C+4 / Old Bridge

Wetlands Delineation Report (100 pgs) Feb (1987)

+ soil logs + profile descriptions

195 pgs

ML000406E

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WETLANDS DELINEATION REPORT

prepared for

Olympia and York Planned Development

Old Bridge Township, Middlesex County

New Jersey

February, 1987

SUBMITTED TO:

O&Y Old Bridge Development Corporation
760 Highway 18
East Brunswick, New Jersey 08816

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Nr. 10

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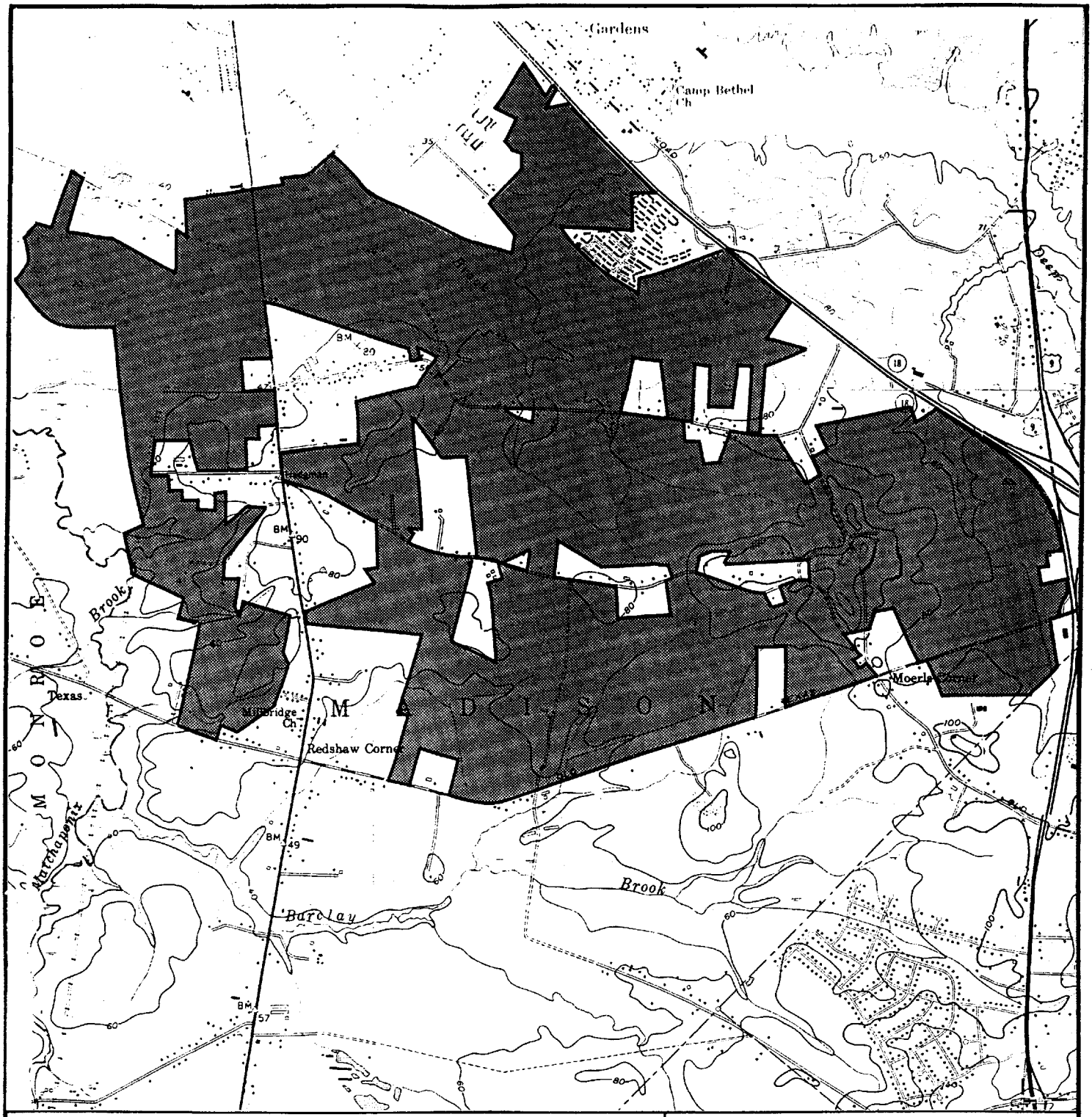
INTRODUCTION

In 1985 Olympia and York Old Bridge Development Corporation initiated plans to develop its holdings in Old Bridge Township, Middlesex County, New Jersey. As part of the planning process they contracted with Amy S. Greene, Environmental Consultants to identify and delineate the boundaries of any wetlands occurring at the site, so as to comply with all federal, state and local programs regulating the use of these wetlands. The total holdings involved in the project approximate 2600 acres which include areas of mixed forest, agricultural fields, abandoned fields and developed properties.

The large size of the project and the existence of numerous outparcels, especially along the existing roads, make enumeration of the included blocks and lots of dubious value. A general site location map (Figure 1) provides a sense of the project bounds at a small scale; the wetlands delineation map (Appendix 4, Back folder) provides project boundaries at a large scale, and include the precise locations of included parcels and outparcels, topographic information, and some internal surface features. The wetland delineation map



Source:

USGS 7.5 Minute series
Freehold and South Amboy
Quadrangle

O & Y Development
Corporation Holdings

N

0 2610'

FIGURE 1
SITE LOCATION MAP

O & Y Old Bridge
Development Corp.
Old Bridge Township
Middlesex County, N.J.

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was prepared by Taylor, Wiseman, and Taylor, Consulting Engineers from field surveys of wetland delineated by Amy S. Greene Environmental Consultants and existing boundary surveys.

The site is typical of those on the western edge of the outer Coastal plain in New Jersey, consisting of low ridges separated by broad flats; this landscape is punctuated by the presence of sandy knolls along the length of the higher ridges. The project area has its highest elevations in the southeastern corner where several knolls reach between 125-145 feet above mean sea level. This high ground crosses the central portions of the site between Pleasant Valley and East Greystone Roads and terminates in a small knoll slightly to the north of Texas Road and west of Englishtown Road. Site topography generally slopes downward to the north and west where the mean elevations range below 40 feet. Slopes in the central portions of the project are steep to moderate, consequently drainage in most of these areas is good. Areas away from the ridge however generally have little relief, and thus are less well drained, poorly drained, or have impounded water present over all or part of the year.

The central ridge forms the divide for the four

subbasins that drain the site. North of the ridge but east of Englishtown Road is drained by Iresick Brook, a tributary of South River. To the south and east of the central ridge, Deep Run, also a tributary of South River, drains the site. The southern and western portions of the site are drained by the Matchaponix Brook and its tributary, Barclay's Brook. The Matchaponix also discharges into South River. The entire site is therefore in the South River subbasin of the Raritan drainage basin.

The purpose of this study was to delineate the wetlands, as defined by the U. S. Army Corps of Engineers (USACOE), that occur on this site; this report presents the results of this delineation.

WETLAND DEFINITION

Wetlands are defined as areas that meet all three of the following criteria established by the U. S. Army Corps of Engineers (USACOE) (USACOE, 1986).

First, they are sites on which the predominant plant species are hydrophytic. Hydrophytic species are those plants that are especially adapted either physiologically or morphologically to deal with anaerobic soil conditions for a major part of the growing season. Anaerobic conditions (low soil oxygen tensions) are primarily the result of periodic or permanent saturation of the soil, either by groundwater or by flow from adjacent waters. Since many plants have wide ecological ranges and thus most plants are not restricted to a single type of habitat, the U. S. Fish and Wildlife (FWS) has developed a classification scheme that assigns species to habitat classes according to the following rule:

Plant affinity for wetland conditions

Classification	% occurrence in wetlands
Obligate (OBL)	> 95
Facultative Wet (FACW)	66-95
Facultative (FAC)	33-66

Facultative Upland (FACU) 33

Wetland vegetation is identified as those areas that are dominated by obligate (OBL), facultative wet (FACW), and facultative (FAC) species.

Second, sites must have as their predominate substrates soils that exhibit hydric characteristics. Hydric conditions for mineral soils with low to moderate organic content are defined as soil B horizons with chroma less than 2 and value more than 4 if mottling is present or chromas less than 1 and value more than 4 if no mottling is present. Low chroma numbers are an index of the degree of soil reduction as a result of anaerobic soil conditions.

Sandy soils often fail to hold color, therefore the criteria outlined above are inappropriate to judge whether a sandy soil is or is not exhibiting hydric conditions. For sandy soils, three other criteria are used: 1) the presence of high organic contents in the upper horizons, 2) the presence of organic pans (spodic horizons or B2h), and 3) the presence of organic streaks throughout the horizons. The surface accumulation of organic matter is a result of anaerobic conditions at the surface caused by inundation or groundwater saturation of the soil for a significant portion of the

growing season; decomposition rates under these reducing conditions are extremely low. The presence of high amounts of organic matter in the surface horizons leads to streaking in the lower horizons as the decomposed material slowly moves down the profile following the water table in the summer and fall. The depth of the seasonal high water table is often indicated by the depth and thickness of the spodic horizon that forms when leached organic material accumulates at the point of groundwater saturation. Sandy soils are considered to be hydric when this spodic horizon occurs within 18-20 inches of the surface, has low chroma, and exceeds one inch in thickness.

Together these two sets of criteria allow most soils to be classified as either hydric or non-hydric. New Jersey soils have been classified according to their hydric potential in a joint memorandum from the USDA Soil Conservation Service and the USFWS National Wetland Inventory (USDI, 1984). This listing was revised and updated by the Soil Conservation Service (SCS) in August, 1986. Three groups of soils are recognized:

Group 1 - Soils which always display consistent hydric conditions.

Group 2 - Soils which display consistent hydric

conditions throughout most of their range but that require field verification of hydric conditions for each occurrence.

Group 3 - Soils which may exhibit hydric conditions but this condition must always be determined by field verification.

However, unlisted soils may also exhibit hydric conditions and thus be associated with wetlands; these cases must be individually verified in the field.

Last, soils must be either saturated by water within 10-12 inches of the soil surface or be covered with standing water for a substantial portion of the growing season.

WETLANDS DELINEATION

Using the above criteria, field surveys of the site's vegetation, soils and hydrology were performed during the period from March, 1986 to February, 1987. An estimated 60 miles of line that delineates approximately 1460 acres of wetland was flagged by Amy S. Greene, Environmental Consultants and the flags located and mapped by surveying crews of Taylor, Wiseman, and Taylor, Consulting Engineers. Based on this field survey and supplemented by previously existing soil surveys, wetlands maps, and aerial photographs, wetlands occurring on the site were identified, delineated and mapped.

Appendix 1 contains a list of vascular plant species encountered and their abundance in both upland and wetland communities. Appendix 2 contains the profile descriptions of soils sampled during the delineation. Appendix 4 contains the wetland delineation map as prepared by Taylor, Wiseman, and Taylor. This map shows the delineation lines, property lines, soil boring and photograph locations, topographic lines, and some internal physical features. Appendix 5 shows

the distribution of plant community types within the upland and wetland portions of the site. The location of the soil borings that are detailed in Appendix 2 are shown on the map designated Appendix 4.

VEGETATION

A. Introduction

The objectives of this section are threefold. First, is to provide a general description of the plant communities extant on the site. Second, it attempts to roughly correlate the occurrence of particular communities, their constituent species and their gross physiognomy, with the major physical and historical factors on the site. These factors include physical aspects such as topography, slope, general site relief, surface hydrology, and soils, along with temporal and human aspects such as disturbance frequency and severity, and past and current land use practices. Last, this section serves as a method for reporting the results of the wetland delineation in the context of the entire site vegetation rather than as an unconnected series of individual spot descriptions of the vegetation adjacent to the delineated line.

The scope of this section is to develop neither a detailed plant resource survey nor a vegetation map. Either of these requires a more rigorous sampling and

analytical methodology than that employed herein. The intended objectives of this section are more limited. Therefore the descriptions and correlations in this report are based upon a combination of previous studies on the site, aerial photogrammetry, field notes compiled during the delineation, and finally, a series of transects chosen both to clarify community limits and to confirm the conclusions based on aerial photogrammetry.

B. Methodology and Sources

1. Previous Studies.

Three previous studies of either all or part of the site vegetation exist; they are: 1. the U. S. Fish and Wildlife Service National Wetland Inventory maps (USFWS NWI, Figure 2), 2. the Natural Resources Inventory prepared for the Township of Old Bridge by Dames and Moore (1975), and 3. the Environmental Impact Statement prepared for Olympia and York Old Bridge Development Corporation by Quennell Associates (1979).

The National Wetland Inventory (NWI) maps identify areas of palustrine, broad-leaved, deciduous forest (PF01) directly adjacent to or associated with the major streams on the site. The largest area delineated on the USFWS NWI map is associated with the Iresick Brook system which drains the central portion of the site. The wetland delineated occurs in the central and northern portions of the site bounded by Englishtown Road to the west, East Greystone Road to the south and Marlboro Road to the east. The lowland forest associated with the Iresick Brook and its tributaries is

the largest wetland delineated by the USFWS. Two other areas are also identified as PFO1 by the USFWS. The first is associated with the Matchaponix Brook and its tributary, Barclay's Brook. Barclay's Brook drains the area south of East Greystone Road and east of Marlboro Road, on the west its drainage basin is restricted to the area generally east of Englishtown Road; Matchaponix Brook drains those areas west of Englishtown Road. Together these two streams have areas of PFO1 associated with them in the south central, southwestern and northwestern portions of the site. The second is an area of PFO1 associated with the highly anastomosed drainage basin of Deep Run, which drains the areas south and east of Marlboro Road.

The USFWS NWI map provided a preliminary basis for the identification of wetland forests. However, the utility of this mapping was limited for the following reasons:

1. The USFWS NWI mapping was done at a small scale (1:80,000) from aerial photographs. This small scale has detail sufficient for only the most general classifications.

2. Community species compositions are either

lacking or fragmentary.

and 3. After the field survey was completed, discrepancies were noted between the lines delineated by Amy S. Greene Environmental Consultants and the extent of wetlands identified by the NWI. Some of these discrepancies can be attributed to the limits of resolution available at the mapping scale used by the NWI; others are due to methodological differences between the two estimates. Field delineations were carried out under criteria established by the U. S. Army Corps of Engineers (USACOE, 1986), these criteria will allow the inclusion of cultivated or recently abandoned fields as wetland if they meet the standards defined by USACOE. The USFWS NWI maps apparently excluded or were unable to distinguish old fields and late successional woodlands that had wetland characteristics. As such, some areas, especially in the southern sections of the site, are classified by this report as wetland communities that were not identified by the NWI.

The Natural Resource Inventory (NRI) of Old Bridge Township gave a broad classification of plant communities throughout the site. This report recognized and mapped communities in three general categories: water

related habitats, forested habitats and field habitats. Water related habitats included freshwater communities associated with streams, open marshes and ponds. Forested habitats were subdivided into four communities: pine-oak, mixed oak and two mixed forests differentiated by their position as either upland or lowland formations. Field communities were identified as being either cultivated or abandoned old fields. Although this classification was useful as a preliminary guide, the small mapping scale and the lack of community descriptions made its utility limited.

The Environmental Impact Statement (EIS) prepared for the Olympia and York Old Bridge Development Corporation identified and mapped (at a scale of 1:4800) seven broad categories of vegetation on the site; brief descriptions of the prominent species in each community and the relationship of the community to selected environmental factors was included in the narrative that accompanied the maps. Further, this study recognized the need to segregate the old field and late successional areas for special attention. This consideration of the temporal and land use factors is notable in its attempt to specifically treat these areas

as separate structural and functional entities rather than simply as stages leading to one of the forested communities. A modification of the classification used in the EIS has been used in the remainder of this current report.

2. Aerial Photography

Enhanced, false color infrared aerial photographs (approximate scale 1:12000) flown by Air-ography, Levittown, PA were used to provide a preliminary map of plant communities on the site. This draft map was then supplemented by data both from the field notes and from the located wetland delineation lines to produce a second draft map. Verification of approximate community boundaries was provided by a series of transects chosen after reference to the draft maps. The final vegetation community map is the result of therefore of this process of successive refinement.

3. Field Surveys

Field notes, describing the vegetation of both

upland and wetland communities, and soil samples were taken at points along each delineation line. Each set of notes was keyed to a flag number on the line; subsequently the flags were located and mapped at a scale of 1:2400 by surveyors from Taylor, Wiseman, and Taylor, Consulting Engineers. These notes form the basis of both the species list and the abundance value of each species in the various communities as presented in Appendix 1.

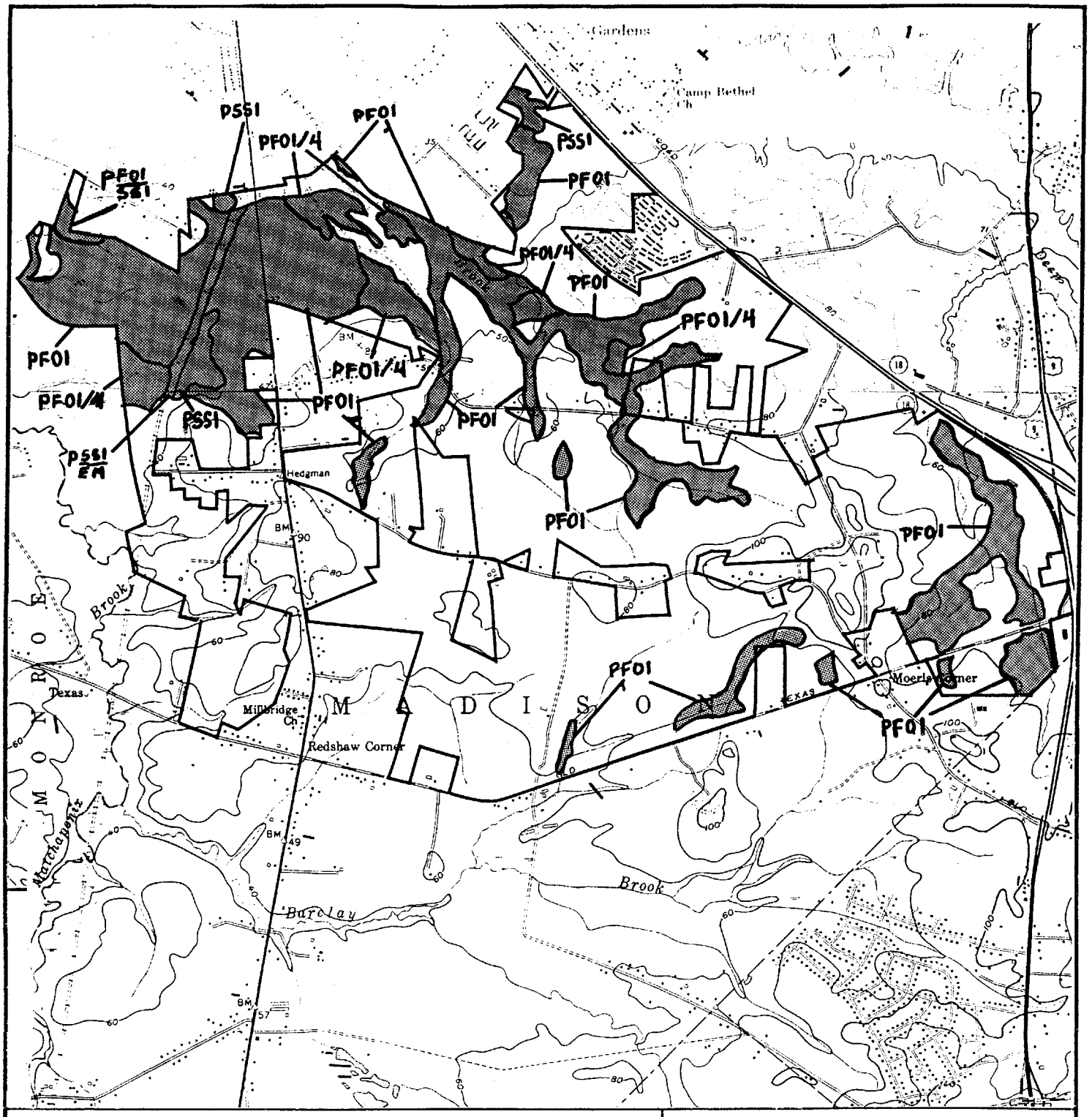
After the field delineation was completed, a series of transects was established to supplement the field notes. These transects sampled the vegetation at points of community change. Where such change was adjacent to a flagged line, the nearest flag was used to locate the sample; if the sample was not near any flagged line, compass headings and distances, topography and any landmarks were used to approximately locate the sample with the aid of both maps and aerial photographs.

