A. INTRODUCTION

This chapter describes the project site's existing geology, soils, and topography and conditions likely to exist in the future assuming the proposed project is not built. Next, it discusses the potential impacts that could result from site excavation and regrading to facilitate roadway, infrastructure, and building placement for the proposed project. Finally, the chapter details impact avoidance measures that could be implemented to prevent such impacts as potential erosion and sedimentation from construction activities.

PRINCIPAL CONCLUSIONS

The proposed project would be located on the more level portions of the project site parcel, avoiding the site's steeper slopes. Project phasing during construction would limit the amount of ground disturbance to smaller areas that can be effectively contained with erosion control measures. These project components would avoid any significant impacts to downstream waters related to erosion and sedimentation.

Blasting of rock is expected for the construction of several building foundations. This work would be located far from any adjacent properties/residences, and all excavated rock would be retained on-site in the construction of the proposed project.

The footprint of the proposed project would be kept to a minimum, requiring excavation to achieve the project's interior building space requirements. Excess earth material resulting from this activity would be disposed of on-site at one or more designated soil deposition areas.

Therefore, due to project design and implementation of erosion control measures, no significant impacts to geology, topography, or soils are expected from the proposed project.

B. EXISTING CONDITIONS

TOPOGRAPHY AND SLOPES

The project site is located adjacent to Route 22 in the Town of Patterson, NY. The footprint of the proposed project would be located adjacent to the existing Watchtower Educational Center (WEC) facilities on the eastern slopes of the valley formed by Cranberry Mountain to the east and the Great Swamp to the west.

TOPOGRAPHY

Existing topography is shown in **Figure 5-1**. The hillside that contains the project site ascends upslope to the east into forested land. The eastern boundary of the project site parcel has an elevation of approximately 1,100 feet. Elevation continues to rise off-site from the eastern project site parcel boundary to 1,232 feet at the summit of Cranberry Mountain. The parcel descends downslope to an elevation of 500 feet adjacent to Route 22. The proposed amended site area would be located within the central portion of the WEC properties, primarily between elevations 550 to 750 feet.

SLOPES

Disturbance to steeply sloped land increases the potential for soil erosion and typically requires the installation of more infrastructure for building site development than on less sloped lands. It is for these reasons that steep slopes are considered in environmental review.

There is moderate to steeply sloping terrain on the overall contiguous WEC properties located both east and west of Route 22. West of Route 22, the terrain is more level, generally less than 10 percent slope. East of Route 22, slopes are generally steeper, with a mix of level areas less than 10 percent slope, to slopes exceeding 25 percent. Overall, on the approximately 650 acres of contiguous undeveloped land encompassing the project site and surrounding WEC properties, more than 50% (333 acres) contain slopes less then 10 percent, 12 percent (79 acres) contain slopes between 10 to 15 percent, 17 percent (113 acres) contain slopes between 15 to 25 percent, and 19 percent (122 acres) contain slopes exceeding 25 percent. **Figure 5-2** depicts the slope categories on the contiguous WEC properties.

The 362.5-acre project site parcel itself (lot #53) contains 23.5 percent, or 85.4 acres, of slopes of 0 to 10 percent. A total of 59.4 acres, or 16.4 percent, of the project site parcel contains slopes ranging from 10 to 15 percent. Slopes ranging from 15 to 25 percent occur on a total of 100.4 acres, or 27.7 percent, of the project site. Steep slopes of 25 percent or greater occur throughout the site, encompassing 32.4 percent, or 117.3 acres. These steeper slopes are located primarily in the Mountain Brook stream channel, on the western slope of Cranberry Mountain, and intermittently within the interior portions of the existing campus loop roadway system.

SUBSURFACE AND BEDROCK GEOLOGY

OVERVIEW OF PROJECT SITE GEOLOGY

The project site is located in the Highlands Geographic Province, a region occupied by metamorphic and igneous rocks of Late Precambrian and Early Paleozoic age. These rocks crop out in northeast-trending belts and form the core of the Appalachian Mountains in southeastern New York. The region’s geology consists primarily of metamorphic, crystalline rocks dominated by gneiss on the ridges and more easily erodible sedimentary sandstone, dolomite, and shale underlying the valleys. According to the Geologic Map of New York, Lower Hudson Sheet (Fisher *et al*., 1970), the bedrock within the project site is the Manhattan Formation consisting of sillimanite, garnet, muscovite, biotite, plagioclase, quartz gneiss, and a discontinuous unit of amphibolite. Bedrock underlying portions of the WEC properties west of Route 22 consists of Stockbridge marble, which is less resistant to weathering than the Manhattan Formation and has therefore formed a low-lying valley.

Putnam County has been affected by glaciation beginning nearly 300,000 years ago. Glacial reformation of topography smoothed out the ground surface and often deepened valleys that were oriented in the direction of glacial advance. Glacial till, deposited as ground moraine directly from the bottom of glacial ice, is the dominant overburden material in the county. The project site is mapped as Kame deposits and till, according to the Surficial Geologic Map of New York-Lower Hudson produced by the New York State Education Department (1989).

7.15.09

WEC Properties Boundary

0 200 500 FEET
SCALE

Figure 5-1

Existing Topography

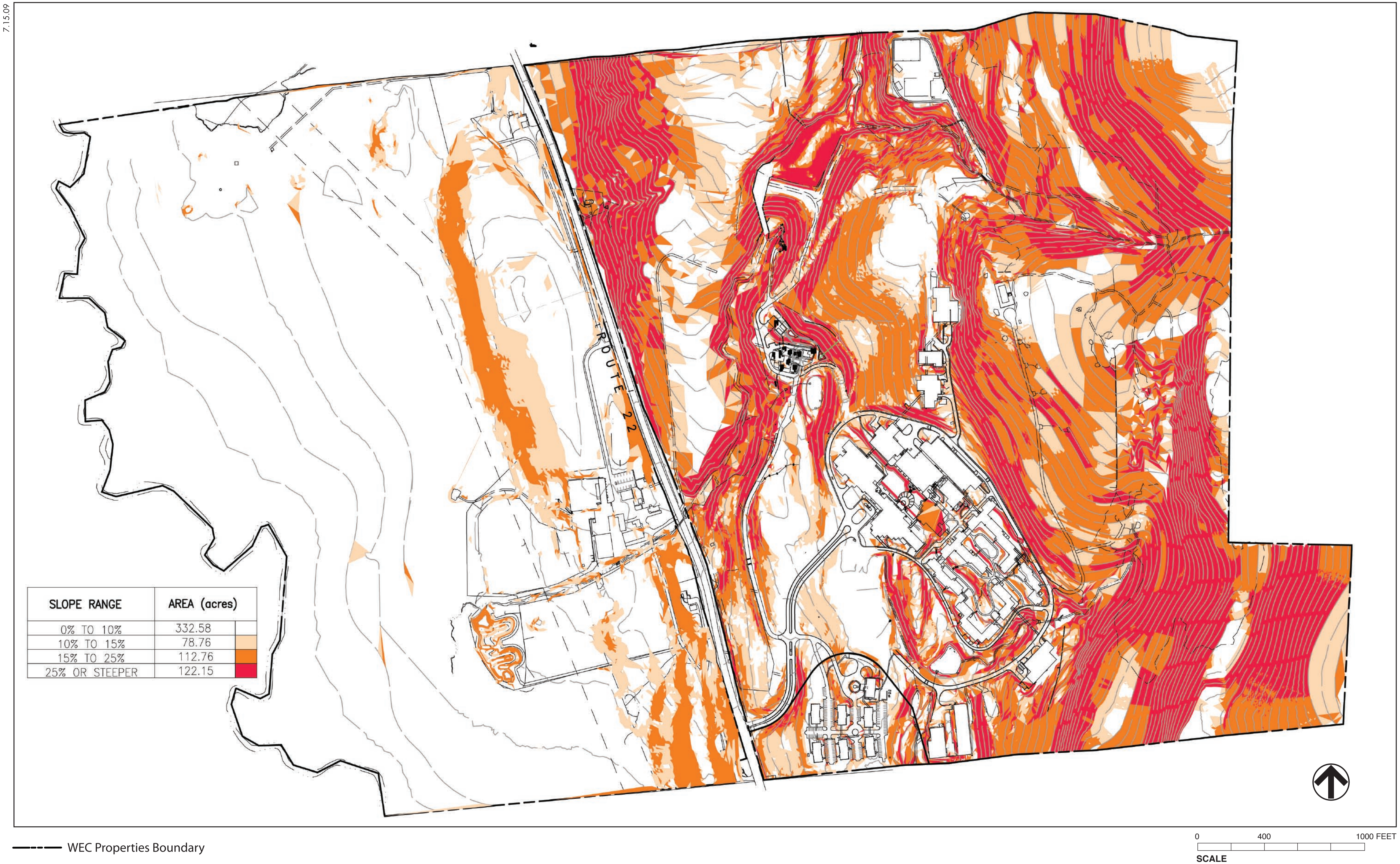

Figure 5-2
Existing Slopes

Several areas of rock outcropping exist on the project site. Extensive rock outcrops occur on the steep slopes of the southern and eastern portions of the site. Smaller outcrops exist in the streambed and adjacent knolls of Mountain Brook.

ON-SITE SUBSURFACE BORINGS

To characterize the subsurface conditions underlying the location of the proposed project's buildings and improvements, a subsurface investigation consisting of test borings was performed in March 2008 by Clough Harbour & Associates, LLP (CHA). The results of this investigation are contained in full in Appendix B, "Preliminary Geotechnical Engineering Report," CHA (May 23, 2008).

A previous geotechnical investigation conducted on-site in 1990 found subsurface conditions consisting of glacial till underlain by bedrock at depths up to 45 feet below ground.[1] CHA's May 2008 investigation supports these findings. CHA encountered completely weathered bedrock below sand and glacial till at depths ranging from 3.0 to 8.0 feet on upper slopes and generally becoming deeper, up to depths of 40.0 feet below ground surface, as the site slopes downward to the south and west toward Route 22. Groundwater level observations taken in four borings 24 hours after drilling ranged from 11.0 to 26.0 feet below ground surface.

Subsurface conditions are summarized below:

- **Topsoil**—Approximately 2.0 feet of topsoil was encountered in the surface soils of boring B-5, located at the edge of an undisturbed, wooded area of the project site.
- **Fill**—Fill matter composed of varying amounts of fine to coarse sand, fine to coarse gravel, and clayey silt/silty clay was encountered in all test borings at the ground surface, with the exception of boring B-5. The fill varies in thickness across the project site from 1.0 to 7.0 feet thick. The fill is brown, orange, and/or white, and moist to wet. Standard Penetration Test values (N-values) of the fill matter range from 2 to 41, which is indicative of very loose to compact conditions. Due to the lack of records indicating that the fill material was placed with proper compaction, it is considered uncontrolled fill.
- **Sand**—Fine to coarse sand with little to trace amounts of fine to coarse gravel and little to trace amounts of clayey silt was encountered in all test borings, except B-5, at depths ranging from approximately 2.0 to 31.0 below grade. Sand is generally brown/orange and classified as moist to wet. N-values for this material range from 4 to 55, reflecting very loose to very compact conditions.
- **Silty Clay/Clayey Silt**—Silty clay/clayey silt with little to trace amounts of fine to coarse gravel and sand was encountered interbedded in the sand and glacial till layers in two borings, B-3 and B-13. This material was encountered in B-3 and B-13 from approximately 18 feet to 23 feet and 9.2 feet to 10.0 feet below grade, respectively. The silt clay/clayey silt is brown, dark brown, tan, gold, and classified as moist to wet. The N-value in the material ranges from 2 to 41.
- **Glacial Till**—Glacial till on the site is generally composed of varying amounts of fine to coarse gravel, fine to coarse sand, and clayey silt/silty clay. The glacial till stratum underlies the sand layer, extending to the top of bedrock or to boring termination at depths ranging from 16.0 to 47.0 feet below grade. The glacial till varies in color (brown, tan, orange, and gray) and is classified as moist to wet and very hard or very compact. Cobbles and boulders are likely to be scattered throughout the glacial till based on rig action observations during drilling.

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[1] Results of *Geotechnical Report for the Proposed Watchtower Educational Center* CHA (June 1990) referenced in *Preliminary Geotechnical Engineering Report* CHA (May 23, 2008), see Appendix B.

- **Completely Weathered Bedrock**—Completely weathered bedrock was encountered in borings B-2, B-5 to B-7, B-9, B-12, B-14 to B-20, B-24, and B-25 below the sand and glacial till stratums at depths ranging from 3.0 to 8.0 feet at the northern corner of Area 1, gradually increasing in depth, up to 40.0 feet below grade. Completely weathered bedrock is generally gray/brown, classified as moist to wet and very compact.
- **Bedrock**—Gneiss bedrock was encountered beneath the completely weathered bedrock in borings B-2, B-3, B-5 to B-7, B-10, and B-17 to B-25 extending to boring termination. The gneiss bedrock varies in color (gray, black, white, red, orange, and gold) and is medium hard. The bedrock is freshly weathered with close fracture spacing and fair to excellent RQD [Rock Quality Designation] values.

TEST PIT INVESTIGATION

AKRF, Inc. conducted a deep-hole test pit investigation on May 28, 2008, to further assess subsurface conditions on the project site for the purpose of siting stormwater management basins. Eighteen (18) test pits were excavated and soil descriptions were recorded by AKRF personnel with New York City Department of Environmental Protection (NYCDEP) oversight. The locations of test pits are shown in the large-scale plan C-101 “Existing Conditions Plan” and test pit logs can be found in Appendix B.

Test pits were advanced to groundwater or until bedrock was encountered or until a maximum target depth of 13.0 feet was reached. Total depth of test pits ranged from 1.5 to 14.25 feet below grade. Subsurface conditions encountered in individual test pits are detailed and described on the test pit logs included in Appendix B. Subsurface conditions were similar for each of the areas examined, and are generally described below:

- **Topsoil**—Approximately 0.5 to 1.5 feet of topsoil was encountered in the surface soils of all test pits, excluding TP-23 and TP-24.
- **Loam**—Fine- to medium-grained sandy/silty loam was identified at depths ranging from 0.5 to 13.17 feet below grade. In several test pits, a loam-gravel mix was encountered at depths ranging from 2.5 to 7 feet below grade.
- **Fill Material**—Potential fill material consisting of sand and silt was observed in two test pits: TP-24 and TP-27, from 1.0 to 3.33 feet and 3.83 to 7.42 feet below grade, respectively.
- **Groundwater**—Groundwater seepage was observed in eight test pits (TP-15 to 18, 20, 23, 27, and 30) at depths ranging from 6.75 to 11 feet below grade.
- **Bedrock**—Bedrock was encountered in four test pits (TP-1, 31, 32, and 33) at depths ranging from 1.5 to 3.5 feet below grade.

SURFACE SOILS

OVERVIEW

The U.S. Department of Agriculture (USDA) identifies major classifications of soils that have similar characteristics (such as texture and drainage) into a series. Within each series, soils differ in slope and other characteristics that affect their use. On the basis of these differences, soil series are further divided into phases (soil mapping units). Different soil phases exhibit variable water storage, erosion potential, and other characteristics significant from a development perspective.

Table 5-1 contains a complete list of the soil mapping units located on the project site parcel and lists their primary characteristics. The spatial arrangement of these soil types on the project site parcel, as mapped by the USDA Soil Conservation Service (SCS) Soil Survey of Putnam and Westchester Counties (1994), is shown in **Figure 5-3**.

Table 5-1
Soils on the Project Site

Symbol	Soil Series Name	Depth to Bedrock	Drainage Characteristics
ChB	Charlton loam, 2 to 8 percent slopes	More than 60 inches	Gently sloping, very deep, and well-drained soil on hilltops and parts of hillsides formed in glacial till derived from granite, schist, and gneiss. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is slight, surface runoff medium, and water capacity moderate. “K” Factor: 0.24.)
ChC	Charlton loam, 8 to 15 percent slopes	More than 60 inches	Strongly sloping, very deep, and well-drained soil found on hillsides. (Permeability is moderate to moderately rapid throughout the profile. Erosion hazard is moderate, surface runoff medium, and water capacity moderate. “K” Factor: 0.24.)
ChD*	Charlton loam, 15 to 25 percent slopes	More than 60 inches	Very deep and moderately steep, well-drained soil found on hillsides. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is severe, surface runoff rapid, and water capacity moderate. “K” Factor: 0.24.)
ChE*	Charlton loam, 25 to 35 percent slopes	More than 60 inches	Steep, very deep, and well-drained soil found on hillsides. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is very severe, surface runoff very rapid, and water capacity moderate. “K” Factor: 0.24.)
CIB	Charleton loam, 2 to 8 percent slopes, very stony	More than 60 inches	Gently sloping, very deep, and well-drained soil on hilltops and parts of hillsides. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is slight, surface runoff medium, and water capacity moderate. “K” Factor: 0.20 to 0.24.)
CrC*	Charlton-Chatfield complex, 2 to 15 percent slopes, rolling, very rocky	More than 60 inches	Very deep and moderately deep, well-drained, and somewhat excessively drained Chatfield soil and well-drained Charlton soil found on hilltops and hillsides. Generally 50 percent Charlton soil, 30 percent Chatfield soil, and 20 percent other soils and rock outcrop. Rock outcrop covers 2 to 10 percent of the surface. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is moderate, surface runoff medium, and water capacity moderate. “K” Factor: 0.24.)
CsD*	Chatfield-Charlton complex, hilly, very rocky, 15 to 35 percent slopes	24 inches, fractured granitic bedrock	Very deep and moderately deep, well-drained, and somewhat excessively drained Chatfield and the well-drained Charlton soil found on hilltops and hillsides. (Permeability is moderate or moderately rapid. Erosion hazard is severe, surface runoff rapid, and water capacity low (Chatfield) to moderate (Charlton). “K” Factor: 0.20 to 0.24.)
CtC*	Chatfield-Hollis-Rock outcrop complex, rolling	10 to 40 inches	Rolling, moderately deep, well-drained to somewhat excessively drained soils and areas of rock outcrop (granite, gneiss, and schist). (Permeability is moderate or moderately rapid. Erosion hazard is moderate, surface runoff medium, and water capacity low to very low. “K” Factor: 0.20 to 0.24.)
CuD*	Chatfield-Hollis-Rock outcrop complex, hilly	10 to 20 inches	Moderately deep to shallow, well-drained and somewhat excessively drained soil and areas of rock outcrop on hillsides in bedrock-controlled landscapes. (Permeability is moderate or moderately rapid. Erosion hazard is severe, surface runoff rapid, and water capacity low to very low. “K” Factor: 0.20 to 0.24.)
HrF	Hollis-Rock outcrop complex, very steep	10 to 20 inches	Shallow, very steep, well-drained and somewhat excessively drained soil and areas of rock outcrop on hillsides in bedrock-controlled landscapes. Slopes range from 35 to 60 percent. (Permeability is moderate or moderately rapid. Erosion hazard is very severe, surface runoff is very rapid and, water capacity is very low. “K” Factor: 0.24 to 0.32.)
PnB*	Paxton fine sandy loam, 2 to 8 percent slopes	More than 60 inches	Gently sloping, very deep, and well-drained soil found on broad ridges and small hills. (Permeability is moderate on the surface and slow or very slow in the substratum. Erosion hazard is slight, surface runoff is medium, and water capacity is moderate. “K” Factor: 0.24 to 0.32.)
SbB*	Stockbridge silt loam, 2 to 8 percent slopes	More than 60 inches	Very deep, gently sloping, and well-drained soil found on the top of broad ridges and hills. (Permeability is moderate in the surface layer and in the upper part of the subsoil and slow or moderately slow in the lower part of the subsoil and in the stratum. Erosion hazard is slight, surface runoff slow, and water capacity is high. “K” Factor: 0.24 to 0.37.)
SbC*	Stockbridge silt loam, 8 to 15 percent slopes	More than 60 inches	Very deep, strongly sloping, and well-drained soil found on the sides of broad ridges and hills. (Permeability is moderate in the surface layer and in the upper part of the subsoil and low or moderately slow in the lower part of the subsoil and in the substratum. Erosion hazard is moderate, surface runoff medium, and water capacity high. “K” Factor: 0.24 to 0.37.)
SbD*	Stockbridge silt loam, 15 to 25 percent slopes	More than 60 inches	Very deep, moderately steep, and well-drained soil found on the sides of ridges and hills. (Permeability is moderate in the surface layer and in the upper part of the subsoil and slow or moderately slow in the lower part of the subsoil and in the substratum. Erosion hazard is severe, surface runoff rapid, and water capacity high. “K” Factor: 0.24 to 0.37.)

