The severe limitations that these soils present are associated with steep slopes and presence of a sandy surface layer

which can readily be address through proper attention to typical grading, drainage and landscaping techniques.

TABLE 2-1
SOIL PROPERTIES & LIMITATIONS

Parameter	CpA	CpC	CuB	De	RdA	RhB
Engineering properties:						
Depth to seasonal high-water table	>4 feet			1-1/2 to 2	>4 feet	
Profile/USDA texture	0-22 in.: Fine sand to coarse sand 22-60 in.: Coarse sand to gravelly sand		**	0 to 25 in.: Sand to fine sand or loamy sand. 25-53 in.: Sand to stratified sand and gravel.	0-32 in.: Sandy loam and fine sandy loam 32-65 in.: Sand, loamy sand, gravelly sand, gravelly loamy sand	*
Permeability	0-22 in.: >6.3 in./hr. 22-60 in.: >6.3 in./hr.			0 to 25 in.: > 6.3 in./hr. 25-53 in.: > 6.3 in./hr.	0-32 in.: 2.0-6.3 in./hr. 32-65 in.: >6.3 in./hr.	
Available moisture capacity	0-22 in.: 0.03-0.04 in./in. 22-60 in.: 0.02-0.04 in./in.			0 to 25 in.: 0.04 - 0.06 in./in. 25-53 in.: 0.02 - 0.04 in./in.	0-32 in.: 0.11-0.15 in./in. 32-65 in.: 0.02-0.07 in./in.	
Suitability as a Source of:						
Topsoil	Poor: coarse texture		**	Poor: coarse texture	Good	*
Fill Material	Good: needs binder in places			Good	Good: material below a depth of 27 inches needs binder in places	
Soil features affecting:						
Highway location	Poor trafficability; extensive cuts and fills likely on CpC			Seasonal high water table	---	
Embankment foundation	Strength generally adequate for high embankments; slight settlement; moderately steep to steep slopes on CpC			Strength generally adequate for high embankments; slight settlement		
Foundations for low buildings	Low compressibility; large settlement possible under vibratory load; moderately steep to steep slopes on CpC		**	Low compressibility; large settlement possible under vibratory load; seasonal high water table	Low compressibility	*
Farm ponds (reservoir)	Rapid permeability; moderate and moderately steep to steep slopes on CpC			Seasonal high water table; rapid permeability	Rapid permeability in layers of substratum	
Irrigation	Very low available moisture capacity; rapid water intake; moderate and moderately steep to steep slopes on CpC			Seasonal high water table; very low available moisture capacity; rapid water intake	Moderate to rapid water intake; moderate available moisture capacity	
Limitations of the soil for:						
Sewage disposal fields	Slight	Slight to moderate: slopes in places	Slight	Moderate: seasonal high water table a depth of 1-1/2 to 2 feet	Slight	Slight
Homesites						
Streets & parking lots		Moderate to severe: slopes	Moderate: slopes			Moderate: slopes
Lawns, landscaping & golf fairways	Severe: sandy surface layer		Severe: sandy surface layer	Severe: sandy surface layer		Slight
Paths & trails			Moderate: sandy surface layer			
Picnic grounds & extensive play areas						

* Riverhead and Haven soils, graded, 0 to 8 slopes (RhB) have not been included since characteristics are too variable to estimate for all limitations.
** Per Soil Survey, not included because characteristics are too variable to estimate.

Soil Borings and Depth to Groundwater

Specific information regarding soil characteristics was obtained during the installation of two sets of soil borings installed on the subject property. The first set, completed in November of 2016 (see **Appendix B-5**) included six borings over the entire site, and indicated water table elevations as shown in **Table 2-2**:

TABLE 2-2
SOIL BORING RESULTS
November 2016

Boring	**Estimated Surface Elevation** (feet asl*)	**Depth to Water Table** (feet bgs**)	**Estimated Elevation of Water Table** (feet asl)
SB-1	31	13	18
SB-2	49	Not encountered	--
SB-3	33	15	18
SB-4	31	11	20
SB-5	30	12	18
SB-6	43	Not encountered	---

* asl - above sea level
** bgs - below ground surface

These borings indicate that the water table only had a vertical variation of 2 feet from north to south (18 to 20 feet asl).

The second set of borings was installed in May 2018 as part of the Phase II ESA prepared for the project (see **Appendix B-2**), and enabled detailed analyses of subsurface soil and groundwater quality conditions. The following **Table 2-3** summarizes the water table elevation-related data of that study.

TABLE 2-3
SOIL BORING RESULTS
May 2018

Boring	**Estimated Surface Elevation** (feet asl)	**Depth to Water Table** (feet bgs)	**Estimated Elevation of Water Table** (feet asl)
SB-001	36	18	18
SB-002	25	8	17
SB-003	42	23	19
SB-004	44	23	21
SB-005	32	8	24

The second set of borings, completed after the first round of borings, found that the water table elevations exhibited a perceptible slope trending downward in a southeasterly direction, from a low elevation of 17 to 19 feet asl in the site's eastern, southeastern and southern parts toward the northwest, where elevations were 21 to 24 feet asl.

It is expected that the differences in water table elevations and configurations between late-2016 and mid-2018 reflect changes in the water-year conditions based on recharge of precipitation over that time period.

Review of the soil boring logs generated based on the observation of soil samples collected by East Coast Geoservices at the property generally indicates that below the surficial top soil layer overlying the site, soils generally consist of well drained fine sand with traces of gravel.

In addition, a percolation test was conducted at the subject property during October of 2018 the purpose of which was to assess the leaching capabilities of subsurface soils related to drainage and sanitary design. The study included the installation of five (5) percolation test wells at locations throughout the property followed by percolation testing conducted in accordance with 10NYCR, Appendix 75-A and the NYSDOH Residential On-site Wastewater Treatment Design Handbook. The percolation test wells at each location were installed at depths equivalent to the bottom of the leaching structures proposed for each area and varied in depth from eight to eighteen feet below ground surface (bgs).

Following installation, each of the test wells were presoaked for at least four (4) hours to the greatest extent practicable, one (1) day prior to percolation testing. The percolation tests were conducted by filling each test well with water to a depth of six (6) inches above the well bottom and then measuring the rate of drop from six (6) inches to five (5) using an electronic water level indicator. The testing at each well was repeated a minimum of three (3) times and/or until two (2) successive tests were approximately equivalent.

The following **Table 2-4** summarizes the results for each percolation test well.

TABLE 2-4
PERCOLATION TEST RESULTS
October 2018

Test Well ID#	Test #1	Test #2	Test #3	Test #4	Test #5
	minutes				
PW-1	0.33	0.22	0.10	0.08	NC
PW-2	49	35	22	23	25
PW-3	(see Note below)				
PW-4	0.46	0.56	0.52	0.63	NC
PW-5	16	16	14	15	NC

Notes: NC – Test Not Conducted

> Water poured into test well drained too quickly to measure. Continuous water flow poured into well at a rate of approximately one (1) gallon per minute only resulted in a rise in water level to four (4) inches above the bottom of the well. Once water flow was terminated, drainage was instantaneous.

Review of the results above finds that the soils in the locations of the subject property that were subject to soil borings and percolation tests maintain excellent leaching capabilities for sanitary and drainage installations. A copy of the percolation report which includes the locations of the percolation tests is provided in **Appendix A-87**.

Soil and Recognized Environmental Conditions

The prior country club use on the site included a number of operational aspects that resulted in potential and/or actual contamination of soil and groundwater quality on and below the site. These impacts were determined and evaluated in the numerous ESAs conducted between 2006 and 2018 and are detailed in **Section 1.2.2** of this document, and so need not be repeated here.

In consideration of these evaluations, new Phase I and II ESAs were prepared for the applicant in 2018 to summarize any remaining unaddressed issues that may merit remediation. As detailed in **Section 1.3.2**, the Phase I ESA (dated June 2018) found a number of items, for which recommendations were provided, and so need not be repeated here.

In response to the recommendations of the Phase I ESA, a Phase II ESA was prepared in July 2018. The scope of this Phase II ESA was limited to the area of the golf course and did not include the buildings or parking areas. The applicant has prepared the recommended SMMP (see **Appendix B-3**). The RECs associated with the ASTs, ACM and UICs will be addressed as part of the onset of construction of the proposed project. No additional effort is necessary to address the HREC associated with the historic spill as the spill has been closed.

Topography

Similar to soils, since the subject site was most recently used as a golf course, surface topography has been altered over most of the subject site. **Figure 2-2** depicts the topographic character of the project site, which had been altered from pre-golf course use conditions. The site has generally flat topography, but is divided into three areas of similar elevation: the eastern portion is somewhat lower than the southern and the northwestern portions. More specifically, the eastern portion of the site is generally 25 to 35 feet above sea level (asl), while the south and northwest portions vary between 40 and 50 feet asl.

The highest elevations on the site are approximately 50 feet asl, found in numerous locations in the northwestern portion of the property; these areas are associated with elevated tees and greens of the golf course. The lowest elevation is about 25 feet, in the eastern portion of the site. In the lower elevation areas of the site, the minimum depth to the water table is about 10 feet bgs, while in the area of the highest elevation areas, the water table is about 28 feet bgs.

Figure 2-3 depicts the project site's slopes, divided into five slope intervals. **Table 2-5** below

indicates the acreages and percentages of these slope intervals. As can be seen, the majority of the site (104.1 acres, or 72.1%) is characterized by slopes of less than 10%, with an additional 5.6% (6.35 acres) exhibiting moderate slopes. Only approximately 3.3% of the site (3.79 acres) would be considered to have steep slopes (i.e., 15% and greater).

TABLE 2-5
SLOPE ANALYSIS*

Slope Intervals and Areas (acres)					
Less than 10%	10% - 14.9%	15% - 19.9%	20% - 24.9%	25% and above	Total
104.20	6.35	2.74	0.88	0.17	114.33

* See **Figure 2-3**.

2.1.2 Anticipated Impacts

Soils

Based on the values in **Table 1-5b**, it is estimated that a total of about 109.22 acres (95.5% of the site) will be cleared and subject to grading to construct the buildings, paved surfaces, drainage pond and new landscaping associated with the project. Consequently, it is expected that development will occur on each of the six soil types present. However, the type and amount of that development vary significantly. Comparison of **Figures 2-1 and 1-2a** indicates that the CuB and De soils (which occupy only minimal amounts of the property) will be disturbed to only minimal degrees, and will be occupied by open landscaped areas. The four remaining soils, which occupy much larger amounts of the site, will all be developed with residential buildings, the STP and maintenance building, paved surfaces, landscaping and the drainage pond.

Table 2-1 can be used to determine soil properties and constraints with respect to the types of development proposed for each soil type listed. For the four soil types on the subject property whereon the large majority of development will occur, moderate to severe constraints are related to the presence of a sandy surface layer (CpA and CpC), and slopes (CpC and RhB). These constraints can be readily addressed through proper engineering of slopes, grading/drainage, and soil preparation for landscaping to establish groundcover.

With respect to the STP, it is noted that this facility will be sited on areas overlain by CpA soils, which display only slight limitations on the operation of such a facility. The drainage pond will be located on CpA and CpC soils which provide a suitable base for establishment of the pond and will facilitate leaching over overflow stormwater will benefit from rapid permeability of these soils. Conformance with the applicable minimum standard for vertical separation between the water table and the recharge facilities of the STP and drainage system will be sufficient to allow for their proper operation.

Soils exhibiting limitations related to sandy surface layer comprise approximately 28.6% of the subject property. This limitation is not expected to be an impediment to location of roads, parking, or buildings. Establishment of turfed and landscaped areas will be 48.8% of the site, and impediments with respect to a sandy surface layer will be managed through soil preparation for the intended use. Soils will be amended to establish healthy growing conditions and nutrient and water retention properties needed to support the limited areas of landscaping. In the case of the proposed project this may potentially affect lawns, ornamental shrubs and turf grasses. The potential impacts related to this limitation with respect to erosion potential and revegetation can be overcome by using proper grading techniques and erosion control measures, installing proper drainage and using suitably-adapted drought tolerant indigenous vegetative species for landscaping as well as site stabilization and restoration. These measures will be used to minimize potential impacts due to surface soils where appropriate. Landscaping practices common to sandy soil areas will be employed and implemented at the time of construction, following the site plan review and approval process which will include landscape plan preparation. This will ensure that potential impacts with respect to a sandy surface layer are adequately addressed and as a result, no long-term soil impacts are expected.

Soils exhibiting limitations related to slopes comprise 10.2% of the site. The limitation of slopes may affect the installation of sewage disposal fields, homesites, streets and parking lots as well as the establishment of landscape vegetation related to concerns of providing stable surface areas to properly control erosion and drainage. The site plan has been designed to take slope constraints into consideration. Roads have been placed in low slope areas and homesites are planned in areas with construction areas of flatter surfaces. Planned grading of strategic locations of the site will be necessary to provide appropriate and stable surface areas to allow development of the proposed project.

Limitations related to seasonal high water are limited to only the De soils and only comprise approximately 0.6% of the subject property. This portion of the property is proposed to be occupied by open landscaped surfaces. Potential impacts related to a seasonal high water table elevation are expected to be extremely limited and related to flooding, which will be mitigated through proper grading and drainage system design.

The overall grading of the property is expected to result in a well graded cut and fill soil characteristic that will provide a suitable and stable soil surface for the intended use. Grading will be conducted with heavy equipment that will redistribute soils in the general area of their origin, and there are no soil sorting processes that would generate excessive fine material.

In consideration of the above, the characteristics of soils on the subject property are not expected to present an impact on the project following the implementation of appropriate mitigation measures (i.e., grading, installation of appropriate landscape species, appropriate sanitary and drainage design, etc.) to be instituted through project design.

Soil Borings, Depth to Groundwater

Review of soil boring logs revealed that soils underlying the subject property generally consist of well drained fine sand with traces of gravel. In addition, percolation tests conducted at the subject property found that the soils maintain a high rate of permeability and exhibit excellent drainage characteristics. As a result, the proposed project is not expected to present any significant impacts related to drainage and recharge following development.

Review of the soil boring logs also revealed that the depth to water on the subject property is encountered at depths ranging from eight feet to twenty-three feet bgs or at elevation ranging from seventeen to twenty-four feet above msl. The depth to the water table and leaching capabilities of the underlying soils, when considered relative to drainage and sanitary system design, are expected to mitigate any potential for groundwater mounding or alterations of groundwater flow direction following project development.

Stormwater Systems

All stormwater runoff generated on the property will be retained and recharged in a drainage system conforming to Town requirements, which includes the ability to handle 8 inches of runoff. While the project's drainage system is designed for 5 inches of storage, it is expected that the high percolation rate of the site's soils will enable the project's drainage system to handle the required 8 inches of runoff. All stormwater will be collected as well as recharged within the site through a series of roadside catch basin and drywells, and a 1.78-acre pond/retention area to be excavated in the center of the site. The Town Engineering Department will review the system for sufficiency as part of the site plan review process.

The project's drainage system will be designed to comply with State Pollutant Discharge Elimination System) requirements under the NYSDEC SPDES General Permit and Chapter 47 of the Islip Town Code. Under these requirements, a site-specific Stormwater Pollution Prevention Plan (SWPPP) must be prepared and submitted to the Town for review and approval as a condition to final site plan approval. The SWPPP evaluates the proposed drainage system to ensure that it meets the NYSDEC and Town requirements for treatment and retention of stormwater runoff. The SWPPP must demonstrate that the proposed stormwater management system is sized adequately to ensure that there is no net increase in peak stormwater discharges from a property once developed. Drainage for the project will be designed and installed in accordance with Town of Islip and NYSDEC SWPPP requirements. Additional details regarding the stormwater system are provided herein.

Runoff generated within the project area will be contained on-site. A Pond/Retention Area, swales, and leaching pools will be designed and installed to effectively store runoff for a 5-inch rain event. This plan requires the post development peak runoff rates to not exceed the pre-development peak runoff rates for a 100-year storm. Since all stormwater will be disposed of on-site and be filtered by the natural sands that are present; no additional stormwater treatment devices will be required or installed.

The bottom of the unlined retention pond will be 2 feet above the groundwater table. Pond areas with less than two feet of separation between the bottom of the pond and groundwater will be lined along the bottom. The liner will be extended vertically along the slope of walls such that that the top of the liner will be a minimum of two feet above the groundwater. Whenever practical, swales and the pond will be interconnected to limit the potential of an overflow condition.

Soil erosion and sediment control plans will be prepared and implemented during construction will be prepared in accordance SWPPP and the Town of Islip requirements. Installation of the stormwater infrastructure will depend on the construction phasing of the project, however there will be adequate storage volumes available for the disturbed areas. During construction and after construction completion, the drainage system will be inspected in accordance with the NYSDEC SWPPP requirements.

The system will be designed to comply with SPDES requirements under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (hereafter, the "General Permit"). Based on existing developments in the area, local geologic conditions, and adequate depth to groundwater, subsoils are expected to be of suitable quality to allow efficient recharge of stormwater, subject to further evaluation during subsequent project review (see **Section 1.6.6** for additional information in regard to erosion control during construction).

Wastewater Systems

Sewage generated by the residences and the amenity spaces will be conveyed by a gravity sewer sub collection system to an on-site STP. The gravity sewer will be designed in accordance with the SCDHS, SCDPW and the Ten States Standards.

The STP will be constructed to treat 377,000 gallons of sewage per day. The design flow for sewage generated on the project is estimated at 307,125 gpd. The STP will be designed to handle an additional 69,875 gpd of sewage from offsite sources.

