ATTACHMENT 7 - 2532B Shawnee Wetland Management Plan final with attachments - PSM 3-30-2021 [228956] (consisting of 53 sheets)

Compensatory Wetland Mitigation Proposal & Design Plans

Shawnee Valley Residential Development
Smithfield Township
Monroe County, Pennsylvania

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1.0 Introduction

This submittal is intended to fulfill compensatory wetland mitigation requirements associated with a Pennsylvania Department of Environmental Protection (PADEP) and U. S. Army Corps of Engineers Joint Permit (DEP Application #E45-482) to authorize impacts to waters and wetlands, resulting from the proposed project activities. The original wetland mitigation proposal and attachments were prepared and submitted in accordance with the PADEP Design Criteria – Wetlands Replacement/Monitoring dated 2/97 (PADEP, 1997) and the Draft Compensatory Mitigation Guidelines, Philadelphia District Regulatory Program dated 12/03 (USACE, 2003). The original mitigation proposal was approved in 2006 (Appendix A) and has subsequently been revised and updated to comply with the current U.S Army Corps of Engineers (USACE) regulations for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR, Part 332).

This revised mitigation proposal and design is based upon field data and observations collected in 2006 and presumes the site conditions have remained unaltered. However, if the current site conditions (i.e.: hydrology, topography, etc..) have significantly changed additional data may need to be collected and the design revised accordingly to ensure successful mitigation.

The proposed wetland mitigation project is located in Smithfield Township, Monroe County, PA (Figure 1). The property to be used for wetland mitigation is currently owned by Shawnee Stage 1. LLC (SS1), PO Box 261, Shawnee on Delaware, PA 18356. The total area of disturbance associated with the construction of the proposed wetland mitigation project is approximately 1.0 acres.

2.0 Objectives

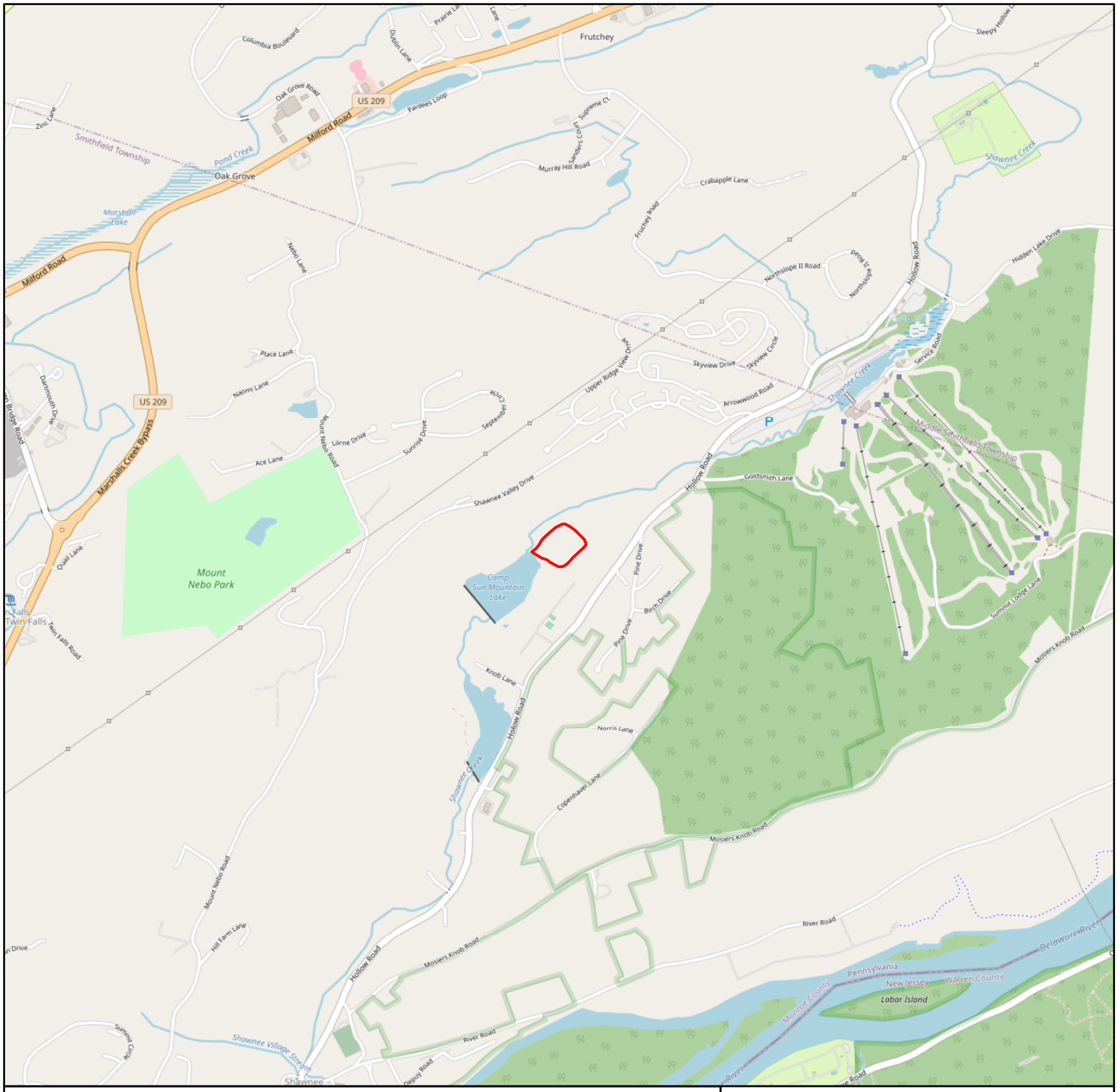
The proposed mitigation project is intended to offset the wetland/waters impacts and loss of wetland functions and values associated with construction of the proposed residential development project located in Smithfield Township, Monroe County, PA.

The goals of the proposed mitigation project are:

- To create a minimum of 0.719 acres of palustrine forested, broad-leaved deciduous, saturated to seasonally flooded wetlands (PFO1B/C)
- To improve water quality and habitat within the watershed by creating additional riparian buffers adjacent to the unnamed tributary

2.1 Existing & Proposed Wetland Functions

Most of the project area was historically forested and dominated by the Oak-Hickory forest type (Eyre, 1980). During the period of European settlement, portions of the forest area were cleared for agricultural production. Some of the wetlands delineated within the project area, particularly those within the floodplain of the unnamed tributary were flooded by impoundments (Camp Sun Mountain Lake and Shawnee Lake) constructed downstream from the proposed mitigation site. In addition, a recreational field was constructed by excavating portions of the adjacent slope and



Legend

Approximate Mitigation Site Location

N
W E
S

Figure 1
County Road Map

Wetland Mitigation Plan
Shawnee Development Tract
Smithfield and Middle Smithfield Twps.
Monroe County, Pennsylvania

AGE Project #2532

2,000
Feet

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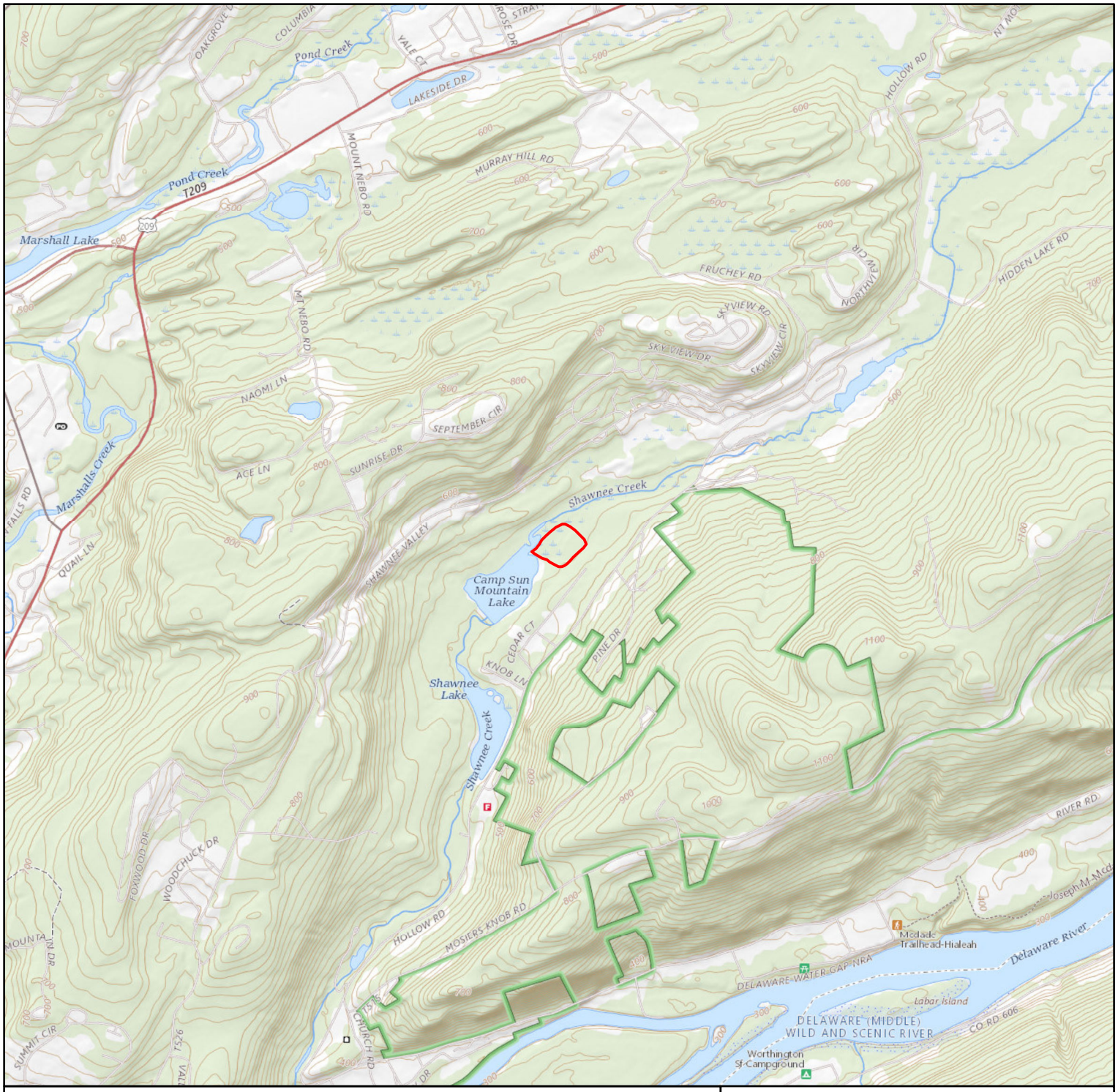
Sources:
Open Street Map (and) contributors, CC-BY-SA.



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Approximate Mitigation Site Location

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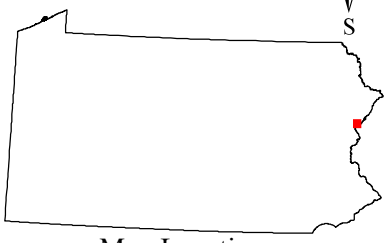

Map Location

Sources:
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset; USGS Global Ecosystems U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed May, 2020.

Figure 2
USGS Topographic Map

Wetland Mitigation Plan
Shawnee Development Tract
Smithfield and Middle Smithfield Twps.
Monroe County, Pennsylvania

AGE Project #2532

2,000
Feet

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utilizing the excavated material to fill areas and create a level field. Plant communities within the wetlands and adjacent uplands have been affected by these historical disturbances. Multiflora rose and Nepal microstegium are common species within the transitional woodland and recreation field. Multiflora rose is listed on the Pennsylvania Noxious Weed Control List (PA Code Title 7, Chapter 110.1).

The hydrogeomorphic (HGM) approach (Brinson, 1993a) classifies wetlands based on the geomorphic setting, water source and transport, and hydrodynamics regardless of vegetative components. Vegetative composition and structure within a wetland directly affects the habitat related functions and indirectly affects the hydrologic and biogeochemical functions through evapotranspiration and primary productivity processes. Therefore, it is possible to group wetlands with similar geomorphic setting (landscape position) and hydrologic attributes within one HGM type. These HGM types relate primarily to the edaphic controls of a particular wetland and provide a better baseline for functional comparisons as opposed to the existing plant communities which have been affected by anthropogenic disturbances.

Based on the HGM approach of Brinson (1993a), Wetlands associated with the proposed road crossings (i.e. impact sites) would be classified as alluvial headwater wetlands with shallow groundwater and overbank flooding as the primary water sources, and seasonal hydrodynamics based on variations in precipitation and evapotranspiration. Based on the Cowardin et al. (1979) classification and the detailed wetland delineation for the property, the wetlands associated with the proposed road crossings were classified as palustrine scrub-shrub, broad-leaved deciduous and palustrine forested, broad-leaved deciduous, saturated (PSS1/FO1B). The proposed mitigation site is designed to be a depressional wetland located on an alluvial landform with precipitation, shallow groundwater, and peak flows from the unnamed tributary as hydrologic sources. Seasonal hydrodynamics will vary based on precipitation, streamflow and evapotranspiration. The anticipated wetland type would be palustrine, broad-leaved deciduous, saturated or seasonally flooded (PFO1B/C).

2.2 Potential Wetland Functions & Ecological Processes

A wetland value can be defined as the monetary worth or importance of a wetland characteristic as determined by society. Examples of wetland values would include timber production, fish and wildlife harvest, water quality protection, flood desynchronization, aesthetics, and recreation. In contrast, a wetland function is a physical, chemical, or biological property of a wetland contributing to the overall integrity of the ecosystem. Examples of wetland functions would include: primary productivity, litterfall, decomposition, organic export, sediment deposition, nutrient / toxicant retention, consumer activity, maintenance of characteristic community structure & composition, and surface water storage (Chesapeake Bay Program, 1995; Gregory et al., 1991; Mitsch and Gosselink, 1993; Taylor et al., 1990; Wilkinson et al., 1987). Wetland values are often affected by the level of certain wetland functions, which in turn are affected by certain ecological processes occurring in the wetland. For example, a value such as water quality protection is dependent upon externalities in the marketplace that determine the monetary worth, but is also affected by wetland functions that control the ability of the system to provide water quality protection. These functions include primary productivity, nutrient/toxicant retention, sediment deposition, consumer activity, ground water discharge, and maintenance of characteristic community structure & composition. Certain

ecological processes such as: mineralization of nutrients, hydrologic flux, heat flux, and photosynthesis affect these functions.

2.4 Ecological Processes and Functions in Project Area Wetlands

Ecological processes and functions in alluvial and depressional wetlands, can be grouped into three categories: ecosystem dynamics, biogeochemical processes, and surface/ground water storage (Taylor et al., 1990). Although stratified into artificial groupings, all functions and processes within the system are highly interrelated. Depressional and headwater alluvial wetlands are somewhat different from the larger alluvial floodplain wetlands with respect to the subsidies they receive. Larger alluvial wetlands are subsidized by solar radiation and a periodic influx of nutrients in floodwaters. Depressional and headwater alluvial wetlands are typically located in the upper positions within the watershed; therefore, they do not typically receive a large nutrient and sediment influx from floodwaters (Brinson, 1993b).