4. Compilation

Communities were defined by two methods. The first relied upon a subjective evaluation of whether there was

a consistent and persistent physiognomic and compositional difference that easily delineated a community in the field. Communities found at the extremes of the physical environment, i.e. those on the highest, best drained sites and those in the lowest and most poorly drained areas, along with successional areas that clearly appeared on the aerial photographs, were most easily defined by this procedure.

The second method used a form of tabular analysis analogous to the hand method of Ellenberg and Mueller-Dombois (1967); abundance data on each species supplied from the field notes was used as input for the analysis. This more objective analysis was able to differentiate those communities that were more closely related along the continuum of environmental factors. Such communities usually lacked clear boundaries in the field and intergraded along their contact zones with the adjacent communities. Communities identified by this technique were verified both by examination of aerial photographs and by field surveys.



	NWI Wetlands
PFO1	Palustrine forested broad-leaved deciduous wetland
PFO1/4	Palustrine forested needle leaved evergreen and broad-leaved deciduous
PSSI	Palustrine scrub/shrub broad-leaved deciduous
PEM	Palustrine emergent wetland

SOURCE:
USFWS National Wetland Inventory, 1979

FIGURE 2
USFWS NWI
WETLANDS MAP

O & Y Old Bridge
Development Corp.
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Middlesex County, N.J.

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C. Results

Seven major community types were defined on the site: Pine forest (P), Oak-Pine woodland (OP), Mixed Oak forest (MO), Mixed Hardwood forest (HW), Late Successional woodland/forest (PW), Early Successional old fields (OF), and Water Related habitats (SS), such as marshes, stream beds and bottoms, bogs and open water.

Two (OP, and MO) of the seven communities are essentially upland, usually found on the hilltops, upper and mid-slopes where soils are well to extremely well drained. They form an intergrading series at the dry end of the complex topographic-moisture gradient. At the other extreme of this gradient is the collection of habitats collectively designated SS; the sole character uniting this group is the presence of standing or flowing water throughout most of the year. By definition this community occupies the lowest elevations and depressions on the site. The positions of the four remaining communities (P, HW, PW, and OF) along environmental gradients are more complex.

The pine forest community (P) is an upland formation best developed on sandy, well to very well drained soils. However, It is found not only on ridges and upper slopes but also on small hillocks, sand ridges, and valley floors. These lower elevation sites have little relief and often have restricted or poor drainage. Thus, the pine forest community includes a certain amount of wetland, usually interspersed within a matrix of dry pine forest. This community therefore occupies a position on the topographic-moisture gradient which is at the dry end when elevation is high or relief is great, but on the wetter end when the converse is true.

The HW community occupies the broad middle of the topographic-moisture gradient and therefore has both wet and dry components within a general mixed forest community. Topographically this community occurs on the mid to lower slopes, but is best developed on the valley floors where relief is low. Clear distinctions based on abrupt changes in species composition or structure often were not present. Rather, it was slight changes in structure or variation in the abundance of particular species or species groups that indicated communal

differences. Field delineations relied not only upon vegetation but also upon soils and hydrology to delineate wetland from upland; often such change was over very short distances with little evident floristic change. Given this set of conditions, it appears more logical to define a single mixed deciduous forest unit with wetland (HWW) and upland (HWU) variants rather than two units of community rank (e.g. the lowland association and mixed deciduous forest associations as per the EIS). The wetland mixed hardwood forest (HWW) along with the late successional wooded wetlands (PWW) discussed below constitute the majority of the area designated as palustrine, broad-leaved, deciduous forest (PFO1) by the NWI of the Fish and Wildlife Service.

The two remaining communities (PW and OF) are primarily distinguished not by their positions along the topographic-moisture gradient but rather by their position along a temporal-disturbance gradient. These communities are the product not only of topography, soils and hydrology but also are a result of past and present land use and disturbance. The two communities constantly intergrade with each other over the landscape; likewise, the PW community intergrades into

the more mature forest and woodland communities (P, OP, MO, and HW). Additionally, both these communities have been subdivided into wetland and upland variants for the reasons outlined above. Topographically these communities occur from hilltops to stream bottoms, however, they are most common in the bottomlands. This landscape position is a result of past farming practices which preferentially used the flat valleys as opposed to the higher slopes.

Floristically, 318 species from 199 genera were encountered and identified in the course of the field delineations. A total of 68 families of vascular plants were represented on the site. Since no attempt was made to compile a flora of the area, this list should be considered a very conservative estimate of species richness and diversity over the site as a whole.

The results of the community analysis and wetland delineation are presented in three forms:

1. A tabular list of plant species and their associated abundance in each of the communities (Appendix 1).

2. A narrative describing each community type and its relationship to site environmental factors.

and 3. A preliminary mapping of the communities on the site based on aerial photographs and the wetland location map prepared by Taylor, Wiseman, and Taylor, Consulting Engineers (Appendix 5).

D. Community Descriptions

1. Oak-Pine Woodland (OP)

a. composition and structure

This community consists of either an open canopied woodland to grassy savanna or in some areas, an open canopied forest. Areas may be dominated by pitch pine (Pinus rigida FACU), often with no associated sub-dominant canopy species; but more commonly, canopy dominance is shared by three species, pitch pine, chestnut oak (Quercus prinus UPL) and blackjack oak, (Q. marilandica). Other trees which occur in this community are: scrub pine (Pinus virginiana), sassafras, (Sassafras albidum FACU-), post oak (Q. stellata UPL), black oak (Q. velutina), scarlet oak (Q. coccinea), and smaller amounts of white oak (Q. alba FACU).

Tall shrubs, usually scrub oak (Q. ilicifolia), are infrequent in the open woodlands but low shrub layers are often well developed. The low shrub layers are composed of dense tangles of lowbush (Vaccinium vacillans FACU) and dwarf (V. angustifolium FACU-) blueberries, black huckleberry (Gaylussacia baccata

FACU), and sheep laurel (Kalmia angustifolia FAC), along with lesser amounts of other ericaceous shrubs.

Herbaceous layers are not well developed where low shrub cover is high, however, where shrub layers are sparse, grasses, such as crinkled hairgrass (Deschampsia flexuosa), poverty oatgrass (Danthonia spicata), blackseed needlegrass (Stipa avenacea), and silvery beard grass (Andropogon ternarius FACU), and sedges of the Montanes section of the genus Carex (especially the black margined sedge, Carex nigromarginata) form the major portion of the ground cover. Other herbaceous species frequently encountered in this community are cowwheat (Melampyrum lineare FACU), long leaved houstonia, (Houstonia longifolia), yellow lady slipper (Cypripedium calceolus FAC+) and coast jointweed (Polygonella articulata). The last species is characteristic of blowouts and other dry, open areas in this community. Bracken fern (Pteridium aquilinum FACU) frequently occurs in this community irrespective of the type of ground cover.

b. topography, slope and soils.

Oak-Pine woodlands in which the canopy is almost

wholly pitch pine, occupy many of the knolls and ridgetops on the site. These stands may extend down to midslope only on the steeper hills where pine dominated stands intergrade with and gradually yield to oak dominated stands. Additional areas occupied by this formation are the low hilltops and sandridges at lower elevations. These low elevation oak-pine areas usually abruptly yield to mixed hardwoods (HW) or wetland variants of pine forest (P), but may grade into mixed oak or dry pine forest if soils remain moderately well drained.

In most cases, the oak-pine community is underlain by well to excessively well drained sandy soils such as members of the Lakehurst and Lakewood series. They may also be found on the better drained areas of Atsion and Klej soils.

This community occupies the extreme dry end of the topographic-moisture gradient either on an overall site basis, or on a local basis where it occupies the local highground on sandier soils.

2. Mixed Oak Forest (MO)

a. composition and structure

Closed canopy forest dominated by white, black, and scarlet oaks occupies many of the higher elevation points and upper slopes on the site. On drier sites, associated species include pitch pine, blackjack oak, and post oak; these species may become codominant as this community intergrades into either oak-pine woodland (OP) or pine forest (P). On sites of intermediate moisture, shagbark (Carya ovata FACU-) and pignut (C. glabra FACU-) hickories, sassafras, and black gum (Nyssa sylvatica FAC) become frequent canopy associates. On the lowest elevations and hence the wettest areas, this community intergrades into hardwood forest (HW) with red maple (Acer rubrum FAC), sweet gum (Liquidambar styraciflua FAC) and black gum becoming prominent. Concomitantly, black oak becomes less common while two other oaks (willow (Q. phellos FAC+) and southern red (Q. falcata FACU-)) sporadically appear in the canopy.

Understories in the drier areas resemble those found in the oak-pine woodland (OP), primarily consisting of low ericaceous shrubs, bracken fern and

graminoids. Where canopy closure is greater, and drainage usually less free, the understory becomes a dense layer of tall shrubs such as sweet pepperbush (Clethra alnifolia FAC+), dangleberry (Gaylussacia frondosa FAC) and tall bush blueberry (Vaccinium corymbosum FACW-) entangled by moderate to dense masses of greenbriars (both Smilax rotundifolia FAC and S. glauca FAC). Low ericaceous shrubs such as sheep laurel and low bush blueberry are often prominent even where tall shrub canopies are well developed.

Herbaceous layers are usually sparse, consisting of small patches of gramminoids, bracken fern, spring ephemerals (Solomon's seal (Polygonatum biflorum FAC), false Solomon's seal (Smilacina racemosa FACU-) and mayflower (Maianthemum canadense, FAC-)), and woodland composites (e.g., white snakeroot (Eupatorium rugosum) and white topped aster (Sericocarpus asteroides)).

b. topography, slope and soils.

Mixed oak forest (MO) is best developed on the higher elevation areas on the site, that include not only the hilltops but also the steeper upper and midslopes of these hills. However, where drainage

remains good, this community extends downslope onto the valley floors.

This community often occurs on the well drained, sandy, upland soils of the Lakehurst and Lakewood series where it intergrades into the oak-pine (OP) woodland on the driest sites. However, the majority of this community occurs on slopes and lower elevation sites underlain by the better drained variants of Atsion and Klej soils. Here, when drainage worsens, the community grades into either hardwood forest (HW) or wetland variants of the pine forest (P) community. Small areas of MO occur on Keyport soils, but only on the upper elevations where relief is sufficient to maintain good drainage. The clayey subsoil of this series often leads to poor drainage, a condition that apparently excludes the development of MO and encourages the growth of more hydrophytic species such as red maple, black gum, and sweet gum.

3. Pine Forest (P)

a. structure and composition

Closed canopy forest dominated by pitch pine is common throughout the site. Since this community is often found in areas of low relief, upland and wetland variants are separated by very small transition zones, but significant changes in the abundance and composition of the understory between wetland and upland variants are obvious in the field. Physiognomically it differs from oak pine woodland in the more complete canopy closure and as a consequence of this closure, only a sparse low shrub layer develops in the drier areas. However, a dense tall shrub strata is often observed in wetland portions of this community. Pitch pine cover varies from between approximately 30 to 90% of total arborescent cover in this community; white, black, and chestnut oaks along with sassafras are codominant in the drier areas while red maple, scarlet oak and black gum become prominent in the wetter sites.

In the well drained areas, the woody understory consists of scattered shrubs (high bush, low bush and dwarf blueberries, dangleberry, shadbush (Amelanchier

canadensis FAC), sweet pepperbush and sheep laurel) and thickets of greenbriar and glaucous greenbriar.

Herbaceous layers are sparse to very sparse with small areas of sedges (Carex spp.), mixed woodland grasses, clubmoss (ground pine (Lycopodium obscurum FACU) and ground cedar (L. complanatum FACU-)), a few forbs, and creeping suffructescent perennials (e. g. creeping wintergreen (Gaultheria procumbens FACU) and partridge berry (Mitchella repens FACU)).

In contrast, understories in the wetland portions of pine forest (P) are characterised by the development of dense to very dense tall shrub stratas. These strata often contain large individuals of high bush blueberry, arrowwood viburnum (Viburnum dentatum FAC), chokeberry (Aronia arbutifolia FACW), fetterbush (Leucothoe racemosa FACW), and maleberry (Lyonia ligustrina FACW). These shrub layers are often highly tangled thickets bound together by greenbriars.

Herbaceous layers are non-existent as a structural component in the wetland pine forest although scattered herbs may be found in some areas.

The transition zone between the wet and dry variants is usually marked by the presence of four

species: two hollies (inkberry (Ilex glabra FACW-) and winterberry (I. verticillata FACW+), sweetbay (Magnolia virginiana, FACW+), and swamp azalea (Rhododendron viscosum OBL). The first three remain largely at the interface between the two variants, while the last is often an important constituent of the wetland shrub layer.

The pine community (P) grades into OP upslope where soils are better drained and into HW where drainage becomes restricted or the soils become heavier.

b. topography, slope, and soils

Pine forest occurs throughout the site on various topography situations but it is most common on the low, sandy ridges and plains found along the northern portions of the site. It is also found on thin sand ridges between stream channels on the western and central portions of the area. This community is most common on Atsion and Klej soils irrespective of drainage. Since both the pine community and many areas of these soils are found on areas of low relief, drainage conditions change sharply, over very short distances, and likewise so does the nature of the vegetation.

4. Mixed Hardwood Forest (HWW and HWU).

a. composition and structure.

The mixed hardwood (HW) communities are defined by the presence of red maple and black gum as canopy dominants. Since there is sufficient change in the both community composition and structure within the canopy and the understory, this community has been divided into two phases, an upland variant (HWU) and essentially a palustrine variant (HWW). In the drier phases of the community (HWU), codominants include white and scarlet oaks, while in the wetter phases (HWW), sweet gum becomes a canopy dominant. The upland phase usually grades into either one of the upland communities (OP or MO) if slope increases and soils become better drained, or into pine forest (P) if relief is low and drainage becomes impaired. The wetland phase constitutes the majority of that forest identified as PF01 by the NWI. This wet forest often grades into some form of a water related community (SS) as relief becomes less and streams broaden to cover large areas with standing or sluggishly flowing water.

i. Upland Mixed Hardwood Forest (HWU)

HWU is characterized by a somewhat closed to dense canopy of red maple, black gum, white, and scarlet oak other associates which may become locally abundant and important include shagbark hickory, pignut hickory and sassafras. More open areas of the canopy, especially along wood edges and near the interfaces with successional woodlands (PW), may have grey birch (Betula populifolia FAC), cherry birch (Betula lenta FACU), and black cherry (Prunus serotina FACU) associated in the canopy.

Understories consist of dense growths of tall shrubs, primarily sweet pepperbush, high bush blueberry, and dangleberry. Low ericaceous shrubs are usually commonly present but usually have low abundances. Structurally, the understory forms a dense thicket from 3 to 9 feet tall which is interwoven with large tangles of greenbriar. As the soils become wetter, shrub growth first becomes more dense along the transition zone, but then often becomes less dense as drainage worsens. Greenbriar thickets appear to both heighten and increase in density until open water is reached.

The herbaceous layer is often a well developed strata of ferns (New York fern (Thelypteris novaboracensis FAC), hayscented fern (Dennestaedtia punctilobula)), clubmosses, suffructescent creeping perennials and spring ephemerals. This herbaceous layer resembles that of the mixed oak community in both structure and composition.

The transition zone between the two mixed hardwood forest variants may be very broad, often with no distinct vegetational change. Shrubs common to the boundary between the two pine forest variants are also common in the transition zone between the wetland and upland mixed hardwoods.

ii. Wetland Mixed Hardwood Forest (HWW)

Canopy dominants in this community include red maple, sweet gum and black gum; the proportion of each vary with the degree of soil saturation. Black gum appears most abundant in the drier areas, red maple in the wet to very wet areas, and sweet gums often are most abundant in the wettest portions. Few other trees are associated in this community type with the exception of scarlet oak and occasionally swamp white oak (Quercus

bicolor FACW+). The shrub understory is structurally similar to that of the HWU but often there is an increase in the density and height of the greenbriar tangles. Compositionally there is a marked increase in the percentage of fetterbush, swamp azalea, arrowwood viburnum, black blueberry (Vaccinium atrococcum) and high bush blueberry and a reduction in the abundance of sweet pepperbush.

Herbaceous layers are well developed only in canopy gaps or where HWW adjoins streams. In these cases an understory of grasses (rice cutgrass (Leersia oryzoides OBL), white grass (L. virginica, FACW), beardgrass (Eulalia viminea) and stout wood reed (Cinna arundinacea FACW+)) and ephemerals (e. g. mayflower, solomon's seal, indian cucumber (Medeola virginiana) may be well developed. Ferns, especially cinnamon fern (Osmunda cinnamomea, FACW), often cover large areas to the exclusion of shrubs as drainage becomes poorer.

b. topography, slope, and soils.

This community is best developed on the bottomlands and valleys especially where relief is slight. On the finer textured, heavier soils, or where clay pans cause

perched water tables, this community may extend appreciable distances upslope into areas that would appear more conducive to the formation of mixed oak forest. HWU is found on the less well drained Atsion and Klej soils and also on the better drained portions of the Keyport and Woodstown series. Conversely, HWW is generally on the most poorly drained sandy soils, and on the poorly to very poorly drained heavier soils (i. e. Elkton and Keyport). The wetland variant also occurs on the alluvial soils associated with the stream beds.

5. Successional Communities (PW and OF).

Many areas on the site are products of the disturbance regimes that result from past land use practices and other human activities. Disturbed areas include burned tracts, gravel pits, dumps, old roads, and utility line right of ways. The vegetation on these areas is a response both to the disturbance type as well as its duration, frequency and severity. Other communities have resulted from past agricultural land use where the type of agriculture practiced, the time since abandonment, and the composition of the surrounding communities have all affected the course of vegetation development.

Coupled with both these processes is the role of other human activities, particularly modification of site hydrology by ditching and drainage. Many areas are crisscrossed by systems of drainage ditches, roads and embankments, all of which have affected local site hydrology. When maintained, these structures lowered groundwater and produced local uplands; however, with abandonment, much of this land has reverted to wetland. The interaction of these factors has produced a mosaic

of successional communities that are frequently difficult to delineate in the field.

Two major structural groups have been defined: late successional woodlands/forest, where the dominant species are trees, and early successional old fields where the dominant species are shrubs and herbaceous perennials. Within each group both upland and wetland variants have been recognized.

5A. Late Successional Woodland/Forest (PWW and PWU)

a. structure and composition.

Structurally these communities are defined by the presence of dense, generally even aged stands of pole sized (3-8" DBH) trees that usually form a tight, closed canopy. Compositions vary widely but red maple, sweet gum, and black gum are often the dominant species. This canopy composition suggests affinities with the HW communities. Often interspersed within the young stands are large, open grown, individual trees (frequently white pine (Pinus strobus FACU), red maple, white oak and red oak (Quercus borealis FACU-), that indicate the edges of the former agricultural fields. Shrub understories are variable, ranging from sparse to dense but herbaceous layers are usually well developed.

i. Upland Late Successional Communities (PWU).