The sewage treatment process will be a sequencing batch reactor. This process is commonly utilized in similar facilities throughout Suffolk County and long-term operation of this types of system has demonstrated that effluent will routinely meet the NYSDEC SPDES requirements for reduction of nitrogen and suspended solids.

Treated effluent will discharge into a leaching pool groundwater disposal system. Due the relatively shallow depth from grade to the water table beneath the project site**,** the groundwater disposal system will be designed and installed in accordance with SCDPW standards for discharge to a disposal system with a high groundwater condition. There will be four separate leaching pool clusters, such that one leaching pool cluster can be held out of

service at all times in reserve, to address any surge in demand. The groundwater disposal system will be designed for two hundred percent of the daily design flow. The complete installation of the groundwater disposal system will occur when the STP is constructed.

Approvals from the SCDHS, NYSDEC and SCDPW will be required. Specifically, review and approval of an Engineering Report and Construction Plans and Specifications by the SCDHS and SCDPW will be required, ensuring that this facility will be built to and operated in conformance to established regulations. Finally, the STP will be required to obtain a SPDES permit from the SCDHS/NYSDEC.

PWGC prepared a groundwater mounding analysis to investigate the maximum height of a mound that will form directly below the leaching pools of the STP discharge system and to determine what, if any, local effects the mound will have on site and with regards to the surrounding area.

A total of 600 leaching pools are being proposed for the project with only 150 pools receiving STP effluent at any given time. A simplified conservative approach was taken with regard to establishing an equivalent discharge bed area. The bottom area of 150 leaching pools was combined into a single composite area (A) totaling 11,781 SF. In reality, 150 pools will occupy more than this area as the pools will be arrayed in a linear fashion with 8 feet between rows of pools. The smaller composite area is being used in the analysis as it will reduce the total area that the peak daily discharge will be spread out over and, thus, produce a conservative estimate of a mound height. A square shaped area was further used to additionally concentrate the STP effluent and produce a higher mounding effect. Thus, a square area with equal length (L) and width (W) dimensions of 108.5 feet each is being conservatively used in the analysis.

The percolation rate of STP effluent into groundwater was then calculated using the peak daily design flow rate of 377,000 gpd and a leaching area of 11,781 SF. This produced a maximum percolation rate (i) of 4.28 feet/day (2.14 inches/hour). With the required infiltration rate established specific hydrogeological parameters used in mounding analyses were then researched for the site based on soil borings conducted by PWGC as part of the Phase II Environmental Site Assessment investigation. Generally, the shallow soils at the site were characterized as medium to course sands with gravel. Specific yields (Sy) for materials of this nature are cited as having average values of 0.26 to 0.27. Published USGS information was reviewed for local hydraulic conductivity (KH) values as well as the initial saturated aquifer thickness (hi). USGS maps for the Upper Glacial aquifer in the area of the site indicate fairly conductivity material with an estimated horizontal hydraulic conductivity of 2,000 gpd/SF (267.4 feet/day) and a saturated aquifer thickness on the order of 100 feet.

The Hantush Derivation (**1967**) for calculating groundwater mounds under rectangular recharge areas was employed to solve for the maximum expected mound height beneath the proposed leaching area.

Using the variables and methods described above a maximum 1.2 foot rise in the water table directly beneath the leaching area was predicted. A time period of 10 years was selected to provide a sufficiently long duration in order for the leaching system to reach steady state conditions (i.e., conditions are no longer changing with increasing time). As per SCDPW requirements the leaching pools need to be installed a minimum of 3 feet above the high historical groundwater elevation for the area. Based on the predicted maximum groundwater mound height the bottoms of the leaching pools should not become submerged due to saturated conditions. During periods of recharge as STP effluent leaches out of the bottoms of the pools the unsaturated zone between the pool bottoms and the water table will become wetted. As the area in and around the leaching pool fields is prohibited to be anything other than a grassed area per SCDPW requirements no utilities or building foundations should be impacted other than those associated with the STP.

The horizontal extents of the mounding effects were also evaluated as part of this analysis. Equations developed by Herman Bouwer (**1999**) using the Thiem equation (radial well flow hydraulics) as a basis were employed to estimate the radius of influence of the leaching field under steady state conditions.

Utilizing the method above yielded a result of 5,369 feet. This means that at this distance from the center of the leaching area after a significantly long period of time and at a constant recharge rate of 4.28 feet/day there will be no detectable increase in the water table elevation. The peak mounding conditions will occur directly under the center of the proposed leaching field. The mound created will theoretically have a parabolic type of shape to it where it starts to drop off rapidly right after the extents of the leaching field and start to take on an asymptotic trajectory where it gradually returns to the natural water table at 5,369 feet from the center of the field.

The STP is proposed to have 600 shallow leaching pools with only 150 in service at a time. Thus, a rotational usage pattern could be established, if necessary, to reduce over usage of any particular grouping of leaching pools. The analysis assumes a constant recharge rate of 377,000 gpd, which is the proposed peak STP capacity. In reality, the plant will not operate at capacity very often and flows will likely constantly vary and be considerably lower than 377,000 gpd. The leaching pools will also be arrayed in a larger and more linear type of configuration than evaluated under this analysis, this will create an overall lower mounding height and with a lower mounding height it will also have less reach or effect in the horizontal direction as well.

The mounding study report has been provided in **Appendix E-10.** Based on this study, and the analyses presented above concerning soils, depth to groundwater and topography, no significant adverse impacts are expected as a result of stormwater and wastewater systems. It is important to note that drainage on the site is expected to be effectively contained as a result of the information presented herein, and as a result, will not exacerbate any off-site drainage issues that may occur in the area of the proposed site. Further information with respect to water quality is presented in **Section 2.2.1**.

Soil and Recognized Environmental Conditions

As discussed above, the July 2018 Phase II ESA recommended actions to address the RECs identified with respect to the subject site, including preparation of a Soil and Materials Management Plan, sampling, remediating and decommissioning the existing drainage and septic systems, cleaning out and removing the ASTs, and UICs (i.e., the storm drains and septic systems), and inspecting the buildings for ACM.

The applicant has prepared the recommended SMMP (included as **Appendix B-3**), and the RECs associated with the ASTs, ACM and UICs will be addressed as part of the onset of construction of the proposed project.

As a result of the studies and remediation programs completed on the site since 2006, the analyses conducted for the 2018 Phase I and II ESAs and the recommendations contained therein, and anticipating completion of those recommended remediation efforts, no significant soil contamination issues remain unaddressed on the subject property.

Topography

The subject site is a fallow golf course, which was subject to clearing and grading to establish the 18-golf holes and related site features for this use. Clearing and grading of the site will be necessary to provide appropriate and stable surface areas to allow development of the proposed project. Overall, it is anticipated that 109.22 acres (95.5%) of the subject property will be subject to grading operations. However, as shown on **Figure 2-3**, the majority of the site is comprised of relatively flat topography which does not require extensive overall grading, therefore, no significant adverse impacts are expected. The most extensive grading in terms of depth of excavation and filling is expected to occur in the northern, central and southeastern portions of the property that exhibits the most severe slopes in order to accommodate the STP, recharge/detention pond and drainage swale, respectively. In addition, the drainage pond and recharge basin locations will involve soil removal from the site to establish these features. The excavation materials will be used as fill elsewhere on the site. Overall it is anticipated that approximately 268,883 CY of soil will be "cut", of which 222,043 CY will be retained on-site for use as "fill"; the remaining 46,840 CY will be removed from the site). Fill will be required in some areas of the property and the material required can be obtained from on-site sources and redistributed as necessary. Profiles of the internal roadway system will be prepared at the time of site plan review, to conform with Town road grade design specifications in order to provide a safe road system, and this will control overall site grading. In general, the site will continue to exhibit its regional topographic profile decreasing in elevation from north to south. All created soil slopes will be 1:3 or less and will be stabilized using ground cover material. As a result, it is expected that topographic impacts will be minimized to the maximum extent practicable. The preliminary grading plans provided herein provide information for the purpose of SEQRA analysis. Subsequent to change of zone approval, full grading and drainage plans will be prepared for the site plan application. These plans will be subject to further review by the Town Engineer and Planning staff prior to approval and construction.

A safeguard against erosion from steep slopes is achieved through the NYSDEC SPDES review of stormwater control measures consistent with Phase 2 stormwater permitting for construction sites in excess of 1-acre (SPDES GP-0-15-002). Under this program, a Notice of Intent (NOI) must be filed with the NYSDEC 60-days prior to commencement of construction, and a site-specific SWPPP must be maintained on site. In addition, a copy of the final NOI, the SWPPP, and erosion & sedimentation control plans will be submitted to the Town simultaneously with the NYSDEC submission. This process, as well as construction and operation of the proposed project are discussed in **Section 1.6.6**.

Given the nature of the site's topography (wherein only limited amounts of steep slopes are present), the balancing of cut and fill materials, implementation of erosion control measures during construction, and the Town's review and approval process, no significant adverse long-term impacts are expected with respect to topography.

2.1.3 Proposed Mitigation

- Erosion and sedimentation may occur during the construction phase. The potential impacts with respect to erosion potential can be overcome by using proper grading techniques and implementing erosion control measures, installing proper drainage facilities and using suitably-adapted drought-tolerant indigenous vegetative species for landscaping as well as site stabilization and restoration.
- Landscaping practices common applied to sandy soil areas will be employed and implemented at the time of construction, following the site plan review and approval process which will include landscape plan preparation. This will ensure that potential impacts with respect to a sandy surface layer are adequately addressed and as a result, no long-term soil impacts are expected.
- Short-term soil impacts will be mitigated through erosion control measures which are detailed under a site-specific erosion control plan.
- Fill may be required in some areas of the property and it is expected that the material required can be obtained from on-site sources and redistributed as necessary.
- A protocol shall be established to ensure that any topsoil imported to the site shall come from a NYSDEC certified source.
- All created soil slopes will be 1:3 or less and will be stabilized using ground cover material.
- All stormwater runoff generated on the property will be retained and recharged in a drainage system conforming to Town requirements, which includes the ability to handle a minimum of 8 inches of runoff. While the project's drainage system is designed for 5 inches of storage, it is expected that the high percolation rate of the site's soils will enable the project's drainage system to handle the required 8 inches of runoff. The Town Engineering Department will review the system for sufficiency as part of the site plan review process.
- The grading plan is used for preliminary drainage design and DEIS analysis. A detailed grading and drainage plan will be prepared for the site plan application, and will provide details of overall site grading and will require Town review and approval prior to initiation of grading activities.
- An additional safeguard is achieved through the NYSDEC SPDES review of stormwater control measures consistent with Phase 2 stormwater permitting for construction sites in excess of 1-acre.

- As no significant adverse impacts are anticipated with respect to geological resources, the proposed mitigation measures are expected to be sufficient to properly protect these resources, so that no additional mitigation measures are necessary or proposed.
- This work will be conducted in coordination with the SMMP to address contaminated surface soils on the site.

2.2 Water Resources

2.2.1 Existing Conditions

Surface Water, Drainage/Flooding & NURP Study

Surface Water - There are no natural surface water bodies on the subject site. There are several water hazards on the golf course, but these are entirely artificial in origin. Further, there are no natural surface water bodies in the vicinity in the downslope (southerly) direction that are tributary to runoff from the subject site.

A description/discussion of the Green's Creek watershed and the quality of surface water within it are presented in the sub-section titled "Water Resources Plans and Studies" below.

Drainage/Flooding - Stormwater runoff currently generated on the subject site either recharges within the property by infiltrating into the soil on-site (the large majority of the site includes pervious surfaces), or flows downslope into collection areas where it is directed into the property's existing drainage system. Anecdotal evidence of flooding has been reported by local residents in the area of Green's Creek which is located approximately 1,500 feet southeast of the subject property. The subject property has not exhibited any indication of issues related to flooding and it is concluded that the flooding issues noted above are related to the general high groundwater conditions in the area and not a result of recharge from the subject property.

NURP Study (1982) - The Long Island Regional Planning Board prepared the LI Segment of the Nationwide Urban Runoff Program (NURP) Study (**Koppelman, 1982**). This program attempted to address, among other things, the following:

- the actual proportion of the total pollutant loading that can be attributed to stormwater runoff, given the presence of other point and non-point sources and conditions within the receiving waters;

The purpose of the NURP Study, carried out by the US Geological Survey, was to determine:

- the source, type, quantity, and fate of pollutants in stormwater runoff routed to recharge basins; and
- the extent to which these pollutants are or are not attenuated as they percolate through the unsaturated zone.

In order to accomplish this, five recharge basins, located in areas with distinct land use types, were selected for intensive monitoring during and immediately following storm events. Five recharge basins (three in Nassau and two in Suffolk), were chosen for the study on the basis of type of land use from which they receive stormwater runoff. While this document and the testing conducted dates back to 1982, it is a useful reference given the comprehensive nature of the sampling of sediments from recharge facilities of various land use types. There are no more up-to-date references that resulted in the generation of such comprehensive empirical data for various land use practices on Long Island. The following is a listing and description of each drainage area:

Site Location	Land Use
Centereach	Strip Commercial
Huntington	Shopping Mall, Parking Lot
Laurel Hollow	Low Density Residential (1-acre zoning)
Plainview	Major Highway
Syosset	Medium Density Residential (1/4-acre zoning)

The land use included in the NURP report that is most like the proposed use would be medium density residential (the Syosset site was the example analyzed). The empirical data generated by the NURP study results for this land use type are shown in **Table 2-6**.

None of the parameters examined within the NURP Study violated the standards for the reported constituents at the studied site, with the exception of turbidity and pH. As expected, slightly elevated levels of heavy metals were detected; however, their concentrations were significantly reduced through attenuation and did not exceed standards. Chloride concentrations generally increase by two orders of magnitude during the winter months. Chloride is not attenuated in soils like lead and chromium (**Koppelman, 1982**), and thus it is anticipated that the amount of chloride contributed to groundwater will be correlated with the amount of salt applied to roadways and parking areas within the stormwater drainage area. Nitrogen was detected at a concentration of 2.55 mg/l, which is less than the drinking water standard of 10 mg/l. However, this elevated concentration likely the result of sanitary discharges and fertilization practices conducted at the time of testing. This exemplifies the need for control of landscape practices and determination of fertilizer (including nitrogen) application on a site-specific basis as well as treatment of sanitary discharges. These analyses are conducted for the proposed project and documented in **Section 2.2.2.** Finally, coliform and fecal streptococcal indicator bacteria are removed from stormwater as it infiltrates through the soil.

TABLE 2-6
STORMWATER IMPACTS FROM LAND USE
NURP Study, Syosset (Medium Density Residential)

Parameter	Medium Density	Standard
Spec. Cond. (µmhos)	104	[n]
pH	5.1	6.5-8.5
Turbidity (NTU)	26	5
Hardness (mg/l)	16.5	[n]
Calcium (mg/l)	4.85	[n]
Magnesium (mg/l)	1.2	[n]
Sodium (mg/l)	4.25	[n]
Potassium (mg/l)	1.4	[n]
Sulfate (mg/l)	7.05	250
Fluoride (mg/l)	0.1	1.5
Chloride (mg/l)	7.3	250
Nitrogen-Total (mg/l)	2.55	10
Phosphorus (mg/l)	0.010	[n]
Cadmium (µg/l)	2.5	10
Chromium (µg/l)	1.0	50
Lead (µg/l)	6.0	50
Arsenic (µg/l)	0.0	25
Coliform (MPN)	13.0	[n]
Coliform, fecal	3.0	[n]

Source: Koppelman, 1982, p. 26-29
[n] - no standard for parameter

Based on the sampling program, the NURP Study reached the following relevant findings and conclusions:

Finding: Stormwater runoff concentrations of most of the inorganic chemical constituents for which analyses were performed were generally low. In most cases, they fell within the permissible ranges for potable water; however, there were two notable exceptions:

- median lead concentrations in stormwater runoff samples collected at the recharge basin draining a major highway (Plainview) consistently exceeded the drinking water standards;
- chloride concentrations in stormwater runoff samples generally increase two orders of magnitude during the winter months.

Conclusion: In general, with the exception of lead and chloride, the concentrations of inorganic chemicals measured in stormwater runoff do not have the potential to adversely affect groundwater quality.

Finding: The number of coliform and fecal streptococcal indicator bacteria in stormwater range from 10^0 MPN [most probable number] to 10^{10} MPN per acre per inch of precipitation.

Conclusion: Coliform and fecal streptococcal indicator bacteria are removed from stormwater as it infiltrates through the soil.

The handling of stormwater for the proposed use and potential impact on groundwater will be considered in **Section 2.2.2**.

Hydrologic Conditions

Groundwater on Long Island is derived from recharge of precipitation, sanitary wastewater discharge, and irrigation. Generally, recharge water passes downward through the unsaturated subsurface zone to the water table, which is the upper surface of saturated soils that comprise the Upper Glacial aquifer. Generally, the water table underlying Long Island forms a linear mound of groundwater that crests under the central portion of the Island. The apex of this crest forms an east-west trending ridge in the water table, known as the groundwater divide, that gradually slopes downward towards the north and south shores of Long Island. The configuration of this groundwater mound creates a hydraulic gradient, which causes groundwater to flow downslope under gravity in a direction perpendicular to contours of equal elevation (generally toward the north and south shores) as they descend from the groundwater divide. In addition to horizontal flow, water flow within the central and inland portions of the Island is characterized by a deep flow system which exhibits a generally vertical component that provides recharge to the deeper Magothy and Lloyd aquifers, before flowing to the north and south shores in these deeper aquifers. Groundwater recharge along the shorelines tends to flow horizontally in a shallow flow system through the Upper Glacial aquifer and eventually discharges from subsurface systems into streams or marine surface waters (**Krulikas, 1986**).