Table 5-1 (cont'd)
Soils on the Project Site

Symbol	Soil Series Name	Depth to Bedrock	Drainage Characteristics
SgC*	Stockbridge-Rock outcrop complex, rolling, 5 to 15 percent slopes	More than 60 inches	Very deep, well-drained Stockbridge soil and areas of limestone rock outcrop found in on landscapes where limestone bedrock is dominant. Slopes range from 5 to 15 percent. (Permeability is moderate in the surface layer and the upper part of the subsoil and slow or moderately low in the lower part of the subsoil and in the substratum. Erosion hazard is moderate, surface runoff medium, and water capacity high. "K" Factor: 0.24 to 0.37.)
SuB*	Sutton loam. 3 to 8 percent slopes	More than 60 inches	Gently sloping, very deep, and moderately well-drained soil found on concave foot slopes and along drainageways in the uplands. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is moderate, surface runoff medium, and water capacity high. "K" Factor: 0.24 to 0.28.)

Note: * Indicates soil unit is within the proposed footprint of disturbance. "K" Factor given indicates the erosion potential of each soil type. This indicates the susceptibility of a soil to sheet and rill erosion by water. Values of "K" range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to erosion.
Source: Soil Survey of Putnam and Westchester Counties, New York, USDA Soil Conservation Service.

Each of the soils represented on the project site is common to Putnam County. In order of prevalence, the most predominant soil classes within the project area are Stockbridge (Sb), Charlton loam (Ch), Charlton-Chatfield complex (Cr), Chatfield-Charlton complex (Cs), and Sutton (Su). These soils are described in detail below.

STOCKBRIDGE SERIES

The Stockbridge Series is the predominant soil series in the area of the project site that would be disturbed in the development of the proposed project, located within the orchard, pasture areas, and the main visitor parking area. The Stockbridge Series consists of very deep, well-drained soils that formed in the loamy glacial till derived mainly from limestone, marble, and schist. These soils are usually found on glaciated uplands. Slopes in the Stockbridge Series range from 2 to 25 percent in the proposed disturbance area of the project site.

Three phases of the Stockbridge Series occur in the proposed disturbance area: Stockbridge silt loam, 2 to 8 percent slopes (SbB); Stockbridge silt loam, 8 to 15 percent slopes (SbC); and Stockbridge silt loam, 15 to 25 percent slopes (SbD). All three phases have a perched water table at a depth of more than 6 feet throughout the year. The permeability for this soil is moderate in the surface layer and in the upper part of the subsoil, and slow or moderately slow in the lower part of the subsoil and in the substratum. Available water capacity is high, with a bedrock depth of more than 60 inches. Surface runoff grades from slow to rapid, and erosion hazard increases from slight to severe as slope percentage increases. This soil series is well suited for the cultivation of crops. According to the USDA, these soils do have some moderate to severe limitations for dwellings with basements, roads, and septic tank absorption fields due to their slope and slow permeability. Some moderate limitations are associated with proposed roadways due to seasonal frost action and slope. Development constraints due to slope can also occur on those Stockbridge soil mapping units having slopes from 8 to 25 percent; however, these limitations may be overcome with proper engineering and site design.

The Stockbridge soil found in much of Patterson and underlying the existing orchard site on the WEC campus is noted for silt loam with poor cohesive properties. In cohesionless soils such as this, the soil particles do not stick together effectively due to their physical and chemical properties. Once this silt loam is in suspension, it takes a significant period of time to settle out due to its light weight and inability to adhere to other particles. The applicant has experience implementing effective erosion controls to overcome these limitations gained during the initial

construction of the WEC and on more recent maintenance activities. Limitations on size of disturbance and diligent maintenance of erosion control measures have proved effective at minimizing the migration of very small, colloidal particles off-site.

CHARLTON SERIES

The Charlton series consists of very deep, well-drained soils on the sides and tops of glaciated hills. These soils formed in glacial till derived from granite, schist, and gneiss. Slopes in the Charlton series range from 2 to 35 percent on the project site. Three phases of the Charlton series occur on the project site: Charlton loam, 15 to 25 percent (ChD), Charlton loam, 25 to 35 percent (ChE), and Charlton-Chatfield complex, 2 to 15 percent (CrC). All three phases have a perched water table at a depth of more than 6 feet throughout the year. Permeability of the Charlton soils is moderate or moderately rapid throughout the profile. Available water capacity is moderate and bedrock is at a depth of more than 60 inches. Surface runoff is rapid to very rapid and erosion hazard severe to very severe in the Charlton loam phases. Surface runoff is rated medium and erosion hazard moderate for the Charlton-Chatfield phase. The soil is poorly suited to the cultivation of crops. This series does experience some moderate to severe construction limitations due to slope; however, these limitations may be overcome with proper engineering and site designs.

CHATFIELD SERIES

The Chatfield series exists on the project site as a complex of Chatfield and Charlton soils. These soil complexes are present in the northern portion of the orchard and in the area of the proposed audio/video building expansion. The soil in the Chatfield series consists of moderately deep, well-drained, and somewhat excessively drained soils on the sides and tops of glaciated hills. These soils formed in glacial till deposits over highly fractured, folded, and tilted granite, schist, and gneiss. Slopes range from 2 to 35 percent on the project site. The depth to bedrock ranges from 20 to 40 inches to 60 inches below grade. The permeability is moderate to moderately rapid throughout the soil profile. The erosion hazard may be severe during construction and surface runoff is rated as rapid. The available water capacity of the Chatfield-Charlton complex is low to moderate. According to the USDA, the Chatfield-Charlton series has severe limitations for building site and sanitary facility development due to the shallow depth to bedrock and slope.

SUTTON SERIES

Sutton loam is present in the southern portion of the pasture on the project site. The Sutton series consists of very deep, moderately well-drained soils formed in gravelly glacial till derived mainly from granite, schist, and gneiss. This soil series is typically found on the lower concave side slopes, in slight depressions, and along drainageways in the uplands. Slope of the Sutton loam present on site ranges from 3 to 8 percent. The permeability of the soil is moderate to moderately rapid throughout the profile. The available water capacity is high. The erosion hazard and surface runoff are moderate. This soil series does have some moderate to severe limitations for building site development due to the wetness and slope. The high water table, approximately 1.5 to 2.5 feet below the surface from November through April, is the main limitation for dwellings with basements; however, with proper engineering these limitations may be overcome. The potential for frost action limits the construction of local roads and streets.

HOLLIS SERIES

Hollis-Rock Outcrop and Chatfield-Hollis soils are located in the region of the existing excess soil deposition area upslope from the existing WEC buildings, which contains vegetation clippings, compost, and some soil stockpiling. It is bordered by forest and rock outcrops. The Hollis series consists of shallow, well-drained, or somewhat excessively drained soils on bedrock-controlled uplands. These soils are typically found on the sides and tops of hills and in valleys. Slopes for the HrF series range from 35 to 60 percent. Permeability is moderate or moderately rapid. Erosion hazard is very severe, surface runoff is very rapid, and water capacity is very low. Building site development for Hollis soils is described as "severe" due to shallow depth to bedrock and slope. The region of on-site Hollis soils is not proposed for building site development.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

No changes in site soils or bedrock geology are anticipated in the future without the proposed project. Further, no blasting or soil movement is expected. Finally, there is limited potential for soil erosion in the future without the proposed project.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT

This section describes the proposed project's potential impacts to soils, geology, and topography. It also outlines measures that would be employed during the construction of the proposed project to avoid any significant impacts.

SUMMARY

The proposed amended site plan of the WEC campus would result in the alteration of a portion of the geology, soils, and topography on a comparatively small portion of the applicant's properties. Specifically, the proposed area of disturbance would occur on approximately 49.1 acres, or approximately 7 percent of the approximately 691 acres of land owned by the applicant.

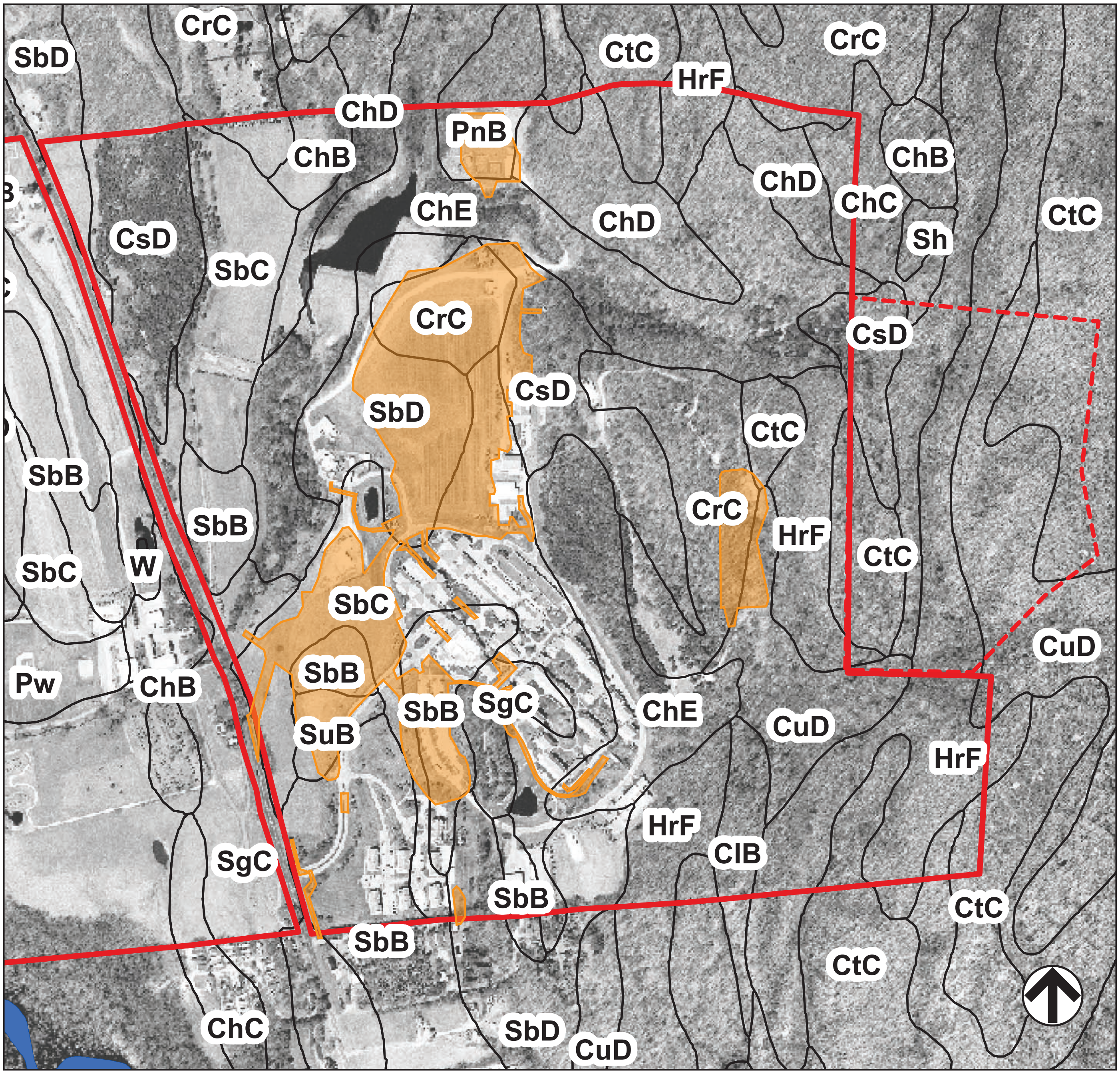
The proposed site design has been developed to strike a balance between surface disturbance and the need for excavation. Reducing the footprint of surface disturbance through the placement of building floors and parking areas below ground level is a central component of the design. In addition, to minimize steep slope disturbance, the proposed project would be located on the comparatively less steep portion of the project site, currently occupied by the orchard and lawn area.

The proposed project would require the excavation of approximately 196,100 cubic yards of earth material, of which 42,910 cubic yards is expected to be rock. The location of the cut and fill areas is shown in **Figure 5-4**. Of the total excavated material, more than half (110,600 cubic yards) would be used as fill in the regrading of the construction area. The net excess material is 85,500 cubic yards to be disposed of at a separate location on the project site parcel.

A detailed table of cut/fill volumes by construction activity is provided in Appendix B.

Disturbance to slopes greater than 25 percent would be minimized, totaling approximately 5.6 acres and comprising 11 percent of the overall area of site disturbance. Disturbance to slopes greater than 15 percent would be approximately 20.5 acres, representing 42 percent of the total site disturbance and 9 percent of the overall slopes greater than 15 percent contained on the WEC properties.

6.23.09



WEC Properties Boundary

Valley Farms Corporation Property Boundary

Area of Disturbance

0 500 1000 FEET

SCALE

ChB Charlton loam, 2 to 8 percent slopes
ChC Charlton loam, 8 to 15 percent slopes
ChD* Charlton loam, 15 to 25 percent slopes
ChE* Charlton loam, 25 to 35 percent slopes
CIB Charleton loam, 2 to 8 percent slopes, very stony
CrC* Charlton-Chatfield complex, 2 to 15 percent slopes, rolling, very rocky
CsD* Chatfield-Charlton complex, hilly, very rocky, 15 to 35 percent slopes
CtC* Chatfield-Hollis-Rock outcrop complex, rolling
CuD* Chatfield-Hollis-Rock outcrop complex, hilly
HrF Hollis-Rock outcrop complex, very steep
PnB* Paxton fine sandy loam, 2 to 8 percent slopes
SbB* Stockbridge silt loam, 2 to 8 percent slopes
SbC* Stockbridge silt loam, 8 to 15 percent slopes
SbD* Stockbridge silt loam, 15 to 25 percent slopes
SgC* Stockbridge-Rock outcrop complex, rolling, 5 to 15 percent slopes
SuB* Sutton loam. 3 to 8 percent slopes

* indicates soil unit is within the proposed footprint of disturbance.

Figure 5-3

Onsite Soils

Figure 5-4
Cut and Fill Plan

DISPOSITION OF EXCESS EARTH MATERIAL

The majority of the soil and rock material excavated during construction of the proposed project would be used for grading the area west of the proposed detention basin, as shown on the large-scale plans that accompany this DEIS (Drawings CG-101 to CG-107). As the design of the proposed project has progressed, the latest cut/fill calculations have determined that excess earth material to be excavated from the construction site would need to be deposited elsewhere on the project site parcel. This excess soil material would be permanently deposited on the WEC properties at one of two proposed locations. The preferred location is the area in and around the existing "excess soil deposition area-." Placement of this excess material at this location has been included in the overall 49.1-acre limit-of-disturbance footprint for the project as a whole. An alternate site would be the existing "north pasture" area, currently used for cow grazing. This alternative would require the installation of a stream crossing of Mountain Brook. (The location of the two possible excess soil deposition areas is shown in Figure 14-1 of Chapter 14, "Construction.")

Following input from the Town and involved agencies, one of these two sites would be chosen. At either location, soil would be deposited with appropriate erosion controls to avoid movement of sediment off-site and would be permanently revegetated to avoid any long-term water quality impacts.

At the preferred location, access would be via an existing gravel road leading to the existing excess soil deposition area. This existing road and culverts would be maintained without any modifications. The limits of disturbance of the fill material would be kept away from the existing natural rock faces flanking the existing excess soil deposition area to the east and west. The fill would be contained using New York State Department of Environmental Conservation (NYSDEC) soil stabilization methods (i.e., sediment basins and traps, debris basins, riprap outlets, topsoiling, hydroseeding, and silt fences). In order to terminate ("toe-in") portions of the lower edges of the spoils area, precast concrete interlocking block or rip-rap would be placed. A graded filter of gravel and sand sizes (or filter fabric) would be placed behind it to prevent soil migration.

At the alternate location, the north pasture area, similar methods of erosion control would be applied. A portion of the access would be using an existing gravel road. The remaining section would be provided via a new gravel road and new bridge across Mountain Brook.

For either excess soil location, topsoil would be placed over the fill and immediately replanted. All stockpiled topsoil berms would be immediately stabilized within 7 days of construction. The cut and fill operations would follow the phasing noted in **Table 5-2** below.

PROJECT PHASING

The location of active ground disturbance would be staggered into separate phases over the project's duration to limit the potential for soil erosion. The location of each construction phase is shown in the large-scale plans that accompany this DEIS (Drawing Number CD-101: Overall Construction Phase Plan) and discussed in more detail in Chapter 14.

