

**PENNSYLVANIA GAME COMMISSION**

**STATE GAME LAND 214 EDUCATION WETLANDS  
CONSTRUCTION**

Northwest Region  
Pine Township  
Crawford County

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## **PROJECT SPECIFICATIONS**

The Contractor shall comply with the *Contract Terms and Conditions* provided with the Bid Documents including but not limited to the following:

**INSURANCE REQUIREMENTS** – In accordance with the *Contract Terms and Conditions*, the Contractor is required to have in place during the term of the Contract and any renewals or extensions thereof, the following types of insurance, issued by companies acceptable to the Commonwealth and authorized to conduct such business under the laws of the Commonwealth of Pennsylvania:

- A. **Worker's Compensation Insurance** for all of the Contractor's employees and those of any subcontractor, engaged in Work at the site of the project as required by law.
- B. **Public Liability and Property Damage Insurance** to protect the Commonwealth, the Contractor, and any and all subcontractors from claims for damages for personal injury (including bodily injury), sickness or disease, accidental death and damage to property including the loss of use resulting from any property damage, which may arise from the activities performed under the Contract or the failure to perform under the Contract, whether such performance or non-performance be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either. **The minimum amounts of coverage shall be \$250,000 per person and \$1,000,000 per occurrence for bodily injury, including death, and \$250,000 per person and \$1,000,000 per occurrence for property damage.** Such policies shall be occurrence rather than claims-made policies and shall not contain any endorsements or any other form designated to limit and restrict any action by the Commonwealth, as an additional insured, against the insurance coverage in regard to Work performed for the Commonwealth.

Prior to commencement of the Work under the Contract and at each insurance renewal date during the term of the Contract, the Contractor shall provide the Commonwealth with current certificates of insurance. **These certificates or policies shall name the Commonwealth AND Pennsylvania Game Commission as additional insured and shall contain a provision that the coverage's afforded under the policies will not be cancelled or changed until at least thirty (30) days written notice has been given to the Commonwealth.**

**COMPLIANCE WITH LAW** – The Contractor shall comply with all applicable federal and state laws and regulations and local ordinances in the performance of the Contract.

**WORKMANSHIP** - All Work shall be performed in a Workmanlike manner and all materials and labor shall be in strict and entire conformity with the contract documents and specifications.

**INSPECTION AND CHANGES** - All Work is subject to inspection and acceptance by the Pennsylvania Game Commission. Any Work rejected as defective or unsuitable shall be

removed and replaced with suitable Work and materials at the sole cost of the Contractor to the complete satisfaction of the Game Commission.

Changes shall be in accordance with the *Contract Terms and Conditions*.

**TEMPORARY SERVICES AND JOB CONDITIONS** - The Contractor shall be responsible for providing any and all temporary facilities necessary to execute and protect the Work. The Contractor shall accept all conditions as found upon examination of the site and shall coordinate, plan, and execute the Work accordingly. The Contractor shall cooperate in the arrangements of the Work as necessary to least affect the administration or operations of existing buildings, facilities, and infrastructure. The Contractor shall keep the Work site clean at all times.

**PREVAILING WAGE** – Prevailing minimum wages apply to this project. See *Contract Terms and Conditions* and attached Prevailing Wage Determination.

The Contractor and each Subcontractor shall file a statement each week and a final statement at the conclusion of the Work on the contract with the contracting agency, under oath, and in form satisfactory to the Secretary, certifying that workmen have been paid wages in strict conformity with the provisions of the contract as prescribed by this section or if wages remain unpaid to set forth the amount of wages due and owing to each workman respectively. The PA Labor and Industry “Weekly Payroll Certification for Public Works Projects” form shall be used. The initial and final Payroll Certifications shall be notarized.

**PAYMENT TERMS** - A schedule of values is provided with the bid. Payment will be made on a monthly basis upon satisfactory completion of items listed on the Schedule of Values and in accordance with the *Contract Terms and Conditions*.

All payments due to the Contractor shall be processed after all Work has been inspected and approved by an agent of the Pennsylvania Game Commission. Payment will not be made for Work that is not progressing satisfactorily or for unsuitable or defective Work.

Payments may be withheld for failure to provide required documentation for the project including but not limited to required submittals / shop drawings and weekly submission of Certified Payrolls.

**INVOICING** – All Project invoices shall be submitted directly to:

Austin Kieffer, P.E. – Engineering Division  
Pennsylvania Game Commission  
2001 Elmerton Avenue  
Harrisburg, PA 17110  
Office: 717-787-4250 Ext.73613  
Email: [akieffer@pa.gov](mailto:akieffer@pa.gov)

All invoices must be submitted in black and white with no color and shaded areas. Invoices must include the Purchase Order Number, Contractor’s SAP Vendor Number, and the Contractor’s

name and address as listed on the Purchase Order. Payment items on invoices shall match the items on the Purchase Order. Failure to submit invoices that meet these requirements will result in a delay of payment.

**Please Note:** Vendors are reminded to **NOT** include employer identification numbers, Social Security Numbers, bank account information, or other personally identifiable information on their invoices. That information is uniquely tied to your SAP Vendor Number and, for security purposes, should not be explicitly stated on an invoice.

**CONTRACT TERM** - The Contract shall commence upon delivery of Purchase Order to Contractor and shall terminate on **September 30, 2021**. Contract time is of the essence of the Project. All Work must be completed and accepted by this date.

**EXCISE TAXES, PENNSYLVANIA SALES TAX** - The Commonwealth is exempt from all Excise Taxes. See *Contract Terms and Conditions*.

**OFFSET PROVISION** - The Contractor agrees that the Commonwealth may set off the amount of any state liability or other debt of the Contractor or its subsidiaries that is owed to the Commonwealth and not being contested on appeal against any payments due the Contractor under this or any other contract with the Commonwealth.

**PERFORMANCE SECURITY / CONTRACT BONDS** – Within 10 days after award of the purchase order, the Bidder to whom the Contract is awarded, shall provide **Contract Performance Security** in a form acceptable to the Commonwealth for the amounts listed below and in accordance with the *Contract Terms and Conditions*.

A **Performance Bond** at one hundred percent (100%) of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions of the contract.

Performance bonds shall be executed by a surety company authorized to do business in the Commonwealth and listed on the current U.S. Dept. of Treasury, Bureau of Fiscal Service, Department Circular 570 (<https://fiscal.treasury.gov/surety-bonds/list-certified-companies.html>). Bonds shall include a current Power of Attorney dated the same as the date of the bond. Bonds shall be made payable to the Commonwealth.

**GUARANTY / WARRANTY** – See *Contract Terms and Conditions* – all items are warranted for a period of one year following delivery by the Contractor and acceptance by the Commonwealth.

**HOLD HARMLESS PROVISION** - See *Contract Terms and Conditions* - The Contractor shall hold the Commonwealth harmless from and indemnify the Commonwealth against any and all third party claims, demands and actions based upon or arising out of any activities performed by the Contractor and its employees and agents under this Contract, provided the Commonwealth gives Contractor prompt notice of any such claim of which it learns.

**ADDITIONAL PROVISIONS -**

Contractor shall comply with the conditions listed below in accordance with the *Contract Terms and Conditions*:

1. **Steel Products Procurement Act**
2. **Prohibition Against the Use of Certain Steel and Aluminum Products (Trade Practices Act)**
3. **Reciprocal Limitations Act** - The form GSPUR89 (*Reciprocal Limitations Act Requirements*) is attached. The Contractor shall complete the applicable portions of pages 3 and 4 of the form and submit the completed pages within two days after the bid opening.

## **PROJECT SPECIFICATIONS**

The Contractor shall comply with the *Contract Terms and Conditions* provided with the Bid Documents including but not limited to the following:

**INSURANCE REQUIREMENTS** – In accordance with the *Contract Terms and Conditions*, the Contractor is required to have in place during the term of the Contract and any renewals or extensions thereof, the following types of insurance, issued by companies acceptable to the Commonwealth and authorized to conduct such business under the laws of the Commonwealth of Pennsylvania:

- A. **Worker's Compensation Insurance** for all of the Contractor's employees and those of any subcontractor, engaged in Work at the site of the project as required by law.
- B. **Public Liability and Property Damage Insurance** to protect the Commonwealth, the Contractor, and any and all subcontractors from claims for damages for personal injury (including bodily injury), sickness or disease, accidental death and damage to property including the loss of use resulting from any property damage, which may arise from the activities performed under the Contract or the failure to perform under the Contract, whether such performance or non-performance be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either. **The minimum amounts of coverage shall be \$250,000 per person and \$1,000,000 per occurrence for bodily injury, including death, and \$250,000 per person and \$1,000,000 per occurrence for property damage.** Such policies shall be occurrence rather than claims-made policies and shall not contain any endorsements or any other form designated to limit and restrict any action by the Commonwealth, as an additional insured, against the insurance coverage in regard to Work performed for the Commonwealth.

Prior to commencement of the Work under the Contract and at each insurance renewal date during the term of the Contract, the Contractor shall provide the Commonwealth with current certificates of insurance. **These certificates or policies shall name the Commonwealth AND Pennsylvania Game Commission as additional insured and shall contain a provision that the coverage's afforded under the policies will not be cancelled or changed until at least thirty (30) days written notice has been given to the Commonwealth.**

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**PREVAILING WAGE** – Prevailing minimum wages apply to this project. See *Contract Terms and Conditions* and attached Prevailing Wage Determination.

