SECTION 327100 - CONSTRUCTED WETLANDS

This section includes methods for Wetland Mitigation.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Constructed wetlands / wetland mitigation.

* + - 1. REFERENCES
				1. Plant Nomenclature: Conform to the latest edition of "Standardized Plant Names" as adopted by the American Joint Committee of Horticultural Nomenclature.
				2. Size and Grading Standards: Conform to the current edition of "American Standard for Nursery Stock" - Sponsor - the American Association of Nurserymen Inc., unless otherwise specified.
				3. Wetland Planting Guide: Conform to “WETLAND PLANTING GUIDE FOR THE NORTHEASTERN UNITED STATES” by Gwendolyn A. Thunhorst as adopted by Environmental Concern, Inc.
			2. SEQUENCING

The sequences below are examples only. Edit the General Construction sequencing notes below to suit project conditions.

* + - * 1. General Construction: <**Describe practice type and location at Facility**>.

Provide a protective barrier fence where indicated on drawings.

Provide temporary and sediment and erosion controls around the project area prior to soil disturbance from construction activity.

Provide excavation and grading associated with installation of new stormwater conveyance systems.

Construct new treatment pond, install new drainage structures connecting to treatment pond, and divert stream flow from existing stream corridor to new treatment pond.

Provide geotextile slope protection fabric and permanent seeding of all disturbed areas not associated with the mitigation work area.

Install proposed entrance road, apron approach to proposed vehicle compound, including conduit, potable water, communications and sanitary hook-ups.

* + - * 1. Wetland Mitigation Construction: The following provides the suggested sequence of activities anticipated to be necessary to complete this mitigation project. Some of these activities may be conducted concurrently as the project progresses.

Conduct a site meeting between the Contractor, the Landscape Architect, and the Director’s Representative to review the project plans, staging/stockpile areas, and material disposal areas.

Flag boundaries of existing wetlands to be avoided adjacent to the earthwork areas.

Install silt fence and other erosion and sedimentation control facilities in place for work in this project area.

Construct the temporary access road necessary to perform wetland mitigation work.

Clear and grub earthwork areas.

Strip and stockpile acceptable topsoil from excavation and fill areas.

Survey earthwork areas and set grade stakes as required.

Install temporary sediment traps and drainage channels as required.

Complete the Excavated Wetland Creation Areas to rough grade, using acceptable clean fill materials from these excavations to concurrently construct the protective earthen berms.

Blend and place Wetland Planting Substrate on completed rough grade areas within the Excavated Wetland Creation Areas.

Regrade the areas including drainage channels allowing for positive site runoff conditions.

Spread topsoil on remaining exposed cut slopes and protective earthen berms.

Water the Excavated Wetland Creation Areas to saturate the Wetland Planting Substrates.

Plant the wetland tree and shrub mix on the wetland enhancement areas following applicable details.

Apply the wetland seed mix and mulch to all areas of Wetland Mitigation Planting Substrate.

Apply the wetland seed mix and mulch to all remaining exposed areas of the wetland enhancement area and earthen berm.

Install Wetland Restoration signs where shown on the contract drawings.

Water as needed to maintain the optimum moisture levels for the seeded areas and planted stock until the wetland seed mix is adequately germinated to withstand inundation.

Provide outfall soil separation fabric and riprap to specified thickness and required invert elevation.

Remove the temporary access road.

Complete site cleanup and seed and plant all remaining disturbed upland areas with the appropriate seed mixes specified herein.

Inspect and approve mitigation area by OGS/ACOE Personnel.

* + - 1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. List of Plants: Before plant material is shipped to the project site, submit a complete itemized list of all plants including the source of supply.
				5. Product Data: Furnish the following with each planting material delivery:

Invoice indicating sizes and variety of plant material.

Certificates of inspection required by State and Federal agencies.

Labels for each plant or bundles of plants indicating name and size.

* + - * 1. Quality Control Submittals:

Worker's Qualifications Data: Names and addresses of 5 similar projects that each person has worked on during the past 2 years.

* + - * 1. Sample: One pound of seed in Vendor’s unopened package with label and seed analysis.
				2. Certificates: Seed, plant material, topsoil, pH adjuster, fertilizer, soil conditions, and organic mulch. Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Copies of the material certificates shall include the following:

Plant Material: Classification, botanical name, common name, size, quantity by species, and location where grown.

Topsoil: Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

pH Adjuster: Sieve analysis and calcium carbonate equivalent.

Fertilizer: Chemical analysis and composition percent.

Soil Conditioner: Composition and source.