Table 5-2 summarizes the proposed construction activity by phase and the approximate area of disturbance for each construction activity. **Some of the boundaries for the phases overlap and therefore the sum of the areas of disturbance for the individual phases is greater than the total actual area of disturbance for the project which is 49.1 acres.**

Table 5-2
Proposed Phasing for Areas of Disturbance

Phase and Duration	Area of Disturbance	Construction Activity
Phase 1 (45 Days)	9.2 Acres	Recycling Building, Construction Entrances, Lower Pond, Temporary Construction Facilities – Construction entrances off Route 22 and installation of road to connect to existing road by Recycling Building – Construction entrances for new Loop Road and existing road to area of new Recycling Building – Excavation, installation of foundation, and stabilization of area of new Recycling Building – Excavate/fill and grade for overflow event parking – Establish construction storage area by G Residence – Install construction trailers and temporary parking area – Establish temporary rock crushing and top soil storage area – Construct Lower Pond sediment basin. Basin to be converted to permanent detention pond following completion of construction activities. – Establish Lower Pond berm area – Stabilize all areas
Phase 2 (40 Days)	8.7 Acres	Loop Road, Audio/Video Building, Staging Area – Blast, excavate, and install temporary surface from station 50+00 to 55+00 on Loop Road – Blast, excavate, and install temporary surface for staging materials at location of future North Audio/Video Building – Install haul road from new Loop Road to Lower Pond berm area – Preparing staging area and road for stockpiling of excavated materials – Stockpile Lower Pond berm – Stabilize all areas
Phase 3 (70 Days)	3.8 Acres	G Residence, Courtyard between G Residence and H Residence, North Bridge from G to H Residence – Excavation, installation of foundation, and stabilization of area of new G Residence – Level and install temporary surface for staging materials at location of new residence courtyard – Stockpile Lower Pond berm – Stabilize all areas
Phase 4 (120 Days)	4.5 Acres	H Residence, South Bridge from H to G Residence – Excavation, installation of foundation, and stabilization of area of new H Residence – Stockpile Lower Pond berm – Stabilize all areas
Phase 5 (120 Days)	9.3 Acres	Maintenance/North Office Building, Loop Road, Tunnel from H Residence to Maintenance/North Office Building, Upper Pond – Excavation of Maintenance/North Office Building to bedrock – Use excavated soils to construct Loop Road from station 0+00 to 11+00 – Construct Upper Pond sediment basin. Basin to be converted to permanent detention pond following completion of construction activities – Excavation and installation of utility tunnel between H Residence and Maintenance/North Office Building – Stabilize all areas
Phase 6 (140 Days)	7.5 Acres	Maintenance/North Office Building, Loop Road, Cart Path – Blast, excavation, installation of foundation, and stabilization of area of Maintenance/North Office Building – Establish backfill storage berm in location of new West Audio/Video Building – Construct Loop Road from station 11+00 to 20+00 – Construct Cart Path – Stockpile materials in upper storage area berm – Stabilize all areas

Table 5-2 (cont'd)
Proposed Phasing for Areas of Disturbance

Phase and Duration	Area of Disturbance	Construction Activity
Phase 7 (60 Days)	2.4 Acres	Visitor Parking Lot – Construct new Visitor Parking Lot and stabilize surrounding area – Stabilize all areas
Phase 8 (40 Days)	3.9 Acres	Tunnel from Powerhouse to Maintenance/North Office Building, Maintenance/North Office Building retaining walls – Excavation, installation of foundation, and stabilization of area tunnel connected to North Office Building – Backfill Maintenance/North Office Building foundation – Install Maintenance/North Office Building retaining walls and backfill – Stabilize all areas
Phase 9 (90 Days)	2.4 Acres	Loop Road, Audio/Video Building, Tunnel from Audio/Video Building to Maintenance/North Office Building – Construct Loop Road from station 55+00 to 60+00 and adjacent parking areas – Blast, excavation, installation of foundation, and stabilization of area of West Audio/Video Building – Blast, excavation, installation of foundation, and stabilization of area of tunnel from West Audio/Video Building to Maintenance Building – Excavation, installation of foundation, and stabilization of area of North Audio/Video Building – Stabilize all areas
Phase 10 (90 Days)	5.4 Acres	Bus Parking Lot, Lobby Addition, Services Building Addition, Visitor Services Building, Passenger Pick-up/Drop-off Addition at E Residence, F Residence, and Parking at Patterson Inn – Remove existing parking lot and construct new Bus Parking Lot – Excavation, installation of foundation, and stabilization of area of Lobby Addition. – Excavation, installation of foundation, and stabilization of area of Services Building Addition – Excavation, installation of foundation, and stabilization of area of new Visitor Services Building – Construct passenger pick-up/drop-off areas at E Residence, F Residence, and parking at Patterson Inn – Finalize site landscaping
Total 815 Days	**57.1 Acres**	

TOPOGRAPHY AND SLOPES

The proposed new buildings would be arranged on the project site to maximize the use of the lesser-sloped areas. In addition, the location of the proposed project was chosen to utilize previously disturbed (cleared/regraded) areas for the new buildings and the existing roadway network rather than the more steeply sloped and typically forested areas elsewhere on the WEC properties. Retaining walls would also be considered as a means to mitigate the steep slopes. In this way, significant impacts to topography and slopes would be avoided. The chosen project location would result in the least potential for erosion and minimize bedrock disruption. The conversion of the existing orchard to fully vegetated land would also reduce the potential for seasonal wind erosion. The proposed grading plan is shown on the large-scale plans that accompany this DEIS (Drawings CG-101 to CG-107).

The majority of the proposed development would be located in the existing orchard, which has a moderate slope, less than 25 percent. The proposed project would disturb some steep slopes on the site. However, disturbance to slopes greater than 25 percent would be minimized, totaling approximately 5.6 acres and comprising 11 percent of the overall area of site disturbance. Areas of site disturbance on existing slopes within the overall 49.1-acre footprint of disturbance are shown in **Figure 5-5**. The alternate excess soil deposition area (north pasture area) is also shown for reference, but because it is only considered as an alternative, its slope disturbance is not included in the impact calculation.

Table 5-3 indicates the acreage of disturbance by slope category.

Table 5-3
Slope Disturbance

Slope Category	Acreage of Disturbance
0-10 percent	20.0 acres
10-15 percent	8.4 acres
15 percent to 25 percent	14.9 acres
25 percent or greater	5.6 acres

A slope stability analysis is required by the Town of Patterson for slopes greater than 3H: 1V (horizontal: vertical), such as the proposed new road construction in the office building area. If necessary, final graded slopes would be stabilized using "reinforced earth" methods with geogrid in layers as the fill is brought up to grade. It is anticipated that retaining walls would be constructed on the east side of the proposed Maintenance and North Office Building.

SUBSURFACE AND BEDROCK GEOLOGY

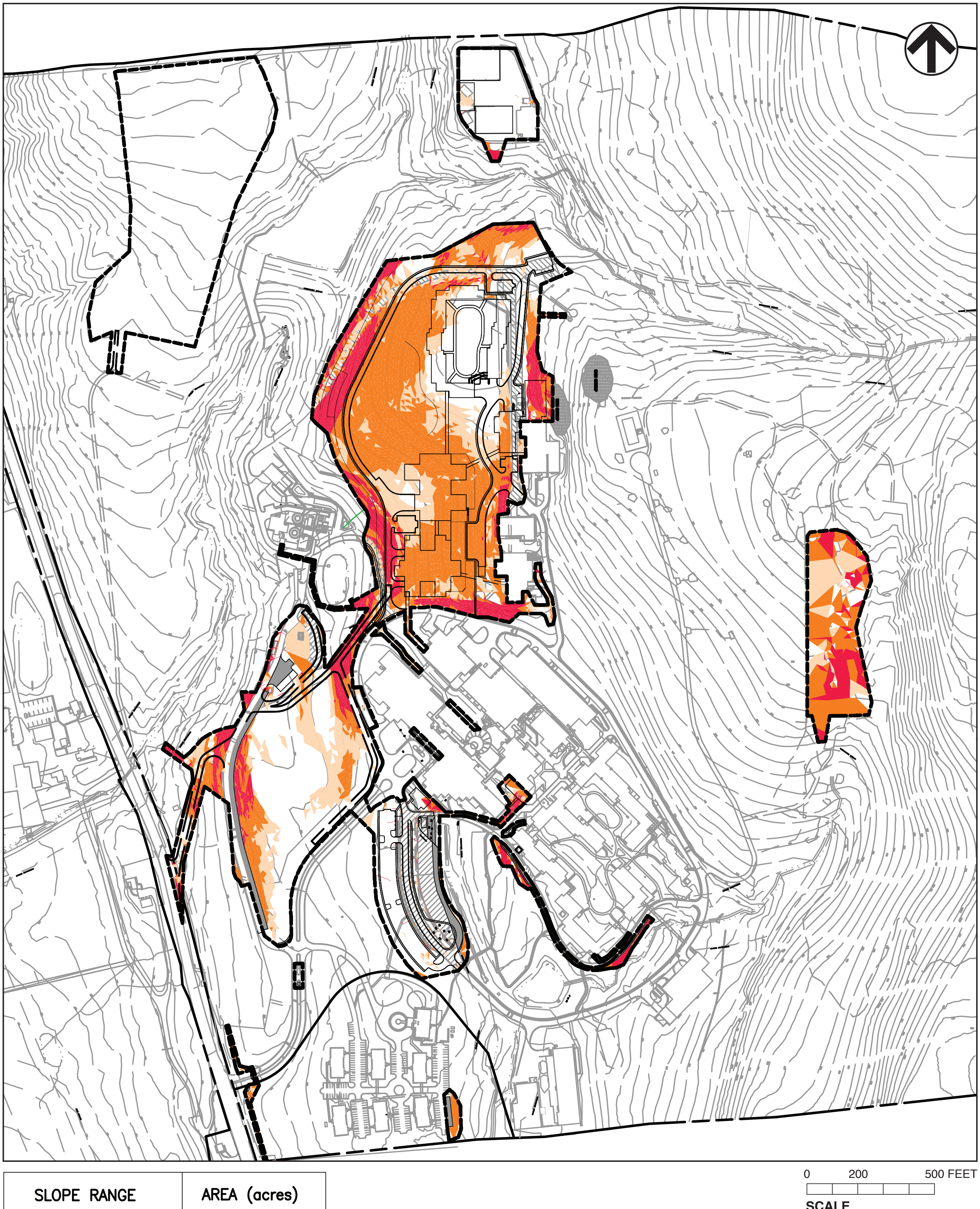
The proposed project has been designed to minimize the extent of bedrock disturbance. For example, the proposed building locations were modified after the bedrock profile was determined, in order to reduce the conflict with the bedrock. Design components to minimize bedrock disturbance would include the use of stepped footings below the proposed garage. However, due to the shallow depth of bedrock on the project site, the excavation or blasting of approximately 42,910 cubic yards of bedrock is expected. The locations of expected areas of bedrock removal are shown in **Figure 5-6**.

Various methods of rock excavation would be used during site construction depending on the type and condition of the bedrock at a particular area. In soft weathered rock, standard construction equipment is typically sufficient to excavate or "rip" the bedrock. If the rock is less weathered and stronger, additional mechanical devices, such as a hydraulic hammer mounted on an excavator, may be required to break the rock down into removable size pieces for excavation. As a last resort, to break apart massive, strong, and fresh (non-weathered) bedrock, drill and blast operations would be used if required to fragment the rock so that it can be excavated. By using combinations of these techniques, rock excavation can be performed in a responsible manner as was done during the original construction of the facility. Each of these methods, described further below, would produce vibrations and noise that could create a temporary disturbance to adjacent property owners.

MEASURES TO AVOID BLASTING IMPACTS

Where blasting is necessary for bedrock removal on-site, it would be carried out in conformance with all local, state, and federal regulations. Schedules for blasting and rock ripping (day, hour, and duration) would be provided to the town and limited to Monday through Friday during normal working hours.

The most common complaints with blasting are ground vibrations and noise. (It should be noted that noise complaints are often due to the air horns used to signal a pre-blast warning and a post-



SLOPE RANGE	AREA (acres)	
0% TO 10%	20.0	
10% TO 15%	8.4	
15% TO 25%	14.9	
25% OR STEEPER	5.6	

Figure 5-5
Area of Slope Disturbance

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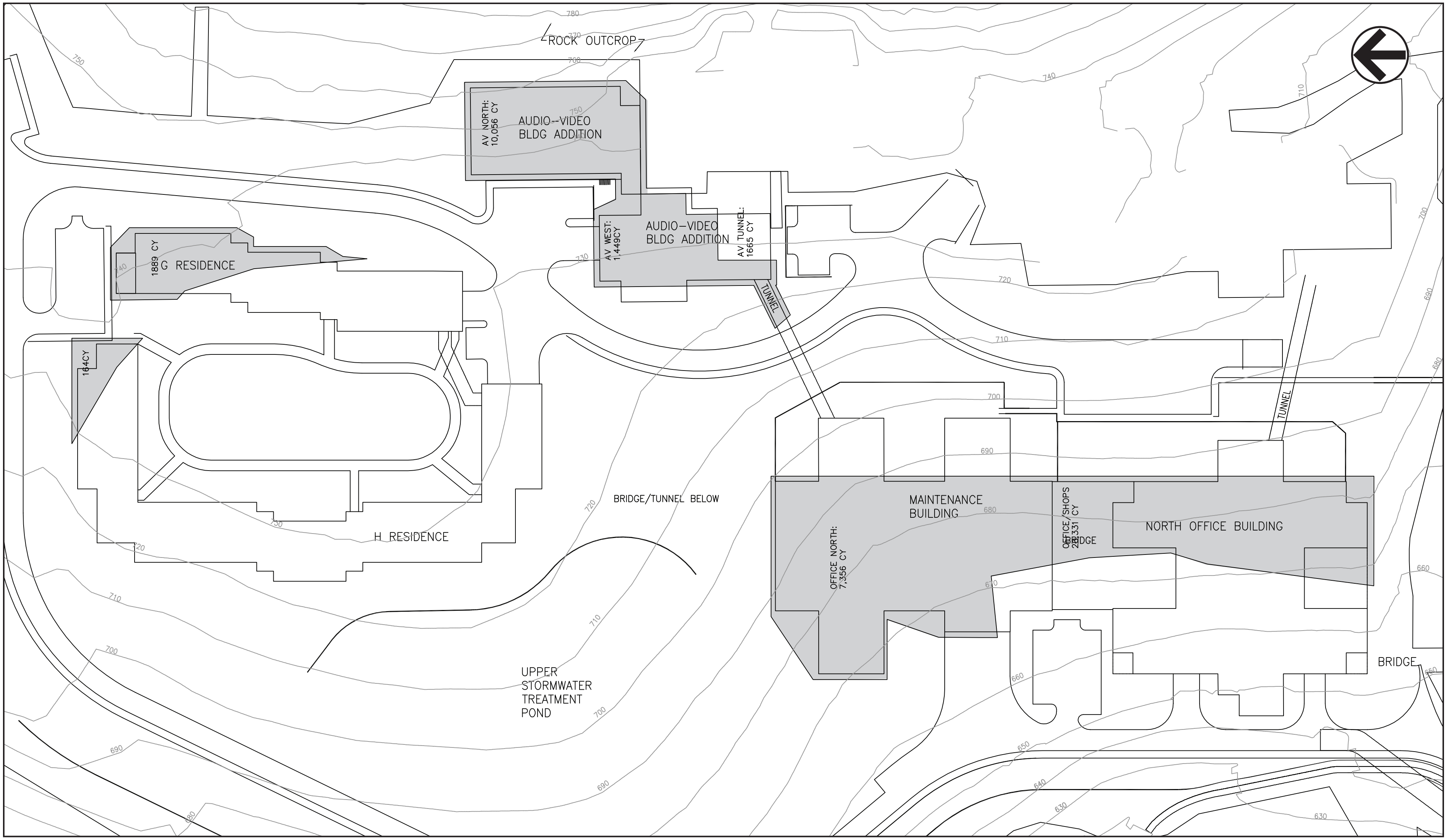

Schematic Not To Scale

Bedrock Removal

Figure 5-6

Areas of Expected Bedrock Removal

blast all clear sign rather than the noise of the actual blast.) However, careful blast design and careful monitoring of the blast effect can minimize potential complaints.

Both the noise of construction and any vibration associated with blasting are diminished with distance. The nearest existing off-site residences to the proposed construction site are located approximately 2,200 feet to the south and 1,500 feet to the north. At this distance, no significant noise or vibration impacts are expected. In addition, rock to be blasted would be covered with earth, further mitigating sound and vibration. Reaction to noise is caused by the duration and intensity of the sound. Typically, a blast is of short duration, causing little reaction.

To avoid impacts from necessary rock blasting, blasting would be carefully supervised and controlled. An appropriate blasting program would be finalized in conjunction with final construction plans. Under proper supervision and control, rock blasting would be accomplished safely, and with no significant adverse impact on the public and nearby properties.

All blasting operations would be carried out in conformance with New York State regulations governing the storage and use of explosives and the certification/licensing of blasting personnel. (12 NYCRR Chapter 1, Subchapter A, Part 39. Stat. Auth. at: Labor Law§21, 27-a, 27, 29, 462, art.16, General Business Law §483).

While the Town of Patterson has no municipal blasting regulations, measures typically used to avoid blasting impacts include:

- Blasting would be done with such quantities and strengths of explosives and in such a manner to break the rock approximately to the intended lines and grades, and leave the rock not to be excavated in an unshattered condition.
- Care would be taken to avoid excessive cracking of the rock upon or against which any structure would be built, and to prevent damage to existing pipes or other structures and property above or below ground.
- All operations involving explosives would be conducted by experienced and New York State-licensed personnel and with all possible care to avoid injury to persons and damage to property. In addition, the licensed blaster(s) would at all times have their license(s) on the work site and permit them to be examined by any appropriate official.
- Sufficient warning would be given to all persons near the work before a charge is exploded.
- To limit potential for blasting damage to nearby structures, blasting vibrations would be limited to a maximum peak particle velocity of 2 inches per second (2 ips).
- All blasting effects would be supervised and monitored by a professional engineer or geologist. This monitoring would utilize seismographic equipment if fragile buildings, as defined by New York State Office of Parks, Recreation, and Historic Preservation, or already structural deficient buildings are within 100 feet of the blasting site. The seismic recordings would be preserved.
- If rock is excavated beyond the limits indicated in the project plans, the excess excavation, whether resulting from overbreakage or other causes, would be backfilled with the specified backfill that is applicable for that section of the project.

POTENTIAL USES OF EXCAVATED ROCK

Excavated rock, whether a result of blasting operations or mechanical excavation methods, could potentially be used on-site for a variety of purposes including, but not limited to: rip-rap, slope reinforcement, base material for the new construction, landscaping features and erosion control. The rock can typically be left in its excavated state (i.e., size and shape) for the functions listed above.

SURFACE SOILS

The proposed project would require excavation of soil and the grading of topography, which would result in the exposure of soil to natural forces. Several soil types located on the project site have severe erosion potential, including the Charlton loam and the steeper slopes of Stockbridge silt loam. If not properly managed, the temporary exposure of bare soil accelerates the potential for erosion. This acceleration in soil erosion could potentially lead to siltation of the on- and off-site wetlands, ponds, and streams, located on and adjacent to the project site. This may cause a reduction in surface water quality. Measures to avoid impacts from the proposed project are discussed below.

STORMWATER POLLUTION PREVENTION PLAN

To prevent the potential negative effects of soil erosion, the proposed project would conform to the requirements of NYSDEC State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges Associated with Construction Activity Permit No. GP-0-10-001. This permit requires that proposed projects disturbing more than 1 acre of land must develop a Stormwater Pollution Prevention Plan (SPPP), containing both temporary erosion control measures during construction and post-construction stormwater management practices to avoid flooding and water quality impacts in the long term.

The Town of Patterson is a regulated, traditional land use control MS4. Therefore, the SPPP would be reviewed by the Town. Once approved, an MS4 SPPP Acceptance Form would be issued and submitted with the Notice of Intent (NOI) to NYSDEC for review and approval. The SPPP for the proposed project would also be reviewed and approved by the New York City Department of Environmental Protection (NYCDEP). It is expected that conforming to the approved SPPP would prevent any significant amounts of particulate matter from being transported into the natural stream channels of Mountain Brook and the unnamed stream in the southern portion of the project site. Thus, the proposed excavation and grading activities would not cause any significant adverse impact.

Further details on the SPPP are provided in Chapter 7, “Stormwater Management,” and in the complete SPPP found in Appendix F. The location of stormwater management and erosion control measures are shown in the separate, large-scale stormwater management plans and erosion and sediment control plans prepared for the SPPP and included as part of this DEIS.

METHODS OF EROSION AND SEDIMENT CONTROL

Protection from erosion and sedimentation would be provided through the use of a variety of measures:

- Silt fences would be used to trap eroded soils in sheetflow. A silt fence is a filter fabric designed to permit water to pass through but block suspended sediment in stormwater runoff.
- Hay bales with associated reinforcement and filtration materials would also be placed around catch basins to filter out sediment from stormwater before it enters catch basins.