As shown in **Figure 2-5**, groundwater underlying the site lies at an elevation of between approximately 15 feet asl at the southerly property line, and rising toward the north, reaching about 22 feet asl beneath the site's northern border.). As described in **Section 2.1.1**, the topographic elevation of the site varies between 25 and 50 feet asl, In the area of the site's lowest elevation, the water table is about 10 feet bgs, while in the area of the site's highest elevation, the water table is about 28 feet bgs. Based on contours depicted in **Figure 2-5**, groundwater in the unconfined, shallow (Upper Glacial) aquifer will flow in a southerly direction in the vicinity of the project site.

Review of **Figures 2-5 and 3-5c** indicates that there are no public water supply wellfields in the area downgradient and within 1,000 feet of the subject site. Additionally, **Figure 3-5d** shows that the SCWA maintains its distribution network throughout this area, supporting a conclusion that there are no private potable water supply wells in this area.

Groundwater Quality

SCWA Annual Water Quality Report (2018) – The most recent Annual Water Quality Report of the SCWA was referenced to determine the quality of water in the area beneath the subject site. The report was issued in early 2018, and listed test results conducted on water provided to the public during 2017. As noted, the subject site is located in SCWA Distribution Area 1. The results of the tests are provided in **Table 2-7**, and show that, while a number of inorganic compounds, one synthetic organic compound, and three disinfection byproducts were detected, none of these were above or near their respective NYSDEC regulatory limits. Additionally, no volatile organic compounds, and no pharmaceuticals were detected.

TABLE 2-7
GROUNDWATER QUALITY DATA, 2017
SCWA Distribution Area 1

Parameters	Average Value	Maximum Contaminant Limit (MCL)
Inorganic Compounds		
Alkalinity, total, mg/l	37.2	[n]
Aluminum, mg/l	0.03	[n]
Ammonia, free mg/l	ND	[n]
Arsenic, µg/l	ND	10
Barium, mg/l	ND	2
Boron, mg/l	ND	[n]
Bromide, mg/l	ND	[n]
Cadmium, µg/l	ND	5
Calcium, mg/l	12.8	[n]
CO_2, calculated, mg/l	6.1	[n]
Chloride, mg/l	18.7	250
Chromium, total, µg/l	ND	100
Cobalt-59, µg/l	ND	[n]
Color, color units	ND	15
Copper, mg/l	0.05	AL=1.3
Dissolved solids, total, mg/l	79	[n]
Fluoride, mg/l	ND	2.2
Hardness, total, mg/l	38.5	[n]
Hexavalent Chromium, µg/l	0.14	[n]
Iron, µg/l	186	300
Lead, µg/l	ND	AL=15
Lithium, µg/l	1.6	[n]
Magnesium, mg/l	1.56	[n]
Manganese, µg/l	ND	300
Molybdenum, µg/l	ND	[n]
Nickel, µg/l	1.3	100
Nitrate, mg/l	1.40	10
Perchlorate, µg/l	0.16	15
Phosphate, total, mg/l	0.66	[n]
pH	7.2	[n]
pH, field, pH units	7.3	[n]
Potassium, mg/l	0.63	[n]
Silicon, mg/l	4.5	[n]
Sodium, mg/l	7.3	[n]
Specific conductance, µmho/cm	128	[n]

Strontium-88, mg/l	0.036	[n]
Sulfate, mg/l	8.0	250
Surfactants, mg/l	ND	0.50
Titanium, µg/l	ND	[n]
Total Organic Carbon (TOC), mg/l	ND	[n]
Turbidity, NT units	ND	5
Vanadium, µg/l	ND	[n]
Zinc, mg/l	ND	5
Synthetic Organic Compounds, Pesticides and Personal Care Products		
Alachlor ESA, µg/l	ND	50
Alachlor OA, µg/l	ND	50
Aldicarb sulfone, µg/l	ND	2
Aldicarb sulfoxide, µg/l	ND	4
1,2-Dibromomethane (EDB), µg/l	ND	2
Diethyltoluamide (DEET), µg/l	ND	50
1,4-Dioxane, µg/l	0.13	50
Hexazinone, µg/l	ND	50
Metalaxyl, µg/l	ND	50
Metolachlor, µg/l	ND	50
Metolachlor ESA, µg/l	ND	50
Metolachlor OA, µg/l	ND	50
Perfluorohexane Sulfonic Acid, µg/l	ND	50
Perfluorononanoic Acid, µg/l	ND	50
Perfluorooctane Sulfonate, µg/l	ND	50
Terbacil, µg/l	ND	50
Tetrachloroterephthalic Acid (TCPA), µg/l	ND	50
Volatile Organic Compounds		
Chlorobenzene, µg/l	ND	5
Chlorodifluoromethane, µg/l	ND	5
Cis-1,2-Dichloroethene, µg/l	ND	5
Dibromomethane, µg/l	ND	5
Dichlorodifluoromethane, µg/l	ND	5
1,3-Dichlorobenzene, µg/l	ND	5
1,1-Dichloroethane, µg/l	ND	5
1,2-Dichloroethane, µg/l	ND	5
1,1-Dichloroethene, µg/l	ND	5
1,2-Dichloropropane, µg/l	ND	5
Ethyl Benzene, µg/l	ND	5
Methylethylketone (MEK), µg/l	ND	50
Methyl-Tert-Butyl Ether (MTBE), µg/l	ND	10
o-Xylene, µg/l	ND	5
p,m-Xylene, µg/l	ND	5
Tetrachloroethene, µg/l	ND	5
Tetrahydrofuran, µg/l	ND	50

Toluene, µg/l	ND	5
1,2,4-Trichlorobenzene, µg/l	ND	5
1,1,1-Trichloroethane, µg/l	ND	5
Trichloroethene, µg/l	ND	5
Trichlorofluoromethane, µg/l	ND	5
1,2,3-Trichloropropane, µg/l	ND	5
1,1,2-Trichlorotrifluoroethane, µg/l	ND	5
Pharmaceuticals and Personal Care Products		
Carbamazepine, µg/l	ND	50
Dilantin, µg/l	ND	50
Gemfibrozil, µg/l	ND	50
5-(4-Hydroxyphenyl)-5-Phenylhydantoin, mg/l	ND	50
Ibuprofen, µg/l	ND	50
Imidacloprid, µg/l	ND	50
Lamotrigine, µg/l	ND	50
Meprobamate, µg/l	ND	50
Phenobarbital, µg/l	ND	50
Primidone, µg/l	ND	50
Sulfamethoxazole, µg/l	ND	50
Disinfectant and Disinfection By-Products		
Bromochloroacetic Acid, µg/l	ND	50
Bromodichloroacetic Acid, µg/l	ND	50
Bromodichloromethane, µg/l	ND	80**
Bromoform, µg/l	ND	80**
Chlorate, µg/l	0.09	[n]
Chlorine, residual, mg/l	0.87	4
Chloroform, µg/l	0.36	80**
Dibromochloromethane, µg/l	ND	80**

ND - Not detected.
[n] - No standards for parameter
AL - Action Level.
** The MCL is the sum of the four ** compounds.

On-Site Water Quality Test Results - PWGC conducted a Phase II ESA at the subject property in July of 2018 and included the collection of groundwater samples from six (6) monitoring wells installed throughout the property. The samples from each well were analyzed for the presence of volatile and semi-volatile organic compounds as well as pesticides, herbicides and metals. No semi-volatile organic compounds, pesticides or herbicides were detected in any of the samples collected. Only one volatile organic compound (acetone) was detected but is suspected to have originated as a laboratory contaminant since there is no known source on the subject property. The only metals detected above their respective groundwater quality standards were iron, manganese and sodium and were concluded to have originated from natural sources (native rocks and minerals) which are typically found in Long Island groundwater. A copy of the Phase II ESA report is provided in **Appendix B-2**.

Nitrogen Budget - The groundwater budget for an area is expressed in the hydrologic budget equation, which states that recharge equals precipitation minus evapotranspiration plus overland runoff. This indicates that not all rain falling on the land is recharged. Loss in recharge is represented by the sum of evapotranspiration and overland runoff. The equation for this concept is expressed as follows:

R = P - (E + Q)

where: **R** = recharge
P = precipitation
E = evapotranspiration
Q = overland runoff

Nelson, Pope & Voorhis, LLC (~~NP&V~~NPV) has utilized a microcomputer model developed for its exclusive use in predicting both the water budget of a site and the concentration of nitrogen in recharge. The model, named **SONIR** (**S**imulation **of N**itrogen **in R**echarge), utilizes a mass-balance concept to determine the nitrogen concentration in recharge. Critical in the determination of nitrogen concentration is a detailed analysis of the various components of the hydrologic water budget, including recharge, precipitation, evapotranspiration and overland runoff.

The **SONIR** model includes four sheets of computations: 1) Data Input Field; 2) Site Recharge Computations; 3) Site Nitrogen Budget; and 4) Final Computations. All information required by the model is input in Sheet 1. Sheets 2 and 3 utilize data from Sheet 1 to compute the Site Recharge and the Site Nitrogen Budget. Sheet 4 utilizes the total values from Sheets 2 and 3 to perform the final Nitrogen in Recharge computations. Sheet 4 also includes tabulations of all conversion factors utilized in the model.

It should be noted that the simulation is only as accurate as the data which is input into the model. An understanding of hydrologic principles is necessary to determine and justify much of the data inputs used for water budget parameters. Further principles of environmental science and engineering are applied in determining nitrogen sources, application and discharge rates, degradation and losses, and final recharge. Users must apply caution in arriving at assumptions in order to ensure justifiable results. There are a number of variables, values and assumptions concerning hydrologic principles, which are discussed in detail in a user manual developed for the SONIR Model and provided in **Appendix E-1.**

The model was run to obtain the existing water budget and nitrogen concentration in recharge (see **Table 1-5b**). The site currently has a total site recharge of 89.21 million gallons per year (MGY), with a total nitrogen concentration of 5.45 milligrams per liter (mg/l) and 4,052.39 pounds (lbs) of nitrogen loading per year under conditions when the golf course was operational and the balance is precipitation nitrogen which is an existing condition related to

atmospheric deposition. An additional nitrogen budget was prepared for the now current conditions associated with a fallow golf course that is periodically mowed, but not fertilized or irrigated. Under these conditions, the site has a total site recharge of 82.82 MGY, with a total nitrogen concentration of 0.72 mg/l and 499.84 lbs of nitrogen loading per year. The results of these analyses are presented in **Appendix E-2.**

Water Resources Plans and Studies

208 Study - The Long Island Regional Planning Board, in conjunction with other agencies, prepared a management plan for Long Island groundwater resources in 1978 under a program funded by Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The purpose of the 208 Study was to investigate waste disposal options and best practice for ground and surface water protection. The study delineated Hydrogeologic Zones for the formulation of management plans based on groundwater flow patterns and quality (**Koppelman, 1978**). The site is located in Groundwater Management Zone VI, a zone that discharges to Moriches Bay and the eastern portions of the Great South Bay where due to a low flushing rate, contaminant concentrations are not sufficiently dispersed and diluted.

Stormwater runoff is the vehicle by which pollutants move across land and through the soil to groundwater or surface waters. Contaminants accumulate or are disposed of on land and developed surfaces. Sources of contaminants include:

- animal wastes;
- highway deicing materials;
- decay products of vegetation and animal matter;
- fertilizers;
- pesticides;
- air-borne contaminants deposited by gravity, wind or rainfall;
- general urban refuse;
- by-products of industry and urban development; and
- improper storage and disposal of toxic and hazardous material.

It has been recommended that Zone VI be protected through the expansion of sewering and the control of stormwater runoff, as well as the minimization of population density, where possible.

Suffolk County Comprehensive Water Resource Management Plan (2015) - The 2015 Suffolk County Comprehensive Water Resource Management Plan (SCCWRMP) is an update to the 1987 SCCWRMP to reflect more recent development trends, resource plans and studies, and government programs and regulations pertinent to water supply and water resource protection. The following description of that update program has been taken from the Executive Summary, dated March 2015:

Introduction

Water is the single most significant resource for which Suffolk County bears responsibility. As the impact of Superstorm Sandy underscored, more than at any time in our history, we are obliged to come to terms, in every sense, with the water that surrounds us. Suffolk County's water quality is at a tipping point. We face an alarming trend in the quality of the water our families drink, compounded by impairment of many bodies of water in which our families play. Moreover, the source of these impairments has demonstrably degraded the wetlands that serve as our last line of natural defense against storm surge.

While today our drinking water generally meets quality standards, elevating levels of contaminants raise serious concern. Many of our rivers, estuaries and bays are impaired as result of eutrophication. Nitrogen, which primarily spews from residential septics and cesspools, as well as fertilizer, are the principle culprits that spur hypoxia, harmful algal blooms, diminution of sea and shellfisheries, and degradation of our protective natural infrastructure – wetlands and seagrass beds that act as wave and storm surge buffers. Sea level rise, which also contributes to marshland degradation, is projected to raise groundwater levels, increasing vulnerability to saltwater inflation, and further compromising on-site wastewater treatment infrastructure largely composed of cesspools and septic tanks.

Perhaps nowhere have we seen the impact of nitrogen pollution in more stark terms than in the Great South Bay. At one time, this bay produced more than half the clams eaten in our country. However, over the past quarter-century, the clam harvest in the Great South Bay has fallen by 93 percent, destroying an entire industry which once accounted for 6,000 jobs. While clams were once over-harvested, they have largely failed to recover due to recurrent brown tides fed primarily from nitrogen from septic systems and cesspools. We must decide if this type of impaired surface water body will be our region's future or if we can restore our bays to health.

In advance of the release of the 2015 Suffolk County Comprehensive Water Resources Management Plan ("Comp Plan"), this Executive Summary Update is spotlighting the Comp Plan's critical findings, and relevant post-Superstorm Sandy considerations, in order to spur a critical public dialogue about the scope of the problem and begin to frame near-term solutions. While many environmental issues related to groundwater and surface waters have arisen since the previous Plan (1987), one elemental condition has remained constant: the vast majority of Suffolk residents rely on on-site wastewater disposal systems that discharge to groundwater. In addition, fertilizer use, industrial and commercial solvents, petroleum products, pesticides and a host of other manmade contaminants have had profound and long-lasting impacts on groundwater quality, as well as on fresh surface waters and coastal marine waters into which groundwater and stormwater runoff discharge.

In the face of sea-level rise and extreme weather events, Suffolk County is compelled to devise the means and methods to live and thrive with the water beneath, by and around us.

The updated SCCWRMP delineated and addressed the following Critical Findings:

Critical Findings

"We have a million and a half people, approximately 74%, or roughly a million people, who are not sewered. This is probably the only place in the world with that large a density in this tight a space where the waste is going into a sole source aquifer immediately beneath us that we're drinking, and this is a big concern."

Downward Trajectory in Groundwater Quality:

1. Nitrogen is public water enemy #1, as nitrate contamination from unsewered housing and fertilizer use poses a threat to both drinking water supplies and coastal marine habitat and resources. Nitrogen-induced nutrient loading and eutrophication can lead to many negative impacts on estuarine environments including harmful algal blooms (HABs), hypoxia [little or…], and even anoxia [no oxygen];
2. Volatile organic chemicals (VOCs), another priority contaminant group, derived from commercial, industrial, and consumer use, impacting large portions of the aquifer, public water supply and private wells;
3. Pesticides pose a threat, especially to private wells in agricultural areas; and,
4. Pharmaceuticals and personal care products are an emerging concern.

Surface Water Impairments:

5. Due to excess coliform bacteria and nitrogen, many of the water bodies surrounding Suffolk County have been designated as impaired by the NYSDEC. In fact, the vast majority of Long Island's 60-mile long South Shore Estuary Reserve was declared impaired by the NYSDEC in 2010.
6. Brown tide algae invasions have been plaguing Long Island estuaries for nearly a quarter-century, according to Dr. Chris Gobler of Stony Brook's School of Marine & Atmospheric Sciences (SoMAS), obliterating a shellfish habitat that once provided one half of all hard clams for the nation.
7. There was an 18-36% loss of tidal wetlands between 1974 and 2001 according to NYSDEC.
8. The NYS Seagrass Taskforce estimates that the 200,000 acres of seagrass in Long Island's bays and harbors in 1930 have shrunk by nearly 90% to 22,000 acres.

The costs of redressing water-related issues are significant; the economic consequences of not doing so are potentially devastating in property values alone. Then there is Long Island tourism, producing revenues of $4.7B/yr, with approximately 28% of visitors – 5.1M/yr – visiting parks and beaches. "Coastal habitats shield people and property from sea-level rise and storms," reducing their exposure by half, according to marine ecologists at Stanford Woods Institute for the Environment.

Nitrogen from Unsewered Areas

Suffolk County, with a population larger than 11 states and a region that derives its drinking water from the ground, must pay particular attention to the 360,000 sub and non-performing septic/cesspools in Suffolk, accounting for well over 74% of the homes. They are particularly problematic in areas with high water tables and in close proximity to surface waters. When flooded or submerged in groundwater, septic systems do not function as designed and they fail to adequately treat pathogens. Excess nitrogen from sewage threatens our valuable natural resources, coastal defenses, and human health.