The Contractor and each Subcontractor shall file a statement each week and a final statement at the conclusion of the Work on the contract with the contracting agency, under oath, and in form satisfactory to the Secretary, certifying that workmen have been paid wages in strict conformity with the provisions of the contract as prescribed by this section or if wages remain unpaid to set forth the amount of wages due and owing to each workman respectively. The PA Labor and Industry “Weekly Payroll Certification for Public Works Projects” form shall be used. The initial and final Payroll Certifications shall be notarized.

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Email: [akieffer@pa.gov](mailto:akieffer@pa.gov)

All invoices must be submitted in black and white with no color and shaded areas. Invoices must include the Purchase Order Number, Contractor’s SAP Vendor Number, and the Contractor’s

name and address as listed on the Purchase Order. Payment items on invoices shall match the items on the Purchase Order. Failure to submit invoices that meet these requirements will result in a delay of payment.

**Please Note:** Vendors are reminded to **NOT** include employer identification numbers, Social Security Numbers, bank account information, or other personally identifiable information on their invoices. That information is uniquely tied to your SAP Vendor Number and, for security purposes, should not be explicitly stated on an invoice.

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**PERFORMANCE SECURITY / CONTRACT BONDS** – Within 10 days after award of the purchase order, the Bidder to whom the Contract is awarded, shall provide **Contract Performance Security** and a **Payment Bond** in a form acceptable to the Commonwealth for the amounts listed below and in accordance with the *Contract Terms and Conditions*.

A **Performance Bond** at one hundred percent (100%) of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions of the contract.

A **Payment Bond** in an amount equal to one hundred percent (100%) of the contract amount.

Performance and Payment Bonds shall be executed by a surety company authorized to do business in the Commonwealth and listed on the current U.S. Dept. of Treasury, Bureau of Fiscal Service, Department Circular 570 (<https://fiscal.treasury.gov/surety-bonds/list-certified-companies.html>). Bonds shall include a current Power of Attorney dated the same as the date of the bond. Bonds shall be made payable to the Commonwealth.

**GUARANTY / WARRANTY** – See *Contract Terms and Conditions* – all items are warranted for a period of one year following delivery by the Contractor and acceptance by the Commonwealth.

**HOLD HARMLESS PROVISION** - See *Contract Terms and Conditions* - The Contractor shall hold the Commonwealth harmless from and indemnify the Commonwealth against any and all third party claims, demands and actions based upon or arising out of any activities performed by the Contractor and its employees and agents under this Contract, provided the Commonwealth gives Contractor prompt notice of any such claim of which it learns.



**ADDITIONAL PROVISIONS -**

Contractor shall comply with the conditions listed below in accordance with the *Contract Terms and Conditions*:

1. **Steel Products Procurement Act**
2. **Prohibition Against the Use of Certain Steel and Aluminum Products (Trade Practices Act)**
3. **Reciprocal Limitations Act** - The form GSPUR89 (*Reciprocal Limitations Act Requirements*) is attached. The Contractor shall complete the applicable portions of pages 3 and 4 of the form and submit the completed pages within two days after the bid opening.

## RECIPROCAL LIMITATIONS ACT REQUIREMENTS

Please Complete Applicable Portion of Pages 3 & 4 and Return with Bid.

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NOTE: These Requirements Do Not Apply To Bids Under \$10,000.00

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### I. REQUIREMENTS

- A.** The Reciprocal Limitations Act requires the Commonwealth to give preference to those bidders offering supplies produced, manufactured, mined or grown in Pennsylvania as against those bidders offering supplies produced, manufactured, mined or grown in any state that gives or requires a preference to supplies produced, manufactured, mined or grown in that state. The amount of the preference shall be equal to the amount of the preference applied by the other state for that particular supply.

The following is a list of states which have been found by the Department of General Services to have applied a preference for in-state supplies and the amount of the preference:

	<b>STATE</b>	<b>PREFERENCE</b>
1.	Alaska	7% (applies only to timber, lumber, and manufactured lumber products originating in the state)
2.	Arizona	5% (construction materials produced or manufactured in the state only)
3.	Hawaii	10%
4.	Illinois	10% for coal only
5.	Iowa	5% for coal only
6.	Louisiana	4% meat and meat products 4% catfish 10% milk & dairy products 10% steel rolled in Louisiana 7% all other products
7.	Montana	5% for residents * 3% for non-residents* *offering in-state goods, supplies, equipment and materials
8.	New Mexico	5%
9.	New York	3% for purchase of food only
10.	Oklahoma	5%
11.	Virginia	4% for coal only
12.	Washington	5% (fuels mined or produced in the state only)
13.	Wyoming	5%

- B.** The Reciprocal Limitations Act requires the Commonwealth to give preference to those bidders offering printing performed in Pennsylvania as against those bidders offering printing performed in any state that gives or requires a preference to printing performed in that state. The amount of the preference shall be equal to the amount of the preference applied by the other state for that particular category of printing.

The following is a list of states which have been found by the Department of General Services to have applied a preference for in-state printing and the amount of the preference:

	<b>STATE</b>	<b>PREFERENCE</b>
1.	Hawaii	15%
2.	Idaho	10%
3.	Louisiana	3%
4.	Montana	8%
5.	New Mexico	5%
6.	Wyoming	10%

- C.** The Reciprocal Limitations Act, also requires the Commonwealth to give resident bidders a preference against a nonresident bidder from any state that gives or requires a preference to bidders from that state or exclude bidders from states that exclude nonresident bidders. The amount of the preference shall be equal to the amount of the preference applied by the state of the nonresident bidder. The following is a list of the states which have been found by the Department of General Services to have applied a preference for in-state bidders and the amount of the preference:

<b>STATE</b>	<b>PREFERENCE</b>
1. Alaska	5% (supplies only)
2. Arizona	5% (construction materials from Arizona resident dealers only)
3. California	5% (for supply contracts only in excess of \$100,000.00)
4. Connecticut	10% (for supplies only)
5. Montana	3%
6. New Mexico	5% (for supplies only)
7. South Carolina	2% (under \$2,500,000.00) 1% (over \$2,500,000.00)
	This preference does not apply to construction contracts nor where the price of a single unit exceeds \$10,000.
8. West Virginia	2.5% (for the construction, repair or improvement of any buildings)
9. Wyoming	5%

<b>STATE</b>	<b>PROHIBITION</b>
1. New Jersey	For supply procurements or construction projects restricted to Department of General Services Certified Small Businesses, New Jersey bidders shall be excluded from award even if they themselves are Department of General Services Certified Small Businesses.

D. The Reciprocal Limitations Act also requires the Commonwealth not to specify, use or purchase supplies which are produced, manufactured, mined or grown in any state that prohibits the specification for, use, or purchase of such items in or on its public buildings or other works, when such items are not produced, manufactured, mined or grown in such state. The following is a list of the states which have been found by the Department of General Services to have prohibited the use of out-of-state supplies:

<b>STATE</b>	<b>PROHIBITION</b>
1. Alabama	Only for printing and binding involving "messages of the Governor to the Legislature", all bills, documents and reports ordered by and for the use of the Legislature or either house thereof while in session; all blanks, circulars, notices and forms used in the office of or ordered by the Governor, or by any state official, board, commission, bureau or department, or by the clerks of the supreme court . . . /and other appellate courts/; and all blanks and forms ordered by and for the use of the Senate and Clerk or the House of Representatives, and binding the original records and opinions of the Supreme Court . . . /and other appellate courts/
2. Georgia	Forest products only
3. Indiana	Coal
4. Michigan	Printing
5. New Mexico	Construction
6. Ohio	Only for House and Senate bills, general and local laws, and joint resolutions; the journals and bulletins of the Senate and house of Representatives and reports, communications, and other documents which form part of the journals; reports, communications, and other documents ordered by the General Assembly, or either House, or by the executive department or elective state officers; blanks, circulars, and other work for the use of the executive departments, and elective state officers; and opinions of the Attorney General.
7. Rhode Island	Only for food for state institutions.

\*If the bid discloses that the bidder is offering to supply one of the above-listed products that is manufactured, mined, or grown in the listed state, it shall be rejected. Contractors are prohibited from supplying these items from these states.

## II. CALCULATION OF PREFERENCE

In calculating the preference, the amount of a bid submitted by a Pennsylvania bidder shall be reduced by the percentage preference which would be given to a nonresident bidder by its state of residency (as found by the Department of General Services in Paragraph C<sub>above</sub>). Similarly, the amount of a bid offering Pennsylvania goods, supplies, equipment or materials shall be reduced by the percentage preference which would be given to another bidder by the state where the goods, supplies, equipment or materials are produced, manufactured, mined or grown (as found by the Department of General Services in Paragraphs A and B above).

