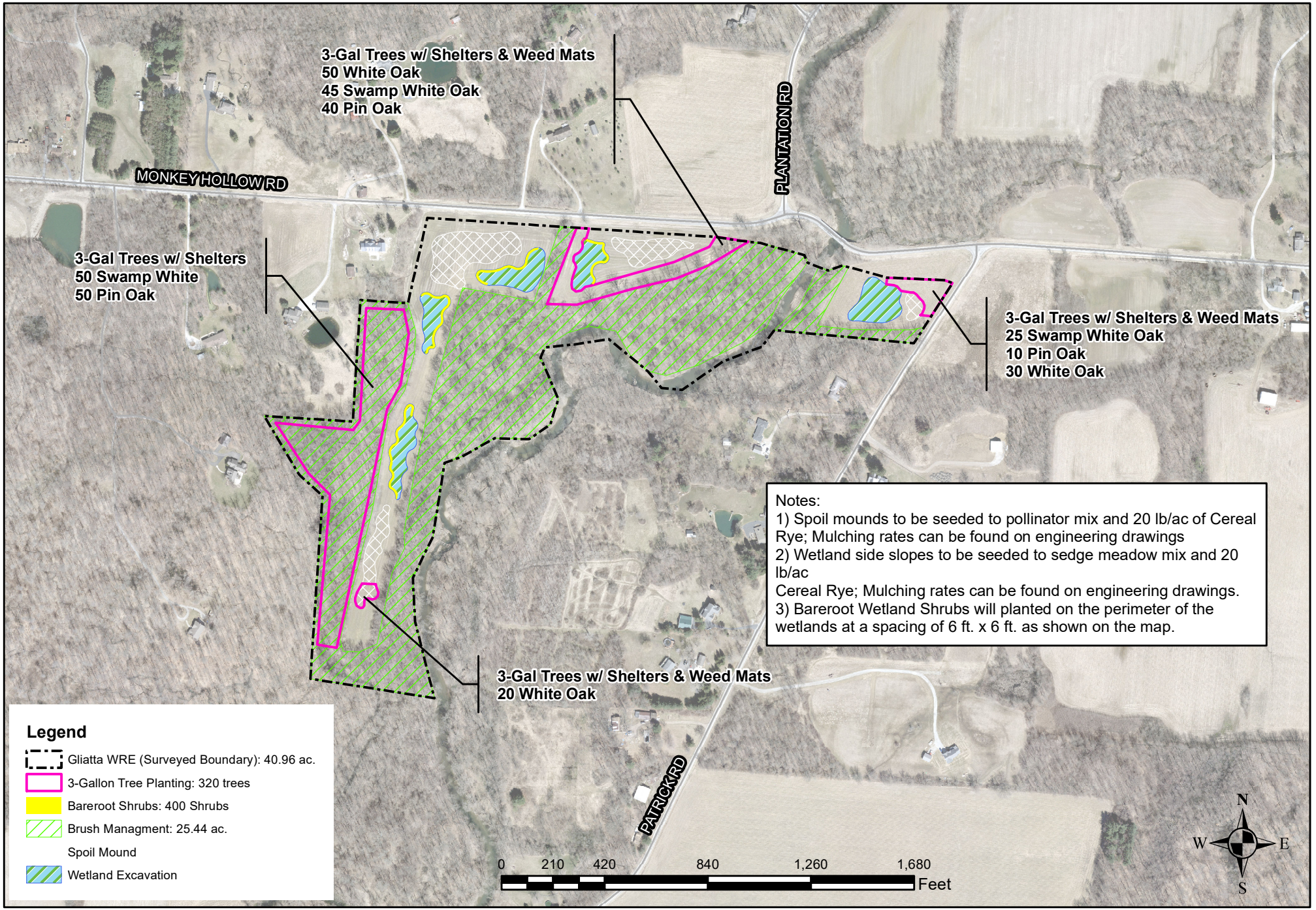
Bart Gliatta WRE - 545E342301YQV - Wetland Restoration Map

Location: Porter Twp., Delaware Co., Ohio 40°17'36.4"N 82°49'49.2"W

Date: 6/24/2024



GENERAL CONSTRUCTION NOTES FOR WETLANDS

1. INFORMATION FOR LAYOUT OF SITE IMPROVEMENTS SHALL BE FURNISHED.
2. CONSTRUCTION OPERATIONS MAY LEAD TO THE DISCOVERY OF EXISTING SUBSURFACE DRAINAGE SYSTEMS OR LINES. ALL DRAINS SHALL BE DISABLED AND/OR REROUTED. REROUTING, REPLACING, OR DISABLING OF EXISTING DRAINAGE LINES MUST BE APPROVED BY THE ENGINEER, TECHNICIAN, OR NRCS WETLAND TEAM LEADER.
3. A FINAL INSPECTION OF ALL PROJECT COMPONENTS SHALL BE CONDUCTED. WHEN ALL COMPONENTS ARE ACCEPTED, THE SUBCONTRACTOR SHALL BE RELEASED FROM THE SITE.
4. ALL DISTURBED AREAS SHALL BE SEEDED, MULCHED, AND FERTILIZED ACCORDING TO THE NRCS–OHIO PRACTICE STANDARD 342 – CRITICAL AREA PLANTING CONSERVATION PRACTICE JOB SHEET.
5. GRASS SEED USED SHALL BE FROM AN OHIO DEPT. OF AGRICULTURE (ODA) REGISTERED SOURCE AND SHALL MEET NRCS SPECIFICATIONS.
6. ALL PERMITS INCLUDING STATE, FEDERAL, AND LOCAL ARE THE SOLE RESPONSIBILITY OF THE LANDOWNER OR THEIR REPRESENTATIVE.
7. THE CONTRACTOR IS RESPONSIBLE FOR USING ALL APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE LIKELIHOOD OF SITE EROSION AND OFFSITE SEDIMENT TRANSPORT. WHEN SITE STABILIZATION CANNOT BE COMPLETED WITHIN 14 DAYS OF THE COMMENCEMENT OF CONSTRUCTION, AN OHIO EPA NPDES PERMIT MAY BE REQUIRED.
8. ALL STATE AND FEDERAL SAFETY REGULATIONS SHALL BE FOLLOWED.
9. THE CONTRACTOR SHALL TAKE A SUFFICIENT NUMBER OF SURVEY SHOTS TO VERIFY EXISTING GROUND ELEVATIONS SHOWN ON DRAWINGS.
10. AN AS–BUILT DRAWING SHALL BE DEVELOPED. CHANGES IN QUANTITIES, ELEVATIONS, AND STRUCTURE LOCATIONS ARE TO BE DOCUMENTED ON THE AS–BUILT CONSTRUCTION DRAWINGS.
11. SPOIL MOUNDS ARE TO BE BUILT IN 8" LIFTS AND COMPACTED WITH MULTIPLE PASSES WITH HEAVY MACHINERY OVER THE ENTIRE SURFACE OF EACH LIFT. MAXIMUM HEIGHT FOR SPOIL MOUNDS WILL BE INDICATED ON THE PLANS.
12. WETLAND POOL AREAS SHALL BE CONSTRUCTED BETWEEN A MINIMUM OF 18" TO A MAXIMUM OF 2 ½' DEEP. REFER TO PLANS FOR SIDE SLOPE GRADES AND BOTTOM ELEVATIONS.
13. ESTIMATED TOP SOIL REMOVAL IS FOR STRIPPING THE POOL AREAS AND STOCKPILING.
14. TILE SEARCH LOCATIONS SHALL NOT DISTURB EXISTING TREE TRUNKS.
15. ALL CONSTRUCTION AND STAGING ACTIVITIES SHALL BE CONTAINED WITHIN THE EASEMENT AND SET BACK A MINIMUM DISTANCE OF 15 FEET FROM EASEMENT/PROPERTY LINES OR AS SHOWN ON THE PLANS.

SHEET NO.	SHEET TITLE
1	COVER SHEET
2	QUANTITIES SHEET
3	OVERALL PLAN VIEW
4–6	WETLAND PROFILES
7	TILE SEARCH DETAILS

Contractor Name:_____

Date Completed:_____

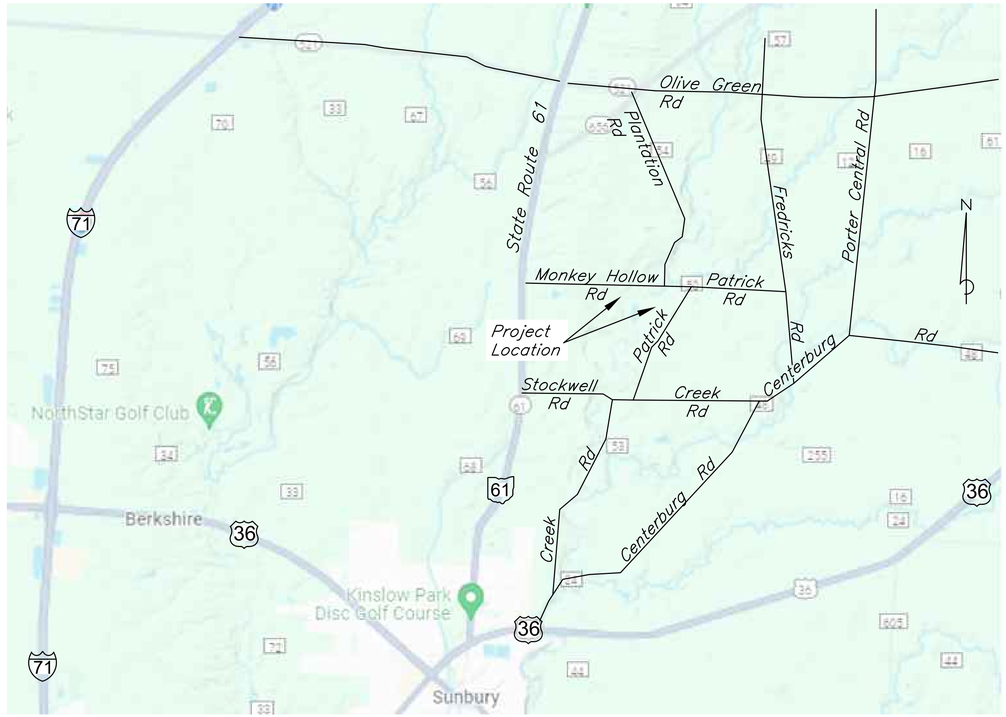
CONSTRUCTION APPROVAL

The practices shown on these plans have been installed in accordance with the plans and specifications, and meets the applicable NRCS practice standards.

Construction Approved:_____

Title:_____

Date Approved:_____



VICINITY MAP
Not to Scale

*******NOTICE********

CONTACT NRCS / SWCD OFFICE AT
740–362–4011
AT LEAST 2 WORKING DAYS PRIOR TO
CONSTRUCTION FOR PRE–CONSTRUCTION CONFERENCE

A Pre–construction meeting must be held between the landowner, contractor, and local NRCS/SWCD office. The local NRCS/SWCD office must be informed at least 2 working days prior to any construction to schedule layout and inspection of work. Failure to give adequate notice may result in the withdrawal of NRCS/SWCD technical assistance. If this occurs, NRCS/SWCD cannot certify that the practice meets NRCS standards and specifications.

WETLAND POOL NOTE

Wetland pool elevations are subject to seasonal water table and rainfall conditions.

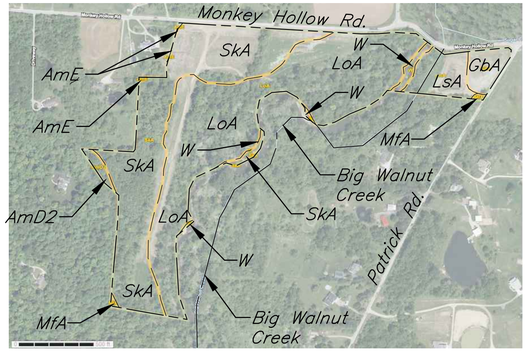
UNDERGROUND UTILITIES AT EXCAVATION SITE

OHIO811 I.D.# A328502407

CONTRACTOR OHIO811 I.D.#_____

UTILITY INFORMATION 1/				OHIO811 MEMBER/ LIMITED BASIS PARTICIPANT
NAME	ADDRESS	PHONE NO.	NO REPLY	
BSDP–Brightspeed	P.O. Box 2159 Fayetteville, NC 28301	833–692–7773		X
DCOP– Del–Co Water	6658 Olentangy River Rd, Delaware, OH 43015	740–548–7746		X
MWEP–Consolidated Electric Coop	4993 State Route 521 Delaware, OH 43015–8766	740–363–2641		X
WCOP–Charter Com (Spect/Time Warner)	1314 Polaris Pkwy, Columbus, OH 43240	888–406–7063		X

1/ IF NO UTILITIES ARE IDENTIFIED IN THE AREA, CHECK THIS BOX. ☐



500 0 500 1000 1500
Scale in Feet

N

SOILS MAP

Mapped Soils
AmD2–Amanda Silt Loam 12 to 18 percent sloped.
AmE–Amanda Silt Loam 18 to 25 percent sloped.
GbA–Gallman Silt Loam 0 to 2 percent sloped.
LoA–Lobdell Silt Loam 0 to 2 percent sloped, occasionally flooded.
LsA–Lobdell Channery Substratum Sloan, 0 to 2 percent sloped,occasionally flooded.
MfA–Millgrove Silt Loam, 0 to 2 percent sloped.
SkA–Sloan Silt Loam, 0 to 1 percent sloped, occasionally flooded.
W– Water

Practices shall be installed and maintained according to the attached Ohio NRCS Material and Construction Specifications and Operation and Maintenance Plans:

Wetland Restoration –	*657*	*Lined Waterway or Outlet – 468*
Critical Area Planting –	*342*	*JOB CLASS – IV*
Mulching –	*484*	

NRCS OH–21 Excavation Construction Specification

NOTICE TO LANDOWNER AND EXCAVATOR

Landowners or operators, sponsoring organizations, and contractors are liable for any damage resulting from disruption of a utility service caused by construction activities. NRCS makes no representation on the existence or non–existence of utilities on this site.

Excavator must notify all utilities at least 48 hours, and not more than 10 days, prior to the planned commencement of excavation.

Call OHIO811 (800–362–2764 or 811) for a listing of OUPS and OGPUPS members and limited basis participant members.

EROSION AND SEDIMENT CONTROL

The contractor is responsible to use all appropriate Best Management Practices to minimize the likelihood of site erosion and offsite sediment transport.
When final site stabilization cannot be completed within 14 days of the commencement of construction, an Ohio EPA NPDES permit may be required (landowner is responsible for obtaining this if required)

Refer to the NRCS "NEM 520 Soil and Water Resource Development, Subpart A – Erosion and Sediment Control" document.

CULTURAL RESOURCES DISCOVERY NOTE

If Cultural Resouces items are Found during Construction, Immediately Stop Work and Notify Bryan Lee, NRCS Cultural Resources Coordinator at 614–255–2487.

Date 03/24 04/24 05/24
Designed C. Coe
Drawn C. Coe, C. Copley
Checked C. Nugent
Approved BLAKE ARTHUR
Digitally signed by BLAKE ARTHUR
Date: 2024.06.03 11:54:32 -04'00'

Bart Gliatta
WRE–Wetland Restoration
Cover Sheet

Delaware County, Ohio
Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No. gliatta_wetland.dwg

Drawing No.