Suffolk County has identified priority high density (greater than 5 homes per acre) and medium density (1 to 5 homes per acre) residential subregions within the contributing areas with the following characteristics:

1. With a depth to groundwater of 10 feet or less; and/or
2. Contribute to an area that is listed as a 303(d) impaired water body.

Finally, the updated SCCWRMP settled on the following management goals, designed to protect groundwater and surface water resources:

> Water Resource Management Plan Goals
> The goals and objectives summarized on Table ES-1 are targeted to protect and improve ground and surface water quality in the coming years, recognizing that maintenance of these invaluable resources is vital to the health and economic well-being of Suffolk County residents, and to enable provision of a healthy and safe supply of potable water to County residents through 2030. Although it is acknowledged that full achievement of these goals within the next twenty years may not be realized, the recommendations presented in this document provide the framework for continued improvement of the County's water resources and provision of a reliable, high quality potable supply for future generations.
>
> The goals and objectives are consistent with County policy declarations that are articulated in the Suffolk County Sanitary Code:
>
> > *…760-701: "The designated best use of all groundwaters of Suffolk County is for public and private water supply, and of most surface waters for food production, bathing and recreation…it is hereby declared to be the policy of the County of Suffolk to maintain its water resources as near to their natural condition of purity as reasonably possible for the safeguarding of the public health, and to that end, to require the use of all available practical methods of preventing and controlling water pollution from sewage, industrial and other wastes, toxic or hazardous materials, and stormwater runoff" and*
> >
> > *760-401: "the policy of the County of Suffolk is to protect the groundwater to insure the availability of an adequate and safe source of water supply for generations to come by: enforcing the local, state and federal laws regulating water supply; promoting the extension of public water supply to all areas of the County; maintaining a process of groundwater planning; carrying out research and development in the field of alternatives to community water supply; and by promoting education and acceptance of the importance of groundwater management and protection."*

Green's Creek and Brown's River Watershed Management Plan (January 2007) - The Green's' Creek and Brown's River Watershed Management Plan (hereafter, "*the Green's Creek WMP*") was prepared by the Town of Islip in response to the preparation of the South Shore Estuary Reserve (SSER) Comprehensive Management Plan (see **Figure 2-8**). That document states as follows with respect to general surface water quality impacts that drove creation of the SSER Plan, and led to the Green's Creek WMP:

> The water quality of the creeks and bay has deteriorated as impervious surfaces have increased, in turn increasing surface runoff into the water bodies. Pollutant-laden runoff surface flows into wetlands or is collected into storm drain system where pipes and headwalls discharge it into the waterbodies. The runoff carries automotive oils, lawn fertilizers and pesticides, animal wastes, sediments, and garbage. The polluted runoff and heavy flows discourage native vegetation in the creeks, increased algae growth in the ponds, suffocate wildlife species, reduce aesthetics and

erode the shorelines. The pollutants are carried to the bay, where the negative effects continue on a larger scale.

The following description of the Green's Creek WMP and its recommendations is taken from the Executive Summary of that document.

This Watershed Management Plan (WMP) focuses on Green's Creek and Brown's River in the Town of Islip, Suffolk County, New York. Green's Creek and Brown's River are tributaries to the Great South Bay portion of the South Shore Estuary Reserve (SSER). The WMP characterizes the natural resources, habitats, and environment of the watersheds, identifies water quality and living resource impairments, recommends actions to protect the watersheds from further degradation, and develops a strategy to restore the watersheds. The plan also forms a framework to guide future decisions and provides a point of reference by which progress can be measured.

The overall goal of this WMP is the protection, restoration, and enhancement of water quality and living resources in Green's Creek and Brown's River.

For the Green's Creek and Brown's River corridors, the specific goals that will aid in achieving the overall goal are:

- Improve the water quality in the Green's Creek and Brown's River watersheds
- Improve the ecological health in the Green's Creek and Brown's River watersheds
- Enhance the eligibility of the watersheds for funding through participation in partnerships in regional environmental initiatives

Section 2, *Watershed Characterization,* includes review of the geographic setting, examination the water quality classifications, identification of the existing drainage infrastructure and connectivity and an outline of the municipal jurisdictions within the watersheds. Section 3, *Protection and Management Recommendations,* includes recommendations and actions that, if undertaken, can improve watershed habitat, increase community watershed knowledge, and reduce pollutant sources and levels. Section 4, *Pollutant Load Analysis and Restoration Actions,* includes analysis of pollutant loads from surface runoff at each outfall, recommendations for improvements and identification of specific target projects and actions. The final section, *Implementation Strategies,* identifies coordination efforts required, new codes, revisions to existing policies and programs, and sources of funding necessary to implement the proposed
actions and recommendations.

In order to advance the WMP's goals and objectives, this document recommends that a number of measures be undertaken. These recommendations are summarized as follows:

- *Habitat protection and management recommendations* including wetland and fish habitat restoration measures such as dredge spoils removal, tidal flow improvements, invasive species removal, hydrologic improvements, riparian buffers reestablishment, improvements to fish passage, instream habitat, and shoreline, and trout population research.
- *Educational and outreach recommendations* including increasing knowledge of pollution impacts to homeowners, boaters, and commercial establishments, expanding tributary

identification signage and providing interpretive exhibits, and expanding school watershed educational programs.

- *Point and nonpoint source pollution management and control recommendations* including increasing monitoring programs and educational efforts, implementing drainage area-wide structural control of the water quality storm event, and implementing non-structural programs for road maintenance, pest management and sanitary system review to reduce pollution loads generation.
- *Institutional recommendations* including establishing task forces and collaborative efforts with school and stakeholder organizations.

Several priority actions and target projects have been identified as having the greatest potential individual impacts on the water quality in the waterbodies. The priority actions include:

- improvements to infrastructure maintenance programs,
- fertilizer and pesticide use reduction through development of Integrated Pest Management (IPM) plans,
- land acquisition of sensitive parcels whose development would negatively impact the waterbodies; and,
- installation of drainage infrastructure that will capture and recharge or treat and release the water quality storm event (WQSE).

The greatest pollutant mitigation can be realized by focusing target projects on the subwatersheds identified as contributing the largest loads. The recommended target projects include:

- six locations under Town jurisdiction (Tariff Street, Jones Drive, and Brook Street on Green's Creek and Astor Drive, Valerie Court, and Amy Street on Brown's River) with a total estimated construction cost for implementing the proposed improvements on $590,000, and;
- six roadway drainage locations on Montauk Highway and Middle Road that are under Suffolk County jurisdiction and will total $1,750,000 in estimated construction costs.

As shown in **Figure 2-8**, according to the Green's Creek WMP, the project site is within the watershed of Green's Creek, but is not within the surface drainage boundary of Green's Creek, meaning that none of the runoff from the site reaches this surface water body. As such, with respect to surface flow of stormwater, there is no connection between the subject site and this surface water body; the subject site does not contribute to the water quality impacts currently experienced on either Green's Creek or the SSER.

The Green's Creek WMP includes a number of recommendations pertinent to governmental bodies, but does not provide any recommendations applicable or specific to the subject site.

2.2.2 Anticipated Impacts

Surface Water, Drainage/Flooding & the NURP Study

Surface Water - As there are no natural surface water bodies or wetlands on or tributary to or from the site, no such surface waters can or will be impacted by the proposed project.

Drainage/Flooding – Development of the site will result in a greater quantity of impervious surfaces than under existing conditions; however, the proposed project will also result in effective containment of drainage on the site based on stormwater storage for a design storm event. As a result, the quantity of runoff generated on-site will be increased as a result of the proposed project but will be directed to the on-site drainage containment system. Specifically, installation of an on-site drainage system to current design standards will ensure retention of drainage on the site based on an applicable design storm capacity and subject to review and approval of the Town Engineer during site plan review. As a result, potential impacts related to stormwater recharge that could leave the site and potentially impact neighboring properties at lower elevations will be managed through the installation of drainage as outlined herein and in **Section 1.4.2**.

All stormwater runoff generated on the property will be retained and recharged in a drainage system conforming to Town requirements, which includes the ability to requirement to handle 8 inches of runoff. While the project's drainage system is designed for 5 inches of storage, it is expected that the high percolation rate of the site's soils will enable the project's drainage system to handle the required 8 inches of runoff. As shown in the **Grading and Drainage Plan**, all stormwater will be collected as well as recharged within the site through a series of roadside catch basin and drywells, a 1.78-acre pond/retention area to be excavated in the center of the site and a drainage swale will be graded in the southeastern corner of the property. As shown in the plan, the system will have a capacity of 1,390,146.1 cubic feet (CF) of storage, exceeding the capacity of 1,034,970 CF for 5 inches of storage by 34.32%. The Town Engineering Department will review the system for sufficiency as part of the site plan review process.

This plan requires the post development peak runoff rates to not exceed the pre-development peak runoff rates for a 100-year storm. Since all stormwater will be disposed of on-site and be filtered by the natural sands that are present; no additional stormwater treatment devices will be required or installed.

The bottom of unlined retention pond will be 2 feet above the groundwater table. Any pond areas with less than two feet of separation between the bottom of the pond and groundwater will be lined along the bottom. The liner will be extended vertically along the slope of walls such that that the top of the liner will be a minimum of two feet above the groundwater. Whenever practical, swales and the pond will be interconnected to limit the potential of an overflow condition.

A detailed grading and drainage plan will be prepared as part of site plan application, subsequent to Town Board approval of the requested change of zone. The Town will be responsible for the review and approval of the drainage design, to be conducted during site plan review.

Potential stormwater impacts include erosion, sedimentation, direct overflow to surface water, and impaired quality of recharge water. Erosion and sedimentation will be controlled through design and the SWPPP, such that surface transport of sediment will not occur. There are no nearby water bodies, and the site will not generate direct runoff off-site as a result of the proposed stormwater containment and recharge system. Water quality impacts are not expected based on employment of best management practices for control of stormwater through containment and leaching systems that attenuate pollutants. As a result, no significant adverse impacts from stormwater have been identified.

As discussed in **Section 1.4.3**, The system will be designed to comply with SPDES requirements under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (hereafter, the "General Permit"). Based on existing developments in the area, local geologic conditions, and adequate depth to groundwater, subsoils are expected to be of suitable quality to allow efficient recharge of stormwater, subject to further evaluation during subsequent project review.

NURP Study (1982) - It is noted that approximately 92.2% of the site consists of vegetation and bare soils. Under the proposed project, impervious surfaces will be increased resulting in an increase in stormwater runoff which will require retention.

In conformance with Town of Islip requirements, all stormwater runoff generated by impervious surfaces will be retained on-site, and will be recharged to groundwater. The drainage system will be designed to accommodate at least 5 inches of storage. The Applicant will be requesting a Planning Board relaxation from the Town's Land Development and Subdivision ordinance design criteria requiring storage capacity for an 8-inch storm event. The Town will be responsible for the review and approval of the drainage design, to be conducted during site plan review.

The drainage system will be designed to comply with SPDES requirements under NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity and Chapter 47 of the Town Code.

Based on information presented in the NURP Study, the project's drainage system design is expected to be an appropriate means of handling stormwater. It is noted that the Syosset site did exhibit nitrogen concentrations of 2.55 mg/l in sediments associated with recharge facilities. While this is less than the drinking water standard for nitrogen of 10 mg/l, it is important to consider stormwater as a source of nitrogen in overall site recharge. The proposed project is in conformance with the applicable recommendations of the NURP Study in regard to the proposed stormwater recharge system.

Based upon information presented in the NURP Study, the increased recharge volume (discussed in detail below) is not anticipated to contain significant concentrations of pollutants. As noted above, in conformance with Town requirements, all stormwater runoff generated by

impervious surfaces will be retained on-site and would infiltrate through surface detention systems and subsequently be recharged to groundwater. The NURP Study found that any organic chemicals that may be present in stormwater generally volatilize on surfaces, and inorganic chemicals and bacteriological indicators are removed as recharge infiltrates through soil.

Based on project design through use of the stormwater system noted above, the proposed development of the site is not expected to have a significant impact to groundwater resources underlying the property and surrounding area as related to the recharge of stormwater runoff.

Hydrologic Conditions

Regionally, groundwater is observed to flow in a southerly direction and the depth to the water table has been found to range from eight to twenty-three feet below ground surface on the subject site. This provides an adequate unsaturated zone when considering project design through which recharge can percolate prior to reaching the water table, resulting in the attenuation and filtration of many potential pollutants. This conclusion is supported by the conclusions of the Nationwide Urban Runoff Program, for a site in medium-density residential use, which corresponds to that of the project site.

As discussed in **Section 1.4.5**, the proposed project is anticipated to generate a volume of sanitary effluent which is greater than the allowable flow for use of a septic system on the site, so that connection to an on-site STP is necessary.

The STP will be constructed to treat 377,000 gallons of sewage per day. The design flow for sewage generated on the project is estimated at 307,125 gpd. The STP will be designed to handle an additional 69,875 gpd of sewage from offsite sources.

The sewage treatment process will be a sequencing batch reactor. This process is commonly utilized in similar facilities throughout Suffolk County and long term operation of this types of system has demonstrated that effluent will routinely meet the NYSDEC SPDES requirements for reduction of nitrogen and suspended solids.

Treated effluent will discharge into a leaching pool groundwater disposal system. Due the relatively shallow depth from grade to the water table beneath the project site**,** the groundwater disposal system will be designed and installed in accordance with SCDPW standards for discharge to a disposal system with a high groundwater condition. There will be four separate leaching pool clusters, such that one leaching pool cluster can be held out of service at all times in reserve, to address any surge in demand. The groundwater disposal system will be designed for two hundred percent of the daily design flow. The complete installation of the groundwater disposal system will occur when the STP is constructed.

Approvals from the NYSDEC, SCDHS and Suffolk County Department of Public Works (SCDPW) will be required; review and approval of an Engineering Report and Construction Plans and

Specifications by the SCDHS and SCDPW would be required, ensuring that this facility will be designed, constructed operated in conformance to established regulations. Finally, the STP will be subject to a SPDES permit from SCDHS issued on behalf of the NYSDEC.

It is expected that the substantial increase in the acreage of impervious surfaces on the site will result in a substantial increase in the volume of stormwater runoff generated on-site, with an associated increase in the volume of water recharged to groundwater on-site. This will benefit groundwater resources, by increasing the amount of groundwater available for eventual use as potable water.

A Groundwater Mounding Analysis was prepared by PWGC for the proposed project, to *"…investigate the maximum height of a mound that will form below the leaching pools [for the STP] and to determine what, if any, local effects the mound will have on site and with regards to the surrounding area."* That report (see **Appendix E-10**) states as follows:

> The proposed sewage treatment plant (STP) will be capable of treating and discharging a peak daily flow rate of 377,000 gpd of wastewater. The plant effluent is proposed to be discharged to groundwater via a series of shallow 10-foot diameter leaching pools. Depth to groundwater in the area of where the STP effluent leaching pools are being considered is on the order of 8 feet. The shallow depth to groundwater, the large number of leaching structures proposed and the estimated peak daily design flow rate will create an artificial groundwater mound in the vicinity of the discharge field. This groundwater mounding analysis has been performed to investigate the maximum height of a mound that will form directly below the leaching pools and to determine what, if any, local effects the mound will have on site and with regards to the surrounding area.

With respect to the potential vertical rise in the water table as a result of effluent recharge, the analysis states as follows:

> The calculator output predicts a maximum 1.2-foot rise in the water table directly beneath the leaching area. A time period of 10 years was selected to provide a sufficiently long duration in order for the leaching system to reach steady state conditions (i.e., conditions are no longer changing with increasing time).
>
> As per SCDPW requirements the leaching pools need to be installed a minimum of 3 feet above the high historical groundwater elevation for the area. Based on the predicted maximum groundwater mound height the bottoms of the leaching pools should not become submerged due to saturated conditions. During periods of recharge as STP effluent leaches out of the bottoms of the pools the unsaturated zone between the pool bottoms and the water table will become wetted. As the area in and around the leaching pool fields is prohibited to be anything other than a grassed area per SCDPW requirements no utilities or building foundations should be impacted other than those associated with the STP.

The analysis calculated the horizontal distance that the mound of effluent recharged from the site could extend. The analysis states as follows in this respect:

Solving the equation… produces a result of 5,369 feet. This means that at this distance from the center of the leaching area after a significantly long period of time and at a constant recharge rate of 4.28 feet/day there will be no detectable increase in the water table. Again, this a very conservative analysis. The peak mounding conditions will occur directly under the center of the proposed leaching field on site at the Greybarn-Sayville development. The mound created will theoretically have a parabolic type of shape to it where it starts to drop off rapidly right after the extents of the leaching field and start to take on an asymptotic trajectory where it gradually returns to the natural water table at 5,369 feet from the center of the field.

The STP is proposed to have 600 shallow leaching pools with only 150 in service at a time. Thus, a rotational usage pattern could be established to reduce over usage of any particular grouping of leaching pools. The analysis assumes a constant recharge rate of 377,000 gpd, which is the proposed peak STP capacity. In reality, the plant will not operate at capacity very often and flows will likely constantly vary and be considerably lower than 377,000 gpd. The leaching pools will also be arrayed in a larger and more linear type of configuration than evaluated under this analysis, this will create an overall lower mounding height and with a lower mounding height it will also have less reach or effect in the horizontal direction as well.

