C. Geology

1. Introduction

The ~~p~~Project ~~s~~Site is situated in the Reading Prong, part of the New England Province. The area's high relief is due to the Housatonic Mountains of New England, and is known regionally as Quaker Hill. The former HVPC campus is situated at the low area of the Hill. The area to the west of the HVPC is part of Chestnut Ridge[1]. The site is bisected by the Swamp River and its associated wetlands, also known as the Great Swamp. The site is partially situated in the Swamp River Valley with elevations ranging from approximately elevation 420 feet up to elevation 940 feet.

The following summarizes the existing geologic conditions, potential impacts due to construction and the temporary and permanent measures proposed to mitigate these impacts.

2. Existing Conditions

a. Soils

On-site soils include a combination of more than 30 different soil types, predominantly consisting of Carlisle, Chatfield, Farmington, Hollis and Stockbridge combinations. Refer to attached figure, Existing Soils Map, Exhibit III.C-1, for soil type and hydrologic soil group (HSG) delineations of on-site soils.

According to the Dutchess County Soil and Water Conservation District Interpretative Soils Report (1978), Udorthents and Carlisle Muck represent approximately 20 percent of the on-site soils and are predominantly located north and west of the HVPC. In the County's report, Udorthents are described as "graded and filled land, partially paved and paved urban areas." This area is inclusive of the HVPC and is approximately 13 percent impervious. During construction, special consideration ~~will~~would have to be made to keep excavation sites and stockpiles dry and compaction performed per specifications. Carlisle Muck is defined as "deep, nearly level, very poorly drained, medium lime, organic soil formed in waterlogged bogs. The available water capacity is high. Permeability is moderately rapid." This area is significantly comprised of existing wetlands which ~~will~~would not be disturbed during or after construction.

To the west of the Udorthents/Carlisle Muck soil types, on-site soils are comprised of predominantly Stockbridge Farmington and Farmington Galway mixes, representing approximately 16 percent of the total on-site soils. Stockbridge Farmington soils consist of a majority of Stockbridge soils defined as "deep, moderately steep to very steep, well drained, medium lime, loamy soil formed in till. The available water capacity is moderate. Permeability is slow." The remaining Farmington soils are "shallow, steep, well drained, medium lime, gravelly loam soil formed in till that is 10 inches to 20 inches thick over bedrock. The available water capacity is low. Permeability is moderate." Farmington Galway soils contain a higher percentage of the Farmington mix with the remaining Galway soils defined as "moderately deep, rolling, well drained, medium lime,

[1] Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, Joseph C. Lu, P.E., P.C. Consulting Engineers, page 22, August 1988.

gravelly loam soil formed in till that is 20 inches thick over bedrock. The available water capacity is moderate. Permeability is moderate." During construction, rock removal is anticipated for earthwork cut greater than two feet.

To the east of the Carlisle Muck, on-site soils are comprised of mainly Stockbridge, Chatfield Hollis and Hollis Chatfield soils, representing approximately 44 percent of the total on-site soils. Chatfield soils are defined as "moderately deep, nearly level to sloping, well drained, low lime, loamy soil formed in till that is 20 to 40 inches thick over bedrock. The available water capacity is low to moderate. Permeability is moderate." Hollis soils are described as "shallow, gently sloping to sloping, well drained, low lime, loamy soil formed in till that is 10 inches to 20 inches over bedrock. The available water capacity is low. Permeability is moderate." Due to approximately 45 percent of this area estimated as steep slopes of 15 percent or greater, slope stabilization ~~will~~would be required during construction. Rock removal is also anticipated.

The following table, On-Site Hydrologic Soil Group Summary, Table III.C-1, further summarizes the breakdown of the on-site soils by their HSG, including the area of impervious surfaces within each group.

Table III.C-1
On-Site Hydrologic Soil Group Summary

Soil Group	**Total Area** (AC)	**Percent of On-Site (%)**	**Impervious Area (AC)**	**Ex Percent Impervious (%)**
HSG A	6	*1%*	0	*0%*
HSG A/D	196	*19%*	23	*12%*
HSG B	105	*10%*	3	*3%*
HSG C	607	*60%*	20	*3%*
HSG C/D	58	*6%*	1	*1%*
HSG D	35	*4%*	0	*0%*

Additional description of the on-site soil types based upon information from the Soil Survey of Dutchess County, New York is presented below.