Sheet 1 of 7

Description of Work, Measurement and Payment

Item	Work Description	Quantity Description	Measurement and Payment 2/
Critical Area Planting	Includes all work necessary to seed and fertilize disturbed areas as indicated on drawings. Seed mix and rates, and seedbed preparation will be according to seeding tables shown on the drawings.	Dimensions and locations for each area to be seeded will be shown in plan views in the construction drawings.	The seeding area is to be measured after seeding is completed. Payment will be based on the total area seeded to the nearest 0.1 acre for each type of seeding area.
Excavated Wetlands	Includes all work to construct the excavated wetland as shown on drawings. Stripping and stockpiling of topsoil is planned as part of this item. Soil replacement, if required, will be as described on the drawings. Spoil and debris placement in the areas shown on the drawings is included as a part of this item.	Volume and areas shown in the drawings include excavation to the design subgrade which include removal of the topsoil layer. Design quantities were calculated in two parts. The first part consisted of using field survey shots to create a CAD topographic surface model. The second part consisted of creating CAD excavation grading model. Quantity volumes were determined by the difference between the surface and the grading model. Quantity volumes were then checked using manual methods.	Payment will be based on the actual volume excavated (cubic yards), including the stripping of topsoil. Payment volume must be verified with enough field survey to define the before construction existing ground and the post construction excavated surface.
Mulching	Includes the application of straw mulch or other state approved natural material by hand or mechanical means. Mulch shall cover the entire seeding bed. Measures to protect mulch from wind erosion and washout includes netting and/or using a spade or roller to push mulch into soil.	Refer to the Critical Area Planting seeding dimensions for mulch coverage quantities.	Mulched areas shall be measured after work is completed. Payment will be based on the total area seeded to the nearest 0.1 acre.
Tile Block	Includes crushing 10 feet of the exposed tile line that is identified to be blocked and backfilling the trench.	Quantities are not calculated.	Payment will be made by the number of tile drain lines exposed and crushed. Replacing or re-routing the tile is not included.
Tile Search	Includes searching for existing tile to a depth of 4 feet with a continuous trench along the lengths shown on the drawings. If tile is found during the search, the field office is to be contacted at the telephone number shown on Sheet 1 of the drawings to determine the course of action, unless at that location the drawings specify the tile is to be blocked. See Work Description and Measurement and Payment of "Tile Block" below in this table.	Length of tile search was measured on the drawings.	Length of tile search will be measured to the nearest foot after construction is completed. Payment will be made by the length of tile search completed.
Water Control Structure Removal	Includes all work necessary to remove the water control structure box and appurtenances (excavation, anti-seep collars, cut off and cap pipes, pipe, and water control structure box) required to reconstruct dike to the design section required as shown on the drawings. If applicable, the water control structure box is to be salvaged in good condition for landowner disposal or reuse.	Quantities will not be measured.	The subgrade after the water control structure and pipe removed will be inspected. Payment will be made by the number of water control structures removed.
Excavated Dike Notch	Includes all work to excavate the trapezoidal notch as shown on the drawings. Stripping and stockpiling of topsoil is planned as part of this item. Spoil material locations are shown on the drawings and is included as a part of this item.	Volume and areas shown in the drawings include excavation to the design subgrade which include removal of the topsoil layer. Design quantities were calculated in two parts. The first part consisted of using field survey shots to create a CAD topographic surface model. The second part consisted of creating CAD excavation grading model. Quantity volumes were determined by the difference between the surface and the grading model. Quantity volumes were then checked using manual methods.	Payment will be based on the actual volume excavated (cubic yards), including the stripping of topsoil. Payment volume must be verified with enough field survey to define the before construction existing ground and the post construction excavated surface.
Excavated Dike Notch - Type C Riprap	Includes all work necessary to furnish and install Type C Riprap as bank and bottom protection as shown on the drawings.	Dimensions are described or shown on the drawings.	The area of riprap is to be measured after installation. Payment will be made to the nearest cubic yard.

Quantities and Components

Item	Component	Related Quantity	Conservation Practice Standard	Design Quantity	As-Built Quantity	Unit
Excavated Wetland A	Excavated Wetland	200.7 CY	Wetland Restoration (657)	0.7		acres
Excavated Wetland B	Excavated Wetland	803.1 CY	Wetland Restoration (657)	0.4		acres
Excavated Wetland C	Excavated Wetland	903.4 CY	Wetland Restoration (657)	0.6		acres
Excavated Wetland D	Excavated Wetland	647 CY	Wetland Restoration (657)	0.4		acres
Excavated Wetland E	Excavated Wetland	567.1 CY	Wetland Restoration (657)	0.5		acres
Excavated Dike Notch	Excavated Wetland	30.9 CY	Wetland Restoration (657)	0.02		acres
Water Control Structure (WCS)	Excavated Wetland	_____	Wetland Restoration (657)	_____		ea.
Critical Area Seeding: Excavated Wetlands A, B, C, D, E	Seeding	_____	Critical Area Planting (342)	0.9		acres
Critical Area Mulching: Excavated Wetlands A, B, C, D, E	Mulching	_____	Mulching (484)	0.9		acres
Critical Area Seeding: Spoil Areas A, B, C, D	Seeding	_____	Critical Area Planting (342)	2.7		acres
Critical Area Mulching: Spoil Areas A, B, C, D	Mulching	_____	Mulching (484)	2.7		acres
Dike Notch Excavation Type C Riprap:	Riprap	12.1 CY	Lined Waterway or Outlet (468)	0.02		acres
Tile Search	_____	_____	Wetland Restoration (657)	300 0		LF
Tile Block	_____	_____	Wetland Restoration (657)	0		each

Bill of Materials

Item	Amount	Unit
Excavated Dike Notch (Wetland A & B Plan View, sht. 4)		
Type C Riprap	12.1	CY

Note: Refer to Attached Job Sheet for Project Seeding Rates

Date
Designed C. Coe 03/24
Drawn C. Coe, C. Copley 04/24
Checked C. Nugent 05/24
Approved BLAKE ARTHUR Digitally signed by BLAKE ARTHUR Date: 2024.06.03 15:45:54 -04'00'

Bart Gliatta
Wetland
Quantities & Construction Details
Porter Township
Delaware County, Ohio

United States Department of Agriculture
Natural Resources Conservation Service

File No. gliatta_wetland.dwg

Drawing No.

Sheet 2 of 7

Wetland C
Finished Elevation: 1035.0
See Wetland C&D Plan Profile Sheet, Sht. 5.

BM 2
Elev: 1037.22
Desc: Western Wetland Post

Spoil Mound B
See Wetland A&B Plan Profile Sheet, Sht. 4.

Plantation Road

Monkey Hollow Road

Gliatta WRE Site Boundary

Wetland A
Finished Elevation: 1036'
See Wetland A&B Plan Profile Sheet, Sht. 4.

BM 1
Elev: 1039.97
Desc: NE Site Corner

Spoil Mound C
See Wetland C&D Plan Profile Sheet, Sht. 5.

Wetland D
Finished Elevation: 1035.0'
See Wetland C&D Plan Profile Sheet, Sht. 5.

Wetland B
Finished Elevation: 1035'
See Wetland A&B Plan Profile Sheet, Sht. 4.

Notch Dike Here
Length: 35'
Elevation: 1038'

Existing Water Control Structure/Pipe

Patrick Road

350' (Approx. Length)

350' (Approx. Length)

Existing Dike

Spoil Mound A
See Wetland A&B Plan Profile Sheet, Sht. 4.

Wetland E
Finished Elevation: 1033.5'
See Wetland E Plan Profile Sheet, Sht. 6.

Spoil Mound D
See Wetland E Plan Profile Sheet, Sht. 6.

Proposed Spoil Trail

100 0 100 200 300
Scale in Feet

LEGEND

TILE SEARCH
EASMENT LINE
PROPOSED DIKE NOTCH
EXISTING SUBSURFACE DRAIN
BENCHMARKS BM1
OVERHEAD UTILITY

Note: If Tile is Found Refer To Sheet 7, Tile Search Details

Date
Designed C. Coe 03/24
Drawn C. Coe, C. Copley 04/24
Checked C. Nugent 05/24
Approved BLAKE ARTHUR Digitally signed by BLAKE ARTHUR Date: 2024.06.03 15:46:13 -04'00'

Bart Gliatta
Wetland
Overall Plan View

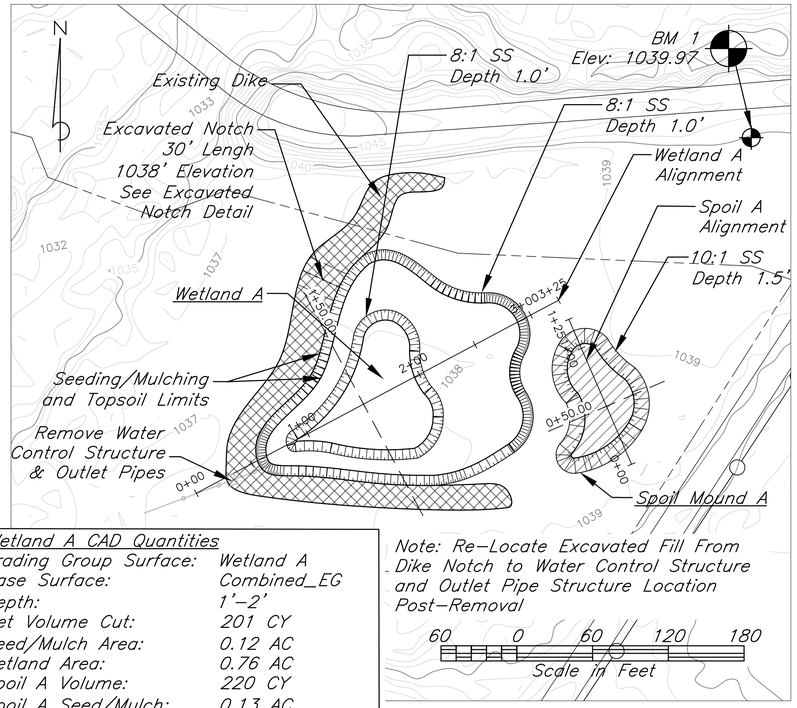
Delaware County, Ohio
Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No. gliatta_wetland.dwg

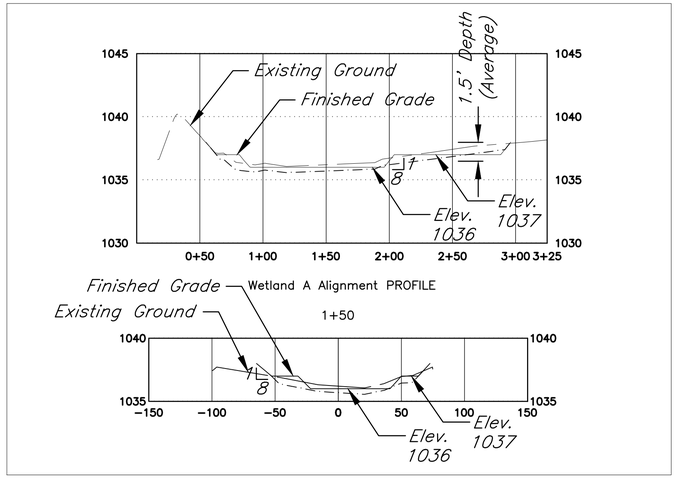
Drawing No.

Sheet 3 of 7

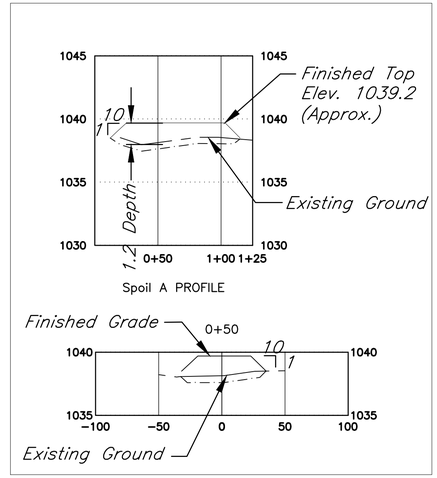


Wetland A CAD Quantities	
Grading Group Surface:	Wetland A
Base Surface:	Combined_EG
Depth:	1'-2'
Net Volume Cut:	201 CY
Seed/Mulch Area:	0.12 AC
Wetland Area:	0.76 AC
Spoil A Volume:	220 CY
Spoil A Seed/Mulch:	0.13 AC

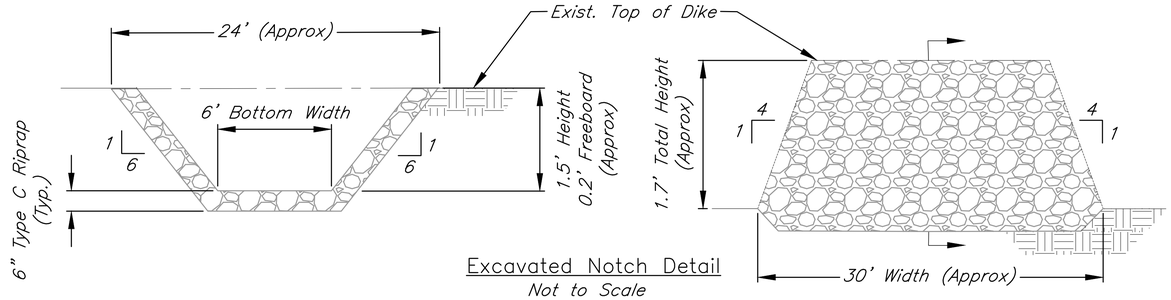
Wetland A Plan View



Wetland A Alignment/Cross-Section



Spoil A Alignment/Cross-Section



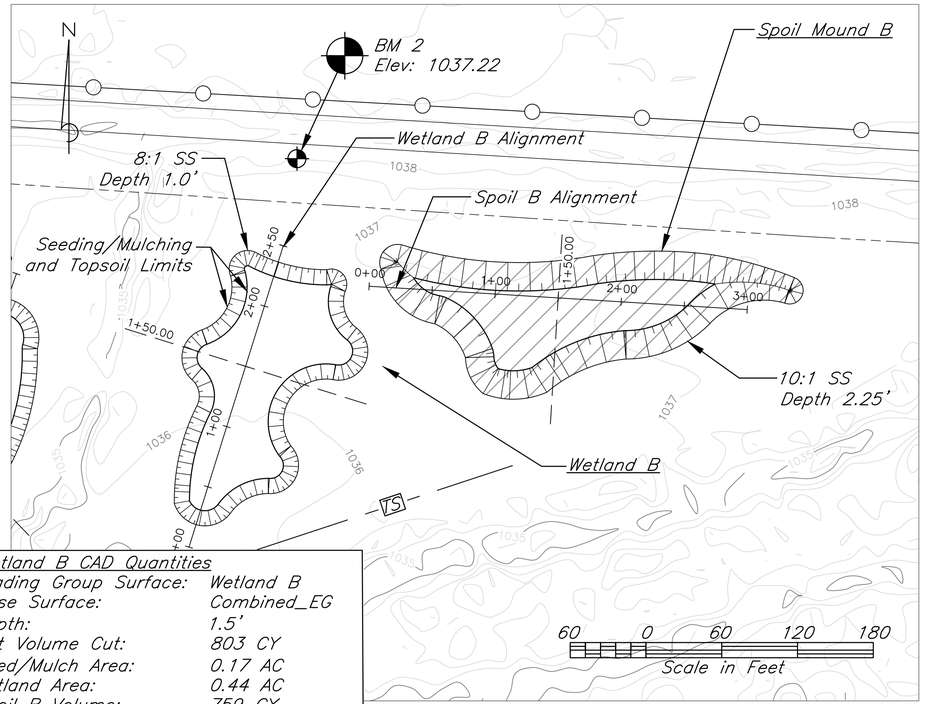
Excavated Notch Detail
Not to Scale

Cross Section A-A

Profile

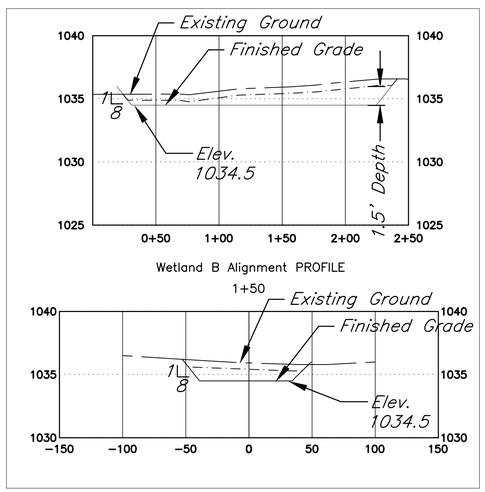
Note: Do Not Place Topsoil, Seed/Mulch on Wetland Bottom.
Place Topsoil Seed/Mulch on Side Slopes.
Remove 6" Topsoil Before Excavation/Fill.