Figure 3-5c shows that there are no public water supply wellfields within 1,000 feet of the subject site in the downgradient direction (south), and **Figure 3-5d** shows that this area is fully served by public water supplied by the SCWA (suggesting that there are no private potable water wells in this area). In consideration of these two conditions, it may be concluded that recharge generated on the project site will not impact the quality of groundwater that would be used for public or private use.

Groundwater Quality

The subject site is not located in any established Suffolk County, Town of Islip, or private Sewer District. While there exists a private STP east of Lakeland Avenue serving Sayville Commons, sewer district adjacent to the east, it does not have the capacity to meet the wastewater treatment needs of the proposed project. Thus, the proposed project is not able to utilize an existing public sewer system to convey its sanitary wastewater to an off-site STP for treatment and disposal.

Sanitary wastewater flow and discharge requirements are determined by the SCDHS, under the jurisdiction of SCSC Article 6, which also addresses sewage facility requirements for realty subdivisions, development and other construction projects in order to limit the loading of nitrogen in various groundwater management zones as established by the SCDHS. As promulgated under Article 6, a Population Density Equivalent must be determined for the site in order to determine the type of sewage disposal system that would be allowed for a proposed project. This equivalent (or total allowable flow) is then compared to the design sewage flow for the project. If the project's design sewage flow exceeds the Population Density Equivalent, a community sewerage system or on-lot sewage treatment system is required. If the project's design sewage flow is less than the site's Population Density Equivalent, a conventional

subsurface sewage disposal system may be used, provided individual systems comply with the current design standards and no community sewerage system is available or accessible.

The project site is located within Groundwater Management Zone VI as defined by the SCDHS. Based on the requirements of Article 6, if an on-site septic system is proposed, no more than 300 gallons may be discharged per acre (assumed for calculation purposes as 40,000 SF) on a daily basis within this zone. The site acreage used for determining this Population Density Equivalent must not include wetlands, surface waters, or land in flood zones. Therefore, as no such resources are present on the site, the net site area is 114.34 acres in size, and the Population Density Equivalent (total allowable flow) on the subject site is 34,290 gpd as determined in **Section 1.4.5**. As the project design flow of 307,125 gpd is greater than the allowable flow, the Applicant proposes to construct an on-site STP.

The following general description of the project's wastewater treatment system was prepared by the project's engineering consultant.

Sewage Collection, Treatment and Disposal

Sewage generated by the residences and the amenity spaces will be conveyed by a gravity sewer sub collection system to an on-site STP. The gravity sewer will be designed in accordance with the SCDHS, SCDPW and the Ten States Standards. Pipes will be constructed of PVC [poly vinyl chloride] pipe, and precast concrete manholes will be installed when there is a change in direction or size of the pipes, or to provide convenient access points to the collection system for maintenance personnel. Each ground floor residence will have a separate connection to the sewer collection system. Residences located above the ground floor will share a sewer house connection.

All sewage generated on-site will flow from the sewage collection system into a sewage pumping station adjacent to the proposed STP. The pumping station will convey sewage to the holding tanks, screens and process tanks within the STP. The pumping station will be designed for a flow rate of 377,000 gpd. The design flow for the project is estimated at 307,125 gpd. The pump station will be designed to handle an additional 69,875 gpd of flow from off-site sources [see below]. The installation of the collection system will occur in phases since land grading activities will be required to ensure sewer pipes are installed in conformance with regulatory requirements. Sewer pipes installed underneath the main access roadways will be installed when that roadway is constructed.

The STP will be constructed to treat 377,000 gallons of sewage per day. The design flow for sewage generated on the project is estimated at 307,125 gpd. The STP will be designed to handle an additional 69,875 gpd of sewage from offsite sources.

The STP will be completely enclosed within a building. The building will have architectural features and exterior fenestrations to mimic a barn. The sewage treatment process will be a sequencing batch reactor. This process is commonly utilized in similar facilities throughout Suffolk County and long term operation of this types of system has demonstrated that effluent will routinely meet the NYSDEC SPDES requirements for reduction of nitrogen and suspended solids.

The STP will be constructed at the commencement of the project [i.e., as part of Phase 1]. The process tanks will be constructed of reinforced concrete. A total of six tanks will be constructed. Four tanks will be process tanks and will permit operation of the treatment plant at the lower flows while construction of the residential units proceeds in phases. As additional residences become available and sewage flows increase, additional process tanks will be put online. The sewage treatment plant will have additional process tanks to store influent flow such that processing of the sewage can continue during low influent flows. This will significantly improve the effluent quality. A separate process tank will store waste activated sludge. Waste activated sludge will be removed from the site on a monthly or longer basis by a waste hauler for additional offsite processing. The sewage treatment plan will have both influent and effluent screens. The effluent screens will further reduce the concentration of suspended solids such that it will reduce the size and maintenance requirements of the leaching pool groundwater disposal system. . Standby power will be designed and installed such that the sewage treatment plant will be operation in the event of a primary power failure.

Treated effluent will discharge into a leaching pool groundwater disposal system. Due the relatively shallow depth from grade to the water table beneath the project site [see **Section 2.1.1],** the groundwater disposal system will be designed and installed in accordance with SCDPW standards for discharge to a disposal system with a high groundwater condition. There will be four separate leaching pool clusters, such that one leaching pool cluster can be held out of service at all times in reserve, to address any surge in demand. The groundwater disposal system will be designed for two hundred percent of the daily design flow. The complete installation of the groundwater disposal system will occur when the STP is constructed.

The proposed STP has been designed with a capacity in excess of the volume of wastewater expected from the proposed project (307,125 gpd), as well as additional capacity to handle the 69,875 gpd from the downtown hamlet businesses. Thus, the STP will have a capacity of 377,000 gpd.

Approvals from the NYSDEC, SCDHS and Suffolk County Department of Public Works (SCDPW) will be required; review and approval of an Engineering Report and Construction Plans and Specifications by the SCDHS and SCDPW would be required, ensuring that this facility will be designed, constructed operated in conformance to established regulations. Finally, the STP will be subject to a SPDES permit from SCDHS issued on behalf of the NYSDEC.

As noted in **Section 1.2.5**, as one of the Community Benefits, the proposed project includes extension of a sanitary sewer line from the on-site STP to the downtown Sayville hamlet center south of the site, so that this area can be served by the project's tertiary STP. This benefit will have the effect of providing treatment for the downtown area for water quality benefits, and will assist in encouraging growth in the downtown area by making wastewater treatment available. The benefit of the conveyance pipe and treatment capacity will come with no public cost; however, the individual connections to the new system would be borne by each landowner.

It is expected that the new sewer line (4-inch diameter force main) would run from the STP easterly to Lakeland Avenue, then south beneath that roadway south to Montauk Highway (Suffolk County Route 85). From that intersection, 4-inch force mains will run east to Hanson Place, and westerly to West Lane (see **Appendix A-~~7~~6**). As part of the Community Benefits of the proposed PDD, the Applicant will provide the portion of the sewer main beneath Lakeland Avenue, from the project site to Montauk Highway.

Nitrogen Budget - Utilizing the same mass balance model described in **Section 2.2.1**, the water balance and concentration of nitrogen in recharge were calculated for the proposed project. **Table 1-5a** provides tabulations of existing and proposed site conditions, respectively. These coverage quantities were used in the SONIR model to obtain the results described herein.

The SONIR computer model results for the proposed project (**Appendix E-3**) indicate that a total of 237.85 MG/yr of water will be recharged on the site. The concentration of nitrates (as nitrogen) in this recharge is determined to be 5.02 mg/l for the proposed project as compared to 5.45 mg/l for pre-existing conditions when the golf course was in operation and 0.72 mg/l for the current fallow golf course conditions. The nitrogen load associated with the proposed project is 9,951.00 lbs/year. The concentration and load include the additional treatment capacity for the downtown Sayville area as will be described below. This represents an increase over the pre-existing condition when the golf course was in operation which was 4,052.39 lbs/year and 499.84 lbs/year for the current fallow golf course.

In order to offset and mitigate the increase in nitrogen load associated with the proposed project, the proposed project includes installation of a sewer main and expanded STP capacity to treat 69,875 gpd of wastewater from downtown Sayville (which is accounted for above). For comparison purposes, discharge of this wastewater would have an untreated concentration of 50 mg/l[2], as compared with a treated concentration of 8 mg/l. This results in a substantial reduction of nitrogen within the same watershed. Downtown Sayville is located nearer to Great South Bay and Green's Creek. The removal of this effluent from downtown Sayville, with conveyance to the STP on the subject site, and treatment to 8 mg/l with on-site discharge at that concentration represents a substantial water quality benefit. Groundwater as well as downgradient surface water impacts will be reduced as a result of the treatment of this effluent.

This benefit is quantified on Sheet 4 of **Appendix E-3**, which demonstrates that the reduction in nitrogen 7,237.16 lbs/year. When removed from the project nitrogen load of 9,951.00 lbs/year, the resultant reduced load is 2,713.84 lbs/year. When factoring in the reduction in load, the concentration of nitrogen in recharge is reduced to 1.37 mg/l. The project will have

[2] SCDHS General Guidance Memo #28 includes guidelines for siting proposed or expanded STPs; this memo indicates: "A total nitrogen concentration of 50 mg/l may be used when calculating the equivalent mass loadings."

substantially less nitrogen load that the pre-existing conditions when the golf course was in operation.

A summary of the nitrogen impact assessment results is provided in **Table 2-8** below.

TABLE 2-8
NITROGEN IMPACT ASSESSMENT RESULTS

Parameter	Existing Prior Golf	Existing Fallow Land	Proposed Pre-Mitigation	Proposed With Mitigation
Nitrogen Concentration (mg/l)	5.45	0.72	5.02	1.37
Nitrogen Load (lbs)[2]	4,052.39	499.84	9,951.00	2,713.84

This analysis indicates that the proposed project will have a substantial beneficial impact with respect to nitrogen in water quality, particularly when compared pre-existing golf use conditions. No significant adverse nitrogen impacts are expected based on the proposed mitigation.

Other Potential Sources of Impact - The project Applicant is responsible for the operation of other project sites on Long Island. The partially completed Greybarn project in Amityville is an example of one of these properties. R Squared contracts with a landscape service contractor to have all landscape and turf maintenance done by a professional company that adheres to rigid industry standards.[3] Fertilization is properly applied after adjusting the pH of soil to maximize plant uptake of nutrients. Well maintained turf results in maximum uptake of nitrogen. Fertilizer is costly to apply and as a result is used judiciously to only apply what is necessary to maintain healthy turf. This reduces the application of fertilizer, and also reduces the amount that is leached through the root zone to groundwater. Nitrogen in fertilizer is applied at 0.25 lbs/1000 SF, four times per year, for a total of 1.0 lbs/1000 SF. This coupled with the reduced area of fertilized landscape results in a low concentration of nitrogen attributable to landscaping. Typically residential nitrogen application is in the range of 2.04 lbs/year. When compared with a subdivision of homeowners, with each homeowner applying fertilizer to achieve a green lawn, the fertilization under the proposed Greybarn at Sayville project will be less.

Other use of chemicals is similar. Individual homeowners can apply as much crabgrass preventer/pre-emergent chemical and/or Roundup® weed killer as they wish, simply by purchasing and applying the materials. No license is required to apply chemicals and there are no limits on the herbicide/pesticide chemicals that can be applied. The proposed project will be managed through a contract with a landscape company that adheres to stringent industry

[3] Greybarn uses Wade Associates, Inc. for landscape maintenance. Conversations with the principal, Gus Wade on November 12, 2018 provided information to further the understanding and assessment of landscape maintenance.

standards. Landscape contractors are trained in the proper use of chemicals to minimize application rates and maximize effectiveness in achieving the purpose of pest control and properly maintained landscaping. There is a practical side in that reducing the application of landscape maintenance products also reduces cost to the operator. The end result is that less chemical product is applied by a landscape service contractor than a typical homeowner.

In the case of Greybarn at Sayville, a contractor will be used and that company has trained personnel, NYSDEC licensed herbicide/pesticide applicators and any use of chemicals is consistent with recommended rates of the manufacturer. Any lawn/landscape care will involve limited use of pre-emergent (crabgrass preventer), weed control, insect control and spot use of Roundup®. The selected contractor indicates that a typical regimen of application involves application of lime 1 time/year at a rate of 0.5 lbs/1000 SF for pH adjustment to maintain healthy turf. Roundup® may be applied; however, this is a spot, foliar application, only on sunny days and the product controlling the target plants is also subject to evaporation and lack of transport. Pre-emergent is applied two times per year on turf and one time per year on landscape beds, primarily during the spring season. Broad-leaf weed control is used on a spot basis for effective control. Insect control may be used one time per year typically in July.

It is noted that no storage or mixing of chemicals will occur on-site, as the landscape contractor stores and mixes any application materials and brings them to the site. The practices noted above are typical of all lawn/landscape maintenance conducted by landscape contractors. These practices are intended to maximize effectiveness and minimize use of product and will be completed by trained personnel, NYSDEC licensed pesticide applicators, and in conformance with label instructions. All landscaping requires maintenance and such maintenance practices are typical for all types of development. As discussed herein, the use of a landscape maintenance contractor is expected to reduce use of chemicals as compared with use of the site under single family residential zoning. There is also a reduction in application of fertilizers and pest controls as compared to the prior golf course use, which would have involved more intensive turf maintenance practices to support golf use and play. Given the information presented herein, no significant adverse impact is expected with respect to other potential source of impact involving chemical storage and use.

Water Resources Plans and Studies

208 Study - The Site is located in Groundwater Management Zone VI. It is recommended in the 208 Study that development in this zone utilize public sewers if available, or provide for wastewater collection/treatment with nitrogen removal. Therefore, as noted above, the proposed development will direct all sanitary wastewater to an on-site sewage treatment facility. As a result, the proposed project will be designed to implement those recommendations of the 208 Study that involve groundwater protection and best management practice for protection of water supply and management of wastewater, and therefore no adverse impacts are anticipated.

Suffolk County Comprehensive Water Resource Management Plan (2015) - The following lists the Goals of the updated SCCWRMP that pertain to the proposed project, along with brief discussions as to the project's conformance to each.

Groundwater Resource Management Goals

GOAL 1: All groundwater shall be in compliance with the stricter of New York State Ambient Groundwater standards and guidance values or Maximum Contaminant Level Goals (MCLGs) to the greatest extent feasible and practical. Water quality that is better than the existing standards should be preserved, to the greatest extent feasible and practical.
This Goal is addressed to regulating agencies and public water suppliers. However, the proposed project will support this Goal to the extent that it will conform to SCSC Article 6 and Article 12 requirements, which will minimize potential adverse impacts to groundwater quality.

GOAL 2: Nitrogen loading should be reduced to the greatest feasible and practical for the protecting of current and future drinking water supplies and to restore/maintain ecological functions of streams, lakes, estuaries and marine waters. Arrest and reverse the trend of increasing nitrogen concentrations in ground and surface waters to the greatest extent feasible and practical by decreasing the nitrogen loading from septic systems and fertilizers.
Nitrogen loading to groundwater is reduced to the greatest extent practicable by providing a tertiary STP for the proposed project. This will help slow the trend of increasing nitrogen added to the aquifer, and the project will remove an existing source of nitrogen impact to the watershed by providing sewering capabilities for downtown Sayville. Fertilizer use is limited to 12.02 acres (10.5%) of the site, and proper turf management will ensure maximum uptake of nutrients by turf grass.

GOAL 3: Concentrations of other regulated and unregulated contaminants in groundwater should be minimized to the greatest extent feasible and practical, to protect current and future drinking water supplies and to restore/maintain ecological functions of streams, lakes, estuaries and marine waters. Reduce the discharge of volatile organic compounds and other regulated and unregulated contaminants to groundwater.
The proposed project will support this Goal to the extent that it will conform to SCSC Article 6 and Article 12 requirements, which will minimize potential adverse impacts to groundwater quality. In addition, since the project is residential in nature, few potentially toxic or hazardous substances would be present or used on the site.

GOAL 4: Land use patterns should be consistent with the protection of the County's groundwater and surface water resources, including the protection of existing and future drinking water supplies.
The proposed project will provide a land use pattern that is in keeping with protection of groundwater and surface water resources. The project will retain natural vegetation, limit fertilizer dependent vegetation, and will provide for the development of an STP which will be designed with extra capacity to accommodate off-site sources. This will allow the project to conform to the SCCWRMP with respect to minimizing nitrogen impacts originating in unsewered areas. The project will therefore provide measures for protection of existing and future drinking water supplies.

GOAL 5: Groundwater quality and quantity should be maintained to protect and preserve the County's drinking water supply and natural resources.

*Nitrogen budget modeling (see **Table 5-1**) shows that the proposed project will have lower amounts of and concentrations of nitrogen in its recharge than would be the case for either use of the site under existing zoning or the prior golf course operation. Based on water resource evaluation of the project, no adverse water resource impacts are anticipated and therefore, the proposed project will protect and preserve the County's drinking water supply and natural resources.*

GOAL 6: Groundwater levels should be maintained to protect and preserve the long-term sustainability and ecological functions of existing surface water resources.
The proposed project is not expected to change groundwater levels as a result of proper STP design well in conformance with Town and County regulations. Site use is dispersed such that recharge will be distributed around the site and thus is not expected to impact groundwater elevations.

Drinking Water Supply Goals
GOAL 2: A community public water supply should be available to all Suffolk County residents.
This Goal is addressed to regulating agencies and public water suppliers. It is noted that the proposed project will connect to the public water supply network of the SCWA for drinking water purposes, and will provide necessary connections to that network.