Upland late successional forest is characterized by the association of grey birch, black cherry, scarlet oak, sassafras, honey locust (Robinia pseudoacacia), bird cherry (Prunus avium) and white ash (Fraxinus americana FACU), along with the canopy dominants. Often

one of these associate species may locally form dense, nearly monospecific stands.

Understory shrubs include clonal thickets of sumacs (Rhus copallinum and R. typhina), large individuals of pasture rose (Rosa multiflora), and intermixed thickets containing arrowwood viburnum, spicebush (Lindera benzoin FACW) and sweet pepperbush, usually accompanied by tangles of greenbriar and glaucous greenbriar.

The herbaceous strata usually includes mixtures of grasses (e. g. sweet vernal grass (Anthoxanthum odoratum FACU), perennial bentgrass (Agrostis perennans FAC), and Kentucky (Poa pratensis FACU) and Canadian (Poa canadensis FACU) bluegrasses), sedges (Carex sec. Montanes and Ovales), hayscented, New York and bracken ferns, clubmosses, dewberry (Rubus flagellaris FACW), and a variety of forbs.

ii. Wetland Late Successional Forest (PWW)

The wetland variant commonly has appreciable quantities of one or more of the following species: river birch (Betula nigra FACW), grey birch, scarlet oak, willow oak, and blue beech (Carpinus caroliniana FAC), present in the canopy. Additionally, in some

areas green (Fraxinus pensylvanica subintegerrima FACW) and red (F. pensylvanica pensylvanica FACW) ash may be locally common.

The understory shrub layer closely parallels that of the HWW community with arrowwood viburnum, fetterbush, high bush blueberry and sweet pepperbush common. Large expanses of this community may have the shrub layer dominated by dense tangles of greenbriar.

Herbaceous layers in the more open and the wetter portions support dense gramminoid growth. Grasses, such as rice cutgrass, sweet vernal grass, white grass, stout woodreed, deer tongue (Dichanthelium clandestinum FAC+) and fowl manna grass (Glyceria striata OBL), and sedges (porcupine sedge (Carex hystricina OBL), long sedge (C. folliculata OBL), and sallow sedge (C. lurida OBL), are associated with ferns (marsh fern (Thelypteris thelypteroides FACW+), royal fern (Osmunda regalis OBL) and sensitive fern (Onoclea sensibilis FACW)) to form a dense herbaceous cover. Thick patches of bugleweed (Lycopus virginiana OBL) also occur in association with other forbs characteristic of wet, shaded habitats.

b. topography, slope and soils.

Late successional forest occurs on all slopes and soils but it is most common in the valleys and other areas of low relief and moderate slopes. This position results from the preference of farmers for nearly level fields. Many of the areas exhibit evidence of mounding and ditching, the abandonment of which has allowed water to pond in some areas.

Most of the PW communities occur on the heavier soils (i. e. Klej and Keyport) rather than the sandier Atsions, Lakehursts and Lakewoods. This distribution results no doubt from the preferences of farmers for these particular soils. Small areas of PW have also been observed both on soils of the Hammondton and Woodstown series and also on alluvium.

5B. Early Successional Old Fields (OFU and OFW)

a. composition and structure.

Early old fields are characterized by the predominance of shrubs and herbaceous perennials, although the line separating old field from woodland is arbitrary. Again both wetland and upland variants have been recognized.

i. Upland Old Field (OFU)

Upland old fields structurally range from sand blow outs and gravel pits where the vegetation resembles the low shrub and herbaceous layer of the OP community, to more mesic communities dominated by forbs and grasses characteristic of old fields in the Piedmont and Inner Coastal Plain Provinces. In general, shrub strata are composed of scattered clumps of pasture rose, blackberry (Rubus allegheniensis FACU-), arrowwood viburnum, sumacs, and bayberry (Myrica pensylvanica FAC) often associated with small trees (e. g. hawthorns (Crataegus spp.), grey dogwood (Cornus racemosa FACWFA), red cedar (Juniperus virginiana FACU), and young red maples, sweet gums and black gums).

On most sites however, the dominant plants are the tall perennial old field forbs such as the various goldenrods (Solidago juncea, S. canadensis FACU, S. gigantea FACW, S. odora, S. nemoralis, S. rugosa FAC, and S. graminifolia), queen Anne's lace (Daucus carota), yarrow (Achillea millefolium FACU), cudweed (Gnaphalium obtusifolium), asters (Aster ericoides FACU, A. pilosus FAC-, and A. novae-angliae FACW-), throughworts (Eupatorium rotundifolium FAC-, E. album, and E. hyssopifolium NC). Other important species include grasses (broomsedge (Andropogon virginicus FACU, little bluestem (Schizachyrium scoparium FACU), bluegrasses, timothy (Phleum pratense FACU), and orchard grass (Dactylis glomerata FACU)), dry sedges of the Montanes section of Carex, and shorter forbs such as cinquefoil (Potentilla canadensis), plantains (Plantago lanceolata FAC, and P. virginica UPL) and hawkweeds (Hieracium pratense, and H. florentinum). The structure and composition of these dry upland fields varies greatly in response to conditions before, during and after cessation of cultivation.

ii. Wetland Old Fields (OFW)

Wet old fields are structurally and compositionally quite distinct. Tall forbs are sparse with the exception of boneset (Eupatorium perfoliatum FACW+), joe pye weeds (Eupatoriadelphus fistulosus FACW and E. maculatum FACW) and ironweed (Vernonia noveboracensis FACW). The upland grasses and sedges are replaced by a mixture of rushes (common rush (Juncus effusus FACW+), hydrophytic sedges (sallow, long and porcupine sedge, wool grass (Scirpus cyperinus FACW+), and wetland grasses (bushy broomsedge (Andropogon glomeratus FACW+), beardgrass, deer tongue, reed canary grass (Phalaris arundinacea FACW+) and reedgrass (Phragmites australis FACW). Low forbs such as the decumbant knotweeds (Polygonum hydropiper OBL, and P. hydropiperoides OBL), meadow beauty (Rhexia virginica OBL), sensitive fern, and suffructescent shrubs (meadowsweet (Spirea latifolia FACW+) and steeplebush (S. tomentosa FACW)) are common.

Both old field communities grade into each other and also grade into late successional forest in a complex manner as a result of local drainage conditions, disturbance regimes and community age. Wetland old field (OFW) frequently intergrades into water related

communities (SS), especially where relief is low.

b. topography, slope and soils.

These communities occur throughout the site with distribution similar to that of the late successional woodlands.

6. Water Related Communities (SS)

This set of communities is a highly artificial group related only by the presence of flowing or standing water. Included in this group are open marshes, bogs, stream and bank communities both in the open and beneath canopies, and isolated small ponds. Since all these communities are wetland, and easily identified in the field, no detailed description will be given. Species compositions and affinities with these communities are presented in Appendix 1.

SOILS

Soil borings were taken at frequent intervals to identify hydric soils and to aid in the delineation of wetlands. Borings were conducted with open bucket soil augers, screw augers and oakfield tubes.

Soil profile descriptions were written for representative soil series and are included in this report (Appendix 2). Profile descriptions follow procedures outlined in the Soil Conservation Service "National Soils Handbook" and present the following items: depth from ground surface, soil texture in USDA and Unified Soil Classification Systems, soil color, soil consistence, soil structure, outstanding soil features, and depth to seasonal high water table.

A hydric soil is defined by the USDA Soil Conservation Service as a soil that is saturated to within 10-12 inches of the surface during most of the growing season. These soils have an acuic moisture regime, a deficiency of oxygen near the surface manifested by a dark surface layer, and/or ponded water during the growing season.

Hydric soils (wetland soils) are within drainage classes "poorly drained" and "very poorly drained" as specified by the USDA Soil Conservation Service. The seasonal high water table is at or near the surface and is indicated by a low chroma gray matrix of two or less with mottling or one without mottling in the Munsell Soil Color Charts. Mottling should be prominent in the soil matrix and be at least six inches thick to classify a water table by this method. Other soil features used to identify a water table near the surface in sandy soils include: a heavy

organic mat above the surface soil (Ao), streaking of subsurface horizons especially in the albic horizon (A2), and the presence of organic pans (B2h).

Depth to free standing water was also measured in the field during our investigation, if encountered.

As defined by the Soil Conservation Service, a seasonal high water table is the zone of saturation at the highest average depth during the wet season of December through April.

Seasonal high water tables in Coastal Plain areas are of two types: apparent water tables and perched water tables. An apparent water table is the level at which water stands in a freshly dug borehold or pit. This water table is caused by groundwater that rises to within six feet of the soil surface during the wet season. A perched water table is one that exists in the soil above an unsaturated zone. In most instances, a finely textured silty or clayey lens inhibits the downward flow of water and "perches" the water at that level. This finely textured soil layer normally lies atop a sandy layer. If a borehold is extended through the "clayey lens," water levels will fall as water flows downward through the unsaturated zone.

There were seventeen (17) soil series identified on the subject property. These soils are grouped into units known as "soil associations." The associations presented on the following table are organized according to soil texture and drainage class.

Texture Characteristics	Well	Moderately Well	Somewhat Poorly	Poorly	Very Poorly
Sandy profile (Albic horizon >6" thick)	Lakewood	Lakehurst	Lakehurst	Atsion	Berryland
Sandy profile (Albic horizon <6" thick)	Evesboro	Klej	Klej	Atsion	Pocomoke
Sandy Loam Subsoil	--	Hammonton	Hammonton	--	Mullica
Sandy Clay Loam and Clayey Subsoil	--	Woodstown Keyport	Woodstown Keyport	Fallsington Elkton	--
Organic Soils	--	--	--	--	Manahawki

Remaining soils that do not fit under the preceeding drainage catenas include: Fluvaquents (Alluvial), moderately well drained Aquic Udipsamments (fill land), and poorly drained fill land (Aquents).

For reference, drainage classes are arranged by depth to seasonal high water table from the ground surface. Drainage classes are: well drained (deeper than 60 inches), moderately well drained (18-48 inches), somewhat poorly drained (12-18 inches), poorly drained (6-12 inches), and very poorly drained (0-6 inches).

The seventeen soil series identified in the field were well distributed throughout the project site. By reviewing the wetland lines individually, however, a pattern of one to two soil associations per line is evident. Therefore, the reader should use the soil logs in conjunction with the overall wetlands map of the site to determine a localized pattern of soil series distribution.

One generalization that can be made is that Lakewood soil occurred more frequently on higher elevations at the eastern and

central portions of the site. Lakewood soils here were located in the "Englishtown Sand" geologic formation. Coarse and fine drained soils occurred in both the "Magothy Sands" and "Merchantville-Woodbury Clay" formations.

Lakewood, Lakehurst and Atsion soils have sandy profiles throughout and are classified as Quartzipsamments or Spodosols. "Psamments" means sand and therefore the full taxonomic name means "quartz sands." These soils form under coniferous forest cover and have an albic horizon (bleached) directly beneath the dark gray surface soil. This albic horizon is light gray and is caused by organo-mineral complexes that move through the profile with rainwater and remove iron and other constituents. This albic horizon should not be confused with gray mottling. Constituents removed from the albic horizon are deposited in the horizon below known as the "spodic horizon." This spodic horizon is brittle and dark reddish brown in color due to the accumulation of organic matter, aluminum and iron. Thickness of the organic surface mat and spodic horizon (B2h), and organic staining in the albic horizon (A2) were used to determine hydric characteristics in these soils.

Berryland is related to the Lakewood-Lakehurst soils and is a very poorly drained Typic Haplaquod. The soil profile is generally dark colored due to the accumulation of organic matter and a gleyed "C" horizon (Cg) is present.

The Evesboro-Klej association also consists of sandy material with an albic horizon less than 6 inches thick. Evesboro is a fine sand and is a well drained Typic

Quartzipsamments. Klej is a somewhat poorly to moderately well drained Aquic Quartzipsamments.

Pocomoke has a pale colored sandy to sandy loam profile and is a very poorly drained Typic Umbraquult.

The Hammonton-Mullica association has a pickup of clay in the "B" horizon with a texture of sandy loam at this horizon. The substratum is generally loamy sand. Hammonton is a somewhat poorly to moderately well drained Aquic Hapludult. Mullica is a very poorly drained Typic Umbraquult.

The Woodstown-Fallsington association and the Keyport-Elkton association have a pronounced accumulation of clay in the subsoil and substratum. Woodstown and Keyport soils are somewhat poorly to moderately well drained Aquic Hapludults. Fallsington and Elkton are poorly drained Typic Ochraquults.

Fluvaquents is a "flood plain" soil that consists of depositional material from stream overflow. The soil profile does not have good horizon development due to the frequent addition of sediment from stream overflow. Soil texture in the profile varies from sandy loam or loamy sand to silt loam. Free standing water was at the ground surface. Fluvaquents is a hydric soil and occurred along stream corridors.

Fill land occurred adjacent to Route 18. The fill material lies atop Atsion soil and is at least 24 inches thick. The fill is presumed to be ditch spoil or excess fill from the construction of Route 18. This fill land was mostly moderately well drained with smaller pockets that were poorly drained.

Manahawkin muck occurred in low depressional areas and is a very poorly drained Terric Medisaprist. A thick layer of organic

muck (sapric material) overlies a dark gray loamy sand.

A summary of the preceeding soil series is listed on Table 1 for easy reference.

TABLE 1

Soil Series	Drainage Class	S.C.S. Status
Lakewood	Excessively well drained	Non-hydric
Lakehurst	Somewhat poorly to moderately well drained	Non-hydric
Atsion	Poorly drained	Hydric or Non-hydric
Berryland	Very poorly drained	Hydric
Evesboro	Well drained	Non-hydric
Klej	Somewhat poorly to moderately well drained	Non-hydric
Hammonton	Somewhat poorly to moderately well drained	Non-hydric
Pocomoke	Very poorly drained	Hydric
Mullica	Very poorly drained	Hydric
Woodstown	Somewhat poorly to moderately well drained	Non-hydric
Fallsington	Poorly drained	Hydric
Keyport	Somewhat poorly to moderately well drained	Non-hydric
Elkton	Poorly drained	Hydric
Manahawkin	Very poorly drained	Hydric
Fluvaquents	Poorly drained	Hydric

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APPENDIX 1

Vascular Plant Species

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)										
			P	OP	MO	HW	WU	PW	WU	OW	F U	SS	
Lycopodiaceae													
Lycopodium obscurum	ground pine	FACU				X	O	X	O			X	
Lycopodium complanatum	ground cedar	FACU-			O	O	X	O	X				
Equistaceae													
Equisetum arvense	field horsetail	FAC						O					
Osmundaceae													
Osmunda cinnamomea	cinnamon fern	FACW			O	X	O	X	O			X	
Osmunda regalis	royal fern	OBL				O		O				O	
Polypodiaceae													
Dennstaedtia punctilobula	hay-scented fern				O	O	X	O	X			O	
Onoclea sensibilis	sensitive fern	FACW				O		X	O	X	O	X	
Athyrium felix-femina	lady fern	FAC	O	O									
Thelypteris thelypteroides	marsh fern	FACW+				O		X	O	O		X	
Thelypteris noveboracensis	New York fern	FAC			X	X	X	X	X			X	
Dryopteris austriaca var. spinulosa	spinulose wood fern	FACW^						O	O				
Polystichum acrostichoides	Christmas fern	NC						X	O				
Pteridium aquilinum	bracken fern	FACU	X	X	O		O		O		X		
Pinaceae													
Pinus strobus	white pine	FACU					O		O				
Pinus rigida	pitch pine	FACU	X	X	O	O	O						
Pinus virginiana	scrub pine		O	O	O								
Cupressaceae													
Juniperus virginiana	red cedar	FACU							O		O		
Typhaceae													
Typha latifolia	common cattail	OBL										X	
Poaceae													
Bromus tectorum	downy chess										O		
Bromus inermis	smooth brome							O	O	O	O		
Festuca pratensis	meadow fescue	FACU*								X	O		

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Festuca rubra	red fescue	FACU									X	
Vulpia octoflora	slender fescue										O	
Glyceria obtusa	blunt manna-grass	OBL				O		O		O		X
Glyceria striata	fowl mannagrass	OBL						X		X		X
Poa pratensis	Kentucky bluegrass	FACU						X	X	X	X	
Poa compressa	Canadian bluegrass	FACU						O	O	O	X	
Poa trivialis	rough bluegrass	FACW						O		O		O
Eragrostis spectabilis	purple lovegrass	UPL									O	
Eragrostis pectinacea	carolina lovegrass	FAC								O	O	
Dactylis glomerata	orchard grass	FACU						O	X	O	X	
Chasmanthium laxum	slender spike-grass	FAC				O						
Phragmites australis	common reedgrass	FACW								X	O	
Triodia flava	greasy grass		O	O	O					O	X	
Triplasis purpurea	sand grass		O	O							O	
Deschampsia flexuosa	crinkled hairgrass		X	X	O							
Holcus lanatus	velvetgrass	NR						O	O	O	O	
Danthonia spicata	poverty oat-grass		X	X	O				O	O	O	
Agrostis perennans	autumn bentgrass	FAC*						O	X	X	X	
Cinna arundinacea	stout woodreed	FACW+				X	X	X	O	O	O	O
Phleum pratense	timothy	FACU									O	
Muhlenbergia schreberi	nimble will	FAC								O	O	
Muhlenbergia frondosa	satin grass	FACW*						O	O	O		O
Sporobolus vaginiflorus	sheathed rush-grass	FACU*	O	O							O	
Stipa avenacea	blackseed needlegrass		X	X								
Aristida curtisii	Curtis' three-awn	FACU*		O							O	
Aristida oligantha	few-flowered aristida		O								O	
Anthoxanthum odoratum	sweet vernal grass	FACU^						X	X	X	X	
Phalaris arundinacea	reed canary grass	FACW+				X		X	O	X	O	O
Leersia virginica	white grass	FACW				X	O	X	O			
Leersia oryzoides	rice cutgrass	OBL				X		X				X

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Poaceae (continued)												
Digitaria sanguinalis	hairy crabgrass	FACU-									X	
Digitaria ischaemum	crabgrass										O	
Panicum verrucosum	warty panic grass	FACW	O	X	O					O	O	
Panicum dichotomiflorum	fall panic grass	FACW-								X	X	
Panicum virgatum	switchgrass	FAC	O	O						O	O	
Panicum rigidulum	red-top panic grass	FACW+	O	O								
Dichanthelium dichotomum ssp. dichotomum	forked panic grass	FAC				O	O	X	O	O	O	
Dichanthelium acuminatum	wooly panic grass	FAC*	O	O	O				O		X	
Dichanthelium clandestinum	deer tongue grass	FAC+				O	O	X	O	X	O	X
Setaria glauca	yellow foxtail	FAC									X	
Setaria faberii	Faber's foxtail										X	
Echinochloa crusgalli	barnyard grass	FACU								O	O	
Cenchrus longispinus	sandbur		O	O							O	
Schizachyrium scoparium	little bluestem	FACU*		O							X	
Andropogon virginicus	broom sedge	FACU	O	O							X	
Andropogon ternarius	silvery beard-grass	FACU	X	X							X	
Andropogon glomeratus	bushy beardgrass	FACW+								X	O	X
Eulalia viminea	beardgrass					O				X		X
Cyperaceae												
Cyperus retrorsus	cylinder flatsedge	FAC-	O	O							O	
Cyperus strigosus	straw-colored nutsedge	FACW								O	O	O
Dulichium arundinaceum	three way sedge	OBL										X
Scirpus cyperinus	wool grass	FACW+								X		X
Eleocharis tenuis	poverty spikerush	FACW+								X		X
Rhynchospora capitellata	false bog rush	OBL		O								
Carex rosea	stellate sedge					O	O	O	O			O
Carex annectens	yellow fruited sedge	FACW			O					O	X	
Carex vulpinoidea	fox sedge	OBL								O	O	X