- Temporary sedimentation basins would detain stormwater during construction of the proposed project.
- To prevent rapid erosion on steep slopes, stormwater conveyance would require several mitigation techniques, such as concrete pipes, special joints, energy dissipation, and thrust restraint.
- During winter operations, snow accumulations would be removed from active work sites and placed in a snow dump located on the project site. The snow dump would be located in an area that would prevent any potential for stormwater pollution.
- Long-term sediment and erosion control measures would be accomplished through the permanent establishment of vegetative cover on all exposed soil. Vegetation would be reestablished based on a site-specific landscape plan to be refined in the SPPP. Landscape plans would be strictly adhered to by the contractor, thereby ensuring that appropriate plants are used to stabilize soil and prevent erosion in the long term.
- The proposed project would require some areas of deep excavation in which perched groundwater may be encountered at shallow depths. During construction, any water accumulation in open excavation areas would be removed within 24 hours and discharged to on-site sedimentation basins in conformance with New York State dewatering specifications.
- Construction phasing for the project, as discussed earlier in this chapter and in Chapter 14, is another important component that would help avoid erosion and sedimentation by limiting the amount of bare soil exposed to precipitation at any one time.

CONSTRUCTION CONSIDERATIONS TO AVOID IMPACTS

The geotechnical investigation (CHA, May 23, 2008) performed for the proposed project determined that the existing on-site sand and glacial till subsurface deposits are suitable to support proposed structures on shallow spread foundations and would also be suitable for the placement of floor slabs. The use of existing fill soils, found in portions of the proposed project footprint, may be considered suitable for floor slab placement based on the results of a final geotechnical investigation to be completed subsequent to final project approvals. The existing sand subsurface material does not meet the requirements for structural fill material based on laboratory results. Therefore, it would not be used for this purpose. Instead, fill material would be obtained from crushed, excavated rock from the project site.

Design components to facilitate the proper structural and subsurface stability include:

- Exterior footings would be founded at a minimum depth of 4.0 feet below finished grade to provide frost protection.
- Interior footings in heated areas may be founded at a minimum of 2.0 feet below the bottom of the floor slab.
- Isolated footings would be a minimum of 36 inches in least dimension and continuous footings would be a minimum of 18 inches wide.
- Structural backfill would extend behind retaining walls at least half the wall height. The structural backfill would be capped with a layer of relatively impervious material to minimize percolation of surface water behind the walls.
- A minimum of 6 inches of clean, compacted crushed stone would be placed beneath the floor slabs to enhance support and provide a working base above the soil sub-grade.

- A polyethylene vapor barrier would be used between the crushed stone and concrete floor slab to eliminate vapor transmission into buildings spaces.
- Proposed foundations located partly on bedrock and partly on soil may need additional design components.
- The subgrade beneath the proposed structures and backfill behind their foundations would be maintained in dry conditions at all times. Drain tiles with crushed stone or gravel backfill would be placed adjacent to exterior footings at an elevation below floor slabs.
- A licensed engineer would be retained to observe proof rolling of the subgrade, foundation excavations, and review subgrade conditions prior to slab and foundation construction and make recommendations for any unsuitable conditions encountered.
- Dewatering would likely be required during the construction of the proposed project. Perched groundwater was encountered in test borings at depths as shallow as 6.75 feet. Groundwater would be maintained at a minimum depth of 2.0 feet below the excavation bottom at all times to maintain stable conditions. Dewatering methods suitable for this site would include the use of pumps, diversion and drainage ditches, and toe drains to divert water from construction excavation into temporary pits designed for water filtering.

By employing the above-mentioned construction measures, significant impacts related to building foundation construction would be avoided. ✷

A. INTRODUCTION

This chapter discusses the proposed project's potential impacts to water supply and utility services at the Watchtower Educational Center (WEC). An evaluation of existing water supply (potable and fire protection), sanitary services, energy (electricity and gas), and solid waste services is provided, followed by an assessment of future conditions without the proposed project and future conditions with the proposed project. Finally, proposed mitigation measures and conservation efforts are also discussed.

PRINCIPAL CONCLUSIONS

As detailed below, the proposed project, including its additional 500 residents at the existing WEC campus, would not result in any significant water supply or utility impacts requiring mitigation. Based on the existing usage at the facility, there are adequate provisions within the existing facilities to provide service for the proposed project. Through the implementation of water conservation practices in the existing and proposed buildings, the applicant would not exceed its currently permitted water withdrawal and wastewater flow. Further, as a participant in the Green Globes™ program, the applicant would incorporate energy and water conservation practices throughout the proposed buildings as well as the existing structures, where feasible.

B. EXISTING CONDITIONS

POTABLE WATER SUPPLY

OVERVIEW

Permits from Putnam County Department of Health (PCDOH) and New York State Department of Health (NYSDOH), in addition to the New York State Department of Environmental Conservation (NYSDEC), were obtained for the WEC campus as part of the original 1988 development project. A total daily demand of 165,000 gallons per day (gpd) was developed based on an assumed per capita consumption of 100 gpd for the main complex and 75 gpd for Patterson Inn. Additional allowance was provided for laundry and visitors. The applicant currently operates the "Watchtower Water Supply" (NYSDOH Public Water Supply Identification Number 3921721) and the "Annual Drinking Water Quality Report" is produced in conformance with NYSDOH requirements (see Appendix D for the latest report).

The WEC campus currently relies on private wells for its potable water supply and fire protection. Eleven bedrock wells and four sand wells were drilled on-site (both east and west of Route 22) during the original study performed for the 1988 DEIS (see Appendix C for the 1988 pumping tests and groundwater analyses performed by CA Rich Consultants). An extensive on-site investigation of the wells concluded that five were suitable for production, and these wells are still in use today for water supply. Three of the five wells are bedrock wells (designated as

"W-2," "W-4," and "W-6") located east of New York State (NYS) Route 22. These are bedrock wells drilled into metamorphic rock of the Manhattan Formation. The other two are sand and gravel wells located west of Route 22, designated as "SW-1" and "SW-2." The location of each of the five water supply wells is shown in **Figure 6-1**.

A safe yield, the maximum rate of continuous diversion or withdrawal that can be maintained indefinitely without depleting the groundwater supply, was determined for the WEC facility during the initial development of the site in 1988. The composite well yield from the wells developed for the existing WEC campus is 240 gallons per minute (gpm) with the largest rock well out of service and exceeds the minimum safe yield requirement (or twice the daily demand) as set by NYSDOH. However, the bedrock wells that are part of the well system have required costly maintenance to maintain the required yield. Based on the recommendations in a groundwater supply analysis conducted by Stanley M. Remington, consulting hydrogeologist, at the applicant's request, additional sand and gravel wells would help alleviate maintenance issues by providing a backup to the bedrock wells (see Appendix C). Permits for connecting two additional wells that have been drilled in the sand and gravel aquifer are currently being pursued by the applicant as part of a separate application. The locations of these additional wells are shown in Figure 6-1. See Appendix C.7, Pumping Test Report January 2010 by CA Rich Consultants, detailing the results of the development of the two additional wells and the 72-hour testing of the 7-well system conducted in October 2009.

WATER USE

Records of potable water flow at the WEC between June 2006 and December 2008 show that average monthly water usage is about 79 gallons per capita per day (gpcd). Higher amounts approaching 100 gpcd have been seen during the summer months, largely due to the activity of the cooling towers. These figures are based on the turbine water meter reading.

In 2006, the applicant made some adjustments to the steam system and converted the laundry dryers to gas in lieu of steam. Since these adjustments, there has been a reduction in 10,000 gpd. or approximately 10 gpcd. In 2008, the water supply system served an average of 1,167 residents with potable water. Usage usually remains below 90 gpcd; however, per capita water consumption in July 2008 was approximately 97.9 gpcd due to the flushing of the potable water system for routine maintenance. In 2008, average monthly water usage at the WEC ranged from 82,790 gpd in January to 110,476 gpd in July. Backup flow data from the water system is provided in the Water System Engineering Report dated February 26, 2009, included as Appendix D.

STORAGE AND TREATMENT

Potable water is stored in a 405,000-gallon water storage tank located east of the existing Audio/Video building (see Utilities Plan, **Figure 6-2**). Based on fire code and NYSDOH requirements, the tank was designed to store 240,000 gallons for fire protection plus 165,000 gallons (permitted average daily demand).

The original treatment facility consisted of pH adjustment and chlorination. However, after several years of operation, problems with the heat exchangers at the complex caused by calcium and magnesium hardness required constant maintenance by the facility personnel. In 1993, a temporary treatment system was installed and evaluated in a NYSDOH approved pilot study. A water softening facility that incorporates lime/potassium carbonate softening and filtration was designed and installed in 1996-1997.

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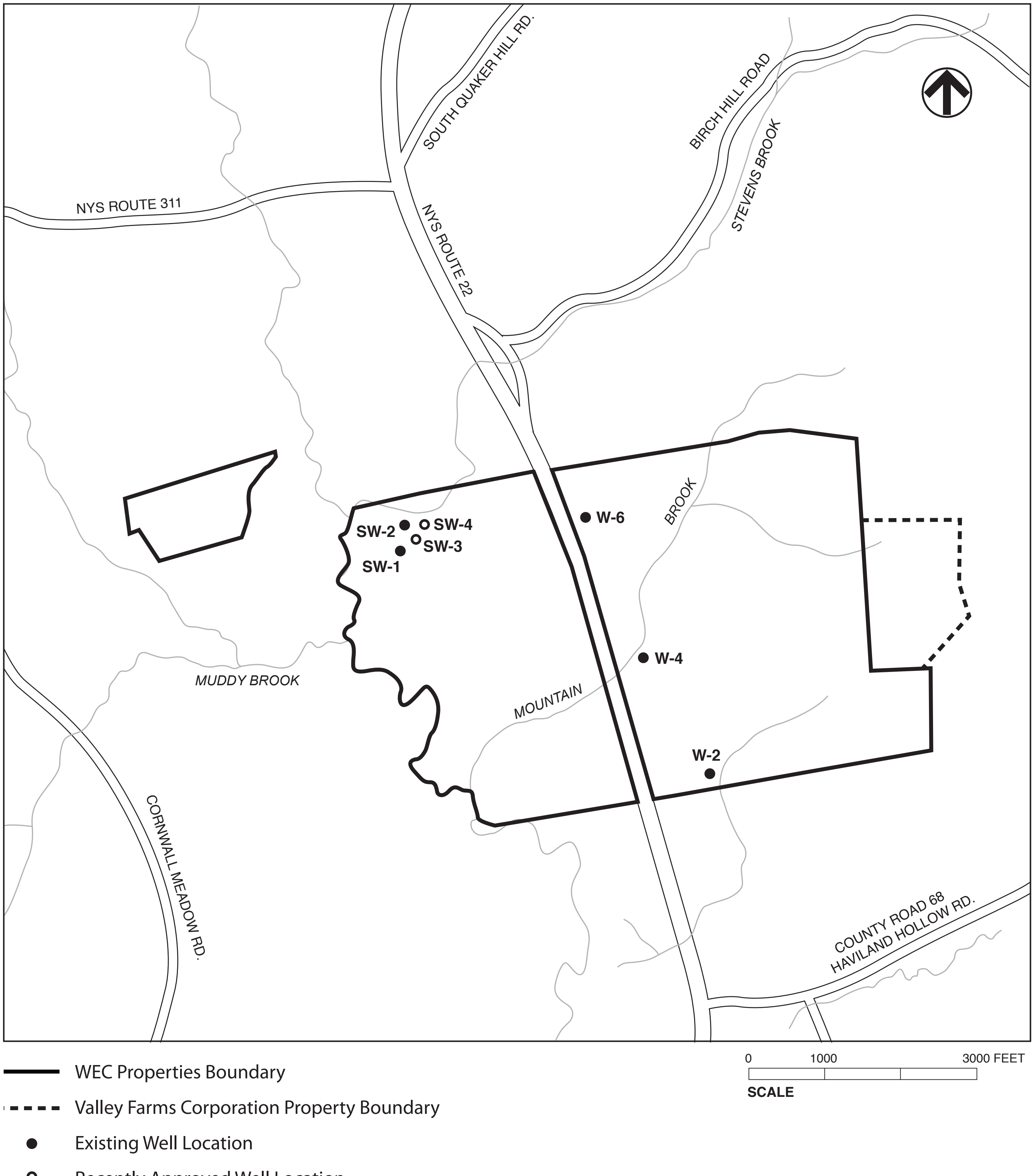

Figure 6-1

Existing Water Supply Well Locations

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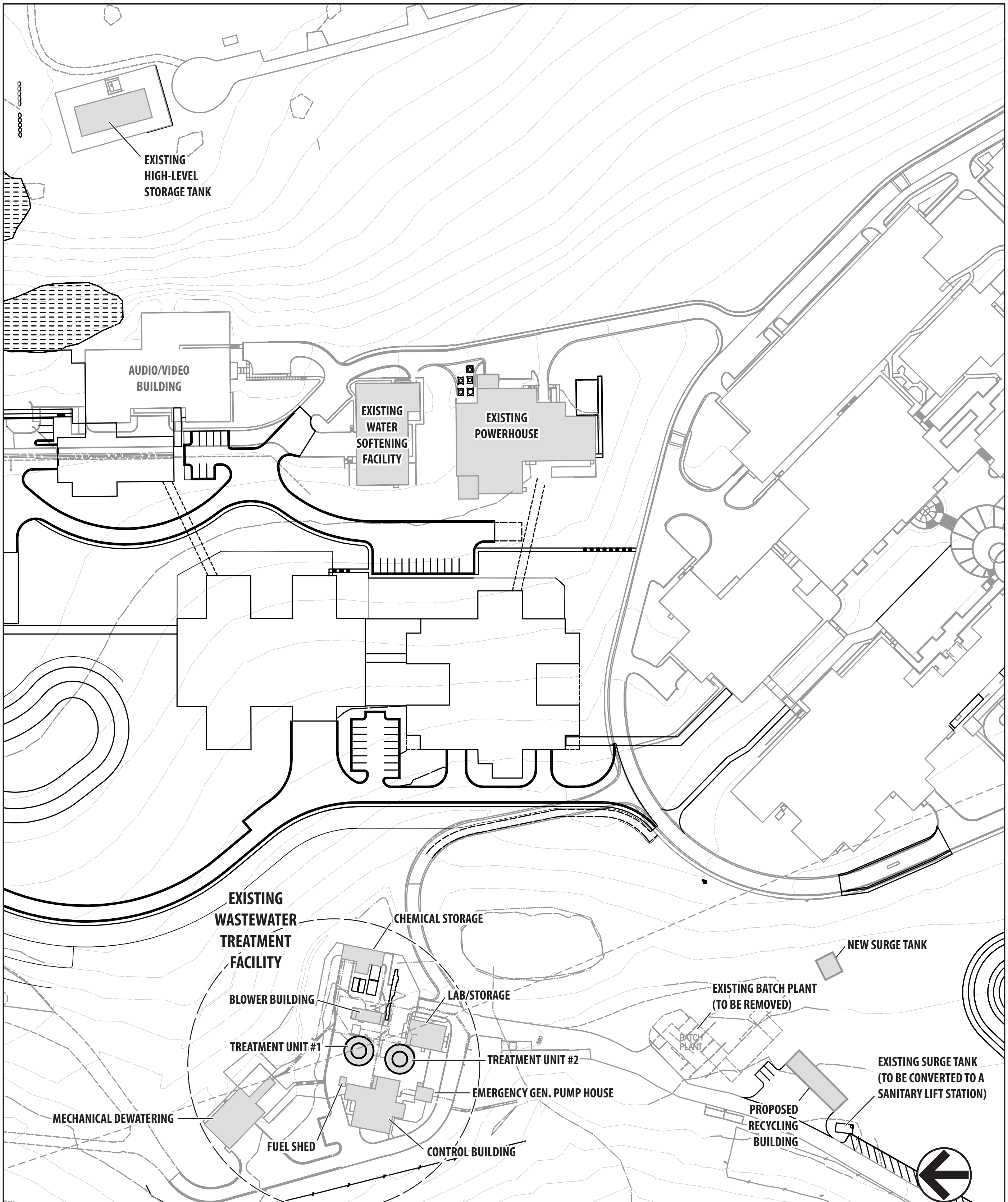

Figure 6-2
Utilities Plan

The design basis for the plant is 230 gpm, based on the required safe yield rate, with the plant operating continuously. The water treatment process is described in detail in Appendix D (Engineer's Report – Water Softening Facility, March 12, 1996) and is summarized in the following 10 steps:

1) Raw-water blending;
2) Chemical injection;
3) Rapid mix;
4) Flocculation;
5) Clarification;
6) pH adjustment;
7) Filtration;
8) Alkalinity adjustment;
9) Chlorination; and
10) Storage.

Water from the wells and the surge tank are combined within the two raw-water blending tanks, creating a fixed chemical ratio. The water is then pumped to a 24-foot-high head tank that provides gravity flow through the water treatment plant. Steps 2 through 5 all occur within three 12-foot-diameter ClariCone™ vessels, where hydrated lime, potassium carbonate, and anionic polymer are added to precipitate out most of the hardness minerals in the raw water. Heavy solids that settle to the bottom of the tank are conveyed via gravity to sludge storage/thickening tanks. Sulfuric acid is injected in the pipe between the cone and filters, where it is blended in a static mixer reducing the pH level. Solids are removed via gravity flow through two dual-cell rectangular Decel filters, composed of anthracite and sand. The supernatant from the backwash water is decanted to supernatant storage tanks and then recycled through the cones at up to 10 percent of the raw water flow rate.

The final treatment steps are corrosion control and disinfection, where sodium bicarbonate and sodium hypochlorite are added. In addition to all of these treatment steps, there is equipment for chemical storage and handling. To allow for the continuous operation of the water treatment facility, the chemical feed systems are designed with redundancy or spare parts on-site.

Sludge storage tanks are cylindrical tanks located below the floor level, capable of storing at least 5 days worth of sludge from the cones. A filter press is used to dewater the sludge for hauling.

The Water Treatment Facility has provisions for sampling and monitoring throughout the treatment process to allow for proper operation of the plant. The sampling and monitoring also provide a record of the quality of water and a general gauge of the equipment performance. There are also alarms on certain portions of the system that are used to inform the operators of potential problems or shut down the plant in an emergency.

The Water Treatment Facility was approved by NYSDOH and operates in conformance with its requirements. Chlorine levels are monitored daily to ensure proper dosing and to ensure conformance with NYSDOH standard for minimum chlorine residual of 0.20 mg/l. This daily standard has been met, according to the "Annual Drinking Water Quality Report for 2008" (see Appendix D).

AQUIFER RECHARGE

The five contiguous WEC property parcels, totaling 709.3 acres, are part of a subwatershed with an area of 4.55 square miles (2,912 acres). For the purpose of calculation, the mean annual precipitation rate used is approximately 51 inches, established over a period of 30-years as measured by the National Oceanic and Atmospheric Administration (NOAA) at its climatologic measurement station in Yorktown Heights, NY approximately 20 miles to the southwest of the Watchtower site (NOAA 2002). The recharge volume is conservatively estimated at 8-inches annually which equals a daily recharge average of 1,732,993 gallons for the entire subwatershed. The Watchtower parcels equal 24.35 percent of the subwatershed (709 / 2,912).[1]

Impervious area is defined as ground covered by concrete, asphalt or other hard surface that inhibits the infiltration of surface water. The current impervious land surface on the Watchtower parcels is approximately 42.3 acres. The remaining 667.0 acres of pervious ground allows an average daily recharge of 396,945 gallons. The amount of expected groundwater recharge for the WEC properties is well in excess of the 115 gpm (165,000 gpd) currently permitted for withdrawal by the WEC.