Organic Mulch: Composition, source, and treatment against fungi growth.

* + - * 1. As-Built Drawing:

As-built topographic drawings with [**1-foot**] <**Insert desired interval**>contour intervals.

Complete list of species planted in the mitigation area.

Source of the vegetative materials.

* + - 1. QUALITY ASSURANCE
				1. Worker's Qualifications: The persons performing the planting and their supervisor shall be personally experienced in the planting and caring of plant material and shall have been regularly employed by a company engaged in the planting and caring of plant material for a minimum of 2 years.
				2. Caliper trees up to 4 inches in caliber at a point 6 inches above ground.
				3. Do not use woody plant material from regions south of latitude 39 degrees unless such material has been lined out in nurseries located north of latitude 39 degrees for at least 2 growing seasons. Latitude 39 degrees is approximately a line from Annapolis, MD to Cincinnati, OH.
			2. DELIVERY, INSPECTION, STORAGE, AND HANDLING
				1. Delivery: A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery. Shrub stock and sapling stock shall be delivered to the job site not more than 7 working days prior to their respective planting date.
				2. Plant Material Identification: Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical plant name and size.
				3. Protection During Delivery: Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.
				4. Deliver fertilizer in manufacturer's standard sized bags showing weight, analysis, and manufacturer's name. Store under a waterproof cover or in a dry place as designated by the Director's Representative.
				5. Inspection: Shrub stock, sampling stock, seed, and wetland vegetative plug material shall be inspected upon arrival at the job site by the Director’s Representative for conformity to type and quantity with regards to their respective specifications.
				6. Storage:

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Plant material shall not be stored longer than 7 days without the concurrence of the Director’s Representative. Plant material shall be protected from direct exposure to wind and sun. Bare-root plant material shall be heeled-in. All plant material shall be kept in a moist condition by watering with a fine mist spray until installed.

Storage of other materials shall be in designated areas. All wetland vegetative plug materials shall be kept moist until planting.

* + - 1. PROJECT CONDITIONS
				1. Water will be furnished by the State from existing facilities as directed. Furnish hoses and connections required to adequately water plants.
			2. SCHEDULING
				1. Plant deciduous, woody plants between October 1 and May 15 whenever temperature is above 32 degrees F and soil is in workable condition, unless otherwise approved in writing.
				2. Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum 21 days. The time limitation between installing the plant material and placing the mulch shall be a maximum 72 hours.
			3. PLANTING GUARANTEE
				1. The guarantee shall extend for a period of one year from the date of physical completion. Physical completion for the Work of this Section is the date or dates when all the planting operations, or seasonal portions of the planting operations, or replacement planting operations have been completed and are accepted by the Director's Representative.
1. PRODUCTS
	* + 1. SUPPLIERS
				1. Unless otherwise approved by the Director’s Representative, seed and plant stock materials shall be obtained from one or more of the following suppliers:

Ernst Conservation Seeds, 8884 Mercer Pike, Meadville, PA 16335, (800) 873 - 3321

Pinelands Nursery, Inc., 323 Island Road, Columbus, NJ 08022, (609) 291-9486

Clear Ridge Nursery, Inc., 217 Clear Ridge Road, Union Bridge, MD 21791, (410) 775 – 7700

Ion Exchange, Howard and Donna Bright, 1878 Old Mission Drive, Harpers Ferry, IA 52146-7533, (563) 535- 7231

Southern Tier Consulting, Inc., 2701-A Route 305, P.O. Box 30, West Clarksville, NY 14786, (585) 968-3120

Approved equivalent.

* + - 1. WETLAND PLANTS

Ensure that the drawings show an itemized plant list for wetland enhancement areas. The following species are recommended:

Shrubs: *Aronia arbutifolia* (Red Chokeberry, FACW), *Cornus amomum* (Silky Dogwood, FACW), *Sambucus Canadensis* (Common Elderberry, FACW), *Viburnum trilobum* (American Cranberry Bush, FACW).

Trees: *Acer rubrum* (Red Maple, FAC), *Acer saccharinum* (Silver Maple, FACW), *Betula populifolia* (Gray Birch, FACW), Fraxinus pennsylvanica (Green Ash, FACW), *Quercus bicolor* (Swamp White Oak, FACW+).

* + - * 1. Shrubs and Trees:

Shrubs and trees of the varieties in the itemized plant list shown on the Drawings and true to botanical name as listed in Hortus Third.

Nursery grown stock unless otherwise indicated in the itemized plant list.

Acclimated plants true to genus and species.