GOAL 3: Residential and commercial irrigation should be managed to reduce peak demands on water supply infrastructure.
Irrigation water for the project will be provided either by the existing well that previously serviced the Island Hills Golf Course, or by a new on-site irrigation well that would be installed for the proposed project. The existing well and pump is permitted by NYSDEC, and has a capacity of 750 gallons per minute. The existing well is located adjacent to Bohemia Parkway south of 11th Street. The existing well and pump can adequately meet the irrigation requirements for this project. A new irrigation distribution system will be installed to service the landscape areas and the main landscaping pond. Irrigation water will be utilized to maintain turf lawns and vegetation in these areas. The SCWA is aware the potable water system will not be used for irrigation purposes. The project sponsor is aware the SCWA will require notification if potable water will be utilized for irrigation purposes. The irrigation well system will be independent of the SCWA system and therefore will not affect peak demands of the SCWA for drinking water supply.

Wastewater Management Goals
GOAL 1: Improve groundwater quality to maintain a potable water supply to serve existing and future populations by reducing effluent nitrogen loads from existing and future onsite sewage disposal systems and sewage treatment plants.
Nitrogen loads have been modeled and determined to not cause a significant adverse impact. Nitrogen loads are decreased as a result of the proposed STP, fertilizer dependent limitations, and proper turf management as well as providing sewage conveyance and treatment for downtown Sayville.

GOAL 3: Reduce and/or eliminate the impacts of pharmaceuticals and personal care products from wastewater effluent for increased public health and marine life protection.
The STP for the proposed project will be designed, constructed , operated and maintained under the purview of appropriate County and NYS agencies, and will be subject to review and permitting procedures of the SCDHS, SCDPW and NYSDEC. At the present time, an STP is not required by these reviewing entities to treat wastewater for discarded pharmaceuticals and/or personal care products.

The proposed project is not of a type that would tend to increase the potential for illicit discarding of pharmaceuticals and personal care products any more than development under the site's existing zoning.

GOAL 4: Provide development opportunities for continued economic growth to support future population growth while limiting wastewater nitrogen discharge.
The project will increase tax revenue to taxing jurisdictions including the school district. The project will provide needed housing opportunities for workers in businesses in the Town and community, will provide consumers for local business and will increase employment opportunities providing a significant economic benefit from construction, operation and beneficial ripple effect on the economy. The project limits wastewater discharge impact through use of an STP for on-site sanitary waste treatment as well as provision for treatment of wastewater from downtown Sayville.

Green's Creek and Brown's River Watershed Management Plan (January 2007) - As discussed above and demonstrated by **Figure 2-8**, while the subject site is within the Green's Creek Watershed, it is not within the surface drainage area of Green's Creek. This means that stormwater runoff generated on the site does not flow from the site to reach this surface water body, either by surface flow or through public storm sewer system outfall. As required by Town Code, the proposed project will include a drainage system that will retain and recharge all stormwater on the site, so that the proposed project will not contribute to the water quality impacts currently experienced by Green's Creek.

2.2.3 Proposed Mitigation

- In conformance with the Town of Islip requirements, all stormwater runoff generated on developed surfaces will be retained on-site, to be recharged to groundwater through the proposed drainage system for the project. This system will be subject to detailed review by Town engineering staff during the site plan review process, ensuring that no impacts will occur to off-site properties. As such, no additional mitigation measures are necessary or proposed.
- Adherence to the proposed SWPPP (to be prepared for the SPDES General Permit and would include an erosion control plan) would ensure that stormwater generated during the construction period is controlled, and that erosion and its associated impacts is minimized. As such, no additional mitigation measures are necessary or proposed.
- Provision of an on-site STP which will be designed with extra capacity to accommodate off-site sources will mitigate impacts to groundwater quality from any on-site recharge of sanitary wastewater. The applicant will construct this STP, and will install 10,300 feet of conveyance pipe as well as expanded treatment capabilities to serve downtown Sayville with wastewater treatment.
- No significant increase in the potential for adverse impact on groundwater quality is anticipated from accidental spillage or release of toxic or hazardous chemical substances. The nature of the proposed residential use is such that no toxic or hazardous materials (other than common household cleaners) would be present or used on the project site.

2.3 Ecology

2.3.1 Existing Conditions

Vegetation

The project site is predominantly developed with a golf course and associated landscaping. Areas of natural vegetation exist in patches throughout the property. The site is primarily surrounded by residential development. Contiguous vegetation in the area generally does not exist, as the landscape is highly fragmented due to the existing residential development, with the exception of the West Sayville National Wildlife Refuge that lies to the southwest of the project site.

The 114.34 acre subject parcel was inspected on May 29, 2018 and August 17, 2018. ~~Qualifications of NP&V staff that inspected the subject parcel are included in **Appendix G-1**.~~ The ecological inspections were conducted during early morning hours generally around 7-9 AM in order to target the browsing, feeding and activity periods when wildlife would be expected to be observed. Inspections were conducted during spring and summer periods using the random transect method which seeks out wildlife activity in expected areas based on habitat, canopy, shrub and groundcover vegetation, and the level of activity in the surrounding area. This method is opportunistic in terms of visiting each habitat type on the property and recording observations of wildlife that is observed directly or detected by calls or other evidence. Personnel trained in wildlife observations completed the survey and recorded species based on the survey. Since it is not possible to observe all wildlife that may be expected, information recorded during these inspections is noted in species lists included in this section, and is supplemented by additional information including natural research of species expected based on Long Island habitat types, information from the NY Breeding Bird Atlas, and contact with the NY Natural Heritage Program, as referenced in this section. Qualifications of NPV staff that inspected the subject parcel are included in **Appendix G-1** and supplemental information is contained in **Appendices G-2** through **G-6**.

The majority of the site is fallow golf course that remains subject to mowing. As a result, areas of the project site developed with the golf course and associated facilities can best be described as Mowed Lawn, Mowed Lawn with Trees, and Paved and Unpaved Paths/Roadways as defined by **Edinger *et al.* 2014**. The small remaining natural areas within the property can best be described as Pitch Pine-Oak Forest and Successional Southern Hardwood Forest as defined by the classification system developed by the NYSDEC **(Edinger *et al.*, 2014).**

The Island Hills Country Club main building and club member facilities are located in the northeast corner of the property. A small shed is located in the center of the property and the remaining maintenance facilities are located in the southwest corner of the site along Bohemia Parkway. There are two locations where previously wooded areas are used for the dumping of landscape debris. The remainder of the development area is landscaped and maintained as the golf course. **Figure 2-9** provides a habitat map of the subject property. The existing site habitat

quantities as determined by aerial photography and field inspections by ~~NP&V~~NPV are presented in **Table 2-8** and changes in habitat quantities will be described further herein. Below is a detailed description of the habitat types found on site along with a list of species present or expected on the site.

Edinger (2014), defines Successional Southern Hardwood Forest as *"a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees and shrubs include any of the following: American elms (Ulmus americana), slippery elm (Ulmus rubra), white ash (Fraxinus americana), red maples (Acer rubrum), box elders (Acer negundo), silver maple (Acer saccharinum), sassafrass (Sassafras albidum), gray birch (Betula populifolia), hawthorns (Crataegus spp.), eastern red cedar (Juniperus virginiana), and choke-cherry (Prunus virginiana). Certain introduced species are commonly found in successional forests, including black locust (Robinia pseudo-acacia), tree-of-heaven (Ailanthus altissima), and buckthorn (Rhamnus cathartica). Any of these may be dominant or codominant in a successional southern hardwood forest. This is a broadly defined community and several seral and regional variants are known."* Species found within this habitat type include multiflora rose (*Rosa multiflora*), sassafrass (*Sassafrass albidum*), black cherry (*Prunus serotina*), white oak (*Quercus alba*), and tree-of-heaven (*Ailanthus altissima*). As evidenced in historic aerial photographs included in **Appendix G-2,** the area dominated by this forest type was previously cleared. As a result of the previous clearing in this area and subsequent lack of maintenance, this forest type became established within a 6.50 acre portion of the overall site.

Edinger (2014) defines Pitch Pine-Oak Forest as *"a mixed forest that typically occurs on well-drained, sandy soils of glacial outwash plains or moraines; it also occurs on thin, rocky soils of ridgetops. The dominant trees are pitch pine (Pinus rigida) mixed with one or more of the following oaks: scarlet oak (Quercus coccinea), white oak (Q. alba), red oak (Q. rubra), or black oak (Q. velutina). The relative proportions of pines and oaks are quite variable within this community type. Examples can range from having widely spaced pines that are often emergent above the oak canopy to a nearly pure stand of pines with only a few widely spaced oak trees. The shrub layer is well-developed with scattered clumps of scrub oak (Quercus ilicifolia) and a nearly continuous cover of low heath shrubs such as lowbush blueberries (Vaccinium pallidum, V. angustifolium) and black huckleberry (Gaylussacia baccata). The herbaceous layer is relatively sparse; characteristic species are bracken fern (Pteridium aquilinum var. latiusculum), wintergreen (Gaultheria procumbens), and Pennsylvania sedge (Carex pensylvanica)."* Species found within this habitat include Pitch Pine *(Pinus rigida),* White Oak *(Q. alba)* and Red oak *(Q. rubra).* Most of the area which includes this dominant forest type was left untouched since 1948 as seen in the historic aerial photographs included in **Appendix G-2.** As a result of the lack of clearing in these locations, the Pitch Pine-Oak forest is present over 8.44 acres of the project site.

It is noted that natural areas of the site are fragmented and mostly near the perimeter of the site. Consequently, these areas are subject to off-site impacts such as automobile traffic, domestic pets and activities occurring in the yards of adjoining residential properties. In

addition, these areas are bordered by the golf course which operated from approximately 1938 to 2015. The golf course was subject to mowing and turf care practices including fertilization and pest control, as well as the stresses of golf play. As a result, natural areas on the site are not considered pristine and are compromised as a result of these existing influences.

The remainder of the site is comprised of landscaped areas, previously functioning ponds, unvegetated clearings, and impervious surfaces/structures. **Table 2-9** below provides the quantities of the habitats encountered on the site.

Appendix G-3 presents a list of vegetation observed or expected on site given the habitats present; it is based upon field investigations conducted by ~~NP&V~~NPV on May 29, 2018 and August 17, 2018. This list is not meant to be all-inclusive but was prepared as part of several field inspections to provide a detailed representation of what is found on site. Care was taken to identify any species that might be unusual for the area.

TABLE 2-9
HABITAT QUANTITIES
Existing Conditions

Coverage Type	Existing Conditions	
	Coverage (acres)	Percent
Landscaped	**90.05** (1)	**78.76**
Natural	**14.94**	**13.07**
Water Surfaces	**0.15** (2)	**0.13**
Unvegetated	**3.86**	**3.37**
Pervious Paths	0.28	0.25
Sand Traps	2.80	2.45
Cleared	0.77	0.67
Paved Surfaces	**4.38**	**3.83**
Building Footprint	**0.96**	**0.84**
Total	**114.34**	**100.00**

(1) All existing landscaping is not irrigated or fertilized.
(2) Composed of decorative ponds adjacent to golf course clubhouse.

Wildlife

Site inspections were performed on May 29, 2018 and August 17, 2018 by ~~NP&V~~NPV staff, whose qualifications can be found in **Appendix G-1**. Relatively few wildlife species other than song birds were observed on site, although it is expected that the woodland and terrestrial cultural habitats on the property should support a number of wildlife species common to suburban habitats, particularly those species that are more tolerant of human activity. Species that avoid humans and/or those species that are sensitive to development are less likely to inhabit the site. The following paragraphs describe the wildlife observed or expected on site. Further detail regarding potential wildlife on site and adaptability to a change in habitat is provided in **Appendix G-4**.

Birds- Avian species which might be expected on the property include a variety of woodpeckers, wrens, titmice, nuthatches, thrushes, creepers, flycatchers, swallows, warblers, corvids, thrashers, orioles and blackbirds, doves, starling, grosbeaks, finches, towhees and sparrows. During the warmer months, a variety of warblers may also migrate into the area. Owls and raptors may use the site for hunting and limited numbers may breed in the surrounding areas. The subject site is not expected to be critical habitat for any avian species utilizing the site.

During the site visits, northern cardinals, blue jays, mourning doves, chickadees, mocking birds and a red-tailed hawk were all seen or heard on site. During a site visit conducted by the Applicant's Director of Environmental Affairs, Wild turkeys (*Meleagris gallopavo)* were

identified within the project site. In order to provide a more detailed representation of the avian species potentially present on site, the NYS Breeding Bird Atlas was reviewed to obtain data from the 2000-2005 Breeding Bird Survey for the census block encompassing the subject parcel (**Appendix G-5)**. This study surveyed the entire State by 25 km² census blocks over a five-year period (2000 to 2004) to determine the bird species which breed within the State. Most of the species listed by the NYSDEC breeding bird survey are likely to be found on site. No unique species or species of special concern are expected given the surrounding site uses. The bird species either identified or expected to use the site are listed in **Appendix G-4** site. **Table 2-10** below contains a summary of the expected bird species to be found on the property.

TABLE 2-10
BIRD SPECIES

	cedar waxwing	*Bombycilla cedrorum*
	great horned owl	*Bubo virginianus*
*	red tailed hawk	*Buteo jamaicensis*
*	northern cardinal	*Cardinalis cardinalis*
	American goldfinch	*Carduelis tristis*
	house finch	*Carpodacus mexicanus*
	yellow-billed cuckoo	*Coccyzus americanus*
	Northern flicker	*Colaptes auratus*
	Northern bobwhite	*Colinus virginianus*
	rock pigeon	*Columba livia*
	Eastern wood-pewee	*Contopus virens*
	American crow	*Corvus brachyrhynchos*
*	blue jay	*Cyanocitta cristatta*
	chestnut-sided warbler	*Dendroica pensylvanica*
	yellow warbler	*Dendroica petechia*
	gray catbird	*Dumetella carolinensis*
	willow flycatcher	*Empidonax traillii*
	common yellowthroat	*Geothlypis trichas*
	barn swallow	*Hirundo rustica*
	wood thrush	*Hylocichla mustelina*
	Baltimore oriole	*Icterus galbula*
	orchard oriole	*Icterus spurious*
	Eastern screech owl	*Megascops asio*
	red-bellied woodpecker	*Melanerpes carolinus*
**	Wild turkeys	*Meleagris gallopavo*
	song sparrow	*Melospiza melodia*
*	northern mockingbird	*Mimus polyglottus*
	black-and-white warbler	*Mniotilta varia*
	brown-headed cowbird	*Molothrus ater*
	great-crested flycatcher	*Myiarchus crinitus*
*	black-capped chickadee	*Parus atricapillus*
	tufted titmouse	*Parus bicolor*
	house sparrow	*Passer domesticus*

Rose-breasted grosbeak	*Pheucticus ludovicianus*
downy woodpecker	*Picoides pubescens*
hairy woodpecker	*Picoides villosus*
rufous-sided (eastern) towhee	*Pipilo erythrophthalmus*
rose-breasted grosbeak	*Pheucticus ludovicianus*
black-capped chickadee	*Poecile atricapillus*
common grackle	*Quiscalus quiscula*
ovenbird	*Seiurus aurocapilla*
white-breasted nuthatch	*Sitta carolinensis*
chipping sparrow	*Spizella passerina*
field sparrow	*Spizella pusilla*
European starling	*Sturnus vulgaris*
brown thrasher	*Toxostoma rufum*
house wren	*Troglodytes aedon*
American robin	*Turdus migratorius*
eastern kingbird	*Tyrannus tyrannus*
blue-winged warbler	*Vermivora pinus*
red-eyed vireo	*Vireo olivaceus*
* mourning dove	*Zenaida macroura*

* Species observed on site by ~~NP&V~~NPV staff.
** Species observed on site by Applicant's staff

Mammals - The habitats found on the proposed project site are expected to support a number of mammal species. Small rodents and insectivores such as mice, shrews and voles are expected to be the most abundant mammals, but the property and surrounding area should also support larger mammals. White-tailed deer nesting site and the eastern gray squirrel were observed on the subject site.

A list of the mammal species that are expected to occur on the property is provided in **Appendix G-4**. This list is not meant to be all-inclusive but is intended to provide a list of the most common species. **Table 2-11** below lists ~~a summary of the contains~~ a summary of the expected mammal species to be found on the property.

Amphibians and Reptiles - Considering the current condition of the site and the lack of water in the existing ponds, this site is not expected to provide a sustainable habitat for amphibian species. However, there are two toads that are common on Long Island in upland habitats. The spadefoot toad occurs in woods, shrublands and fields with dry, sandy loam soils, and breeds in temporary pools **(Behler and King, 1979)**. The Fowler's toad prefers sandy areas near marshes, irrigation ditches and temporary pools. These species are the most likely amphibians to be present on the site given proper living conditions. Salamanders and frogs may have also potentially utilized the ponds on the property during the golf course operations at the site; however, no amphibian species were visually observed during the site visits as the ponds contained no water at the time. Species that were not observed during these surveys, but

would be expected based on site habitat are included in the species list found in **Table 2-12** in order to fully account for potential impacts to observed and expected amphibians and reptiles.