See Appendix C.4, Hydrogeologic Analysis, Watchtower Educational Center, Town of Patterson, N.Y. January 2010, for an analysis of existing water resources, groundwater availability and water supply potential for the WEC and surrounding environs.

EMERGENCY POWER

If there is a loss of power from the primary supplier, New York State Electric and Gas (NYSEG), the WEC has alternative sources of power to continue the operation of the water supply system, including the Water Treatment Facility. The Water Treatment Facility receives emergency power from the on-site Powerhouse.

FIRE PROTECTION

Sprinklers are provided in residential hallways and below-grade parking garages. Standpipes are provided in all exit stairways. Currently there is adequate flow and pressure to provide fire suppression in an emergency. The high-level storage tank is connected to the facility-wide hydrant system. Additional storage for fire protection and irrigation is provided by the 13-million-gallon reservoir located on-site at Mountain Brook.

WASTEWATER

WASTEWATER TREATMENT FACILITY

The applicant is currently operating under NYSDEC State Pollutant Discharge Elimination System (SPDES) Permit #NY-0165778 for the discharge of treated wastewater effluent from the Wastewater Treatment Facility to Mountain Brook. The SPDES permit allows a monthly average daily flow of 165,000 gpd; however, the plant currently treats a monthly average daily flow of 96,000 gpd. Other SPDES permit effluent limits are shown in **Table 6-1** along with their average monthly values, demonstrating full compliance with effluent limits.

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[1] Based on average annual rainfall of 51 inches and assuming 84.3 percent loss to runoff and evapotranspiration. See Appendix C for recharge calculations.

Table 6-1
Wastewater Effluent vs. SPDES Permit Limits

Parameter	Limit	Monthly Average[1]
$CBOD_5$	5.0 mg/l	< 3.0 mg/l
Solids, Suspended	10.0 mg/l	< 4.3 mg/l
Solids, Settleable	< 0.1 ml/l	< 0.1 ml/l
pH	6.5 to 8.5 su.	6.7 to 8.0 [2]
Ammonia (as NH3)	1.5 mg/l (June 1 – October 31) 2.0 mg/l (November 1 – May 31)	< 1.0 mg/l < 1.0 mg/l
Phosphorus, Total (as P)	0.5 mg/l	< 0.2 mg/l
Dissolved Oxygen	7.0 mg/l minimum	8.3 to 9.8 mg/l [2]
Coliform, Fecal	200/100 ml (30 day geometric mean) 400/100 ml (7 day geometric mean)	< 8/100 ml < 8/100 ml
Turbidity	≤ 0.5 NTU in 95% of the time 5.0 NTU instantaneous maximum	≤ 0.5 NTU 98.5% of the time < 3.0 NTU

Notes: [1] Average calculated from Wastewater Facility Operations Reports as submitted to the Putnam County Department of Health (January 2008 through June 2009).
[2] Minimum-Maximum range (January 2008 through June 2009).

The Wastewater Treatment Facility was put into operation in 1991 and underwent an upgrade in 1994-1995. This upgrade was to provide additional flow equalization and primary clarification to address the biochemical oxygen demand issues. The Wastewater Treatment Facility discharges to Mountain Brook, which is contributory to the East Branch Reservoir and is a NYSDEC Class C stream. The reservoir is part of the New York City East of Hudson Water Supply system. The Wastewater Treatment Facility was upgraded in 2002 to comply with the requirements of the City of New York's "Watershed Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources." This upgrade included the installation of dual sand filters for enhanced phosphorous removal, backup disinfection with automatic startup, and sand filtration. Engineering reports detailing the original design of the Wastewater Treatment Facility, the 1994-1995 upgrade, and the dual sand filter design are included in Appendix E.

The current treatment process used for the Wastewater Plant at the Watchtower Educational Center is the single-stage nitrification mode of the activated sludge process. The Wastewater Treatment Facility can be broken down into six treatment processes: preliminary treatment, primary treatment, secondary treatment, tertiary treatment, disinfection, and solids handling. **Figure 6-3** shows the process flow diagram of the Wastewater Treatment Facility. The plant consists of two flow equalization tanks, two primary clarifiers, two aeration tanks, two secondary clarifiers, three filter trains, and two disinfection units. The sand filters used are dual sand filters, which are considered to be microfiltration equivalent under the upgrade program instituted by the New York City Department of Environmental Protection (NYCDEP). Discharge takes place through a cascade aerator, which ensures that the water entering into Mountain Brook is well oxygenated at a level similar to or higher than the water in the stream. The solids handling facility is designed with a 60-day holding time for sludge with the plant running at full capacity of its permitted limit.

Since its inception in 1991, the Wastewater Treatment Facility has had no flow violations.

COLLECTION SYSTEM

Wastewater is collected from the WEC and Patterson Inn located on the east side of NYS Route 22. Most of the collection system is gravity sewer, but there are five pump stations capable of pumping 565 gpm. These pump stations are connected to emergency power in the event of a power outage. Due to the type, age, and maintenance of the collection system, inflow and infiltration (I&I) problems are minimal.

Grease interceptors are located in the kitchen facilities to prevent grease and oil from entering the sanitary sewer system. WEC staff clean out the grease interceptors periodically, as needed.

EMERGENCY POWER

The wastewater collection system and the Wastewater Treatment Facility are served by emergency electrical power.

ELECTRICITY AND GAS

Electric and gas services are provided to the WEC by NYSEG. Current peak electricity demand is 2.6 megawatts (MW) and the existing maximum daily transport quantity (MDTQ) of natural gas is 650 decatherms (Dth).

The WEC also has the capability to provide power to critical facilities during an emergency. Backup power is provided by generators at the on-site Powerhouse and, in addition, dedicated diesel generators are located at the Wastewater Treatment Facility, Patterson Inn, and Warehouse.

SOLID WASTE

The applicant engages several vendors to haul solid waste off-site, depending on the nature of the waste. Average monthly municipal solid waste generation and the applicable haulers are shown in **Table 6-2. Table 6-3** shows waste that is generated from routine operations and maintenance activities on-site. The location of each landfill or disposal venue to where solid waste is hauled is shown in **Table 6-4**.

Table 6-2
Average Monthly Municipal Solid Waste Generation at the WEC

Waste	Quantity (lbs)	Quantity Per Capita (lbs)	Vendor	Frequency of Pick-up
General Municipal Solid Waste	82,780	71.18	All American Waste	5 times/month
Cardboard (Recycled)	10,400	8.94	All American Waste	1-2 times/month
Paper (Recycled)	6,880	5.92	All American Waste	1 time/2 months
Bottles/Cans (Recycled)	7,620	6.55	All American Waste	1 time/month
Metal (Recycled)	10,460	8.99	All American Waste	1 time/month
Total	**118,140**	**101.58**	---	---

Source: Watchtower Bible and Tract Society of New York, Inc.

7.15.09

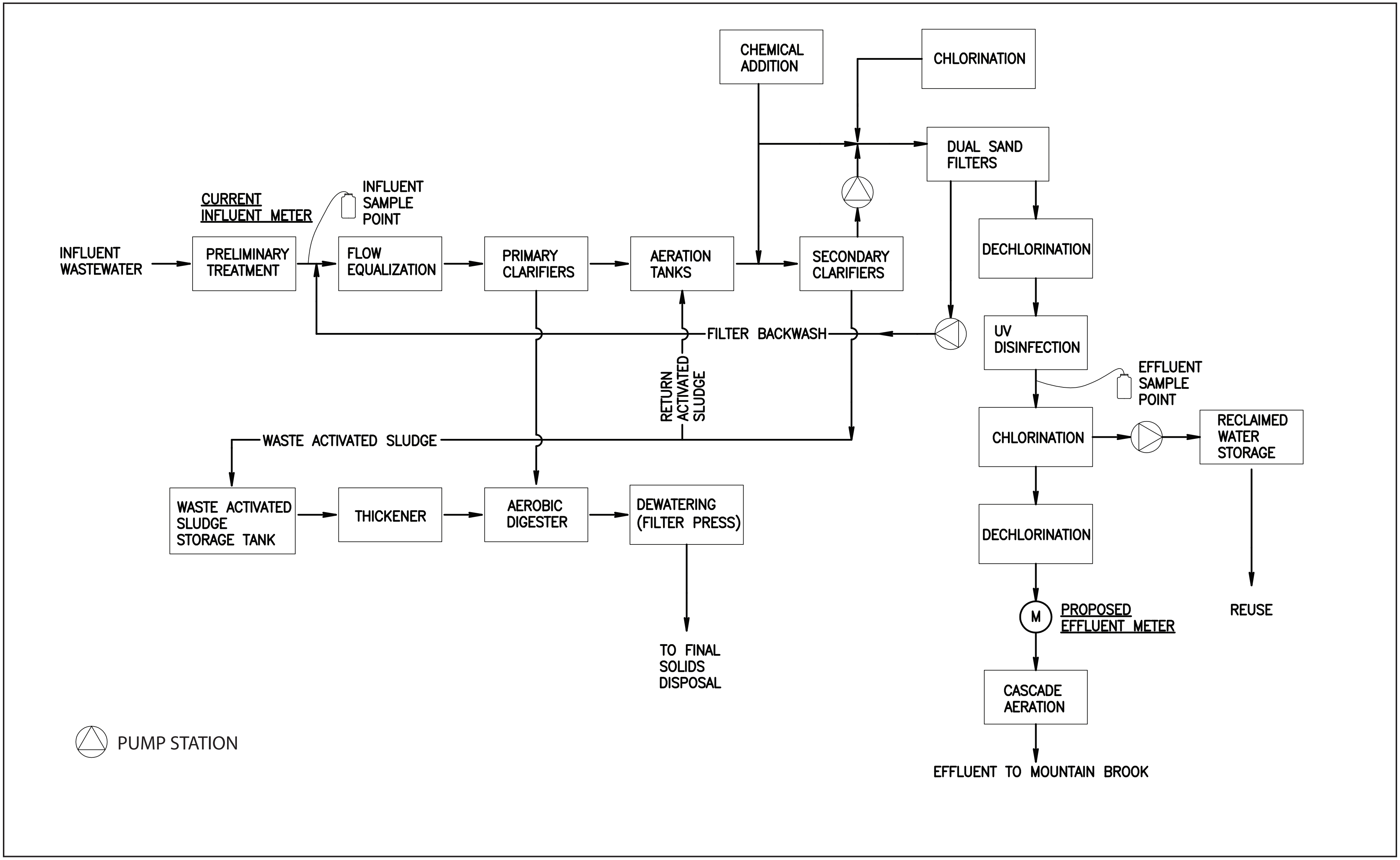

Figure 6-3

WWTF Process Diagram

Table 6-3
Operational and Maintenance Solid Waste Generation at the WEC

Waste	Quantity (Cubic yards)	Vendor	Frequency of Pick-up
Wastewater Sludge	20	Synagro	1 time/4-5 weeks
Construction and Demolition Debris	30	All American Waste	3-4 times/month
Lime Sludge	20	Waste Management Industrial of CT	1 time/2 months
Source: Watchtower Bible and Tract Society of New York, Inc.			

Table 6-4
Landfill Locations

Vendor	Disposal Location
Synagro	199 Municipal Road, Waterbury, CT 06708-4304
Jones Septic Services	City of Poughkeepsie Sewer Treatment Plant
All American Waste	*Trash and demo:* Harlem Valley in New York *Recyclables:* Murphy Road Recycle, New Milford, CT
Waste Management Industrial	425 Perinton Parkway, Fairport, NY 14450
Source: Watchtower Bible and Tract Society of New York, Inc.	

Over the past year the average amount of municipal solid waste generated monthly at the WEC was 118,140 pounds (of which 35,360 pounds was recycled), or 3.39 pounds per capita per day (based on an existing average overnight population of 1,163 people). This is below the national average published by EPA (for 2007) of 4.60 pounds per capita per day. Over the past year, on average, 29.9 percent of the mixed solid waste generated at the WEC was recycled. This includes glass, metal, plastic, cardboard, and paper waste streams.

C. THE FUTURE WITHOUT THE PROPOSED PROJECT

POTABLE WATER SUPPLY

In the future without the proposed project, water demand would be minimally reduced. Several initiatives to improve water supply and efficiency of use at the WEC are being investigated and would be implemented based on the economies of the individual measures.

In 1996, the applicant retained Stanley Remington, a consulting hydrogeologist, to evaluate the water supply system (see Appendix C, Groundwater Supply Analysis, Watchtower Education Center. S. Remington, 8.12.96). This analysis concluded that “the bedrock wells are not a long-term reliable source of water” due to the poor transmissivity and low storativity of the Manhattan metamorphic rock in conjunction with its small recharge areas. According to the analysis, there is a potential for these wells to go dry during severe drought conditions.

The sand and gravel wells access water stored in unconsolidated sand and gravel glacial deposits overlying marble of the Stockbridge formation. The on-site sand and gravel aquifer is more productive than the bedrock wells due to their ability to retain larger quantities of groundwater. Permeability and porosity of on-site bedrock aquifers is negligible; water is stored solely in secondary fractures. To minimize the drawdown effect of the bedrock wells on the aquifer, the applicant obtained permits from PCDOH and review by the Town of Patterson Planning Board to drill and test two additional sand and gravel wells on the west side of NYS Route 22. These additional wells are being installed to allow for maintenance of the bedrock wells and to provide backup of the water supply well network, without increasing the 165,000 gpd water taking permit. See Appendix C.7, Pumping Test Report January 2010 by CA Rich Consultants, detailing the results of the development of the two additional wells and the 72-hour testing of the 7-well system conducted in October 2009. The analysis evaluates the minimal effect on the aquifer and surface water bodies.

SANITARY SYSTEM

Wastewater flow at the WEC without the proposed project would be reduced due to the water-saving initiatives mentioned above.

ELECTRICITY AND GAS

Without the proposed expansion, electric and gas demand at the WEC would remain relatively steady. Any slight increases would be easily accommodated by existing NYSEG facilities.

The applicant is actively investigating the installation of a modest amount of photovoltaic power on-site. Initially, the capacity would likely be 50kW; however, there is the potential for it to expand in the future.

SOLID WASTE

Solid waste generation is expected to continue at existing rates without the proposed project. The WEC would continue to operate under existing conditions, therefore producing similar solid waste amounts.

D. PROBABLE IMPACTS OF THE PROPOSED PROJECT AND MITIGATION

POTABLE WATER SUPPLY

The proposed project would accommodate an additional 500 residents on the WEC campus, bringing the maximum capacity to approximately 2,050, and would increase potable water demand on-site. As discussed in Chapter 2, “Project Description,” and the Water System Engineering Report in Appendix D, average residential population at the WEC is expected to be approximately 1,800. Based on the average historical water usage of 79.3 gpcd, projected average water demand at the WEC would be approximately 143,000 gpd. The applicant intends to ensure that it remains within its 165,000 gpd limits established by its NYSDEC water usage permit and SPDES permit for wastewater flow by implementing water conservation/recycling/reuse measures, discussed below. The applicant is actively pursuing Green Globes™ certification for the new buildings, which includes third-party verification and has evaluated where certain criteria could be implemented to reduce water demand.

Green Globes™, similar to Leadership in Energy and Environmental Design (LEED), is a green building guidance and assessment program that uses a rating and certification system. The environmental impact is assessed on a 1,000-point scale in multiple categories: energy, indoor environment, site impact, water, resources, emissions, and project/environmental management. The intent is for the design team to fully evaluate the environmental impacts through the design, procurement, construction, and commissioning process. Several water-saving projects or practices that conserve water resources and discharge fewer liquid effluents were evaluated in the "Water Conservation/Reuse/Recycling Options Feasibility Study" (see Appendix D).

The applicant would implement water conservation measures for economic and environmental reasons and to remain within its 165,000 gpd SPDES allowance. The following water conservation measures A to C (and likely D) are being considered and would involve retrofitting existing buildings and new installation in proposed WEC facilities as outlined below:

- **Measure A**: This option would retrofit existing 2.5-gpm showerheads throughout the WEC with 1,200 low-flow 1.5-gpm showerheads. Conserving water flow in showers would reduce potable water and wastewater flow by approximately 13,300 gpd.
- **Measure B**: This option would retrofit existing flushometers that use 1.6 gallons of water per flush (gal/flush) with reduced-flow flushometers that allow a 1.1-gal/flush when the lever is pulled up instead of down. This option is being considered for women's restrooms. Potable water and wastewater use would be reduced by 1,200 gpd.
- **Measure C**: This option involves replacement of washing machines on-site with longer-lasting and more efficient machines. The preferred option being considered is the option referred to as Measure "C1" in the Water Conservation/Reuse/ Recycling Options Feasibility Study. Measure "C1" would replace washing machines with a commercial model that is more efficient than existing machines and would reduce potable water and wastewater flows by 1,800 gpd.
- **Measure D**: Measure D involves the replacement of urinals in the men's restrooms with high efficiency urinals, reducing flushes from 1 gal/flush to 1/8 gal/flush. As a result, potable water and wastewater flows would be reduced by 1,100 gpd.

By implementing each of these measures, water and wastewater demand at the WEC could be reduced by a total of 17,400 gpd.

To accomplish further reductions in water demand with the proposed project, the following additional measures E and F will be pursued in new buildings:

- **Measure E**: Measure E involves the installation of 250 dual flush gravity tank toilets in new residences. Retrofitting existing residences is not economical. Existing toilets use approximately 1.6 gal/flush. Dual flush toilets allow a 0.8 gal/flush for liquid-only flushes. Potable water and wastewater flow reductions would be roughly 1,200 gpd.
- **Measure F**: This option would reuse effluent from the Wastewater Treatment Facility in the cooling towers, which currently use about 2,400,000 gallons per year. Reduction in potable water and wastewater flows would be seasonal: 1,500 gpd (January), 6,000 gpd (April), and 18,000 gpd (August).

  Further measures to reduce water usage will be investigated to determine if they are practical and economically feasible.

Existing average monthly water usage, projected water demand with the proposed project, and potential reduction in water use by implementing the measures discussed above, are shown in **Table 6-5**.

Table 6-5
Comparison of Existing and Future Average Water Demand

Existing Usage	Projected Demand	Projected Demand with Water Conservation
*92,432 gpd	142,980 gpd	121,480 gpd
Notes: *Based on records of water usage between June 2006 and December 2008.		
Sources: Water System Engineering Report (Appendix D), Watchtower Bible and Tract Society of New York, Inc.		

While the Applicant’s permit is based on 30-day averages, the following information regarding peak usage is provided. Peak daily potable water usage from October 2007 through October 2009 ranges from 105,890 gpd to 141,340 gpd, excluding the July 2008 peak of 149,640 gpd caused by hydrant flushing as discussed under “B. Existing Conditions, Water Usage.” Multiplying the existing peak daily to average monthly usage ratio (141,340/92,432) times the projected monthly demand of 142,980 gpd (without the proposed water conservation), the projected peak daily usage result is 218,600 gpd. This projected peak daily water demand is well under the NYSDEC water supply permit maximum daily demand limit of 330,000 gpd. The two additional sand and gravel wells on the west side of NYS Route 22 will ensure that the full permitted peak daily flow can continue to be supplied. The water softening facility is permitted for 330,000 gpd with the largest unit out of service, and has been tested to over 400,000 gpd. The 165,000 gallons of water storage in the high level tank reserved for daily flow fluctuations should be adequate to meet any peak instantaneous flows in the water supply system.