THIS FORM MUST BE COMPLETED AND RETURNED WITH THE BID

**III. STATE OF MANUFACTURE**

All bidders must complete the following chart by listing the name of the manufacturer and the state (or foreign country) of manufacture for each item. If the item is domestically produced, the bidder must indicate the state in the United States where the item will be manufactured. **This chart must be completed and submitted with the bid or no later than two (2) business days after notification from the Issuing Office to furnish the information. Failure to complete this chart and provide the required information prior to the expiration of the second business day after notification shall result in the rejection of the bid.**

ITEM NUMBER	NAME OF MANUFACTURER	STATE (OR FOREIGN COUNTRY) OF MANUFACTURE

**IV. BIDDER'S RESIDENCY**

**A.** In determining whether the bidder is a nonresident bidder from a state that gives or requires a preference to bidders from that state, the address given on the first page of this invitation to bid shall be used by the Commonwealth. If that address is incorrect, or if no address is given, the correct address should be provided in the space below:

Correct Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- B.** In order to claim the preference provided under Section I.B., Pennsylvania resident bidders must complete the following or have such information on file with the Issuing Office:
1. Address of bidder's bona fide establishment in Pennsylvania at which it was transacting business on the date when bids for this contract/requisition were first solicited: \_\_\_\_\_
  2. **a.** If the bidder is a corporation:
    - (1) The corporation  is or  is not incorporated under the laws of the Commonwealth of Pennsylvania.
      - (a) If the bidder is incorporated under the laws of the Commonwealth of Pennsylvania, provide date of incorporation: \_\_\_\_\_
      - (b) If the bidder is not incorporated under the laws of the Commonwealth of Pennsylvania, it must have a certificate of authority to do business in the Commonwealth of Pennsylvania from the Pennsylvania Department of State as required by the Pennsylvania Business Corporation Law (15 P.S. §2001). Provide date of issuance of certificate of authority: \_\_\_\_\_
    - (2) The corporation  is or  is not conducting business in Pennsylvania under an assumed or fictitious name. If the bidder is conducting business under an assumed or fictitious name, it must register the fictitious name with the Secretary of the Commonwealth and the office of the prothonotary of the county wherein the registered office of such corporation is located as required by the Fictitious Corporate Name Act, as amended 15 P.S. §51 et seq. Corporate bidders conducting business under an assumed or fictitious name must provide date of registry of the assumed or fictitious name: \_\_\_\_\_
  - b.** If the bidder is a partnership:
    - (1) The partnership  is or  is not conducting business in Pennsylvania under an assumed or fictitious name. If the bidder is conducting business under an assumed or fictitious name, it must file with the Secretary of the Commonwealth and the office of the prothonotary the county wherein the principal place of business is located as required by the Fictitious Name Act of May 24, 1945, P.L. 967, as amended 54 P.S. §28.1. Partnerships conducting business under an assumed or fictitious name must provide the date of filing of the assumed or fictitious name with the Secretary of the Commonwealth: \_\_\_\_\_
    - (2) The partnership  is or  is not a limited partnership formed under the laws of any jurisdiction other than the Commonwealth of Pennsylvania. If the bidder is an Out-of-state limited partnership, it must register with the Pennsylvania Department of State as required by the Act of July 10, 1981, P.L. 237, as amended, 59 Pa. C.S.A. §503. Out-of-state limited partnerships must provide the date of registry with the Pennsylvania Department of State: \_\_\_\_\_
  - c.** If the bidder is an individual:

He or she  is or  is not conducting business under an assumed or fictitious name. If the bidder is conducting business under an assumed or fictitious name, he or she must file with the Secretary of the Commonwealth and the office of the prothonotary in the county wherein the principal place of business is located as required by the Fictitious Name Act of May 24, 1945, P.L. 967, as amended, 54 P.S. §28.1. Individuals conducting business under an assumed or fictitious name must provide the date of filing of the assumed or fictitious name with the Secretary of the Commonwealth: \_\_\_\_\_

## **TECHNICAL SPECIFICATIONS**

The following stipulations, specifications and description of Work are defined and described as Technical Specifications and it is understood and agreed that everything herein contained is hereby made part of the Contract. Wherever any feature of the Work is not fully set forth in these Technical Specifications and is necessary for the completion of Work, it shall be understood that the same is governed by the rules of the best prevailing practice for that class of Work, as determined by the Pennsylvania Game Commission and its representatives.

These Technical Specifications and any drawings, maps and/or plans forming a part thereof, will cover the furnishing of all labor, equipment, tools, materials, and related items necessary to perform the Work, as required under this Contract.

- Section 1 – Summary of Work
- Section 2 – Measurement and Payment
- Section 3 – Erosion and Sediment Control
- Section 4 – Excavation
- Section 5 – Grading
- Section 6 – Constructed Topography
- Section 7 – Pipe Bedding & Backfill
- Section 8 – Riprap
- Section 9 – Water Control Structure
- Section 10 – Restoration

## **ATTACHMENTS**

The following Attachments are included:

- Construction Drawings
- NPDES Permit

## **TECHNICAL SPECIFICATION SECTION 1 - SUMMARY OF WORK**

### **1.1 – SCOPE OF PROJECT**

This project involves the excavation of an educational wetland in Pine Township, Crawford County including construction, excavation, compacting, hauling, grading, site stabilization, seeding, culvert installation, control structure installation and related work.

### **1.2 – WORK AREA**

SGL #214 is located in Pine Township, Crawford County. The project site is located south of Linesville PA.

The site is owned by the Pennsylvania Game Commission (PGC).

### **1.3 – WORK HOURS**

The work hours at the project site are during regular PGC business hours which are Monday through Friday, 7:45AM to 4:00PM. Work during different hours must have prior written approval by the PGC. Requests for different working hours must be submitted in writing three days in advance.

### **1.4 – ACCESS TO WORK AREA**

Access to the project sites and staging of equipment and materials shall be coordinated with the PGC. The Contractor shall keep access roads leading to the project sites open for use by the PGC. The Contractor is required to repair any ruts or other damage to the access roads or vegetated areas caused by construction and access equipment.

### **1.5 – CONTROL OF WORK AREA**

Coordinate with PGC staff for access and control of work areas (closure of work areas). Provide barricades, signs and other devices as needed to prevent unauthorized access to work areas (parking areas) until construction activities are completed.

Do not block public roads at any time during construction. If necessary, provide temporary Maintenance and Control of Traffic in accordance with PennDOT Pub. 213 Temporary Traffic Control Guidelines and related PennDOT references.

### **1.6 – PERMITS, LAWS AND REGULATIONS**

The Contractor shall procure and pay for all permits, licenses, inspections, conveniences, or other approvals necessary for the execution of the contract. The PGC is in the approval process of an NPDES permit for the earth disturbance at the project location. The PGC is not aware of any additional permits required for this project.

The Contractor shall comply with all laws, ordinances, rules, orders and regulations relating to the performance of the work, the protection of adjacent property, the maintaining of surface passageways, guard fences, and/or other protective facilities. It is the contractor's responsibility to abide by the conditions set by NPDES permit to mitigate any erosion or unnecessary earth disturbance. All BMPs are to be performed and mitigated to prevent earth migration from the site.

All applicable Federal and State laws and regulations, municipal ordinances and rules and regulations of all authorities, having jurisdiction over construction of the project shall apply to the contract throughout, and they shall be deemed to be included in the contract as a part, thereof, the same as though herein written out in full.

All regulations of the Occupational Safety and Health Act are in effect on this contract. It will be the Contractor's responsibility to make themselves aware of all appropriate County, State and Federal regulations that apply to this contract.

Any violations incurred from improper execution of the above provisions shall be paid for by the Contractor. Loss of time on the project from such violations will not be tolerated.

#### **1.7 – ROAD PERMITS AND BONDING**

The Contractor shall coordinate, acquire, pay for, and maintain for the duration of the project any and all permits or bonds required by local municipalities and/or PennDOT to utilize public roads and infrastructure for heavy hauling and related construction activities. Responsibilities shall include any pre or post construction inspections and related reports if required. All costs related to permitting and bonding public roadways and infrastructure shall be included with and incidental to the Bid submitted by the Contractor and will not be paid for separately.



**TECHNICAL SPECIFICATION SECTION 2 – MEASUREMENT AND PAYMENT**

**2.1 – GENERAL**

- A. The items on the Bid Form for this Contract will be measured and the payment made in accordance with this Section.
- B. All payments will be made at the unit prices for each item listed in the Bid Form.
- C. Any items not specifically listed on the Bid Form but are specified and/or are necessary to complete the Work will be considered incidental to the related items listed on the Bid Form.

**2.2 – PAY ITEMS AND MEASUREMENT METHODS**

Pay items are listed in the order they appear on the Bid Form and unless stated otherwise, the numbers correspond to the Pay Item Numbers on the Bid Form and the Purchase Order.

- 1. ADMINISTRATION, MOBILIZATION, TERMS AND CONDITIONS, CONTRACT BONDS
  - a. This price and payment shall constitute full compensation for providing Performance and Payment Bonds, insurance coverage and certificates, compliance with the Terms and Conditions, and general project requirements except where specifically described and scheduled elsewhere, mobilization, demobilization, temporary facilities, municipal and state (PennDOT) roadway bonding requirements / fees and costs / inspections, and compliance with requirements of permits and approvals (not measured and paid for elsewhere) required for the project by the Contract Documents.
  - b. Unit of Measurement: Lump Sum.
- 2. SOIL EROSION AND SEDIMENTATION CONTROL
  - a. This price and payment shall constitute full compensation for providing Soil Erosion and Sedimentation Controls as specified and shown and directed by PGC staff including but not limited to all labor, materials, equipment, supervision, and related work and incidental items required to prevent accelerated soil erosion and surface water contamination and to address and correct erosion problems that occur during construction. A rock construction entrance is also considered part of this pay item.
  - b. Unit of Measurement: Lump Sum
- 3. EXCAVATION –
  - a. This price and payment shall constitute full compensation for excavating and grading the area to facilitate the wetland, striping and stockpiling of topsoil, providing an embankment stabilized and lined with clay in the watercourse is also part of this pay item.