Surface / ground water storage

Surface and groundwater storage capacity of a wetland is dependent upon various physical attributes, including flood duration, flood frequency, extent of flooding, soil physical properties, landscape position, and aquifer characteristics. Depressional and headwater alluvial wetlands are typically small in size and receive hydrologic subsidies from precipitation and localized surface runoff. Therefore, depressional and headwater alluvial wetlands do not typically provide substantial water storage. Headwater alluvial wetlands are generally narrow with limited floodplains. During a flood event, surface waters occupy the majority of the floodplain. The duration of flooding in alluvial headwater wetlands is short due to the limited size of the upstream watershed, small floodplain, and relatively high gradient. Water velocity may be slowed within alluvial headwater wetlands depending on the vegetative characteristics and roughness coefficient (microtopographic relief) (Gosselink et al., 1990a; Lugo et al., 1990). Limited surface water storage and flood desynchronization may occur, especially when alluvial headwater wetlands are considered within a landscape context. In addition, high soil organic matter content may contribute to additional storage of floodwaters. Although the magnitude of surface water storage in individual alluvial headwater wetlands may not be very high, the cumulative storage effect of numerous alluvial headwater wetlands may result in a short-term storage of surface water and desynchronization of downstream floodwaters. The alluvial headwater wetlands within the project area are characterized by shallow lateral flow. There is also potential for ground water discharge based on the regional geology. The surrounding upland soils have loamy A horizons with permeability rates ranging from 0.6 to 2.0 in/hr (Lipscomb, 1981). In addition, many of the upland soils have clay loam textured subsoil and fragipans with permeability lower than that of the A horizons. During the dormant season and following large precipitation events, the A horizons of upland soils become saturated. Water moves laterally across the subsoil or fragipan and is discharged into the alluvial headwater wetland systems. Shallow subsurface flow from the surrounding uplands would be relatively low in nutrients due to the biogeochemical transformations of precipitation within the upland soil profiles.

Ecosystem dynamics

Ecosystem dynamics includes such functions as decomposition, primary productivity, litterfall, organic export, maintenance of characteristic community structure & composition, and consumer activity. Organic matter decomposition and subsequent nutrient mineralization are crucial ecosystem processes that affect primary productivity and organic export. Resident populations of macro- and microorganisms are largely responsible for organic matter decomposition in the soil environment (Dickinson, 1974). The major groups of organisms include: bacteria, actinomycetes, fungi, protozoa, nematodes, and other macroinvertebrates. In wetland soils the abundance of some of these organisms may be limited due to anaerobic conditions, nutrient availability, low pH, or other factors. Fungi are particularly sensitive to anaerobic conditions, but most bacteria are capable of anaerobic growth. Organic substrates have been shown to lack certain nitrogen-fixing bacteria, nitrifying bacteria, actinomycetes, certain fungi, and many soil animals (Dickinson, 1974). Various site characteristics will influence the types of soil organisms present and their level of activity. These factors generally include: temperature, pH, oxygen availability, light, chemical constituents, and adsorptive interactions with mineral particles. Studies have shown that decomposition rates are influenced primarily by temperature, moisture, and litter quality (Brinson, 1977; Brinson et al., 1981; Chamie and Richardson, 1978; Melillo et al., 1982; Meentemeyer, 1978). In general, higher temperatures usually stimulate soil organism activity, but extreme temperatures may cause mortality of certain soil organisms resulting in lower decomposition rates (Dwyer and Merriam, 1981; Whitford et al., 1981). Substantial disturbance that results in the removal of a forest or shrub canopy, may result in increased solar radiation at the soil surface and greater daily temperature fluctuations in the upper soil profile. In addition, many soil organisms are negatively photoactic (Dickinson, 1974). Soil pH may also affect the activity of soil organisms; however, pH usually varies greatly between micro site and with soil depth. Williams and Crawford (1983) showed that microbial activity was actually higher at pH 3.0-4.5 in organic soil as compared with that at pH 6.0-8.0 in artificial media. Decomposition under anaerobic conditions is generally slower than in aerobic environments (Chamie and Richardson, 1978). The natural chemical constituents of the soil and/or litter may also affect soil organisms. An often cited example is the stimulation of microbial activity by the addition of nitrogen to a carbon rich substrate. However, naturally occurring microbial populations may not always be severely limited by low concentrations of nitrogen and phosphorus (Williams and Crawford, 1983).

Some types of litter may contain organic compounds which inhibit microbial growth, and the production of ethylene under anaerobic conditions is toxic to soil organisms. Mineral soil components can affect soil organism activity either directly by adsorption of microorganisms directly onto soil particles, or indirectly by adsorption of extra cellular enzymes. In addition to the abiotic factors, soil organisms directly interact in the soil and many toxic, competitive, and synergistic interactions can occur. Although decomposition rates are generally high in large riverine forests, there may be extreme variations due to fluctuating water table and micro relief (Brinson, 1990; McClellan et al., 1990; Reddy and Patrick, 1975; Sorenson, 1974).

Due to the relatively flat micro topography in the alluvial headwater and depressional wetlands, a relatively narrow range in decomposition rates is expected. Decomposition rates are expected to be low in the adjacent riverine habitat due to the prevailing anaerobic conditions. The water table appears to fluctuate throughout most of the upper 10-45cm of the soil profile. The decomposition

rate is expected to be highest within the zone of fluctuating water table. In aerobic soils, the primary end products of organic matter decomposition are carbon dioxide (CO_2), water, nitrate (NO_3), sulfate (SO_4), and residual humic materials (mostly lignin). In anaerobic soils, decomposition of organic matter proceeds more slowly due to the kinds of microorganisms involved and the net energy return. The resulting end products include the production of: CO_2, methane (CH_4), hydrogen (H_2), ammonia (NH_3), hydrogen sulfide (H_2S), low molecular weight acids, and residual humic materials (Gambrell and Patrick, 1978; Ponnamperuma, 1972). Several anaerobic processes are instrumental in the degradation of organic carbon. Fermentation occurs under highly reduced conditions and results in the formation of low molecular weight acids and alcohols, and carbon dioxide (CO_2), which may be lost as dissolved organic carbon (DOC). Methanogenesis results in the formation of methane gas from carbon dioxide under extremely reduced conditions.

Generally, productivity of alluvial headwater and depressional wetlands is higher than that of comparable upland forests, since both nutrients and moisture are less limiting (Brinson, 1990; Mengel and Lea, 1990). In addition, flowing water systems or systems with a pulsing hydroperiod tend to have higher productivity rates (Brinson et al., 1981; Gosselink et al., 1990a).

Organic export refers to the flushing of particulate (POC) and dissolved organic carbon (DOC). Organic export is dependent on all of the aforementioned functions as well as hydroperiod. Alluvial headwater wetlands are typically precipitation and runoff dominated. Depressional wetlands are typically precipitation dominated. Inputs of water from precipitation sources contain low concentrations of DOC and particulates. However, inputs of water from agricultural and/or roadway runoff may contain elevated levels of particulates, salt, and pesticide residuals. The majority of the organic export from alluvial headwater wetlands is most likely derived from within the system as a result of productivity, litterfall, and decomposition. Since depressional wetlands do not typically have outlets, organic export from these systems is expected to be low.

Consumer activity refers to the secondary productivity of the system via vertebrate and invertebrate consumers. Consumer activity for alluvial headwater and depressional wetlands is dependent upon primary productivity within the system, since few inputs are derived from upstream areas. However, it is generally thought that riparian wetlands, representing a transition between aquatic and terrestrial environments, support high consumer activities (Forsythe and Roelle, 1990). Many predominantly aquatic or terrestrial species are able to utilize the transitional environment of riparian wetlands. This opportunistic use of the floodplain is enhanced by fluctuation of water levels and the linearity of riverine systems. Fluctuating water levels provide a means of access for both aquatic and terrestrial species, and the linearity of these systems provide substantial "edge" between upland and wetland habitat (Brinson et al., 1981). Researchers have shown that abundance and diversity of vertebrate and invertebrate species is generally higher in riparian wetlands than surrounding upland habitats (Brooks et al., 1991; Dickinson, 1978).

Biogeochemical Processes

Biogeochemical processes include: sediment deposition, nutrient/toxicant retention, and biochemical transformations. Sediment deposition is dependent upon physical characteristics of the floodplain, water velocities, and sediment loading (Scott et al., 1990). Water velocity in alluvial headwater wetlands is generally slow, even during peak flows. Water velocity in depressional

wetlands is also slow. Slow water velocities would permit a substantial amount of suspended sediments to be deposited. However, there must be a significant source of sediment loading. Sediment loads to wetlands can arise from upland silvicultural, agricultural, and/or development activities (Riekerk et al., 1989). Development activity and existing roads are the primary sources of sediment within the project area.

Nutrient retention within riparian ecotones has been recognized as an important function of these systems (Gilliam, 1994; Vought et al., 1994). Nutrient/toxicant retention is a function of nutrient/toxicant loading, hydrologic characteristics, vegetation, sediments, and micro fauna (Elder, 1987). In turn, each of the latter factors is influenced by a variety of physical, chemical, and biological attributes of the system. For instance, hydrologic characteristics are a function of: basin size, channel gradient, sinuosity of the channel, micro relief, and stem density. Overall nutrient/toxicant retention in a particular system is the result of complex multivariate interactions and cannot be determined simplistically. Gilliam and Skaggs (1987) found that roughly 90 percent of the nitrogen was removed from agricultural runoff in North Carolina by a riparian wetland prior to reaching the stream. Peterjohn and Correll (1984) and Jordan et al. (1993) also documented substantial retention of nitrogen and phosphorous in surface and subsurface flows in Maryland by a riparian forest, and Lowrance et al. (1984) demonstrated the ability of Coastal Plain riparian forests in Georgia to act as sinks for many macronutrients. Cooper (1990) documented a 56-100% loss of nitrate in the soils of a small headwater riparian zone. Sources of nutrient/toxicant runoff arise from adjacent agricultural operations, roads, and residential developments and via surface runoff and subsurface tile drains (Brenner et al., 1991; Hanson et al., 1994; Warwick and Hill, 1988).

The capacity of riparian buffers to retain nitrogen is probably high, but retention of phosphorous may be limited by sedimentation rates and inherent absorption capacity of the sediment (Brinson et al., 1984; Richardson, 1985; Whigham et al., 1988). Biochemical transformations occur in the standing water and sediments of alluvial headwater wetlands. In anaerobic sediments oxygen becomes reduced first, followed by nitrate, manganese, ferric iron, sulfates, and organic acids (Gambrell and Patrick, 1978). As mentioned previously, denitrification may be an important function of saturated wetland soils. Solubilized ferric iron and manganese may immobilize phosphorous, and may reach toxic concentrations in reduced soils. It is generally believed that heavy metals and chlorinated hydrocarbons accumulate and are degraded in saturated soils (Taylor et al., 1990).

Nitrogen is often one of the most limiting elements for plant growth. Retention and transformation of nitrogenous compounds are often cited as a desirable function of wetland ecosystems. The nitrogen retention/transformation capacity of a given system is dependent upon loading rates, biota, hydrology, and sediment characteristics (Elder, 1987). The primary mechanism of nitrogen removal in wetlands is biological processing through denitrification and biotic assimilation (Chescheir et al., 1991; Kuenzler, 1988; Lowrance, 1992). Organic nitrogen is present in organic matter and fixed from the atmosphere by various organisms, but not available to plants for uptake. Nitrogen fixation occurs naturally in wetlands through Cyanobacteria (blue-green algae) at the soil surface, free-living bacteria such as *Clostridium* in the bulk of the soil, and a non-leguminous symbiosis between bacteria of the genus *Frankia* and wetland shrubs of the genus *Alnus* and *Myrica* (Carlyle, 1986). In general, nitrogen fixation may be reduced by low pH (<4.5) or high availability of external ammonium-N, but may be stimulated by alternate wetting and drying cycles (Buresh et al., 1980).

Nitrogen fixation estimates in wetlands range from negligible amounts to 40 g $N/m^2/yr$ for salt marsh (Nixon and Lee, 1986). Cyanobacteria are especially intolerant of pH below 6.0, but *Clostridium* will tolerate acid conditions (Buresh et al., 1980). DiStefano and Gholz (1989) observed a reduction in nonsymbiotic dinitrogen fixation in slash pine flatwoods following application of N-P-K fertilizer. In systems where there is a large external input of inorganic nitrogen, internal nitrogen fixation is most likely low.

In flooded soils, conversion of organic-N to inorganic-N or ammonium-N (NH_4) begins in the anaerobic zone where ammonification or mineralization occurs. The process of mineralization of organic-N may occur under aerobic conditions as well; however, inorganic-N is released in larger quantities and faster in anaerobic soils than in aerobic soils because less immobilization of N occurs in anaerobic media (Ponnamperuma, 1972). Mineralization of ammonium-N is also enhanced by cycles of wetting and drying, but depressed by acidic, highly organic conditions (Carlyle, 1986). Once ammonium-N is formed it may be absorbed by plants and micro fauna, or immobilized by adsorption to negatively charged soil particles. Brinson et al. (1984) found that most of the nitrogen added to an alluvial swamp forest in North Carolina was stored in sediments (15%) or lost through denitrification (30%), and only a small percentage (3.6%) was stored in trees. Following mineralization of N in flooded soils, ammonium usually diffuses to aerobic zones where it is oxidized. Oxidation of ammonium-N (nitrification) by chemoautotrophic bacteria ultimately yields nitrate-N (NO_3). Nitrate-N is highly mobile in the soil solution and may be leached into groundwater, transformed through assimilation by plants and microorganisms, or undergo dissimilation (nitrate respiration) (Ponnamperuma, 1972). Nitrification is progressively inhibited below soil pH of 6.0, although tolerant microbial populations may develop under acid conditions (Carlyle, 1986). Nitrate assimilation by biota is not usually the dominant pathway in most reduced soils since ammonium-N is the preferred source (Carlyle, 1986; Gambrell and Patrick, 1978). Nitrate respiration or denitrification seems to be the primary pathway of nitrate-N in flooded soils. However, vegetation type may affect the ability of the riparian system to assimilate nitrate. Haycock and Pinay (1993) demonstrated that trees (*Populus* sp.) were superior (99% retention of NO_3) to grass (*Lolium* sp.) (84% retention of NO_3) with regard to nitrate retention, especially during the winter months.

Denitrification is an obligatory anaerobic process and is considered the primary pathway of nitrate loss in some wetlands (Chescheir et al., 1991; Gambrell and Patrick, 1978). Brinson et al. (1984) reported dentitrification rates of 13.0 g N/m^2/10 month period for a nitrogen enriched alluvial swamp forest in North Carolina, but Gholz et al. (1985) reported rates of 0.06 g $N/m^2/yr$ for a slash pine flatwoods in Florida. Denitrification rates are slowed in acid soils, but enhanced by the presence of organic matter and alternating wet/dry cycles. The rate-limiting step in denitrification is usually the diffusion of nitrate to anaerobic sediments (Chescheir et al., 1991). In denitrification, nitrate-N is converted to nitrous oxide (N_2O) or dinitrogen gas (N_2). An intermediate step in this process and nitrification of ammonium-N is the production of nitrite (NO_2). Ponnamperuma (1972) suggests that aerobic denitrification via nitrite may account for significant losses, especially in alternately wet and dry soils. Continuous submergence may lead to a decrease in denitrification losses (Ponnamperuma, 1972). Lowrance (1992) demonstrated that maximum denitrification occurred in the shallow, periodically saturated soil horizons as opposed to the deeper anaerobic horizons.