TABLE 2-11
MAMMAL SPECIES

short-tailed shrew	*Blarina breuicauda*
Virginia opossum	*Didelphis virginiana*
big-brown bat	*Eptesicus fuscus*
southern-flying squirrel	*Glaucimys volans*
silver-haired bat	*Lasionycteris noctivagans*
red bat	*Lasiurus borealis*
woodchuck	*Marmota monax*
striped skunk	*Mephitis mephitis*
meadow vole	*Microtus pennsylvanicus*
pine vole	*Microtus pinetorum*
house mouse	*Mus musculus*
long-tailed weasel	*Mustela frenata*
mink	*Mustela vison*
Keen's bat	*Myotis keenii*
little-brown bat	*Myotis lucifugus*
**white-tailed deer	*Odocoileus virginianus*
muskrat	*Ondarta zibethicus*
white-footed mouse	*Peromyscus leucopus*
Eastern pipistrelle	*Pipistrellus subflavus*
racoon	*Procyon lotor*
Norway rat	*Rattus norvegicus*
Eastern mole	*Scalopus aquaticus*
* Eastern gray squirrel	*Sciurus carolinensis*
masked shrew	*Sorex cinereus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern chipmunk	*Tamis striatus*
red fox	*Vulpes vulpes*
meadow-jumping mouse	*Zapus hudsonicus*

* Species observed on site by ~~NP&V~~NPV staff during field visits.
** Deer bed was located however the species was not present during field visits.

TABLE 2-12
REPTILE AND AMPHIBIAN SPECIES

Amphibians	
common gray treefrog	*Hyla versicolor*
Eastern spadefoot toad	*Scaphiopus holbrooki [s]*
Fowler's toad	*Bufo woodhousei fowleri*
American bullfrog	*Rana catesbeiana*
green frog	*Rana clamitans*
marbled salamander	*Ambystoma opacum [s]*
red-backed salamander	*Plethodon cinerus cinerus*
red-spotted newt	*Notophthalmus viridescens*
spotted salamander	*Ambystoma maculatum*
spring peeper	*Hyla crucifer*
wood frog	*Rana sylvatica*
Reptiles	
common snapping turtle	*Chelydra serpentina*
Eastern box turtle	*Terrepene Carolina [s]*
Eastern garter snake	*Thamnophis sirtalis*
eastern milk snake	*Lampropettis d. triangulum*
Eastern ribbon snake	*Thamnophis s. sauritus*
Northern ringneck snake	*Diadophis punctatus*
Northern water snake	*Natrix sipedon sipedon*
painted turtle	*Chrysemys picta*
stink pot	*Sternotherus odoratue*

[s] NYSDEC special concern species
* Species observed on site by ~~NP&V~~NPV staff

Several species of reptiles might potentially be found on the property, including the eastern garter snake, and eastern milk snake (**Wright, 1957**). All of these species are terrestrial species found in a variety of habitats. The garter snake is relatively tolerant of human activity, but prefers moist soils and would have been present near the small ponds to the northeast of the property. The milk snake is found in soils of varying moisture content. These snakes are all colubrid snakes, which feed on whole animals such as worms, insects or small amphibians (**Behler and King, 1979**). The larger milk snake will also take small rodents and birds (**Behler and King, 1979**).

The only turtle species common to terrestrial habitats on Long Island (although listed in New York State as a species of special concern) is the eastern box turtle, which requires very little water (**Obst, 1988**). The species is found in a variety of habitats and prefers moist woodlands. The box turtle feeds primarily on slugs, earthworms, wild strawberries and mushrooms (**Behler and King, 1979**). The similar wood turtle utilizes both aquatic and terrestrial habitats but is restricted to eastern Long Island (**Conant and Collins, 1991**).

A list of reptile species that might occur on site given the existing habitats is included in **Appendix G-4**. This list is not intended to be all-inclusive but provides a detailed representation of what is or is likely to be found on site.

Rare and Endangered Species Potential

No rare, threatened or endangered plants were observed on site. The NY Natural Heritage Program (ECL 9-1503) was contacted to determine if there is any record of rare plants, habitats or wildlife in the vicinity. The Natural Heritage Program returned sixteen (16) records of known occurrences of rare or state-listed plants or significant natural communities on or in the vicinity of the subject site. Correspondence with the Natural Heritage Program is contained in **Appendix G-6**. No endangered species were encountered during inspections of the property by ~~NP&V~~NPV staff.

Comprehensive Conservation Plan, Long Island National Wildlife Refuge Complex *(2006)*

This plan was prepared and adopted by the US Fish & Wildlife Service in September 2006. It describes the known habitat and wildlife resources within the designated refuge areas on Long Island, and addresses management issues for each. The following is the Purpose and Need sub-section of the plan.

> This Comprehensive Conservation Plan (CCP) for the Long Island National Wildlife Refuge Complex (Complex) was prepared pursuant to the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. An Environmental Assessment (EA), required by the National Environmental Policy Act of 1969 was prepared concurrent with the draft CCP.
>
> This final CCP presents the combination of management goals, objectives, and strategies that we believe will best achieve our vision for the Complex; contribute to the National Wildlife Refuge System (Refuge System) mission; achieve refuge purposes; fulfill legal mandates; address key issues; and incorporate sound principles of fish and wildlife management, and serve the American public. The CCP will guide management decisions and actions on the refuge over the next 15 years. It will also be used as a tool to help the state of New York natural resource agencies, our conservation partners, local communities, and the public understand our priorities.

Among the individual refuges evaluated in the CCP were the Sayville Unit (26± acres) and associated FAA Property (101± acres), now designated as the Sayville National Wildlife Refuge SNWR; see **Figure 2-9**). Both of these areas are proximate to the project site but are separated from the subject site by intervening existing residential development. The northeastern corner of the Sayville Unit is located approximately 260 feet from the site's western border on Hauppauge Road, and the northern boundary of the FAA Property is about 750 feet south of the project site's southern border. Included in the CCP were brief descriptions of the habitats and wildlife species of each refuge, with particular emphasis on rare, threatened or endangered species present. The following is taken from the CCP for the Sayville Unit (including the FAA Property).

Terrestrial Habitats
Sayville, and its associated 101-acre FAA property, consists primarily of pitch pine and scrub oak stands, interspersed with grasslands dominated by little bluestem. The FAA property supports the largest population in New York State of the federally listed endangered sandplain gerardia. The continual management of sandplain gerardia at Sayville and other Complex refuges is vital for its recovery. The FAA was legally mandated to transfer the 101-acre property to the Service after the buildings were removed. At this point, the buildings have been removed, but the property has yet to be transferred.

A variety of terrestrial migratory birds uses the refuge, and the potential exists for attracting more grassland-dependent birds.

Fish and Wildlife
The lack of surface waters at Sayville limits its species diversity to terrestrial species. Its terrestrial habitats, young pitch pines, scrub oaks, and grasslands, provide excellent habitat for Neotropical migratory birds and resident passerines.

Birds
Raptors.- Sayville provides important migratory habitat for certain raptor species, particularly American kestrel, and sharp-shinned, Cooper's, and red-tailed hawks.

Other Migratory Birds.- Songbirds are a conspicuous component of species at Sayville. That songbird community is diverse, and includes many Neotropical migrant species. Breeding songbirds dominant in forested habitats include the ovenbird, American redstart, common yellowthroat, gray catbird, and rufous-sided towhee. Breeding songbirds dominant in shrub and grassland habitats include song sparrows, swallows, and blue-winged, yellow, and prairie warblers.

Mammals
Dominant terrestrial mammals include white-tailed deer, eastern cottontail, gray squirrel, eastern mole, eastern chipmunk, white-footed mouse, meadow vole, red fox, opossum, short-tailed shrew, and raccoon.

Reptiles and Amphibians
Eastern box turtles and eastern hognose snakes are of interest because of their perceived current decline on Long Island, where both were once considered abundant, dominant species.

Rare, Threatened or Endangered Species
On September 7, 1988, sandplain gerardia was listed as an endangered species under the provisions of the Endangered Species Act of 1973, as amended. The plant is known to grow at two sites on Cape Cod, six sites on Long Island, one site in Baltimore County, Maryland, and one site in Washington County, Rhode Island. Its overall population has declined from 49 historical records to the 10 populations that remain today. Its decline can be attributed to the loss and degradation of suitable habitat caused by increased development, vegetative succession, and changing historical disturbance regimes.

The CCP includes a number of Goals for management within the refuges, which are informed by specific Objectives and associated Strategies to achieve those Objectives *"…designed to enhance the quality, effectiveness, and sustainability of our management priorities. They will increase our protection and management of endangered, threatened or other species of concern, including migratory wildlife. They will also increase the number and quality of opportunities for compatible, wildlife-dependent, public recreation, and allow the Complex to benefit from its proximity to New York City and urban communities."* Following are the Goals and Objectives of the CCP:

Goal 1. **Improve the biological diversity and integrity of upland cover types to sustain high quality habitat for migratory passerine birds.**
- Objective 1: White-tailed deer management
- Objective 2: Invasive plant management
- Objective 3: Restore and maintain fire dependent native plant communities
- Objective 4: Restore and enhance bird populations
- Objective 5: Increase grassland size to benefit nesting grassland birds

Goal 2. **Restore the biological health of aquatic habitats to high-quality conditions on the Complex salt marshes, bays, tidal**
- Objective 1: Reduce Phragmites
- Objective 2: Enhance habitat conditions for salt marsh sharp-tailed sparrow and seaside sparrow
- Objective 3: Decrease insecticide use in marsh communities
- Objective 4: Shoreline restoration
- Objective 5: Oyster Bay
- Objective 6: Enhance brook trout

Goal 3. **Restore and increase the biological diversity and integrity of native grasslands to foster endangered plant recovery and the communities upon which they depend.**
- Objective 1: Sandplain gerardia
- Objective 2: Grasslands

Goal 4. **Enhance the functionality of coastal strand habitats as they relate to beach nesting Colonial water birds and shorebirds to meet optimal population levels.**
- Objective 1: Assess plover/tern breeding potential
- Objective 2: Active management of habitat/predator/public use

Goal 5. **Provide priority wildlife-dependent recreational and educational opportunities when compatible with the resource and available funding.**
- *Objective 1: Visitor Service Plan*
- *Objective 2: Headquarters/Visitor Facility*
- *Objective 3: Public Access to Refuge Lands*
- *Objective 4: Interpretation*
- *Objective 5: Wildlife Observation and Photography*
- *Objective 6: Environmental Education*
- *Objective 7: Fishing*

Objective 8: Hunting

Goal 6. Communicate and collaborate with local communities and partners throughout Long Island to promote the National Wildlife Refuge System and the Complex.
Objective 1: Outreach

The subject site has no direct inter-relationship with the Sayville National Wildlife Refuge. The subject site was operated as a golf course from approximately 1938 to 2015. Since cessation of golf course use, mowing is still conducted to maintain the property. The site is separated from the refuge by intervening residential development. Potential ecological impacts of the proposed project are addressed in the next section.

2.3.2 Anticipated Impacts

Vegetation

The impacts to the ecological resources of a site are generally a direct result of clearing of natural vegetation, increase in human activity and associated wildlife stressors, and the resulting loss and fragmentation of wildlife habitat. While the majority of the development area is mowed grass (90.04 acres) there remains portions of natural habitats (14.94 acres) on the site. The majority of this natural vegetation is composed of Pitch Pine – Oak Forest habitat covering an area of 8.44 acres. There are portions of this habitat along the southwest and southeast edge of the property that have remained untouched since prior to 1948.

As was noted in **Section 2.3.1**, natural areas of the site are fragmented and mostly near the perimeter of the site. Consequently, these areas are subject to off-site impacts such as automobile traffic, domestic pets and activities occurring in the yards of adjoining residential properties. In addition, these areas are bordered by the golf course which operated from approximately 1938 to 2015. The golf course was subject to mowing and turf care practices including fertilization and pest control, as well as the stresses of golf play. As a result, natural areas on the site are not considered pristine and are compromised as a result of these existing influences.

The changes in habitat quantities for the overall property are listed in **Table 2-13**. The planned development will ultimately provide 58.55 acres of landscaped (primarily consisting of native revegetated and limited fertilized lawn) area within the project site. Of the provided landscaped acreage, 36.51 acres will be low-mow meadow and 10.02 acres will be native landscapes; the remaining 12.02 acres will be fertilized and irrigated. As a result, 46.53 acres of native restored habitat will combine with 5.12 acre of remaining natural vegetation to ensure that 51.65 acres (or 45.2%) of the site will continue to provide natural habitat for wildlife. The project will result in some removal of portions of existing woodland vegetation on the property as quantified in **Table 2-13** below; however, this will be offset by restored natural areas in combination with retained wooded areas. It is noted that the majority of the proposed development will occur in areas which were previously cleared for landscaping or now consist

of Successional Southern Hardwood forest, which is of less ecological value as it is currently impacted by the predominance of invasive species found within this habitat.

Although specific plans for the development of the proposed townhomes have not been developed at this time, an estimate of coverage proposed in the **Concept Plan** was used for the purpose of quantifying habitat loss is provided in **Table 2-13** below.

Wildlife

The majority of the site is or was maintained turf for a golf course. This area comprises 90.05 acres or 78.76% of the site. The golf course ceased operations in 2015, but the site is still being mowed. The majority of existing natural habitat within the development area is dominated by Pitch Pine – Oak Forest. The property is not expected to act as a refuge for rare native flora or fauna, but does contain a small population of local birds and mammals and limited herptiles as listed in **Section 2.3.1**. The existing habitat as well as proposed site conditions will favor those wildlife species that prefer edge and suburban habitats and those that are tolerant of human activity. Most of the species present on the property are tolerant of human activity and will continue to utilize the site.

TABLE 2-13
HABITAT QUANTITIES
Existing Conditions and Proposed Project

Coverage Type	Existing Conditions		Proposed Project		Change (acres)
	Coverage (acres)	Percent	Coverage (acres)	Percent	
Landscaped	**90.05** (1)	**78.76**	**58.55**	**51.20**	**-31.50**
Fertilized and Irrigated	0.00	0.00	12.02	10.51	+12.02
Native Landscapes	0.00	0.00	10.02	8.76	+10.02
Native Low-Mow Meadow	0.00	0.00	36.51	31.93	+36.51
Natural	**14.94**	**13.07**	**5.12**	**4.48**	**-9.82**
Water Surfaces	**0.15** (2)	**0.13**	**3.46** (3)	**3.02**	**+3.31**
Unvegetated	**3.86**	**3.37**	**2.25**	**1.97**	**-1.61**
Pervious Paths	0.28	0.25	2.25	1.97	+1.97
Sand Traps	2.80	2.45	0.00	0.00	-2.80
Cleared	0.77	0.67	0.00	0.00	-0.77
Paved Surfaces	**4.38**	**3.83**	**31.86**	**27.87**	**+27.48**
Sidewalks, Paths and Patio	2.75	2.41	9.91	8.67	**+7.16**
Roadway and Parking	1.63	1.42	21.95	19.20	**+20.32**
Building Footprint	**0.96**	**0.84**	**13.10**	**11.46**	**+12.14**
Total	**114.34**	**100.00**	**114.34**	**100.00**	**0.00**

(1) All existing landscaping is not irrigated or fertilized.
(2) Composed of decorative ponds adjacent to golf course clubhouse.

(3) Includes new 1.78-acre pond/detention area and 1.68 acres of pools.

The phased development and establishment of significant native restoration areas will allow existing mobile species to relocate within the site. Some loss of less mobile species is expected; however, wildlife inhabiting the site is common to the area. A total of 5.12 acres of natural vegetation is proposed to remain within the project site, which when combined with restored native habitats will provide 51.65 acres (or 45.2%) of the site in natural habitat for wildlife. Although the proposed project will provide less natural area, the development areas are expected to provide substantial restored habitat that will support wildlife species on the site.

In the short term, through phasing, other undeveloped areas of the site will experience increases in wildlife populations. It is possible that lands adjacent to the property will experience an increase in the abundance of some wildlife populations due to displacement of individuals by the construction phase of the proposed project. Mobile species and particularly large mammals such as fox and deer would be expected to find suitable habitat on-site and within the area where larger areas of natural open space currently remain. Ultimately, competition with both conspecifics and other species already utilizing the resources of the surrounding lands would be expected to result in a net decrease in population size for most species. The removal of 9.82 acres of existing natural habitat will be offset by restoration of native habitats on the site. Similar to current conditions, it is anticipated that species that prefer edge habitat will be prevalent within the proposed development.

The golf course use was subject to turf maintenance through fertilization and application of pesticides/herbicides for pest control. The proposed project will reduce the amount of maintained turf from 90.05 acres to 12.02 acres and will reduce the turf management practices to approximately 1/3 the application of fertilizer and minimal pest control. As described in **Section 2.2.2**, limited fertilizer will be used after proper pH adjustment to establish healthy turf. When compared with a subdivision of homeowners, this will result in less use of fertilizer, and is certainly substantially less than the operation of a golf course. Other use of chemicals is similar. Individual homeowners can apply as much crabgrass preventer, pre-emergent and weed killer, and the golf course would have involved much more application of chemical products, as did the golf course. The proposed project will be managed through a contract with a landscape company that adheres to stringent industry standards. A contractor will be used and that company has trained personnel, NYSDEC licensed herbicide/pesticide applicators and any use of chemicals is consistent with recommended rates of the manufacturer. Any lawn/landscape care will involve limited use of pre-emergent (crabgrass preventer), weed control, insect control and spot use of weed killer. It is noted that no storage or mixing of chemicals will occur on-site, as the landscape contractor stores and mixes any application materials and brings them to the site. The practices noted above are typical of all lawn/landscape maintenance conducted by landscape contractors. These practices are intended to maximize effectiveness and minimize use of product and will be completed by trained personnel, NYSDEC licensed pesticide applicators, and in conformance with label instructions. All landscaping requires maintenance and such maintenance practices are typical for all types of development. As discussed herein,

the use of a landscape maintenance contractor is expected to reduce use of chemicals as compared with use of the site under single family residential zoning. There is also a reduction in application of fertilizers and pest controls as compared to the prior golf course use, which would have involved more intensive turf maintenance practices to support golf use and play. Most significant is that the maintained turf area will be reduced from 90.05 acres to 12.02 acres, and will be more carefully managed than golf or a residential subdivision. Given the information presented herein, no significant adverse impact is expected with respect to wildlife, as the proposed project reduces the use of chemicals as compared with the prior golf course as well as use of the site for a single-family subdivision in conformance with zoning.