Excavated Notch Quantities	
Net Volume Cut:	30.9 CY
Notch Area:	0.02 AC
Type C Riprap:	12.1 CY
WCS/Pipe Structure Location Fill:	3.8 CY

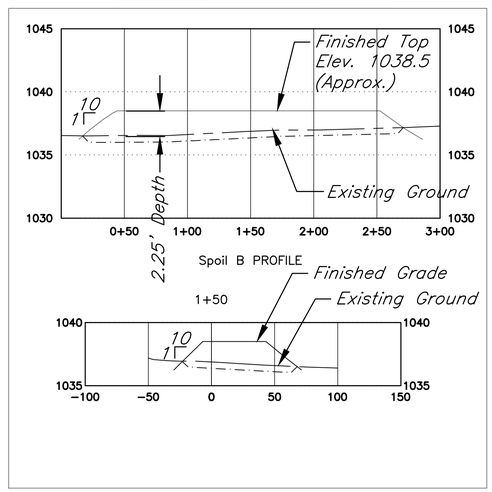


Wetland B CAD Quantities	
Grading Group Surface:	Wetland B
Base Surface:	Combined_EG
Depth:	1.5'
Net Volume Cut:	803 CY
Seed/Mulch Area:	0.17 AC
Wetland Area:	0.44 AC
Spoil B Volume:	759 CY
Spoil B Seed/Mulch:	0.53 AC

Wetland B Plan View



Wetland B Alignment/Cross-Section



Spoil B Alignment/Cross-Section

Date	
Designed	C. Coe — 03/24
Drawn	C. Coe, C. Copley — 04/24
Checked	C. Nugent — 05/24
Approved	BLAKE ARTHUR — Digitally signed by BLAKE ARTHUR Date: 2024.06.03 15:46:36 -04'00'

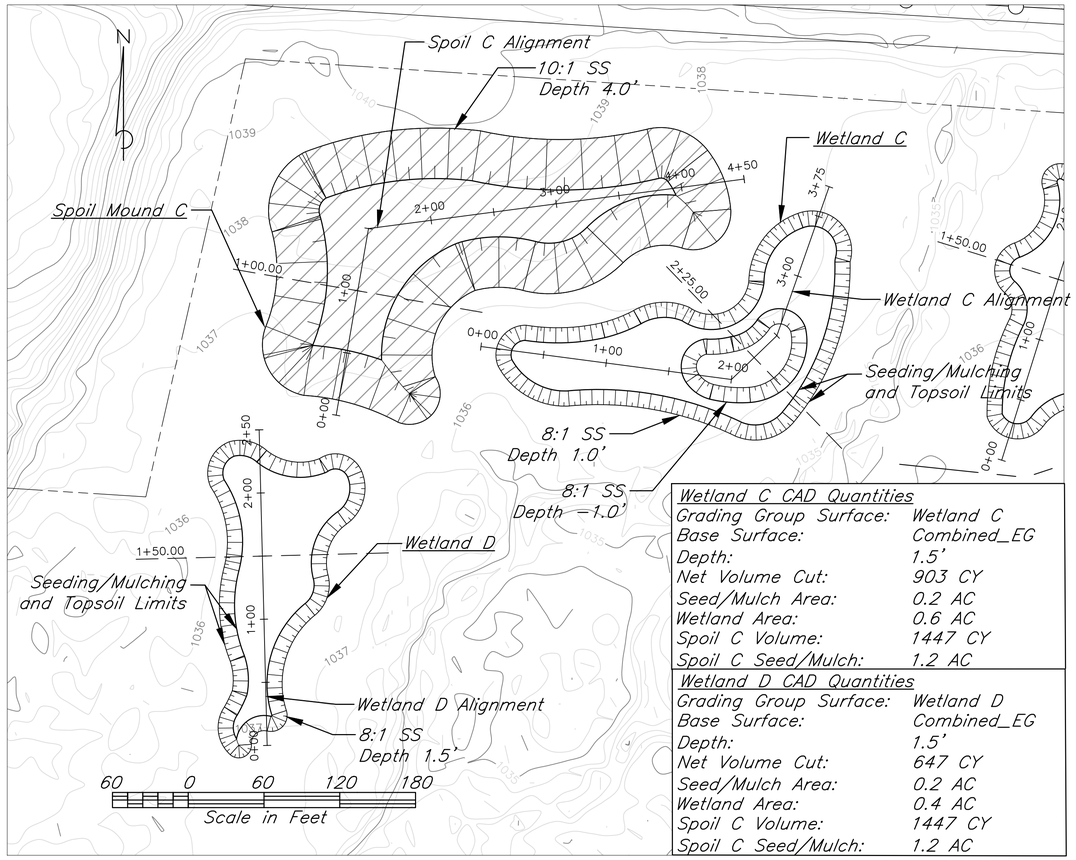
Bart Gliatta
Wetland
Wetlands A & B Plan View
Delaware County, Ohio
Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No.
gliatta_wetland.dwg

Drawing No.

Sheet 4 of 7

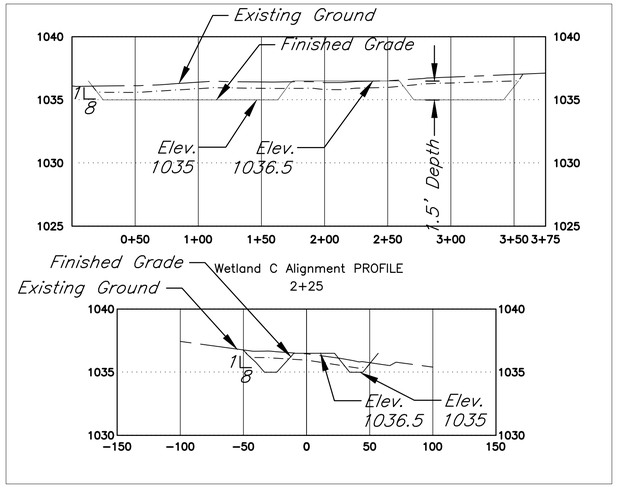


Wetland C CAD Quantities	
Grading Group Surface:	Wetland C
Base Surface:	Combined_EG
Depth:	1.5'
Net Volume Cut:	903 CY
Seed/Mulch Area:	0.2 AC
Wetland Area:	0.6 AC
Spoil C Volume:	1447 CY
Spoil C Seed/Mulch:	1.2 AC

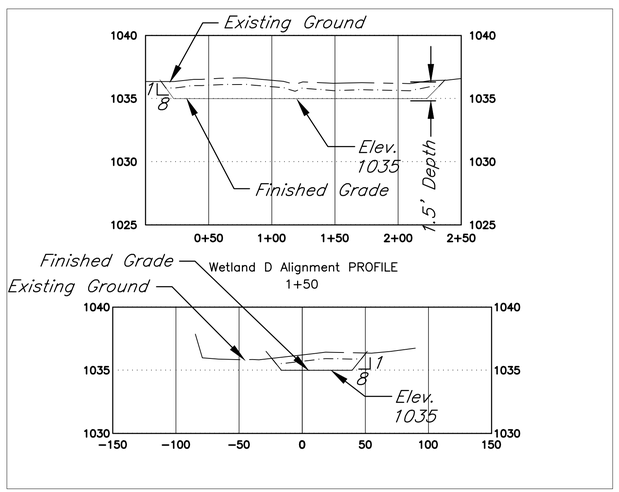
Wetland D CAD Quantities	
Grading Group Surface:	Wetland D
Base Surface:	Combined_EG
Depth:	1.5'
Net Volume Cut:	647 CY
Seed/Mulch Area:	0.2 AC
Wetland Area:	0.4 AC
Spoil C Volume:	1447 CY
Spoil C Seed/Mulch:	1.2 AC

Wetland C–D Plan View

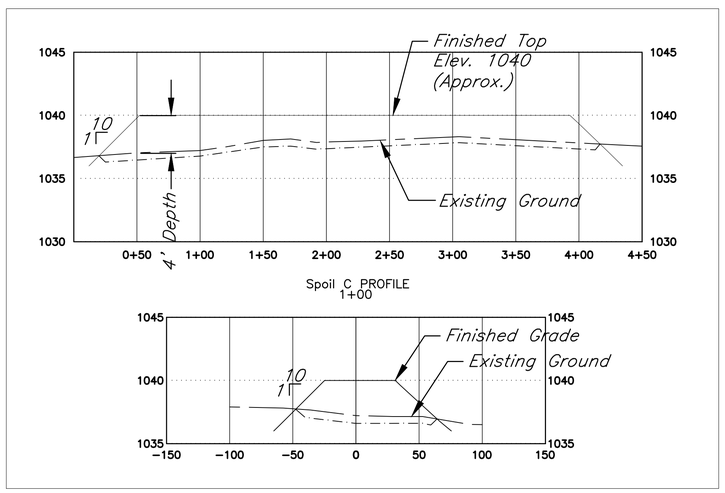
Note: Do Not Place Topsoil, Seed/Mulch on Wetland Bottom.
Place Topsoil Seed/Mulch on Side Slopes.
Remove 6" Topsoil Before Excavation/Fill.



Wetland C Alignment/Cross–Section



Wetland D Alignment/Cross–Section



Spoil C Alignment/Cross–Section

Date
Designed C. Coe 03/24
Drawn C. Coe, C. Copley 04/24
Checked C. Nugent 05/24
Approved BLAKE ARTHUR Digitally signed by BLAKE ARTHUR Date: 2024.06.03 15:46:55 -04'00'

Bart Gliatta
Wetland
Wetlands C & D Plan View

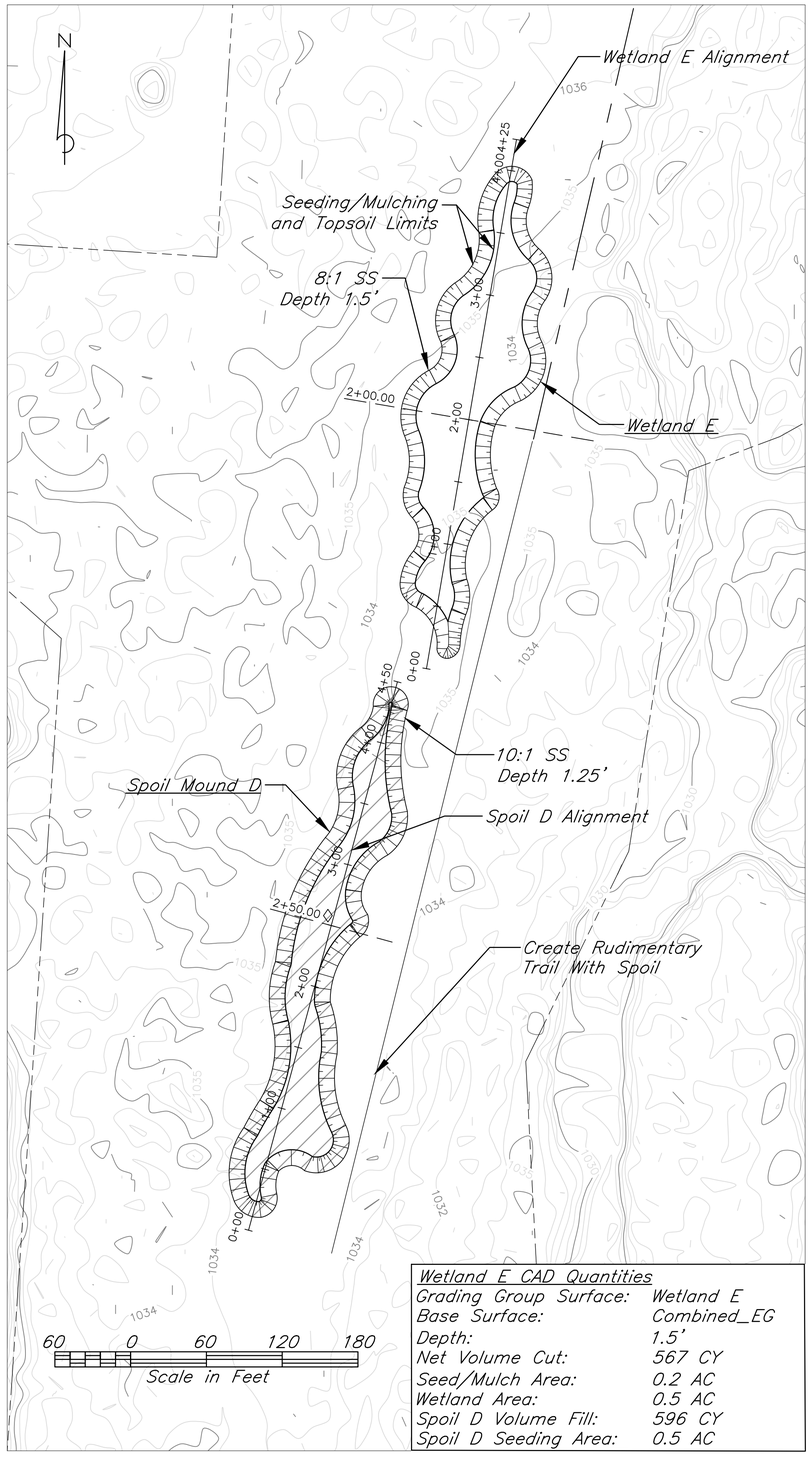
Delaware County, Ohio
Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No. gliatta_wetland.dwg

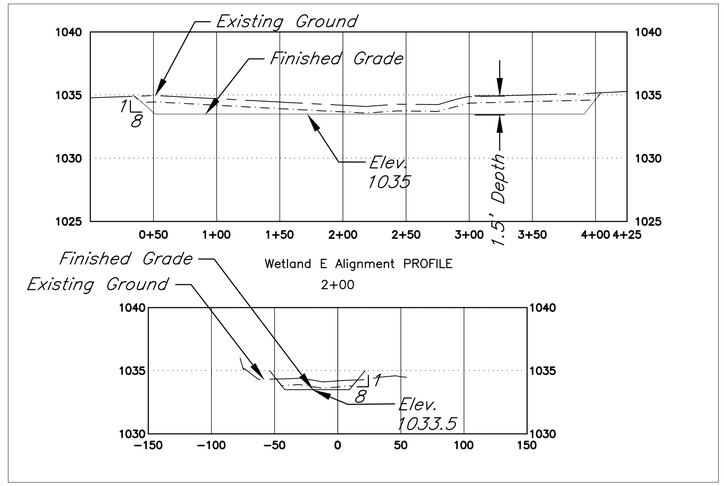
Drawing No.

Sheet 5 of 7

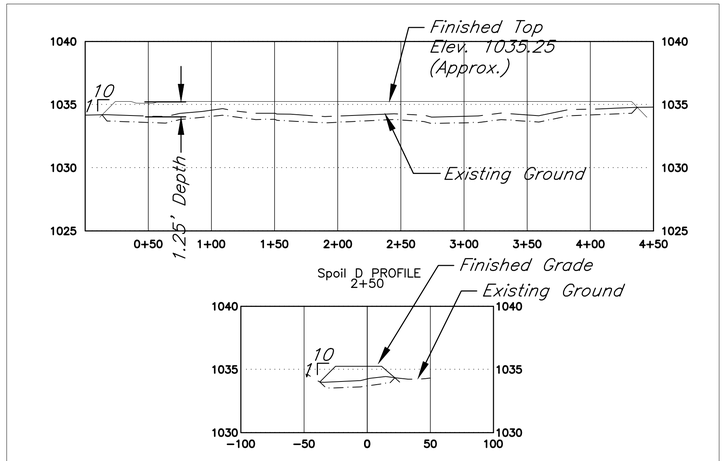


Wetland E CAD Quantities	
Grading Group Surface:	Wetland E
Base Surface:	Combined_EG
Depth:	1.5'
Net Volume Cut:	567 CY
Seed/Mulch Area:	0.2 AC
Wetland Area:	0.5 AC
Spoil D Volume Fill:	596 CY
Spoil D Seeding Area:	0.5 AC

Wetland E Plan View



Wetland E Alignment/Cross-Section



Spoil D Alignment/Cross-Section

Note: Do Not Place Topsoil, Seed/Mulch on Wetland Bottom.
Place Topsoil Seed/Mulch on Side Slopes.
Remove 6" Topsoil Before Excavation/Fill.