Phosphorus is closely tied to sedimentary cycles and is retained by wetlands primarily by adsorption/precipitation reactions, although some uptake can be attributed to biotic assimilation (Brinson et al., 1984; Kuenzler, 1989; Richardson, 1985; Simons et al., 1989). The principal inorganic soluble form is orthophosphate, which forms several ions depending on pH. Orthophosphate is the primary form of phosphorus available for plant uptake, other less available forms are usually tied up in organic matter. The predominant ionic form of phosphorus at low pH is H_2PO_4, and at high pH is PO_4. In general, H_2PO_4 is considered more available to plants; however, this relationship is complicated by the presence of soluble iron and aluminum in acid soils or calcium in alkaline soils (Brady, 1974). Phosphorus forms soluble and insoluble complexes in wetland soils; however, it is more available in flooded soils as compared to well-drained soils, and more available in organic soil as compared to mineral soils (Gambrell and Patrick, 1978; Ponnamperuma, 1972). Water soluble phosphorus becomes available to plants under anaerobic conditions due to hydrolysis of ferric and aluminum phosphates, release of phosphorus adsorbed to clays, reduction of ferric iron, and subsequent release of chemically bonded phosphorus (Ponnamperuma, 1972). Richardson (1985) found that soil adsorption of phosphorus in wetlands was greater for mineral soils than for organic soils. However, the phosphorus retention capacity of wetlands soils is related more to the amount of extractable aluminum and iron than to soil texture. Phosphorus may be immobilized for plant uptake by precipitation of insoluble phosphates with ferric iron, calcium, and aluminum under aerobic conditions; adsorption of phosphorus onto clay particles, organic peat, and ferric and aluminum hydroxides and oxides; and the binding of phosphorus in organic matter as a result of incorporation into biomass (Mitsch and Gosselink, 1993). An estimate of phosphorus uptake by plants in an alluvial swamp forest was only 0.3% of the total applied, while sediment storage accounted for 46% (Brinson et al., 1984). Other estimates of wetland sediment accumulation of phosphorus range from 44 $mg/m^2/yr$ (cypress swamp) to 3400 $mg/m^2/yr$ (alluvial swamp) (Nixon and Lee, 1986).

Sulfur is rarely limiting to plant growth in wetlands, but may become toxic under extremely reduced conditions. Sulfate reduction in flooded soils is usually mediated by obligate anaerobic bacteria of the genus *Desulfovibrio*, which utilize sulfates (SO_4) in anaerobic respiration. They function best in the pH range of 5.5 - 9.0, will tolerate high concentrations of salt and hydrogen sulfide, but are inhibited by nitrate or low temperatures (Ponnamperuma, 1972). Gambrell and Patrick (1978) indicate that sulfate reduction may be inhibited below pH of 4.2. One of the end products of sulfate reduction is hydrogen sulfide gas, a common indicator of reduced systems. Sulfides may combine with ferrous iron to form insoluble ferrous sulfide (FeS) precipitates (Gambrell and Patrick, 1978). Sulfate reduction is highest near neutral pH; however, it may occur in acid soils, although sulfate is strongly adsorbed to clay and hydrous oxides of iron and aluminum at low pH. Reduction of sulfates (SO_4) and subsequent production of sulfides may result in negative effects to plants due to direct toxicity of sulfide to plant roots, precipitation of sulfur with metals and reduced availability for plant growth, and the immobilization of zinc and copper by sulfide precipitation (Ponnamperuma, 1972). Sulfides may be oxidized back to sulfur and sulfates by chemoautotrophic aerobic microorganisms such as *Thiobacillus*.

Calcium and magnesium are both available as exchangeable cations. Availability is related to mineral weathering, degree of leaching, and anthropogenic inputs. Equilibrium concentrations of calcium and magnesium are established between exchangeable forms and solution forms. Both nutrients may become deficient in acid and/or organic soils due to lack of weatherable mineral

forms (Foth, 1978). In an upland hardwood forest, the pool of available calcium was cycled within the ecosystem with few losses. Most of this available pool was derived from mineralization of organic matter (56%) (Likens et al.,1977). In wetland systems, this large pool of calcium in the organic matter could potentially be exported in particulate form or accumulate in organic deposits. At higher pH, calcium may function to immobilize phosphorus (Richardson and Nichols, 1985).

Like calcium and magnesium, potassium in soils is weathered from minerals and reaches an equilibrium concentration in the soil solution, where it is available to plants. Potassium is one of the most highly mobile macronutrients and is readily leached from vegetation and soils (Brady, 1974). Organic and sandy soils are usually deficient in potassium due to the lack of weatherable minerals. However, the parent materials within the project area are likely to contain adequate levels of weatherable minerals. Therefore, the wetlands within the project area are likely to contain adequate levels of potassium. Unlike calcium or magnesium, potassium may be fixed in the soil by migration onto the mineral lattice. Potassium fixation in mineral soils is an important conservation process to reduce loss through leaching (Foth, 1978). Potassium fixation in soil is dependent on: the nature of the soil colloids, wetting and drying processes, freezing and thawing, and presence of excess cations (Brady, 1974). Clay minerals with 2:1 structure (illite and vermiculite) are more effective at fixing potassium than 1:1 clays. Alternate freezing and thawing also increases the release of fixed potassium. Potassium fixation tends to be higher in alkaline soils than in acid soils. Low pH and low percent base saturation generally leads to high losses of exchangeable potassium (> 70%) (Brady, 1974).

Iron and manganese are both readily reduced in flooded soils. Both elements become soluble in their reduced form and are available to plants. Ferrous iron may be responsible for immobilization of phosphorus as well as iron oxide precipitates in the rhizosphere. Ponnamperuma (1972) indicates that acid soils high in organic matter and iron may temporarily build up high concentrations of water soluble iron, but acid soils high in organic matter and low in iron may build up high concentrations of iron that persist for months. This same phenomenon was observed for soluble manganese as well. Iron toxicity to plants is possible in reduced soils as a result of iron coatings in the rhizosphere (Gambrell and Patrick, 1978). Iron and manganese may become deficient in aerobic alkaline soils because of the insolubility of the hydroxide and oxide forms (Foth, 1978).

2.4 Functional Assessment of Wetlands and the Proposed Mitigation

The proposed road crossings will affect areas classified as alluvial headwater wetlands and open waters. A variety of ecological functions can be attributed to these wetland types and are described in the latter section. The functions attributed to affected wetlands are dependent upon the chemical, biological, and physical attributes of the wetland as well as regional characteristics and regional wetland extent. Wetland functions typically attributed to the affected wetlands include primary productivity, litterfall, decomposition, organic export, sediment deposition, nutrient / toxicant retention, consumer activity, surface water storage, ground water discharge, and maintenance of characteristic community structure & composition (Table 1).

Edaphic factors such as alternating aerobic and anaerobic cycles, periodic flooding, and fine-textured mineral soils favor high primary productivity within the affected wetlands and the proposed wetland mitigation project. Initial primary productivity may be limited within the

mitigation project due to soil disturbance resulting from construction of the project and below optimum soil organic matter content. The effects of soil disturbance within the proposed mitigation project will be ameliorated by special disking and bedding provisions contained on the proposed grading plan. The below optimum soil organic matter content of the soils will be ameliorated by addition of suitable organic mulch to the topsoil within the wetland mitigation project.

Litterfall may be negatively affected by the removal of native forest cover within the affected wetlands. Some of the affected wetlands are forested with moderate litterfall but some of the affected wetlands are open water with relatively low inherent litterfall due to the lack of woody vegetation. Replacement of native tree and shrub species within the wetland mitigation area would increase the litterfall function as the trees mature. In addition, special provisions have been added to ensure the survival of several relatively large (i.e. >12 inches DBH) trees within the proposed wetland mitigation project and surrounding the project. The project has been designed to avoid direct impacts to large trees in the area. Preservation of existing trees within the mitigation site and around the perimeter of the site will ensure immediate litterfall within the project.

Decomposition is favored by the alternating aerobic and anaerobic hydroperiod within the existing and proposed wetlands. In addition, decomposition is favored by the increased solar radiation resulting from the relatively open canopy in the affected wetlands. However, decomposition is limited by the lack of organic sources (i.e. litterfall) and was ranked as moderate for both situations.

Organic export is favored by the pulsing hydroperiod and overbank flooding common in alluvial wetlands but is limited by primary productivity and litterfall. Depressional wetlands are generally isolated and trap organic material. Although the proposed mitigation has some depressional wetland features, it will remain connected to the existing forested wetland system during flooding events. Therefore, organic export was ranked moderate for the affected wetlands and the proposed wetland mitigation.

Sediment deposition was ranked moderate in the proposed wetland mitigation project due to moderate to high anticipated woody stem densities, low water velocity, and enhanced microtopographic relief (i.e. bedding). However, a substantial sediment source may not be present in the region (i.e. adjacent areas are primarily forested). Sediment deposition was ranked moderate in the affected wetlands due to the high woody stem densities and location adjacent to riparian areas. There is not a significant source of sediment in the limited upstream watershed surrounding the affected wetlands.

Nutrient/toxicant retention is favored by the pulsing hydroperiod, landscape position (i.e. riparian buffer and depressional), and fine-textured soils within the wetlands. The fine-textured mineral soils favor the adsorption of phosphorus and the pulsing hydroperiod favors nitrogen mineralization. Nutrient sources may present in the upstream watershed of the affected wetlands from existing residential development, septic systems, and commercial development. Nutrient sources are limited within the upstream watershed of the proposed mitigation project. Microtopographic relief is moderate within the affected wetlands but high within the proposed

wetland mitigation project due to the specified bedding procedures. Woody stem density is high within the affected wetlands and the proposed wetland/stream mitigation. Nutrient/toxicant retention was ranked high for the affected wetlands since they are immediately adjacent to open waters and riparian areas.

Although the loamy textured soils provide some in-situ water storage, the wetlands are located along relatively high gradient streams or within depressional features. The affected wetlands have moderate microtopographic relief, but the proposed wetland mitigation project will have high microtopographic relief due to the proposed bedding. Therefore, surface water storage was ranked low in the affected wetlands and moderate within the mitigation project due to the bedding and depressional features.

Consumer activity within the affected wetlands is believed to be moderate due to resource influx from upstream areas and interconnection with open water areas. The proposed wetland/stream mitigation should promote relatively high consumer activity through a combination of added coarse woody debris, wildlife habitat enhancement features, diversity of micro-habitats, and alluvial inputs.

Maintenance of characteristic community structure & composition is moderate within the affected wetlands due to the historical alteration of native forests and construction of impoundments along the tributary. The existing communities within the proposed mitigation site are degraded and characterized by invasive, non-native species. The proposed mitigation project will result in the establishment of native wetland plant communities within a portion of the abandoned recreation field. This function was ranked moderate for the proposed wetland mitigation due to the anticipated restoration of native forest types and implementation of a program to control invasive, non-native species during the monitoring period.

Ground water discharge is believed to be moderate for the affected wetlands and the proposed mitigation project due to the landscape position in a narrow stream valley.

2.5 Potential Functional Effects of the Proposed Project

The proposed project will result in direct impacts to 0.435 acre of open water and 0.284 acre of palustrine forested and scrub-shrub wetlands from the construction of the proposed road crossings. The road crossings have been designed to minimize impacts to the affected wetland areas. The road crossings will allow for adequate baseflow and floodflow to downstream wetland areas. The proposed road crossings will be oriented perpendicular to the existing tributary and will utilize existing substandard crossing locations (i.e. existing dams) where possible. Based on the design considerations and location of the proposed road crossings, we do not expect the proposed crossings to result in degradation of the overall riparian system associated with the unnamed tributary. Minimal wetland functions will be lost as a result of the direct impacts. The lost functions will be replaced as part of the onsite wetland mitigation project (see Table 1).

TABLE 1: Summary of Wetland Function Rankings, Proposed Shawnee Valley Residential Development, Smithfield Township, Monroe County, PA			
Wetland Function and/or Value	**Qualitative Evidence**	**Functional Ranking**	
		Proposed Mitigation	**Affected Wetlands**
Primary productivity	- mildly acid soils - pulsing hydroperiod & periodic flooding - mineral soil matrix - soil disturbance within mitigation area	**LOW (initial) to MODERATE**	**MODERATE**
Litterfall	- native forest cover removed within Wetland B - herbaceous species dominate	**MODERATE**	**MODERATE**
Decomposition	- increased solar radiation due to open canopy forest in affected wetlands and mitigation - pulsing hydroperiod & periodic flooding - predominantly aerobic soils during growing season - limited by organic material sources (i.e. litterfall)	**MODERATE**	**MODERATE**
Organic Export	- pulsing hydroperiod & periodic flooding - limited by litterfall & primary productivity - connected to downstream areas	**MODERATE**	**MODERATE**
Sediment Deposition	- water velocities relatively low due to stream gradient and high woody stem density - sediment loading reduced due to land use upstream	**MODERATE**	**MODERATE**
Nutrient / Toxicant Retention	- water velocities moderate to low - nutrient/toxicant loading possible due to upstream land use - pulsing hydroperiod (aerobic & anaerobic cycles) - silt loam mineral soils provide adsorption sites	**MODERATE**	**HIGH**
Surface Water Storage	- silt loam mineral soil provides some in-situ storage - microtopography moderate in affected wetlands and high in mitigation project - depressional features in mitigation project store water	**MODERATE**	**LOW**
Consumer Activity	- primary productivity is expected to be moderate - influx from upstream watershed - adjacent to open water and riparian areas - added habitat diversity in mitigation project	**MODERATE**	**MODERATE**
Maintenance of Characteristic Community Structure & Composition	- native forest cleared for agriculture in Wetland B - riparian corridor fragmented due to agriculture surrounding Wet. B but will be restored through mitigation - suitable for early succession/disturbance species - non native species dominant in existing buffers	**HIGH**	**MODERATE**
Groundwater discharge	- spring flow noted at base of slopes - low landscape position in stream valley	**MODERATE**	**MODERATE**

3.0 Site Selection

The site proposed for the required compensatory wetland mitigation was selected with the following criteria in mind:

- The proposed mitigation site is located on-site and within the same watershed.
- The on-site hydrology is sufficient to support the designed, created wetland based upon the hydrology data collected and the corresponding earthwork / grading plan.
- The function / value of the created wetland is consistent with the impacted wetlands.

4.0 Site Protection Instrument

The property to be used for the proposed project is currently owned by SS1. Upon completion of the project, the wetland mitigation site will be deed restricted and will be owned by SS1. A draft conservation easement for the wetland mitigation project is contained in Appendix C. Access to the wetland mitigation project, for the purpose of inspection, maintenance, and monitoring will be provided via Hollow Road.

5.0 Baseline Information

5.1 Ecological Description

The entire property is located within the Blue Mountain Section of the Ridge & Valley Physiographic Province (Sevon, 2000). The subject property is underlain by the Ridgeley and Coeymans Formations (Drc) (Socolow, 1980). The wetland mitigation site is located within the PA State Planning Watershed 1D in the Shohola-Bushkill Creek cataloging unit (02040104) (USGS, 1974) (Figure 2). The unnamed tributary is listed as a High Quality - Cold Water Fishery (HQ-CWF) (PA Code Title 25, Chapter 93).

Existing cover types in the vicinity of the proposed wetland mitigation project include abandoned recreational field, forested wetland and transitional woodland. The abandoned recreational field was dominated by unidentified grasses, autumn olive (*Eleagnus* angustifolia), multiflora rose (*Rosa* multiflora), grass-leaved goldenrod (*Euthamia graminifolia*) and Canada goldenrod (*Solidago canadensis*). The forested wetlands adjacent to the unnamed tributary were dominated by red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), northern arrowwood (*Viburnum recognitum*), gray dogwood (*Cornus racemosa*), tussock sedge (*Carex stricta*), skunk cabbage (*Symplocarpus foetidus*) and sphagnum moss (*Sphagnum* sp.). A transitional woodland area is located between the forested wetland and abandoned recreational field. The transitional woodland contains a few semi-mature trees (i.e. >12 inches DBH), but is predominantly dominated by shrubs and herbaceous vegetation. Tree species within the transitional woodland include sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), slippery elm (*Ulmus rubra*), bigtooth aspen (*Populus grandidentata*), green ash and red maple. The shrub stratum is dominated by multiflora rose and privet (*Ligustrum vulgare*) and the herbaceous stratum is dominated by Nepal microstregium (*Microstegium vimineum*).