WATER SYSTEM UPGRADES

The existing water distribution system would require modifications to provide potable water to new buildings. These changes are summarized below, and explained in more detail in the Water System Engineering Report (see Appendix D). A larger two-compartment surge tank, with upgraded pumps and force mains, would replace the existing surge tank to provide greater flexibility in operation and redundancy in the event of mechanical failure or maintenance work. The new surge tank and associated appurtenances would be located near the existing surge tank (see Figure 6-2).

The applicant intends to increase the capacity of the supernatant pumps at the Water Softening Facility from 25 gpm to 50 gpm in order to meet its 10 percent supernatant allowance. A new lime feeder would also be installed.

New distribution mains and a fire hydrant system would be installed for the new buildings. The preliminary layout of these systems is shown on the large-scale drawings CU-101 and CU-104 Utilities Plan that accompany this DEIS.

The cooling towers at the existing Powerhouse currently use potable water. As discussed earlier, the applicant is pursuing a reuse of treated wastewater effluent initiative to reuse effluent from the Wastewater Treatment Facility in the cooling towers to reduce demand on the potable water supply. A potable water connection would remain available when effluent is unavailable. A reduced pressure zone principle backflow preventer would be included on the potable water line to ensure separation of potable water and effluent.

AQUIFER RECHARGE

The proposed project would increase impervious surface on-site by 10.2 acres, to a total of 52.5 acres. The remaining 656.8 acres of pervious ground allows an average daily recharge of 390,875 gallons. The amount of expected groundwater recharge for the WEC properties is well in excess of the 115 gpm (165,000 gpd) currently permitted for withdrawal by the WEC. Projected water demand with the proposed project would be below this with a calculated average of 142,980 gpd (or 121,480 gpd with the proposed water reduction measures discussed above). Once permits are received for connecting the new sand and gravel wells to the potable water system, water withdrawal will be less dependent on the bedrock aquifer and will be distributed over a larger area.

See Appendix C.4, Hydrogeologic Analysis, Watchtower Educational Center, Town of Patterson, N.Y. January 2010, for an analysis of existing water resources, groundwater availability and water supply potential for the WEC and surrounding environs.

WASTEWATER

WASTEWATER TREATMENT FACILITY

The proposed project is expected to increase average and peak wastewater flow to 135,800 gpd or 154,400 gpd for populations of 1,803 and 2,050, respectively. To minimize the potential for exceedances, the applicant has reviewed water saving measures that can be implemented throughout the existing building program as well as the proposed buildings. The reduction in the total discharge volume is being pursued through water conservation engineering. This is discussed above in the "Potable Water Supply" section. Reuse of treated wastewater effluent for the Powerhouse cooling towers would reduce wastewater flows approximately 1,500 gpd (in January) and 18,000 gpd (in July).

The existing Wastewater Treatment Facility would be able to handle the additional projected flows from the proposed new buildings. The two 36,000 gallon flow equalization tanks would adequately serve any expected peak instantaneous flows in the wastewater system. The 165,000 gpd SPDES permit limit is based on average monthly wastewater flow. The proposed additional waste flow is not expected to change the chemistry of the waste stream, necessitating changes in the treatment process. As demonstrated in the Waste Assimilation Capacity Analysis completed in August 2008 for the proposed project (see Appendix E), effluent quality would remain within the acceptable limits and therefore not adversely affect surface water quality, including Mountain Brook to which treated wastewater is discharged. Calculations demonstrating the biochemical oxygen demand (BOD), nitrogen and hydraulic capacity loadings through the Wastewater Treatment Facility are provided in the Wastewater System Engineering Report (see Appendix E). This report includes updated flow figures that demonstrate that the Wastewater Treatment Plant can handle the proposed additions.

Only minor modifications to the existing Wastewater Treatment Facility would potentially be required with the proposed project. The present SPDES permit uses the influent meter to record flows. A final effluent meter will be installed in a new underground vault downstream of the existing chlorine contact tank to accurately record flows in view of the desire to recycle and reuse treated wastewater in the cooling towers. Application to modify the SPDES permit to allow for this flow metering location adjustment has been approved by NYSDEC, with the permit modification taking effect January 1, 2010. In addition, a new connection between the Wastewater Treatment Facility and the cooling towers would be required to convey effluent.

WASTEWATER COLLECTION SYSTEM

The existing sewerage collection system was constructed in conformance with PCDOH, NYSDEC, and NYCDEP requirements. The existing conveyance system would be modified to allow new connections from the proposed buildings. The system would be designed in accordance with 10 States Standards, NYCDEP Watershed Rules and Regulations, and DEC-88 Design Standards. The WEC has never experienced a SPDES flow parameter violation. Therefore, in accordance with Section 18-37 of the NYCDEP Watershed Rules and Regulations, the proposed new connections would not be prohibited. All designs and plans applicable to each service connection would be submitted to NYCDEP in conformance with Section 18-37(d) and the applicant would provide notification to the NYCDEP 48 hours prior to the installation of the service connection.

The proposed buildings would be served by the existing gravity sewer and manholes. A new lift station would be needed for the recycling area, which is lower than the trunk sewer. The lift station would also serve temporary construction facilities proposed for this area. The existing surge tank would be converted to a lift station as it is in an appropriate location and is no longer needed for the water system. A new surge tank, located approximately 230 feet uphill from the proposed lift station, would be installed for the water system, as previously described.

ELECTRICITY AND GAS

Projected electric and natural gas demand from the proposed project is expected to be 0.9 MW (megawatts) and 200 Dth (decatherms), respectively. This would bring the total WEC facility's (existing and proposed) usage to 3.5 MW (megawatts) and the MDTQ of 850 Dth (decatherms). NYSEG's current natural gas distribution system would comfortably accommodate the increase. However, NYSEG's Haviland Hollow substation would require NYSEG to make adjustments to equipment within the existing substation to support the increased electric demand from the WEC campus. There will not be a need to enlarge the physical footprint or size of the existing Haviland Hollow Substation. NYSEG has agreed to meet the future demand with equipment adjustments.

Through the proposed project, the applicant intends to implement several energy-saving measures. Energy efficiency that would be incorporated into the proposed project would meet or exceed the *Energy Conservation Construction Code of New York State.* Furthermore, the proposed project would accommodate Green Globes™ practices and technologies, where possible. These energy-saving measures would include the following:

- Automated control of lighting systems using schedule-based lighting control panels, occupancy sensing devices, digital timers, fluorescent dimmable and light emitting diode (LED) lighting technologies, daylight harvesting and photocells.
- Automated control and temperature setback of heating, ventilation, and air conditioning (HVAC) systems. Energy-recovery air handlers and economizer operations would be used whenever possible.
- Thermally efficient windows would be installed. Window glazing would be effectively used to allow the transfer of heat from the sun during the winter and reduce heat gain during the summer where possible.
- Building and HVAC piping insulation meeting or exceeding current standards would be incorporated into the designs.

Electric utilities, data, and telephone communications would be installed in underground duct banks to affected buildings.

SOLID WASTE

The proposed recycling facility would handle all of the non-hazardous waste and recyclable materials generated on-site. Solid waste generation is expected to remain at 3.39 lbs/person/day, based on a total average population of 1,803 people at the WEC after the proposed project is completed, well below the EPA generation rate of 4.60 lbs/person/day. Due to the increased population, there would be an anticipated increase in average monthly solid waste generation of 32.49 tons.

The applicant would continue to store solid waste on-site and have it hauled on a regular basis. **Table 6-6** below compares existing average monthly per capita solid waste generation at the WEC shown earlier in Table 6-2 with anticipated per capita solid waste generation after the proposed project is completed.

Table 6-6
Average Monthly Solid Waste Generation at the WEC
After Completion of the Proposed Project

Waste	Existing Quantity (lbs per capita)	Future Quantity (lbs per capita)
General Municipal Solid Waste	71.18	71.28
Cardboard	8.94	8.96
Paper	5.92	5.92
Bottles/Cans	6.55	6.56
Metal	8.99	9.01
Total	**101.58**	**101.73**

Source: Watchtower Bible and Tract Society of New York, Inc.

✷

A. INTRODUCTION

This chapter describes the potential environmental impacts of the proposed development of the Watchtower Educational Center (WEC) amended site plan project on stormwater runoff. An analysis of the pre- and post-development stormwater was performed to fully evaluate the effects of the project on stormwater runoff. A hydrologic modeling program was used to determine existing peak flow conditions. This same model was used to develop the post-development stormwater management system in order to equal the pre-development peak flow rates after construction. In addition to peak flow analysis, pollutant loading calculations were performed to demonstrate that the proposed stormwater practices would adequately treat stormwater runoff, minimizing detrimental water quality effects to receiving water bodies.

PRINCIPAL CONCLUSIONS

While the proposed impacts associated with the new impervious surface and change in land use would increase the peak flow as well as the pollutants in stormwater runoff, the proposed stormwater mitigation measures would minimize the potential impacts.

B. REGULATORY CONTEXT

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Any land disturbance greater than 5,000 square feet requires coverage under the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System General Permit 0-10-001 (SPDES GP-0-10-001). The project is located within the New York City East of Hudson Watershed; therefore, conformance with the requirements of the New York State Stormwater Management Design Manual (NYSSMDM) Chapter 10 – Enhanced Phosphorous Removal Standards would be necessary. A Notice of Intent form must be completed and filed with NYSDEC Division of Water in Albany to obtain coverage under the SPDES General Permit 0-10-001. A letter of acknowledgement from NYSDEC would be required prior to commencement of construction activities.

The embankments for proposed stormwater basins would require a dam permit in conformance with Article 15, §0503 (Implementing Regulations at 6NYCRR Part 608). The NYS Guidelines for Design of Dams, Appendix A of the NYSSMDM, would be followed. NYSDEC is currently undergoing a public review period for proposed changes to these regulations and the specific triggers. Currently, any dam greater than 10 feet requires a dam permit. However, if the proposed changes are finalized, dams greater than 15 feet would require a dam permit. As part of the proposed project, there are two stormwater basins, called ponds 1 and 2, described in more detail in the sections that follow. With the NYSDEC proposed rule changes it is likely that a dam permit would only be required for the embankment of the upper stormwater basin. Both proposed embankments would be downstream from the newly proposed WEC residences and offices.

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

The project site is located within the East Branch Croton Reservoir watershed, a phosphorous restricted reservoir, and therefore it falls under the requirements of the “Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and Its Sources” (WRR). The reservoir is part of the New York City watershed system, which supplies drinking water to 9 million people within New York City and other municipalities. A “phosphorous restricted” reservoir indicates that the phosphorous load to the reservoir from its contributing drainage basin results in exceedances of the phosphorous water quality values established by the NYSDEC and set forth in its Technical and Operational Guidance Series (TOGS) as determined by the New York City Department of Environmental Protection (NYCDEP) based on its annual review.

The following sections of the WRR apply to the proposed project:

- §18-39(c) requires NYCDEP’s review and approval of a Stormwater Pollution Prevention Plan (SPPP) for disturbances greater than 5 acres.
- §18-39(a)(1) prohibits impervious surfaces within 100 feet of a NYCDEP-delineated watercourse.
- §18-39(c)(2) states that proposed development within a phosphorous restricted basin requires the capture and treatment of stormwater runoff generated from a 2 year, 24-hour storm event.

The provisions within §18-39 – Stormwater Pollution Prevention Plans and Impervious Surface – of the WRR were developed to help protect the public health by preventing potential contamination to and degradation of the water supply. The intent is to minimize pollutant discharges from both point and non-point sources, limit phosphorous discharges, and reduce impacts due to construction. This was achieved through the prohibition of certain activities within proximity of the reservoir, reservoir stem, wetlands and watercourses. In accordance with the WRR, the placement of impervious surfaces within 100 feet of a watercourse is prohibited.

NYCDEP staff has visited the project site to delineate watercourses within the proposed limit of disturbance. These watercourses, perennial and intermittent, were survey-located and mapped. This map was confirmed by NYCDEP staff and can be found in the large scale drawings that accompany this DEIS (See Drawing C-105).

TOWN OF PATTERSON

Conformance with the Stormwater, Soil Erosion and Sediment Control (Town Code Chapter 133) would be required. Typically, this can be achieved through conformance with the NYSDEC General Permit 0-10-001. The Town of Patterson as a regulated, land use MS4 is responsible to review the SWPPP and complete the MS4 acceptance form prior to WEC filing the Notice of Intent with the NYSDEC.

C. METHODOLOGY

The proposed project would be located within the East of Hudson watershed The current NYCDEP WRR require conformance with NYSDEC SPDES General Permit 93-06 and

"Reducing the Impacts of Stormwater Runoff from New Development" for the design of stormwater treatment practices. This manual and General Permit have been superseded at the state level with updated guidance and design requirements. Certain practices, such as filtering practices, specified in the current NYSSMDM are not typically accepted within the New York City watershed. Additionally, the NYCDEP WRR requires capture and treatment of stormwater runoff generated from the 2-year, 24-hour storm event for projects located within a phosphorous restricted basin.

While there are plans for the NYCDEP to modify the WRR and incorporate the latest NYSDEC SPDES GP-0-10-001, it is unclear when this change will occur and whether there will be additional stipulations within a revised WRR. Therefore, the stormwater treatment practices have been designed to meet the current WRR, including the requirement that stormwater basins be designed to capture and treat the runoff generated from the 2-year, 24-hour storm event from new impervious surfaces. This would meet or exceed the requirements of Chapter 10 – Enhanced Phosphorous Removal Standards outlined in the NYSSMDM. The NYSDEC requirement for Water Quality Volume (WQv) for enhanced phosphorous removal is to capture the estimated runoff from the 1-year, 24-hour design storm. The method for estimating the runoff volume is based on the United State Department of Agriculture (USDA) NRCS Technical Release 20 and Technical Release 55.

HYDROLOGY MODEL

To analyze the peak flow in existing and proposed conditions, Hydrocad was used to model the hydrology. Hydrocad is a computer aided design tool used to evaluate and analyze the stormwater runoff from the site. The program models the surface flow through proposed stormwater practices calculating the plug-flow and center-of-mass detention time within the basins. A simultaneous routing process is used to evaluate the impacts associated with stormwater practices in series. The program is based on USDA, Natural Resources Conservation Service (NRCS) Technical Releases TR20 and TR55. TR55 and TR20 are tools that were developed to calculate the volume and peak discharge rates of stormwater runoff for rainfall events over a 24-hour period. Runoff volumes and rates are calculated by determining the curve numbers (CN) and calculating the time of concentration (T_c) for each subcatchment area depending on the given rainfall value. The CN values are based on the TR55 table and the hydrologic soil group, cover type, hydrologic condition, and antecedent runoff condition. The T_c represents the time it takes for surface water to travel the hydraulically most distant point within the subcatchment area.

The following rainfall values for Putnam County, shown in **Table 7-1**, were used in the analysis. For the purposes of the hydrologic analysis, the runoff was based on Type III rainfall distribution for the northeast region. The following rainfall values are based on the 24-hour storm event. These values represent the rainfall distribution for various storm frequencies.

Table 7-1
Rainfall Values

Storm Event (Year)	Rainfall Value (inches)
1	3.1
2	3.5
10	5.5
25	6.0
100	9.5
1Source: Northeast Regional Climate Center	

POLLUTANT LOADING CALCULATIONS

The Pollutant Coefficient Method was used to analyze the effects of the proposed development on the water quality of the stormwater runoff. This is a tool used to estimate the annual pollutant load from a land use. The pollutant coefficients vary depending on the land use and amount of impervious surfaces. As shown in **Table 7-2**, coefficients from the following land use types were used to calculate the pre- and post-development pollutant loading.

Table 7-2
Pollutant Loading Coefficients

Land Use Type	Coefficient (lbs/acre/year)			
	TSS[1]	BOD[2]	TP [1]	TN[1]
Forested/Wooded	76.54	6	0.0979	1.78
Orchard/Grass/Land-scaped	307.94	19	0.1157	3.74
Impervious surfaces	716.45	111	0.712	4.63

Notes:
1 Source of these pollutant loading coefficients is the 'Fundamentals of Urban Runoff Management: Technical and Institutional Issues' produced by the Terrene Institute in cooperation with USEPA, 1994.
2 Sources of these pollutant loading coefficients is the 'Reducing the Impacts of Stormwater Runoff from New Development', produced by NYSDEC, April 1992.

D. PRE-DEVELOPMENT CONDITIONS

The project site is located on NYS Route 22 between the intersection of Haviland Hollow Road and Birch Hill Road. The topography varies throughout the site as the eastern portion of the property is primarily steep and slopes down toward Route 22. The flatter portion of the site occurs on the property west of Route 22 where the Great Swamp, a Critical Environmental Area and a NYSDEC wetland, is located.

There are three watercourses that traverse the property, which are described in detail in Chapter 8, "Surface Waters and Wetlands." The first, located in the northeastern portion of the WEC properties, is called Mountain Brook. This stream, as it crosses the WEC site, is a 2nd Order stream with its source originating both on WEC's site and also on State lands to the east. Stream flow is conveyed westward and is contained within the on-site, in-line reservoir, which was constructed in the early 1990s. Effluent from the WEC's wastewater treatment plant discharges to Mountain Brook just downstream of the on-site reservoir. Mountain Brook travels south and west under Route 22 approximately 1,200 feet north of Watchtower Drive, and it is then conveyed through the western portion of the WEC properties, ultimately discharging into the Great Swamp.

To fully evaluate the potential downstream impacts associated with the proposed project, a visual assessment of an approximately 1,800-foot segment of Mountain Brook was performed in April 2009. The study segment begins immediately below an in-stream reservoir located on Mountain Brook within the WEC properties and extends to the intersection of Mountain Brook and NYS Route 22. Within the study segment, Mountain Brook is a moderately steep, mildly meandering stream that is partially confined within the valley walls. The channel bed is either flat or consists of an undulating sequence of steps, composed of large cobbles and boulders, and intervening pools. The stream channel appears to be laterally and vertically stable. Banks are generally steep and well-vegetated with active erosion sites confined to outer meander bends. Bedload transport rates are low, as evidenced by a lack of mid-channel and point-bar formation.

Several in-stream bedrock outcroppings and grade controls were observed in the lower half of the study area, suggesting a high degree of resistance to vertical adjustment within these areas.

The second stream is located in the eastern portion of the WEC properties, northeast of B Residence. This unnamed stream travels south and west through the existing developed portion of the site, through an existing pond (located southwest of F Residence) and converges with a third intermittent stream just west of the existing Vehicle Repair building.

The third, intermittent stream begins an intermittent watercourse east of the existing visitor parking lot and travels south to an existing pond located south of loop road. The unnamed stream and intermittent stream meet up near the WEC properties boundary and continue south and west, ultimately discharging into the Great Swamp.

The upper portions of the WEC properties are predominantly wooded until reaching the existing WEC campus, which includes several residential and office buildings, the Patterson Inn, a wastewater treatment facility, a water treatment facility, recreational courts, and various agricultural uses, including cattle, orchards.

The WEC was built prior to promulgation of the NYSDEC or NYCDEP regulations requiring treatment of stormwater runoff. The existing ponds that detain stormwater runoff are located in-stream and therefore could not be modified for treatment of stormwater runoff from the proposed WEC amended site plan.

As shown in **Table 7-3**, the following soils, which were incorporated in the stormwater analysis, can be found on the WEC properties or adjacent sites based on the USDA Natural Resource Conservation Service Soil Survey of Putnam and Westchester Counties, NY. The table includes the hydrologic soil group, referring to the soil's runoff-producing characteristic and infiltration capacity. These groups are important in the selection of the CN in the hydrologic analysis.