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Cyperaceae (continued)												
Carex scoparia	pointed broom sedge	FACW						O	O	O	O	
Carex festucacea	fescue sedge	FAC-*						O	O			
Carex albolutescens	whitened sedge	FACW			O	O	O	O	O			
Carex brevior	smooth sedge	OBL^						O				O
Carex pensylvanica	Pennsylvania sedge								X		X	
Carex nigromarginata	black-edged sedge		X	X					X		O	
Carex laxiflora	loose-flowered sedge				O			O	O			
Carex amphibola	narrow leaved sedge	NA		O								
Carex gracillima	graceful sedge					O		O				
Carex virescens	ribbed sedge		O					O				
Carex stricta	tussock sedge	OBL^				O		O	O	X	O	X
Carex folliculata	long sedge	OBL#				O		X	O	X		X
Carex hystricina	porcipine sedge	OBL				X		X		X		X
Carex lurida	sallow sedge	OBL						X		X		X
Carex lupulina	hop sedge	OBL^				O		X	O	X	O	X
Carex spp.	sedges	OBL										
Carex (sec. Montanes)	woodland sedge		O	O	O		O	O	O		O	
Araceae												
Symplocarpus foetidus	skunk cabbage	OBL				X		X				X
Arisaema triphyllum	Jack-in-the-pulpit	FACW-				O	O	O	O			
Commelinaceae												
Commelina communis	asiatic dayflower	FAC-						X	O	O		O
Juncaceae												
Juncus effusus	common rush	FACW+						X	O	X	O	
Juncus bufonius	toad rush	FACW						O				
Juncus tenuis	slender rush	FAC-	O	O				O	O	O	X	
Juncus secundus	secund rush	FAC^									O	
Luzula multiflora	path rush	FACU	X	X	X		O		O			

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)										
Liliaceae												
Erythronium americanum	trout lily							O				
Allium canadense	chive garlic	FACU						O	O		O	
Allium vineale	crow garlic	FAC*							O		X	
Asparagus officinalis	asparagus	FACU						O	O	O	O	
Maianthemum canadense	mayflower	FAC-			O	X	X	X	X			O
Medeola virginiana	Indian cucumber					X	O	X				
Smilax rotundifolia	greenbriar	FAC^		O	X	X	X	X	O			X
Smilax glauca	glaucous greenbriar	FAC*		O	O		O					
Polygonatum biflorum	Solomon's seal	FAC*				X	X	O	O			
Smilacina racemosa	false Solomon's seal	FACU-			O	O	X	O	O			
Dioscoreaceae												
Dioscorea villosa	wild yam	FAC*				O						O
Iridaceae												
Iris versicolor	wild flag	OBL										X
Sisyrinchium angustifolium	blue-eyed Mary	FACW-								O	O	O
Orchidaceae												
Cypripedium calceolus	yellow lady-slipper	FAC+	X	O								
Spiranthes cernua	nodding ladies tresses	FACW									O	
Salicaceae												
Populus grandidentata	big toothed aspen	FACU-					O		O			
Salix nigra	black willow	FACW^								O		O
Myricaceae												
Myrica asplenifolia	sweet fern								O	O	O	
Myrica pensylvanica	bayberry	FAC	O	O						O	X	
Juglandaceae												
Carya tomentosa	mockernut								O			
Carya ovalis	red pignut				O				O			
Carya ovata	shagbark hickory	FACU-			X		O					
Carya glabra	pignut	FACU-			O		O					

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)										
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS	
Betulaceae													
Corylus americana	hazel-nut						O						
Carpinus caroliniana	blue beech	FAC			O	O	O	O	O				
Betula alleghaniensis	yellow birch	FAC				O	O						
Betula lenta	cherry birch	FACU				O	X	O	O				
Betula nigra	river birch	FACW				X	O	X	O				
Betula populifolia	grey birch	FAC			O	O	X	X	X	O	X		
Alnus rugosa	speckled alder	FACW+				O		O	O			O	
Fagaceae													
Fagus grandifolia	American beech	FACU			O		O						
Castanea dentata	American chestnut				O								
Quercus alba	white oak	FACU*		X	X	O	X		O				
Quercus stellata	post oak	UPL		X	O		O						
Quercus bicolor	swamp white oak	FACW+				X							
Quercus prinus	chestnut oak	UPL	O	X	O		O						
Quercus phellos	willow oak	FAC+				O	O	O					
Quercus ilicifolia	scrub oak		O	X	O				O		X		
Quercus falcata	southern red oak	FACU-				O	O	O					
Quercus marilandica	black-jack oak		O	X	O						O		
Quercus velutina	black oak			O	X		O						
Quercus borealis	northern red oak	FACU-			X		O		O				
Quercus palustris	pin oak	FACW						O					
Quercus coccinea	scarlet oak			O	X	X	X	X	X				
Ulmaceae													
Ulmus americana	American elm	FAC					O						
Moraceae													
Morus rubra	red mulberry	FACU							O				
Urticaceae													
Pilea pumila	clearweed	FACW				O	O	O				X	

Appendix 1: List of plant species with associated abundances in upland and wetland communities at Olympia and York, Old Bridge Development Corporation site, Old Bridge Township, Middlesex County, New Jersey. March 1986-February 1987.

Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)										
			P	OP	MO	H W W	H W U	P W W	P W U	O W W	O F U	SS	
Polygonaceae													
Rumex crispus	curly dock	FACW^								O	O		
Rumex acetosella	sheep sorrel	FACW^								O	X		
Polygonella articulata	coast jointweed		X	O									
Polygonum pensylvanicum	pinkweed	FACW								O	O		
Polygonum hydropiperoides	marshpepper knotweed	OBL^						X		X		X	
Polygonum hydropiper	water pepper	OBL						X		X		X	
Polygonum scandens	false buckwheat	FAC								O	O		
Polygonum sagittatum	arrow-leaved tearthumb	OBL										X	
Polygonum arifolium	hastate-leaved tearthumb	OBL										X	
Polygonum cuspidatum	Mexican bamboo									O	O	O	
Phytolaccaceae													
Phytolacca americana	pokeweed	FACU+						O	O	X	X		
Caryophyllaceae													
Stellaria media	common chickweed										X		
Lychnis alba	white campion									O	X		
Dianthus armeria	Deptford pink								X	O	X		
Magnoliaceae													
Magnolia virginiana	sweetbay magnolia	FACW+				X	O						
Ranunculaceae													
Ranunculus pensylvanicus	Pennsylvania buttercup	OBL								O		X	
Thalictrum dioicum	early meadow rue	FAC				O		O					
Berberidaceae													
Berberis thrunbergii	Japanese barberry					O	O	O	O	O	O		
Lauraceae													
Lindera benzoin	spicebush	FACW^				O	X	O	X				
Sassafras albidum	sassafras	FACU-	O	X	X	O	X	X	X	O	O		
Brassicaceae													
Lepidium campestre	field cress										O		
Lepidium virginicum	poorman's pepper	FACU-									O		

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Brassicaceae (continued)												
Thlaspi arvense	penny cress									O	X	
Capsella bursa-pastoris	shepherds purse	FACU									O	
Alliaria petiolata	garlic mustard	FAC*						O	X	O	O	
Saxifragaceae												
Philadelphus coronarius	mock orange								O		O	
Hydrangia paniculata	hydrangia								O			
Hamamelidaceae												
Liquidambar styraciflua	sweet gum	FAC			O	X	X	X	X	X	X	
Rosaceae												
Spirea latifolia	meadowsweet	FACW+								O	O	X
Spirea tomentosa	hardtack	FACW								O		O
Fragaria virginiana	strawberry	FACU									X	
Potentilla canadensis	cinquefoil							X	X	X	X	
Geum vernum	avens	FACU						O				
Rubus allegheniensis	blackberry	FACU-								O	X	
Rubus flagellaris	northern dewberry	FACW*				O	O	X	X	X	X	
Rosa multiflora	multiflora rose							O	X	O	X	
Prunus serotina	black cherry	FACU*			O		X	O	X	O	O	
Prunus virginiana	choke cherry	FACU					O					
Prunus avium	bird cherry						X		X			
Aronia arbutifolia	chokeberry	FACW		O	O	X	O					O
Crataegus spp.	hawthorns										O	
Amelanchier canadensis	shadberry	FAC	O			O	X					
Fabaceae												
Baptisia tinctoria	wild indigo			O							O	
Desmodium canadense	tick-trefoil	FAC						X	X	X	X	
Trifolium arvense	rabbit's foot clover										X	
Robinia pseudoacacia	black locust								X		O	

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Oxalidaceae												
Oxalis stricta	wood sorrel										X	
Geraniaceae												
Erodium cicutarium	storks bill											
Simarubiaceae											O	
Ailanthus altissima	tree of heaven					O	O	O	X			
Polygalaceae												
Polygala sanguinea	purple milkwort	FACU									O	
Anacardiaceae												
Toxicodendron radicans	poison ivy	FAC							O	O	O	
Rhus copallinum	winged sumac								X		X	
Rhus typhina	staghorn sumac								X		X	
Aquifoliaceae												
Ilex opaca	American holly	FACU+			O	O	O					
Ilex glabra	inkberry	FACW-			O	X	O					O
Ilex verticillata	winterberry	FACW+				X	O	X	O			X
Celastraceae												
Celastrus scandens	bittersweet							O	O			
Celastrus orbiculatus	oriental bittersweet								O		O	
Aceraceae				O	X	X	X	X	X	X	X	X
Acer rubrum	red maple	FAC										
Acer negundo	box elder	FAC+						O	O			
Balsaminaceae												
Impatiens biflorum	jewelweed	FACW^						X	O	X		X
Vitaceae												
Vitis aestivalis	summer grape	FACU				O	O					
Vitis vulpina	chicken grape	FAC				O	O	O	O			
Vitis spp.	wild grape				O	O	O	O	O			
Parthenocissus quinquefolia	Virginia creeper	FACU			O	O	X	O	O		O	

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Hypericaceae												
Ascyrum hypericoides	St. Andrew's cross	FACU	X	O								
Hypericum punctatum	St. Johnswort									O	O	
Hypericum canadense	canada St. Johnswort	FACW^						O				X
Hypericum gentianoides	orangeweed	FACU^									X	
Triadenum virginicum	swamp St. Johnswort	OBL				X						X
Violaceae												
Viola papilionacea	meadow violet	FAC								O	O	
Viola cucullata	marsh blue violet	FACW+								O		X
Elaeagnaceae												
Elaeagnus angustifolia	russian olive	FACU							X	O	X	
Melastomataceae												
Rhexia virginica	meadow beauty	OBL^								X	X	X
Onagraceae												
Oenothera biennis	evening primrose	FACU-									X	
Apiaceae												
Daucus carota	Queen Anne's lace									O	X	
Cornaceae												
Cornus florida	flowering dogwood	FACU-			O		O					
Cornus racemosa	grey dogwood	FACWFA^								O	O	
Nyssaceae												
Nyssa sylvatica	black gum	FAC		O	X	X	X	X	X	X	X	X
Clethraceae												
Clethra alnifolia	sweet pepperbush	FAC+		O	X	X	X	X	X	X		X
Ericaceae												
Monotropa uniflora	indian pipe	FACU-	O	O								
Chimaphila maculata	spotted wintergreen		O									
Rhododendron viscosum	swamp azalea	OBL			O	X	X					
Leiophyllum buxifolium	sand myrtle		O	O								
Kalmia angustifolia	sheep laurel	FAC^	X	X	O	O	O				O	

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Kalmia latifolia	mountain laurel	FACU	O									O
Leucothoe racemosa	fetterbush	FACW			O	X	O	O	O			O
Lyonia ligustrina	maleberry	FACW			O	X	O					O
Lyonia mariana	staggerbush	FAC-	O	O							O	
Chamaedaphne calyculata	leather-leaf	OBL			O							
Gaylussacia baccata	black huckleberry	FACU	X	X			O					
Gaylussacia frondosa	dangleberry	FAC		O	X	O	X		O			
Epigaea repens	trailing arbutus					O						
Gaultheria procumbens	wintergreen	FACU		O	O		O					
Vaccinium angustifolium	dwarf blueberry	FACU-	X	X	O		O				O	
Vaccinium vacillans	lowbush blueberry	FACU^	X	X	X		O					
Vaccinium caesariense	New Jersey blueberry	OBL				O						O
Vaccinium atrococcum	black blueberry					X	O	O				O
Vaccinium corymbosum	highbush blueberry	FACW-			O	X	X	X	X			
Vaccinium macrocarpon	cranberry	OBL										
Primulaceae												
Lysmachia quadrifolia	whorled loosestrife								O			
Oleaceae												
Fraxinus americana	white ash	FACU					O		X		O	
Fraxinus pennsylvanica												
ssp. pennsylvanica	red ash	FACW						O	O			
ssp. subintegerrima	green ash	FACW						O	O			
Ligustrum vulgare	privet								O			
Apocynaceae												
Apocynum cannabinum	dogbane	FAC						O	O	O	X	
Convolvulaceae												
Convolvulus sepium	hedge bindweed										O	
Cuscuta gronovii	dodder									O		X
Lamiaceae												
Trichostema dichotomum	blue curls							O		O		

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Lamiaceae												
Prunella vulgaris	self heal	FACU+						O	O	O	O	O
Lycopus virginicus	bugleweed	OBL						X	X	O		O
Lycopus americanus	water hoarhound	OBL						O				X
Mentha arvensis	field mint	FACW								O	O	
Mentha spicata	spearmint	OBL									O	
Scrophulariaceae												
Linaria canadensis	slender toadflax										X	
Veronica arvensis	speedwell										X	
Agalinis purpurea	purple gerardia	FACW*	X	X							X	
Melampyrum lineare	cow wheat	FACU	X	O								
Plantaginaceae												
Plantago lanceolata	English plantain	FAC*									O	
Plantago major	common plantain	FACW*									O	
Plantago virginica	dwarf plantain	UPL									X	
Rubiaceae												
Houstonia longifolia	long leaved houstonia		X	X							X	
Mitchella repens	partridge-berry	FACU				O	X	O	X			
Galium aparine	cleavers	FACU				O	O					
Caprifoliaceae												
Viburnum acerifolium	maple-leaved viburnum						O					
Viburnum nudum	possumhaw	OBL			O	X	O					
Viburnum lentago	nannyberry	FAC						O				
Viburnum prunifolium	black-haw	FACU						O	X		O	
Viburnum dentatum	arrow-wood viburnum	FAC*			O	X	X	X	X	O		X
Sambucus canadensis	elderberry	FACW-								O		X
Lonicera japonica	Japanese honeysuckle	FAC-					O		O	O	O	
Lonicera tartarica	tartarian honeysuckle								O			
Symphoricarpos orbiculatus	coralberry	NR						O	O	O	X	

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4)									
			P	OP	MO	H W	W U	P W	W U	O W	F U	SS
Campanulaceae												
Triodanis perfoliata	Venus's looking glass	FAC		0							0	
Lobeliaceae												
Lobelia inflata	indian tobacco							0	0	0	0	
Asteraceae												
Helianthus giganteus	sunflower	FACW									X	
Bidens coronata	swamp beggertick	OBL								X		X
Ambrosia trifida	giant ragweed	FAC								X	0	
Ambrosia artemisiifolia	ragweed	FACU									X	
Bidens frondosa	beggertick	FACW^								X		
Achillea millefolium	yarrow	FACU									X	
Chrysanthemum leucanthemum	ox-eye daisy										X	
Artemesia biennis	biennial wormwood	NA							X	0	X	
Erechtites hieracifolia	fireweed	FACU		0					0		X	
Heterotheca subaxillaris	golden aster	NC	0	0								
Solidago nemoralis	hoary goldenrod										X	
Solidago juncea	early goldenrod									0	X	
Solidago odora	sweet goldenrod								0		X	
Solidago rugosa	rough goldenrod	FAC								X	0	
Solidago gigantea	smooth goldenrod	FACW								0	0	
Solidago canadensis	tall goldenrod	FACU								0	X	
Solidago graminifolia	flat topped goldenrod									X	X	
Conyza canadensis	horseweed		0	0							0	
Gnaphalium obtusifolium	cudweed										X	
Erigeron strigosus	fleabane	FACU+									0	
Erigeron annuus	daisy fleabane	FACU									0	
Sericocarpus asteroides	white topped aster				X							
Aster ericoides	heath aster	FACU									X	
Aster novae-angliae	New England aster	FACW-								X	X	
Aster pilosus	panicled aster	FAC-*									X	

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Scientific Name (1)	Common Name	Code (2)	Species Abundance (3,4) P	OP	MO	HW	W U	PW	W U	OW	F U	SS
Asteraceae												
Aster spp.	oldfield asters	FAC									X	
Eupatoriadelphus fistulosus	hollow joe pye weed	FACW						X	O	X		
Eupatoriadelphus maculatus	spotted joe pye weed	FACW						O		X		
Eupatorium album	throughwort										X	
Eupatorium rotundifolium	round leaved throughwort	FAC-									X	
Eupatiorium hyssopifolium	whorled throughwort	NC									X	
Eupatorium perfoliatum	boneset	FACW+										X
Eupatorium rugosum	white snakeroot					X	O		O			
Vernonia noveboracensis	New York ironweed	FACW								X	O	X
Centaurea maculosa	knapweed										O	
Hieracium pratense	common hawkweed										X	
Hieracium florentinium	hawkweed										X	
Taraxacum officinale	dandelion	FACU-									O	

Notes:

1) Nomenclature according to the National List of Scientific Plant Names. (USDA/SCS, 1982).
2) Indicator species codes derived primarily from Reed, 1986. * denotes regional rather than New Jersey indicator value (no NJ indicator value given). Species denoted #, have indicator values according to the USACOE August, 1986 interim list. Species codes designed ^, are according to the FWS August, 1982 list.
3) X = species that occur frequently with local or widespread abundance in this community.
   O = designates species that occur either infrequently or with low abundance in this community.
4) Community Type Key: P--Pitch Pine forest, OP--Oak/Pine forest/woodland, HW--mixed hardwood forest (w-wetland, u-upland), PW--late successional woodland/forest (w-wetland, u-upland), OF--old field (w-wetland, u-upland), SS--water related hasbitats.

APPENDIX 2

Soil Logs and Profile Descriptions

SOIL & ENVIRONMENTAL SERVICES, INC.

Boring No.	Soil Names	Flag Location	Status
1	FLUVAQUENT	AA4	Wetland
2	KLEJ	AA14	Upland
3	MULLICA	B1	Wetland
4	HAMMONTON	B12	Upland
5	FILL	BB2	Wetland
6	FILL	BB5	Upland
7	FILL	BB18	Upland
8	ATSION	BB30	Wetland
9	FILL	BB52	Wetland
10	BERRYLAND	BB120	Wetland
11	FLUVAQUENT	C(bar)15	Wetland
12	ELKTON	C(bar)32	Wetland
13	KLEJ	C(bar)47	Upland
14	MANAHAWKIN	C(bar)47	Wetland
15	LAKEHURST	CC3	Upland
16	ATSION	CC10	Wetland
17	KLEJ	CC34	Upland
18	FLUVAQUENT	D(bar)18	Wetland
19	ELKTON	D(bar)30	Wetland
20	KEYPORT	D(bar)39	Upland
21	KLEJ	DD6	Upland
22	ELKTON	E(bar)4	Wetland
23	LAKEWOOD	E(bar)4	Upland
24	KEYPORT	E(bar)14	Upland
25	MANAHAWKIN	E(bar)14	Wetland
26	KLEJ	E(bar)30	Upland
27	ELKTON	E(bar)38	Wetland
28	KEYPORT	E(bar)38	Upland
29	KEYPORT	F(bar)1	Upland
30	KLEJ	FF209	Upland
31	MANAHAWKIN	FF220	Wetland
32	WOODSTOWN	G17	Upland
33	KLEJ	G(bar)34	Upland
34	ATSION	G(bar)35	Wetland
35	ATSION	GG44	Wetland
36	LAKEHURST	GG44	Upland
37	POCOMOKE	H(bar)4	Wetland
38	KEYPORT	H130	Upland
39	ATSION	J1	Wetland
40	MULLICA	K9	Wetland

SOIL & ENVIRONMENTAL SERVICES, INC.