5.2 Wetlands

Based on a wetland delineation completed in February 2004 through October 2004 by personnel from Piedmont Environmental Consultants, Inc. and reviewed by the USACE, the proposed wetland mitigation area contains no jurisdictional wetlands. Forested wetlands (PFO1B) are adjacent to the unnamed tributary and are described in the latter paragraph. Existing forested wetlands will not be disturbed as part of the proposed project. The surveyed wetland boundary is depicted on the construction plans for the project.

5.3 Soils

Mapped soil types within the wetland & stream mitigation areas primarily include Alden mucky loam (Ad) (Mollic Endoaquepts) and Mardin channery silt loam (MaB) (Typic Fragiudepts) (Figure 3) (Lipscomb, 1981). AGE collected topsoil and subsoil samples from within the wetland mitigation project area. Laboratory analysis by the Penn State University Agricultural Analytical Services Laboratory indicated that the predominant subsoil texture within the proposed wetland mitigation area varied from loam to clay loam (n = 4) and the predominant topsoil texture within the proposed wetland mitigation area was loam (n = 4) (Table 2). Topsoil and subsoil textures varied between soil borings 1 and 2 located in historic fill material associated with an abandoned recreation field and soil borings 3 and 4 located in native soil material.

TABLE 2: Summary of Soil Boring Data from the Proposed Wetland Mitigation Area Shawnee Valley Development, Smithfield Township, Monroe County, PA

Horizon	Soil Boring & Location			
	Boring SB#1 (abandoned recreational field on fill)	Boring SB#2 (abandoned recreational field on fill)	Boring SB#3 Mon. Well (native soil)	Boring SB#4 (native soil material)
A	0-8”, 10YR 4/3 loam	0-8”, 10YR 4/3 clay loam	0-8”, 10YR 3/4 loam	0-4”, 10YR 3/4 loam
B1	8-14”, 10YR 5/3 clay loam (fill) with few, faint, medium, 10YR 5/1 redox depletions as soft masses	8-30”, 10YR 5/3 clay loam (fill)	8-32”, 10YR 4/6 loam,	4-18”, 10YR 4/6 loam with 5% gravel coarse fragments
B2	14-24”, 10YR 4/3 loam	----------	----------	----------
C	>24” rocky / gravelly fill material	----------	32-36”+, 10YR 4/6 loam with 5-10% gravel cs frags	> 18” rocky / gravelly parent material

Soil morphology was observed at four (4) soil boring locations within the proposed wetland mitigation area (Table 2). In general, the soil profiles within the northwestern portion of the proposed wetland mitigation site corresponded with native soil material and were loamy. Soil profiles in the southeastern portion of the wetland mitigation site corresponded with historic clay loam fill material associated with the abandoned recreation field. Soil fertility was determined for topsoil samples obtained within the proposed wetland mitigation site (Table 3).

TABLE 3: Soil Chemical Characteristics of Topsoil Samples Obtained from the Proposed Shawnee Valley Wetland Mitigation Project					
Parameter	**SB1**	**SB2**	**SB3**	**SB4**	**Comment / Recommendation**
pH	6.3	5.8	5.3	5.8	Slightly acid
Phosphorus (lbs/ac)	32.0	26.0	52.0	64.0	Below optimum, fertilize
Potassium (meq/100g)	0.3	0.4	0.2	0.3	Below optimum, fertilize
Magnesium (meq/100g)	0.6	0.7	0.4	0.6	Below optimum, fertilize
Calcium (meq/100g)	8.7	6.1	4.1	5.1	Below optimum, apply lime
Cation Exchange Capacity	12.9	12.9	12.8	11.7	----------
% Organic Matter	5.1	2.7	4.7	3.9	Below optimum, apply organic amendments

Legend

Approximate Mitigation Site Location

Ad - Alden mucky silt loam
CmA - Chippewa and Norwich silt loams, 0-5% slopes
MaB - Mardin channery silt loam, 3-8% slopes

N
W E
S

Sources:
Soil Survey Geographic (SSURGO) database for Monroe County, Pennsylvania, USDA, Natural Resources Conservation Service, Fort Worth, Texas, June 2020.

PEMA 2018 0.5-foot Orthoimagery, specifications are based on the U.S. Geological Survey National Geospatial Program Base Ortho Specification, Version 1.0. The data were developed based on a horizontal projection/datum of NAD83 (2011) State Plane Pennsylvania, US Survey Feet.

Figure 3
SSURGO Soils Map

Wetland Mitigation Plan
Shawnee Development Tract
Smithfield and Middle Smithfield Twps.
Monroe County, Pennsylvania

AGE Project #2532

400
Feet

AMY GREENE ENVIRONMENTAL
a DAVEY company

5.3 Existing Hydrologic Attributes

The primary watercourse associated with the wetland mitigation project is an unnamed tributary to the Delaware River. The tributary originates near the Shawnee Mountain Ski Area and flows southwest into the Delaware River near Shawnee on the Delaware (Figure 2). The watershed upstream from the proposed wetland mitigation site was estimated to be approximately 915 acres (1.43 mi^2) based on USGS topographic information and an examination of upstream drainage patterns.

One (1) automatic water monitoring device was installed within the wetland mitigation project area in January 2006 in accordance with USACE guidelines (WRP, 1993). The automatic shallow groundwater monitoring well installed within the mitigation area was calibrated to collect water elevation data at 24 hour intervals. Short-term hydrologic data from the mitigation area indicate a shallow groundwater table within 25-30 inches of the soil surface at the monitoring well location (Figure 4). However, precipitation during the monitoring period was below normal. Precipitation at the Allentown, PA airport during February, 2006 and March 1 to 26, 2006 was 1.82 inches and 0.92 inches, respectively. Normal precipitation for February is 2.96 inches and normal precipitation for March is 3.77 inches. Based on the below normal precipitation during the monitoring period, we intend to continue collecting data from the monitoring well through spring 2006 in order to validate the wetland mitigation project design.

Shallow groundwater elevations at the monitoring well during the period of record (below average precipitation) ranged from 25 inches to 30 inches below the ground surface (Figure 4). An ephemeral ditch was also observed in the vicinity of the proposed wetland mitigation project. The ditch originates on the mountain slope adjacent to the proposed mitigation site and flows in a northwesterly direction. Flow within the ditch disappears into the unconsolidated fill associated with the abandoned recreational field.

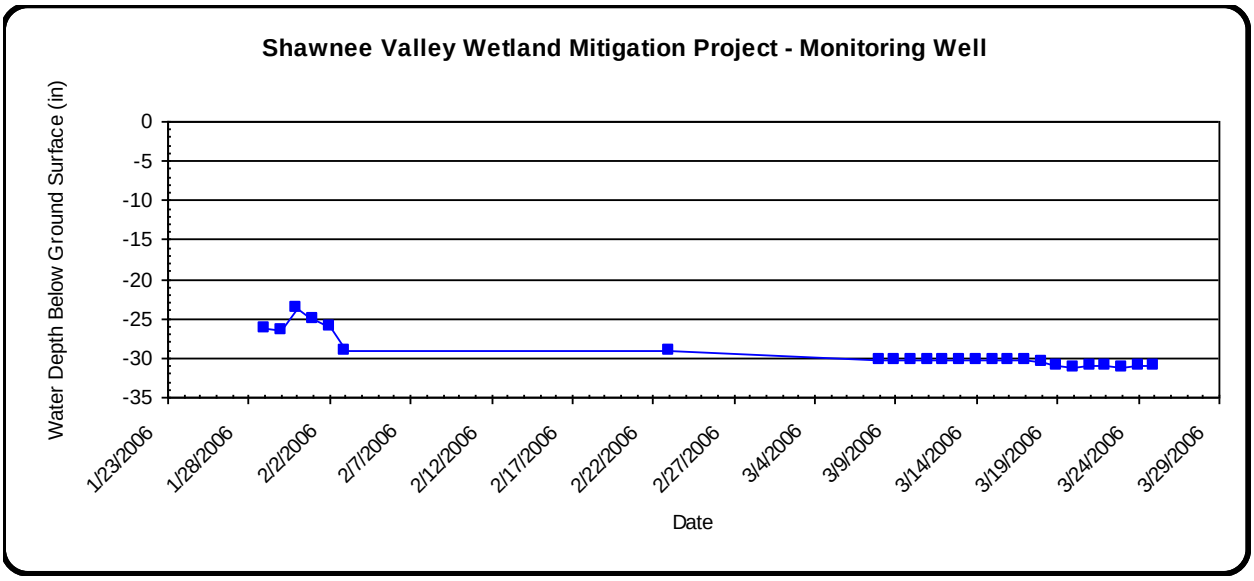

Figure 4: Hydrograph from Monitoring Well at the Shawnee Valley Wetland Mitigation Project, Smithfield Township, Monroe County.

5.4 Plant Communities

Existing plant community types in the vicinity the proposed wetland mitigation project include abandoned recreational field, forested wetland and transitional woodland. The abandoned recreational field was dominated by unidentified grasses, autumn olive (*Eleagnus* angustifolia), multiflora rose (*Rosa* multiflora), grass-leaved goldenrod (*Euthamia graminifolia*) and Canada goldenrod (*Solidago canadensis*). The forested wetlands adjacent to the unnamed tributary were dominated by red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), northern arrowwood (*Viburnum recognitum*), gray dogwood (*Cornus racemosa*), tussock sedge (*Carex stricta*), skunk cabbage (*Symplocarpus foetidus*) and sphagnum moss (*Sphagnum* sp.). A transitional woodland area is located between the forested wetland and abandoned recreational field. The transitional woodland contains a few semi-mature trees (i.e. >12 inches DBH), but is predominantly dominated by shrubs and herbaceous vegetation. Tree species within the transitional woodland include sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), slippery elm (*Ulmus rubra*), bigtooth aspen (*Populus grandidentata*), green ash and red maple. The shrub stratum is dominated by multiflora rose and privet (*Ligustrum vulgare*) and the herbaceous stratum is dominated by Nepal microstregium (*Microstegium vimineum*).

6.0 Determination of Credits

Based on discussions with the Applicant and a review of the development plans, the wetland/waters impacts resulting from the approved project include 0.142 acres of palustrine forested wetlands and 0.435 acres of waters associated with an unnamed tributary to the Delaware River (Figure 2). The Applicant proposes to provide a minimum 0.719 acres of compensatory mitigation through onsite wetland creation within the floodplain of the unnamed tributary (Table 1).

TABLE 1: Summary of Compensatory Wetland & Waters Mitigation Proposed for the Shawnee Land Holdings Project, Smithfield Township, Monroe County, PA

Activity	Category	Permitted Area (ac)	Designed Area (ac)	Mitigation Equivalency
Proposed Unavoidable Wetland Impacts (PFO)	Wetland Impact	0.142 ac @ 2:1 ratio	----------	----------
Proposed Stream & Open Water Impacts	Waters Impact	0.435 ac @ 1:1 ratio	----------	----------
Required Compensatory Mitigation	Required Mitigation	0.719 ac	0.890 ac	----------
Creation of wetlands through excavation, micro-topography enhancement, and planting	Wetland Creation	0.719 ac @ 1:1 ratio	0.890 ac @ > 1:1 ratio	0.89 ac
Mitigation equivalency contained in the proposed wetland/waters mitigation project design =				**0.890 ac**

7.0 Mitigation Work Plan

Detailed construction plans for the proposed wetland creation design are included with this submission. The plans depict the proposed excavation and associated tasks necessary for the creation of 0.89 acre of palustrine forested wetlands. Following construction, a deed restriction will be recorded to protect the wetland mitigation project in perpetuity (Appendix C).

7.1 Proposed Planting & Stabilization

The proposed forested wetland (0.89 ac) will be stabilized by seeding with annual ryegrass (*Lolium multiflorum*) (100 lbs/ac or 2.3 lbs/1000ft^2), redtop (*Agrostis alba*) (5 lbs/ac or 2 oz/1000ft^2), New England aster (*Aster novae-angliae*) (0.5 lb/ac or 0.19 oz/1000ft^2), common sneezeweed (*Helenium autumnale*) (2 lb/ac or 0.75 oz/1000ft^2), and swamp sunflower (*Helenium angustifolius*) (2 lb/ac or 0.75 oz/1000ft^2). The forested wetland will be planted with a combination of containerized plant materials and bareroot planting stock. Plant species specified for installation include pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), American sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), silky dogwood (*Cornus amomum*), northern arrowwood (*Viburnum recognitum*), gray dogwood (*Cornus racemosa*) and buttonbush (*Cephalanthus occidentalis*).

All disturbed areas and cut slopes (0.71 ac) will be planted with native tree/shrub species and seeded with a native, warm season grass mix including little bluestem (*Andropogon scoparius*) (5 lbs/ac or 2 oz/1000ft^2 PLS), big bluestem (*Andropogon gerardii*) (5 lbs/ac or 2 oz/1000ft^2 PLS), Indian grass (*Sorghastrum* nutans) (5 lbs/ac or 2 oz/1000ft^2 PLS), Switchgrass (*Panicum virgatum*) (15 lbs/ac or 5.5 oz/1000ft^2 PLS), oats (*Avena sativa*) (10 lbs/ac or 4 oz/1000ft^2 PLS), annual ryegrass (*Lolium multiflorum*) (10 lbs/ac or 4 oz/1000ft^2 PLS), Black-eyed susan (*Rudbeckia hirta*) (2.0 lb/ac or 0.75 oz/1000ft^2), purple coneflower (*Echinacea purpurea*) (2.0 lb/ac or 0.75 oz/1000ft^2), and Lance-leaved coreopsis (*Coreopsis lanceolata*) (2.0 lb/ac or 0.75 oz/1000ft^2). The upland plantings include eastern redcedar (*Juniperus virginiana*), white pine (*Pinus strobus*), Virginia pine (*Pinus virginiana*), gray dogwood (*Cornus racemosa*), and black chokeberry (*Aronia melanocarpa*). The coniferous plantings will increase the diversity of cover types available for wildlife species.

7.2 Proposed Wildlife Habitat Features

Several design features will be incorporated to promote use of the area by native wildlife species. Dead snags and/or perch trees will be installed within the wetland and cut slope areas. The dead snags are intended to promote the use of the area by woodpeckers and raptors. Use of the area by raptors will help control rodent populations and subsequent damage to planted trees and shrubs. Bluebird nest boxes and bat boxes will also be installed within the site. Coarse woody debris (4-10 inches diameter) will be placed within the wetland creation area to provide habitat for macroinvertebrate and amphibian species. Brush piles will also be constructed within the wetland creation and enhancement area.

7.3 Proposed Hydrologic Attributes

Hydrology for the proposed wetland creation and enhancement area will be derived from several sources including precipitation, seasonally high groundwater/lateral flow, surface flow from the relocated ditch, and occasional peak flows from unnamed tributary. Shallow groundwater (i.e. lateral flow) will be intercepted by excavation along the eastern boundary of the project area. A small ditch will be relocated into the proposed wetland mitigation site and stabilized according to details provided on the design plans. Hydrologic sources from shallow groundwater and surface flow will be spread across the proposed wetland mitigation area by excavation to create a slope less than 1% and bedding perpendicular to the slope to create micro-topographic relief ranging from 8-12 inches. Surface water will be captured within the wetland creation area and infiltrate back into the groundwater table. There will be no surface outlet to the existing wetlands or unnamed tributary.

The anticipated hydroperiod throughout the majority of the wetland mitigation area is anticipated to vary from seasonally saturated to seasonally flooded. Several small closed depressions will be created to form ephemeral ponds within the project area. The hydroperiod of the ephemeral ponds is expected to be seasonally flooded. The hydroperiod of the proposed wetland mitigation area should approximate natural seasonally saturated wetlands (5% – 25% of the growing season) (Environmental Laboratory, 1987).