Well-developed root and branch systems. Do not prune branches before delivery.

Free of disease, insect eggs, bark abrasions, and disfiguring knots.

Buds intact and reasonably closed at time of planting.

Balled and burlapped from soil which will hold a natural ball. Manufactured balls are unacceptable.

Conform to size indicated or larger, or within the minimum maximum size bracket when so indicated. Larger plants cut back to specified dimensions will not be accepted.

* + - * 1. Trees:

Single erect leader from ground to top, surrounded with uniformly arranged branches.

Free from frost cracks, broken bark, and dead or broken branches.

Transplanted, or root pruned 360 degrees at least once during the previous 3 years.

* + - * 1. Noxious Species: All seed, plant stock, and other revegetation materials shall be free from seed or other plant materials from the following noxious species:

Echinochloa crusgalli (Barnyard Grass)

Glyceria maxima (Reed Meadowgrass)

Lythrum salicaria (Purple Loosestrife)

Phalaris arundinacea (Reed Canary Grass)

Phragmites australis (Common Reed)

Polygonum cuspidate (Japanese Knotweed)

Typha spp. (Cattails)

* + - * 1. Substitutions: Substitutions will not be permitted without written request and approval from the Director’s Representative and the Landscape Architect.
			1. WETLAND SEEDS
				1. Seed: State-certified seed of the latest season’s crop provided in original sealed packages bearing the producer’s guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material.

Labels shall be in conformance with applicable State seed laws.

Weed seed shall not exceed one percent by weight of the total mixture.

All seed mixing shall take place at the job site in the presence of the Director’s Representative.

* + - * 1. Wetland Seed Mixture:

| **FACW WETLAND MEADOW SEED MIX:**\* SEED AT 15 BULK POUNDS PER ACRE \* |
| --- |
| 20% | *Elymus virginicus* | Virginia Wild Rye |
| 19% | *Carex vulpinoidea* | Fox Sedge |
| 5% | *Heliopsis helianthoides* | Ox Eye Sunflower |
| 5% | *Scirpus atrovirens* | Green Bulrush |
| 5% | *Verbena hastata* | Blue Vervain |
| 5% | *Eupatorium perfoliatum* | Boneset |
| 5% | *Euthamia graminifolia* | Grass Leaved Goldenrod |
| 5% | *Jancus effusus* | Soft Rush |
| 3% | *Carex lupulina* | Hop Sedge |
| 3% | *Eupatorium maculatum* | Spotted Joe Pye Weed |
| 3% | *Scirpus polyphyllus* | Many Leaved Bulrush |
| 2% | *Carex comosa* | Cosmos Sedge |
| 2% | *Scirpus cyperinus* | Wool Grass |
| 2% | *Carex lurida* | Lurid Sedge |
| 2% | *Bromus altissima* | Wild Broome Grass |
| 2% | *Glyceria grandis* | American Mannagrass |
| 1.5% | *Eupatorium fistulosum* | Joe Pye Weed |
| 1% | *Vernonia noveboracensis* | New York Ironweed |
| 1% | *Gerum laciniatum* | Rough Avens |
| 1% | *Penthorum sedoides* | Ditch Stonecrop |
| 1% | *Zizia aurea* | Golden Alexanders |
| 1% | *Ludwigia alternifolia* | Seedbox |
| 1% | *Helenium autumnale* | Common Sneezeweed |
| 1% | *Carex scorparia* | Blunt Broom Sedge |
| 1% | *Aster umbellatus* | Flat Topped/Umbrella Aster |
| 1% | *Cinna arundinacea* | Wood Reedgrass |
| 0.5% | *Mimulus ringens* | Square Stemmed Monkey Flower |
| 0.5% | *Senecio aureus* | Golden Ragwort |
| 0.5% | *Geum aleppicum* | Yellow Avens |

* + - 1. WETLAND PLUG MIX
				1. Plugs: Wetland Vegetative Plugs shall be 2.4 inches across, 2 inches deep of live healthy wetland plants.
				2. Mixture of Plants (Plugs): Intermittent planting groups shall consist of the following plug grouping mixture:

Carex stricta (uptight sedge) OBL, Carex vulpinoidea (fox sedge) OBL, Juncus effusus (soft rush) FACW +, Scirpus atrovirens (green bulrush) OBL and Scirpus cyperinus (wool-grass) FACW+.

* + - 1. PLANTING SOIL
				1. Topsoil for Wetland Substrate shall be obtained from outside sources.

Required bulk organic content: between 10 and 20 percent, as determined by AASHTO-T-194.

Required pH: between 6 and 8.

