USDA Soils

To ascertain the general consistency of the subsurface materials on the site publicly available NCSS soils data1 has been collected and interpreted. The following series soil is mapped entirely underlying the site, and described2 below:

Urban Land (URWETB) – series soils. Described as ground surface covered by pavement, concrete, buildings, and other structures underlain by wet disturbed and natural soils material (wet substratum). The soil profile is typically disturbed and does not resemble any mapped soil unit due to anthropogenic modification of the profile.

Typically the urban land series is derived from local native soils that may be mapped adjacent to the urban land mapped complex. The following series is mapped adjacent to the site in question:

Parsippany Series (PbphAT, PbpAT) – series consists of deep, poorly drained soils in extinct lake basins and near streams. They are formed in silty and clayey sediments. A typical soil profile consists of very dark grayish brown (10YR 3/2) to dark gray (10YR 4/1) silt loam from surface to 4 inches, gray (10YR 6/1) silty clay loam from 4 to 9 inches, gray (5YR 5/1) to reddish brown (5YR 4/4) silty clay from 9 to 29 inches, nearly equal portions of brown (7.5 YR 5/4) and strong brown (7.5YR 5/6) silty clay loam from 29 to 50 inches, and reddish brown (5YR 4/3) silt loam from 50 to 70 inches. The depth to water table is reported as being between 0 and 12 inches.

Geology

Site geology can provide diagnostic information that relates to the nature of materials that may occur at depth compared to mapped soils. Most soil units terminate a depths in the range of seven (7) feet. Investigation and desktop review of the geologic units mapped in the vicinity will provide information related to expectations of materials at depth.

The project site is located in the Piedmont Physiographic Province of New Jersey. The Piedmont Province is an area underlain by slightly folded and faulted sedimentary rocks of Triassic and Jurassic age and igneous rocks of Jurassic age.

The site is located generally in the north eastern section of the Province relative to the north-south direction, in a glaciated area of New Jersey. The units mapped under or near the site are described below:

Continuous Till Deposits (ct) – are generally greater than 20 ft thick. May be as much as 200 ft thick and are associated with the Wisconsinan glacial advances. Grain size of matrix generally reflects underlying bedrock. Hydrologic character of the deposit is similar to an unconfined aquifer. In the Passaic basin between Summit and Morristown till overlies productive, confined lacustrine-fan and fluvial sand and gravel aquifers in places. This site may contain similar conditions due to the proximity of the site to these established deposits.

Lake Bottom Sediment (l) – consist of silt, clay, and fine sand deposited on the bottoms of glacial lakes. As much as 250 ft thick. Hydrogeologic character of the deposit is generally confining or semi-confining. Deposit is underlain by productive confined and semi-confined lacustrine-fan and fluvial aquifers in places.

Boonton Formation (Jb) – reddish-brown to brownish-purple, fine-grained sandstone, siltstone, and mudstone. These deposits are situated below the glacial formations and comprise the bedrock in the area. The sandstone facies are commonly micaceous, interbedded with siltstone and mudstone in fining-

upward sequences (Van Houten Cycles) mostly 5-13ft thick. Red, gray and brownish-purple siltstone and black, blocky, partly dolomitic siltstone and shale are common in lower part.

Interpretation

The encountered subsurface materials reveal the site expected to be underlain by unconsolidated well graded/poorly sorted mixtures of glacial diamicton. There is the potential for gravel to cobble size deposits. However, based on the mapped soil and geologic units in the area it is expected that the materials will tend to be medium- to fine-grained in consistency. This is particularly noted in the description of the continuous till formation mapped on the site.

The thickness of these deposits are expected to extend to depths on the range of 30 to 50 feet and unconformably overly the Triassic/Jurassic deposits of the bedrock formations below. The diagenesis of the soils considered in the context of the parent materials from which they are derived reveal several important factors that must be considered in the formulation of a stream bank stabilization scheme:

1. The soils and surficial geologic formations are thick, unconsolidated masses of well graded materials in the range of medium- to fine-grained constituents. That is to say the soils will be a loose conglomeration of sand and silt. Theses types of soils have the propensity to be highly erodible. This will be problematic for solutions that propose the use of an open cell type system, exposed soil faces, terminate at shallow depth, and rely on abutting the surface of the slope.
2. The depth of unconsolidated materials could extend well below stabilization that will comprise a surface armoring. The potential for undermining is exaggerated in this situation and will be problematic.
3. Groundwater influence on the structure should be limited to fluctuations influenced by the surface water features. The soil deposits should have adequate hydraulic conductivity to mitigate significant hydrostatic load. This is provided that proper drainage is provided on the retaining structure.
4. Close proximity of the bank to the cemetery will pose problems with structures that need lateral embedment to maintain stability. This issue is compounded due to the height of the escarpment.

Conclusion

The sediments mapped under the site provide adequate substrate to support nearly any structural improvement along the bank. The primary limiting factors on the site may include:

1. The erosivity of the deposits - open structures that expose the soils will be prone to failure and maintenance issues due to soil washing.
2. Significant height of bank - will result in structures that require lateral embedment. This embedment will encroach in close proximity to the interred.
3. Channel velocity - is estimated in the order of 15 ft/s. The use of rubble reinforcement will likely reqpire significant mass.

In consideration of these factors it is recommended that stream bank be stabalized with a thin walled armoring such as timber, steel, or vinyl sheet piling. Pending the completion of borings along the bank.

This assessment has been combleted without the benefit of site specific testing or investigation and is therefore subject to change based on the results of any testing and investigation.

Recommendations

1. For the 265 ft length of stream being considered for stabilization, we recommend the completion of five (5) borings to depths of 30 feet (or greater) below current grades. This will require two working days andaccess to the top of the slope with drilling equipment.
2. Sheet piling will likely consist of vinyl for ease of installation, handling, and extended life span. Vinyl will also provide a less obtrusive exposed profile.

1Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [April, 2013].

2Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online at http://soils.usda.gov/technical/classification/osd/index.html. Accessed [April, 2013].