Upland Soils

Chatfield-Hollis complex, very rocky (CtC, CtD) consists of approximately 40 percent Chatfield soil, 40 percent Hollis soil, and 20 percent rock outcrop and other soils. Other soils may include Charlton and Sutton loams. This soil unit is found on hilltops, narrow ridges, and side slopes that are underlain by folded schist, granite, or gneiss bedrock. Chatfield soil is located on lower concave slopes, while Hollis soil is found on upper slopes, hilltops, and near rock outcrops. Chatfield soil is moderately deep (20 to 40 inches to bedrock) and Hollis soil is shallow (10 to 20 inches to bedrock). Both soils are well drained and somewhat excessively drained and are formed in glacial till deposits. Chatfield soil typically contains dark brown (10YR 3/3) fine sandy loam over olive brown (2.5Y 4/4) loam, and dark grayish brown (2.5Y 4/2) gravelly fine sandy loam. The substratum contains dark grayish brown (2.5Y 4/2) gravelly fine sandy loam. Hollis soil typically contains dark grayish brown (10YR 4/2) loam over dark yellowish brown (10YR 4/4) loam, and olive brown (2.5Y 4/4) loam. Slopes range from 5 to 16 percent for soils designated CtC, and from 15 to 30 percent for soils designated CtD. Chatfield-Hollis complex has moderate to moderately rapid permeability throughout the profile. Surface runoff is medium and erosion hazard is moderate in areas with slopes less than 15 percent. Slopes greater than 15 percent have rapid surface runoff and severe erosion hazard. The areas of this complex that are less steep and deeper to bedrock may be acceptable for some development activities. The major limitations of this soil complex are slope and shallow depth to bedrock.

Other minor soil types include Charlton and Sutton loams. These soils are inclusions which are located within the soil map units, but they are not separately mapped. Charlton loam is very deep (greater than 60 inches) to bedrock and is well drained. Charlton loam has a depth to water of more than six feet, and moderate or moderately rapid permeability. Charlton soil typically contains very dark grayish brown (10YR3/2) loam over dark brown (10YR 3/3) loam and dark yellowish brown (10YR 4/4-4/6) sandy loam. Dark grayish brown (2.5Y 4/2) sandy loam comprises the subsoil. This soil is found on hilltops and parts of hillsides. Sutton loam is very deep to bedrock and is moderately well drained. Sutton loam has a water table at a depth of 1.5 to 2.5 feet below grade from November through April, and moderate or moderately rapid permeability. Sutton loam typically contains dark brown (7.5YR 3/2 and 10YR 4/3) loam in the surface layers. Subsoil layers contain dark brown (7.5YR 4/4) gravelly loam over mottled dark yellowish brown (10YR 4/4) gravelly fine sandy loam. The substratum consists of firm, mottled, dark grayish brown (2.5Y 4/2) gravelly sandy loam over friable, mottled, dark brown (10YR 4/3) gravelly fine sandy loam. This soil is found on lower concave sideslopes, in slight depressions, and along drainageways in glaciated uplands. Both Charlton and Sutton loams are formed in glacial till deposits.

Copake gravelly silt loam (CuA, CuB, CuC, CuD, CuE) is very deep to bedrock and well drained. This soil is formed in glaciofluvial deposits high in limestone fragments. Copake loam is found on valley floors and outwash plains. Copake gravelly silt loam typically contains dark brown (10YR 3/3) gravelly silt loam over dark yellowish brown (10YR 4/6) gravelly loam, and olive brown (2.5Y 4/4) and yellowish brown (10YR 5/4) loam. The substratum contains light olive brown (2.5Y 5/4) very gravelly loamy coarse sand. Slopes range from 0 to 2 percent for soils designated CuA, from 2 to 6 percent for soils designated CuB, from 5 to 16 percent for soils designated CuC, from 15 to 30 percent for soils designated CuD, and from 25 to 45 percent for soils designated CuE. Copake gravelly silt loam has moderate to moderately rapid permeability in the surface layer and subsoil, and very rapid in the substratum. Surface runoff is slow to medium and erosion hazard is slight to moderate in areas with slopes of 16 percent or less. With slopes between 15 and 30 percent, surface runoff is medium and erosion hazard is severe, increasing to rapid surface runoff and very severe erosion hazard with slopes ranging from 25 to 45 percent. The areas of this complex that have slopes of less than 16 percent are acceptable for some development activities. The major limitations of this soil are slope in the steeper portions, and rapid permeability in the substratum.