The proposed actions relating to hydrologic modifications of the site include:

- excavation of the proposed wetland mitigation areas to final elevations specified in the design plans
- relocate a small ephemeral ditch to capture surface flow
- enhance microtopography and reduce surface runoff losses by bedding the site perpendicular to the slope

7.4 Proposed Soils

Existing topsoil within the wetland mitigation area was sampled to determine fertility, texture, and organic matter content (Table 3). Seeding and stabilization specifications were based on the site specific soil analysis. Organic amendments such as leaf mulch and/or woody chips will be identified from local sources and transported to the site prior to and or during excavation. Organic amendments will be incorporated with the topsoil to increase the organic matter content. Organic amendments, free of noxious weed seeds, should be equivalent to approximately one-third of the topsoil volume.

7.5 Pest Management

In order to reduce the damage associated with deer browsing, select tree and shrub species may be protected with tree shelters or the wetland mitigation project may be fenced with an eight (8) foot deer exclusion fence. Containerized tree and shrub species will be protected from rodent damage by installation of photodegradable plastic collars.

8.0 Maintenance Plan

Invasive and/or exotic plant species will be controlled during the monitoring period. Ultimately, the applicant (SS1), is responsible for routine maintenance and pest management within the wetland mitigation project area. Common invasive species anticipated in the proposed wetland mitigation site include multiflora rose, common reed (*Phragmities australis*), purple loosestrife (L*ythrum salicaria*), and reed canary grass (*Phalaris arundinaceae*). Routine maintenance for control of unwanted plant species will be conducted twice during each growing season to ensure that these species do not become well established within the wetland mitigation site. The routine maintenance may include digging, pulling, and/or removing invasive plants from the wetland mitigation areas. If necessary, a suitable herbicide treatment will be applied by a certified pesticide applicator.

9.0 Performance Standards

The proposed Shawnee Valley Wetland Mitigation Project will be deemed "successful" if, after a period of five (5) years following completion of construction, the specified wetland creation area (i.e. 0.719 acres) has been created, there is at least 85% survival of mitigation plantings throughout the wetland creation and enhancement areas, and at least 85% coverage of desirable plant species throughout the wetland creation and enhancement areas. Wetland areas will be documented by a post-construction, as-built survey and field wetland delineation of the wetland mitigation project based on techniques specified in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). Plant survival and coverage estimates will be documented through the approved monitoring protocols contained in this report.

10.0 Monitoring Requirements

The proposed monitoring period will commence following completion of construction and continue for a period of five (5) years or until all success criteria are achieved, whichever is longer.

The extent of wetland hydrology will be verified by review of field indicators during wetland delineation and data obtained from onsite monitoring devices. A total of two (2) automatic recording wells (i.e. RDS Ecotone-40 model) will be installed at representative locations within the wetland creation area. Monitoring wells will be distributed to adequately describe the hydrologic conditions within the wetland mitigation areas. Automatic monitoring wells will be maintained throughout the monitoring period to collect data at a 24 hour interval throughout the year.

Vegetative success criteria will be evaluated by systematic sampling within the wetland mitigation area. Permanent vegetation plots will be established within the wetland mitigation area at four (4) representative locations. Plots will be located in the field and mapped on the "as-built" survey of the wetland mitigation area. The proposed sampling methodology for inventory

plots is discussed in detail by Peet et al. (1998). An abbreviated discussion of the procedure follows. The standard observation unit will be a 10 x 10 meter module (0.01 ha/0.02 ac). Generally, each plot will consist of a 2 x 2 array of modules (0.04 ha/0.10 ac). A 2 x 5 array is the recommended size for description of forest communities (Peet et al., 1998), however, smaller arrays may be used in areas with homogeneous overstory vegetation or dense understory. Within each array, woody stem presence, cover, and diameter, and height will be recorded within each module. Depending on coverage of herbs and bryophytes, these strata will be sampled using a subset of modules or nested quadrats within modules. Plot and site data will be recorded for each array including soil morphology, aspect, slope, elevation, topographic position, and total estimated cover of the vegetative strata (trees, saplings, shrubs, herbs, vines, and bryophytes).

If 85% survival of the planted trees and shrubs is not achieved the mitigation site may need to be replanted to compensate for the species that did not survive or otherwise failed to become established. Likewise, areas that fail to achieve 85% cover may need to be re-seeded and/ or replanted to establish the required coverage.

11.0 Long-Term Management Plan

The mitigation site will continue to be maintained following the mandatory (5) monitoring period to address issues that may arise over time including but not limited to invasive species management, soil erosion, unexpected mortality of the established vegetation, damage from herbivory (i.e. deer browse / buck rub), sediment deposition from adjacent sites and / or site vandalism.

Annual site inspections are recommended, at a minimum, and should be conducted in late spring / early summer (May – July) after herbaceous plants have emerged and the deciduous trees and shrub have fully leaved out to help determine the health / vigor of the established plants. The presence and severity of invasive species should be noted and if necessary a management strategy developed which may include manual removal and / or herbicide application.

The site owner of record (currently SS1) will be solely responsible for the long-term management of the mitigation site to maintain its' function and value and the associated cost of inspections, any necessary maintenance activities and / or corrective measures. Annual long-term maintenance costs will vary depending on the condition of the site and if any maintenance is required. As the site will be deed restricted, USACE will have the authority to access and inspect the site to ensure it is being properly maintained.

12.0 Adaptive Management Plan

An adaptive management plan will be employed to address unforeseen site conditions, issues with the compensatory wetland mitigation design and any other factors that would otherwise impede the successful construction and restoration of the proposed mitigation site. This is especially important given the original mitigation proposal was submitted and approved in 2006 and as such site conditions could have changed since the data and observations were originally collected.

It is advisable therefore to utilize the project designer for construction oversight, post-construction monitoring, maintenance inspections and maintenance supervision due to the familiarity with the design methodology and pre-existing site conditions. This is the key component of the suggested adaptive management plan.

Revisions to the original mitigation design will be suggested as needed during construction, should unexpected site conditions arise. All suggested recommendations / revisions will be communicated to USACE for guidance and approval. Corrective measures will be recommended should construction and / or restoration not progress as anticipated (such as modifying the grading plan to compensate for unforeseen changes in on-site hydrology).

Regular site inspections should be conducted by a qualified restoration ecologist or professional wetland scientist during construction and restoration to identify any developing issues and determine if corrective measures / design modifications are warranted. Typical modifications may include substituting plant species, modifying seed mix compositions, incorporating erosion control measures to mitigate unexpected erosion issues and incorporating wildlife controls such as herbivory fence and / or deer fence to minimize damage to the installed plant materials.

All suggested modifications will be documented and submitted to USACE for guidance and approval. The site will continue to be monitored for (5) years once construction and restoration is completed to further document the condition of the mitigation site, establishment of vegetation and to report any issues with its' development.

13.0 Financial Assurances

Financial assurances are required by USACE (33 CFR 332.3(n)) to ensure the construction and maintenance of the compensatory mitigation site is fully funded. As the referenced project is being facilitated by a private owner (SS1) it is understood that USACE may require proof (i.e. trust fund or bond) that the required funds are secured prior to construction being authorized. The estimated costs associated with the construction, monitoring and maintenance of the proposed mitigation site are included in Table 5.

Table 5 – Estimated Costs for the Construction, Monitoring and Maintenance of the Shawnee Valley Development Compensatory Mitigation Site

Description	**Estimated Costs**
site clearing	$ 20,000
excavation and site grading	$ 106,000
seed application	$ 10,000
plantings (containers and bare root)	$ 15,000
herbicide application (during construction)	$ 7,500
as-built survey	$ 5,000
5 year post-construction monitoring and reporting	$ 75,000
5 year maintenance costs (invasive species, management, re-plantings, re-seeding etc…)	$ 80,000
Total Cost (estimated)	**$ 318,500**

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APPENDIX A

Coordination & Correspondence

Pennsylvania Department of Environmental Protection

2 Public Square
Wilkes-Barre, PA 18711-0790
February 16, 2010

Northeast Regional Office

570-826-2511
Fax 570-830-3016

CERTIFIED MAIL NO. 7008 3230 0002 4876 7025

Mr. Ted Hunter
Senior Vice President
Shawnee Development, Inc.
8427 South Park Circle
Orlando, FL 32819

Re: Water Obstruction & Encroachment Permit
DEP Application No. E45-482
APS No. 565493
Shawnee Development Phases 1B through 4
Smithfield Township and Middle Smithfield
Township, Monroe County

Dear Mr. Hunter:

Enclosed are duplicate copies of your Water Obstruction and Encroachment Permit. Please review the permit so that you are aware of the extent of the authorization and conditions. **PLEASE SIGN BOTH COPIES OF THE WATER OBSTRUCTION & ENCROACHMENT PERMIT, RETURN THE FILE COPY TO THIS OFFICE WITHIN 15 DAYS AND KEEP THE OTHER COPY FOR YOUR RECORDS.** A self-addressed envelope is enclosed for your convenience. Please note that you do not have authorization to begin your project until DEP receives your signed copy of the Water Obstruction & Encroachment Permit. **IF YOU BEGIN WORK PRIOR TO DEP RECEIVING THE SIGNED COPY OF THE PERMIT, YOU ARE SUBJECT TO PENALTIES TOTALING UP TO $10,000 PER DAY.** The Department will provide you with an acknowledgment letter upon receipt of the fully-signed permit.

Prior to the commencement of construction, the enclosed Acknowledgment of Apprisal of Permit Conditions must be completed and signed by you and an individual responsible for the supervision or conduct of the construction work, acknowledging and accepting the general and special conditions contained in the permit. Unless the signed Acknowledgment of Apprisal of Permit Conditions is submitted to this office, the permit is void.

A copy of both the Permit and the Acknowledgment of Apprisal of Permit Conditions must be available at the work site for inspection upon request by any officer or agent of the Department or any other Federal, State, County and Municipal agency.

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, 717-787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, 800-654-5984. Appeals must be filed with the Environmental

Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in Braille or on audiotape from the Secretary to the Board at 717-787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD (717-787-3483) FOR MORE INFORMATION.

Should you have any questions about this permit, please contact Kevin S. White, P.E., Environmental Group Manager, Watershed Management Program, at the above telephone number.

Sincerely,

Joseph J. Buczynski, P.E.
Environmental Program Manager
Watershed Management Program

Enclosures

cc: Ms. Estelle Eberhardt/Irick, Eberhardt & Mientus, Inc.

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT CORPS OF ENGINEERS
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA, PENNSYLVANIA 19107-3390

REPLY TO
ATTENTION OF

JAN 16 2009

Regulatory Branch
Applications Section II

SUBJECT: CENAP-OP-R-2006-00051
Shawnee Valley Development
PADEP - E45-482

Attn: Mr. Gene Trowbridge
Pennsylvania Department of Environmental Protection
Northeast Regional Office
Soils and Waterways Section
Two Public Square
Wilkes Barre, Pennsylvania 18701-3296

Dear Gene:

This is in regard to an application by C & M Shawnee Land Holdings, Mr. John Ciliberto for a Department of the Army permit to construct a residential subdivision in Smithfield Township, Monroe County, Pennsylvania.

Upon review of the application submitted by your office, the U.S. Army Corps of Engineers has determined that the above referenced project qualifies for the Pennsylvania State Programmatic General Permit (PASPGP-3), provided the special conditions enumerated in the enclosed letter are included with the permit. Consequently, should your office determine to authorize the project, please forward the enclosed letter to the permittee as an attachment to the PASPGP-3 in association with the State permit.

Should you have any questions regarding this matter, please contact Melissa Mertz of this office at (570) 842-1044 between the hours of 1:00 and 3:30 p.m. or by writing to the above address.

Sincerely,

Michael P. Leggiero
Senior Staff Biologist

Enclosure

DEPARTMENT OF THE ARMY

PHILADELPHIA DISTRICT CORPS OF ENGINEERS
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA, PENNSYLVANIA 19107-3390

REPLY TO
ATTENTION OF

Regulatory Branch
Applications Section II

JAN 16 2009

SUBJECT: CENAP-OP-R-2006-00051 (PASPGP-3)
PADEP #: E45-482
Project Name: Shawnee Valley Development

C & M Shawnee Land Holdings, L.P.
Mr. John Ciliberto
2421 Bristol Road
Warrington, PA 18976

Dear Mr. Ciliberto:

Reference is made to the application submitted to place fourteen (14) crossings of regulated waters and wetlands to facilitate a residential subdivion. The work is to be done on both the northern and southern side of Hollow Road, surrounding Sun Mountain Lake and Shawnee Lake, MonroeCounty, Pennsylvania.

You are hereby authorized by the U.S. Army Corps of Engineers to conduct the above referenced work under the authority of the enclosed Pennsylvania State Programmatic General Permit (PASPGP-3) (Enclosure 1). Please note that you must conduct the authorized work in accordance with the requirements and conditions of the PASPGP-3 and the following special conditions:

Special Conditions:

1. All work done in association with the above noted project shall be conducted in accordance with the project plans identified as: "PROPOSED CULVERT CROSSING NUMBER...", prepared by Urban Research and Development Corporation, dated September 12, 2005, unrevised, scale 1"=50', sheets 1, 2, 3, 10, 11, 12, and 16 of 16 and plans with a revision date of December 2, 2008, sheets 4 – 9, 13, 14 and 15 of 16. The stated purpose of the project is to provide access to a proposed residential subdivision. The project plans provide for 0.457 acre of permanent impact to waters of the U.S. including wetlands and 0.413 acre of temporary impacts to waters of the U.S. including wetlands (Enclosure 2).

2. Construction activities shall not result in the disturbance or alteration of greater than 0.87 acre of waters of the United States.

3. Any deviation in construction methodology or project design from that shown on the above noted drawings must be approved by this office, in writing, prior to performance of the work. All modifications to the above noted project plans shall be approved, in writing, by this office. No work shall be performed prior to written approval of this office.

4. This office shall be notified within 10 days of the completion of the authorized work by completing and signing the enclosed "PASPGP-3 PERMIT COMPLIANCE, SELF CERTIFICATION FORM" (Enclosure 3). All notifications required by this condition shall be in writing and shall be transmitted to this office by registered mail. Oral notifications are not acceptable. Similar notification is required each time maintenance work is to be done under the terms of this Corps of Engineers permit.

5. The permittee shall comply with all Erosion and Sedimentation requirements as required by the Monroe County Conservation District.

6. In accordance with the proposed conservation easement plan entitled "Shawnee Valley Final Plan Conservation Easements", prepared by Urban Research and Development Corporation, dated March 20, 2007, no revisions, scale 1"= 150', sheet 1 of 1, the area depicted as the conservation easement area shall be placed in a conservation easement that shall be reviewed by and concurred to in writing by both this office and the State College office of the U.S. Fish and Wildlife Service. This shall occur prior to the start of the regulated activities. This area includes the proposed mitigation area.

7. The permittee shall create 0.719 acre of mitigation to compensate for the project impacts. This mitigation area is located within the Conservation Easement area as cited in Special Condition 6. The mitigation area shall be constructed and planted in accordance to the following approved plans: SHAWNEE LAKE DEVELOPMENT WETLAND MITIGATION", prepared by Amy S. Green Environmental Consultants, Inc., dated march 30, 2006, unrevised, scale 1" = 20', sheets 1 and 2 of 2.

8. The mitigation area shall be monitored as per the success criteria depicted in section 4.0 of the "COMPENSATORY WETLAND MITIGATION PROPOSAL AND DESIGN PLAN" document, dated March 30, 2006. In addition to the success criteria depicted here the monitoring report shall also contain:

a. The name of the person performing the evaluation;
b. A list of any invasive species encountered on the site;
c. Methods to control any invasive species encountered;
d. The percent of aerial coverage by plants considered to by hydrophytes (FAC or wetter);
e. Photographs of the site and a map depicting the photo locations;
f. A summary of any corrective measures that might be needed.