Date
Designed C. Coe 03/24
Drawn C. Coe, C. Copley 04/24
Checked C. Nugent 05/24
Approved BLAKE ARTHUR
Digitally signed by BLAKE ARTHUR
Date: 2024.06.03 15:47:13 -04'00'

Bart Gliatta
Wetland E
Wetland E Plan View

Delaware County, Ohio
Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No.
gliatta_wetland.dwg

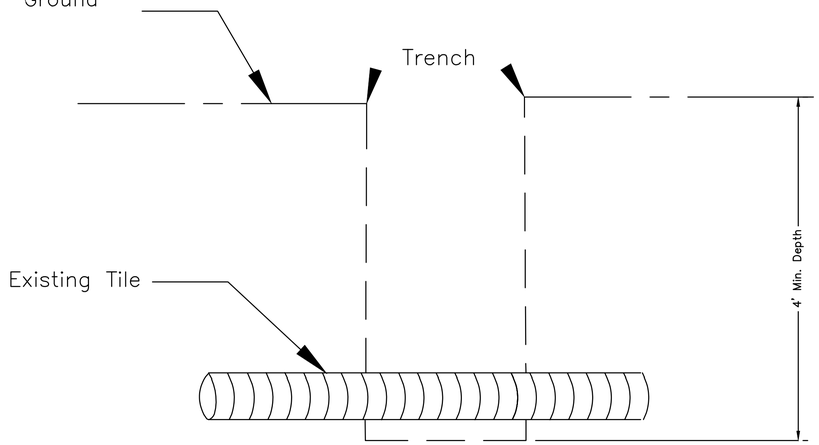
Drawing No.

Sheet 6 of 7

Tile Search and Construction Notes

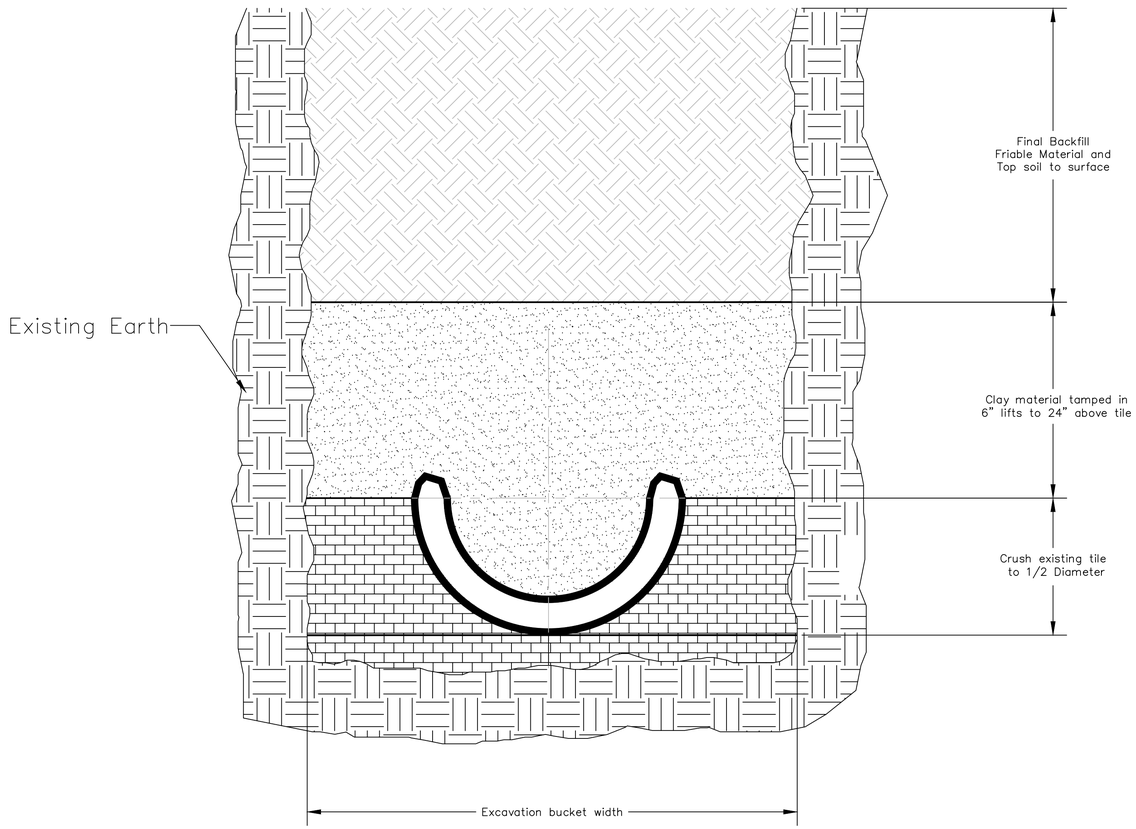
1. Tile search investigations are applicable to federal and state guidance for excavation and trench safety.
2. Tile searches shall be continuous segment with a start and end according to the locations on the plan map.
3. Trenches shall be a minimum of 10 inches wide and 4 feet deep measured from the original ground elevation. A deeper trench may be required if NRCS Representative determines the site conditions require it.
4. The trench shall not be backfilled until the NRCS Repesentative has completed all of the following:
   - 4.1. Examine the trench and excavated materials.
   - 4.2. Measure the trench length and depth.
   - 4.3. Survey any found conduit or structures.
5. Size, material, operating condition, and direction of flow of each conduit shall be documented. Each conduit found shall have its location and elevation surveyed before it is destroyed, fixed, or re–routed.
6. When destroying tile, excavate the tile down to existing grade for a minimum length of 4 feet along the tile and crush the tile completely. Repeat this process every 20 feet along the tile until a distance away from the permanent pool equal to below is reached:
   - 6.1. For Blount soils the total destruction distance away from permanent pool is:
     - 6.1.1. 35 feet for tile 2 feet below ground
     - 6.1.2. 55 feet for tile 3 feet below ground
     - 6.1.3. 65 feet for tile 4 feet below ground
     - 6.1.4. 75 feet for tile 5 feet below ground
   - 6.2 For Pewamo soils the total destruction distance away from permanent pool is:
     - 6.2.1 35 feet for tile 2 feet below ground
     - 6.2.2 50 feet for tile 3 feet below ground
     - 6.2.3 60 feet for tile 4 feet below ground
     - 6.2.4 70 feet for tile 5 feet below ground
7. If destroyed tile is still in use downstream of the destruction trench, plug the tile at the end of the destruction trench using manufacture connection or rocks tightly packed together with a plastic sheet to prevent soil infiltration.
8. When replacing pipe, use non–perforated pipe with equal or greater capacity than existing and use watertight connections. When replacing clay or concrete tile with single–wall corrugated plastic pipe, use the next larger nominal size.
9. When re–routing pipe, follow the design as noted on these plans. If no design exists, follow the NRCS Representative's recommendations.
10. If the investigation trench has been excavated below the existing drain grade, backfill the trench with #57 or #8 gravel up to the spring line of the pipe to support the pipe and keep it from deforming.
11. Make connections with manufactured fittings and tight joints. where joints have gaps that would allow soil to enter, cover the joint with a resilient material such as coal tar pitch treated roofing paper, fiberglass sheet or mat, or plastic sheet.
12. For backfill material above grade, use selected soil free of hard clods, rocks, or frozen soil. Hand tamp the backfill material around the haunch zone of the pipe in layers not over 4 inches thick to provide support. Hold the pipe in place while placing and compacting backfill material around pipe to ensure proper alignment and grade is maintained. Within 2 feet of the pipe, keep backfill material free of large rocks, frozen material, and large dry clods.
13. After the trench has been backfilled and compacted to 6 inches above the pipe, backfill the remainder of the trench as follows:
    - 13.1. For trenches located under or near structures, back in 6 inch layers and compact each layer to a density equal to or greater than the surrounding soil.
    - 13.2. For other locations, backfill with excavated soil material until the backfill extends at least 6 inches above the existing ground elevation and is well rounded over the trench.

Typical Cross Section of Tile Search Trench



Tile Destruction

1. Crush tile completely
2. Compact clay in 6" lifts until 24" above tile.
3. Backfill remainder of trench with excavated material.



Date
Designed C. Coe 03/24
Drawn C. Coe, C. Copley 04/24
Checked C. Nugent 05/24
Approved BLAKE ARTHUR Digitally signed by BLAKE ARTHUR Date: 2024.06.03 11:54:33 -04'00'

Delaware County, Ohio

Bart Gliatta Wetland Tile Search Details

Porter Township

United States Department of Agriculture
Natural Resources Conservation Service

File No. gliatta_wetland.dwg

Drawing No.

Sheet 7 of 7

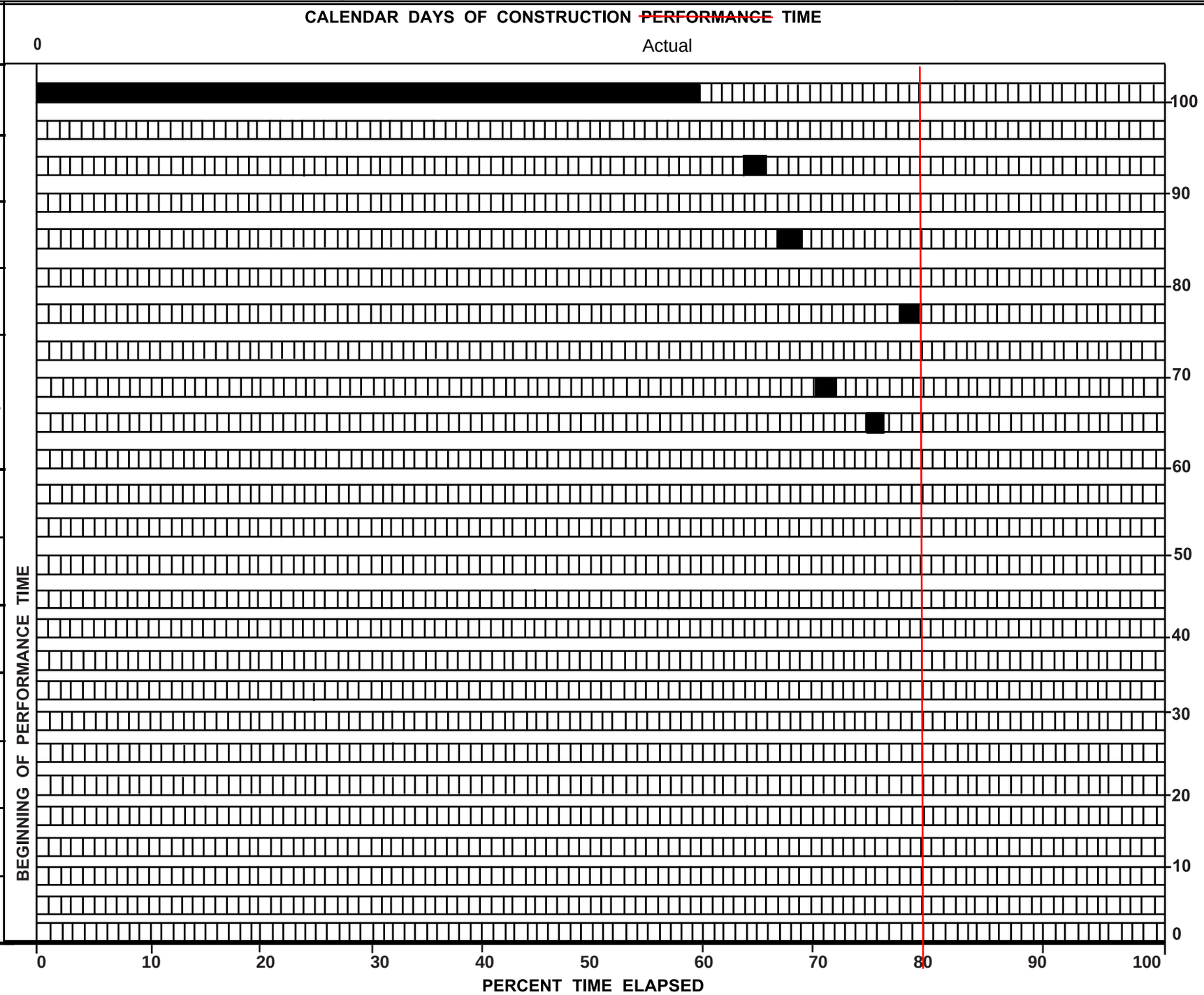
NRCS-AS-52
REV. 3-72

SCHEDULE OF OPERATIONS FOR CONSTRUCTION

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PROJECT	STATE	CONTRACTOR	INVITATION OR CONTRACT NO.
BART C GLIATTA - WRE PROJECT	Delaware Co. OH	Design	

ITEM NO.	WORK OR MATERIAL
1	Survey,H&H Modeling, Floodplain Permitting & Report
2-3	Wetland Restoration(657) - Tile Search and blocking
4	Wetland Restoration(657) - Excavated Wetland
5	Wetland Restoration(657) - Mobilization
6	Lined Waterway or Outlet (468) ODOT Stone type C Rip Rap
7	Critical Area Planting (342) - Grass/legume mix - with mulch



EACH HORIZONTAL INTERVAL EQUALS 1 CALENDAR DAYS OF CONSTRUCTION PERFORMANCE TIME

80 Actual Days

80 Days Performance Time

SUBMITTED _____
Contractor

BY _____ DATE _____

TITLE Project Engineer/ COR

APPROVED

_____
Contracting Officer — Date

_____
Government Representative — Date

INDEX OF CONSTRUCTION AND MATERIAL SPECIFICATIONS

SPEC. NO.	CONSTRUCTION SPECIFICATIONS	MATERIAL SPECIFICATIONS
1	Big Walnut creek H&H Analysis	
2	Stake-Out/ Earthwork	
3	Tile Search	
4	Tile Blocks	Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 24 inch ASTM F 667
5	Excavation	
6	Mobilization and Demobilization	
7	ODOT Stone type C Rip Rap	
8	Seeding and mulching	523 Rock for Riprap

Construction Specification 1—Big Walnut creek H&H Analysis

1. Scope

The purpose of this study is to conduct a hydrologic and hydraulic (H&H) analysis utilizing HEC-RAS software to support the application for a local floodplain permit required for wetland restoration efforts within the floodplain

2. Topographic Survey & Creek Cross Sections

Conduct a topographic survey of the project area to capture necessary elevation data for H&H modeling. Locate existing utilities and significant land features within the designated study area. Utilize GIS and LIDAR data where applicable to supplement survey efforts. Develop a base map incorporating all surveyed features and prepare deliverables for use in the H&H study

3. H&H Modeling

Prepare a FEMA Effective, Corrected Effective, and Proposed Conditions Model with Floodway Analysis. Develop a hydrologic model of the study area using HEC-RAS software. Perform hydraulic analysis to assess existing and proposed conditions related to wetland restoration efforts. Determine water surface elevations and floodplain extents under various storm event conditions. Assess the potential impacts of the wetland restoration on floodplain characteristics

4. H&H Report & Floodplain Permitting

Compile results into a formal H&H report, including floodplain mapping, model outputs, and technical findings. Prepare documentation required for obtaining the local floodplain permit. Coordinate with local regulatory agencies to ensure compliance with applicable floodplain management regulations. Address comments from reviewing agencies and make necessary modifications to the permit application as required. Submit the final permit application and supporting documents to the appropriate local authority.

5. Measurement and payment

Method 1—For items of work for which specific lump sum prices are established by the contract, the extent of hydrologic and hydraulic (H&H) analysis is not measured or determined for payment. Payment for (H&H) is made at the contract lump sum price for the item and shall constitute full compensation for all labor, equipment, tools, applicable and associated fees, and all other items necessary and incidental to the satisfactory completion of the word.

Construction Specification 3-4—Subsurface Drain Investigation, Removal, And Repair

1. Scope

The work shall consist of investigation, location, repair, and/or removal of subsurface drains (tile) near new or existing animal waste storage facilities or in wetland restoration, enhancement, or creation project areas, or other situations where subsurface drains may be present.

2. Investigation and Location

An inspection trench at least 10 inches wide shall be dug at the location shown on the drawings or as directed by the engineer or his representative. The trench shall be at least 4 feet deep measured from the original ground line, unless otherwise shown on the plans or a deeper trench is desirable based on site conditions. The Engineer shall examine the trench and excavated material to identify tile lines.