Farmington-Galway complex, very rocky (FcB, FcC, FcD) consists of approximately 40 percent Farmington soil, 30 percent Galway soil, and 30 percent rock outcrop and other soils. This soil unit is found on hilltops, narrow ridges, side slopes, and till plains that are underlain by folded limestone bedrock. Rock outcrop covers 2 to 20 percent of the surface. Galway soil is located on lower concave slopes, while Farmington soil is found on upper slopes, hilltops, and near rock outcrops. Farmington soil is well drained and somewhat excessively drained, and Galway soil is well drained and moderately well drained. Farmington soil is shallow and Galway soil is moderately deep to bedrock. Both soils are formed in glacial till deposits. Farmington soil typically contains dark brown (10YR 3/3) loam over light olive brown (2.5Y 5/6) very fine sandy loam. Galway soil typically contains dark brown (10YR 3/3) gravelly loam over dark yellowish brown (10YR 4/4) gravelly loam, and dark brown (10YR 4/4 and 4/3) gravelly loam. The substratum contains dark brown (10YR 3/3) gravelly loam. Slopes range from 1 to 6 percent for soils designated FcB, from 5 to 16 percent for soils designated FcC, and from 15 to 30 percent for soils designated FcD. Farmington-Galway complex has moderate permeability throughout the profile. Surface runoff is slow to medium and erosion hazard is slight to moderate in areas with slopes less than 16 percent. With slopes between 15 and 30 percent, surface runoff is rapid, and erosion hazard is severe. The areas of this complex that have a slope of less than 16 percent are acceptable for some development activities. The major limitations of this soil are slope in the steeper portions and depth to bedrock, along with depth to water (in the Galway portion).

Farmington-Rock outcrop complex, very rocky (FeE) consists of approximately 60 percent Farmington soil, 20 percent rock outcrop, and 20 percent other soils. Farmington soils are described above. Farmington-Rock outcrop complex is found on hills and sideslopes that are underlain by folded limestone bedrock. The slopes for this soil unit range from 25 to 65 percent. Surface runoff is very rapid, and erosion hazard is very severe. Because of very steep slopes and shallow depth to bedrock, development of this soil unit is not recommended.

Hollis-Chatfield-Rock outcrop complex (HoF) consists of approximately 40 percent Hollis soil, 25 percent Chatfield soil, 25 percent rock outcrop, and 10 percent other soils. Other soils may include Charlton loam. Hollis, Chatfield, Charlton, and Sutton loams are described above. Hollis-Chatfield-Rock outcrop complex is found on hills and sideslopes that are underlain by folded schist, granite, or gneiss bedrock. Hollis soils are commonly on upper areas near areas of rock outcrop, while Chatfield soils are commonly located in lower concave areas. The slopes for this soil unit range from 45 to 70 percent. Surface runoff is very rapid, and erosion hazard is very severe. Because of very steep slopes and shallow depth to bedrock, development of this soil unit is not recommended.

Massena silt loam (MnB) is very deep to bedrock and somewhat poorly drained. This soil is formed in glacial till deposits and is found on concave footslopes and along drainageways on till plains. Massena silt loam typically contains dark grayish brown (10YR 4/2) silt loam over mottled yellowish brown (10YR 5/4) loam, and mottled grayish brown (2.5Y 5/2) fine sandy loam and loam. The substratum contains dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) fine sandy loam. Slopes range from 3 to 8 percent. Massena silt loam has moderate permeability in the surface layer, and moderately slow and slow in the subsoil and the substratum. Surface runoff is medium and erosion hazard is moderate. Massena silt loam has a water table at a depth of one to one-and-a-half feet below grade from November through May. Because of wetness, many development activities within this soil unit are severely limited

Pawling silt loam (Pg) is very deep to bedrock and moderately well drained. This soil is formed in alluvium deposits and is found on floodplains. Pawling silt loam typically contains very dark grayish brown (10YR 3/2) silt loam over dark brown (10YR 4/3) silt loam, and mottled dark brown (10YR 4/3) loam. The substratum contains grayish brown (10YR 5/2) gravelly loamy sand and brown (10YR 4/3) very gravelly sand. Slopes range from 0 to 3 percent. Pawling silt loam has moderate permeability in the surface layer and the subsoil, and moderately rapid to rapid in the substratum. Surface runoff is slow and erosion hazard is slight. Pawling silt loam has a water table at a depth of one-and-a-half to two feet below grade from February through April, and is prone to occasional flooding. Development in areas containing this soil is severely limited by wetness and flooding.