Test the organic components separately for organic content and determine the volumetric blending ratio necessary to achieve the required bulk organic content of the Wetland Planting Substrate. Testing shall also include soil pH, and a limestone addition rate shall be established to achieve the required pH.

Tests shall be conducted on samples composited from 5 random grab samples from each of the organic material for every 1,000 cubic yards of Wetland Planting Substrate produced.

Wetland Planting Substrate blending:

The Contractor shall provide the results of the organic content testing, the blending ratio, and the limestone addition rate for approval by the Director’s Representative prior to blending the Wetland Planting Substrate.

Blending of the Wetland Planting Substrate shall be conducted at the job site in the presence of the Director’s Representative.

The specified fertilizer shall be thoroughly mixed with the Wetland Planting Substrate during blending at the rate of ½ pound per cubic yard of Wetland Planting Substrate produced.

* + - * 1. Soil Amendments: Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite is not recommended.

pH Adjuster: The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602.

Limestone: Limestone material shall be pulverized agricultural limestone with a minimum calcium carbonate content of 90 percent and shall be ground such that at least 90 percent shall pass through a No. 10 sieve and a minimum 50 percent shall pass through a No. 60 sieve.

Fertilizer:

For Wetland Planting Substrate: dry, free-flowing, uniform composition, controlled release, commercial grade formulation of 19-6-12 NPK analysis.

For topsoil placement areas: dry, free-flowing, uniform composition, controlled release, commercial grade formulation of 16-8-16 NPK analysis.

Fertilizer Tablets: Fertilizer tablets shall be Forestry Suppliers Brand, 5-gram, Planting Tablets, or an approved equal.

Organic Material: Organic material to be introduced into the wetland seed substrate will consist of wood chips and organic soils. All organic amendments shall be free from chemical contamination, trash, litter, seed or other plant materials from noxious plant species listed, and any other materials detrimental to plant growth or unsuitable for physical blending of the Wetland Planting Substrate.

Soil Conditioner: Soil conditioner shall be sand, calcined clay, or gypsum for single use or in combination to meet topsoil requirements for the plant materials specified.

* + - * 1. In the presence of the Director’s Representative, place the soil amendments over the topsoil piles and turn over the combined elements a minimum of 3 times until thoroughly mixed.
			1. MULCH
				1. Peat Moss: Finely granulated material, passing a ½ inch sieve, free of sticks, woody roots, stones and other objectionable material, and of such physical condition that it can be readily incorporated with the topsoil. Furnish material conforming to the following criteria:

pH value: 3.0 to 5.0.

Moisture: 25 percent to 50 percent.

Organic Material: Not less than 47 percent (90 percent dry basis).

* + - * 1. Wood Chips: Hardwood or softwood chips produced by a standard wood chipping machine, free of leaves, young green growth, wood shavings, sawdust, or any foreign material. Chips shall not exceed 3 inches in greatest dimension.
				2. Shredded Wood: Wood fiber produced from either hardwood or softwood trees, free of tannic acid, leaves, young green growth, wood shavings, sawdust or other objectionable foreign material.
			1. MISCELLANEOUS MATERIALS
				1. Stakes, Deadmen and Guy Stakes: Sound, durable White or Red Cedar, or other approved wood, free of insect or fungus infestation.
				2. Guy Wire or Cable: No. 12 galvanized iron wire or cable.
				3. Tree Wrapping:

4-inch-wide strips of jute burlap or waterproof paper by Eaton Brothers Corp., 3530 Lakeview Road, Hamburg, NY 14975, (888) 322-3530.

Or equal.

* + - * 1. Protective Hose: 2-ply garden hose cut to required lengths to protect tree trunks from damage by wires.
				2. Tree Wound Paint: Antiseptic, waterproof, adhesive, elastic tree wound paint containing no kerosene, coal tar, creosote, or other material harmful to cambium or living tissue.
				3. Anti-desiccants:

Wilt-Pruf by Wilt-Pruf Products, Inc., P.O. Box 469, Essex, CT 06426, (800) 972-0726.

Or equal.

* + - * 1. Landscape Fabric:

Typar Pro 3301, by TYPAR, 70 Old Hickory, TN 37138-3651, (800) 541-5519.

Or equal.

1. EXECUTION
	* + 1. INSPECTION

Do not plant any plant material until after inspection and approval in writing of plant shipments. Secure written approval of any substitutions before planting. Remove rejected material from planting areas.

* + - 1. PREPARATION
				1. Planting layout:

Stake out tree locations and planting areas.