9. At the end of the five (5) year monitoring period described in Special Condition 8, the wetland mitigation area shall exhibit at least 85% aerial coverage by hydrophytic vegetation.

10. Monitoring of the mitigation area shall take place during the growing season (between April and October) and the report shall be submitted to this office by December 31st of each year for

the five (5) year period beginning in 2009. This monitoring period may be extended and/or additional work may be required by this office to ensure 0.719 acre of successful wetland creation.

11. An as-built plan of the wetland mitigation area shall be submitted to this office within thirty (30) days of the completion of the construction of the mitigation area. This plan shall depict spot elevations in order to confirm proper grading of the site.

12. Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 8 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers.

13. A deed restriction shall be developed for the following lots: Lot 101, 102, 103, 104, 105, 113, 114 for areas demarcated as waters of the U.S. including wetlands. The approved jurisdictional determination plan description is as follows: Plans prepared by Urban research and Development Corporation, entitled "SHAWNEE VALLEY AMENDED FINAL PLAN NATURAL FEATURES", dated November 15, 2004, last revised February 1, 2007, scale 1"=400', sheet 1 of 5; "SHAWNEE VALLEY AMENDED FINAL PLAN NATURAL FEATURES", dated November 15, 2004, last revised February 1, 2007, scale 1"=100', sheet 2 of 5; and "SHAWNEE VALLEY AMENDED FINAL PLAN NATURAL FEATURES", dated November 15, 2004, last revised April 25, 2006, sheets 3-5 of 5. A draft of this deed restriction shall be sent to the Corps for review and written approval within sixty (60) days of the date of this permit. Upon approval by this office, the deed restriction shall be recorded with the property deed. Within thirty (30) days of the date of the approval, a copy of the recorded deed restriction shall be sent to this office. No regulated activities can occur on these properties until the deed restriction has been recorded.

14. Signs shall be place along all residential lots which abut the conservation easement area. The wording for these signs shall be as depicted on Enclosure 4.

15. The permittee is responsible for ensuring that the contractor and/or workers executing the activity(s) authorized by this permit have knowledge of the terms and conditions of this authorization and that a copy of the permit document is at the project site throughout the period the project is underway.

If you should have any questions regarding this matter, please contact Melissa Mertz of this office at (570) 842-1044 or write to the above address.

Sincerely,

Michael P. Leggiero
Senior Staff Biologist

Enclosures

Copies Furnished:

PADEP, NE Regional Office (Wilkes-Barre, PA) - E45-482
Monroe County Conservation District
Urban Research and Development Corporation–Mr. Len Policelli
Penn's Trail Environmental–Maureen Watson/McDermott
Smithfield Township
U.S. Fish and Wildlife Service–State College
CENAP-OP-R (Mertz)

APPENDIX B – Color Photographs

PHOTO #1: Looking northwest from the existing backstop within the abandoned recreation field (1/27/06)

PHOTO #2: Looking northeast at abandoned recreation field and proposed wetland mitigation site (1/27/06)

APPENDIX B – Color Photographs

PHOTO #3: Looking northeast at the transitional woodland between the existing wetlands and the abandoned recreation field (1/27/06)

PHOTO #4: Looking northwest at the existing forested wetlands adjacent to the unnamed tributary (1/27/06)

APPENDIX B – Color Photographs

PHOTO #5: Looking north at the ditch as it disappears into unconsolidated fill associated with the recreation field. The ditch will be routed into the wetland mitigation project (1/27/06)

PHOTO #6: Looking south at the small ditch flowing from the hillslope adjacent to the proposed mitigation project.

APPENDIX C
Proposed Deed Restriction for Wetland Mitigation Area

WHEREAS, Shawnee Stage 1, LLC of Shawnee on Delaware PA, hereinafter called the Grantor, is the owner in fee simple of certain real property, hereinafter called "Restricted Property", which property is described as follows:

(insert metes and bounds)

WHEREAS, the Restricted Property is a wetland or a compensatory wetland mitigation project under the regulatory jurisdiction of the Philadelphia District of the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act (33 USC 1344).

WHEREAS, the Grantor is the applicant for a Corps of Engineers permit, number **«ACTIONID»**, to place fill in wetlands other than that property called restricted property, hereinafter called "other wetlands", in accordance with plans which form a part of the U.S. Army Corps of Engineers permit number **«ACTIONID»** and; the U.S. Army Corps of Engineers has regulatory jurisdiction of said wetland pursuant to Section 404 of the Clean Water Act (33 USC 1344).

WHEREAS, the Grantor and the U.S. Army Corps of Engineers have reached an agreement whereby the Grantor will be permitted to place fill in other wetlands in accordance with the terms and conditions of Corps of Engineers permit number **«ACTIONID»** , and; that in consideration for the Grantor to place fill in other wetlands, the Grantor will mitigate the adverse environmental effects resulting from the placement of fill material in other wetlands by enhancing, enlarging,and/or creating wetlands per the approved wetland mitigation plan and establishing a buffer around said wetlands (if required by the Corps of Engineers), which when completed will be what is described as the Restricted Property and dedicating the realty described as Restricted Property for the perpetual use as a conservancy area in accordance with the terms and conditions f this document and the above mentioned permit.

WHEREAS, a permit to place fill in other wetlands would not have been granted but for the dedication of the Restricted Property for environmental mitigation, and; which in 30 days of the receipt of this document from the U.S. Army Corps of Engineers, the Grantor shall submit to the U.S. Army Corps of Engineers a certified copy of this document, as recorded in the office of

the County Recorder for Monroe County, Pennsylvania; and the Grantor specifically acknowledges as fact that said permit is issued in consideration for the execution and recording of this document and compliance with the covenants and deed restrictions herein.

NOW THEREFORE, the Grantor, for and in consideration of the facts recited above enters into the following covenants and deed restrictions on behalf of himself/herself, his/her heirs and assigns:

1. The U. S. Army Corps of Engineers will have the right to enforce by proceedings in law or equity the covenants and deed restrictions set out herein and this right shall not be waived by one or more incidents of failure to enforce said right;
2. Employees of the U. S. Army Corps of Engineers will have the right to view the Restricted Property in its natural, scenic, and open condition and the right to enter Restricted Property at all reasonable times for the purpose of inspecting Restricted Property to determine if the Grantor, or his heirs or assigns, is complying with the covenants and deed restrictions herein;
3. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no dredged or fill material placed on Restricted Property except as necessary for completion of mitigation as provided pursuant to the U.S. Army Corps of Engineers permit number **«ACTIONID»**.
4. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no commercial, industrial, agricultural, residential developments, buildings, or structures, including but not limited to: signs, billboards, other advertising material, or other structures placed on Restricted Property.
5. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no removal or destruction of trees or plants, mowing, draining, plowing, mining, removal of topsoil, sand, rock, gravel, minerals or other material except as necessary for completion of mitigation as provided pursuant to the U.S. Army Corps of Engineers permit number **«ACTIONID»** and the associated special conditions.
6. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no operation of snowmobiles, dunebuggies, motorcycles, all-terrain vehicles or any other types of motorized vehicles, except as necessary for completion of mitigation as provided pursuant to the U.S. Army Corps of Engineers permit number **«ACTIONID»**.
7. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no application of insecticides

or herbicides except as specified by U. S. Army Corps of Engineers permit number **«ACTIONID»**.
8. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no grazing or keeping of cattle, sheep, horses or other livestock.
9. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no hunting or trapping on the Restricted Property.
10. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no utility lines placed overhead or within the Restricted Property, including but not limited to: telephone or other communication lines, electrical, gas, water or sewer. Existing lines may remain, but any maintenance
work requiring intrusion into the Restricted Property shall require prior authorization by the U.S. Army Corps of Engineers.
11. Without prior express written consent from the U. S. Army Corps of Engineers there shall be no modifications to the hydrology of the Restricted Property, either directly or indirectly, that would allow more water onto, or that would drain water away from, the Restricted Property. Such prohibited modifications include, but are not limited to: ditching, changes to any water control structures, repairing of drainage tiles, or alterations to any naturally occurring structures.
These land use restrictions and other terms of these deed restrictions and covenants may be changed, modified or revoked only upon written approval of the U.S. Army Corps of Engineers. To be effective such approval must be witnessed, authenticated, and recorded pursuant to the law of the Commonwealth of Pennsylvania. Except as expressly limited herein, the Grantor reserves for him/herself, his/her heirs and assigns, all rights as owner of Restricted Property, including the right to use the property for all purposes not inconsistent with this grant. The terms and conditions of these deed restrictions and covenants shall, as of the date of execution of this document, bind the Grantor to the extent of his legal and/or equitable interest in Restricted Property, and; these deed restrictions and covenants shall run with the land and be binding on the Grantor and his heirs and assigns forever. The terms and conditions of these deed restrictions and covenants shall be both explicitly included in any transfer, conveyance, or incumbrance of Restricted Property or any part thereof, and; any instrument of transfer, conveyance, or incumbrance affecting all or any part of Restricted Property shall set forth the terms and conditions of this document.

IN WITNESS WHEREOF, said Grantor has caused its corporate seal to be hereto affixed, and has caused its name to be signed to these presents by its President, and attested by its Secretary, this __ day of _____ , 2006.

IMPRESS (Name of Corporation)
CORPORATE SEAL
HERE
BY
PRESIDENT
ATTEST:
SECRETARY

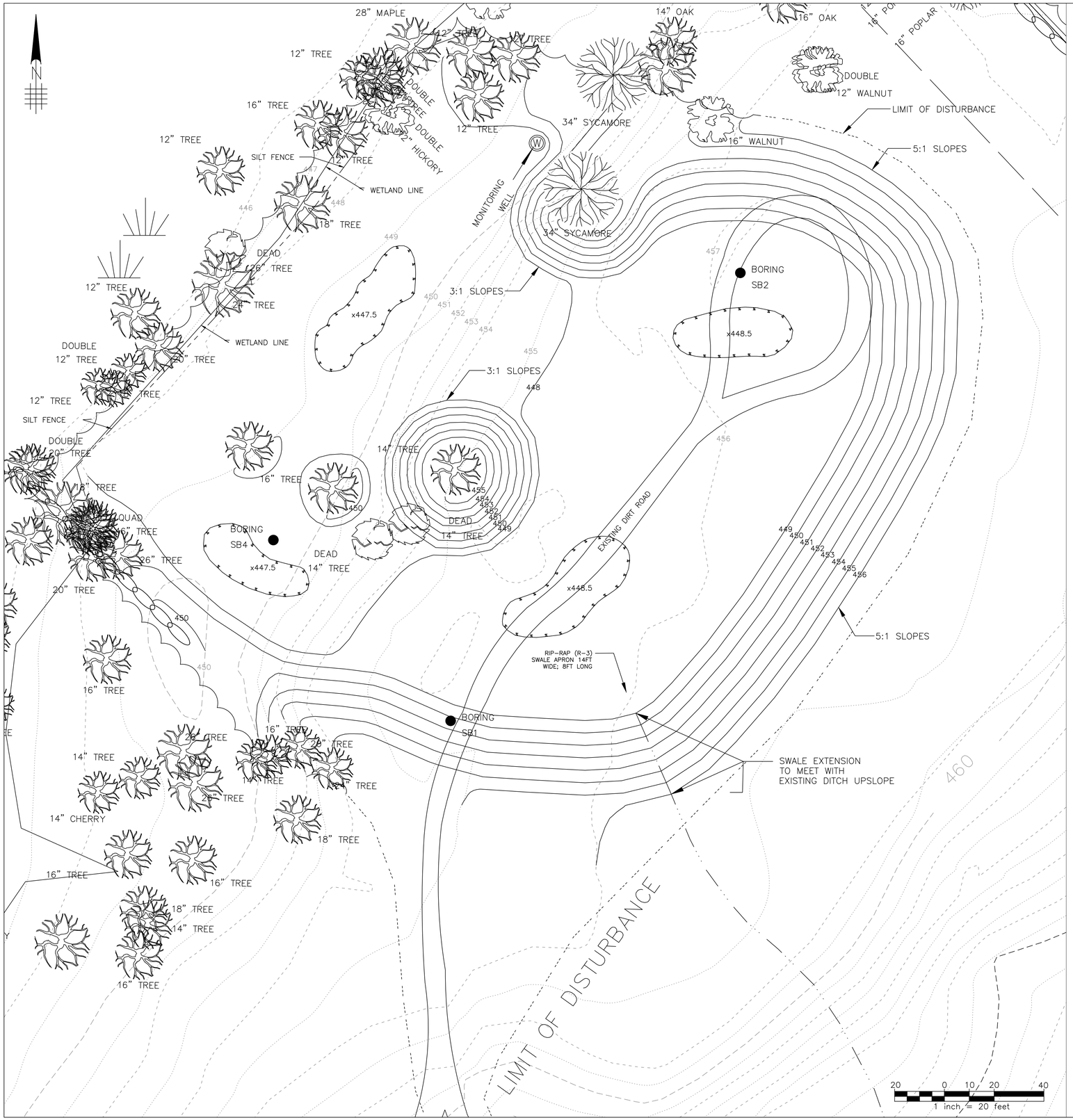
Commonwealth of Pennsylvania, County of Monroe

I, the undersigned, a Notary Public in and for said County, in the Commonwealth aforesaid, DO HEREBY CERTIFY, that personally known to me to be the President of the corporation, and personally known to me to be the Secretary of said corporation, and personally known to me to be the same persons whose names are subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that as such President and Secretary, they signed and delivered the said instrument, and caused the corporate seal of said corporation to be affixed thereto, pursuant to authority given by the Board of Directors of said corporation, as their free and voluntary act, and as the free and voluntary act and deed of said corporation, for the uses and purposes therein set forth,

Given under my hand and official seal, this day __ of _____ , A.D. 2006.

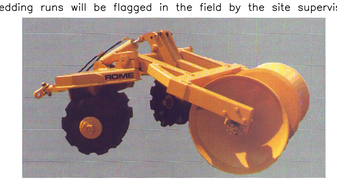
NOTARY PUBLIC
My Commission expires , 20__

APPENDIX D
Wetland Mitigation Design Plans



Bedding Notes:

1. Prior to bedding, the wetland creation & enhancement areas will be disked as specified in the disk treatment detail. The disk will be aligned to provide maximum micro-bedding of the soil. Disking will be primarily oriented perpendicular to the slope and should follow the approximate route of the specified bedding runs.
2. All bedding shall be conducted in accordance with the notes and specifications contained on this plan.
3. Bedding shall be completed using a Marden Model DB-4WP-LT or Rome Model TRBRS-6 bedding harrow. Similar equipment may be acceptable but must be approved in writing by the site supervisor.
4. Bedding shall approximately follow the topographic contours within the wetland creation area as indicated on this plan and should be at least 12 inches in height.
5. Bedding runs will consist of parallel passes of the bedding plow on 10-foot centers.
6. Bedding runs will be flagged in the field by the site supervisor.



Disk Treatment Detail:

1. Disk treatment is intended to break up the surface soil and create micro-relief within the wetland creation area (.89 ac) and cut slopes (.71 ac).
2. The disk treatment will be accomplished using low ground pressure equipment such as typical agricultural equipment, ATVs or similar vehicles approved by the site supervisor.
3. Disk treatment will consist of surface tillage within the wetland creation area and cut slopes as designated on the plans. The depth of surface tillage shall be between 4-6 inches.
4. A disk similar to the Tufline ATVD series all-terrain vehicle disk or typical agricultural equipment may be used.
5. The minimum vertical tillage depth shall be 4 inches as measured by field performance, as determined solely by the site supervisor.
6. The maximum horizontal distance between disks shall be 12 inches as measured by field performance, as determined solely by the site supervisor.
7. The disking should be conducted with one pass oriented perpendicular to the slope of the wetland creation area. On cut slopes, the contour disking should be conducted with one pass oriented perpendicular to the slope.
   Disking should be completed at least 24 hours prior to planting, unless directed otherwise by the site supervisor.