Any excavation for the AASHTO #1 Rock construction entrance is to be included in this pay item. Excavation for the control structure is also to be part of this task. Operations of the wetland construction include but not limited to all labor, materials, equipment, supervision, excavation, brush and vegetation clearing, disposal of waste materials, and other related work required to strip and excavate the area to required elevations to gain bank material.

b. Unit of Measurement: Lump Sum.

4. COMPACTED BACKFILL -

a. This price and payment shall constitute full compensation to deposit, grade, shape and compact the proposed wetland banks as specified and shown on the drawings / details and directed by PGC staff including but not limited to all labor, materials, equipment, supervision, excavation and earthwork operations. This work also involves depositing the clay material for sealing the base of the wetland. Contractor shall provide adequate construction excavation and earthmoving equipment suitable for the required work including but not limited to a dozer with a 6-way blade/road grader, excavator and vibratory roller.

b. Unit of Measurement: Lump Sum.

5. R-4 RIP-RAP AGGREGATE

a. This price and payment shall constitute full compensation to grade and shape truck turnarounds as specified and shown on the drawings / details and directed by PGC staff including but not limited to all labor, materials, equipment, supervision, excavation and earthwork operations, compaction of subgrade, and related work required to provide the base.

b. Unit of Measurement: Tons – Loose as shipped and dumped at the site. Quantity in Bid is estimated based on anticipated volume required. Actual quantity measured and paid shall be based on load slips provided by the aggregate supplier / quarry where the material is obtained and weighed. **The Contractor shall provide copies of ALL aggregate load slips including a project summary sheet provided by the aggregate supplier for verification of quantities and quality control. Load slips shall include the following minimum information: 1) supplier, 2) contractor, 3) project name, 4) aggregate type, 5) quantity delivered (tons), 6) delivery date, and 7) specific delivery location. In addition to individual load / weigh slips, a summary spreadsheet in Microsoft Excel format of all aggregate material shipments shall be provided.**

6. INSTALLATION OF CONTROL STRUCTURE

a. This price and payment shall constitute full compensation to install the provided control structure. The contractor to supply all anchors, fasteners and hardware to properly install the structure. Filter fabric is considered to be incidental and to be included with the

installation of the control structure. The control structure is to be installed as shown in contract documents and as directed by PGC staff including but not limited to all labor, materials, equipment, supervision, acceptable backfill material, sealing and related work required to provide the drain pipe.

b. Unit of Measurement: Lump Sum

7. RESTORATION – FERTILIZER, SEEDING, STRAW MATS, TURF REINFORCEMENT MAT

a. This price and payment shall constitute full compensation to stabilize and restore all disturbed areas along the roadway corridor as specified and shown and directed by PGC staff including but not limited to all labor, materials, equipment, supervision, seed mixtures, mulches, soil amendments, and related work.

b. Unit of Measurement: Lump Sum

**TECHNICAL SPECIFICATION SECTION 3 - EROSION AND SEDIMENTATION CONTROL**

**3.1 -SCOPE**

This work is implementing the erosion and sedimentation control measures contained on the drawings and described herein. Compliance with Chapter 102 of the Department of Environmental Protection's regulations is also required.

**3.2 – PROCEDURE**

- A. **Project Description** – See Project Summary and related Erosion and Sedimentation Control plan specifications and drawings / details included with the Contract Documents as well as supplemental information and requirements provided by PGC staff.

This Soil Erosion and Sedimentation Control Plan is designed to control soil erosion at its source and to prevent runoff flows from carrying sediment beyond the work area limits. The Contractor is responsible for the implementation and execution of this plan and for providing and maintaining proper soil erosion and sedimentation controls during the duration of the project until permanent stabilization conditions are achieved.

- B. **Stormwater Runoff and Drainage** - The project site consist of access corridors and undeveloped, well vegetated and rural PGC State Game Lands. Post construction run off will reach existing drainage features and surface waters by way of overland flow consistent with existing conditions. Existing storm water flow at the individual sites will not be substantially altered as a result of the project. Existing drainage features or facilities disturbed during construction shall be repaired or reconstructed by the Contractor.

Construction details are included with or referenced in the Contract Documents. The roadway and adjacent areas shall be graded as needed to provide the desired range cross section and suit existing site conditions and requirements for access. Range surfaces will be surfaced with top soil stripped from the site. All disturbed areas will be restored to their pre-construction conditions with seed and mulch.

Drainage from the project site flows to Pymatuning Reservoir (WWF).

- C. **Soils Information / Limitations** - Soils information for the project is available from the U.S.D.A. Natural Resources Conservation Service soil survey for Pennsylvania. Soils information is included in the attached E & S Plan Template.  
Subsurface conditions from the NRCS Soil Survey have not been verified in the field by the PGC.

The Contractor shall provide appropriate excavation equipment and construction techniques to conduct earthwork operations required for the project.

- D. Hydrology and Hydraulics** - Construction will not significantly affect the overall hydrology of the project sites. Minimal vegetation clearing and grubbing and grading work will be required for construction. Roadways will be stabilized with aggregate and all other disturbed areas and pre-construction drainage patterns will be restored to their pre-construction condition after the construction activities have ended.

The Contractor shall provide and maintain E&S controls during construction as described herein and shown on the details to minimize the impact of runoff during rainfall events. Once the temporary impacts of construction have ended, the pre-existing hydrology will be re-established.

**E. Erosion Control Measures –**

1. General
  - A. Accelerated erosion control shall be accomplished through the rapid stabilization of all disturbed surfaces throughout the project area, use of Best Management Practices (BMPs), and precautions in the use of construction equipment.
  - B. During the earth disturbance activity, precautions must be taken to prevent accelerated erosion, minimize damage, injury or destruction of property; prevent pollution; protect natural vegetation not targeted for removal during the activity/project; and protect natural drainage ways and surface waters. All disturbed areas shall be stabilized immediately.
  - C. The Contractor shall provide temporary erosion control measures as required and site conditions dictate to reduce the erosion potential of the site. Compost Filter Sock shall be provided as needed in accordance with the attached details and as directed by PGC staff.
2. Temporary Stabilization
  - A. Provide temporary stabilization of disturbed areas as shown on the details.
  - B. At a minimum, all disturbed areas shall be temporarily restored and stabilized (mulched) within 4 days of the disturbance. Seed mixture and application rates are included in the specifications.
3. Permanent Stabilization
  - A. Permanent seeding and soil supplements shall be provided on disturbed and final graded areas during the germinating season as soon as practical but not more than 15 days after disturbance. Seeding and mulching shall be provided as specified herein and as shown on the drawings / details. At a minimum, all disturbed areas shall be temporarily restored and stabilized (mulched) within 4 days of the disturbance. Seed mixture and application rates are included in the specifications.

- B. Provide permanent stabilization of disturbed areas as specified herein.
  - C. The project area will be considered permanently stabilized when all permanent control measures/facilities have been completed and are operational, all temporary control measures/facilities removed, and a minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation is established.
4. Maintenance
- A. Maintain temporary control measures and facilities as shown on the details.
  - B. Sediment accumulation shall be removed and disposed of at approved locations. These locations shall be selected such that the sediment will not erode into the construction area or any natural waterway.
  - C. Stabilized coarse aggregate (stone or gravel) surfaces that become eroded shall be restored with additional coarse aggregate materials.
  - D. Any permanent seeded areas that become eroded shall be repaired / regraded, seeded, and new mulch applied.
  - E. If the vegetative cover deteriorates and becomes ineffective, a fertilization and re-seeding program shall be established and carried out as the construction proceeds. Areas where failures have been experienced in the establishment of both permanent and temporary vegetative protection shall be promptly treated. Re-establishment of permanent vegetative cover shall be initiated as soon as possible.
  - F. After permanent site stabilization has been achieved, temporary erosion and sedimentation controls must be removed. Areas disturbed during removal of the control must be stabilized immediately. Re-grade areas as needed and seed and mulch using the permanent seeding schedule as indicated.
- F. **Hydrology and Hydraulics** - Construction will not significantly affect the overall hydrology of the project sites. Minimal vegetation clearing and grubbing and grading work will be required for construction. Roadways will be stabilized with aggregate and all other disturbed areas and pre-construction drainage patterns will be restored to their pre-construction condition after the construction activities have ended.

The Contractor shall provide and maintain E&S controls during construction as described herein and shown on the details to minimize the impact of runoff during rainfall events. Once the temporary impacts of construction have ended, the pre-existing hydrology will be re-established.

**G. Erosion Control Measures –**

- 1. General
  - A. Accelerated erosion control shall be accomplished through the rapid stabilization of all disturbed surfaces throughout the project area, use of Best Management Practices (BMPs), and precautions in the use of construction equipment.