3. Tile Repair

Unless designated for removal, replace damaged conduit with new conduit having equal or greater capacity using material specified in Section 6 or 7. When replacing short sections of clay or concrete tile with single-wall corrugated polyethylene pipe, use the next larger nominal size.

Make connections with manufactured fittings and tight joints. Where joints have gaps that would allow soil to enter, cover the joint with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheet.

If the investigation trench has been excavated below the existing drain grade, backfill the trench with gravel or well-pulverized soil in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to provide a firm foundation for the conduit at the existing grade. Do not backfill with any soil containing broken tile fragments.

Using selected soil free of hard clods, rocks, or frozen soil, hand tamp the backfill material around the haunch of the pipe in layers not over four (4) inches thick to provide support. Hold the conduit in place mechanically while placing backfill material around and over the conduit to ensure proper alignment and grade is maintained. Complete the backfill operation according to Section 5.

4. Tile Removal

Remove conduits as shown on the plans or directed by the Engineer or his representative, including envelope filter material or other flow enhancing material when present.

Crush the conduit 20 FT in both directions of inspection trench. Cap or plug the open ends of the disconnected conduit to prevent soil entry when the conduit will continue to function downstream, unless otherwise shown on the plans. For a minimum distance of two feet around and above each sealed conduit end, backfill in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to a density equal to or greater than the surrounding undisturbed soil. Do not backfill with any soil containing broken tile fragments, large stones, frozen material, or large dry clods.

If shown on the plans or directed by the Engineer, reroute upstream drain lines so the

capacity of the upstream drainage system is maintained. Install conduit in accordance with Ohio NRCS Construction Specification 606, Subsurface Drain.

5. Backfill

Compact soil around disturbed tile as specified in Section 3 (Tile Repair) and Section 4 (Tile Removal). Keep the backfill within 5 feet of the conduit free from large stones, frozen material, and large dry clods. Unless otherwise shown on the plans, backfill the remainder of the trench as follows:

For trenches located under or near structures, backfill in 6 inch layers and compact each layer to a density equal to or greater than the surrounding undisturbed soil.

For other locations, backfill the remainder of each trench with the excavated soil material which shall extend above the ground surface and be well rounded over the trench.

6. Materials

Unless otherwise shown on the plans, conduit and fittings used for repair shall conform to the specifications listed in Table 1. Perforated pipe shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the pipe. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

Table 1. Acceptable pipe for subsurface drain repair

Kind of Pipe[#]	Specification
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 24 inch	ASTM F 667
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 2 to 60 inch	ASTM F 2648[$]
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 12 to 60 inch	ASTM F 2306[$]
Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Clay drain tile	ASTM C 4
Concrete drain tile	ASTM C 412

[#] Pipe sizes are nominal and the ranges are inclusive

[$] Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable

Construction Specification 5—Excavation

1. Scope

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

2. Classification

Excavation is classified as common excavation, rock excavation, or unclassified excavation in accordance with the following definitions.

Common excavation is defined as the excavation of all materials that can be excavated,

transported, and unloaded using heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by excavators having a rated capacity of one cubic yard or larger and equipped with attachments (shovel, bucket, backhoe, dragline, or clam shell) appropriate to the material type, character, and nature of the materials.

Rock excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of ripping and excavating equipment larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than 1 cubic yard encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

For the purpose of these classifications, the following definitions shall apply:

Heavy ripping equipment is a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a track type tractor having a power rating of at least 250 flywheel horsepower unless otherwise specified in section 10.

Wheel tractor-scraper is a self-loading (not elevating) and unloading scraper having a struck bowl capacity of at least 12 cubic yards.

Pusher tractor is a track type tractor having a power rating of at least 250 flywheel horsepower equipped with appropriate attachments.

Unclassified excavation is defined as the excavation of all materials encountered, including rock materials, regardless of their nature or the manner in which they are removed.

3. Use of excavated material

Method 1—To the extent they are needed, all suitable material from the specified excavations shall be used in the construction of required permanent earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer. The contractor shall not waste or otherwise dispose of suitable excavated material.

Method 2—Suitable material from the specified excavations may be used in the construction of required earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer.
.

4. Excavation limits

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work. Excavations outside the lines and limits shown on the drawings or specified herein required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.

5. Borrow excavation

When the quantities of suitable material obtained from specified excavations are insufficient to construct the specified earthfills and earth backfills, additional material shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as specified in section 10 or as approved by the engineer.

Borrow pits shall be excavated and finally dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage.

6. Over excavation

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the engineer. Concrete that will be exposed to the atmosphere when construction is completed shall meet the requirements of concrete selected for use under Construction Specification 31, Concrete for Major Structures, or 32, Structure Concrete, as appropriate Concrete that will be permanently covered shall contain not less than five bags of cement per cubic yard. The concrete shall be placed and cured as specified by the engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill. The exception to this is that if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding, or drainfill. Before correcting an overexcavation condition, the contractor shall review the planned corrective action with the engineer and obtain approval of the corrective measures.

7. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits is measured and computed to the nearest cubic yard by the method of average cross-sectional end areas or by methods outlined in section 10 of this specification. Regardless of quantities excavated, the measurement for payment is made to the specified pay limits except that excavation outside the specified lines and grades directed by the engineer to remove unsuitable material is included. Excavation required because unsuitable conditions result from the contractor's improper construction operations, as determined by the engineer, is not included for measurement and payment. The pay limits shall be as designated on the drawings.

Construction Specification 6—Mobilization and Demobilization

1. Scope

The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

2. Equipment and material

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in section 4 of this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

3. Measurement and payment

For items of work for which specific lump sum prices are established in the contract, payment for the work is made at the contract lump sum price. Payment will constitute full compensation for all flaggers, labor, materials, equipment, and all other items necessary and incidental to the completion of the work.

Construction Specification 7—Rock Riprap

1. Scope
The work shall consist of the construction of rock riprap revetments and blankets, including filter or bedding where specified.

2. Material
Rock riprap shall conform to the requirements of Material Specification 523, Rock for Riprap, or if so specified, shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits. At least 30 days before rock is delivered from other than designated sources, the contractor shall designate in writing the source from which rock material will be obtained and provide information satisfactory to the contracting officer that the material meets contract requirements. The contractor shall provide the contracting officer's technical representative (COTR) free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in section 8.
Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.
Based on a specific gravity of 2.65 (typical of limestone and dolomite) and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve size of rock	Approx. weight of rock	Weight of test pile
16 inches	300 pounds	6,000 pounds
11 inches	100 pounds	2,000 pounds
6 inches	15 pounds	300 pounds

When specified in Section 8 or when it is necessary to verify the gradation of the rock riprap, a particle size analysis shall be performed in accordance with ASTM D5519, Test Method A or B. The analysis shall be performed at the work site on a test pile of representative rock. The mass of the test pile shall be at least 20 times the mass of the largest rock in the pile The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.
Filter or bedding aggregates when required shall conform to Material Specification 521, Aggregates for Drainfill and Filters, unless otherwise specified. Geotextiles shall conform to Material Specification 592, Geotextile.
3. Subgrade preparation
The subgrade surface on which the rock riprap, filter, bedding, or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved material and shall

conform to the requirements of the specified class of earthfill.
Rock riprap, filter, bedding, or geotextile shall not be placed until the foundation preparation is completed and the subgrade surface has been inspected and approved.

4. Equipment-placed rock riprap

The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures.

5. Hand placed rock riprap

The rock riprap shall be placed by hand on the surface and to the depth specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on its vertical edge except where it is laid like paving stone and the thickness of the rock equals the specified depth of the riprap course.

6. Filter or bedding

When the contract specifies filter, bedding, or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate is not required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

6. Measurement and payment

For items of work for which specific unit prices are established by the contract, the quantity of each type of rock riprap placed within the specified limits is computed to the nearest ton by actual weight. For each load of rock for riprap placed as specified, the contractor shall furnish to the COTR a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Construction Specification 8—Seeding and Mulching

1. Scope

The work consists of preparing the area for treatment; furnishing and placing seed, sprigs, mulch, fertilizer, inoculant, lime, and other soil amendments; and anchoring mulch in designated areas as specified.

The following BioPreferred® product categories are applicable to this specification:

— mulch and compost materials

— erosion control materials

— fertilizers

— agricultural spray adjuvants

2. Material

Seed—All seed shall conform to the current rules and regulations of the state where it is being used and shall be from the latest crop available. It shall meet or exceed the standard for purity and germination.

Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination. No seed will be accepted with a test date of more than 9 months before the delivery date to the site. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable shall be as defined in the current State laws relating to agricultural seeds. Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the contracting officer.

Fertilizer—Unless otherwise specified, the fertilizer shall be a commercial grade fertilizer. It shall meet the standard for grade and quality specified by State law. Where fertilizer is furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample of the fertilizer shall be furnished to the contracting officer for chemical analysis.

Inoculants—The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used except four times the amount shall be used when seed is applied using a hydraulic seeder. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

Lime and other soil amendments—Lime shall consist of standard ground agriculture limestone, or approved equivalent. Standard ground agriculture limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Other soil amendments shall meet quality criteria and application requirements.

Straw mulch material—Straw mulch shall consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses, or other plants as specified in section 7. The mulch material shall be air-dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds is not permitted. The contractor shall provide a method satisfactory to the contracting officer for determining weight of mulch furnished.

Other mulch materials—Mulching materials, such as wood cellulose fiber mulch, mulch tackifiers, synthetic fiber mulch, netting, and mesh, are other mulching materials that may be required for specialized locations and conditions. These materials, when specified, must be accompanied by the manufacturer's recommendations for methods of application..

3. Seedbed preparation and treatment

Areas to be treated shall be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking, or both, may be necessary to properly prepare a seedbed. Where equipment cannot operate safely, the seedbed shall be prepared by hand methods by scarifying to provide a roughened soil surface so that broadcast seed will remain in place.

If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on a compacted, polished, or freshly cut soil surface.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations shall be removed or disposed of as specified in section 7.

Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the responsible engineer.

4. Measurement and payment

For items of work for which specific unit prices are established in the contract, each area treated is measured as specified in section 7 and the area calculated to the nearest 0.1 acre. Payment for treatment is made at the contract unit price for the designated treatment, which will constitute full compensation for completion of the work. When specified as an item of work, mesh or netting is measured to the nearest square yard of surface area covered and accepted. Payment is made at the contract unit price and will constitute full compensation for completion of the work.

Material Specification 521—Aggregates for Drainfill and Filters

1. Scope

This specification covers the quality of mineral aggregates for the construction of drainfill and filters.

2. Quality

Drainfill and filter aggregates shall be sand, gravel, or crushed stone or mixtures thereof. Aggregates shall be composed of clean, hard, durable, mineral particles free from organic matter, clay balls, soft particles, or other substances that would interfere with the free-draining properties of the aggregates.

Coarse aggregate may be crushed limestone or other material that has limestone particles included. Aggregates from crushed limestone shall be thoroughly washed and screened to remove limestone dust, limestone fines, and fine soil particles. Limestone shall not be used for fine aggregates except in combination with other material, such that not more than 5 percent of the portion finer than the No. 4 sieve shall be limestone.

Aggregates shall be tested for soundness according to ASTM Method C 88 and shall have a weighted average loss in 5 cycles of not more than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is used.

3. Grading

Drainfill and filter aggregates shall conform to the specified grading limits after being placed or after being compacted when compaction is specified. Grading shall be determined by ASTM Method C 136. The percentage of material finer than the No. 200 sieve shall be determined by the method in ASTM Designation C 117.

4. Storing and handling

Drainfill and filter aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by mixing with other material.

Material Specification 523—Rock for Riprap

1. Scope

This specification covers the quality of rock to be used in the construction of rock riprap.

2. Quality

Individual rock fragments must be dense, sound, and free from cracks, seams, and other defects conducive to accelerated weathering. Except as otherwise specified, the rock fragments must be angular to subrounded. The least dimension of an individual rock fragment must not be less than one- third the greatest dimension of the fragment. ASTM D4992 provides guidance on selecting rock.

Except as otherwise provided, the rock must be tested and must have the following properties:

Rock type 1

- ***Bulk specific gravity (saturated surface-dry basis)***—Not less than 2.5 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Absorption***—Not more than 2 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Soundness***—The weight loss in five cycles must not be more than 10 percent when sodium sulfate is used or more than 15 percent when magnesium sulfate is used.

Rock type 2

- ***Bulk specific gravity (saturated surface-dry basis)***—Not less than 2.5 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Absorption***—Not more than 2 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Soundness***—The weight loss in five cycles must be not more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used.

Rock type 3

- ***Bulk specific gravity (saturated surface-dry basis)—***Not less than 2.3 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Absorption***—Not more than 4 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- ***Soundness***—The weight loss in five cycles must be not more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used.

3. Methods of soundness testing

Rock cube soundness—The sodium or magnesium sulfate soundness test for all rock types (1, 2, or 3) must be performed on a test sample of 5,000 ± 300 grams of rock fragments, reasonably uniform in size and cubical in shape, and weighing, after sampling, about 100 grams each. They must be obtained from rock samples that are representative of the total rock mass, as noted in ASTM D4992, and that have been sawed into slabs as described in ASTM D5121.

The samples must further be reduced in size by sawing the slabs into cubical blocks. The thickness of the slabs and the size of the sawed fragments must be determined by the size of the available test apparatus and as necessary to provide, after sawing, the approximate 100-gram samples. The cubes must undergo five cycles of soundness testing in accordance with ASTM C88.

Internal defects may cause some of the cubes to break during the sawing process or during the initial soaking period. Do not test any of the cubes that break during this preparatory process. Such breakage, including an approximation of the percentage of cubes that break, must be noted in the test report.

After the sample has been dried following completion of the final test cycle and washed to remove the sodium sulfate or magnesium sulfate, the loss of weight must be determined by subtracting from the original weight of the sample the final weight of all fragments that have not broken into three or more fragments.

The test report must show the percentage loss of the weight and the results of the qualitative examination.

Rock slab soundness—When specified, the rock must also be tested in accordance with ASTM D5240. Deterioration of more than 25 percent of the number of blocks is cause for rejection of rock from this source. Rock must also meet the requirements for average percent weight loss stated below.

- For projects located north of the Number 20 Freeze-Thaw Severity Index Isoline (fig. 523–1), unless otherwise specified, the average percent weight loss for Rock Type 1 must not exceed 20 percent when sodium sulfate is used or 25 percent when magnesium sulfate is used. For Rock Types 2 and 3, the average percent weight loss must not exceed 25 percent for sodium sulfate soundness or 30 percent for magnesium sulfate soundness.
- For projects located south of the Number 20 Freeze-Thaw Severity Index Isoline, unless otherwise specified, the average percent weight loss for Rock Type 1 must not exceed 30 percent when sodium sulfate is used or 38 percent when magnesium sulfate is used. For Rock Types 2 and 3, the average percent weight loss must not exceed 38 percent for sodium sulfate soundness or 45 percent for magnesium sulfate soundness.

Figure 523–1 Number 20 Freeze-Thaw Severity Index Isoline (map approximates the map in ASTM D5312)

4. Field durability inspection

Rock that fails to meet the material requirements stated above (if specified), may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipatedfortherock to be installed under thisspecification.

A rock source may be rejected if the rock from that source deteriorates in less than 5 years under similar use and exposure conditions expected for the rock to be installed under this specification, even though it meets the testing requirements stated above.

Deterioration is defined as the loss of more than one-quarter of the original rock volume, or severe cracking that would cause a block to split. Measurements of deterioration are taken from linear or surface area particle counts to determine the percentage of deteriorated blocks. Deterioration of more than 25 percent of the pieces is cause for rejection of rock from the source.

5. Grading

The rock must conform to the specified grading limits after it has been placed within the matrix of the rock riprap. Grading tests must be performed, as necessary, according to ASTM D5519, Method A, B, or C, as applicable.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WETLAND RESTORATION

CODE 657

(ac)

DEFINITION

The return of a wetland and its functions to a close approximation of its original condition as it existed prior to disturbance on a former or degraded wetland site.