41	HAMMONTON	KG175	Upland
42	KLEJ	KG180	Upland
43	MANAHAWKIN	KG300	Wetland
44	ATSION	L5	Wetland
45	LAKEHURST	M3	Upland
46	ATSION	M4	Wetland
47	ATSION	N6	Wetland
48	LAKEHURST	N6	Upland
49	BERRYLAND	P3	Wetland
50	KLEJ	P3	Upland
51	KEYPORT	P54	Upland
52	MULLICA	P59	Wetland
53	ATSION	P110	Wetlands
54	ATSION	PB9	Wetland
55	LAKEHURST	PB9	Uplands
56	MULLICA	Q2	Wetland
57	KLEJ	Q6	Upland
58	KLEJ	Q7	Upland
59	KLEJ	Q10	Upland
60	ATSION	Q204	Wetland
61	ATSION	Q205	Wetland
62	FALLSINGTON	RF8	Wetland
63	KEYPORT	RF8	Upland
64	ELKTON	RH130	Wetland
65	KEYPORT	RH130	Upland
66	ELKTON	RK7	Wetland
67	FALLSINGTON	RR1	Wetland
68	KEYPORT	RR1	Upland
69	FLUVAQUENT	RS1	Wetland
70	FALLSINGTON	RU37	Wetland
71	KEYPORT	RU37	Uplands
72	BERRYLAND	RU206	Wetlands
73	KEYPORT	RU206	Upland
74	ATSION	TC1	Wetland
75	EVESBORO	TC1	Upland
76	ATSION	TC6	Wetland
77	BERRYLAND	TC13	Wetland
78	BERRYLAND	TC20	Wetland
79	ATSION	TC32	Wetland
80	ATSION	TC42	Wetland
81	ATSION	TC47	Wetland
82	KEYPORT	TC60	Upland
83	ELKTON	TD2	Wetland
84	ELKTON	TD11	Wetland
85	ELKTON	TD14	Wetland
86	KEYPORT	TD14	Upland

SOIL & ENVIRONMENTAL SERVICES, INC.

87	A2	Wetland
88	A4	Upland
89	B10	Upland
90	B10	Wetland
91	C2	Wetland
92	D41	Wetland
93	D105	Upland
94	G17	Upland
95	L5	Wetland
96	C(bar)40	Wetland
97	C(bar)40	Upland
98	AB9	Upland
99	AB29	Wetland
100	AC26	Wetland
101	AC26	Upland
102	R280	Upland
103	AE48	Upland
104	AE48	Wetland
105	AH10	Wetland
106	AH10	Upland

APPENDIX 3

Preparers' Resumes

AMY S. GREENE

Environmental Consultant

One Village Court
Flemington, New Jersey 08822
201-788-9676

EDUCATION:

M.S. Ecology, Rutgers University, 1984
B.A. Biology, Boston University, 1974

U.S. Fish and Wildlife Service,
Habitat Evaluation Procedures Certified
U.S. Soil Conservation Service, Soils Course

PROFESSIONAL EXPERIENCE:

Ms. Greene is sole proprietor of Amy S. Greene Environmental Consultants and has been providing professional environmental services to private and publc sector clients since February 1986.

Ms. Greene has over ten (10) years experience in the performance and management of environmental studies. She has prepared wetland evaluations, delineations and mitigation plans for coastal and inland wetlands. She has also conducted wildlife habitat evaluations, natural resources inventories and environmental impact assessments.

Projects completed have entailed environmental planning for residential, commercial and industrial development and wastewater, sludge, solid waste and transportation facilities.

Ms. Greene has prepared successful state and federal permit applications for wetlands filling, waterways dredging, coastal zone development, stream encroachment, pollutant discharge, soil erosion and sediment control plans, NJ Pinelands development and hazardous waste facilities.

Ms. Greene has been principally responsible for performance of the following representative projects:

- O&Y Old Bridge Development Site
  Wetlands Delineation for 92,640 acre parcel in Middlesex County, N.J.

- Howland Hook Marine Terminal Expansion, Staten Island, N.Y.
  Environmental Impact Report for submission to the U.S. Army Corps of Engineers NY District for a dredge and fill permit. Wetland mapping, evaluation and impact mitigation were central issues.

- Arthur Kill Generating Station, Tidal Wetlands Survey
  Wetland communities were mapped and evaluated for preparation of a NY State Tidal Wetlands Permit application.

- Eleanor Roosevelt National Historic Site Natural Resources Inventory
  Monitoring, mapping and description of natural resources, including vegetation and wildlife, aquatic biota, water resources, soils and geology.

- Berkshire Valley Road Expansion Environmental Impact Assessment
  Natural, socio-economic and cultural resources inventory and environmental impact assessment of roadway widening. Issues entailed assessment of endangered and threatened species habitat and mitigation of cultural resources.

- Burlington County Solid Waste Management Facilities Complex, Environmental Impact Statement
  Inventory of natural, socio-economic and cultural resources at a proposed solid waste management site. Master plan development and evaluation of environmental impacts of proposed facilities including a landfill, co-composting facility and leachate treatment plant. Permit applications were prepared for a wetlands fill permit, discharge to surface water permit and 208 consistency determination.

PUBLIC HEARING TESTIMONY:

Howell Township Planning Board and Environmental Commission - Wetlands delineation at a residential development site

Vernon Township Planning Board - Wetlands delineation and endangered and threatened species habitat evaluation for a golf course, hotel and townhouse development

Woodbridge Township Planning Board - Wetlands Assessment Industrial Development

Helmetta Borough Planning Board - Environmental Impact Report Mobile Home Park

Old Bridge Township Planning Board - Wetlands Delineation for Industrial, Commercial & Residential Development

EMPLOYMENT HISTORY:

1986-Present	Environmental Consultant
1980-1986	Princeton Aqua Science, Edison, New Jersey Project Manager/Environmental Scientist
1975-1980	Pandullo Quirk Associates, Wayne, New Jersey Environmental Scientist
1974-1975	Essex County Park Commission, Center for Environmental Studies Park Naturalist

AFFILIATIONS:

Society of Wetland Scientists - Member
Philadelphia Botanical Club - Member
Ecological Society of America - Member

KEVIN W. DOUGHERTY
ENVIRONMENTAL SCIENTIST

Education:

Rutgers University, New Brunswick, New Jersey
Ph.D. Candidate, Botany (expected 1988)

Miami University, Oxford, Ohio, M.S., Botany, 1986

West Chester State College, West Chester, Pennsylvania
B.A., Biology, 1973

Professional Experience:

As Environmental Scientist for Amy S. Greene, Environmental Consultants, Mr. Dougherty has prepared wetland delineation reports for properties throughout New Jersey. Mr. Dougherty has a strong educational background in ecology, botany, geology, soils and hydrology. He has applied this experience in performance of field surveys, research and report writing in preparation of environmental reports for proposed residential, commercial and industrial developments. Mr. Dougherty was responsible for the preparation of the wetland delineation report for the 2,640 acre proposed development site in Old Bridge, N.J. He also was principally responsible for preparation of the Environmental Impact Report for the White Horse Village Continuing Care Retirement Community, Edgmont Township, Pa.

Employment History:

1986-Present	Environmental Scientist/Ecologist Amy S. Greene, Environmental Consultants
1984-1986	Caretaker, Hutcheson Memorial Forest
1985	Co-Adjunct Instructor, Rutgers University, Newark
1984	Teaching Assistant (Summer), Rutgers University
1983	Research Assistant, Miami University
1980-1982	Teaching Assistant, Miami University

Courses Taught or Assisted:
General Botany, General Biology, Environmental Sciences, Plant Anatomy, Physiological Plant Ecology, Dendrology

Fellowships, Grants and Awards:

Special Graduate School Fellowship, Rutgers University 1983-1986

Williard Sherman Turrell Herbarium Fund Grand, 1982

Sigma Xi Grant-in-aid-of Research, 1983

Phi Kappa Phi (Miami University) Researcher of the Year Award, 1982

Professional Society Memberships:

Botanical Society of America
British Ecological Society
Ecological Society of America
Sigma Xi

Published Abstracts:

Dougherty, K.W. and J.L. Vankat. 1983. Community distributions on serpentine areas of Pennsylvania and Maryland. Ohio Journal of Science 83(2): 9.

Dougherty, K.W. and J.L. Vankat. 1983. Soil properties and community distributions on serpentine areas of Pennsylvania and Maryland. Bulletin of the Ecological Society of America 64(2): 160.

Dougherty, K.W. and J.L. Vankat. 1983. Soil properties and community structure on serpentine areas of Pennsylvania and Maryland. American Journal of Botany 70(5 part 2): 42.

JENNIFER ROBINSON
Environmental Scientist/Wildlife Biologist

EDUCATION: Cook College of Rutgers University
B.S. Wildlife Management, 1984

SPECIAL ACHIEVEMENTS: Alpha Zeta Honor Society
Cook College Parents Association Scholarship

PROFESSIONAL EXPERIENCE: Ms. Robinson has four (4) years professional experience in conducting wildlife and ecological research and monitoring programs for both the public and private sector. She has performed ecological studies throughout the state and is therefore familiar with vegetation, wildlife and physical resource components of a broad range of habitats. She has specific experience with endangered and threatened species investigations and public park wildlife management. Her recent projects are predominantly wetlands delineations entailing field determination of wetland/upland boundaries, report preparation, and coordination of wetland boundary approval by regulatory review agencies.

3/86 - Present — Environmental Scientist - Amy S. Greene Environmental Consultant - Duties include field delineation of wetlands based on samplings of vegetation, soils and hydrology; preparation of wetland delineation reports; performance of wildlife species assessments; and preparation of environmental impact statements.

11/85 - 3/86 — Biological Aid - Dept. of the Interior, Fish and Wildlife Service - Great Swamp National Wildlife Refuge, Basking Ridge, N.J. Collected field data on wood duck nesting productivity. Performed field dressings and collected reproductive systems of whitetail deer for laboratory analysis. Assisted with refuge boundary survey.

7/85 - 9/85 — Principal Researcher - Under contract with the Department of Environmental Protection - Endangered and Non-game Species Program, Clinton, N.J.
Conducted intensive trapping effort to determine range and abundance of the eastern woodrat in New Jersey.

12/84 - 2/85 & 12/83 - 2/84 — Deer Project Assistant - Department of Environmental Protection - Division of Fish and Game, Clinton, N.J. Collected, recorded and edited statistical data from the hunter harvest of whitetail deer. Maintained extensive interaction with the public.

9/84 - 1/85 — Data Handler - The Nature Conservancy, Trenton, N.J.
Compiled and encoded information on rare species and unique ecological communities for entry into a computerized data base. Mapped endangered species occurrences on topographical maps.

5/84 - 9/84 — Biological Aid - Department of the Army, ARDC Picatinny Arsenal, Dover, N.J.
Performed wide rnge of wildlife and land management duties. Conducted woodrat population census. Performed regular water sampling/testing. Assisted in various water quality improvement projects. Responsible for nuisance animal control.

6/83 - 10/83 — Research Assistant - Department of Environmental Protection, Division of Fish and Game, Clinton, N.J.
Involved in all aspects of New Jersey whitetail deer management. Assisted in field and laboratory research of many species, including Canada goose, black bear, mourning dove, wild turkey and beaver.

1/82 - 5/82 — Planning Publications Assistant - Department of Environmental Protection, Green Acres Division,Trenton,N.J.
Responsible for the research, preparation and editing of various environmental publications.

6/81 - 9/81 & 5/80 - 9/80 — Technical Assistant - RCA, Moorestown, N.J.
Edited program specifications and organized data inputs using the DEC-20 computer system. Performed data analysis of program results.

Volunteer Positions:

4/83 — Management Advisor - East Brunswick Township Dept. of Community Development, East Brunswick, N.J.
Advised township on proper management of park wildlife.

7/82 — Research Assistant - Herpetological Associates, Burlington County, N.J.
Assisted in habitat and range studies of several native Pine Barrens species.

AFFILIATIONS: Wildlife Society

SOIL & ENVIRONMENTAL SERVICES INC.

PERSONNEL DATA

Donald J. Fortunato

Education:

Stockton State College, NJ - B.S. in Environmental Science with emphasis on soils, hydrology, and geology, 1975.

Rutgers University, NJ - Graduate Study in Soil Science, 1978 to 1979.

Certifications and Professional Affiliations:

Certified Soil Scientist No. 2278 with Soil Science Society of America.

Member - Soil Science Society of S. New England.

Associate member - National Assoc. of Home Builders.

Professional Experience:

Nine years experience with the USDA Soil Conservation Service providing assistance to consultants, governmental agencies, and the public. Experience has included: soil investigations and soil interpretations; waste management planning; design of erosion control and drainage practices; review of sediment control plans; soil testing and analysis; surveying and engineering design; and presentations to trainees on soils, drainage, erosion control, and related resources topics.

Two years experience as owner of Soil & Environmental Services performing soil sampling, soil analysis, hazardous waste investigations, and wetland delineations.

Resumes of other key personnel and subcontractors are available on a job to job basis.

SOIL & ENVIRONMENTAL SERVICES INC.

PERSONNEL DATA

Timothy Cochran

Education: Rutgers University, NJ - B.S. in Earth Sciences, 1977.

Professional Experience: One year experience as soil scientist with private consulting firm. Eight years as soil scientist with State of New Jersey D.E P. Experience includes wetlands mapping, on-site soils investigation, and water resources studies.

SOIL & ENVIRONMENTAL
SERVICES INC.

PERSONNEL DATA

Burton Laux

Education: University of Maryland - B.S. in Soil Science, 1950.

Colorado A & M - Graduate study in Soil Science.

Professional Experience: Twenty nine years with USDA Soil Conservation Service as a soil scientist in Maryland, Hawaii, and New Jersey. Soils consultant since 1979 to present.

SOIL & ENVIRONMENTAL
SERVICES INC.

PERSONNEL DATA

F. Erwin Rice

Education: SUNY, College of Environmental Sciences, Syracuse, NY - B.S. in Forestry, 1949.

Cornell University, NY - Graduate Study in Soil Science, 1950's.

Professional Experience: Two years with U.S. Navy in mapping and airborne divisions. Twenty six years with the USDA Soil Conservation Service as a soil scientist in Alaska, New York and Georgia. Soils consultant since 1979 to present.

SOIL & ENVIRONMENTAL
SERVICES INC.

PERSONNEL DATA

Martina A. Castauho

Education: University of Rhode Island - B.S. in Soil Science, 1978.

Professional Experience: Five years with the USDA Soil Conservation Service as a soil scientist and soil conservationist in Florida and New Jersey. Two years with the U.S.E.P.A. as a soil scientist/hydrogeologist. Presently soil scientist and partner with Soil & Environmental Services, Inc.

PHOTOGRAPHS

KEY TO PHOTOGRAPHS

Photograph	Description
A	Wet mixed hardwood forest dominated by red maple, sweet gum and black gum. Facing SW.
B	Wet mixed hardwood forest, understory dominated by greenbriars, sweet pepperbush and cinnamon fern. Facing east.
C	Wet mixed hardwood forest with understory dominated by greenbriars, winterberry and cinnamon fern. Facing east.
D	Wet mixed hardwood forest, detail with large sweetgum in foreground.
E	Wet hardwood forest, canopy structure. Facing west.
F	Oak Pine woodland, facing southeast. Woodland dominated by pitch pine, scarlet oak, black jack oak and white oak with a low ericaceous understory.
G	Oak Pine woodland of similar composition to above but showing a gramminiod dominated understory.
H	Detail of understory in stream corridor, Greenbriar and cinnamon fern dominate beneath wet mixed hardwood canopy.
I	Dry old field, goldenrods, throughworts, broomsedge and thistles dominate the old field proper, edge areas in background composed of variable amounts of oaks, red maples, sweet gums and glaucous greenbriar.
J	Mixed hardwood forest in stream valley facing east. Well developed herbaceous layer composed primarily of strict and porcupine sedges along with swamp St. Johnswort.
K	Shrub layer detail in same general area as J. Common shrubs include winterberry, arrowwood viburnum, and sweet pepperbush.
L	Dry old field detail with greenbriar, goldenrods and ragweeds.

KEY TO PHOTOGRAPHS
continued

Photograph	Description
M	Dry, sandy old field along Iresick Brook and the power line right-of-way. Typical community of these sandy, dry, disturbed areas.
N	Upland old field, facing south
O	Wet mixed hardwood forest dominated by sweetgum within a stream corridor of a tributary of Iresick Brook.
P	Wet mixed hardwood forest with reduced woody shrub cover, understory predominately cinamon fern.

(A)

(B)

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Ⓔ

Ⓕ

(G)

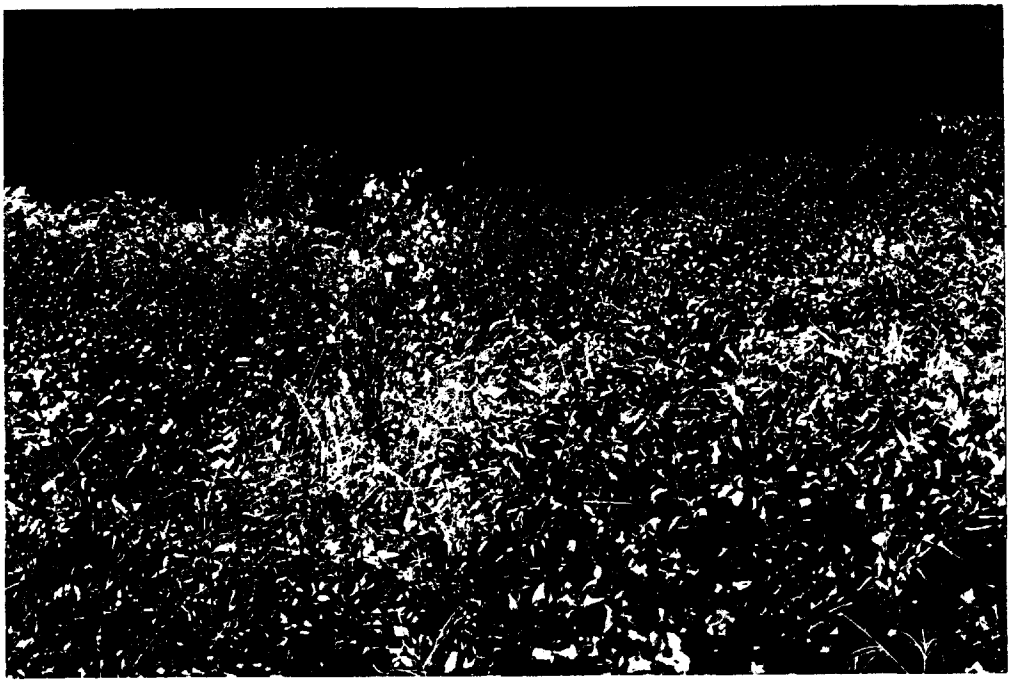
(H)

(I)

(J)

Ⓚ

Ⓛ



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APPENDIX 2

Soil Logs and Profile Descriptions

WETLANDS DELINEATION REPORT

prepared for

Olympia and York Planned Development

Old Bridge Township, Middlesex County

New Jersey

February, 1987

SUBMITTED TO:

O&Y Old Bridge Development Corporation
760 Highway 18
East Brunswick, New Jersey 08816

PREPARED BY:

Amy S. Greene
Environmental Consultants

Nr. 10

SOIL & ENVIRONMENTAL SERVICES, INC.