- B. During the earth disturbance activity, precautions must be taken to prevent accelerated erosion, minimize damage, injury or destruction of property; prevent pollution; protect natural vegetation not targeted for removal during the activity/project; and protect natural drainage ways and surface waters. All disturbed areas shall be stabilized immediately.
  - C. The Contractor shall provide temporary erosion control measures as required and site conditions dictate to reduce the erosion potential of the site. Compost Filter Sock shall be provided as needed in accordance with the attached details and as directed by PGC staff.
2. Temporary Stabilization
- A. Provide temporary stabilization of disturbed areas as shown on the details.
  - B. At a minimum, all disturbed areas shall be temporarily restored and stabilized (mulched) within 4 days of the disturbance. Seed mixture and application rates are included in the specifications.
3. Permanent Stabilization
- A. Permanent seeding and soil supplements shall be provided on disturbed and final graded areas during the germinating season as soon as practical but not than 15 days after disturbance. Seeding and mulching shall be provided as specified herein and as shown on the drawings / details.
  - B. Provide permanent stabilization of disturbed areas as specified herein.
  - C. The project area will be considered permanently stabilized when all permanent control measures/facilities have been completed and are operational, all temporary control measures/facilities removed, and a minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation is established.
4. Maintenance
- A. Maintain temporary control measures and facilities as shown on the details.
  - B. Sediment accumulation shall be removed and disposed of at approved locations. These locations shall be selected such that the sediment will not erode into the construction area or any natural waterway.
  - C. Stabilized coarse aggregate (stone or gravel) surfaces that become eroded shall be restored with additional coarse aggregate materials.
  - D. Any permanent seeded areas that become eroded shall be repaired / regraded, seeded, and new mulch applied.
  - E. If the vegetative cover deteriorates and becomes ineffective, a fertilization and re-seeding program shall be established and carried out as the construction proceeds. Areas where failures have been experienced in the establishment of both permanent and temporary vegetative protection shall be promptly treated. Re-establishment of permanent vegetative cover shall be initiated as soon as possible.
  - F. After permanent site stabilization has been achieved, temporary erosion and sedimentation controls must be removed. Areas disturbed during removal of the control must be stabilized immediately. Re-grade areas as

needed and seed and mulch using the permanent seeding schedule as indicated.

- H. **Recycling and Disposal of Construction Materials** – All construction materials, including soils and aggregates, should be recycled and/or re-used to the greatest extent possible at the Project Site. Woody vegetation waste materials should be shredded/chipped for use on-site as mulch materials if possible or as directed by PGC staff. Other debris and other construction by-products, including waste pipe, metal, paper, plastic, cardboard, batteries, rubber, etc. shall be properly disposed of at a local recycling center or waste transfer/landfill site. The Contractor shall not disposal of waste materials on-site via burning or burial.
- I. **Waste Disposal Sites** – Excess excavated material shall be properly and legally disposed of along the east berm or as directed by the PGC. The contractor shall provide appropriate soil erosion and sedimentation controls for the waste sites and they shall be stabilized. Provision of E&S controls at disposal sites is considered incidental to construction.

Failure to implement soil erosion and sediment pollution control measures may result in a cease and desist order, causing shutdown of the work. No extension of time, nor additional compensation will be granted id such a shutdown should occur as a result of act or neglect of the Contractor.

### **3.3 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.



## **TECHNICAL SPECIFICATION SECTION 4 - EXCAVATION**

### **4.1- SCOPE**

This work is removal, stockpiling, hauling, and grading of all materials encountered for construction of the educational wetland and water control structure.

### **4.2 - PROCEDURE**

**A. General** - Follow all guidelines set forth in the Construction Industry Standards, OSHA 2207, of the Occupational Safety and Health Administration, U.S. Department of Labor. Protect the work, adjacent roadways, and property.

The Contractor is required to contact the PA One Call System at 8-1-1 prior to excavation operations at the site.

The Contractor is responsible for clearing and stripping the earth to and grading the area per the contract documents. The current area is to be stripped of top soil for a minimum of 6" to later be deposited on impoundment banks. The remaining excavated material is to be deposited under the impoundment bank. The impoundment basin is to be lined with approximately a 6" depth of clay material. All excavated fill will be used on sight as a balanced cut and fill site. The PGC will designate a site for depositing spoil material. Do not over-excavate because unauthorized excavation and replacement of materials in the over-excavated areas will not be measured and paid for. Replace over-excavated work with approved fill materials designated by the PA Game Commission.

**B. Excavation** - Remove all materials to the limits shown on the Drawings or as necessary to construct the impoundment area. Proposed elevations on impoundment drawings are to be final elevation of reinstalled or application of 6" depth of clay material in the basin (actual excavation limit to be 6" below final elevation to allow for clay reinstallation).

**C. Disposal** – All excavated materials are to be used on site and any spoil material is to be deposited at a PGC designated location.

### **4.3 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.

**TECHNICAL SPECIFICATION SECTION NO. 5 – GRADING**

**5.1- SCOPE**

This work is preparing the existing ground surface in the impoundment area and embankment for seeding and restoration. This work is to provide a smooth firm surface free of obstructions and unevenness.

**5.2 - PROCEDURE**

**A. General** – All work in this section should be coordinated to provide the designed features of the surface and drainage features. These design features are listed in the contract drawings. These features include an embankment, impoundment area, water control structure and other grading required to connect to existing drainage features.

**B. Grading and Shaping** – Grade and shape the subgrade material to form flat and even base for placement of the seeding and clay base material. A 50hp (min) skidsteer with grader blade, land leveler, landscape rake attachments to be accepted. Other accepted means of equipment would include a motor grader or bulldozer with a 6-way blade.

**D. Compaction** – Compact the graded and shaped material lightly to promote stabilization, however, a hard-panned compacted surface will not be acceptable for establishing vegetation and seeding. The main compaction of the embankment will occur subsurface below the sod level

**5.3 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.

**TECHNICAL SPECIFICATION SECTION NO. 6 – CONSTRUCTED TOPOGRAPHY**

**6.1 - SCOPE**

This specification shall cover the supply of all labor, materials, and equipment required for the construction of potholes, dugouts, basins, meandered channels, peninsula cutoffs or other topographic reconstruction as shown on the plans. The work shall include the excavation, hauling and spreading of materials from within the limits of the cut area, control of water during excavation, the shaping of slopes to the lines and grades shown on the drawings and the disposal of materials within designated areas.

**6.2 – CONSTRUCTION METHODS**

**SITE PREPARATION**

Prior to any excavation, sites shall be cleared and grubbed with topsoil removed in accordance with the specification for SITE PREPARATION. Material cleared and grubbed shall be disposed of per the Engineer's directions. Unless otherwise specified, the debris shall be placed in the spoil areas and secured by incorporating it into the earth fill. Preparation of the site shall be done in a manner that destroys as little vegetation as feasible outside the area to be occupied by the topographic feature and the associated spoil areas. Topsoil removed shall be stockpiled and later re-spread on those areas at a thickness of six (6) inches, unless otherwise specified.

**EXCAVATION**

Excavation shall mean the removal of all materials encountered within the limits of excavation as shown on the drawings or as staked by the Engineer. Excavation shall be performed in as nearly a continuous operation as possible to conform to the required lines, grades and tolerances. Areas over-excavated shall be replaced with suitable materials compacted to a density at least equal to that of the in-situ material or to the satisfaction of the Engineer. The depth specified is nominal so the actual depth may vary 6 inches above and below the specified depth. The side slopes of the excavated basins shall be free of abrupt changes and blend into the existing ground contours.

Connection ditches shall have 3:1 or flatter side slopes. For curved segments, a scour hole effect shall be obtained by over-excavating the outside of the ditch with the inside of the curve being shallower. Material excavated from the designated locations shall be used to create multiple upland habitat conditions based on the height, shape, and location of habitat mounds. Where designated on plans, spoil shaped into a mound shall be placed 25 to 30 feet from edge of basin. The side slopes of the mound shall be 6:1 or flatter. Large spoil areas may be shaped into multiple mounds. The completed earth fill in the mounds and ridges shall be left rough graded. No compaction of the earth fill will be required. Where designated on plans, spoil shaped into a ridge shall be continuous, with a minimum height of 1 foot. The ridge shall be used on the down slope side of a basin to impound additional water over the basin area. Unless otherwise specified, all material to be excavated shall be considered unclassified regardless of their nature or the manner in which they are removed.

**CONTROL OF SURFACE AND SUBSURFACE WATER**

The Contractor is responsible for control of surface water, subsurface water, and drainage during the construction period. All temporary fills, crossings, and culverts necessary to promote drainage during construction will be installed and removed at the Contractor's expense prior to acceptance of the work. Any claims arising from upstream or downstream damages as a result of the construction or failure of these temporary works will be the Contractor's responsibility.

It is the responsibility of the Contractor to control the surface and sub-surface water and drainage in any excavation area, dewatering placement area and borrow area. Should material quality lessen through inadequate drainage, the Contractor may be directed by the Engineer to construct drainage facilities at the Contractor's expense.

### **6.3 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.

**TECHNICAL SPECIFICATION SECTION NO. 7 – PIPE BEDDING & BACKFILL**

**7.1 - SCOPE**

This work is constructing a foundation bed and backfilling the drainage pipes as shown on the Drawings.

**7.2 - APPLICABLE PUBLICATIONS**

AASHTO T 27 - Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.

Pub. 408 - Specifications,  
Pennsylvania Department of Transportation.

Bulletin 14 - Aggregate Producers,  
Pennsylvania Department of Transportation.

**7.3 - MATERIALS**

Aggregate used for constructing the foundation bed and backfilling drainage pipes shall be 2RC select granular material, as specified in Section 703.3 of Pub. 408.

Obtain aggregates from a source listed in Bulletin 14.

**7.4 - PROCEDURE**

Excavate the trench to the dimensions shown on the drawings for installation of the new control structure device. Place stone in the dry, and not on frozen ground for foundation bedding of the new drainage pipes.

Place the stone in layers and shape the stone to conform to the pipe shape. Place the pipe and compact around the pipe to remove any voids in the stone. Compaction of the stone shall be considered satisfactory on the basis of non-movement of the materials under compaction equipment. Compact the stone to provide a firm base for road surfacing operations.