PERMANENT SEEDING & STABILIZATION (Cut Slopes - 0.61 acre)

1. All disturbed areas will be permanently seeded and stabilized with the specified seed mixtures. In addition, all disturbed areas within the Wetland Mitigation Project will be planted with native tree, shrub, and/or herbaceous species according to the details specified in the Planting Plan for the Wetland Mitigation Project. Forested and scrub-shrub wetlands and upland transition areas will be planted at an average density of 730 woody plants/acre.
2. Spring seeding should be completed between March 1 and April 30. Fall seeding will not be permitted on cut slopes without modification of the proposed seed mixture. Any modification to the approved seed mixture requires written acceptance by the Monroe County Conservation District.
3. All wetland transition areas and cut slopes will be fertilized with 1100 pounds per acre of 5-10-5 or equivalent with 30-60% slow release nitrogen. Agricultural lime should be applied at a rate of 2,200 lbs/ac to improve pH, calcium and magnesium levels. Lime and fertilizer application rates are based upon site specific soil fertility testing and analysis by the Penn State Agricultural Analytical Services Laboratory.
4. Fertilizer and lime will be incorporated and the seedbed will be prepared by contour disking with a disk, springtooth harrow, or other suitable equipment to a depth of 4 inches.
5. Cut slopes adjacent to the wetland creation area, and soil stockpiles will be seeded with little bluestem (Andropogon scoparius) (5 lbs/ac or 2 oz/1,000ft2 PLS), big bluestem (Andropogon gerardii) (5 lbs/ac or 2 oz/1000ft2 PLS), Indian grass (Sorghastrum nutans) (5 lbs/ac or 2 oz/1,000ft2 PLS), Switchgrass (Panicum virgatum) (15 lbs/ac or 5.5 oz/1,000ft2 PLS), oats (Avena sativa) (10 lbs/ac or 4 oz/1,000ft2 PLS), annual ryegrass (Lolium multiflorum) (10 lbs/ac or 4 oz/1000ft2 PLS), Black-eyed susan (Rudbeckia hirta) (2.0 lb/ac or 0.75 oz/1,000ft2), purple coneflower (Echinacea purpurea) (2.0 lb/ac or 0.75 oz/1,000ft2), and Lance-leaved coreopsis (Coreopsis lanceolata) (2.0 lb/ac or 0.75 oz/1,000ft2).
6. Seed will be spread uniformly by hand, centrifugal seeder, drop seeder, drill or cultipacker seeder at the specified rates.
7. After seeding, the soil should be firmed with a corrugated roller or drag mat to ensure good seed to soil contact. The soil firming should be performed on the contour using a roller operated perpendicular to the slope.

All seeded areas will be mulched with 3 tons/ac straw or mulch hay (free of undesirable seeds). Straw mulch will be spread uniformly by hand or mechanically so that 85% of the soil surface is covered and anchored using liquid tackifier or crimper.

Shawnee Valley Wetland Mitigation Project Construction Sequence Notes:

1. Survey and stake limits of disturbance, top of slope, toe-of-slope, wetlands, and other sensitive areas (week 1).
2. Install silt fence and additional erosion and sediment controls as specified (week 2). (See URDC Plans for Shawnee Valley Ib.)
3. Maintain all specified erosion and sediment controls as necessary throughout construction (week 2 through completion of construction).
4. Import organic soil amendments as necessary to incorporate with topsoil or spread over topsoil after final grade is achieved (week 2-8)
5. Strip and stockpile 6-8 inches of topsoil and organic material from the wetland creation & enhancement areas and place in temporary onsite stockpile (week 3). Placement and staging of topsoil within the specified limits of disturbance is at the discretion of the earthwork contractor.
6. Excavate to specified subgrade elevation within the limits of disturbance. Subgrade elevation will be verified by the site supervisor (week 3-6). Refer to dewatering dtail for dealing with water in work area.
7. Remove excavated material offsite or to permanent stockpile locations and mass grade (week 3-6).
8. Stake toe-of-slope location as necessary (week 4-6).
9. Site supervisor will verify subgrade and final grade elevations as necessary (week 4-6).
10. Replace and grade 6-8 inches of topsoil and organic material within wetland creation areas to achieve final design elevation (week 7).
11. Disk wetland creation basin and cut slopes as indicated on the Disk Treatment detail shown on the Grading Plan for the Wetland Mitigation Project (week 8).
12. Create micro-topography according to the details specified on the Grading Plan for the Wetland Mitigation Project (week 9).
13. Install wildlife habitat features as indicated by the site supervisor and as shown on the Planting Plan for the Wetland Mitigation Project (week 9).
14. Apply permanent seed mixtures for the wetland creation areas and cut slopes. Lime, fertilize and mulch all disturbed areas as specified (week 10).
15. Install woody plant materials (after permanent seed mixtures are applied) as specified on the Planting Plan for the Wetland Mitigation Project. Planting should be conducted between March 15 and May 15 (week 11 or within suitable time period).

Remove temporary erosion & sediment controls and demobilize equipment (week 12).

GENERAL CONSTRUCTION NOTES

1. Jurisdictional wetland boundaries within the Wetland Mitigation Project Area will be adequately marked prior to commencement of construction activities to prevent trafficking and/or disturbance during construction.
2. Erosion and sedimentation controls will be installed and maintained according to the approved Erosion Control Plan for the Wetland Mitigation Project prior to any earth moving activities. (See URDC Plans for Shawnee Valley Ib.)
3. Organic amendments such as wood chips and/or leaf mulch will be added to the topsoil within the wetland creation area prior to establishment of final grade. Organic amendments should be equivalent to 25% volume of the topsoil or approximately 2-3 inches of organic amendments spread evenly or incorporated with the topsoil.
4. Approximately 6-8 inches of topsoil material and organic amendments will be stripped prior to grading and stockpiled onsite.
5. Graded areas and cut slopes will be excavated 6-8 inches below the specified grade and backfilled with 6-8 inches of stockpiled topsoil material (available from onsite sources).
6. The limits of disturbance are specified on the grading plan.
7. Maintenance of temporary erosion and sediment control measures during construction shall be the responsibility of the earthwork contractor. The earthwork contractor is responsible for removal of all temporary erosion and sediment controls such as silt fence following application of permanent seeding and stabilization measures.
8. Maintenance of permanent erosion and sediment control measures following construction shall be the responsibility of the Applicant.
9. Grading activities and establishment of the final grade will be supervised and approved by the designated site supervisor. The site supervisor shall be an individual experienced with the construction of wetlands and/or ecological restoration projects.

All technical questions, clarifications and/or requests for modifications should be directed to the designated site supervisor.

PERMANENT SEEDING & STABILIZATION (Wetland Creation Area - 1.02 ac)

1. All disturbed areas will be permanently seeded and stabilized with the specified seed mixtures. In addition, all disturbed areas within the Wetland Mitigation Project will be planted with native tree, shrub, and/or herbaceous species according to the details specified in the Planting Plan for the Wetland Mitigation Project. Forested and scrub-shrub wetlands and upland transition areas will be planted at an average density of 730 woody plants/acre.
2. Heavy equipment traffic is prohibited within the wetland creation area following final grading, subsoil treatment, and surface disking.
3. Spring seeding should be completed between March 1 and April 30. Fall seeding is not recommended.
4. Wetland creation areas should not be limed or fertilized.
5. Wetland creation areas will be seeded with annual ryegrass (Lolium multiflorum) (100 lbs/ac or 2.3 lbs/1,000ft2), redtop (Agrostis alba) (5 lbs/ac or 2 oz/1,000ft2), New England aster (Aster novae-angliae) (0.5 lb/ac or 0.19 oz/1,000ft2), common sneezeweed (Helenium autumnale) (2 lb/ac or 0.75 oz/1,000ft2), and swamp sunflower (Helenium angustifolius) (2 lb/ac or 0.75 oz/1,000ft2).
6. Seed will be spread uniformly by hand or by using centrifugal seeder mounted on an ATV or tractor at the specified rates.
7. All seeded areas will be mulched with 3 tons per acre straw or mulch hay (free of undesirable seeds). Straw mulch will be spread uniformly by hand or mechanically so that 85% of the soil surface is covered and anchored using liquid tackifier or crimper.

Date	Checked	Revision
3-19-21	SJR	update title block
4-23-7	SJR	revised notes, added Details sheet
1-17-7	SJR	revised details and apron size

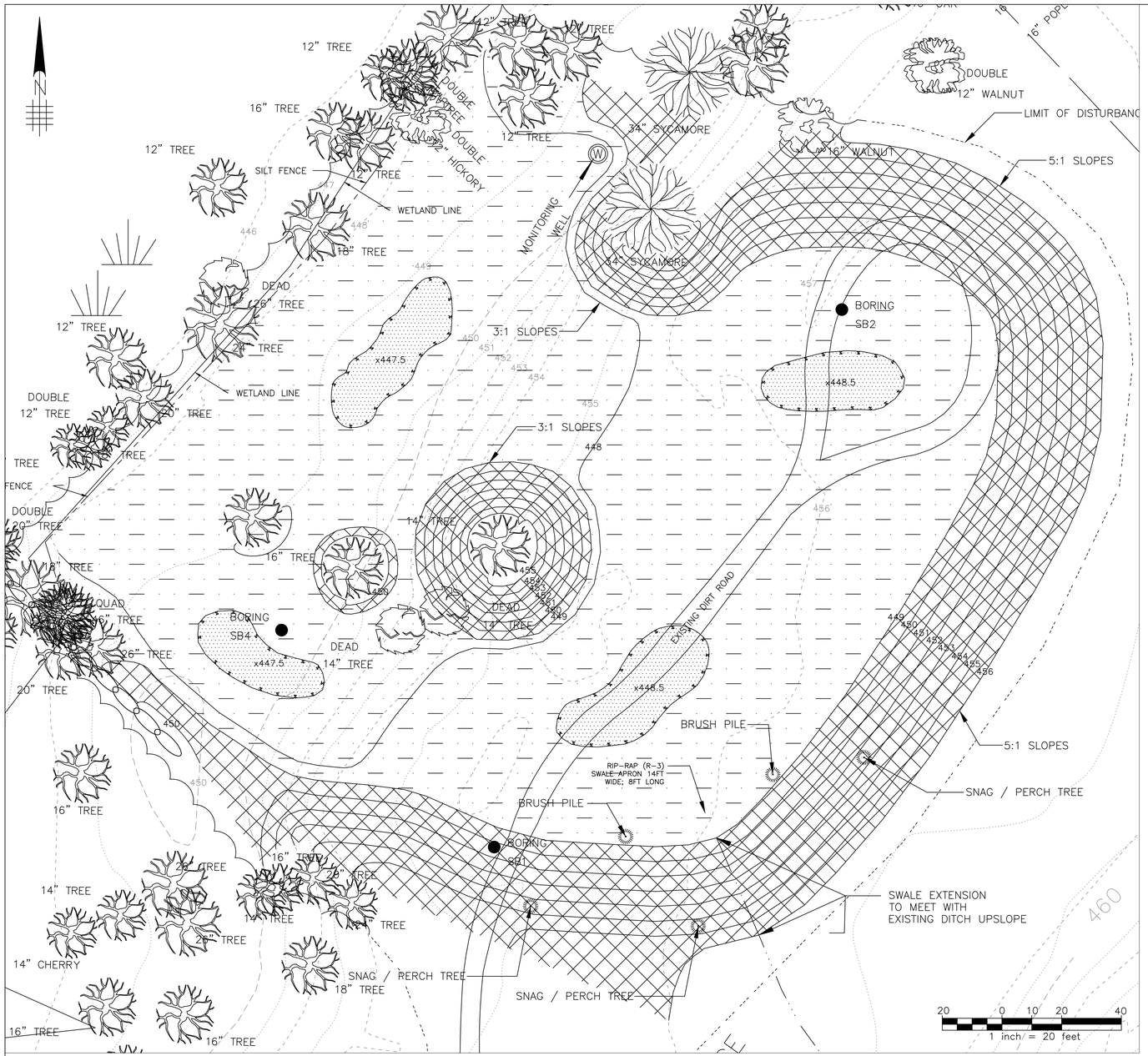
Designed by: DF
Drawn by: SJR
Checked by: DF
Approved by: TSB
Date: March 30, 2006
Scale: 1:240

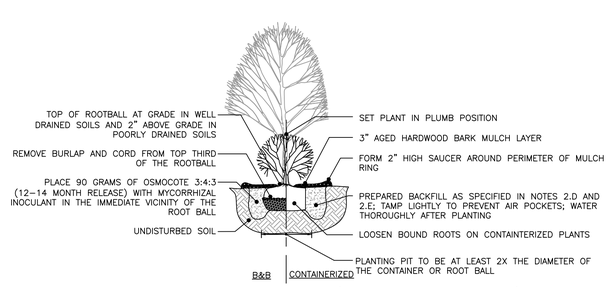
Shawnee Lake Development
Wetland Mitigation
Smithfield and Middle Smithfield Townships
Monroe County, Pennsylvania

GRADING PLAN

AMY GREENE ENVIRONMENTAL
a DAVEY company
4 Walter E. Foran Blvd.
Suite 209
Flemington, NJ 08822
(908) 788-9676

PROJECT 2532
SHEET 1 / 3





TREE & SHRUB PLANTING (B&B AND CONTAINERIZED)
N.T.S.

PLANTING ZONE LEGEND:

- CUT SLOPES
- FORESTED WETLAND CREATION
- EPHEMERAL PONDS
- HABITAT ENHANCEMENT FEATURES

PROPOSED PLANT QUANTITIES & SPECIFICATIONS FOR
Shawnee Valley Wetland Mitigation Project
Smithfield Township, Monroe County, PA

Plant Species	Form	Quantity Forested Wetland Creation	Quantity Ephemeral Ponds	Quantity Cut Slopes
Quercus palustris (pin oak)	#2-#3 container	75	0	0
	18-24 inch bareroot	100	0	0
Quercus bicolor (swamp white oak)	#2-#3 container	75	0	0
	18-24 inch bareroot	0	0	0
Platanus occidentalis (American sycamore)	#2-#3 container	50	0	0
	18-24 inch bareroot	100	0	0
Acer rubrum (red maple)	#2-#3 container	50	0	0
	18-24 inch bareroot	0	0	0
Betula nigra (river birch)	#2-#3 container	50	0	0
	18-24 inch bareroot	0	0	0
Pinus strobus (white pine)	12-18 inch bareroot	0	0	100
Pinus virginiana (Virginia pine)	12-18 inch bareroot	0	0	100
Juniperus virginiana (Eastern redcedar)	#1 container	0	0	50
Cornus amomum (silky dogwood)	#1 container	65	35	0
	18-24 inch bareroot	50	0	0
Cornus racemosa (gray dogwood)	18-24 inch bareroot	50	0	100
Viburnum recognitum (northern arrowwood)	4 inch container / tubling	50	0	0
Aronia melanocarpa (black chokeberry)	18-24 inch bareroot	0	0	100
Ilex verticillata (winterberry holly)	4 inch container / tubling	0	50	0
Cephalanthus occidentalis (buttonbush)	#1 container	0	35	0

Cut Slopes (0.61 acres):
All cut slopes will be planted with a variety of native tree and shrub species. These plantings include several species of shrubs and coniferous trees that will provide a buffer between the wetland mitigation project and adjacent parcels. In addition, the coniferous plantings will increase the diversity of cover types available for wildlife species. Proposed transition area plantings will include a combination of the following native tree and shrub species Juniperus virginiana (Eastern redcedar), Pinus strobus (white pine), Pinus virginiana (Virginia pine), Cornus racemosa (gray dogwood), and Aronia melanocarpa (black chokeberry).