Pits, gravel (Ps) are areas that have been excavated for gravel. Inclusions of up to 30 percent Udorthents and other soils may be included within this soil unit. Udorthents, smoothed are described below. Other soils may include any of the surrounding soil types, including Copake gravelly silt loam, Farmington-Galway complex, very rocky, and Wayland silt loam. Areas of this soil ~~will~~would vary greatly and suitability for development requires on-site investigation.

Stockbridge silt loam (SkB, SkC, SkD) is very deep to bedrock and well drained. This soil is formed in glacial till deposits and is found on hilltops and broad till plains. Stockbridge silt loam typically contains very dark grayish brown (10YR 3/2) silt loam over dark brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam. The substratum contains brown (10YR 5/3) silt loam. Slopes range from 3 to 8 percent for soils designated SkB, from 8 to 15 percent for soils designated SkC, and from 15 to 25 percent for soils designated SkD. Stockbridge silt loam has moderate permeability in the surface layer and the subsoil, and slow to moderately slow in the substratum. Surface runoff is medium and erosion hazard is slight in areas with slopes less than 8 percent. Surface runoff is rapid and erosion hazard moderate to severe in areas with slopes greater than 8 percent. The areas of this complex that have slopes of less than 8 percent may be acceptable for many development activities. The major limitation of this soil is slope in the steeper portions.

Stockbridge-Farmington complex, rocky (SmB, SmC) consists of approximately 50 percent Stockbridge soil, 30 percent Farmington soil, and 20 percent other soils and rock outcrop. Stockbridge and Farmington soils are described above. Stockbridge-Farmington complex is found on hilltops and till plains that are underlain by folded limestone bedrock. Stockbridge soil is commonly found on lower concave slopes and Farmington soil is commonly found on hilltops, upper slopes, and near areas of rock outcrop. Slopes range from 1 to 6 percent for soils designated SmB, and from 5 to 16 percent for soils designated SmC. Surface runoff is medium for slopes 16 percent or less, and erosion hazard is slight to moderate. Because of shallow depth to bedrock, development of Farmington soil is limited. Areas with low slope and Stockbridge soil are acceptable for many development activities. Steeper Stockbridge soils have moderate development limitations due to slope.

Udorthents, smoothed (Ud) consist of very deep, somewhat excessively to moderately well drained soils that have been altered by cutting and filling. Inclusions may include Udorthents with a wet substratum (mainly poorly drained soils prior to filling), Urban land, rock outcrop, and undisturbed soils. Areas of this soil ~~will~~would vary greatly and suitability for development requires on-site investigation.

Wetland Soils

Carlisle muck (Cc) is very deep to bedrock, nearly level, and very poorly drained. This soil is formed in highly-decomposed organic material greater than 51 inches thick over mineral deposits. Areas of Palms muck are included in these areas, with an organic layer between 16 and 51 inches thick. Carlisle muck typically contains black (10YR 2/1) muck in the surface and subsurface layers. Palms muck consists of black (10YR 2/1) muck over dark brown (7.5YR 3/2) or dark gray (10YR 4/1) muck. The substratum is a mineral layer comprised of dark gray (2.5Y 4/1) gravelly fine sandy loam. Carlisle and Palms mucks have a water table at a depth of one-half foot above to one foot below grade from September through June, receding to a depth of 2 feet during dry periods. Carlisle muck has moderately slow to moderately rapid permeability throughout, while Palms muck has moderately slow to moderately rapid permeability in the upper portion, but has moderately slow or moderate permeability in the substratum. Surface runoff is very slow to ponded. Carlisle and Palms mucks are not recommended for any type of development and more suitable soils should be chosen. Seasonal high water table, ponding, slow percolation, and low strength constraints are virtually impossible to overcome.

Halsey mucky silt loam (Ha) is very deep to bedrock and poorly drained to very poorly drained. This soil is formed in glacial outwash deposits and is found along drainageways and in depressions on outwash plains. Halsey mucky silt loam typically contains black (10YR 2/1) mucky silt loam over mottled gray (5Y 5/1) silt loam, mottled gray (N

5/)gravelly loam, and dark gray (N 4/) gravelly sandy loam. The substratum contains very dark gray (N 3/) very gravelly loamy sand. Slopes range from 0 to 3 percent. Halsey mucky silt loam has moderate permeability in the surface layer, moderate or moderately rapid permeability in the subsoil, and rapid permeability in the substratum. Surface runoff is slow to ponded and erosion hazard is slight. Halsey mucky silt loam has a water table at a depth of zero to one-half foot below grade from September through June. Development in areas containing this soil is severely limited by wetness.