**7.5 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.

## **TECHNICAL SPECIFICATION SECTION 8 – RIPRAP**

### **8.1 - SCOPE**

This work shall consist of supply and placement of rock riprap, filterstone, concrete revetment or other aggregate as protective covering along the side slopes, bases of channels, slopes around culverts, and on embankments or such other places as may be indicated on the plans, as specified herein, or as directed by the Engineer.

### **8.2- MATERIALS**

**A. Riprap-** Rock for R-4 riprap shall be durable quality stone conforming to the requirements of Section 850.2a of PennDOT Pub. 408. Obtain the riprap from a source listed in PennDOT Bulletin 14.

Obtain the stone from a source listed in PennDOT Bulletin 14.

**B. Filter Fabric** – Unless otherwise specified, filter fabric shall be utilized in the installation of all riprap and revetment. The filter fabric shall be a nonwoven polyester or polypropylene geotextile. This geotextile shall have a minimum grab tensile strength of 150 pounds as determined by ASTM D4632. The geotextile shall have a maximum opening size equivalent to a #70 U.S. standard sieve.

The contractor shall supply all pins and other items necessary to fasten the filter fabric to the ground so it will not slide or form gaps when placing rock riprap.

All materials shall be handled and stored in a careful and workmen-like manner to the satisfaction of the engineer.

For concrete revetment, the geotextile shall be bonded to the base of the concrete block mats with an overlap of two to three feet incorporated on one end and one side adjacent to each other. The geotextile shall be Class2, Type A geotextile conforming to the requirements of Section 735 of PennDOT Pub. 408. Obtain the geotextile from a source listed in PennDOT Bulletin 15.

### **8.3 - PROCEDURE**

Place the Riprap carefully in a uniform thickness and pattern. The riprap is to be compacted in gently with excavation equipment buckets to ensure the proper setting of the material but not to fragment the aggregate. Compaction of the aggregate shall be considered satisfactory on the basis of non-movement of the materials under light pressure.

Place the stone around the control structure by an excavator bucket and by hand where dropping aggregate could damage the control structure components. The width of riprap placement shall conform to the dimensions shown on the drawings. Make sure the riprap is placed to a proper depth on both the invert sides. Compact the riprap using the smooth surface of a loader or excavator bucket to “set” the riprap and prevent migration. Compaction of the stone shall be considered satisfactory on the basis of non-movement of the materials under light loading.

### **8.4 - MEASUREMENT AND PAYMENT**

Tons, measured by the weight slips from stone supplier, as applicable for the three types of aggregate used for the project.

Aggregate used for replacing caved-in-material, and material excavated beyond the established payment lines will not be measured and paid for.

**TECHNICAL SPECIFICATION SECTION 9 – WATER CONTROL  
STRUCTURE**

**9.1 -SCOPE**

The work of this section shall include the supply of all labor, misc. hardware and equipment required to complete the installation of the **provided** water control structure as called for on the drawings and/or specified herein. The contractor may still be responsible for water control structure hardware but are not limited to the following:

- a) Control structure pins and anchors and any needed risers
- b) Aggregate
- c) Uplift devices
- d) Sealants, caulks, or paints

This work shall consist of coupling the structure to the pipe; excavation; bed preparation; installation of structure and associated hardware with the use of a concrete base pad or form, reinforcement, and concrete placement, or framing and supports as shown on the plans. Work shall also include the supply, placing and compaction of backfill to the lines and grades shown on the drawings or as specified.

**9.2 – MATERIALS**

**SUPPLY OF MATERIALS**

Unless otherwise specified, the Contractor shall supply all couplers, nuts, bolts, riser controls, stoplog channels, sealants, and all accessories necessary to complete the installation as shown on the plans or recommended by the material manufacturer. The structure material, diameter and length shall be as specified on the plans. Unless otherwise specified, the structure shall adhere to the aluminum corrugated metal specification as listed below. All culverts, inlet and outlet pipes, and appurtenances shall match the material and coating of the base riser unless otherwise specified on the plans. All materials supplied by the Contractor shall be subject to inspection by the Engineer.

The following specifications for each material type shall be adhered to.

- 1) Aluminum corrugated metal pipe risers. The minimum acceptable series for aluminum CMP shall be 3000 Series. The material shall meet the requirements of AASHTO M197.
  - a) Pipe shall be close riveted or of a "lock seam" construction. Unless otherwise specified all pipes shall have a 2-2/3" x 1/2" corrugation. The gauge of the pipe shall be as follows unless otherwise specified on the plans:



Pipe Diameter	2-2/3" x 1/2" Corrugations Metal Thickness	3" x 1" Corrugations Metal Thickness
12"-21"	14	NA
24"-36"	12	14
42"-54"	10	12
60"-96"	8	10

- b) All welds shall be 3/16" fillets unless otherwise specified on the plans and should conform to Welded Joint Requirements of the latest edition of the AISC Manual. All bolted connections shall utilize stainless steel bolts, nuts, and washers, grade 18-8 or 304 or better.
  - c) The minimum acceptable series for all structural aluminum, channels, angles, plates, rounds, etc. shall be 5000 Series, unless otherwise specified.
  - d) The portion of the riser that will be embedded in the concrete base shall be coated with asphalt mastic prior to installation.
- 2) Steel corrugated metal pipe risers. Where stated as acceptable on the plans, steel corrugated metal risers shall be made of galvanized or aluminized Type II steel. Galvanized steel corrugated metal pipe shall meet the composition requirements of AASHTO M218. The aluminized Type II steel shall conform to the requirements of AASHTO M274.
- a) Pipe shall be close riveted or of a "lock seam" construction. Unless otherwise specified all pipes shall have a 2 2/3" x 1/2" corrugation. The gauge of the pipe shall be as follows unless otherwise specified on the plans:

Pipe Diameter	2-2/3" x 1/2" Corrugations Metal Thickness	3" x 1" Corrugations Metal Thickness
12"-21"	16	NA
24"-36"	14	16
42"-54"	12	14
60"-96"	10	12

- b) Risers made of galvanized or aluminized Type II steel shall be coated. This coating shall be a double bituminous coating (dipped or sprayed), or a 10 mil polymeric film laminate. The coatings shall be applied to both the inside and outside of the riser. The bituminous coating shall be of double thickness and be in accordance with AASHTO M190 Type "A" Standard Specification. All spray coatings shall conform to AASHTO M243.
- c) All welds shall be 3/16" fillets unless otherwise specified on the plans and should conform to Welded Joint Requirements of the latest edition of the AISC Manual.

- 3) Pre-cast concrete risers. Where stated as acceptable on the plans, pre-cast concrete structures shall conform to the requirements of ASTM C478. The risers shall be of the length shown on the plans. All pipe shall be connected to the riser utilizing a flexible watertight connector as approved by the Engineer.
- 4) Fiberglass, High Density Polyethylene (HDPE) Pipe, and Polyvinyl Chloride (PVC) Pipe Risers. Where stated as acceptable on the plans, Fiberglass, HDPE, and PVC risers shall be approved by the Engineer and shall be of the length shown on the Plans.
  - a) The minimum acceptable series for all structural aluminum, channels, angles, plates, rounds, etc. shall be 5000 Series, unless otherwise specified.
  - b) All bolted connections shall utilize stainless steel bolts, nuts and washers, grade 18-8 or 304 or better.
  - c) The pipe stubs for the structure shall incorporate a gasketed bell and spigot design with the ability to accept watertight HDPE pipe. The gasketed joint shall meet the requirements of ASTM F477 with a minimum watertight performance of 10.8 psi. 36" through 60" diameters shall have a reinforced bell and spigot.
  - d) The structure manufacturer shall weld and/or bond all stub joints on both the interior and exterior of the riser.
  - e) Fiberglass risers shall be of three-piece construction. The two-piece exterior shell shall consist of two molded fiberglass shells with reinforcing ribs and flanges. The fiberglass shall be a polyester resin. The center stop gate shall be of polyethylene construction.
  - f) HDPE risers shall have a smooth interior and annular exterior corrugations. The Engineer shall approve the pipe utilized for the structure. The material shall meet the requirements of ASTM D3350 with a minimum cell classification 335420C. 12" to 48" risers shall meet the requirements of AASHTO M294, Type S. 54" and 60" risers shall meet the requirements of AASHTO MP7.
  - g) PVC risers shall meet the material requirements of ASTM D1784. 12" to 15" risers shall meet the requirements of ASTM D3034. 18" and larger diameter risers shall meet the requirements of ASTM F679.
- 5) Unless otherwise specified, all corrugated metal pipe connections shall be made utilizing the flange coupler as shown on the plans.
- 6) Where called for the plans, annular connecting bands shall be the same material and have the same coating, corrugations, and gauge as specified for the pipe that is to be connected.
  - a) The connecting bands shall be either 24" in width or have a minimum of nine (9) corrugations. The minimum circumferential overlap shall be six (6) inches. If helical pipe is used, a minimum of four (4) re-rolled annular corrugations shall be formed to allow the use of the annular overlapping connecting bands.
  - b) To provide for a watertight joint, a closed cell expanded gasket shall be used in conjunction with connecting band. The gasket shall be at least 24" in width, 3/8" thick, with an unstretched diameter ten (10) percent less than normal pipe size and shall comply with ASTM D1056, Grade SCE-43. Mastic shall be placed on each side of the gasket.