PURPOSE

To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance conditions by restoring:

- Conditions conducive to hydric soil maintenance
- Wetland hydrology (dominant water source, hydroperiod, and hydrodynamics)
- Native hydrophytic vegetation (including the removal of undesired species, and/or seeding or planting of desired species)
- Original fish and wildlife habitats

CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to natural wetland sites with hydric soils which have been subject to the degradation of hydrology, vegetation, or soils.

This practice is applicable only where the natural hydrologic conditions can be approximated by actions such as modifying drainage, restoring stream/floodplain connectivity, removing diversions, dikes, and levees, and/or by using a natural or artificial water source to provide conditions similar to the original, natural conditions.

This practice does not apply to:

- The treatment of point and non-point sources of water pollution (Constructed Wetland (656)).
- The rehabilitation of a degraded wetland, the reestablishment of a former wetland, or the modification of an existing wetland, where specific wetland functions are augmented beyond the original natural conditions; possibly at the expense of other functions (Wetland Enhancement (659)).
- The creation of a wetland on a site location which was historically non-wetland (Wetland Creation (658)).
- The management of fish and wildlife habitat on wetlands restored under this standard (Wetland Wildlife Management (644)).

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at https://www.nrcs.usda.gov/ and type FOTG in the search field.

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CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the restoration shall be clearly defined in the restoration plan, including soils, hydrology, vegetation, and fish and wildlife habitat criteria that are to be met and are appropriate for the site and the project objectives. Identify the hydrogeomorphic (HGM) class(es) of the wetland(s) located on the restoration site.

These planning steps shall be done with the use of the current Ohio NRCS functional assessment models, when available. The objectives will be determined by an analysis of current and historic site functions. They will be based on those functions which can reasonably be supported by current site constraints.

Data from historic and recent aerial photography and/or other remotely sensed data, soil maps, topographic maps, stream gage data, intact reference wetlands, and historical records shall be gathered to document historic conditions.

The soils, hydrology and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed shall be documented in the planning process.

The nutrient and pesticide tolerance of the plant and animal species likely to occur shall be evaluated where known nutrient and pesticide contamination exists. Sites suspected of containing hazardous material shall be tested to identify appropriate remedial measures. If remedial measures are not possible or practicable, the practice shall not be planned.

Water rights, if applicable, shall be assured prior to restoration.

Upon completion, the site shall meet soil, hydrology, vegetation, and habitat conditions of the wetland that previously existed on the site to the extent practicable.

Where offsite hydrologic alterations or the presence of invasive species impact the site, the design shall compensate for these impacts to the extent practicable.

Invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) shall be controlled on the site as necessary to restore wetland functions. The establishment and/or use of non-native plant species shall be discouraged.

Establish vegetative buffers around the wetlands to reduce the movement of sediment and soluble and sediment-attached substances carried by runoff. Use Filter Strip (393) to determine the minimum width of the vegetative buffer.

Embankments, spoil and excavated areas shall be shaped in a manner that is compatible with the existing landscape. For excavated areas leave ground surface as irregular as possible.

Where practicable, spoil material shall be placed on non-hydric soils.

Criteria for Hydric Soil Restoration

Restoration sites will be located on soils that are hydric.

If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil shall be removed to the extent practicable to restore the original soil functions. Document the depth of fill, sediment, spoil, or other depositional material with an on-site investigation.

Excavation beyond that necessary to remove sediment shall meet the criteria found in Wetland Enhancement (659).

Soil hydrodynamic and bio-geochemical properties such as permeability, porosity, pH, or soil organic carbon levels shall be restored to the extent needed to restore hydric soil functions.

Criteria for Hydrology Restoration

The hydroperiod, hydrodynamics, and dominant water source of the restored site shall approximate the conditions that existed before alteration. The restoration plan shall document the adequacy of available water sources based on groundwater investigation, stream gage data, water budgeting, or other appropriate means.

The work associated with the wetland shall not adversely affect adjacent properties or other water users, the capacity of drainage systems on other properties, and shall not back surface water onto an adjoining property or restrict the capacity of adjacent subsurface drainage systems unless agreed to by signed written letter, easement or permit.

Any existing surface or subsurface drainage systems that would affect or be affected by the wetland shall be located and measures taken to determine the extent of those systems. Existing drainage systems will be utilized, removed, or modified as needed to achieve the restoration and ensure drainage rights.

Where practicable, existing subsurface drains (tile) shall be rendered inoperable (blocked or removed) or controlled as needed to meet the goals of the restoration and site conditions. The number and length (25 feet minimum per block) of blocks will depend on soils, topography, and project goals. Where an existing subsurface drain is to be removed under a proposed embankment, at a minimum remove the existing drain from 15 feet upstream from the upstream toe to the downstream toe. Excavated material shall be replaced and compacted to a density equivalent to the surrounding soil beneath embankments and where necessary to prevent undesirable flow from the restoration site.

Refer to NEH, Part 650, Chapter 13, and current Ohio NRCS guidance for information related to surface and subsurface drain plugging.

Water control structures shall only be used to recreate natural hydrologic patterns or to allow management and maintenance of the desired community and shall meet the requirements of Structure for Water Control (587). Timing and level setting of water control structures, if needed, will be based on the actions needed to maintain a close approximation of the original, natural hydrologic conditions, or to meet management goals.

Non-perforated conduits shall be used downstream of a water control structure for a minimum 50 feet and under any embankment from 15 feet upstream from the upstream toe to the downstream toe. The connections of the water control structure and non-perforated conduit will be watertight for the pressure developed at the maximum pool level.

The original natural water supply should be used to reestablish the site's hydrology to approximate the hydrologic conditions of the wetland type. If this is not possible, an alternate natural or artificial water supply can be used; however, these sources shall not be diverted from other wetland resources. If the alternate water source requires energy inputs, these shall be estimated and documented in the restoration plan.

To the extent practicable, reestablish macrotopography (excavations/fills causing an elevation change over 6 inches) and/or microtopography (excavations/fills causing an elevation change less than 6 inches). Use reference sites within the local area to determine desired topographic relief. The location, size, and geometry of earthen structures, if needed, and spoil mounds shall match that of the original topographic features to the extent practicable.

The design of embankment features, not including spoil mounds, and macrotopographic excavations shall meet the criteria of other practice standards to which they apply due to purpose, size, water storage capacity, hazard class, or other parameters. Practice standards to be used include:

- Pond (378),
- Dike (356),
- Grade Stabilization Structure (410), and

- Water and Sediment Control Basin (638)

If no other practice standard applies, they shall meet the requirements for Dike (356).

Embankments constructed on a floodplain with a principal spillway or control structure shall have an additional 1 foot of overfill added to the constructed height to protect the spillway or control structure from damage by the overflow water. This additional height shall be constructed for a distance of 50 feet on each side of the principal spillway or water control structure.

Embankments located on a floodplain where overtopping of the embankment by flow from the floodway into the wetland is likely may have a vegetated spillway area on level natural ground, in excavation, or on compacted fill. Vegetated spillways shall be at least 100 feet wide and have a crest length of at least 25 feet. Compacted fill spillways shall meet the following criteria:

- Height of spillway crest to downstream toe is 2 feet or less
- Design flow depth of 0.5 feet or less
- Inlet and outlet slopes shall be 5:1 or flatter
- Mulching of the spillway is required.

The vegetated spillway shall be located in a position that minimizes the likelihood for flood flows from the stream system to damage the embankment, water control structure, and vegetated spillway.

Excavations from within the wetland shall remove sediment to approximate the original topography or establish a water level that will compensate for the sediment that remains.

Water control structures that may impede the movement of target aquatic species or species of concern shall meet the criteria in Fish Passage (396). Preclude fish access to the wetland unless fish habitat is an objective.

Wetland restoration sites that exhibit soil oxidation and/or subsidence, resulting in a lower surface elevation compared to pre- disturbance, shall take into account the appropriate hydrologic regime needed to support the original wetland functions.

Criteria for Vegetative Restoration

Hydrophytic vegetation restoration shall be of species typical for the wetland type(s) being established and the varying hydrologic regimes and soil types within the wetland. Preference shall be given to native wetland plants with localized genetic material.

Where natural colonization of acceptable species can realistically be expected to occur within 5 years, sites may be left to revegetate naturally. If not, the appropriate species will be established by seeding or planting. To decide if natural revegetation is appropriate, refer to ECS 190-15, Wetland Restoration, Enhancement, Management, and Monitoring for natural regeneration decision keys.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the plan.

Where topsoil will be used as a seedbank, topsoil shall not be stockpiled prior to redistribution during the summer. For other periods, topsoil shall only be stockpiled in a manner that limits deterioration of viable plant parts and seeds. Refer to ECS 190-15, Wetland Restoration, Enhancement, Management and Monitoring, for guidance.

When natural revegetation is used, deep tillage or other methods shall be used to expose the buried seedbank or bring the buried seedbank to the surface. If a site has not become dominated by the targeted species within 5 years, active forms of revegetation will be required.

Where planting and/or seeding is necessary, the minimum number of native species to be established shall be based on a reference wetland with the type of vegetative communities and species planned on the restoration site:

- Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall be established within 5 years, or a suitable precursor to the original community will be established within 5 years that creates conditions suitable for the establishment of the native community. Species richness shall be addressed in the planning of herbaceous communities. Seeding rates shall be based upon the percentage of pure live seed and labeled with a current seed tag from a registered seed laboratory identifying the germination rate, purity analysis, and other seed statistics.
- Where the dominant vegetation will be forest or woodland community types, vegetation establishment will include a mix of woody species (trees and/or shrubs) adequate to establish the reference wetland community.
- Ensure that the approved seeding mixture does not include weed species and invasive species (e.g.: reed canarygrass).

Refer to Conservation Cover (327), Tree/Shrub Establishment (612), Restoration and Management of Declining Habitats (643), Wetland Wildlife Habitat Management (644), NEH, Part 650, Chapter 13, and applicable Ohio Job Sheets and Technical Notes for vegetation establishment guidance.

If uplands are planned as part of a wetland creation, then native species shall be used for these areas as well. Refer to Conservation Cover (327) for herbaceous restorations, or Tree/Shrub Establishment (612) and Upland Wildlife Habitat Management (645) if trees and/or shrubs are desired.

CONSIDERATIONS

Soil Considerations

Consider making changes to physical soil properties, including:

- Increasing or decreasing saturated hydraulic conductivity by mechanical compaction or tillage, as appropriate.
- Incorporating soil amendments.
- The effect of construction equipment on soil density, infiltration, and structure.

Consider changes in soil bio-geochemical properties, including:

- Increasing soil organic carbon by incorporating compost.
- Increasing or decreasing soil pH with lime, gypsum, or other compounds

Hydrology Considerations

Natural drawdown through evapotranspiration is a natural and often desirable process rather than regulating water levels with water control structures. Drawdown of permanent storage is often necessary or desirable to manage wetlands.

Consider the general hydrologic effects of the restoration, including the impacts on downstream stream hydrographs, volumes of surface runoff, and groundwater resources due to changes of water use and movement created by the restoration.

Consider the impacts of water level management, including:

- Increased predation due to concentrating aquatic organisms, including herptivores, in small pool areas during draw downs.
- Increased predation of amphibians due to high water levels that can sustain predators.

- Decreased ability of aquatic organisms to move within the wetland and from the wetland area to adjacent habitats, including fish and amphibians as water levels are decreased.
- Increases in water temperature on-site, and in off-site receiving waters.
- Changes in the quantity and direction of movement of subsurface flows due to increases or decreases in water depth.
- The effect changes in hydrologic regime have on soil bio-geochemical properties, including: oxidation/reduction; maintenance of organic soils; and salinity increase or decrease on site and on adjacent areas.

Vegetation Considerations

Consider:

- The relative effects of planting density on fish and wildlife habitat versus production rates in woody plantings.
- The potential for vegetative buffers to increase function by trapping sediment, cycling nutrients, and removing pesticides.
- The selection of vegetation for the protection of structural measures that is appropriate for wetland function.
- The potential for invasive or noxious plant species to establish on bare soils after construction and before the planned plant community is established.
- The use of prescribed burning to restore wetland and adjacent upland plant communities.
- The manipulation of water levels or topography to control unwanted vegetation.

Fish and Wildlife Habitat Considerations

Consider:

- The addition of coarse woody debris on sites to be restored to woody plant communities for an initial carbon source and fish and wildlife cover.
- The potential to restore habitat capable of supporting fish and wildlife with the ability to control disease vectors such as mosquitoes.
- The potential to establish fish and wildlife corridors to link the site to adjacent landscapes, streams, and water bodies and to increase the sites colonization by native flora.
- The need to provide barriers to passage for unwanted or predatory species.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared for each site according to the requirements set forth in Title 210, National Engineering Manual, Part 541 – Drafting and Drawings, and the Ohio supplement. Plans and specifications shall be recorded using approved specifications sheets, job sheets, or other documentation. The plans and specifications for structural features will include, at a minimum,

- plan view showing the location and extent of the practice(s)
- topographic information (contours) of the site
- quantities and bill of materials
- grading plan with sufficient profiles and cross-sections to define the location, line, and grade of earthfills and excavations
- coordinates or dimensions for stakeout and checkout.
- Site specific construction specifications that describe in writing the installation requirements of the practice(s).

Plans and specifications shall also meet the requirements found in the supporting practice standards.

OPERATION AND MAINTENANCE

A separate Operation and Maintenance (O&M) Plan will be prepared for sites that have structural features. The plan will include specific actions for the normal and repetitive operation of installed structural items, especially water control structures, if included in the project.

The plan will also include the maintenance actions necessary to assure that constructed items are maintained for the life of the project. It will include the inspection schedule, a list of items to inspect, a checklist of potential damages to look for, recommended repairs, and procedures for documentation.

Management and monitoring activities needed to ensure the continued success of the wetland functions may be included in the above plan, or in a separate Management and Monitoring Plan. In addition to the monitoring schedule, this plan may include the timing and methods for the use of fertilizers, pesticides, prescribed burning, or mechanical treatments.

- Circumstances when the use of biological control of undesirable plant species and pests (e.g. using predator or parasitic species) is appropriate, and the approved methods.
- Actions which specifically address any expected problems from invasive or noxious species.
- The circumstances which require the removal of accumulated sediment.
- Conditions which indicate the need to use haying or grazing as a management tool, including timing and methods.
- The timing and level setting of water control structures for the establishment and maintenance of vegetation, soil, and wildlife functions.

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STATEMENT OF WORK
Subsurface Drain (606)
Ohio

These deliverables apply to this individual practice. For deliverables for other planned practices, refer to those specific Statements of Work.

DESIGN

Deliverables

Note: Service providers (TSP or other) are to prepare and document deliverables for the Design, Installation, and Checkout sections and submit all deliverables to the landowner with a copy for NRCS.

All NRCS National Engineering Manual (NEM) (Title 210) references also include applicable Ohio NEM supplements.

1. Design documents that demonstrate criteria in practice standard have been met and are compatible with planned and applied practices. Include—
   - Practice purpose(s) as identified in the conservation plan.
   - List of required permits to be obtained by the client.
   - Certification of compliance with NRCS National and State utility safety policy (National Engineering Manual (NEM) (Title 210), Part 503, Subpart A, “Engineering Activities Affecting Utilities,” Sections 503.0 through 503.6; Subpart B, “Public Safety at Structure Sites,” Sections 503.10 through 503.13; and Subpart C, “Safety During Geologic Investigations,” Sections 503.20 through 503.22).
   - Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to—
     - Capacity.
     - Hydraulics.
     - Materials.
2. Written plans and specifications, including sketches and drawings, will be provided to the client that adequately describe the requirements to install the practice and obtain necessary permits. Develop plans and specifications to conform with the requirements of Ohio Conservation Practice Standard – Subsurface Drain (606) and Ohio NEM Supplement OH541.0
3. Design report and inspection plan as appropriate (210-NEM, Part 511, Subpart B, “Documentation,” Section 511.11 and Part 512, Subpart D, “Quality Assurance Activities,” Sections 512.30 through 512.32).
4. Operation and maintenance plan conforming to requirements stated in the O&M section of Ohio Conservation Practice Standard - Subsurface Drain (606)..
5. Certification the design meets NRCS standards and specifications and is in compliance with applicable laws and regulations (210-NEM, Part 505, Subpart A, “Introduction,” Section 505.0; and Subpart B, “Procedures,” Sections 505.10 through 505.12).
6. Quality assurance plan (210-NEM, Part 512, Subpart D, “Quality Assurance Activities,” Sections 512.30 through 512.32).