Sun silt loam (Su) is very deep to bedrock, nearly level, and poorly drained and very poorly drained. This soil is formed in glacial till deposits. Sun loam typically contains very dark grayish brown (10YR 4/2) silt loam over mottled, light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) loam, and olive gray (5Y 5/2) gravelly loam. The substratum contains mottled olive gray (5Y 5/2) gravelly loam. Sun loam is located along drainageways or in depressions between hills and on till plains. Surface runoff is very slow and erosion hazard is slight. Sun loam has a water table at a depth of one foot above to one-half foot below grade from November through April. This soil has moderate permeability in the surface layer, and slow or very slow permeability in the subsoil and substratum. Sun loam is not recommended for development and more suitable soils should be chosen. Wetness and slow percolation constraints are virtually impossible to overcome.

Udorthents, wet substratum (Ue) consist of soils that are located on filled depressions, drainageways, and areas of marsh or other wetland. Inclusions may include Udorthents, smoothed, Urban land, rock outcrop, and undisturbed soils. Areas of this soil are generally very wet and most development activities are limited.

Wayland silt loam (Wy) is very deep to bedrock, nearly level, and poorly drained and very poorly drained. Wayland loam typically contains very dark gray (10YR 3/1) silt loam over gray (10YR 5/1) silt loam, mottled gray (5Y 5/1) silty clay loam, and mottled gray (5Y 5/1) silt loam. The substratum contains mottled gray (5Y 5/1) silt loam. Wayland silt loam is found in recent alluvium deposits located on floodplains. Surface runoff is very slow and erosion hazard is slight. This soil has a water table at a depth of one-half foot above to one foot below grade from November through June. Wayland loam has moderately slow or moderate permeability in the surface layer, and slow permeability in the subsoil and substratum. Wayland silt loam is not recommended for development and more suitable soils should be chosen. Ponding, flooding, and low strength constraints are virtually impossible to overcome.

b. Topography

The central portion of the site, inclusive of and north and west of the HVPC and the existing wetlands, is fairly level with slopes less than 15 percent. In general, elevations range from 420 feet to 520 feet. The area is located within a narrow extension of the

New England Province known as the Reading Prong, which is between the Valley and Ridge Province to the north and the Piedmont Province to the south[2].

To the west of the existing wetlands, the grades begin to rise with areas to the north that have 15% and greater slopes. The area of steep slopes in this area is estimated to be approximately 67 acres (22 percent). In general, elevations range from 420 feet to 540 feet. To the east of the HVPC, the existing grade quickly rises with slopes equal to and greater than 15%. In general, elevations range from 520 feet to 940 feet with a total area of steep slopes over 15 percent of approximately 300 acres.

Refer to attached figure, Steep Slopes Map, Exhibit III.C-2, for the 2-foot contour map with slopes 0-15%, 15-25% and greater than 25% slopes color rendered.

c. Bedrock

As documented by Dutchess County Department of Planning in their publication, *Natural Resources*, October 1985, the typical bedrock found in the ~~p~~Project ~~s~~Site area is both part of the Wappinger Group and Pelitic Rock.

The Wappinger Group is composed of carbonate rocks including limestones and dolostones. This stone is typically quarried for use in fill and masonry work and is usually found in valleys and lowland areas. According to the Dutchess County Department of Planning, the Pelitic Rock formations are the most extensive bedrock formations in the County, and include shales, slates, phyllites, and schists which can be used locally as fill.

As stated in a letter report prepared by Ground Water Associates, Inc. in 1988, the site is located in the Swamp River Valley with bedrock mapped as phyllite, schist, meta-graywacke and marble. Marble, 'a relatively incompetent rock' was the most common variety of bedrock at the HVPC.[3] To the west of the Center, bedrock is typically Schist Phyllite and to the east it is generally Schist.[4]

Based on historic test borings and wells in the Swamp River Valley, the overburden generally ranges between 12 and 130 feet thick, with the depth to bedrock east of the HVPC being between 5 and 43 feet.[5] The potential for rock removal is discussed below.

d. Unique Features

The New York State Department of Environmental Conservation (NYSDEC) has designated certain areas throughout the State as being of environmental interest for a

[2] Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, Joseph C. Lu, P.E., P.C. Consulting Engineers, page 22, August 1988.