Boring No.	Soil Names	Flag Location	Status
1	FLUVAQUENT	AA4	Wetland
2	KLEJ	AA14	Upland
3	MULLICA	B1	Wetland
4	HAMMONTON	B12	Upland
5	FILL	BB2	Wetland
6	FILL	BB5	Upland
7	FILL	BB18	Upland
8	ATSION	BB30	Wetland
9	FILL	BB52	Wetland
10	BERRYLAND	BB120	Wetland
11	FLUVAQUENT	C(bar)15	Wetland
12	ELKTON	C(bar)32	Wetland
13	KLEJ	C(bar)47	Upland
14	MANAHAWKIN	C(bar)47	Wetland
15	LAKEHURST	CC3	Upland
16	ATSION	CC10	Wetland
17	KLEJ	CC34	Upland
18	FLUVAQUENT	D(bar)18	Wetland
19	ELKTON	D(bar)30	Wetland
20	KEYPORT	D(bar)39	Upland
21	KLEJ	DD6	Upland
22	ELKTON	E(bar)4	Wetland
23	LAKEWOOD	E(bar)4	Upland
24	KEYPORT	E(bar)14	Upland
25	MANAHAWKIN	E(bar)14	Wetland
26	KLEJ	E(bar)30	Upland
27	ELKTON	E(bar)38	Wetland
28	KEYPORT	E(bar)38	Upland
29	KEYPORT	F(bar)1	Upland
30	KLEJ	FF209	Upland
31	MANAHAWKIN	FF220	Wetland
32	WOODSTOWN	G17	Upland
33	KLEJ	G(bar)34	Upland
34	ATSION	G(bar)35	Wetland
35	ATSION	GG44	Wetland
36	LAKEHURST	GG44	Upland
37	POCOMOKE	H(bar)4	Wetland
38	KEYPORT	H13	Upland
39	ATSION	J1	Wetland
40	MULLICA	K9	Wetland

SOIL & ENVIRONMENTAL SERVICES, INC.

41	HAMMONTON	KG175	Upland
42	KLEJ	KG180	Upland
43	MANAHAWKIN	KG300	Wetland
44	ATSION	L5	Wetland
45	LAKEHURST	M3	Upland
46	ATSION	M4	Wetland
47	ATSION	N6	Wetland
48	LAKEHURST	N6	Upland
49	BERRYLAND	P3	Wetland
50	KLEJ	P3	Upland
51	KEYPORT	P54	Upland
52	MULLICA	P59	Wetland
53	ATSION	P110	Wetlands
54	ATSION	PB9	Wetland
55	LAKEHURST	PB9	Uplands
56	MULLICA	Q2	Wetland
57	KLEJ	Q6	Upland
58	KLEJ	Q7	Upland
59	KLEJ	Q10	Upland
60	ATSION	Q204	Wetland
61	ATSION	Q205	Wetland
62	FALLSINGTON	RF8	Wetland
63	KEYPORT	RF8	Upland
64	ELKTON	RH130	Wetland
65	KEYPORT	RH130	Upland
66	ELKTON	RK7	Wetland
67	FALLSINGTON	RR1	Wetland
68	KEYPORT	RR1	Upland
69	FLUVAQUENT	RS1	Wetland
70	FALLSINGTON	RU37	Wetland
71	KEYPORT	RU37	Uplands
72	BERRYLAND	RU206	Wetlands
73	KEYPORT	RU206	Upland
74	ATSION	TC1	Wetland
75	EVESBORO	TC1	Upland
76	ATSION	TC6	Wetland
77	BERRYLAND	TC13	Wetland
78	BERRYLAND	TC20	Wetland
79	ATSION	TC32	Wetland
80	ATSION	TC42	Wetland
81	ATSION	TC47	Wetland
82	KEYPORT	TC60	Upland
83	ELKTON	TD2	Wetland
84	ELKTON	TD11	Wetland
85	ELKTON	TD14	Wetland
86	KEYPORT	TD14	Upland

SOIL & ENVIRONMENTAL SERVICES, INC.

87	A2	Wetland
88	A4	Upland
89	B10	Upland
90	B10	Wetland
91	C2	Wetland
92	D41	Wetland
93	D105	Upland
94	G17	Upland
95	L5	Wetland
96	C(bar)40	Wetland
97	C(bar)40	Upland
98	AB9	Upland
99	AB29	Wetland
100	AC26	Wetland
101	AC26	Upland
102	R280	Upland
103	AE48	Upland
104	AE48	Wetland
105	AH10	Wetland
106	AH10	Upland

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Fluvaquents, very poorly drained

Seasonal Water Table Depth: to surface

Boring Location: Wetlands at flag AA 4

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-15	Loamy sand (SM-SP); very pale brown (10YR 7/4); loose; single grained.
15-24	Loamy sand (SM); dark grayish brown 10YR 3/2; friable to firm; fine granular.
24-55	Loamy sand to sand (SM-SP); light gray 10YR 6/1 to pale brown 10YR 6/3; very friable; medium granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 38 inches

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 37 inches

Boring Location: Uplands at flag AA 14

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 5/2; friable; fine granular.
9-37	Loamy sand (SM); brownish yellow 10YR 6/8; very friable; fine granular.
37-58	Sand (SP); pale brown 10Y 6/3; loose; single grain; few, distinct mottles (7.5YR 7/2) pale gray.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Mullica sandy loam, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetland at flag B 1

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-6	Sandy loam (SM); black 10YR 2/1; friable; medium subangular blocky.
6-12	Sandy loam (SM); dark grayish brown 10YR 4/2; friable; medium subangular blocky; many, prominent yellowish brown mottles (10YR 5/6).
12-18	Heavy Sandy loam (SM); dark grayish brown 10YR 4/2; friable; medium subangular blocky; common distinct mottles (10YR 4/4) dark yellowish brown.
18-25	Sandy loam (SM); yellowish brown 10YR 5/6; friable; medium subangular blocky; common distinct mottles (10YR 4/2) dark grayish brown.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Hammonton sandy loam, moderately well drained

Seasonal Water Table Depth: >25 inches

Boring Location: Upland at flag B 12

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-4	Sandy loam (SM); very dark brown 10YR 2/2; friable; medium granular.
4-12	Sandy loam (SM); yellowish brown 10YR 5/6; friable; medium subangular blocky.
12-25	Heavy sandy loam (SM-SC); yellowish brown 10YR 5/8; friable to firm; medium subangular blocky; few low chroma mottles at 20 inches.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Fill (Aquents), poorly drained

Seasonal Water Table Depth:

Boring Location: Wetlands at flag BB2

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Loamy sand (SM-SP); light olive brown 2.5YR 5/4; loose; single grain.
10-18	Loamy sand (SM-SP); brown 7.5YR 5/4; loose; single grain; common faint mottles (10YR 6/2) light brownish gray.
18-24	Loamy sand (SM); black 10YR 2/1; very friable; fine granular; original horizon.
24-55	Loamy sand (SM); reddish yellow 7.5YR 6/6; very friable; fine granular; common faint mottles (10YR 6/2) light brownish gray.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 20 inches

Soil: Fill (Aquic Udipsamments), somewhat poorly drained

Seasonal Water Table Depth: 24 inches

Boring Location: Upland at flag BB 5

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-20	Loamy sand (SM); light olive brown 2.5Y 5/4; very friable; fine granular; fill material.
20-30	Loamy sand (SM); dark brown 10YR 2/2; friable, fine granular; original horizon; saturated.
30-50	Loamy sand (SM-SP); reddish yellow 7.5Y 6/6 very friable; fine granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 26 inches

Soil: Fill (Aquic Udipsamments), somewhat poorly drained

Seasonal Water Table Depth: 24 inches

Boring Location: Upland at flag BB 18

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-24	Loamy sand (SM); light olive brown 2.5Y 5/4; very friable; fine granular; fill material.
24-30	Loamy sand (SM); black 10YR 2/1; friable, fine granular; original horizon; saturated.
30-60	Loamy sand (SM-SP); reddish yellow 7.5Y 6/6 very friable; fine granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Atsion sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag BB 30

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Loamy sand (SM-SP); black 10YR 2/1; very friable; fine granular; A1 horizon saturated 8 inches.
8-28	Sand (SP); dark grayish brown 10YR 3/2; loose; single grain; A2 albic.
28-35	Loamy sand (SM); dark brown 7.5YR 3/2; friable; single grained massive; B2h spodic.
35-55	Sand (SP); pale brown 10YR 6/3; loose; single grain; faint common mottles (10YR 7/1) light gray.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Fill (Aquents), poorly drained

Seasonal Water Table Depth:

Boring Location: Wetlands at flag BB52

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Loamy sand (SM-SP); light olive brown 2.5YR 5/4; loose; single grain.
8-18	Loamy sand (SM-SP); brown 7.5YR 5/4; loose; single grain; common faint mottles (10YR 6/2) light brownish gray.
18-24	Loamy sand (SM); dark brown 10YR 2/2; very friable; fine granular; original horizon.
24-55	Loamy sand (SM); reddish yellow 7.5YR 6/6; very friable; fine granular; common faint mottles (10YR 5/2) light brownish gray.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Berryland sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: At flag BB 120

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Loamy sand (SM-SP); black 10YR 2/1; very friable; fine granular; A, horizon.
10-22	Sand (SP); gray 5YR 5/1; loose; single grain; A2 albic.
22-25	Loamy sand (SM); dark brown 7.5YR 3/8; friable; single grain (massive); B2h spodic.
25-55	Sand (SP); dark gray 10YR 3/1; loose; single grain; faint common mottles (10YR 7/2) light gray; Cg-gleyed horizon.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: surface

Soil: Fluvaquents, very poorly drained

Seasonal Water Table Depth: to surface

Boring Location: Wetlands at flag C(bar) 15

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-18	Loamy sand (SM-SP); very pale brown (10YR 7/4); loose; single grained.
18-26	Loamy sand (SM); grayish brown 10YR 5/2; friable to firm; fine granular.
26-55	Loamy sand to sand (SM-SP); light brownish gray 10YR 6/2 to pale brown 10YR 6/3; very friable; medium granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Elkton sandy loam, poorly drained

Seasonal Water Table Depth: 6-10 inches

Boring Location: Wetlands at flag C(bar) 32

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-12	Fine sandy loam (SM-ML); dark grayish brown: 10YR 4/2; friable; fine granular; ochric epipedon.
12-27	Fine sandy clay loam (CL-SC); olive yellow 2.5Y 6/6; firm; coarse subangular blocky; many, prominent gray (10YR 5/1) mottles.
27-55	Clay loam (CL-CH); gray 10YR 5/1; very firm; massive; few prominent yellowish red mottles (5YR 5/8).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 40 inches

Boring Location: Upland at flag C(bar) 47

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 6/2; friable; medium granular.
9-40	Loamy sand (SM); olive yellow 2.5Y 6/6; friable; medium granular.
40-60	Loamy sand (SM-SP); pale yellow 2.5 YR 7/4; friable; medium granular; common, faint mottles of yellowish brown (10YR 5/6) and gray (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 6 inches

Soil: Manahawkin muck, very poorly drained

Seasonal Water Table Depth: surface

Boring Location: Wetlands at flag C 47

Logged by: D. Fortunato/ B. Laux

Depth (inches)	Soil Profile
0-20	Muck, sapric (Pt); black 10YR 2/1; friable; massive; herbaceous fibers through matrix.
20-36	Loamy sand (SP-SM); dark grayish brown 10YR 4/2; loose; single grain; organic stains.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 28 inches

Soil: Lakehurst sand, moderately well drained

Seasonal Water Table Depth: 24-30 inches

Boring Location: Upland at flag CC3

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Loamy sand (SM-SP); dark gray 10YR 4/1; very friable; fine granular; A1 horizon.
8-22	Sand (SP); light gray 10YR 6/1; loose; single grain; A2 albic horizon.
22-25	Loamy sand (SM); dark brown 7.5YR 3/2; friable; single grain massive; B2h spodic horizon.
25-55	Sand (SP); pale yellow 2.5Y 7/4; loose; single grain; saturated; common faint mottles (10YR 7/2) light gray.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 6 inches

Soil: Atsion sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag CC 10

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Loamy sand (SM-SP); black 10YR 2/1; very friable; fine granular; A1 horizon saturated 8 inches.
10-30	Sand (SP); dark grayish brown 2.5YR 4/2; loose; single grain; A2 albic.
30-35	Loamy sand (SM); dark brown 7.5YR 3/2; friable; single grained massive; B2h spodic.
35-55	Sand (SP); pale yellow 2.4Y 7/4; loose; single grain; faint common mottles (10YR 7/2) light gray.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 37 inches

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 36-40 inches

Boring Location: Uplands at flag CC 34

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 6/2; friable; fine granular.
9-36	Loamy sand (SM); yellowish brown 10YR 6/8; very friable; fine granular.
36-60	Sand (SP); yellow 2.5Y 7/6; loose; single grain; few, distinct mottles (7.5YR 7/2), pinkish white.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Fluvaquents, very poorly drained

Seasonal Water Table Depth: to surface

Boring Location: Wetlands at flag D(bar) 18

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-18	Loamy sand (SM-SP); very pale brown (10YR 7/4); loose; single grained.
18-24	Loamy sand (SM); grayish brown 10YR 5/2; friable to firm; fine granular.
24-55	Loamy sand to sand (SM-SP); light gray 10YR 6/1 to pale brown 10YR 6/3; very friable; medium granular.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 12 inches

Soil: Elkton sandy loam, poorlx drained

Sdaronal Water Table Depth: 6-12 inahes

Boring Location: Wetlands at flag D(bar) 30

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-12	Fine sandy loam (SM-ML); grayish brown: 10YR 4/2; friable; fine granular; ochric epipedon.
12-28	Silty clay loam (CL); olive yellow 2.5Y 6/6; firm; coarse subangular blocky; many, prominent gray (10YR 4/1) mottles.
28-55	Clay loam (CL-CH); gray 10YR 4/1; very firm; massive; few prominent yellowish red mottles (5YR 5/8).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 30 inches

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18-24 inches

Boring Location: Uplands at flag D(bar) 39

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Fine sandy loam (SM); dark grayish brown: 10YR 4/2; friable; fine subangular blocky.
8-20	Silt loam (ML); olive 5Y 5/4; firm; massive.
20-48	Silty clay loam (CL); brownish yellow 10YR 6/6; firm; massive; commmn, distinct gray mottles (10YR 4/1).
>48	Sandy clay loam (SC-CL); brownish yellow 10YR 6/6; firm; coarse subangular blocky; many, prominent gray mottles (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 36 inches

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 36-40 inches

Boring Location: Uplands at flag DD 6

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 6/2; friable; fine granular.
9-36	Loamy sand (SM); brownish yellow 10YR 6/6; very friable; fine granular.
36-60	Sand (SP); yellow 2.5Y 7/6; loose; single grain; few, distinct mottles (7.5YR 8/0) white.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Elkton sandy loam, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag E(bar)4

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-7	Fine sandy loam (SM-ML); dark gray 10YR 4/1; friable; fine subangular blocky; umbric epipedon.
7-14	Silty clay loam (CL); gray 10YR 5/1; firm; massive; few, prominent strong brown mottles (7.5YR 5/8) - B2t horizon.
14-36	Silty clay loam (CL); brownish gray 10YR 6/2; very firm; coarse subangular blocky; Cg gleyed horizon.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Lakewood sand, well drained

Seasonal Water Table Depth: none

Boring Location: Upland at flag E(bar) 4 (100 ft. upslope)

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-6	Medium sand (SP); dark gray 10YR 4/1; loose; single grain; A1 horizon.
6-15	Medium sand (SP); light gray 10YR 7/1; loose; single grain; A2 - albic horizon.
15-17	Loamy sand (SM); dark reddish brown 5YR 3/4; very friable; massive; B2h - spodic horizon.
17-60	Medium (SP) sand; yellowish brown 10YR 5/6; loose single grain.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York

Standing Water Level: 28 inches

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 22 inches

Boring Location: Upland flag at E(bar) 14

Logged by: D. Fortunato

Depth (inches)	Soil Properties
0-5	Fine sandy loam (SM); very dark gray; 10YR 3/1; friable; fine granular.
5-22	Medium sand (SP); brown; 10YR 6/3; loose; single grain.
22-42	Medium sand (SP); pale yellow; 5Y 7/4; loose; single grain; common, faint brownish gray mottles (10YR 5/2).
42-60	Silty clay loam (CL); olive 2.5Y 6/6; firm; massive; common, prominent gray mottles (10YR 5/1),

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: at surface

Soil: Manahawkin muck, very poorly drained

Seasonal Water Table Depth: at surface

Boring Location: Wetlands at flag E(bar) 14

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-16	Muck, sapric (Pt); black 10 YR 2/1; friable; massive; herbaceous fiber in matrix.
16-45	Loamy fine sand; gray 10YR 4/1; loose; single grain; gleyed horizon.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 36-40 inches

Boring Location: Upland at flag E(bar) 30

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 6/2; friable; medium granular.
9-35	Loamy sand (SM); reddish yellow 5YR 6/8; friable; medium granular.
35-40	Loamy sand (SM-SP); pale yellow 2.5 YR 7/4; friable; medium granular; common, faint mottles of yellowish brown (10YR 5/6) and gray (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Elkton sandy loam, poorly drained

Seasonal Water Table Depth: 6-10 inches

Boring Location: Wetlands at flag E(bar) 38

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-12	Fine sandy loam (SM-ML); dark grayish brown 10YR 3/2; friable; fine granular; ochric epipedon.
12-26	Silty clay loam (CL); olive yellow 2.5Y 6/6; firm; coarse subangular blocky; many, prominent gray (10YR 4/1) mottles.
26-50	Silty clay loam (CL-CH); gray 10YR 5/1; very firm; massive; few prominent yellowish red mottles (5YR 5/8).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 28 inches

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18 inches

Boring Location: Uplands at flag E(bar) 38

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Fine sandy loam (SM); dark grayish brown: 10YR 4/2; friable; fine subangular blocky.
8-18	Fine sandy loam (SM-ML); brown 10YR 5/3; firm; fine granular.
18-45	Silty clay loam (CL); brownish yellow 10YR 6/4; firm; coarse subangular blocky; common, distinct gray mottles (10YR 5/1).
45-50	Sandy clay loam (SC-CL); brownish yellow 10YR 6/6; firm; coarse subangular blocky; many, prominent gray mottles (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 30 inches

Soil: Keyport, sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18-24 inches

Boring Location: Uplands at flag F(bar) 1

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Fine sandy loam (SM); dark grayish brown; 10YR 4/2; friable; fine subangular blocky.
8-20	Silt loam (ML); olive 5Y 5/4; firm; massive.
20-48	Silty clay loam (CL); brownish yellow 10YR 6/6; firm; massive; common, distinct gray mottles (10YR 4/1).
>48	Sandy clay loam (SC-CL); brownish yellow 10YR 6/6; firm; coarse subangular blocky; many, prominent gray mottles (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Klej sand, moderately well drained

Seasonal Water Table Depth: 32-42 inches

Boring Location: Upland at flag FF 209

Logged by: B. Laux

Depth (inches)	Soil Profile
0-8	Sand (SP); dark brown 10YR 3/3; friable; fine granular.
8-20	Sand (SP); strong brown 7.5YR 5/6; loose; massive.
20-32	Sand (SP); yellowish brown 10YR 5/6; loose; massive; many, prominent red (2.5YR 4/8) mottles at 30 inches.
32-36	Sand (SP); light olive brown 2.5Y 5/4; loose; single grain; common, prominent red (2.5YR 4/8) mottles.
36-60	Sand (SP); light olive gray 5Y 6/2; loose; single grain.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 6 inches

Soil: Manahawkin muck, very poorly drained

Seasonal Water Table Depth: surface

Boring Location: Wetlands at flag FF 220

Logged by: D. Fortunato/ B. Laux

Depth (inches)	Soil Profile
0-25	Muck, sapric (Pt); black 10YR 2/1; friable; massive; herbaceous fibers through matrix.
25-39	Loamy sand (SP-SM); dark grayish brown 10YR 4/2; loose; single grain; organic stains.
39-55	Loamy sand (SP-SM) gray 10YR 4/1; loose; single grain.