INSTALLATION

Deliverables

1. Preinstallation conference with client, contractor and NRCS representative
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Installation inspection.
   - Actual materials used (210-NEM-512, Subpart C, “Evaluation of Construction Materials,” Sections 512.20

through 512.23; and Subpart D, “Quality Assurance Activities,” Section 512.33)
- Inspection records.
- Document compliance with quality assurance plan.

5. Facilitate and implement required design modifications with client and original designer.
6. Advise client/NRCS on compliance issues with all Federal, State, Tribal, and local laws, regulations and NRCS policies during installation.

CHECK OUT

Deliverables

1. As-built documentation
   a. Extent of practice units applied.
   b. “Red-line” drawings (NEM Part 512, Construction, Subpart F – As-builts, 512.50 through 512.52),
   c. Final quantities.
2. Certification the installation meets NRCS standards and specifications and is in compliance with permits (210-NEM-505, Subpart B, “Procedures,” Sections 505.10 through 505.12).
3. Progress reporting.

REFERENCES

- Ohio NRCS. Field Office Technical Guide (FOTG), Section IV, Conservation Practice Standard - Subsurface Drain, 606: https://efotg.sc.egov.usda.gov/#/state/OH/documents
- USDA NRCS. 2016. National Environmental Compliance Handbook (Title 190). Washington, D.C. https://directives.sc.egov.usda.gov/
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Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

SUBSURFACE DRAIN

CODE 606

(ft)

DEFINITION

A conduit, or system of conduits, installed beneath the ground surface to manage soil water conditions.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Remove or distribute soil water
- Remove salts and other contaminants from the soil profile
- Mitigate degraded plant health and vigor and undesirable plant productivity due to saturated soil, ponding, and flooding
- Mitigate degraded animal health productivity due to saturated soil, ponding, and flooding

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where a shallow water table exists or where a subsurface drainage system can mitigate one or more of the following adverse conditions caused by excessive soil moisture:

- Poor health, vigor, and productivity of plants
- Poor field trafficability
- Accumulation of salts in the root zone
- Health risk and livestock stress due to pests
- Adverse soil conditions around farmsteads, structures, and roadways

This practice also applies to water distribution through subsurface drain pipe for utilization or treatment.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct this practice to comply with all applicable Federal, State, Tribal, and local laws and regulations. The landowner must obtain all necessary permissions from regulatory agencies or document that no permits are required. The landowner or contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

If wetlands are present, complete an appropriate wetland determination per established procedures. Avoid adverse effects of the drainage system on the ecology and hydrology of the site and on adjacent lands, especially potential or delineated wetlands, existing easements, and wildlife habitat.

Capacity

Base design capacity on the following, as applicable:

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at https://www.nrcs.usda.gov/ and type FOTG in the search field.

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- Recommendations from the State drainage guide
- Application of a locally proven drainage coefficient for the acreage drained
- The yield of ground water based on the expected deep percolation of irrigation water from the overlying fields, including leaching requirement
- Comparison of the site to other similar sites with known subsurface drain yields
- Measurement of the rate of subsurface flow at the site during a period of adverse weather and ground water conditions
- Application of Darcy's law to lateral or artesian subsurface flow
- Contributions from surface inlets based on hydrologic analysis or flow measurements
- Drain inlet opening size versus drain intake rate

The required capacity of the drain can be determined from charts and tables in Chapter 14, Water Management (Drainage) of the Engineering Field Handbook (EFH) Part 650. Where the land to be drained has adequate surface drainage, either natural or artificial, the following coefficients are recommended.

Soil	Coefficient (Inches to be removed in 24 hours)	
	Field Crops	Truck Crops
Mineral	3/8 inch to 1/2 inch	1/2 inch to 3/4 inch
Organic	1/2 inch to 3/4 inch	3/4 inch to 1-1/2 inch

Where it is necessary to admit surface water to the subsurface drainage system through surface inlets, the following coefficients are recommended:

Soil	Co-efficient (Inches to be removed in 24 hours)			
	Field Crops		Truck Crops	
	Blind inlets	Open inlets	Blind inlets	Open inlets
Mineral	1/2 inch to 3/4 inch	1/2 inch to 1 inch	3/4 inch to 1 inch	1 inch to 1-1/2 inch
Organic	3/4 inch to 1 inch	3/4 inch to 1-1/2 inch	1 inch to 2 inch	2 inch to 4 inch

Where high value truck crops might be damaged by water standing on them from 2 to 4 hours during hot weather, a higher coefficient than those given above and/or closer drain spacing shall be necessary to hold crop damage to a minimum

Size

Compute the drain size by applying Manning's formula, using roughness coefficients recommended by the manufacturer of the conduit or coefficients adopted by the regulating authority. Base the size on the maximum design flow rate and compute using one of the following:

- The hydraulic grade line parallel to the bottom grade of the subsurface drain with the conduit flowing full at design flow (normal condition, no internal pressure)
- Conduit flowing partly full where a steep grade or other conditions require excess capacity
- Conduit flowing under internal pressure with hydraulic grade line set by site conditions, which differs from the bottom grade of the subsurface drain

All subsurface drains must have a nominal diameter that equals or exceeds 3 inches.

Internal hydraulic pressure
Drains are normally designed to flow with no internal pressure, and the flow is normally classified as open channel. Maintain the design internal pressure of drains at or below the limits recommended by the manufacturer of the conduit.

Horizontal alignment
Accomplish a change in horizontal direction of the subsurface drain by one of the following methods:

- The use of manufactured fittings
- The use of junction boxes or manholes
- A gradual curve of the drain trench on a radius in accordance with the limitations of the installation equipment and the recommendations of the pipe manufacturer while maintaining grade

Location, depth, and spacing
Base the location, depth, and spacing of the subsurface drain on site conditions including soils, plants, topography, ground water conditions, crops, land use, outlets, saline or sodic conditions, and proximity to wetlands.

The minimum depth of cover over subsurface drains may exclude sections of conduit near the outlet or through minor depressions, providing these sections of conduit are not subject to damage by frost action or equipment travel. To prevent equipment damage in these circumstances (less than 24” of cover) , use dual wall drainage pipe, bed the pipe, and backfill the trench with granular material to a minimum of 2” cover over the top of the pipe. Try to maintain 12” of soil cover in tilled cropland. Otherwise maintain minimum cover stated below.

In mineral soils, provide a minimum depth of cover over subsurface drains of 2 feet.

In organic soils, provide a minimum depth of cover after initial subsidence of 3 feet. If water control structures are installed and managed to limit oxidation and subsidence of the soil, the minimum depth of cover may be reduced to 2.5 feet.

For flexible conduits, base maximum burial depth on the manufacturer’s recommendations for the site conditions or on a site-specific engineering design consistent with methods in NRCS National Engineering Handbook (NEH) (Title 210), Part 636, Chapter 52, “Structural Design of Flexible Conduits.”

For computation of maximum allowable loads on subsurface drains of all materials, use the trench and bedding conditions specified and the compressive strength of the conduit. Base the design load on the conduit from a combination of embedment, backfill, and live loads.

Base live loads on the maximum equipment or vehicle wheel loads. Equipment loads on the conduit may be neglected when the depth of cover exceeds 6 feet.

Minimum velocity and grade
In areas where sedimentation of fine sands and silts is not a hazard, design the minimum grade based on site conditions and velocity of not less than 0.5 feet per second. If a sedimentation potential exists, use a velocity of not less than 1.4 feet per second to establish the minimum grade. Otherwise, include provisions for preventing sedimentation by use of filters or by collecting and periodically removing sediment from installed traps, or by periodically cleaning the lines with high-pressure jetting systems or cleaning solutions. Prior to using high-pressure jetting systems, verify that the jetting system will not damage the pipe or the pipe embedment.

Maximum velocity
Limit the maximum velocity in a perforated corrugated plastic drainage pipe under open channel flow to 12 feet per second unless further restricted by the manufacturer’s recommendation.

Limit the maximum design velocities in open-joint pipe (clay or concrete) to those given in table 1 if protective measures are not installed. Refer to NRCS 210-NEH, Section 16, Chapter 4, “Subsurface Drainage.”

Table 1. Maximum Flow Velocities by Soil Texture

Soil Texture	Velocity (ft/s)
Sand and sandy loam	3.5
Silt and silt loam	5.0
Silty clay loam	6.0
Clay and clay loam	7.0
Coarse sand or gravel	9.0

Protective measures for high velocities in open-joint pipe may include the following, as appropriate:

- Bed the conduit in a sand and gravel envelope that is filter-compatible with the joint openings and surrounding soil
- Wrap the joints with nonwoven geotextile

Releases from water control structures must not cause flow velocities in perforated or open-joint drains to exceed allowable velocities in table 1, unless protective measures are installed.

Thrust control
Follow pipe manufacturer’s recommendations for thrust control or anchoring where the following conditions exist:

- Axial forces that tend to move the pipe down steep slopes
- Thrust forces from abrupt changes in pipeline grade or horizontal alignment that exceed soil-bearing strength
- Reductions in pipe size

In the absence of manufacturer’s data, design thrust blocks in accordance with NRCS 210-NEH-636-52.

Outlets
Provide drainage outlets adequate for the quantity and quality of water to be discharged.

Avoid submerged outlets unless intermittent submerged outlets are designed for protection from root clogging. For discharge to streams or channels, locate the outlet invert above the elevation of normal flow and at least 1 foot above the channel bottom.

For outlets into sumps, locate the discharge elevation above the elevation at which pumping is initiated.

Protect outlets against erosion and undermining of the conduit, entry of tree roots, damaging periods of submergence, and entry of rodents or other animals into the subsurface drain.

Use a continuous section of rigid pipe, without open joints or perforations and with stiffness necessary to withstand expected loads at the outlet end of the drain line. Table 2 shows minimum lengths for the outlet section of the conduit. Unsupported single-wall corrugated plastic pipe is not suitable for the section that outlets into a ditch or channel.

Table 2. Minimum Length of Outlet Pipe Sections

Pipe Diameter (in)	Minimum Section Length (ft)
8 and smaller	10
10 to 12	12
15 to 18	16

Pipe Diameter (in)	Minimum Section Length (ft)
Larger than 18	20

The use and installation of outlet pipe must conform to the following requirements:

- If burning vegetation on the outlet ditch bank is likely to create a fire hazard, select fireproof material for the pipe
- Bury at least two-thirds of the rigid outlet pipe section in the ditch bank and project the cantilever section past the toe of the ditch side slope; or protect the side slope from erosion below the outlet pipe
- If ice or floating debris may damage the outlet pipe, protect the pipe by recessing the cantilevered part of the pipe to protect it from the current of flow in the ditch or channel
- Headwalls used for subsurface drain outlets must be adequate in strength and design to avoid washouts and other failures

For outlets into sumps, locate the discharge elevation above the elevation at which pumping is initiated.

Protection from biological and mineral clogging
Drains in certain soils are subject to clogging of perforations by bacterial action in association with ferrous iron, manganese, or sulfides. Iron ochre can clog drain openings and seal manufactured (fabric) filters. Manganese deposits and sulfides can clog drain openings.

Where bacterial activity is expected to lead to clogging of drains, provide access points for cleaning the drain lines.

Where possible, outlet individual drains to an open ditch to isolate localized areas of contamination and to limit the translocation of contamination throughout the system.

Protection from root clogging
Problems may occur where drains are near perennial vegetation. Drain clogging may result from root penetration by water-loving trees, such as willow, cottonwood, elm, and soft maple, and some shrubs, grasses, and deep-rooted perennial crops growing near subsurface drains. Refer to the USDA PLANTS Database website as a preliminary planning tool for obtaining vegetation properties and qualities information.

Use one or more of the following steps to reduce the incidence of root intrusion:

- Install a continuous section of nonperforated pipe or tubing with sealed joints through the root zone
- Remove water-loving trees for a distance of at least 100 feet on each side of the drain and locate drains a distance of 50 feet or more from noncrop tree species
- Provide for intermittent submergence of the drain to limit rooting depth by installing a structure for water control that allows for raising the elevation of the drain outlet (e.g., an inline weir with adjustable crest)

Utilize the intermittent submergence option only when the raised elevation of the drain outlet will not adversely impact the performance of the land use supported by the subsurface drain, and where the raised elevation will not adversely impact flooding on neighboring properties.

Water quality
Do not connect septic systems to the subsurface drainage system, nor allow animal waste to be directly introduced into the subsurface drainage system.

Materials
Subsurface drains include flexible conduits of plastic, bituminized fiber, or metal; rigid conduits of vitrified clay or concrete; or other materials of acceptable quality.

The conduit must meet strength and durability requirements for the site. All conduits must meet or exceed the minimum requirements of the appropriate and current specifications published by the American Society for Testing and Materials (ASTM), American Association of State Highway Transportation Officials (AASHTO), or the American Water Works Association (AWWA).

Conduit foundation
If soft or yielding foundation conditions are encountered, stabilize the conduit foundation and protect the area from settlement. The following methods are acceptable foundation treatments:

- Remove the unstable material and provide stable bedding of granular envelope or filter material.
- Provide continuous cradle support for the conduit through the unstable section.
- Bridge unstable areas using long sections of a conduit having adequate strength and stiffness to ensure satisfactory subsurface drain performance.
- Place conduit on a flat, treated plank. This method must not be used for flexible conduits (e.g., plastic pipe) without proper bedding between the plank and conduit.
- Use bedding to avoid laying the pipe on rock, rocky soil, or extremely hard soil.

Conduit Placement and bedding
Placement and bedding requirements apply to both trenching and plow-type installations.

Place the conduit on a firm foundation to ensure proper alignment.

The conduits must not be placed on exposed rock, stones greater than 1.5 inches for conduits 6 inches or larger in diameter, or stones greater than three-fourths of an inch for conduits less than 6 inches in diameter. Where site conditions do not meet this requirement, the trench must be over-excavated a minimum of 6 inches and refilled to grade with suitable bedding material. For trench installations where a sand-gravel envelope or compacted bedding is not specified, the conduit embedment must be suitable backfill. Soil excavated from the trench may be used for backfill as long as it contains no hard objects larger than the specified stone sizes above. Place initial backfill to a minimum of 3 inches above the conduit. Compact backfill to a density similar to the surrounding soil material. Mound the backfill over the trench to provide material for settling.

If installation will be below a water table or where unstable soils are present, special equipment, installation procedures, or bedding materials may be needed. These special requirements may also be necessary to prevent soil movement into the drain or plugging of the envelope if installation will be made in materials such as soil slurries.

For the installation of corrugated plastic pipe with diameter of 8 inches or less, specify one of the following bedding methods:

- Provide a shaped groove with an angle of support of 90 degrees or greater in the bottom of the trench for tubing support and alignment
- Provide a sand-gravel envelope, at least 3 inches thick, for support
- Provide compacted embedment material beside and to 3 inches above the conduit

For the installation of corrugated plastic pipe with diameter larger than 8 inches, the same bedding requirements apply except that a semicircular or trapezoidal groove shaped to fit the conduit with a support angle of 120 degrees will be used rather than a V-shaped groove.

For rigid conduits installed in a trench, the same requirements apply except that a groove or notch is not required.

Filter envelopes and materials
Design filters around conduits, as needed, to enhance water entry and stabilize the structure of the surrounding soil material. Determine the need for a filter by the characteristics of the surrounding soil

material, site conditions, and the velocity of flow in the conduit. Use a suitable filter if any of the following conditions exist:

- Local experience with soil site conditions indicates a need
- Soil materials surrounding the conduit are dispersed clays, silts with a plasticity index less than 7, or fine sands with a plasticity index less than 7
- The soil is subject to cracking by desiccation
- The method of installation may result in inadequate consolidation between the conduit and backfill material

Design the sand or sand-gravel filter gradation in accordance with NRCS 210-NEH, Part 633, Chapter 26, “Gradation Design of Sand and Gravel Filters.”