[3] Ground Water Associates, Inc. January 14, 1988 letter to Joseph C. Lu, P.E., P.C. Reference made to Fischer, Isachsen, and Rickard, 1970. *Geologic Map of New York*. The University of the State of New York, State Education Department. New York State Museum and Science Service Map and Chart Series, #15.

[4] Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, Joseph C. Lu, P.E., P.C. Consulting Engineers, Geologic Map of New York Lower Hudson Sheet 1970, August 1988.

[5] Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, Joseph C. Lu, P.E., P.C. Consulting Engineers, page 21, August 1988.

variety of factors including steep slopes and viewshed corridors. These areas have been identified as Critical Environmental Areas (CEA), two of which are located within or adjacent to the Project Site. The Town of Dover requested designation of the Deuel Hollow Area CEA and the County of Dutchess requested designation of the Great Swamp CEA, both of which are illustrated on Exhibit III.C-3, Critical Environmental Area Map. Additional on-site features including identified significant habitat areas and steep slopes have been identified on the previous Environmental Assessment and Steep Slopes Map.

3. Potential Impacts of the Proposed Project

a. Soils

The analysis of potential impacts for the ~~proposed p~~Project has been separated into the following three categories:

(1) Earthwork

It is estimated that approximately 1,050,000 cubic yards (cy) of earthwork cut ~~will~~ would be required with an estimated 1,150,000 cy of fill. The site ~~will~~ would be generally balanced with the likely required export of construction materials. The export of material is expected to consist generally of unsuitable fill material. Depending on the materials composition, transport would be either to a New York State approved landfill or other approved off-site location. Excess topsoil that could not be reused on-site would also be transported off-site. All fill material ~~will~~ would be compacted per specifications and ~~will~~ would be suitable for its ultimate use, as per Chapter 65 of the Dover Code. Refer to Exhibit III.C-4 Earthwork Analysis Map, for a graphical representation of the proposed cut and fill areas.

Due to the removal of topsoil and overburden material, there is a potential for soil erosion, requiring the protection of disturbed areas with temporary and permanent stabilization measures, which will be discussed below.

(2) Construction Measures

The site ~~will~~would be managed in accordance with local, municipal, state and federal regulations, including the New York State Department of Environmental Conservation (NYSDEC) General Permit GP-0-08-001. Protection of disturbed areas, topsoil, and engineering fill systems of import material ~~will~~would be required in order to avoid downstream impacts due to stormwater runoff. In addition, soil stockpiles ~~will~~would be stabilized and maintained per specifications. Without the proper installation and regular on-going maintenance of these construction measures, erosion and transport of sediment laden water offsite could occur.

(3) Stormwater Management Basins

Proposed stormwater management basins, both micro-pool extended detention and wet ponds, do not depend on infiltration as a design criteria (i.e., the function of the stormwater basins is not limited by the properties of the surrounding soil types). Should the ground water elevations impact the available volume for stormwater runoff above the permanent pool elevations, ground water ~~will~~would be diverted at each basin and liners may be installed.

b. Topography

Approximately ~~17~~ 21 percent of the site's steep slopes in excess of 15% would be disturbed (see Exhibit III.C-5 and Table III.C-2). Earthwork activities would be performed in controlled areas with an attempt made to balance cut and fill operations to both limit open areas of excavation and the need to stockpile excavated material for extended periods. ~~Earthwork activities will be performed in controlled areas with every attempt made to cut to fill in small lifts.~~ Construction activities and final design ~~will~~would be compliant with local, municipal, state and federal regulations. Driveways ~~will~~would be designed to comply with the Town Code's 12% maximum grade limitation. Protection of steep slopes and slope stabilization ~~will~~would be required both during and post construction to prevent erosion and transport of sediment laden water offsite.

Table III.C-2
Estimated Amount of Potential Slope Disturbance
by Slope Category

Slope Category	Estimated Amount of Disturbance (acres)
0-15	289
15-25	48
25+	14

Potential impacts from construction on steep slopes could include soil migration from construction activities, as well as soil erosion from open excavation areas. These impacts could affect both on-site and off-site wetlands and watercourses. The installation of both temporary and permanent erosion and sediment controls would mitigate the affects on wetlands and watercourses.

c. Bedrock

Rock removal is anticipated and would be performed either by chipping or blasting, and ~~will~~ would be determined with additional borings or removal of overburden. Quantities of rock cut have been estimated based on two separate methods. The first assumption is based on the soil definitions as presented in the Dutchess County Soil and Water Conservation District Interpretative Soils Report (1978). The second assumption is based on the findings presented in the Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, prepared by Joseph C. Lu, P.E., P.C. Consulting Engineers, August 1988.