Forested Wetland Creation Area (0.92 acres):
The forested wetland creation area will be planted with a combination of native tree and understory species including Quercus biclor (swamp white oak), Quercus palustris (pin oak), Fraxinus pennsylvanica (green ash), Betula nigra (river birch), Acer rubrum (red maple), Cornus amomum (silky dogwood), Cornus racemosa (gray dogwood), and Viburnum recognitum (Northern arrowwood). Tree and shrub species should be installed on a 6ft by 10ft grid (726 plants/ac). The post-construction hydrology within the wetland creation area should be observed prior to planting and individual species should be planted on suitable micro-sites within the wetland creation area. All containerized tree species should be protected from deer browsing and rodent damage by appropriate measures including installation of deer exclusion fencing, tree shelters, and rodent guards.

Ephemeral Ponds (0.10 acres):
Small isolated depressions within the wetland creation area are anticipated to be seasonally flooded and mimic the hydrology of natural ephemeral ponds. These ephemeral ponds will be planted with a mixture of native shrub species including Cephalanthus occidentalis (buttonbush), Cornus amomum (silky dogwood), and Ilex verticillata (winterberry holly) on a 6ft by 6ft grid (1,210 plants/ac). The post-construction hydrology within the wetland creation area should be observed prior to planting and individual species should be planted on suitable micro-sites within the wetland creation area. All containerized tree species should be protected from deer browsing and rodent damage by appropriate measures including installation of deer exclusion fencing, tree shelters, and rodent guards. Coarse woody debris should be placed within the ephemeral ponds prior to plant installation.

PLANTING NOTES

1. All plants shall be true to type and nomenclature and typical of their species or variety. They shall have a normal habit of growth with well developed branch systems and vigorous root systems. They shall be sound, healthy, and vigorous plants, free from visible defects, disfiguration, injury, recognizable disease of any kind, insect eggs, borers, and any infestation.
2. All planting stock will be inspected onsite prior to installation. Planting stock of insufficient size and/or quality will be culled.
3. Planting will be supervised by a Forester, Professional Wetland Scientist or other qualified professional.
4. Quantities, size, and/or type of planting stock may be adjusted based on availability and/or quality. Where possible, the specified quantities, size, and type of planting stock will be used. All modifications must be approved in writing by the site supervisor or Forester supervising the planting.
5. All hardwood planting stock shall have a target root collar diameter of three-eighths inch (3/8") and target height of twenty-four inches (24") as measured from root collar to tip or as indicated on the plant quantities table.
6. All plant stock will be installed between March 15 to May 15 for spring planting and September 15 to November 1 for fall planting. Bareroot planting stock shall not be installed in the fall planting season.
7. Herbaceous competition may be controlled prior to planting and throughout the maintenance and monitoring period by acceptable mechanical and/or chemical methods.
8. Herbivory from deer, rodents, and/or waterfowl may be controlled by installation of electric fencing, exclusion fencing, tree shelters, and/or application of chemical repellents.
9. All planting stock should be inoculated with mycorrhizae as specified and according to best forestry practices, as solely determined by the Forester supervising the planting.
10. All planting stock will be individually fertilized during installation with a 12-8-8 slow release N-P-K formulation as determined from onsite soil fertility data. Reforestation Technologies International (RTI) 10g Restoration Packs are recommended but a suitable substitute may be used. Fertilizer packs shall consist of a 10 gram biodegradable planting packet containing a blend of nutrients and mycorrhizal inoculum including 12% total nitrogen (N), 8% available phosphoric acid (P205), 8% soluble potash (K), and 20% mycorrhizal inoculum auxiliary biotic soil and plant substance (Glomus intraradices / 120 propagules per cc).
11. Fertilizer packets (10g) shall be installed in the following densities: 1 pack per bareroot seedling or < 1 gal. container; 2 packs per 1 gal. container, 4 packs per 2 gal. container; and 6 packs per 3 gal. container.
12. Fertilizer packs shall be installed in contact with plant roots at a depth between 4 to 8 inches below the soil surface.
13. All plant stock will be installed by hand using a dibble bar, hoe-dad, or similar planting tool.

WILDLIFE HABITAT ENHANCEMENT FEATURES

1. Three (3) snags/perch trees will be installed at the locations indicated on the Planting Plan.
2. Snag/perch trees will be at least 30 feet in total length and 8 inches or greater in diameter at the base and constructed from natural logs. All snags/perch trees will be buried perpendicular to the ground surface at least 5 feet below the ground surface.
3. The preferred species for use as snag/perch trees are oaks (Quercus sp.) or black locust (Robinia pseudoacacia). Other species may be used if the preferred species are not available.
4. Snag/perch tree location will be marked in the field by the site supervisor.
5. Two (2) brushpiles will be constructed from coarse woody debris. Brushpiles will be constructed at the toe-of-slope adjacent to the wetland creation area at specified locations as marked in the field by the site supervisor.
6. Brushpiles will be constructed by layering small logs (i.e. bolts) and branches as indicated in the brushpile detail. Brushpiles will be approximately five feet (5ft) by five feet (5ft) in size and between three to five feet (3-5ft) in height.

Additional coarse woody debris shall be installed within the ephemeral ponds in a random arrangement at a density of one bolt per 100ft2. One bolt shall consist of a cull log (any native species) including bark ranging from 6ft to 8ft in length and 4in to 10in diameter.

BRUSH PILE DETAIL

Swale Detail

1. The existing ditch ends on the hillside east of the proposed wetland mitigation area. A shallow swale should be constructed to extend the ditch into the wetland mitigation area as depicted on the plan sheet (See swale detail on sheet 3).
2. Topsoil material (4-6") should be stripped from the proposed route for the relocated ditch
3. See Swale design chart and detail. Rip-rap should be applied after the erosion control matting is installed without compromising the integrity of the matting (See swale detail on sheet 3).
4. The erosion control matting should be a North American Green SC-250 or equivalent. The matting should be of sufficient width to cover the entire channel and extend up the sideslopes approximately 2 feet on either side of the channel. It is anticipated that the width of one roll of matting (6-7 ft) will suffice for this application.
5. The upland / cut slope seed mixture should be applied to all disturbed areas prior to installation of the erosion control matting or rip-rap.

Disturbed areas not covered by the erosion control matting should be seeded then mulched with 3 tons/ac straw or mulch hay (free of undesirable seeds). Straw mulch will be spread uniformly by hand or mechanically so that 85% of the soil surface is covered and anchored using liquid tackifier or crimper.

Summary of Compensatory Wetland & Waters Mitigation Proposed for the Shawnee Land Holdings Project, Smithfield Township, Monroe County, PA

Activity	Category	Permitted Area (ac)	Designed Area (ac)	Mitigation Equivalency
Proposed Unavoidable Wetland Impacts (PFO)	Wetland Impact	0.142 ac @ 2:1 ratio	----------	----------
Proposed Stream & Open Water Impacts	Waters Impact	0.435 ac @ 1:1 ratio	----------	----------
Required Compensatory Mitigation	Required Mitigation	0.719 ac	0.890 ac	----------
Creation of wetlands through excavation, micro-topography enhancement, and planting	Wetland Creation	0.719 ac @ 1:1 ratio	0.890 ac @ > 1:1 ratio	0.89 ac
Mitigation equivalency contained in the proposed wetland/waters mitigation project design =				**0.890 ac**

Date	Checked	Revision
3-19-21	SJR	revise plant quantities table; add mitigation summary table; update title block
4-23-7	SJR	revised notes, added Details sheet
1-17-7	SJR	revised details and apron size

Designed by: DF
Drawn by: SJR
Checked by: DF
Approved by: TSB
Date: March 30, 2006
Scale: 1:240

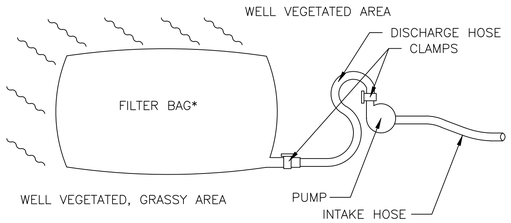
Shawnee Lake Development
Wetland Mitigation
Smithfield and Middle Smithfield Townships
Monroe County, Pennsylvania

PLANTING PLAN

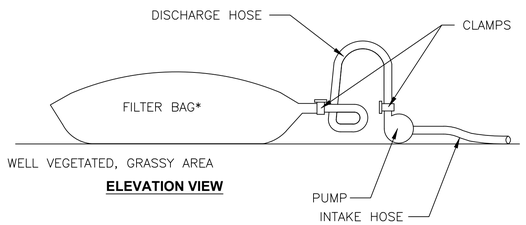
AMY GREENE ENVIRONMENTAL
a DAVEY company
4 Walter E. Foran Blvd.
Suite 209
Flemington, NJ 08822
(908) 788-9676

PROJECT 2532
SHEET 2/3

STANDARD CONSTRUCTION DETAIL #26
Pumped Water Filter Bag



PLAN VIEW



ELEVATION VIEW

NOTES:
1. * NON–WOVEN GEOTEXTILE FILTER BAG SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS. BAGS SHALL RETAIN ALL SEDIMENT PARTICLES LARGER THAN 150 MICRONS.

2. PLACE FILTER BAGS ON STABLE OR WELL VEGETATED AREAS WHICH ARE FLATTER THAN 5% AND WHICH WILL NOT ERODE WHEN SUBJECTED TO BAG DISCHARGES. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE FLOW PATH SHALL BE PROVIDED.

–A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED.

–SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FULL.

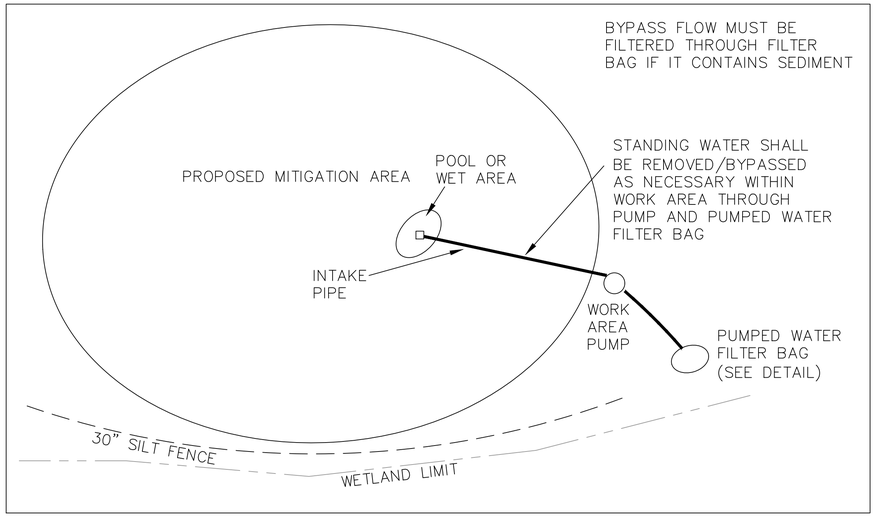
3. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAG IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED.

4. LIMIT PUMPING RATE TO 750 GPM OR 1/2 THE MANUFACTURER'S MAXIMUM PUMPING RATE, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATED AND SCREENED.

5. WHEN SEDIMENTS FILL 1/2 THE VOLUME OF A FILTER BAG, IMMEDIATELY REMOVE THAT BAG FROM SERVICE. PROPERLY DISPOSE OF SPENT BAGS WITH THEIR SEDIMENTS.

6. THE DISCHARGE FROM THE FILTER BAG SHOULD NOT PASS THROUGH A DISTURBED AREA OR CAUSE AN EROSION PROBLEM DOWN SLOPE.

7. THE FILTER BAD DISCHARGE SHALL BE PLACED AT LEAST 100 FEET FROM THE LIMITS OF EXCAVATION IN A LOCATION WHERE THE DISCHARGE WILL FLOW AWAY FROM THE ACTIVE EXCAVATION AREA.



MITIGATION AREA DE–WATERING DETAIL

NTS

1. WORK SHOULD BE COMPLETED DURING PERIODS OF LOW FLOW AND SHALL HAVE SAME DAY INSTALLATION AND STABILIZATION WHENEVER POSSIBLE

–ALL MATERIAL AND EQUIPMENT SHALL BE ON SITE AND AVAILABLE PRIOR TO BEGINING EXCAVATION

2. INSTALL COFFER DAMS AS NECESSARY TO DIVERT WATER FROM WORK AREA VIA TEMP PIPES (MIN 18") OR PUMP

A PUMP MAY BE USED TO DIVERT WATER FROM THE WORK AREA AND UPSTREAM DIVERSIONS, THE PUMP MUST DISCHARGE THROUGH A SEDIMENT FILTER BAG. THE BAG SHALL BE LOCATED DOWNSLOPE OF THE WORK AREA AND DISCHARGE TO UNDISTURBED GROUND.

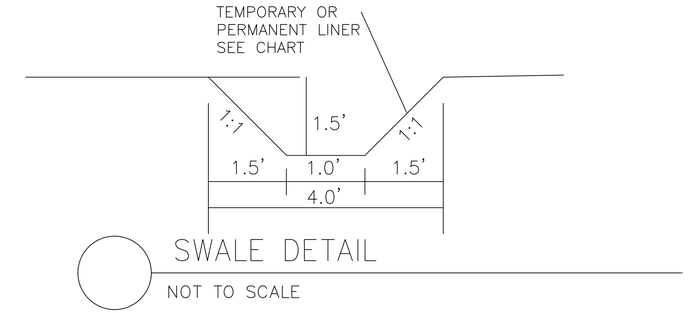
3. PROVIDE SILT FENCE PER THE PLAN DOWNSLOPE OF PROPOSED EXCAVATION TO PROVIDE PROTECTION OF WETLANDS.

4. PROVIDE ORANGE CONSTRUCTION FENCE ALONG THE PERIMETER OF WETLANDS TO REMAIN UNDISTURBED.

5. COMPLETE MITIGATION AREA IN ACCORDANCE WITH 'SHAWNEE VALLEY WETLAND MITIGATION PROJECT CONSTRUCTION SEQUENCE NOTES'.

6. THE CONTRACTOR MUST COMPLY WITH ALL REQUIREMENTS OF APPLICABLE PERMITS.

7. EQUIPMENT AND MATERIALS SHALL NOT BE STORED IN PROTECTED WETLANDS OR WATERS OF THE U.S. AND SHALL BE STORED IN AREAS THAT WILL BE DISTURBED AS PART OF THE FUTURE DEVELOPMENT.



SWALE DETAIL

NOT TO SCALE

SWALE DESIGN CHART

CHANNEL NO.	STATIONS	TYPE	B	D	Z1	Z2	slope	LINING*
DITCH EXT.	SEE PLAN	VI	2.0	1.5	1	1	2–20%	SC250

NOTES:

* or approved equal. See Manufacturer's Lining Installation Detail for Staple Patterns, and Vegetation Stabilization Specifications for Soil Amendments, Seed Mixtures, and Mulching information.

Refer to Postconstruction Stormwater Management Report prepared for Stage Ib by Irick, Eberhardt & Mientus, Inc. for swale details and specifications.

All channels are permanent channels unless otherwise noted

Date	Checked	Revision
3–19–21	SJR	update title block
4–23–7	SJR	revised notes, added Details sheet
1–17–7	SJR	revised details and apron size

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PROJECT 2532
SHEET 3/3