Rare and Endangered Species Potential

As previously stated, the NY Natural Heritage Program identified sixteen (16) records of known occurrences of rare or state-listed plants, significant natural communities or other significant habitats on or in the vicinity of the subject site. As described in **Section 2.4.1** above, these natural communities do not occur on the subject site. The Stiff Tick Trefoil, Sandplain Agalinis and Few-Flowered Nut Sedge were listed as endangered and present within 0.4 miles southwest of the project site however there was no indication of their presence during site visits conducted by ~~NP&V~~NPV. As such, no impacts to rare, threatened or endangered plant species or significant natural communities are anticipated as a result of the proposed project.

Comprehensive Conservation Plan, Long Island National Wildlife Refuge Complex *(2006)*

It is noteworthy that the CCP is a plan for the management of the National Wildlife Refuges on Long Island. Consequently, none of the six Goals of the CCP, nor any of the 24 Objectives of the CCP apply to property outside of the refuges evaluated, including the project site. Similarly, the CCP made no recommendations for use or management of any non-refuge properties. As such, the CCP has no jurisdiction over the project site, and so the achievement of its Goals and Objectives will have no impact on the proposed project.

Although the project site closely approaches the boundaries of the SNWR, developed residential properties separate the project site from both the Sayville Unit and the FAA Property, which minimize the potential for the proposed project site to interact with or otherwise impact the SNWR. Other than from project site wildlife displaced during construction migrating through residential lots to the SNWR, the residential nature of the project is such that there would be minimal potential for it to impact the SNWR. It is expected that post-construction conditions would preclude interactions between the site and SNWR either by wildlife on the project site travelling between the site and the SNWR, or by wildlife passing through the project site to access the SNWR. Such a conclusion is realized in consideration of the following:

- the presence of developed residential lots on land between the project site and the SNWR would discourage wildlife from traversing such land to reach the SNWR;

- the lack of suitable vegetation and habitat, and the developed nature and general level of activity on the project site would not be attractive to larger fauna (e.g., opossum, raccoon, deer) to occupy the site, reducing the potential for such species to migrate to the SNWR;
- the lack of suitable vegetation and habitat, and the developed nature and general level of activity on the project site would tend to discourage larger fauna from attempting to pass through the subject site from areas to the north and east to reach the SNWR.

In addition, it is significant that maintained lawn area will be reduced from 90.05 acres to 12.02 acres and maintenance practices associated with turfed areas will also be reduced. The establishment of additional restored native habitat on the subject site, 51.65 acres (or 45.2%) of the site, will provide a substantial wildlife benefit that will complement the existing refuge properties in the vicinity of the site. As a result, the project will support the SNWR to a greater extent than the pre-existing golf course use and/or a single-family subdivision that conforms to zoning, though a clustered-lot subdivision could produce a greater acreage of restored native habitat than the proposed project.

2.3.3 Proposed Mitigation

- Native plant species that provide food and shelter to wildlife will be utilized in some of the landscaped areas.
- The loss of Successional Southern Hardwood Forest and Pitch Pine - Oak habitat on the property will be partially mitigated through the replanting of both habitat types within the subject site.
- Disturbance will be minimized to the maximum extent practicable, including delineating tree-clearing limits at the site prior to construction in order to avoid inadvertent clearing.
- No known invasive plant species will be utilized, including those species specifically those species listed in Suffolk County Local Law 27-2009 and 6 NYCRR Part 575.
- As no impacts associated with the CCP are expected, no mitigation measures in this regard are necessary or proposed.

2.4 Air Quality

2.4.1 Existing Conditions

The following description of the property's existing air quality conditions and the applicable air quality standards has been taken from the Air Quality Analysis prepared for the proposed project by B. Laing Associates, of Fort Salonga (see **Appendix A-98**).

~~Climate~~
~~The climate in Sayville, New York is warm during the summer when average temperatures tend to be in the 80's and very cold during winter when average temperatures tend to be in the 30's. The National Oceanic and Atmospheric Administration (NOAA) records this local climate data in Islip, New York. The warmest month of the year is July with high average temperature of 83 degrees Fahrenheit, while the coldest months of the year are January and February with a high average of~~

~~temperature 40 degrees Fahrenheit. Temperature variations between night and day tend to be fairly limited during summer with a difference that can reach 15-17 degrees Fahrenheit, and fairly limited during winter with an average difference of approximately 15 degrees Fahrenheit. The annual average precipitation in Islip is between around 43 inches. This locale receives about 42 inches of snow per year on average.~~

Ambient Air Quality

Existing air quality is good for the project site. The median air quality index (AQI) in 2017 for Suffolk County, New York was 39.[4] An AQI between 0 and 50 is satisfactory and air pollution poses little or no risk. Existing air quality standards for New York State are found in the State Ambient Air Quality Standards (SAAQS) which largely mimic the National Ambient Air Quality Standards (NAAQS). Possible relevant pollutants for mobile sources are particulate matter (PM), ozone (O_3) and carbon monoxide (CO). Carbon monoxide is the dominant pollutant and so, it is modeled as provided in NYSDOT's The Environmental Manual (TEM). **Table 2-14** lists the NAAQS.

[4] According to the United States Environmental Protection Agency (EPA) Outdoor Air Quality Data, Air Quality Index Report.

~~NYSDEC monitors air quality throughout the state. There are currently 58 active air monitoring sites in New York State. Parameters observed vary from air monitoring sites. Four (4) monitoring sites are located within NYSDEC Region 1 (Long Island) with one (1) site in Nassau County and three (3) sites in Suffolk County. The closest monitoring site to the project is 5150-10 located at Sagamore Junior High School at 57 Division Street, Holtsville, New York. Parameters are described below.~~

~~Particulate matter less than 2.5 microns in size ($PM_{2.5}$) is measured in Holtsville, New York at station 5151-10. The 5151-10 station had an annual mean standard for last three (3) years (2015-2017) of 6.7 ug/m^3 [microns per cubic meter]. This annual mean was well below the 12 ug/m^3 standard. The 5151-10 station had an average of 98th percentile for last 3 years 15.7 ug/m^3. This average was well below the 35 ug/m^3 standard.~~

TABLE 2-14
NATIONAL AMBIENT AIR QUALITY STANDARDS*

Pollutant	Primary/Secondary	Averaging Time	Level	Form
Carbon Monoxide	Primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead	Primary & Secondary	Rolling 3-month average	0.15µg/m^3	Not to be exceeded
Nitrogen Dioxide	Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary & Secondary	Annual	53 ppb	Annual Mean
Ozone	Primary & Secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution, $PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
	Primary & Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
Particle Pollution, PM_{10}	Primary & Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulphur Dioxide	Primary	1-hour	75 ppb	Not to be exceeded more than once per year on average over 3 years
	Secondary	8-hour	0.5 ppm	Not to be exceeded more than once per year

* http://www.dec.ny.gov/chemical/8542.html

NYSDEC monitors air quality throughout the state. There are currently 58 active air monitoring sites in New York State. Parameters observed vary from air monitoring sites. Four (4) monitoring sites are located within NYSDEC Region 1 (Long Island) with one (1) site in Nassau County and three (3)

sites in Suffolk County. The closest monitoring site to the project is 5150-10 located at Sagamore Junior High School at 57 Division Street, Holtsville, New York. Parameters are described below.

Particulate matter less than 2.5 microns in size ($PM_{2.5}$) is measured in Holtsville, New York at station 5151-10. The 5151-10 station had an annual mean standard for last three (3) years (2015-2017) of 6.7 ug/m^3 [microns per cubic meter]. This annual mean was well below the 12 ug/m^3 standard. The 5151-10 station had an average of 98th percentile for last 3 years 15.7 ug/m^3. This average was well below the 35 ug/m^3 standard.

Ozone is measured at the 5151-10 station in Suffolk County. It is the only pollutant that occasionally exceeds the standard both in NYSDEC Region 1 and State-wide. It is formed from the long-term transport of hydrocarbon emissions in the mid-western United States and as such, is not a "local" enforcement issue on emissions. The average 3 year annual mean for this pollutant was 0.067 parts per million (ppm) for the years 2015 to 2017. The first highest maximum daily eight hour average was 0.081 ppm in 2017 when it slightly exceeded the 0.070 ppm standard.

Sulfur dioxide (SO_2) is monitored at station 5151-10. In 2017, the annual average was recorded at 0.16 parts per billion (ppb) versus an annual standard not to exceed 30 ppb and the one hour average for the last three years (2015-2017) have peaked at 4.43 ppb versus a standard of 75 ppb.

Carbon Monoxide (CO) is not measured at station 5151-10. The closest monitoring station is approximately 40 miles to the west at Queens College 2 (7096-15) and Queens College Near Road (7096-16). The highest one hour value in 2017 at 7096-15 was 1.78 ppm versus a standard of 35 ppm. The highest eight hour value was 0.90 ppm versus a standard of 9.0 ppm. The highest one hour value in 2017 at 7096-16 was 1.76 ppm versus a standard of 35 ppm. The highest eight hour value was 1.20 ppm versus a standard of 9.0 ppm.

Nitrogen dioxide (NO_2) and lead are also not measured at station 5151-10. Monitoring sites are located in Region 2.

Existing conditions noted above are compared with air resource conditions as related to the proposed project in the next section.

2.4.2 Anticipated Impacts

The following description of the potential impacts of the project, and of its potential impacts during construction, is taken from the Air Quality Analysis (see **Appendix A-~~9~~8**).

Mobile Screening

The first level of "air quality screening" as provided in NYSDOT's TEM is essentially a traffic analysis consistent with the Highway Capacity Manual (HCM). This Traffic Impact Study was provided by Nelson & Pope dated November 2018 and is appended to this report by reference. The TEM provides guidance on determination for a required microscale analysis which is based on the consideration of several standards.

Per TEM I-1 Level of Service (LOS) Screening, intersections potentially impacted by the project must be screened for overall LOS. If the LOS is A, B, or C, no further analyses are required. If any signalized intersections have LOS predicted D, E, or F, significant vehicle queuing may occur and further analysis may be required for up to the three worst intersections. In this case, twenty one (21) signalized intersections and twenty one (21) unsignalized intersections were analyzed by the professional traffic operations engineer (PTOE) for LOS in the existing, no build and build phases in both the school phase and summer phase. The analysis for these intersections included Other Planned Developments (OPD). OPD refers to developments located near the project area that are currently under construction or in the planning stages. Traffic generated by these projects may significantly influence the operations of the study intersections and would not be represented in the collected field data. For this analysis, the data for the signalized intersections in the school phase were utilized. The LOS for both the AM and PM scenario in these intersections are provided in Tables 2 and 3, respectively [see **Appendix A-~~98~~98**]. Figure 2 [see **Appendix A-~~98~~98**] depicts the analyzed intersections in aerial view.

Sensitive receptors[5] (i.e., schools, hospitals, etc.) were noted during this air quality analysis for potential impact. There are few schools that exist within the range of the proposed action. The closest sensitive receptor to the project is New Life Nursery School and Church located approximately 600 feet east at 380 Lakeland Ave. This receptor is bordered on the west by residential homes on Chester Street and on the east by Lakeland Ave. The local VFW and Community Ambulance Company exist to the north. The closest intersection analyzed for the project in this location was Lakeland Avenue and Gibbons Court. The LOS level for the proposed Project is B in both the AM and PM scenarios.

Edward J. Bosti Elementary School is located at 50 Bourne Boulevard approximately 1200 feet to the west of the project. The school is bordered to the east by Paramold Manufacturing and ball fields to the west along Locust Avenue. The closest intersection analyzed for the project in this location was Smithtown Avenue and Terry Road/Island Boulevard to the north. The LOS level for the proposed project is B in the AM scenario and LOS A in the PM scenario.

Sayville Middle School and Lincoln Avenue Elementary School are both located to the east of the project east of Johnson Avenue. The closest intersection analyzed for the project in this location was Johnson Avenue and NYS Route 27 South Service Road. The LOS level for the proposed Project is C in the AM and PM scenario.

AM School Peak Scenario - Twenty-one signalized intersections were analyzed for the first level of screening in both the AM and the PM scenario in the Traffic Impact Study. In the AM condition, the findings of the capacity analysis determined that the overall LOS for eighteen (18) of the 21 intersections would achieve LOS of A, B or C as a result of the Project. Thus, no further air quality analysis would be required for those intersection of A, B or C.

Three intersections in the AM traffic analysis resulted in overall LOS of D, E or F in the existing, no build and/or build phases in the school phase. These intersections located north of the site and

[5] 1,000 foot receptor analysis required for modeling. Few sensitive receptors mentioned are outside this determined distance but noted for their existence.

north of NYS Route 27 included (1) Smithtown Avenue and NYS Route 27 North Service Road, (2) Lakeland Avenue and NYS Route 27 North Service Road and (3) Johnson Avenue and NYS Route 27 North Service Road. These intersections, although LOS D, E or F, should not require microscale analyses as there will be no change from LOS in the no build to the build scenario. For example, for the intersection of Smithtown Avenue and NYS Route 27 North Service Road, the LOS in the existing condition is D and the LOS in the no build scenario is E. The LOS with the project developed is E. Thus, the LOS level will not decrease as a result of the project. This is similar to the intersections of Lakeland Avenue and NYS Route 27 North Service Road and Johnson Avenue and NYS Route 27 North Service Road. The LOS level will not degrade as the project is advanced.

PM School Peak Scenario - In the PM condition, the findings of the capacity analysis determined that the overall LOS for seventeen (17) of the 21 intersections would achieve LOS of A, B or C as a result of the Project. Thus, no further air quality analysis would be required for those intersections.

Four intersections in the PM traffic analysis resulted in LOS of D, E or F. These intersections included (1) Smithtown Avenue and NYS Route 27 North Service Road, (2) Lakeland Avenue and NYS Route 27 North Service Road, (3) Johnson Avenue and NYS Route 27 North Service Road which are located north of the site and north of NYS Route 27 and (4) Lakeland Avenue and ~~Tarrif~~Tariff Street/Johnson Avenue which is located south of the project. These intersections, although LOS D, E or F, should not require microscale analyses as there will be no change from LOS in the no build to the build scenario. For example, for the intersection of Lakeland Avenue and ~~Tarrif~~Tariff Street/Johnson Avenue, the LOS in the existing condition is D and the LOS in the no build scenario is D. The LOS with the project developed is E. However, with proposed mitigation measures the LOS level is D. Thus, the LOS level, with mitigation, will not decrease as a result of the project. The intersection of Lakeland Avenue and NYS Route 27 North Service Road will actually improve as a result of the project in the PM condition. The no build scenario is LOS F. The build scenario with mitigation will upgrade the LOS level to E. The intersection of Smithtown Avenue and NYS Route 27 North Service Road will have a LOS E in both the no build scenario and build scenario. This is similar to the intersection of Johnson Avenue and NYS Route 27 North Service Road. Thus, the LOS level will not degrade as the project is advanced.

As a result of the above traffic findings, no significant change in the Level of Service will result from the project. Further, per the Traffic Impact Study, delay times will not increase and may go down slightly. Thus, further mobile analysis should not be required for the project as it would not result in a significant air quality impact.

Construction Screening

The short-term use of heavy equipment operations will result in a temporary, minor increase in pollutant emissions from various equipment used in the construction process for a short-term. However, the major concern during the construction operation will be the control of fugitive dust during site clearing, excavation, demolition and grading operations. Fugitive dust is essentially airborne soil particles caused by heavy equipment operations entraining the soil into the air. To a lesser extent, some fugitive dust emissions will arise from wind erosion of the exposed soils. All construction related air quality impacts will be of relatively short duration. Best construction management practices will be employed to reduce soil erosion and possible sources of fugitive dust. This generally includes the daily use of water/spray trucks in dry periods, anti-tracking pads at

construction entrances and adherence to a Storm Water Pollution Prevention Plan (SWPPP) or Erosion and Sediment Control methods.

In addition, trucks, compressors, cranes, excavators and other equipment will be maintained and in good working condition and turned off when not in use. This will reduce the idling of unused equipment in adherence of state regulations. Reduced idling will reduce potential air pollution.

Given the air quality analyses provided herein, no significant adverse air quality impacts are expected as a result of the operation of the proposed project. It is recommended that measures be implemented to control fugitive dust during construction.

2.4.3 Proposed Mitigation

- Dust control measures are recommended during construction. Measures outlined in **Section 1.6**, Construction and Operation, are sufficient to control these potential impacts. It is noted that any such impacts are short-term, temporary impacts and do not represent a long-term impact.
- Dust monitoring and mitigation measures are a part of the SMMP; therefore, potential impacts from dust raised by disturbance of impacted soils will be subject to a high level of control.
- As a result of the findings in the Air Quality Analysis, no further analysis in regard to potential air quality impacts due to operation of the project, as it is not expected to result in a significant adverse impact on air quality.