As presented in the Dutchess County Soil and Water Conservation District Interpretative Soils Report, representative soil types for the ~~p~~Project ~~s~~Site were defined as ranging from deep (i.e. Carlisle, Stockbridge) to till 20 to 40 inches thick over bedrock (i.e. Chatfield) to till 10 to 20 inches thick over bedrock (i.e. Farmington, Hollis). Based on an assumption of a minimum of 2 feet of overburden, it is estimated that approximately 685,000 cy of the earthwork cut ~~will~~would be rock removal, an estimated 65 percent of the overall earthwork cut. Rock ~~will~~would be chipped and reused on site, resulting in an approximate 10 percent expansion of materials due to voids, equal to an estimated 755,000 cy of usable fill material.

As presented in the Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, based on historic test borings and wells in the Swamp River Valley, the overburden generally ranges between 12 and 130 feet thick, with the depth to bedrock east of the HVPC being between 5 and 43[6] feet. Based on an assumption of a minimum of 5 feet of overburden, it is estimated that approximately 365,000 cy of the earthwork cut ~~will~~would be rock removal, an estimated 35 percent of the overall earthwork cut. Rock ~~will~~would be chipped and reused on site, resulting in an approximate 10 percent expansion of materials due to voids, equal to an estimated 400,000 cy of usable fill material.

The estimated rock removal, ranging between 365,000 cy to 685,000 cy, represents 35 percent to 65 percent of the overall earthwork cut, and ~~will~~ would be further refined as the ~~p~~Project develops and site specific borings and test pits are performed.

Rock removal ~~will~~ would be performed in accordance with all local, state and federal regulations, including pre-blast surveys and blasting protocols and plans when explosives are required for rock cut. Rock processing ~~will~~ would be performed on site with rock crushers to prepare fill material for reuse on-site.

Blasting is expected to occur in excavation areas in which the depth of cut is expected to exceed 5 feet in depth. Refer to DEIS Exhibit III.C-5, Earthwork Analysis for the approximate locations of such areas. All blasting would be conducted in strict compliance with New York State governing regulations 12 NYCRR 39, Possession, Handling, Storage and Transportation of Explosives and Chapter 69 Explosives of the local Town code. Regulations in both 12 NYCRR 39 and Chapter 69 include, but are not limited to, licensed operator requirements, notification requirements of adjoining owners, permit and insurance requirements, notification of local law enforcement agencies, blasting charge limitations, transportation of explosives guidelines, storage of explosives, and other safety precautions.

Please refer to Exhibit III.C-~~4~~5, Earthwork Analysis Map, for additional clarification on the areas of rock removal, blast areas of influence, and the proposed locations of rock processing measures.

d. Erosion and Sediment Control Plan

The erosion and sediment control plan ~~will~~would be prepared in conformance with both the Dover Code and the NYSDEC New York State Stormwater Management Design Manual (April, 2008). In addition, practices ~~will~~would be designed based on the NYSDEC New York State Standards and Specifications for Erosion and Sediment Control (August, 2005).

[6] Phase I Report, Harlem Valley Psychiatric Center Water Supply Study, Joseph C. Lu, P.E., P.C. Consulting Engineers, page 21, August 1988.

The proposed soil erosion and sediment control plan ~~will~~would minimize the downstream erosion by controlling runoff at its source, minimizing runoff from disturbed areas and de-concentrating storm water runoff. Temporary and permanent stabilization methods ~~will~~would be implemented before construction begins and ~~will~~would be continuously modified throughout construction to provide the best methods for stormwater management and pollution prevention. Activities include:

Pre-Construction Activities

- Identify all natural resources and mark and protect them as necessary, (i.e., trees, vegetation).
- Identify on-site and downstream surface water bodies and install controls to protect them from sedimentation.
- Establish temporary stone construction entrance pads to capture mud and debris from the tires of construction vehicles.
- Install perimeter sediment controls such as silt fences as shown on the Project plans.
- All earth disturbances during the pre-construction phase should be limited to work necessary to install erosion and sedimentation controls.