Specified filter material must completely encase the conduit such that all openings are covered with at least 3 inches of filter material, except where the top of the conduit and side filter material will be covered by a sheet of plastic or similar impervious material to reduce the quantity of filter material required. In all cases, the resulting flow path through the filter material must be a minimum of 3 inches in length.

Use geotextile filter materials with the effective opening size, strength, durability, and permeability to prevent soil movement into the drain throughout the expected life of the system. Where the silt content in the soil exceeds 40 percent, ensure the geotextile filter material will not clog during its design life.

Hydraulic envelopes and materials
Use an envelope around subsurface drains, as needed, to improve flow conditions in the area immediately adjacent to the drain.

Materials used for envelopes must not contain materials that will cause an accumulation of sediment in the conduit or render the envelope unsuitable for bedding of the conduit.

Envelope materials must consist of sand-gravel, organic, or similar material. Use an envelope gradation such that 100 percent of sand-gravel passes a 1.5-inch sieve, not more than 30 percent passes a number 60 sieve, and not more than 5 percent passes a number 200 sieve.

Organic or other compressible envelope materials must not be used below the centerline of flexible conduits. If organic or other compressible materials are used they must be of a type that will not readily decompose within the expected lifespan of the practice.

Refer to NRCS 210-NEH, Part 650, Chapter 14, “Water Management (Drainage),” for more complete definitions of envelopes (e.g., hydraulic envelope, filter envelope, and bedding).

Auxiliary structures and protection
The capacity of any structure installed in the drain line must be no less than that of the line or lines feeding into or through the structure.

Structures for water table management, with provisions to elevate the outlet and allow submergence of the upstream drain, must meet applicable design criteria in NRCS Conservation Practice Standard (CPS) Structure for Water Control (Code 587). Mark buried boxes with surface evidence or referenced to fixed aboveground markings or structures.

Underground outlets connected to the subsurface drainage system must meet the applicable provision of NRCS CPS Underground Outlet (Code 620). Design the capacity of the surface water inlet to be no greater than the maximum design flow in the downstream drain line or lines. Install sediment traps if sediment might pose a problem.

Specify pressure relief wells as needed to allow excess flow to escape the conduit and flow over the ground surface. Use pressure relief wells where there is a stable outlet for the flow from the relief well.

Cover the relief well with a grate or other appropriate means to prevent accidental entry of machines, animals, humans, and debris. Design the subsurface drain system to have a positive hydraulic grade to the relief well flow line. Base the relief well system capacity on the flow from the drainage system and other site conditions. Capacity must be adequate to lower the water head to the desired level. Relief wells must not be less than 4 inches in diameter.

Junction boxes, manholes, catch basins, and sediment traps must be accessible for maintenance. Provide a clear opening of not less than 2 feet in diameter or 2 feet by 2 feet square.

Protect the drain system against turbulence created near outlets, surface inlets, or similar structures. Use continuous nonperforated or closed-joint pipe in drain lines adjoining the structure where excessive velocities will occur.

As an alternative to manufactured fittings, install a junction box where three or more lines join or if two lines join at different elevations. Use a solid cover if the junction box is buried. The junction box should have a minimum of 1.5 feet of soil cover. Protect buried boxes from traffic.

If not connected to a structure, close the upper end of each subsurface drain line with a tight-fitting cap or plug of the same material as the conduit, or other durable materials.

Use watertight conduits designed to withstand the expected loads where subsurface drains cross under irrigation canals, ditches, or other structures.

CONSIDERATIONS

When planning, designing, and installing this practice, consider—

- Protection of shallow drains, auxiliary structures, and outlets from damage due to freezing and thawing
- Proper surface drainage to reduce the required capacity of the subsurface drainage system
- Designs that can incorporate drainage water management practices (or facilitate future incorporation of drainage water management) to reduce nutrient loading of receiving waters, including downstream drinking water sources.
- Drainage laterals oriented along elevation contours to improve the effectiveness of drainage water management structures
- The effects of drainage systems on runoff volume, seepage, and the availability of soil water needed for plant growth
- Confirmation of soil survey information with site investigation, including augering and shallow excavations to identify soil profile hydraulic characteristics, soil texture layering, water table depth, etc
- Maximizing wetland functions and values to the extent practicable
- Subsoiling or ripping of soils with contrasting texture layers to improve internal drainage. Where this treatment is needed use NRCS CPS Deep Tillage (Code 324)
- Installations in a dry soil profile to minimize problems of trench stability, conduit alignment, and soil movement into the drain
- The effects to surface water quality
- Using measures to reduce the risk of drain water contamination from surface applications of manure (e.g., temporary flow-blocking devices)
- Using NRCS CPSs Drainage Water Management (Code 554), Constructed Wetland (Code 656), Saturated Buffer (Code 604), or Denitrifying Bioreactor (Code 605) in conjunction with this standard where removal of nitrate nitrogen in subsurface drainage is needed
- Including a tailwater reuse system that conforms to NRCS CPS Irrigation and Drainage Tailwater Recovery (Code 447) in conjunction with this standard where excess soil water will be reused for

irrigation
- The potential existence of a hazardous atmosphere in junction boxes or manholes

PLANS AND SPECIFICATIONS

Prepare plans and specifications for installing subsurface drains according to the applicable criteria that describe the requirements for implementing the practice to achieve its intended purpose.

At a minimum, plans and specifications must include, as applicable—

- Location and plan view of the drainage system
- Wetland delineation(s) – where applicable
- Conduit lengths, grades, spacing, sizes, and type of materials
- Requirements and typical cross sections or details for the subsurface drain, filter, envelope, bedding, and backfill requirements
- Structure locations, dimensions, and elevations
- Profile of mains showing ground line, grade, stationing, and invert elevations at key locations
- Outlet locations, elevations, length, size, pipe material, quality, and protection required
- Bottom or low flow elevation in outlet ditches or streams
- Location of utilities and notification requirements
- Construction specifications describing site-specific installation requirements of the subsurface drain

OPERATION AND MAINTENANCE

Provide an operation and maintenance (O&M) plan with specific instructions for operating and maintaining the system to ensure proper function as designed. At a minimum, the O&M plan must address—

- Necessary periodic inspection and prompt repair of system components (e.g., structures for water control, underground outlets, vents, drain outlets, trash, and rodent guards)
- Winterization protection from freezing conditions (if applicable) for drainage systems in cold climates
- Protection requirements during manure applications (if applicable)

REFERENCES

USDA NRCS. 2008. National Engineering Handbook (Title 210), Section 16, Chapter 4, Subsurface Drainage. Washington, D.C.https://directives.sc.egov.usda.gov/

USDA NRCS. 2017. National Engineering Handbook (Title 210), Part 633, Chapter 26, Gradation Design of Sand and Gravel Filters. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2005. National Engineering Handbook (Title 210), Part 636, Chapter 52, Structural Design of Flexible Conduits. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2021. National Engineering Handbook (Title 210), Part 650, Chapter 14, Water Management (Drainage). Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. “PLANTS Database.” Accessed February 17, 2021. https://plants.sc.egov.usda.gov/

USDA United States Department of Agriculture
Natural Resources Conservation Service

342– Critical Area Planting Implementation Requirements

Producer:	Bart & Erin Gliatta	**Project or Contract:**	545E342301YQV
Location:	Porter Twp	**County:**	Delaware
Farm Name:	N/A	**Tract Number:**	N/A

Practice Location Map

See Attached Conservation Plan Map.

Description of work:

Spoil Mounds and Wetland Side slopes; 3.6 ac.

NRCS Review Only

Designed By:	Nathan Weber	**Date**	6/25/2024

The Practice Purpose(s): (check all that apply)

- [x] Stabilize areas with existing or expected high rates of soil erosion by wind or water.
- [ ] Stabilize stream and channel banks, pond and other shorelines, earthen features of structural conservation practices.
- [ ] Stabilize areas such as sand dunes and riparian areas

Site Preparation

Clear areas to be planted of unwanted materials and smooth or shape if needed. If surface compacted layers are removed with tillage re-firm the soil prior to planting. If not planting with a drill with press wheels culti-pack after seeding to encourage seed soil contact if needed.

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Table 1: Typical seed mix criteria.

	Plant Species	Pure Live Seeding Rate (lb/ac)	Seeding Dates[1] Northern	Southern	Dormant Seeding
☐ Planned Mix	Mix 1: Multipurpose AgLand				
	Turf Type Fescue	40	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
	Kentucky Bluegrass	20			
	Perennial Ryegrass	25			
	85 (lb/ac) total PLS rate				
☐ Planned Mix	Mix 2: Next to Residential Area, Low Retardance, Quick Cover				
	Kentucky Bluegrass	15	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
	Creeping Red Fescue	16.5			
	Annual Ryegrass	1.5			
	Perennial Ryegrass	19			
	52 (lb/ac) total PLS rate				
☐ Planned Mix	Mix 3: Wildlife Secondary Land Use				
	Kentucky Bluegrass	11	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
	Orchardgrass	22.5			
	Annual Ryegrass	1.5			
	Perennial Ryegrass	19			
	~~Red Clover~~	~~2~~			
	56 (lb/ac) total PLS rate				
☐ Planned Mix	Mix 4: Multipurpose AgLand				
	Tall Fescue	40	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
	Kentucky Bluegrass	20			
	Perennial Ryegrass	25			
	85 (lb/ac) total PLS rate				
☐ Planned	Temporary Seeding Options [2]				
	Oats	128	3-1 to 8/1		
	Oats Sudangrass	64 80	6/1 to 8/1		
	Cereal Rye	50-100	3/1 to 11/1		

1. Seeding of perennials may be considered from Jun 1 thru Jul 31 if the area is mulched with an erosion control blanket; timely watering may be needed during this period. Seedings may also be considered between Sep 16 and Oct 15 if an additional 30 lb/ac of cereal rye and mulching with an erosion control blanket. Both periods however are considered "outside the seeding window" and will need to be evaluated for adequate establishment prior to final approval. Seeding between Oct 15 and Dec 1 is not recommended.
2. Temporary seeding should be considered when a site is in the need of protection outside the seeding window.

Table 2: Customized seed mix criteria.

	Plant Species	Pure Live Seeding Rate (lb/ac)	Seeding Dates[1] Northern	Southern	Dormant Seeding
☑ Planned Mix	Cereal Rye	50 lb/ac	3-15 to 5-31 or 8-1 to 9-15	3-15 to 5-31 or 8-1 to 9-15	12-1 to 3-14
	(lb/ac) total PLS rate				

1. Seeding of perennials may be considered from Jun 1 thru Jul 31 if the area is mulched with an erosion control blanket; timely watering may be needed during this period. Seedings may also be considered between Sep 16 and Oct 15 if an additional 30 lb/ac of cereal rye and mulching with an erosion control blanket. Both periods however are considered "outside the seeding window" and will need to be evaluated for adequate establishment prior to final approval. Seeding between Oct 15 and Dec 1 is not recommended.

Fertilizer Amendments:

☐ Planned

Soil Test Method

Proper fertility is essential for any herbaceous vegetation establishment. Use an existing soil test to make applications of fertilizer in accordance with the Ohio Nutrient Management Standard (Code 590). Soil Test used for this option must represent the final soil in which the vegetation will be growing on. If major disruption of the surface soil layer is expected the non-soil test method should be used.

☑ Planned

Non-Soil Test Method

Proper fertility is essential for any herbaceous vegetation establishment. However, when establishing vegetation on sites that have or will have high erosion rates the time for a soil test before making applications and establishment is impractical. In these situations, applications of nutrients as described below should provide the needed nutrients for normal plant growth.

Fertilizer Requirements	Source	Rate of Material
Nitrogen	46-0-0 (Urea)	40 to 50 (lb/ac)
Phosphate (P_2O_5)	11-52-0 (MAP)	60 to 115 (lb/ac)[1]
Potash (K_2O)	0-0-60	50 to 165 (lb/ac) [1]

1. Use lower rates on sites with topsoil or you would expect to be moderate to high in fertility. Use higher rates on highly eroded or low fertility sites away from streams.

Mulching (484):

Mulching (484) is often used in combination with Critical Area Planting. Applying the correct rate with the needed anchoring can be critical to establishing herbaceous vegetation. The table below provides the site-specific information that should be used when using Mulching (484) associated with this establishment. For more information see Ohio CPS Mulching (484) and/or the attached Mulching Implementation Requirement sheet if applicable.

Planned Method	Erosion Potential[1]	Moisture Conservation Need[2]	Mulching Material	Application Rate Per 1000ft^2	Application Rate Per Acre	% Cover	Anchoring Methods
☐	Slight	Normal	Grass Hay or Cereal Grain Straw	85-95 lbs 2-3 bales	1.75-2 tons 90-100 bales	70-80	• Mulch anchoring tool • Disk • Wood cellulose fiber • Asphalt spray • Tackifiers • Polypropylene plastic netting.
☑	High	Normal		100-120 lbs 3-4 bales	2-2.5 tons 100-125 bales	80-90	
☐	High	High		130-150 lbs 4-5 bales	2.75-3 tons 130-150 bales	95-100	
☐	High	High	Erosion Control Blankets	Functional longevity of 12 months (generally have a dry weight per surface area of at least 0.5 lb/sq. yd)			• Install and anchor according to manufacture recommendations

1. Erosion potential is slight if slope is less than 6% and in non-concentrated flow areas; high if slope is greater than 6% or in concentrated flow areas.
2. Moisture conservation need is normal if planting is well within the normal planting dates; high if outside or near the planting date window.

Operation and Maintenance:

- Control access to the area to ensure the site remains stable.
- Protect plantings shall be protected from pests (e.g., weeds, insects, diseases, livestock, or wildlife) as necessary to ensure long-term survival.
- Inspections, reseeding or replanting, and fertilization may be needed to ensure that this practice functions as intended throughout its expected life.
- Observe establishment progress and success at regular intervals until the practice has met the criteria for successful establishment and implementation.

Certification Statement:
I certify that implementation of this conservation practice is complete, meets criteria for the stated purpose(s), and meets the NRCS conservation practice standard and specifications.

X _____
Planner

QUALITY ASSURANCE PLAN
BART C GLIATTA - ACEP WRE PROJECT
PORTOR TWP - DELEWARE COUNTY, OHIO

The following work items shall require continuous inspection

a. Tile search
b. Lined waterway
c. Critical area planting

Items of work requiring intermittent inspection

a. Wetland restoration excavation

Skills required of the inspector and COR:

1. Ability to communicate effectively and to work with contractors.
2. Knowledge of contract requirements, inspector duties and authorities.
3. Knowledge of survey, basic staking, & quantity calculations.
4. Knowledge of construction materials, methods, and procedures.

Additional Skills required of the COR:

1. Have experience in administering FAR contracts.

Testing Equipment and Facilities -construction inspection vehicle, cell phone, surveying equipment, hard hat, safety vest, and 16 unit 1st aid kit.

CO Technical Representative – Barbara Baker, ASTC, Ohio State Office, has experience as a COR on WRE projects. Certified COR Level I.

Inspector – Nathan Weber, Wetland Team Leader, Butler Co. Field Office has experience as a Government Inspector WRE.

Staff hours required:

Actual Construction Days ----------80 work days

COR- 8 hours/week x 8 weeks. ---------- 88 hours

Inspector- 8 hours/day x 5 days. ----------40 hours

It is anticipated that no overtime will be required by the inspector, and that no overtime will be required by the COR, to carry out the terms of the contract and appointment letters, in addition to their other previously assigned duties.

Timing Of Inspection: **ACTUAL DATES TO BE DETERMINED**

Site Showing - May XX, 2026

Bid Opening - June XX, 2026

Approximate start - August XX, 2025

80 work days =

Performance Time - 365 Calendar Days

Recommended Maximum Work week - 5 days/wk.@ 8 hrs./days

Approximate Finish - Aug XX, 2027

Prepared by Joe Lehman - _____

Contracting Officers Representative ---- _____

Asst. State Cons. for Field Operations ---- _____

Approved By:

State Conservation Engineer ---- _____

Contracting Officer ---- _____