- c) The binders for the connecting bands will consist of a minimum of 6 rods and tank lugs, three (3) per side, in accordance with the plans. The minimum rod diameter shall be 7/16" with 1/2" threads. All rods and lugs shall be stainless steel, grade 18-8 or 304 or better.
- 7) When called for on the plans, the Contractor shall supply to the site ready mix concrete, or site mix concrete in accordance with the specification for CAST-IN-PLACE REINFORCED CONCRETE. Forms, reinforcing steel or wire mesh, for the concrete pad for the control structure will be the responsibility of the Contractor. Installation of a concrete base for all prefabricated risers shall be considered incidental to the riser installation and no separate measurement or payment shall be made for this work.

### HANDLING AND STORAGE OF MATERIALS

All materials shall be handled and stored in careful and workmanlike manner to the satisfaction of the Engineer. Any dents or depressions as a result of storage and handling during transportation or installation shall not be allowed. The Contractor shall be responsible for replacement and reinstallation of the damaged riser at his own expense.

### 9.3 CONSTRUCTION METHODS

#### CONTROL OF SURFACE/SUBSURFACE WATER

The contractor is responsible for control of surface water, subsurface water, and drainage during the construction period. All temporary fills, crossings, and culverts necessary to promote drainage during construction will be installed and removed at the Contractor's expense prior to acceptance of the work.

Any claims arising from upstream or downstream damages as a result of the construction or failure of these temporary works will be the Contractor's responsibility.

It is the responsibility of the Contractor to control the surface and sub-surface water and drainage in any excavation area, dewatering placement area and borrow area. Should material quality lessen through inadequate drainage, the Contractor may be directed by the Engineer to construct drainage facilities at the Contractor's expense.

#### CMP, FIBERGLASS, HDPE, & PVC CONTROL STRUCTURE INSTALLATION

Prior to installation of the control structure, any protective coating that has been removed from the structure exposing the pipe shall be recoated. Welding, drilling, bolting or otherwise attaching devices, temporary or permanent, to the structure to assist in structure installation is prohibited.

The Contractor shall compact the in-situ material below the base elevation prior to assembly and erection of the structure. This bed shall be fully leveled and compacted

throughout the full width and length of the trench and to the exact grade as specified, so that the structure shall be uniformly and evenly supported across its footprint.

The control structure, as delivered to the site, shall be cast-in-place into the concrete foundation. Cast-in-place concrete, reinforcing, mixing, delivery and placement shall be carried out in accordance with the specification for CAST-IN-PLACE REINFORCED CONCRETE.

The structure shall be supported with adequate falsework so as to maintain the lines and grades shown on the plans, and to maintain those lines and grades without movement, until the concrete has reached the strength as specified herein.

Care shall be taken in the placement of the concrete so as not to splash concrete on the control structure. All concrete splashed on the structure shall be cleaned off immediately, to the satisfaction of the Engineer.

Contractor shall install the bottom stoplog as shown on the plans. All other stoplogs, slide gates, tiedowns, lock, grating, railing, and assembly tools shall be removed from the control structure prior to installation of the control structure in the concrete base. All of these items shall be re-installed after completion of structure installation.

Falsework, chairs, or supportive devices used in supporting the control structure in the formwork, and to be permanently incorporated in the concrete shall be of the same material and shall be considered as reinforcement. All such falsework, chairs, and supportive devices shall be approved by the Engineer prior to installation. No supportive devices shall protrude from the finished surface of the concrete, unless approved by the Engineer.

Culvert assembly and installation shall be carried out in accordance with the specification for CULVERT AND PIPE INSTALLATION.

### CONCRETE CONTROL STRUCTURE INSTALLATION

The Contractor shall compact the in-situ material below the base elevation prior to assembly and erection of the structure. This bed shall be fully leveled and compacted throughout the full width and length of the trench and to the exact grade as specified, so that the structure shall be uniformly and evenly supported across its footprint.

The control structure shall be set or cast-in-place to the lines and grades shown on the plans. Reinforcement, stoplog channels, gate bolts and other items to be cast-in-place shall be installed as called for on the plans. Falsework, chairs, or supportive devices to be permanently incorporated in the concrete shall be of the same material and shall be considered as reinforcement. All such falsework, chairs, and supportive devices shall be approved by the Engineer prior to installation. No supportive devices shall protrude from the finished surface of the concrete unless approved by the Engineer.

The structure shall be finished in accordance with the specification for CAST-IN-PLACE REINFORCED CONCRETE and once completed, slide gates, stoplogs, grating or railing as specified in the plans shall be installed.

Any culvert or inlet/outlet pipe to be used in conjunction with a pre-cast or cast-in-place concrete control structure shall be installed according to the specification for CULVERT AND PIPE INSTALLATION. That portion of the culvert, which is to be embedded in the concrete, shall have a 1/2" thick butyl or mastic gasket between the culvert and concrete. The gasket shall meet the requirements of ASTM D1056 for "RE" closed all grades while the mastic shall meet AASHTO M190 Type "A" specification.

### BACKFILL

If, in the opinion of the Engineer, the site-excavated material is unsuitable for backfill, the Contractor shall supply, from an assigned borrow area, suitable impervious backfill material. No granular backfill will be allowed unless approved by the Engineer. The payment for supplying this impervious fill shall be considered incidental to the water control structure installation.

If no compaction is specified on the plans or in the specifications the Contractor shall compact the backfill to in-situ conditions or embankment compaction requirements whichever is greater.

Initial backfill shall be deposited in horizontal, uniform layers not exceeding six (6) inches in thickness before compaction, and each layer shall be thoroughly compacted throughout to ensure thorough tamping of backfill around the structure and under the haunches of the pipe stubs. This is to be achieved by hand compaction for a distance of two (2) feet from the structure. Hand compaction of fill material shall be accomplished by the application of motor driven hand tampers or other approved equipment in such a manner that every point of the surface of each layer will be compacted. Each layer will be inspected and approved by the Engineer prior to proceeding with the next layer of fill.

After the above initial backfilling has been completed and approved, the remaining backfill, consisting of suitable site material, shall be placed in layers not exceeding eight (8) inches before compaction. Each layer shall be compacted by mechanical means to a density equivalent to that of the surrounding unexcavated material. Each layer will be inspected and approved by the Engineer prior to proceeding with the next layer of backfill.

No boulders, rock, ice, snow, organic material, or debris shall be permitted in the trench. This material will be classified as unsuitable material and treated as such.

Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacements or which may damage the installation shall not be used.

Backfill shall be executed to the lines and grades shown on the plans and as specified herein. No separate measurement shall be made for backfill. Compensation shall be included as payment for water control structures.

Any appurtenances to be used in conjunction with a water control structure shall be installed according to the specification for STRUCTURE AND CULVERT APPURTENANCES.

## **9.4 QUALITY CONTROL**

### **WORKMANSHIP AND MATERIALS**

All workmanship and materials furnished and supplied under this specification are subject to close and systematic inspection and testing by the Engineer including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or approval that may have been previously given. The Engineer reserves the right to reject any materials or works, which are not in accordance with the requirements of this specification.

### **ACCESS**

The Engineer shall be afforded full access for the inspection and control testing of materials, both at the site of work and at any plant or borrow pit used for the supply of the materials, to determine whether the materials are being supplied in accordance with this specification.

## **9.5 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.

## **TECHNICAL SPECIFICATION SECTION 10 - RESTORATION**

### **10.1 - SCOPE**

This work is securing a satisfactory stand of grass at the educational wetland or where directed by the PGC, and includes preparation of the seed bed, furnishing and placing lime and fertilizer, furnishing and sowing of seed, mulching, and maintaining and tending the seeded areas. Where restoration takes place on embankments and other slopes in excess of 10%, use double net mulch blankets to minimize potential erosion.

### **10.2 - APPLICABLE PUBLICATIONS AND REFERENCES**

Bulletin 15 - Approved Construction Materials, Pennsylvania Department of Transportation. Publication 408 - Specifications, Pennsylvania Department of Transportation.

### **10.3 - MATERIALS**

**A - Grass Seed** – As shown and specified on the drawings and in accordance with PennDOT 408.

Deliver premixed seed in bags or other suitable containers, each fully labeled with the name, trademark, and warranty of the producer and with the mixture type, weed seed percentage, purity percentage, germination percentage, and mix formula or composition.

Do not use seed which has become wet, moldy, or otherwise damaged in transit or storage, has a mix date older than 9 months prior to seeding, or has a test date older than 6 months prior to seeding.

**B - Fertilizer** – If required and specified, use dry formulation of 10-20-20-analysis. Fertilizer shall be delivered in bags or other suitable containers, each fully labeled and bearing the name, trademark, and warranty of the producer.

**C - Lime** - If required and specified, lime application shall conform to Section 804.2(a).1 of Pub.408.

**D – Inoculant** – If required and specified, provide in accordance with Section 804.2(c) of Pub. 408.

**E - Mulches** - Mulches shall be free from mature seedbearing stalks or roots of prohibited or noxious weeds as defined by law. Do not use mulches which are cut into lengths of less than 6 inches. Mulches shall be either one or a combination of the following, shall contain no stems of tobacco, soybeans, or other coarse or woody materials.

- 1. - Straw** - Either wheat or oat straw, and free of weeds and viable seeds, well-cured to less than 20 percent moisture content by weight, not chopped or finely broken.
- 2. - Wood Fiber** - Use wood fiber meeting the requirements of Section 805.2(a).1.c of Pub. 408.
- 3. - Pellet Mulch** - Use pellet mulch meeting the requirements of Section 805.2(a).1. d of Pub. 408.