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Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Woodstown sandy loam, moderately well drained

Seasonal Water Table Depth: >20 inches

Boring Location: Upland at flag G 17

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-2	Sandy loam (SM); dark grayish brown 10YR 4/2; friable; medium subangular blocky.
2-10	Sandy loam (SM); brown 10YR 5/3; friable; fine granular.
10-20	Heavy sandy loam (SM); strong brown 7.5YR 5/8; firm; fine subangular blocky.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 45 inches

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 36 inches

Boring Location: Upland at flag G(bar) 34

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-9	Loamy sand (SM); brownish gray 10YR 5/2; friable; medium granular.
9-36	Loamy sand (SM); reddish yellow 5YR 6/8; friable; medium granular.
36-48	Loamy sand (SM-SP); pale brown 10YR 7/3; friable; medium granular; common, faint mottles of yellowish brown (10YR 5/8) and gray (10YR 5/1).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Atsion sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag G(bar) 35

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Loamy sand (SM-SP); dark gray 10YR 3/1; very friable; fine granular; A1 horizon saturated 8 inches.
10-28	Sand (SP); dark grayish brown 10YR 4/2; loose; single grain; A2 albic.
28-35	Loamy sand (SM); dark brown 7.5YR 3/2; friable; single grained massive; B2h spodic.
35-55	Sand (SP); pale yellow 2.4Y 7/4; loose; single grain; faint common mottles (10YR 7/2) light gray.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 22 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag GG 44

Logged by: E. Rice

Depth (inches)	Soil Profile
0-8	Loamy sand (SM); gray 10YR 5/1; very friable; fine granular; high organic carbon content.
8-15	Loamy fine sand (SM-SP); dark gray 5YR 4/1; very friable, fine granular.
15-25	Loamy fine sand (SM-SP); pale yellow 10YR 7/4; very friable; single grain; few, faint gray (10YR 5/1) mottles.
25-45	Fine sand (SP); light gray 7.5YR 6/1; loose; single grain; organic stains, rust mottles through matrix; bands of light yellowish brown sand (2.5Y 6/4).

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 28 inches

Soil: Lakehurst sand, somewhat poorly drained

Seasonal Water Table Depth: 22 inches

Boring Location: Upland at flag GG 44

Logged by: E. Rice

Depth (inches)	Soil Profile
0-8	Loamy sand (SM-SP); gray 10YR 5/1; loose single grain; A1 horizon.
8-15	Loamy sand (SM-SP); gray 5YR 5/1; very friable; medium subangular blocky; A2 albic horizon: weak spodic (B2h).
15-25	Loamy sand (SP-SM); yellow 10YR 7/6; very friable; coarse subangular blocky; common, faint reddish yellow and strong brown mottles at 22 inches.
25-45	Loamy sand (SP-SM); yellow 10YR 7/6; friable; single grain; common, faint brownish gray (10YR 6/2) mottles.
45-60	Medium sand (SP); light yellowish brown 2.5Y 6/4; loose; single grain.

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Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 8 inches

Soil: Pocomoke sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag H(bar) 4

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Sand (SP); black 7.5YR 2/0; loose; single grain; ochric epipedon.
10-32	Loamy sand (SP-SM); pale brown 10YR 6/3; loose; medium granular; many, faint gray (10YR 6/1) and brownish gray (10YR 6/2) mottles.
32-50	Sand (SP); grayish brown 10YR 5/2; loose; single grain.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam, moderately well drained

Seasonal Water Table Depth: 24 inches

Boring Location: Upland at H13

Logged by: Dougherty/Kirkham

Depth (inches)	Soil Profile
0-4	Sandy loam (SM); dark grayish brown 10YR 3/2; friable; fine granular.
4-9	Sandy loam (SM); brownish yellow 10YR 6/6; friable; fine subangular blocky.
9-19	Heavy sandy loam (SM-SC); yellowish brown 10YR 5/6; friable; medium subangular blocky.
19-35	Sandy clay loam (SC-SM); yellowish brown 10YR 5/8; firm; medium subangular blocky.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 12 inches

Soil: Atsion loamy sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetland at flag J 1

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-3	Loamy sand (SM); black 10YR 2/1; very friable; fine grained.
3-8	Loamy sand (SM); dark brown 10YR 3/2; very friable; fine grained.
8-14	Loamy sand (SM); dark gray 10YR 4/1; very friable; fine grained; water at 12 inches.
14-25	Loamy sand (SM); strong brown 7.5YR 5/8; very friable; fine grained.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Mullica sandy loam, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetland at flag K 9

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-2	Sandy loam (SM); black 10YR 2/1; friable; medium subangular blocky.
2-8	Sandy loam (SM); gray 10YR 4/1; friable; medium subangular blocky.
8-15	Sandy loam (SM); dark grayish brown 10YR 4/2; friable; medium subangular blocky; common faint mottles (10YR 4/4) dark yellowish brown.
15-25	Sandy loam (SM); dark yellowish brown 10YR 4/4; friable; medium subangular blocky; common distinct mottles (10YR 4/2) dark grayish brown.

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P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 46 inches

Soil: Hammonton loamy sand, moderately well drained

Seasonal Water Table Depth: 46 inches

Boring Location: Upland at flag KG 175

Logged by: B. Laux

Depth (inches)	Soil Profile
0-3	Loamy sand (SM-SP); black 5YR 2/1; friable; fine granular.
3-19	Sand (SP); light yellowish brown 2.5Y 6/4; loose; massive.
19-46	Sand (SP); yellowish red 5YR 5/6; loose; medium granular.
46-60	Loamy sand (SM-SP); yellowish brown 10YR 5/8; very friable to loose; coarse subangular blocky; seems to have clay balls, seepage - water.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 25 inches

Soil: Klej loamy sand, somewhat poorly drained

Seasonal Water Table Depth: 18 inches

Boring Location: Uplands at flag KG 180

Logged by: B. Laux

Depth (inches)	Soil Profile
0-4	Loamy sand (SM-SP); black 5YR 2/1; friable; fine granular.
4-10	Sand (SP); light yellowish brown 2.5Y 6/4; loose; massive.
10-20	Sand (SP); yellowish brown 10YR 5/6; loose; single grain.
20-30	Sand (SP); yellowish brown 10YR 5/6; loose; single grain; many prominent mottles (5YR 5/6) yellowish red.
30-60	Sand (SP); yellowish brown 10YR 5/6; loose; fine granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 6 inches

Soil: Manahawkin muck, very poorly drained

Seasonal Water Table Depth: surface

Boring Location: Wetlands at flag KG 300

Logged by: D. Fortunato/ B. Laux

Depth (inches)	Soil Profile
0-24	Muck, sapric (Pt); black 10YR 2/1; friable; massive; herbaceous fibers through matrix.
24-37	Loamy sand (SP-SM); grayish brown 10YR 5/2; loose; single grain.
37-50	Sand (SP); gray 10YR 5/1; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 7 inches

Soil: Atsion loamy sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetland at flag L 5

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-5	Loamy sand (SM); very dark brown 10YR 2/2; very friable; single grain.
5-11	Loamy sand (SM); gray 10YR 5/1; very friable; fine grained.
11-14	Loamy sand (SM); strong brown 7.5YR 4/6; very friable; single grained.
14-25	Loamy sand (SM); gray 10YR 5/1; very friable; fine grained.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 28 inches

Soil: Lakehurst sand, moderately well drained

Seasonal Water Table Depth: 24 inches

Boring Location: Upland at flag M 3

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-7	Sand (SP); dark gray 10YR 4/1; loose; single grain; A1 horizon.
7-15	Sand (SP); light gray 10YR 7/1; loose; single grain; A2 albic horizon.
15-19	Loamy sand (SM-SP); brown 10YR 4/3; very friable; fine granular; B2h spodic horizon.
19-50	Loamy sand (SM-SP); brownish yellow 10YR 6/8; very friable; medium granular; common faint brownish gray mottles (10YR 6/2) at 24 inches.
50-60	Sand (SP); brown 10YR 4/3; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 15 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag M 4

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-8	Sand (SP); dark gray 10YR 4/2; very friable; fine granular; high organic carbon content.
8-30	Sand (SP); light brownish gray 10YR 6/2; loose; single grain; A2 albic horizon; moist at 15 inches.
30-42	Loamy sand (SM); dark reddish brown 10YR 3/3; very friable; fine granular; B2h spodic horizon.
42-60	Sand (SP); dark gray 10YR 4/1; loose; single grain; Cg gleyed horhzon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 16 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag N 6

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-6	Sand (SP); dark gray 10YR 4/2; very friable; fine granular; high organic carbon content.
6-33	Sand (SP); light brownish gray 10YR 6/2; loose; single grain; A2 albic horizon; moist at 16 inches.
33-42	Loamy sand (SM); dark reddish brown 5YR 2.5/2; very friable; fine granular; B2h spodic horizon.
42-60	Sand (SP); dark gray 10YR 4/1; loose; single grain; Cg gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 27 inches

Soil: Lakehurst sand, moderately well drained

Seasonal Water Table Depth: 24 inches

Boring Location: Upland at flag N 6

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-3	Sand (SP); dark gray 10YR 4/1; loose; single grain; A1 horizon.
3-15	Sand (SP); light brownish gray 10YR 6/2; loose; single grain; A2 albic horizon.
15-18	Loamy sand (SM-SP); brown 7.5YR 5/4; very friable; fine granular; B2h spodic horizon.
18-47	Loamy sand (SM-SP); brownish yellow 10YR 6/6; very friable; medium granular; common faint brownish gray mottles (10YR 6/2) at 24 inches.
47-60	Sand (SP); brown 10YR 4/3; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Berryland sand poorly drained

Seasonal Water Table Depth: 0.6 inches

Boring Location: Wetland at flag P 3

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-3	Loamy sand (SM); black 7.5YR 2/0; friable; fine granular; umbric epipedon.
3-12	Loamy sand (SM-SP); very dark grayish brown 10YR 3/2; very friable; single grain; umbric epipedon.
12-28	Sand (SP); gray 10YR 7/1; loose; single grain; common, distinct pale brown mottles (10YR 7/3).
28-34	Sandy clay loam (SC-CL); gray 10YR 6/1; firm; coarse subangular blocky; few, prominent yellowish brown mottles (10YR 6/8).
34-60	Sand (SP); olive yellow 2.5Y 6/6; loose; single grain; common, faint pale brown and gray mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 40 inches

Soil: Klej loamy sand, moderately well drained

Seasonal Water Table Depth: 37 inches

Boring Location: Upland at flag P 3

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-12	Loamy fine sand (SM); dark grayish brown 10YR 5/2; very friable; fine granular.
12-37	Loamy sand (SM); strong brown 7.5YR 5/8; very friable, fine granular.
37-52	Sand (SP); olive yellow 2.5Y 6/8; loose; single grain; common, faint gray mottles (10YR 7/1).
52-66	Loamy sand (SM); gray 10YR 6/1; friable; medium granular; few, distinct yellowish brown mottles (10YR 6/6); Cg gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18 inches

Boring Location: Upland at flag P 54

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-3	Sandy loam (SM); dark grayish brown 10YR 3/2; friable; medium granular.
3-12	Sandy loam (SM); strong brown 7.5YR 5/8; friable; medium subangular blocky.
12-18	Sandy clay loam (SC-CL); strong brown 7.5YR 5/8; firm; medium subangular blocky; few low chroma mottles.
18-25	Sandy clay loam (SC-CL); strong brown 7.5YR 5/8; firm; massive; many, prominent gray (10YR 5/1) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 19 inches

Soil: Mullica sandy loam, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetland at flag P 59

Logged by: W. Kirkham

Depth (inches)	Soil Profile
0-3	Sandy loam (SM); black 10YR 2/1; friable; medium granular.
3-10	Sandy loam (SM); very dark brown 10YR 2/2; friable; medium subangular blocky.
10-20	Sandy loam (SM); dark grayish brown 10YR 4/2; friable; medium subangular blocky; common faint mottles (7.5YR 5/8) strong brown.
20-25	Sandy loam (SM); dark yellowish brown 10YR 4/4; friable; medium subangular blocky; common distinct mottles (7.5YR 4/1) dark gray.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Atsion sand

Seasonal Water Table Depth: 6-12

Boring Location: Wetlands at flag P 110

Logged by: K. Dougherty

Depth (inches)	Soil Profile
0-5	Sand (SP); dark grayish brown 10YR 3/2; loose; single grain.
5-12	Sand (SP); strong brown 7.5YR 5/6; loose; single grain.
12-24	Sand (SP); strong brown 7.5YR 5/8; loose single grain; common, faint brown mottles (7.5YR 4/6).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Atsion sand

Seasonal Water Table Depth: 6-12

Boring Location: Wetlands at flag PB 9

Logged by: K. Dougherty

Depth (inches)	Soil Profile
0-10	Sand (SP); gray 10YR 4/1; loose; single grain; many, distinct light gray mottles (10YR 6/1).
10-14	Sand (SP); grayish brown 10YR 5/2; loose; single grain.
14-28	Loamy sand (SP-SM); brownish gray 10YR 6/2; loose; single grain; many, prominent light gray mottles (10YR 7/1).
28-39	Sandy clay loam (SC); strong brown 7.5YR 6/8; friable; medium granular; many, distinct gray mottles (7.5YR 6/1).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Lakehurst sand

Seasonal Water Table Depth: 24 inches

Boring Location: Uplands at flag PB 9

Logged by: K. Dougherty

Depth (inches)	Soil Profile
0-11	Sand (SP); brownish gray 10YR 5/2; loose; single grain.
11-17	Sand (SP); dark brown 10YR 3/3; loose; single grain.
17-30	Sand (SP); yellowish brown 10YR 5/8; loose; single grain; many, prominent brown and brownish yellow mottles.
30-36+	Sand (SP); olive brown 2.5Y 5/4; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 24 inches

Soil: Mullica sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag Q 2

Logged by: B. Laux

Depth (inches)	Soil Profile
0-8	Sand (SP); dark reddish brown 5YR 2/2; loose; fine granular; 1% pebbles; umbric epipedon.
8-17	Silt loam (ML); black 5YR 2/1; friable; granular; root tannin staining (2.5YR 4/8) red.
17-28	Silt loam (ML); 10YR2/2; friable; granular; yellowish red (5YR 4/8) mottles common.
28-34	Silt loam (ML); very dark grayish brown 2.5Y 3/2 very dark gray 5Y 3/1; sticky; massive.
>34	Silt loam (ML); very dark gray 10YR 3/1; sticky; massive.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 22 inches

Soil: Klej loamy sand, somewhat poorly drained

Seasonal Water Table Depth: 14-16 inches

Boring Location: Upland at flag Q 6

Logged by: B. Laux

Depth (inches)	Soil Profile
0-4	Loamy sand (SP-SM); dark grayish brown 10YR 4/2; friable; fine granular.
4-14	Sand (SP); dark brown 10YR 4/3; loose; massive.
14-22	Sand (SP); light reddish brown 2.5Y 6/4; loose; massive; common, prominent yellowish red mottles (5YR 4/8).
22-29	Sand (SP); light yellowish brown 10YR 6/4; loose; massive; common, prominent yellowish red mottles (5YR 4/8).
29-60	Silty clay loam (CL); yellowish brown 10YR 5/8; sticky; massive; strong brown (7.5Y 5/8) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Klej sand, moderately well drained

Seasonal Water Table Depth: 30 inches

Boring Location: Upland at flag Q 7

Logged by: B. Laux

Depth (inches)	Soil Profile
0-8	Sand (SP); dark brown 10YR 3/3; friable; fine granular.
8-20	Sand (SP); strong brown 7.5YR 5/6; loose; massive.
20-32	Sand (SP); yellowish brown 10YR 5/6; loose; massive; many, prominent red (2.5YR 4/8) mottles at 30 inches.
32-36	Sand (SP); light olive brown 2.5Y 5/4; loose; massive; common, prominent red (2.5YR 4/8) mottles.
36-60	Sand (SP); light olive gray 5Y 6/2; loose; massive.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Klej sand, moderately well drained

Seasonal Water Table Depth: 32 inches

Boring Location: Upland at flag Q 10

Logged by: B. Laux

Depth (inches)	Soil Profile
0-8	Sand (SP); dark brown 10YR 3/3; friable; fine granular.
8-18	Loamy sand (SP); yellowish brown 10YR 5/8; loose; massive.
18-34	Sand (SP); light olive brown 2.5Y 5/4; loose; single grain; common, prominent red (2.5YR 4/8) mottles.
34-60	Sand (SP); light olive gray 5Y 6/2; loose; massive.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 6 inches from surface

Soil: Atsion sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag Q 204

Logged by: B. Laux

Depth (inches)	Soil Profile
0-2	Loamy sand (SM-SP); black 2.5YR N/2; friable; fine granular.
2-8	Sand (SP); black 10YR 2/1; loose; massive.
8-22	Sand (SP); weak red 2.5Y 5/2; loose; massive; yellowish red mottles (5YR 4/8) through matrix.
22-36	Sand (SP); weak red 2.5Y 5/6; loose; massive; yellowish red mottles (5YR 4/8).
36-60	Sand (SP); dark gray 10YR 4/1; loose; single grain; Cg gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Atsion sand, very poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag Q 205

Logged by: B. Laux

Depth (inches)	Soil Profile
0-2	Loamy sand (SM-SP); black 2.5YR N/0; friable; fine granular.
2-18	Sand (SP); very dark gray 10YR 3/1; loose; single grain.
18-22	Sand (SP); weak red 2.5Y 5/2; loose; massive; yellowish red mottles (5YR 4/8) through matrix.
22-34	Sand (SP); grayish brown 10YR 5/2; loose; single grain; yellowish red mottles (5YR 4/8).
34-60	Sand (SP); gray 10YR 5/1; loose; single grain; Cg (gleyed horizon).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 4 inches

Soil: Fallsington sandy loam, very poorly drained

Seasonal Water Table Depth: to surface

Boring Location: Wetlands at flag RF 8

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-4	Sand (mucky) (SP-Pt); dark brown 10YR 4/3; loose; fine granular.
4-18	Sandy loam; gray 10YR 5/1; friable; fine granular.
18-31	Sandy clay loam; yellowish brown 10YR 5/6; friable; fine subangular blocky; common, prominent gray (10YR 5/1) mottles; Bt2 horizon.
31-35	Sandy clay loam; gray 10YR 5/1; firm; massive; common, distinct yellowish brown (10YR 5/6) mottles; Cg-gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam, moderately well drained

Seasonal Water Table Depth: 36 inches

Boring Location: Uplands at flag RF 8

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-4	Sandy loam (SM); dark brown 10YR 4/3; very friable; fine granular.
4-9	Loamy sand (SM-SP); dark yellowish brown 10YR 4/4; very friable; medium subangular blocky.
9-24	Sandy loam (SM); yellowish brown 10YR 5/4; friable; medium subangular blocky.
24-36	Sandy loam (SM); yellowish brown 10YR 5/4; friable; medium subangular blocky; Bt horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: moist throughout