During Construction Activities

- Install runoff and drainage controls as shown on the Project plans and as necessary. These controls should reduce run-off flow rates and velocities as well as divert off-site and clean run-off.
- Stabilize the conveyance system (i.e., ditches, swales, berms etc.) by seeding, mulching, and installing rock check dams.
- Stabilize all stormwater runoff outlets as shown on the Project plans and as necessary.
- Stabilization measures should be initiated as soon as practical in portions of the Site where construction activities have temporarily or permanently ceased, but in no case more than 14 days. Where activities ~~will~~would resume within 21 days in that portion of the Site, measures need not be initiated.
- Limit soil disturbance and exposure of bare earth to a minimum.
- All topsoil stockpiles should be staged in an area away from surface waters and storm drains and should be protected and stabilized.
- Construction vehicles shall enter and exit the site at the stabilized construction entrance. The construction entrances ~~will~~would be maintained during the life of the construction and repaired and/or cleaned periodically to ensure proper function.
- Water trucks ~~will~~would be used as needed during construction to reduce dust generated on-site. The contractor ~~will~~would provide dust control in compliance with applicable local and state dust control regulations.
- At any location where surface run-off from disturbed or graded areas may flow off-site, sedimentation control measures must be installed to prevent sedimentation from being transported.

- Regular inspections and maintenance should be performed as described in the following section.

During and post-construction, efforts ~~will~~would be made to preserve similar drainage patterns as occur today, with undisturbed stormwater runoff and ground water being diverted from temporary swales and sediment traps and permanent stormwater management measures.

e. Unique Features

The Town of Dover recommended the designation of the Deuel Hollow CEA in order to protect the estimated 1,050 acres of land in the southeastern corner of the Town. Due to the steep slopes and soil types found in the area, the goal was to control potential impacts caused by development, such as downstream erosion and flooding.

Proposed construction activities throughout the site, including those near or within the Deuel Hollow CEA and the Great Swamp CEA, ~~will~~would be carefully protected, stabilized and maintained in order to meet the intent of the Town to protect these designated areas.

4. Mitigation Measures

a. Methods

As detailed in the Stormater section, development of the ~~p~~Project would increase the amount of impervious surfaces by approximately 61 acres. Increases to impervious surfaces were minimized by the use of cluster development and New Urbanism Design, resulting in denser development with reduced impervious area requirements. Included in this residential design is the combined retail and residential uses, which further reduces the amount of impervious area by stacking uses and sharing resources. The redevelopment of the HVPC campus ~~will~~would be an efficient way to mitigate impervious surface areas as it ~~will~~would be replacing existing impervious areas.

In addition, rain gardens are being proposed throughout the development, each of which ~~will~~would be designed to treat approximately 1,000 square feet (sf) of impervious runoff such as roof, parking and walks. Refer to Section E. Water Resources and Wetlands for a complete description of all upstream adjuncts proposed to the stormwater management basins.

b. Steep Slopes

As described above, earthwork activities would be performed in controlled areas with an attempt made to balance cut and fill operations to both limit open areas of excavation and the need to stockpile excavated material for extended periods.~~earthwork activities will be performed in controlled areas with every attempt made to cut to fill in small lifts~~. In addition, proposed retaining walls ~~will~~ would be constructed simultaneously. Soil stabilization measures ~~will~~ would be employed both during and after construction, including but not limited to fabric, jute mesh and rock stabilization.

Temporary control measures would be installed prior to construction and would be maintained and adjusted as necessary throughout the construction process. Measures might include, but shall not be limited to, the installation of silt fencing to protect sensitive down grade areas, the construction of temporary diversion swales, silt traps and sediment basins to capture and collect silt laden runoff, and the temporary stabilization of open excavation areas awaiting construction completion.

Permanent control measures would focus on controlling hillside erosion and would be mitigated through the stabilization of steep slope areas. Measures may include, but may not be limited to, the installation of vegetated slopes using a combination of topsoil and seed or groundcover plant material, and where necessary, the installation of erosion control netting on slopes greater than 2:1.

c. Rock Removal

Should blasting be required, it ~~will~~would be performed in accordance with local, municipal, state and federal regulations, including but not limited to pre-blast surveys, warning signals and proper handling of explosives. Neighbors who permit pre-blast surveys may be eligible to make a claim if they can show damage as a result of the building. Detailed specifications for rock removal ~~will~~would be included in the Contract Documents.

d. Sensitive Environmental Resources

The limitations on construction and efforts to avoid identified sensitive environmental resources such as marble knolls and Critical Environmental Areas are described in the following Section III.D, Natural Resources.