DESIGN POINTS

In order to evaluate the potential impacts on stormwater runoff associated with the proposed project, the site has been broken into six discharge analysis points: Design Points 1, 2, 3, 4, 5, and 6. These points were analyzed to evaluate the effects of the proposed development on surface water runoff quality and quantity. The design points and their pre- and post-development contributing subcatchment areas are shown on **Figures 7-1** and **7-2**. Pre- and post-development drainage maps are also provided as part of the Drawing Set. The soil boundaries and T_c flow paths are also shown on these drawings (see Appendix F).

Design Point 1 is located along Mountain Brook, downstream of the existing reservoir. Currently, stormwater runoff is conveyed to various points along the stream via overland flow and several piped discharges, including the discharge pipe from the existing Wastewater Treatment Facility. Because this is a long segment of Mountain Brook, the hydrologic analysis was broken into three segments, or design points 1A, 1B, and 1C. This was done to provide an evaluation of the potential downstream impacts to Mountain Brook. Based on the proposed stormwater management system, there are areas that currently are conveyed via overland or piped outfall and ultimately discharge to the existing reservoir. However, to meet the NYCDEP requirements for water quality, treatment ponds in series are proposed. The location of the ponds requires a portion of the catchment areas to be diverted to a discharge point further downstream from the existing discharge. Therefore, by breaking up the design point into three segments, an analysis of the effects of this diversion can be more accurately reflected.

Table 7-3
Soils on the Project Site

Symbol	Soil Series Name	Hydrologic Soil Group	Drainage Characteristics
ChD	Charlton loam	B	Very deep and moderately steep, well-drained soil. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is severe, surface runoff rapid, and water capacity moderate.)
ChE	Charlton loam,	B	Steep, very deep, and well-drained soil. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is very severe, surface runoff very rapid, and water capacity moderate.)
CrC	Charlton-Chatfield complex,	B	Very deep and moderately deep, well-drained, and somewhat excessively drained Chatfield soil and well-drained Charlton soil. Generally 50 percent Charlton soil, 30 percent Chatfield soil, and 20 percent other soils and rock outcrop. Rock outcrop covers 2 to 10 percent of the surface. (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is moderate, surface runoff medium, and water capacity moderate.)
CsD	Chatfield-Charlton complex, hilly, very rocky,	B	Very deep and moderately deep, well-drained, and somewhat excessively drained Chatfield and the well-drained Charlton soil. [Permeability is moderate or moderately rapid. Erosion hazard is severe, surface runoff rapid, and water capacity low (Chatfield) to moderate (Charlton).]
SbB	Stockbridge silt loam,	C	Very deep, gently sloping, and well-drained soil. (Permeability is moderate in the surface layer and in the upper part of the subsoil and slow or moderately slow in the lower part of the subsoil and in the stratum. Erosion hazard is slight, surface runoff slow, and water capacity is high.)
SbC	Stockbridge silt loam,	C	Very deep, strongly sloping, and well-drained soil. (Permeability is moderate in the surface layer and in the upper part of the subsoil and low or moderately slow in the lower part of the subsoil and in the substratum. Erosion hazard is moderate, surface runoff medium, and water capacity high.)
SbD	Stockbridge silt loam,	C	Very deep, moderately steep, and well-drained soil f. (Permeability is moderate in the surface layer and in the upper part of the subsoil and slow or moderately slow in the lower part of the subsoil and in the substratum. Erosion hazard is severe, surface runoff rapid, and water capacity high.)
SgC	Stockbridge-Rock outcrop complex, rolling	C	Very deep, well-drained Stockbridge soil and areas of limestone rock outcrop. Slopes range from 5 to 15 percent. (Permeability is moderate in the surface layer and the upper part of the subsoil and slow or moderately low in the lower part of the subsoil and in the substratum. Erosion hazard is moderate, surface runoff medium, and water capacity high.)
SuB	Sutton loam	B	Gently sloping, very deep, and moderately well-drained soil (Permeability is moderate or moderately rapid throughout the profile. Erosion hazard is moderate, surface runoff medium, and water capacity high.)
Source: Soil Survey of Putnam and Westchester Counties, New York, USDA Soil Conservation Service.			

The contributing drainage area consists of land use types varying from wooded areas, landscaped areas, orchard, impervious surfaces from the existing buildings, and the loop road.

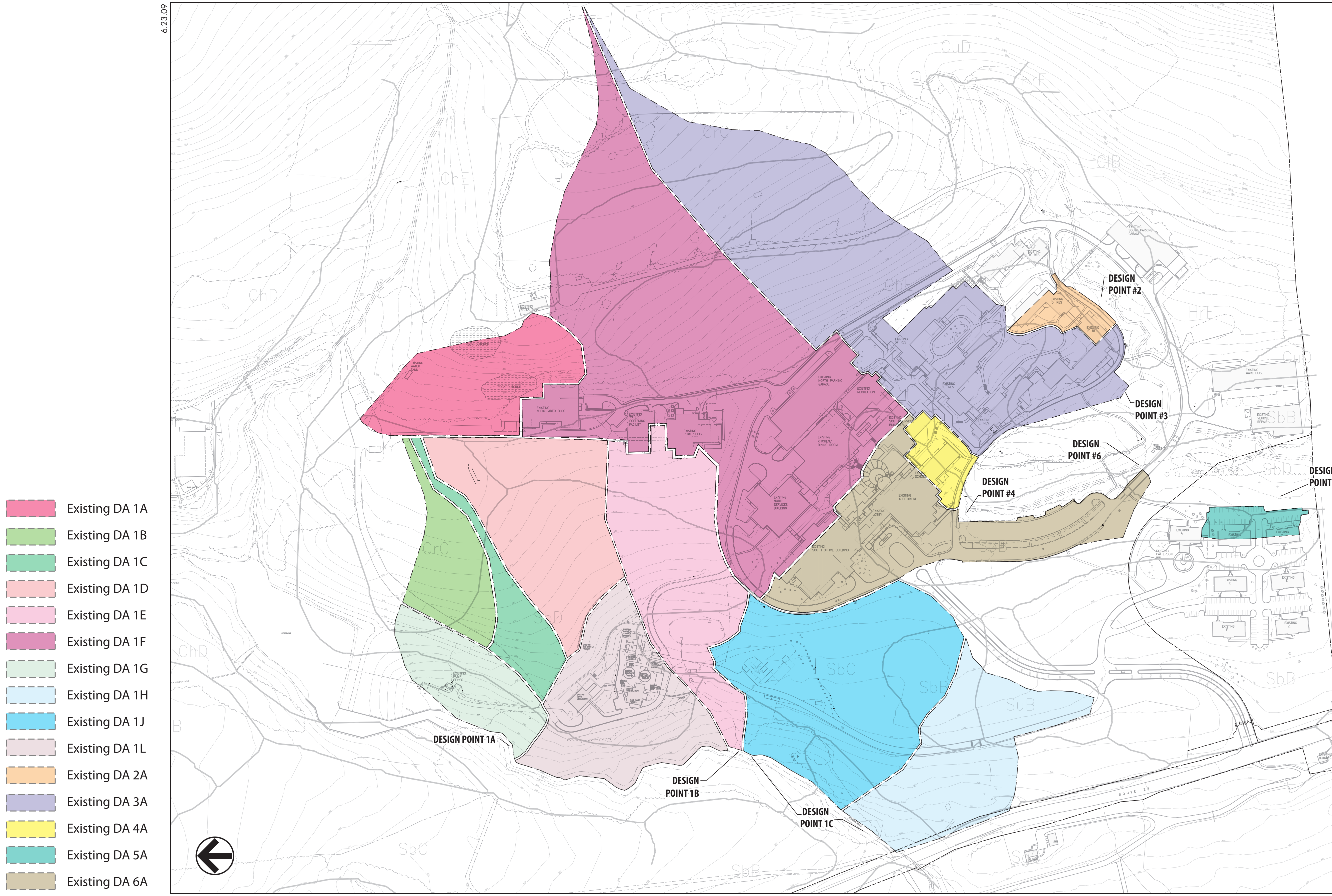

Figure 7-1
Pre-Development Drainage Map

Figure 7-2
Proposed Development Drainage Map

Mountain Brook is a stable stream that shows little evidence of recent movement, either laterally or vertically. Both the channel bed and banks are highly resistant to erosion. In many cases, the degree of movement is limited by steep valley walls and/or bedrock outcroppings in the channel bed. These attributes are suggestive of a stream system with a relatively low sensitivity to hydrologic changes. Mild-to-moderate increases (i.e., <10-20 percent) in stormwater discharges are unlikely to significantly destabilize the channel. However, hydrologic changes are capable of producing unintended and unforeseen changes to stream channels. To minimize the potential for stormwater impacts, the following recommendations are provided:

- Stormwater outfalls will be located away from the active channel margin.
- Areas of poor riparian buffering in the far downstream portion of the site should be enhanced to increase bank resistance to the extent possible.
- Stormwater outfalls have been located in the downstream portion of the study segment where frequent bedrock controls will help to reduce the potential for vertical channel adjustment.

Increases in impervious surfaces associated with the proposed project would also indirectly reduce groundwater recharge. This reduction in groundwater recharge may, in turn, result in lower rates of baseflow, that portion of a stream's flow not directly associated with storm events, within Mountain Brook upstream of the proposed outfall location. The installation of footing drains around the perimeter of proposed structures may also divert shallow groundwater that would otherwise contribute to baseflow.

Design Point 2 is located in the eastern portion of the site west of existing B Residence and adjacent to the existing watercourse. The analysis of this area will evaluate the potential impacts associated with the proposed sidewalk and passenger pick-up and drop-off areas. The pick-up and drop-off areas would be constructed with pervious pavers; however, they are analyzed with a curve number of a gravel road surface.

Design Point 3 is located along the existing portion of loop road adjacent to a watercourse.

Design Point 4 is located downstream of the existing Lobby for the main visitor entrance.

Design Point 5 is located in the southern portion of the site, east of the Patterson Inn and adjacent to the existing unnamed watercourse.

Design Point 6 is located along the intermittent watercourse adjacent to the visitors' parking lot.

The existing pond basins are not routed within this analysis, as they should not be directly affected by the proposed development.

The pre-development peak flows were analyzed at each design point and are presented later in this chapter in Table 7-5.

POLLUTANT LOADING ANALYSIS

Pollutant loading analysis was performed at each of the design points. A comparison table of pre- and post-development pollutant loadings is provided in Section F "Post-Development Conditions," below. The annual pollutant loading rates were calculated for the following constituents: total suspended solids (TSS), biochemical oxygen demand (BOD), total phosphorous (TP), and total nitrogen (TN). The backup for these calculations can be found in the SPPP in Appendix F of this DEIS.

E. THE FUTURE WITHOUT THE PROPOSED PROJECT

No changes to on-site stormwater runoff would occur in the future without the proposed project. As discussed above, the topography and land use have been modified as part of the initial construction of the facility. No further clearing, grading, filling, or excavating within the water resources and their buffers would occur, with the exception of ongoing site maintenance.

F. POST-DEVELOPMENT CONDITIONS

The WEC amended site plan would consist of approximately 904,000 square feet of new interior building space with a footprint of approximately 444,500 square feet of impervious surface. (See Chapter 2, "Project Description," for specific details of the proposed project.)

In the following section, the proposed project's potential effects on stormwater management and erosion and sediment control on the WEC properties are described.

POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

Potential impacts to surface water quality and quantity associated with construction activities are often mitigated with various stormwater mitigation practices. Impacts to the stormwater runoff are often due to changes in land use, installation of impervious surfaces, and change in grading. As vegetation is removed and the amount of impervious surfaces increases, the quality of stormwater runoff decreases, impacting receiving water bodies. Because of changes in land use and increase in impervious surfaces, a smaller volume of stormwater infiltrates into the soil, increasing the peak flow of stormwater runoff. Further discussion of groundwater recharge reduction may be found in Chapter 6, "Water Supply and Utilities."

In order to counteract the impacts of stormwater runoff, from new development and redevelopment, alternative approaches to design and construction have emerged. The Better Site Design (BSD) Manual, developed by NYSDEC, offers guidance for the design of new and redevelopment projects with the focus on conserving natural areas, reducing impervious cover and better integrating stormwater treatment. Many of the design practices listed within the BSD manual have been incorporated into the proposed site work at WEC.

The first approach to the overall design at WEC is the preservation of undisturbed site area in order to maintain natural features and native vegetative areas. This technique coincides with BSD practice #1: preservation of undisturbed and BSD practice #3: reduction of clearing and grading. Both practices ensure that no unnecessary earthwork is performed and instead help to limit overall site disturbance by developing in areas where disturbance has already occurred.

In planning the future development at WEC, the majority of the proposed project displaces land that is currently cleared and actively used for orchard, pasture, and facilities related to the existing WEC. The orchard and lawn areas comprising the bulk of the project site have remained heavily maintained (mowed/cleared) since the time of the initial construction of the WEC in 1989.

Thus by constructing the new development in an area already disturbed, the project has helped to maintain the site's natural character and existing habitat. The basis for this design method is described in the BSD manual as practice #4: locating sites in less sensitive areas. By directing development towards an area of the site with flatter slopes and less environmental impact, the WEC will help to preserve natural floodplain right-of-ways, minimize soil erosion, and reduce earthwork/habitat disturbance.

It is also important to note, that in order to reduce excessive grading and to remain outside of the watercourse buffer zone the project will install retaining walls where necessary. Not only will the walls help to reduce grading but they will also help to reduce steeper unnatural slopes and thus minimize erosion potential. Designing the proposed development outside of the preservation buffer will contribute to improved water quality and riparian ecosystems and habitats. This practice is advised in BSD practice #2: preservation of buffers.

One of the most significant design approaches that the applicant has incorporated into its design is defined under BSD practice #10: building footprint reduction. Under this methodology the impervious footprints of on-site buildings can be reduced by using taller buildings while still maintaining the same floor to area ratio. The most significant benefit achieved from this approach is impervious cover reduction and therefore reductions in stormwater runoff and pollutants.

Another design consideration~~s~~ that was carefully evaluated and implemented included reducing impervious surfaces associated with parking surfaces by constructing a below grade parking facility. This design approach aligns directly with BSD practice #11: parking reduction. Below grade parking reduces surface impervious areas, minimizes development area, and reduces clearing and grading. Of the proposed 434 parking spaces proposed, 351 (80%) will be built below the proposed Maintenance and North Office Building. This will further minimize the impacts on water quality and quantity associated with parking. Where feasible, pervious pavers are proposed in order to reduce runoff by promoting infiltration during the smaller storm events. Pavers are specifically proposed adjacent to watercourse 100 foot buffer areas, where infiltration and pollutant loading reduction will be most effective. Permeable pavers are proposed to be installed at the Recycling Building (7,500+/- sf), event overflow parking (15,000+/- sf), parking area at existing Patterson Inn (2,500+/- sf), a portion of the visitor parking lot (15,000+/- sf), and the parallel parking along the existing loop road (2,000+/- sf)

Post-construction practices are designed to reduce the peak flows to the design point, and where feasible they are designed to allow for groundwater recharge.

In addition to the increase in stormwater runoff flow, water quality of the receiving water bodies may also be impacted due to the increase in nutrient and particulate loading. Pollutants are deposited and collected on the impervious surfaces, which are conveyed during rain events and deposited in the receiving water bodies, and they can impact natural resources. There is an increased potential for sediment deposition during construction activities when soil is exposed and land grading activities are implemented. An erosion and sediment control plan that includes practices and a sequence of construction would help to reduce the potential for sediment transport in stormwater runoff. There are various sources of pollutants depending on land use activities, such as sewage treatment plants, leachate from garbage tips, agricultural uses, pesticide applications, fertilizers, detergents, etc. Therefore, an SPPP should address potential pollutants in the design of structural and non-structural post construction stormwater treatment practices. Post-construction stormwater practices are designed based on contributing drainage area, soil type, existing slopes, and target volume. However, through good site planning and inspection and maintenance procedures the potential for transport of pollutants can be greatly reduced.

The proposed stormwater management system has been designed to address the criteria outlined in the NYSSMDM Chapter 10 – Enhanced Phosphorous Removal Supplement.

The implementation of a stormwater management system is integral in the mitigation of the potential impacts associated with the WEC amended site plan. The following explains the design of the proposed stormwater management system for the project.

STORMWATER PONDS

Soil testing was performed at various locations throughout the site to help evaluate potential locations for stormwater treatment practices. Test pits and percolations tests were performed throughout the proposed development areas to help determine the types of stormwater treatment practices that would offer the best performance. NYCDEP staff were present to witness the soil testing. The test pit locations can be found on the large scale drawing (see C-101 Existing Conditions Plan) and the summary table may be found in the SPPP in Appendix F.

Based on the results, infiltration was generally not considered feasible due to depth to groundwater or the slow percolation rate. Therefore stormwater detention basins were identified as the best method for stormwater treatment. The existing stormwater ponds on the WEC properties are in-stream stormwater practices and could not be adapted for stormwater treatment. Therefore, two new stormwater management ponds are proposed. Treatment of stormwater runoff must occur prior to discharge to a surface water body.

To address NYCDEP requirements, stormwater treatment practices in series are necessary to provide sufficient treatment to meet the pre-development pollutant loading requirements. Therefore, two ponds were designed in series to provide treatment for the majority of areas. Due to elevations, road layout, and the existing topography two ponds could not be placed within proximity of the proposed residences; therefore, the second basin would be located south of the proposed recycling facility. The ponds are referred to as Ponds 1 and 2 in the HydroCAD analysis. See Post-Development Drainage Map in the SPPP (Appendix F).

The stormwater ponds have been designed to capture and treat the stormwater runoff associated with the 2-year, 24-hour storm event. The ponds have also been designed to meet the required elements of the NYSSMDM design criteria for stormwater ponds, specifically wet pond (P-2). The volume of the permanent pool for each pond would be sized to capture 100 percent of the water quality volume (WQv), the runoff from the 1-year, 24-hour storm event.

Approximately 90% of the proposed impervious surfaces would be captured in a stormwater conveyance system that would direct stormwater runoff to the proposed ponds. Less than 10% would be treated by pervious pavers or through the implementation of a vegetated filter strip or no-mow zone. These are typically referred to as low impact development practices that would allow for filtration of stormwater pollutants and decreases in runoff.

The post-development contributing area, 1B, for the upper pond is less than the required 25 acres. However the second pond in series would treat catchment areas 1C, 1G, 1H, 1M, and 1N, as well as 1B, which totals to approximately 25 acres. The following design parameters were included in the development of the stormwater ponds.

- **Forebay**—A forebay would be provided at each inlet point. This would provide primary settling for the larger particulates. The sediment forebay would be sized to contain 10 percent of the WQv. The depth of the upper pond forebay would be 4 feet, while the lower pond would be 6 feet. The outfall from the inlet pipe would be stabilized with riprap to minimize erosion of the ponds’ sideslopes. A fixed depth marker would be installed to assist in the long-term inspection and maintenance plan. This would help determine the depth of sediment accumulation and when maintenance is required.