Soil: Elkton sandy loam

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag RH 130

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-9	Silt loam (MC); black 10YR 2/1; friable; fine granular; ochric epipedon.
9-29	Sandy clay loam (SC); gray 10YR 4/1; firm; medium sub-angular blocky; few, prominent olive brown (2.5 YR 5/6) mottles; Btg horizon.
29-35	Sandy loam (SM-MC); gray 10YR 4/1 friable; massive; common, distinct yellowish brown mottles (10YR 5/8); Cg, gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam, moderately well drained

Seasonal Water Table Depth: 19 inches

Boring Location: Upland at flag RH 130

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-3	Sandy loam (SM-ML); dark brown 10YR 3/3; friable; fine granular.
3-9	Fine sandy loam (SM-ML); yellowish brown 10YR 5/8; friable; fine subangular blocky.
9-19	Sandy clay loam (SC-CL); yellowish brown 10YR 5/6; friable medium subangular block; Bt1 horizon.
19-35	Sandy clay loam (SC-CL); brownish yellow 10YR 6/8; friable to firm; medium subangular block; common, prominent gray (10YR 7/1) mottles; Bt2 horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: moist throughout

Soil: Elkton sandy loam

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag RK 7

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-9	Silt loam (ML); olive gray 2.5Y 3/2; friable; fine granular; ochric epipedon.
9-27	Silty clay loam (ML-CL); gray 10YR 4/1; firm; medium subangular blocky; few, prominent olive brown (2.5 YR 5/6) mottles; Btg horizon.
27-35	Fine sandy loam (SM-ML); gray 2.5Y 6/2; friable; massive; common, distinct yellowish brown mottles (10YR 5/8); Cg, gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Fallsington sandy loam, poorly drained

Seasonal Water Table Depth: 0-6 inches

Boring Location: Wetlands at flag RR 1

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-6	Sandy loam (SP); black 2.5 YR 2/0; very friable; fine granular.
6-24	Sandy clay loam (SC-CL); dark reddish brown 2.5YR 3/3; friable; fine subangular blocky; B2t horizon.
24-35	Sandy clay loam (SC-CL); brown 10YR 5/1; and gray 10YR 5/1; firm; fine subangular blocky; thin platy, slightly plastic pockets; B3t horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam, moderately well drained

Seasonal Water Table Depth: 23 inches

Boring Location: Upland at flag RR 1

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-6	Fine sandy loam (SM-ML); dark brown 10YR 3/3; very friable; fine granular.
6-12	Fine sandy loam (SM-ML); yellowish brown 10YR 5/6; friable; fine subangular blocky.
12-23	Sandy clay loam (SC-CL); brownish yellow 10YR 6/8; friable medium subangular block; Bt1 horizon.
23-35	Sandy clay loam (SC-CL); brownish yellow 10YR 6/8; friable to firm; medium subangular block; common, prominent brownish gray (10YR 6/2) mottles; Bt2 horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 5 inches

Soil: Typic Fluvaquent

Seasonal Water Table Depth: surface

Boring Location: Wetlands at flag RS 1

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-5	Muck (Pt); black 10YR 2/1; friable; 0 horizon.
5-18	Sand (SP); gray 10YR 5/1; loose; single grain; wet.
18-22	Sand (SP); black 10YR 2/1; very friable; massive; wet.
22-35	Sand (SP); dark gray 10YR 4/1; loose; loose; wet.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: moist through matrix

Soil: Fallsington loam

Seasonal Water Table Depth: 6 inches

Boring Location: Wetlands at flag RU 37

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-5	Loam (SM-ML); black 10YR 2/1; friable; fine granular.
5-9	Loam (SM-ML); dark gray 10YR 4/1; friable; fine sub-angular blocky.
9-25	Clay loam (CL); dark gray 10YR 3/1 friable; medium sub-angular blocky; Btg horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: none

Soil: Keyport sandy loam

Seasonal Water Table Depth: 29 inches

Boring Location: Uplands at flag RU 37

Logged by: R. Raimo

Depth (inches)	Soil Profile
0-5	Sandy loam (SM-ML); black 10YR 2/1; friable; fine granular.
5-8	Loam (SM-ML); brownish gray 10YR 5/2; very friable; fine subangular blocky.
8-12	Clay loam (CL); brownish yellow 10YR 6/4 friable; fine subangular blocky; Bt1 horizon.
12-29	Clay loam (CL); brownish yellow 10YR 6/6; firm; medium subangular blocky; Bt2 horizon.
29-35	Clay (CL-CH); brownish yellow 10YR 6/6; firm; medium blocky; Bt3 horizon; common prominent gray mottles (10YR 4/1).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 16 inches

Soil: Berryland sand

Seasonal Water Table Depth: surface

Boring Location: Wetlands at flag RU 206

Logged by: K. Dougherty

Depth (inches)	Soil Profile
0-9	Silt loam (ML); black 10YR 2/1; friable; fine granular.
9-13	Sand (SP); dark gray 7.5YR 3/0; loose; single grain; wet.
13-20+	Sand (SP); gray 10YR 4/1; loose single grain; wet.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 36 inches

Soil: Keyport loamy sand

Seasonal Water Table Depth: 24-30 inches

Boring Location: Upland at flag RU 206

Logged by: K. Dougherty

Depth (inches)	Soil Profile
0-8	Sand (SP); gray 10YR 4/1; very friable; single grain.
8-18	Sand (SP); brownish gray 10YR 6/2; loose; fine granular.
18-34	Sandy loam (SM); dark brown 7.5YR 3/4; friable; medium granular.
34-38	Sandy loam (SM); brown 10YR 5/3; friable; medium granular; common, distinct dark brown mottles (10YR 3/3).

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 18 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 9 inches

Boring Location: Wetlands at flag TC 1

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-3	Sand (SP); very dark gray 2.5Y N3/0; loose; single grain; Ao sand and humus.
3-9	Sand (SP); dark gray 5YR 4/1; loose; single grain.
9-16	Loamy sand (SM-SP); dark reddish brown 5YR 3/2; friable; fine granular; many distinct mottles (5YR 4/1) dark gray.
16-20	Loamy sand (SM-SP); pale brown 10YR 6/3-4; friable; fine granular; water - 18 inches; many distinct mottles (7.5YR 6/5) strong brown.
20-40	Sand (SP); very pale brown 10YR 7/4; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: None

Soil: Evesboro sand, excessively well drained

Seasonal Water Table Depth: None

Boring Location: Uplands 100 ft. upslope of flag TC1 (former J(bar) 1)

Logged by: D. Fortunato

Depth (inches)	Soil Profile
0-10	Fine sand (SP); brown 10YR 5/3; loose; single grain.
10-34	Fine sand (SP); yellowish brown 10 YR 5/8; loose; single grain.
34-60	Fine sand (SP); yellow 10YR 7/8; loose; single grain.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 16 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag TC 6

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-8	Sand (SP); dark gray 10YR 3/1; loose, single grain; A1 horizon.
8-16	Sand (SP); grayish brown 10YR 5/2; loose; single grain; A2 albic horizon; organic stains.
16-27	Loamy sand (SP-SM); brown 10YR 5/3; friable; massive; few, faint grayish brown (10YR 5/2) mottles; B2h horizon.
27-50	Sandy loam (SM); reddish yellow 7.5YR 6/8; friable; massive; many, distinct brownish gray (10YR 6/2) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 18 inches

Soil: Berryland sand, very poorly drained

Seasonal Water Table Depth: 6 inches

Boring Location: Wetlands at flag TC 13

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-2	Humus (PT); black 10YR 2/1; loose.
2-9	Sand (SP); dark gray 7.5YR 4/0; loose; single grained; fill - many (7.5YR 4/2) dark brown; reworked areas.
9-13	Sand (SP); dark gray 10YR 4/1; loose; single grained; old A1 horizon.
13-19	Sand (SP); light brownish gray 10YR 6/2; loose; single grained; old A2; water - 18 inches.
19-27	Loamy sand (SM-SP); dark gray 10YR 4/1; friable; fine granular.
27-40	Sand (SP); grayish brown 10YR 5/2; loose; single grained.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 10 inches

Soil: Berryland sand, very poorly drained

Seasonal Water Table Depth: to surface

Boring Location: Wetlands at flag TC 20

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-8	Humus (Pt); black 10YR 2/1; loose.
8-14	Sand (SP); very dark grayish brown 10YR 3/2; loose; fine granular; water - 10 inches; many distinct mottles (2.5YR 3/2) dusky red.
14-20	Sandy loam (SM-SP); brown 10YR 5/3; very friable; sub-angular blocky.
20-36	Sand (SP); very pale brown 10YR 6/8; loose; fine granular.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 20 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 12 inches

Boring Location: Wetlands at flag TC 32

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-6	Sandy humus (Pt-SP); black 2.5YR 2/0; loose; single grained.
6-10	loamy sand (SM-SP); very dark gray 5YR 4/1; friable; fine granular.
10-28	Loamy sand (SM-SP); very pale brown 10YR 7/3; friable; fine granular; many prominent mottles (7.5YR 5/8) strong brown - % increases with depth.
28-40	Sand (SP); gray 10YR 5/1; loose; single grained; Cg, gleyed horizon.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 20 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 6-12 inches

Boring Location: Wetlands at flag TC 42

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-10	Sand (SP); dark gray 10YR 3/1; loose, single grain; A1 horizon.
10-18	Sand (SP); grayish brown 10YR 5/2; loose; single grain; A2 albic horizon; organic stains, few faint reddish brown mottles (5YR 5/4).
18-24	Loamy sand (SP-SM); brown 10YR 5/3; friable; massive; few, faint grayish brown (10YR 5/2) mottles; B2h horizon.
24-40	Sandy loam (SM); dark brown 10YR 4/3; friable; massive; many, distinct brownish gray (10YR 6/2) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 28 inches

Soil: Atsion sand, poorly drained

Seasonal Water Table Depth: 12 inches

Boring Location: Wetlands at flag TC 47

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-4	Sandy humus (Pt-SP); black 10YR 2/1; loose.
4-8	Loamy sand (SM-SP); dark gray 10YR 4/1; loose; fine granular.
8-14	Loamy sand (SM-SP); pale brown 10YR 6/3; loose; fine granular; common faint mottles (10YR 5/6) yellowish brown.
14-28	Loam (SM); grayish brown 2.5Y 5/2; friable; fine granular; many distinct mottles (10YR 5/6) yellowish brown; decreasing chroma with depth.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 26 inches

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18

Boring Location: Upland at flag TC 60

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-3	Sandy loam (SM); very dark gray; 10YR 3/1; friable, fine granular.
3-8	Sandy loam (SM); brown 10YR 4/3; friable fine granular.
8-18	Sandy clay loam (SC-SM); yellowish brown 10YR 5/4;firm; medium subangular blocky; common, faint gray brown (10YR 5/2) and yellowish brown (10YR 6/4) mottles at 18 inches.
18-40	Sandy loam (SM); brownish gray 10YR 6/2; friable; medium subangular blocky.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 30 inches

Soil: Elkton sandy loam, poorly drained

Seasonal Water Table Depth: 6 inches

Boring Location: Wetland at flag TD 2

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-6	Loamy sand (SM-SP); black 10YR 2/1; friable; fine granular; umbric epipedon.
6-12	Light clay loam (CL); grayish brown 10YR 5/2; firm; medium subangular blocky; many, distinct yellowish brown mottles (10YR 5/6); B2t horizon.
12-36	Clay loam (CL-CH); dark gray 10YR 4/1; very firm; medium subangular blocky; few, faint dark brown (10YR 4/4) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 36 inches +

Soil: Elkton sandy loam, poorly drained

Seasonal Water Table Depth: 6 inches

Boring Location: Wetlands at flag TD 11

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-3	Sandy humus (PT-SP); black 10YR 2/1; loose.
3-8	Loamy sand (SM-SP); dark grayish brown 2.5YR 4/2; loose; single grain; few faint mottles (7.5YR 4/6) strong brown.
8-16	Sandy loam (SM); brown 10YR 5/3; friable; subangular blocky; common distinct mottles (10YR 6/2) light brown gray and (5YR 4/6) yellowish red.
16-24	Loamy sand (SM); very pale brown 10YR 7/3; loose; fine granular; common distinct mottles (10YR 6/6) brownish yellow.
24-36	Sandy clay loam (SC); gray 10YR 5/1; sticky; fine subangular blocky; many prominent mottles (10YR 7/8) yellow.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 30 inches

Soil: Elkton sandy loam poorly drained

Seasonal Water Table Depth: 6 inches

Boring Location: Wetland at flag TD 14

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-7	Loamy sand (SM-SP); black 10YR 2/1; friable; fine granular; umbric epipedon.
7-15	Light clay loam (CL); grayish brown 10YR 5/2; firm; medium subangular blocky; many, distinct yellowish brown mottles (10yr 5/6); B2t horizon.
15-30	Clay loam (CL-CH); yellowish brown 10YR 6/8; very firm; medium subangular blocky; few, faint dark brown (10YR 4/4) mottles.

SOIL & ENVIRONMENTAL SERVICES, INC.
P.O. Box 368, E. Lyme, CT 06333

Site: Olympia & York, Old Bridge, NJ

Standing Water Level: 26 inches

Soil: Keyport sandy loam, somewhat poorly drained

Seasonal Water Table Depth: 18

Boring Location: Upland at flag TD 14

Logged by: T. Cochran

Depth (inches)	Soil Profile
0-3	Sandy loam (SM); very dark gray; 10YR 3/1; friable, fine granular.
3-8	Sandy loam (SM); brown 10YR 4/3; friable fine granular.
8-18	Sandy clay loam (SC-SM); yellowish brown 10YR 5/4;firm; medium subangular blocky; common, faint gray brown (10YR 5/2) and yellowish brown (10YR 6/4) mottles at 18 inches.
18-40	Sandy loam (SM); brownish gray 10YR 6/2; friable; medium subangular blocky.

AMY GREENE CONSULTANTS
Flemington, NJ

Olympia & York Site
Old Bridge, NJ

Location	Depth	USDA Texture	Soil Color
			Hydric (Wetland) Non-hydric (Upland)
87			
A 2	0-15	sandy loam	dark grayish brown 10YR 3/2 matrix 70%
	15-25	sandy clay	strong brown 7.5YR 4/6 mottles 30% (some gray)
Water at 6 inches; hydric			
88			
A 4	0-12	sand	very dark brown, 10YR 3/3
	12-18	sand	strong brown 10YR 5/8
Water at 10 inches; non hydric			
89			
B 10	0-3	sandy loam	very dark grayish brown 10YR 3/2
	3-12	sandy loam	yellowish brown 10YR 5/8
	12-24	sandy loam	yellowish brown 10YR 5/8
Water at 16 inches non-hydric			
90			
Near B10	0-5	sandy loam	black 10YR 2/1
	5-15	loamy sand	brownish gray 10YR 6/2-7/2
	15-25	sandy loam	brownish yellow 10YR 6/6
	25-30	loamy sand	strong brown 7.5YR 5/8, matrix; brownish gray (10YR 6/2) mottles
Hydric			

AMY GREENE CONSULTANTS
Flemington, NJ

Olympia & York Site
Old Bridge, NJ

Location	Depth	USDA Texture	Soil Color
91			
Near C-2	0-2	sandy loam	black 10YR 2/1
	2-5	sandy loam	black 10YR 5/1
	5-10	sandy loam	brownish gray 10YR 6/2
	10-20	sandy loam	yellowish brown 10YR 5/8
Hydric			
92			
D-41	0-3	loam	black 10YR 2/1
	3-10	loam	grayish brown 10YR 5/2
	10-18	sandy clay loam	gray brown 10YR 5/2; matrix; yellowish brown 10YR 5/8 mottles
	18-24	sandy clay loam	grayish brown 10YR 5/2, matrix; yellowish brown 10YR 5/8 mottles
Water at 4 inches hydric			
93			
D 105	0-3	sandy loam	black 10YR 2/1
	3-8	sandy clay loam	yellowish brown 10YR 6/4
	8-16	sandy clay loam	yellowish brown 10YR 6/4
Non-hydric keyport			
94			
G 17	0-2	sandy loam	dark grayish brown 10YR 4/2
	2-10	sandy loam	brown 10YR 5/3
	10-20	heavy sandy loam	strong brown 7.5YR 5/8
No free water at 20 inches non-hydric			

AMY GREENE CONSULTANTS
Flemington, NJ

Olympia & York Site
Old Bridge, NJ

Location	Depth	USDA Texture	Soil Color
95			
L 5	0-5	loamy sand	very dark brown 10YR 2/2
	5-11	loamy sand	gray 10YR 5/1
	11-14	loamy sand	strong brown 7.5YR 4/6
	14-25	loamy sand	gray 10YR 5/1
Water at 7 inches hydric			
96			
C(bar) 40	0-2	organic	very dark brown 10YR 2/2
	2-8	sandy loam	dark gray brown 10YR 4/2
Water - 8 inches, hydric			
97			
C(bar) 40	0-1	organic	very dark brown 10YR 2/2
	1-6	sandy loam	dark grayish brown 10YR 4/2
	6-12	sand	strong brown 7.5YR 4/6
	12-18	sand	strong brown 7.5YR 5/8
Water - 6 inches, non-hydric			
98			
AB 9	0-6	sand	dark brown 7.5YR 4/4
	6-28	sand	strong brown 7.5YR 4/6
	28-30	sand	dark brown 7.5YR 3/2
Water - 28 inches, non-hydric			
99			
AB 29	0-4	sand	black 2.5Y 2/0
	4-24	sand	dark gray 10YR 4/1
Water - 10 inches, hydric			

AMY GREENE CONSULTANTS
Flemington, NJ

Olympia & York Site
Old Bridge, NJ

Location	Depth	USDA Texture	Soil Color
100			
AC 26	0-2	organic	black 10YR 21
	2-10	sand	dark brown, 10YR 3/3
	10-24	sand	light brownish gray 2.5YR 6/2
	24-28	sand	brown 10YR 4/3 matrix (60%); very dark gray 10YR 3/1 mottles (40%)

Water - 12 inches, hydric

101			
AC 26	0-1	organic	black 10YR 21
	1-7	sand	dark yellowish brown, 10YR 4/4
	7-28	sand	strong brown 7.5YR 5/8

No water encountered, non-hydric

102			
R 280	0-2	organic	black 10YR 2/1
	2-6	sandy loam	yellowish brown 10YR 5/4
	6-30	sandy clay	yellowish brown 10YR 5/6

No water encountered, non-hydric

103			
AE 48	0-3	sand	dark brown 10YR 3/3
	3-20	sand	dark yellowish brown 10YR 4/4
	20-24	sand	yellowish brown 10YR 5/8

No water encountered, non-hydric

AMY GREENE CONSULTANTS
Flemington, NJ

Olympia & York Site
Old Bridge, NJ

Location	Depth	USDA Texture	Soil Color
104			
AE 48	0-3	organic	dark brown 7.5YR 3/2
	3-8	sandy loam	very dark gray 10YR 3/1
	8-16	sand	grayish brown 10YR 5/2 matrix 90%; black 10YR 2/1 mottles, 10%
	16-24	sand	yellow 10YR 7/8
Water 12-14 inches, hydric			
105			
AH 10	0-2	organic	black 10YR 2/1
	2-4	sandy loam	black 10YR 2/1
	4-20	sand	dark gray 10YR 4/1
Water 6-8 inches, hydric			
106			
AH 10	0-8	sand	grayish brown 10YR 5/2
	8-22	sand	yellowish brown 10YR 5/6
	22-24	sand	yellowish brown 10YR 5/6 matrix, 80%; light yellowish brown 2.5 Y 6/4 mottles, 20%
No water encountered, non-hydric			