Obtain layout approval from the Director’s Representative prior to excavations of planting pits.

* + - * 1. Plant Pit Dimensions: Minimum width 12 inches, measured at the ground surface. Depth such that shrub / tree root collar remains 2 inches above the original elevation of the excavated wetland.

Balled and Burlapped Plants:

Pit Depth: Not to exceed the ball depth.

Pit Width: Measured at the ground surface, 3 times the width of the ball or as indicated.

Container Grown Plants: 2 times the diameter of the container measured at the ground surface.

Bare Root Plants: Diameter equal to width of roots spread to natural position plus 24 inches, measured at the ground surface.

* + - * 1. Excavation: Excavate pits to the dimensions specified. Dispose of excavated material off-site unless otherwise directed. Holes shall be dug by hand.
			1. PLANTING
				1. Setting Plants:

Fertilizer: One fertilizer tablet for shrub material and two fertilizer tablets for tree stock shall be placed at the base of each planting hole prior to placement of the plant material in the hole.

Backfill pits with wetland planting substrate soil and firm to the level upon which plants were previously growing. Set plants plumb. Plant budded or grafted plants 2 inches below bud or graft line. Complete backfilling with planting soil and settle continually with water. Wetland planting substrate soil shall be smoothly mounded around the shrubs and trees to the level of the root collar. All backfill shall be firmly hand-tamped in place.

Balled Plants: Set plants in position and backfill 1/3 depth of ball. Remove burlap from top and adjust to eliminate air pockets. Complete backfill and settle with water.

Bare-root Plants: Set plant in position and place wetland planting substrate soil around roots settling with water. Use care to avoid bruising or breaking roots when firming soil. Prune bruised or broken roots. Complete backfill and settle with water.

* + - * 1. Wrapping: Wrap deciduous trees within 4 days after planting from the ground line to the height of the second branches. Wrap in a single layer wound spirally starting from base and overlapping 1-1/2 inches. Secure wrapping in place by use of approved staples or other approved methods and materials.
				2. Staking: Set tree stakes into solid ground below bottom of plant before backfilling. Place stakes at the outer edge of the roots or ball in line with the prevailing wind at a 10-degree angle from the tree trunk.
				3. Anti-Desiccant: Apply anti-desiccant spray to broadleaved ericaceous plants planted in the Fall season, as directed.
				4. Surface Finish: Form saucer as indicated on Drawings or as directed. Grade soil to form a basin on lower side of slope plantings, which will catch and retain water. Top dress basins with fertilizer spread evenly at the rate of 1-1/2 pounds per square yard of plant pit surface. Break saucers and basins before ground freezes.
				5. Mulching:

Spread mulch over finished surface of each plant, plant bed and hedge trench in the following amounts:

Wood Chips: 3 inches.

Peat Moss: 3 inches.

Shredded Wood: 2 inches.

Water plants thoroughly after mulching.

* + - * 1. Pruning: Prune immediately after planting as directed by the Landscape Architect.
				2. Guying: Guy deciduous trees 4 inches and over in caliber; trees over 6 feet high with 3 or more stems; and evergreens 6 feet or over in height, with 3 guys immediately after planting. Attach guys to stakes and trees as indicated. Connect multi-stem trees with protected connecting wires maintaining each stems relationship to one another.
				3. Establishment of Planting: Maintain plantings immediately following planting operations and continue throughout the guarantee period. Establishment of plantings shall consist of keeping plants in healthy growing conditions by watering, weeding, cultivating, pruning, spraying, tightening of guys, remulching and by any other necessary operations of establishment. Water all plants at least once a week between April 1 and October 31 with approximately 5 gallons per square yard (1-inch layer of water) per watering unless otherwise directed. Provide additional watering during periods of dry weather when required or when directed. Treat plants with good horticultural preventative or remedial measures to control insects, diseases or rodents.
			1. INSPECTIONS AND REPLACEMENTS
				1. The following inspections apply only to this Section and supersede inspections specified in Section 017716.

Physical Completion Inspection and Replacements: Notify the Director in writing at least ten days prior to requested date of physical completion inspection. Remove and replace dead, unhealthy or badly impaired plants according to the original specification, if so directed. Replace plants during the next planting season if this inspection is not within a planting season.

End of Guarantee Inspection and Replacements: Remove stakes, guy wires and tree wrapping at the end of the one-year guarantee period unless otherwise directed. Remove and replace dead, unhealthy or impaired plants according to original specification, as directed. Replace plantings during the next planting season if end of guarantee period is not within a planting season.

END OF SECTION 327100