- **Sideslopes**—The basins' sideslopes would be 4:1(H:1).
- **Aquatic bench**—A 15-foot-wide aquatic bench would be provided within each pond. The aquatic bench would be set at the top elevation of the permanent pool, allowing for water tolerant vegetation to establish at this level. This type of vegetation would be species native to the New York City watershed.
- **Vegetation**—Landscape plans include various species, including grasses for the sideslopes and emergent wetland species (see Landscape Drawings LD001 and LD101 through 107). The vegetation will help filter out sediment and other pollutants. The plant variety would provide treatment through nutrient uptake.
- **Permanent pool**—The depth in the upper pond would be approximately 4 feet, which is approximately equal to the volume of the 1-year, 24-hour storm. The depth within the lower pond would be approximately 6 feet deep, storing the volume of the 2-year, 24-hour storm.
- **Geometry**—Both ponds have been designed with a length to width ratio of 1.5:1 as required by NYSSMDM.
- **Riprap velocity dissipater**—would be installed at the inlet and outlet of the lower pond. The lower pond would discharge to Mountain Brook, where the banks are stable and the stream bed is rocky. This would minimize the potential for erosion of the stream bed.
- **Freeboard**—One foot of freeboard would be provided.
- **Emergency overflow**—Safe conveyance of the 100-year storm flow would be provided.
- **Maintenance access**—A 12-foot minimum width access path would be provided for long-term maintenance of the stormwater ponds.
- **Outlet control structure**—The pre-cast concrete structure has been designed with a low-flow orifice that would detain the 2-year, 24-hour storm event for a minimum of 24 hours, meeting the requirements outlined in the WRR. The larger storm events would also be conveyed through an opening at the top of the structure designed to attenuate the larger storm events.

ADDITIONAL STORMWATER MANAGEMENT DESIGN FEATURES

Low-impact development practices would be used throughout the site where feasible. There are portions of proposed work that would be within 100 feet of the existing watercourses. Pervious pavers, such as Turfstone™, are proposed in these areas. These are not considered impervious surface by the NYCDEP; therefore, a variance from Section 18-39(a)(1) is not required. These pervious pavers would also be used in other portions of the site where event overflow parking is being proposed. These practices are also proposed in areas where it is difficult to implement standard practices that would meet NYCDEP and NYSDEC design requirements.

A new diesel fueling station with a 2,500-gallon tank and associated containment facilities is proposed between the existing warehouse and vehicle repair buildings located along the southern property. The fueling station and storage tank have been located more than 100 feet from the existing watercourse as is required by NYCDEP WRR. This area is currently an impervious surface and will have a minor impact on water quality and no impact on water quantity as there is no increase in impervious surface. An oil grit separator will be designed and installed to capture and remove any potential pollutants associated with the fueling station. Because there is no net increase in impervious surface in this area, there is no need to further evaluate quantitatively in HydroCAD.

There is a potential for an increase in pollutants associated with parking areas such as petroleum, antifreeze, and refuse. In developing the site plan, parking was designed to be subsurface garages below the proposed buildings. This allows for a smaller footprint for at grade parking surfaces. For those parking surfaces at grade, the current maintenance operations demonstrate the high level of maintenance and upkeep which will continue with the new portions of the site. A hood will be installed at the downstream end of the proposed catch basins to trap floatables and within the catch basin. The deep sumps will also trap the petroleum and antifreeze attached to sediment particles. The accumulated material will be cleaned out of the catch basins in accordance with the long term inspection and maintenance plan.

The two stormwater retention ponds would address the majority of the new development; however, there are portions of the new development that cannot be conveyed into either basin due to topography, existing utilities, and proximity to natural resources. These areas will be addressed as discussed below.

POST-CONSTRUCTION FLOW RATES AND ROUTING

In addition to providing treatment, the ponds have been sized to attenuate the larger storm events to the pre-development peak flows, meeting NYCDEP requirements for the 2-, 10-, 25-, and 100-year, 24-hour storm events. In addition to the WQv sizing requirements previously discussed in this chapter, the NYSSMDM has unified stormwater sizing criteria for the 1-, 10-, and 100-year storms. For the channel protection volume (CPv), 24-hour extended detention of post-developed 1-year, 24-hour storm event is required. Overbank flood (Qp) and extreme flood (Q) requirements are to control the peak discharge from the 10-year and 100-year storms, respectively. Safe conveyance of the 100-year storm and 1-foot of free board is also required for the pond designs.

Table 7-4 compares the pre- and post-development peak flows at each design analysis point. The post-development flows represent the flow at the design point after routing through the proposed ponds. The existing ponds are not routed within this analysis, as they should not be directly affected by the proposed development.

Table 7-4
Comparison of Pre- and Post-development Flows

Design Analysis Point	1-Year Storm Event (cfs)		2-Year Storm Event (cfs)		10-Year Storm Event (cfs)		25-Year Storm Event (cfs)		100-Year Storm Event (cfs)	
	Pre-Develop.	Post-Develop.	Pre-Develop.	Post-Develop.	Pre-Develop.	Post-Develop.	Pre-Develop.	Post-Develop.	Pre-Develop.	Post-Develop.
1A	2.15	1.84	3.25	2.94	10.30	10.00	12.51	12.04	29.91	27.93
1B	24.31	22.58	31.36	28.58	71.61	61.73	82.47	70.48	162.54	133.46
1C	14.26	12.78	18.72	16.68	43.95	38.61	50.72	44.47	100.05	90.84
Combined (1A,1B,1C)	33.71	29.75	45.02	39.21	113.50	96.17	132.47	111.86	273.47	236.17
2	1.57	1.65	1.92	2.01	3.79	3.89	4.27	4.37	7.62	7.71
3	14.27	14.27	19.77	19.77	52.35	52.35	61.34	61.34	128.63	128.63
4	2.09	1.97	2.51	2.33	4.62	4.17	5.15	4.62	8.85	7.80
5	1.89	2.10	2.24	2.47	4.00	4.35	4.44	4.82	7.49	8.05
6	21.60	14.39	25.31	16.97	43.84	29.89	48.43	33.11	80.26	55.39

Note: cfs – cubic feet per second

Table 7-5 below shows the peak water surface elevations for each of the storm events. The starting water surface elevation, or permanent pool, for each pond is equal to 2 times the runoff volume of the contributing area from a 1-year, 24 –hour storm event.

Table 7-5
Maximum Pond Water Surface Elevations

Pond	1-Year Storm Event (ft)	2-Year Storm Event (ft)	10-Year Storm Event (ft)	25-Year Storm Event (ft)	100-Year Storm Event (ft)
1	699.23	699.51	700.16	700.24	700.89
2	588.38	588.65	590.12	590.20	590.98
Note: cfs – cubic feet per second					

The proposed development conditions for Design Point 1 includes the following proposed surfaces: extended loop road, expansion of the Audio/Video building, the Residence buildings, North Office and Maintenance Building, the Recycling Building, event parking overflow, and the visitors parking area. The proposed ponds would treat the stormwater runoff from the new impervious surfaces within drainage areas 1B, 1C, 1G, 1H, 1M, and 1N. Drainage areas 1B and 1C include the majority of the proposed development, as shown in Figure 7-2. Drainage areas 1G and 1M would be diverted from Design Point 6 and conveyed to the lower pond to treat the impervious surfaces associated with the visitor parking lot expansion and Visitor Services Center. The new impervious surfaces from drainage area 1N would be diverted from Design Point 4, allowing for treatment of the new impervious surface associated with the expansion of the existing South Services Building.

The existing concrete Batch Plant would be demolished at the end of construction. This would result in a decrease in impervious surface within this drainage area. Because of the existing topography and poor infiltration rate in this area, it would be difficult to convey stormwater runoff to the proposed pond or construct an infiltration system that meets the design requirements. With the demolition of the concrete batch plant and associated impervious surface there is a decrease in impervious surface within this drainage area. As is demonstrated by the pollutant loading calculations, the reduction in pollutants in the area addresses the potential issues associated with stormwater runoff.

In the proposed condition, Design Points 2, 3, and 5 include pervious pavers of the passenger pick-up and drop-off areas and parking. The types of stormwater treatment practices in theses areas are limited by the existing stormwater conveyance system, existing utilities, steep slopes, and the proximity of the existing watercourse. Therefore, a stormwater treatment practice is not proposed for these drainage areas. Instead, Turfstone™ pavers, or other NYCDEP-approved products, are proposed as a pervious surface. Pervious pavers are designed to allow for infiltration of stormwater runoff through the joint openings and underlying gravel bed. In the areas adjacent to the D and E Residences, the soil type is ChE and CuD. The hydrologic soil group for these soils is 'B' and the permeability is moderate or moderately rapid. In the area adjacent to E Residence, the soil type is part of the C hydrologic soil group where the percolation rate is slow or moderately slow. The subsurface gravel bed would be designed to store a volume of water from the 2 year storm event, addressing any potential issues with the low infiltration rate of the soils in the substratum. The results of the pre- and post-development flows demonstrate that the impacts of these pavers are minimal, and therefore attenuation would not be required. While there would be a slight increase in post-development flows in Design Points 2, and 5, the increase would be minimal. No change is projected for Design Point 3.

The existing stormwater infrastructure and ponds will provide additional treatment of pollutants. The existing ponds also attenuate the peak flow providing detention allowing pollutant to settle out. These ponds were not analyzed in the HydroCAD model as the drainage areas with increased impervious surfaces are directed away from the existing ponds and conveyed to the proposed treatment ponds. The existing ponds are either in-stream or have baseflow due to a seasonal groundwater table.

Nonstructural stormwater management practices include the following:

- Concentrated development of impervious surfaces, especially in areas of previous disturbance; i.e., the orchard areas.
- Long-term soil stabilization through landscaping and maintenance in the developed areas. Prevention of soil loss, through establishment of vegetation and a landscape plan that would increase the amount of tree canopy and healthy ground cover. The landscape plan would also maximize the travel time of stormwater runoff and minimize concentrated flows.
- Increasing the no-mow zones around the watercourses that traverse through the developed portions of the site.
- The grounds maintenance program limits excessive nutrient loading, specifically controlling the application of phosphate-based fertilizers.
- Pervious pavers, to reduce the amount of stormwater runoff through infiltration. The gravel and block pavers would trap sediments and other pollutants, also reducing the amount in the runoff.
- Impervious surfaces for parking have been greatly reduced by locating 351 parking spaces in the cellar level of the Maintenance/North Office Building.

POLLUTANT LOADING ANALYSIS

Table 7-6 shows the pre- and post-development pollutant loading.

Pollutant Loading Removal rates used in the analysis of Design Point 1 were based on the wet pond design, Design 6 parameters provided in "Reducing the Impacts of Stormwater Runoff from New Development" (NYSDEC 1992). The design requirement is that the permanent pool equal four times the volume of runoff from the mean storm or two weeks retention time. This assumption is based on the requirement that the basins be sized to treat the runoff from 0.5 inches of runoff or the mean storm. The permanent pool volumes for the proposed ponds are equal to more than 2 times the runoff volume of the 1-year, 24-hour storm event. The 90% rainfall event is approximately 1.2 inches. The permanent pool volume would be roughly equal to 12 times the runoff volume from the 90% rainfall event. The runoff depth for the drainage areas contributing to the proposed ponds produces an average runoff depth 1.86 inches, for a 2-year, 24-hour storm event. The following pollutant loading removal rates were used for each pollutant.

- 80-100 percent for TSS;
- 60-80 percent for TP;
- 40-60 percent for TN; and
- 40-60 percent for BOD.

Credit for pollutant removal for the proposed porous pavement is based on Design 9, where the facility exfiltrates all runoff, up to the 2-year design storm. The pollutant reduction was taken for the areas where the pervious pavers are proposed for parking, specifically Drainage Areas 1F, 1J, 2, and 5. The following pollutant loading removal rates are typically used for each pollutant.

- 80-100 percent for TSS;
- 60-80 percent for TP;
- 60-80 percent for TN; and
- 80-100 percent for BOD.

EROSION AND SEDIMENT CONTROL

The potential impacts associated with construction activities include sediment deposition, rilling and erosion, and the potential for causing turbidity within receiving water bodies. To address these potential impacts, erosion and sediment control plans have been developed. (See large scale drawings CE-101 through CE-108 and associated details.)

Table 7-6
Pollutant Loading Analysis

Design Analysis Point	Pre-Development pollutant Loading (lbs/year)	Post-Development Pollutant Loading (lbs/year)	Post-development Pollutant Loading w/ Treatment (lbs/year)
Total Suspended Solids (TSS)			
1A	2,678.7	503.4	NA
1B	17,958.0	13,960.8	NA
1C	5,212.6	15,522.4	4,690.7
Subtotal Design Point 1	*25,849.4*	*29,986.6*	*19,155.0*
2	503.4	518.9	493.1
3	4,227.5	4,227.5	NA
4	560.3	515.8	NA
5	513.5	555.5	515.4
6	4,193.2	2,894.1	NA
Biochemical Oxygen Demand (BOD)			
1A	160.1	66.3	NA
1B	1,926.4	1,694.1	NA
1C	375.3	1,666.7	732.3
Subtotal Design Point 1	*2,461.8*	*3427.10*	*2492.7*
2	66.3	69.9	65.8
3	548.3	548.3	NA
4	71.3	68.6	NA
5	73.3	79.8	73.6
6	575.7	387.8	NA
Total Phosphorous (TP)			
1A	1.3	0.4	NA
1B	13.5	11.5	NA
1C	2.5	10.5	3.3
Subtotal Design Point 1	*17.3*	*22.4*	*15.2*
2	0.4	0.4	0.4
3	4.5	3.5	NA
4	0.5	0.4	NA
5	0.5	0.5	0.5
6	3.7	2.5	NA
Total Nitrogen (TN)			
1A	29.5	4.0	NA
1B	173.4	129.7	NA
1C	60.7	145.3	77.8
Subtotal Design Point 1	*263.6*	*279.0*	*211.5*
2	4.0	4.0	3.9
3	33.8	33.8	NA
4	4.6	4.0	NA
5	3.7	4.0	3.8
6	31.6	22.4	NA

The following practices would be used throughout the construction activities to minimize the potential impacts associated with the disturbance:

- Stabilized construction entrance/exit
- Straw bales and/or silt fence

- Storm drain inlet protection
- Material stockpile protection
- Dust control
- Temporary soil stabilization (rolled erosion control blankets, seeding and mulching and soil stabilizers)
- Sump pit
- Dewatering
- Water bar
- Perimeter dike/swale
- Temporary sediment basins
- Containment for temporary fueling station

PROJECT PHASING

The protection of the natural resources, specifically the on-site watercourses, was also carefully factored in the development of the sequence of construction. The phasing of the project is important for the continued operation of the WEC during the construction process. The WEC project will exceed 5 acres of disturbance during the construction process for five of the ten phases, thus a waiver will be necessary from the MS4, the Town of Patterson. The SPPP will comply with the requirements of the General Permit with respects to increased frequency of inspections, increased frequency of soil stabilization, and multiple levels of erosion and sediment control practices.

As explained in more detail in Chapter 14, "Construction," and in the SPPP that accompanies this DEIS in Appendix F, a sequence of construction activities was prepared breaking the construction period into ten (10) phases to limit the area of active construction and avoid erosion and sedimentation. Within each phase, various erosion and sediment practices would be implemented as listed in Table 14-1 of Chapter 14, "Construction."

INSPECTION AND MAINTENANCE

DURING CONSTRUCTION

Inspection and maintenance is important to ensure that the erosion and sediment control practices that are part of the SPPP continue to be effective in preventing sediment and other pollutants from entering the stormwater system. It is the responsibility of the owner to ensure that inspections are completed in accordance with SPDES GP-0-10-001.

As a part of the SPPP inspection and maintenance activities during construction, forms shall be updated and kept on-site, including:

- Erosion and Sediment Control Inspection Report
- Monthly Summary of Inspection Activities
- Record of Stabilization and Construction Activities (used when 5 acres or more would be disturbed at any given time).

Inspections would be conducted by the qualified inspector periodically according to the schedule required by the SPDES GP 0-10-001. During each inspection, the qualified inspector would record the areas of disturbance, deficiencies in erosion and sediment control practices, required maintenance, and areas of temporary or permanent stabilization. The need for modifications to the Erosion and Sediment Control Plan would be identified and implemented immediately.

All maintenance would be completed in accordance with the New York State Standards and Specifications for Erosion and Sediment Control. Any material removed from erosion and sediment control measure would be properly disposed. Disturbed areas and materials storage areas would be inspected for evidence of potential pollutants entering stormwater systems.

All measures would be maintained in good working order; if repairs are found to be necessary, the qualified inspector would notify the owner or operator and appropriate contractor (and subcontractor) of any corrective actions needed within one business day.

Specific maintenance requirements for the proposed temporary practices can be found in the SPPP in Appendix F.

POST CONSTRUCTION INSPECTION AND MAINTENANCE

Following completion of construction, a long-term inspection and maintenance program would be implemented to ensure the proper functioning of the stormwater management system. The program would be carried out by the facilities manager. A detailed checklist of pond inspection and maintenance is included in the SPPP in Appendix F. The maintenance program would include the following:

- The side slopes of the pond would be mowed at a minimum twice a year. If necessary, invasive woody vegetation around and in the pond would be removed to prevent it from becoming established within the pond.
- Litter and debris would be removed from catch basins, vegetated swales, ponds, and the outlet control structures.
- The stormwater management system would be inspected after each major storm event (greater than 2-year, 24-hour storm) to ensure the small orifices and inlets remain open.
- Silt would be cleaned from catch basins and other drainage structures when the depth exceeds half of the depth of the sump.
- Sediment would be removed from detention ponds as needed, but at a minimum of every 5 years. A backhoe or excavator would be used to remove sediment accumulation from the bottom of the basin. However, vehicles would be prevented from traversing the sideslopes to the extent possible to avoid damaging established vegetation. Repairs to the embankment would be done with hand tools to the extent practical.
- Use of road salt for maintenance of parking areas would be minimized.
- Eroded areas and gullies would be restored and re-seeded as soon as possible.

In addition to inspection and maintenance of the stormwater management system inspection of the overall site for areas of potential contamination would also be noted. As demonstrated by the neat grounds and impeccable cleanliness, maintenance is already an important goal at the WEC. Maintenance of existing landscaped areas is performed consistently throughout the year. This would be continued with the WEC amended site plan. Pest control would continue to follow the WEC existing practices, which include an Integrated Pest Management program in conjunction with guidance from the Cornell Cooperative Extension Agency, applicable regulations, and best practices. All potential pollutants, such as petroleum products, chemicals, etc., would be properly stored in designated areas that would minimize contact with precipitation.

WEST NILE VIRUS

The stormwater detention ponds proposed for the project are NYSDEC wet ponds (P-2). Recent field observations conclude that constructed wetlands and stormwater management ponds actually pose a low risk in spreading the West Nile virus since the mosquito species that are found in wetlands and stormwater management ponds tend not to be the variety that are known to carry the West Nile virus. Within a healthy aquatic ecosystem, other aquatic invertebrates (dragonfly larvae and other species) prey on mosquito larvae, thereby reducing mosquito populations. The SPPP would be approved by the NYSDEC and NYCDEP and will include a regular maintenance schedule to be implemented at the completion of construction. This may include the stocking of the basins with species to feed on potential mosquito larvae, and possible aeration systems to be exercised during periods of minimal flow through the ponds.

MITIGATION

The proposed project would incorporate stormwater management practices that would treat runoff from the proposed project. These practices, designed in accordance with the regulations established by NYSDEC and NYCDEP, would include water quality treatment, peak flow attenuation, and temporary and permanent erosion and sediment control measures. The proposed facilities would be sufficient to mitigate the potential impacts of the proposed project related to the quantity and quality of stormwater runoff. Minimizing the impervious surfaces through the use of below grade parking, pervious pavers, and redeveloping portions of previously disturbed portions of the site are additional tools that were used to develop a stormwater management plan that would minimize the impacts to water quality and quantity.

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