**F - Mulch Binders** - Use one of the following mulch binders in accordance with Section 805.2(b) of Pub. 408. Use Recycled Cellulose Fiber, Wood Fiber, Non-asphaltic Emulsion, Polyvinyl Acetate, or a Mixture of Recycled Cellulose Wood Fiber and Wood Fiber. Obtain binders from a producer listed in Bulletin 15. The use of double net straw blankets are to be used on slopes exceeding 10% to minimize erosion.

**G - Water** - Water shall be fresh and free from injurious amounts of oil, acid, alkali, salts, or other materials harmful to the growth of grass.

**H – Topsoil** - Acceptable friable loam that is reasonably free of subsoil, clay lumps, brush, roots, weeds, other objectionable vegetation, stones, other foreign material larger than 2 inches in any dimension, litter, and/or other material unsuitable or harmful to plant growth in accordance with Section 801.2 (a) and 802.2 of Pub. 408.

#### **10.4 - PROCEDURE**

Follow the applicable procedures listed in Section 804.3 of PennDOT Pub.408. The amounts of seed, lime, fertilizer, and mulch specified are the minimum acceptable. Employ modifications if they are deemed necessary, at no additional cost to the PGC, and accept full responsibility for obtaining a satisfactory stand of grass.

**A – Topsoil Furnished and Placed** – Reference Section 802 of Pub. 408. Provide topsoil as shown on the drawings / details and as required to restore disturbed areas. Grade the areas to be covered by topsoil. Using acceptable methods, loosen soil to a depth of 2 inches before placing the topsoil. Remove stones and other foreign material 2 inches or larger in any dimension. Remove and satisfactorily dispose of unsuitable and surplus material. Place topsoil on the prepared areas and, unless otherwise indicated, spread and compact to a 4-inch uniform depth  $\pm 1 \frac{1}{2}$  inches. Compact with a roller having a weight not over 120 pounds per foot width of roller or by other acceptable methods, as directed. Remove over-depth topsoil, unless otherwise agreed upon in writing. Do not place topsoil in a wet or frozen condition.

**B - Sowing** - Sow the seed mixture on a still day at a rate specified in Section 804.2 of Pub.408. Sow by hand or by approved sowing equipment in 2 applications, one-half the seed while the seeder is traveling in one direction and the other half while the seeder is traveling at right angle to the first direction. After sowing, rake, cultipack, or brush drag the surface very lightly, just deep enough to cover the seeds. Rake only in a direction parallel to the contour lines.

**C - Mulching** - After sowing is completed, spread mulch uniformly over the entire seeded area at a rate of 3 tons (dry weight) per acre. The mulch shall be moist at the time of placement.

Apply wood fiber mulch hydraulically in accordance with the manufacturer's tank-mixing instructions. Wood fiber mulch may be incorporated into the slurry after the seed and soil supplements have been thoroughly mixed. Apply wood fiber mulch at a rate of 800 Lbs. per acre unless otherwise indicated by the manufacturer.



On slopes 6:1 or flatter, apply pellet mulch by hand or using a mechanical spreader immediately after seeding, at a rate of 2,615 Lbs. per acre. Thoroughly wet pellet mulch with water without dislodging mulch.

To prevent loss or bunching by wind and to form a soil-binding mulch, anchor the moist mulch to the soil with a mulch binder. Use mulch binders at the following rates:

Recycled Cellulose Fiber - 775 Lbs./Acre Wood Fiber - 775 Lbs./Acre Mixture of Recycled Cellulose Fiber and Wood Fiber - 775 Lbs./Acre Non-asphaltic Emulsion - Manufacturer's Recommended Rate Polyvinyl Acetate - Manufacturer's Recommended Rate.

On slopes where machinery cannot be used, retain the mulch in place by some suitable means which will not be detrimental to subsequent operations.

### **10.5 - MAINTENANCE**

At no additional cost to the PGC, maintain the seeded areas until all work under the Contract has been completed and accepted by the PGC. Maintenance shall include refilling rain-washed gullies, reseeding, reapplying fertilizer, lime and mulch, and removal of large and noxious weeds, as directed by the PGC.

### **10.6 - MEASUREMENT AND PAYMENT**

See Technical Specification Section 2 for description of pay items.



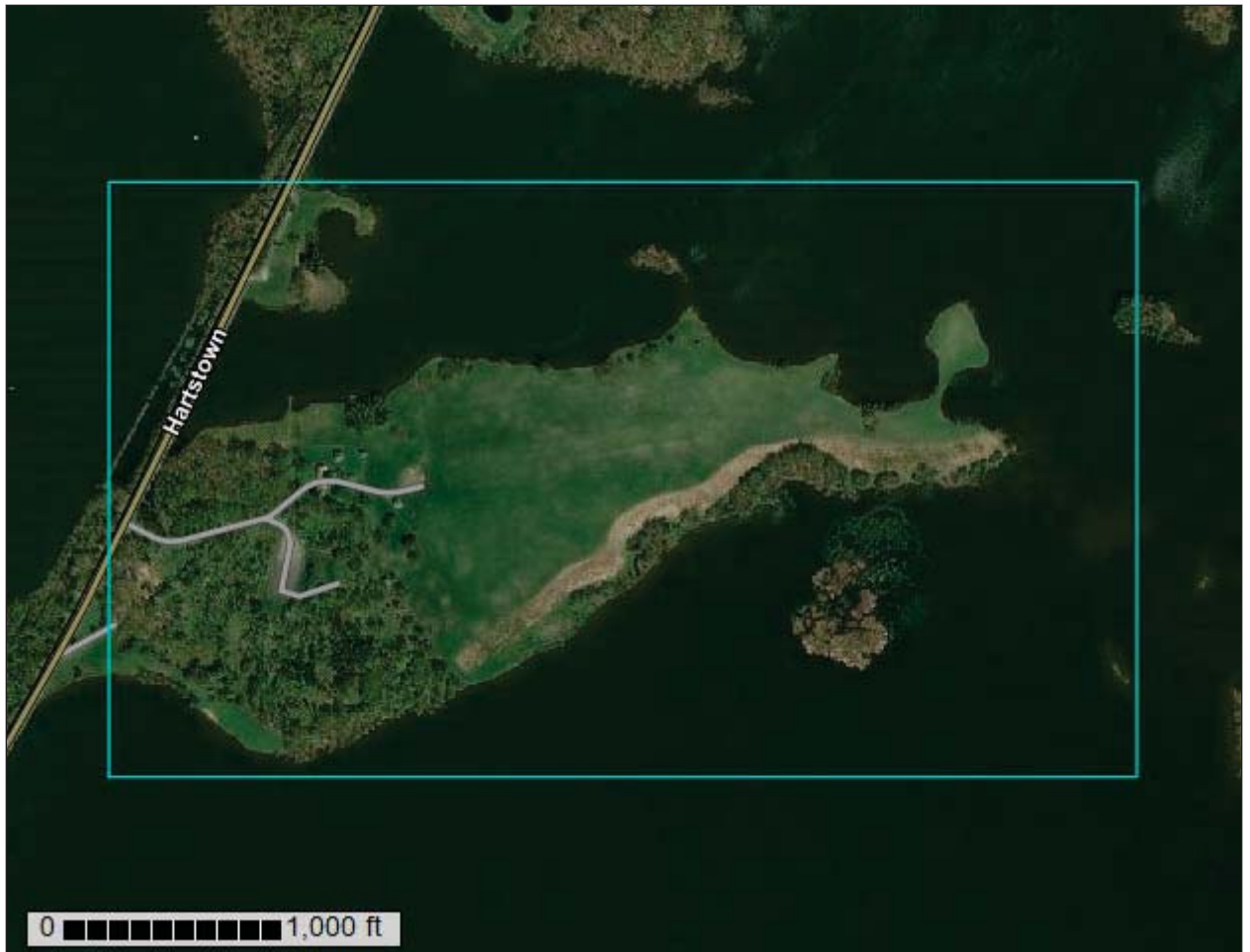
United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for **Crawford County, Pennsylvania**



# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

## Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.



# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map








Soil Map may not be valid at this scale.

Map Scale: 1:7,970 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

## MAP LEGEND

- Area of Interest (AOI)**
-  Area of Interest (AOI)
- Soils**
-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points
- Special Point Features**
-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features
- Water Features**
-  Streams and Canals
- Transportation**
-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads
- Background**
-  Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Crawford County, Pennsylvania  
 Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 6, 2019—Sep 19, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaA	Cambridge silt loam, 0 to 3 percent slopes	8.9	3.0%
CaB	Cambridge silt loam, 3 to 8 percent slopes	76.1	25.3%
CM	Carlisle muck	5.1	1.7%
Hz	Holly silty clay loam	12.0	4.0%
Rh	Red Hook loam	11.3	3.8%
W	Water, census and small	176.4	58.7%
WyA	Wyoming gravelly sandy loam, 0 to 3 percent slopes	10.7	3.6%
<b>Totals for Area of Interest</b>		<b>300.5</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

## Custom Soil Resource Report

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Crawford County, Pennsylvania

### CaA—Cambridge silt loam, 0 to 3 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2vzpy  
*Elevation:* 590 to 1,970 feet  
*Mean annual precipitation:* 33 to 52 inches  
*Mean annual air temperature:* 43 to 52 degrees F  
*Frost-free period:* 135 to 215 days  
*Farmland classification:* All areas are prime farmland

#### Map Unit Composition

*Cambridge and similar soils:* 86 percent  
*Minor components:* 14 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Cambridge

##### Setting

*Landform:* Till plains, moraines  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Till

##### Typical profile

*Ap - 0 to 8 inches:* silt loam  
*Bw - 8 to 24 inches:* silt loam  
*Btx - 24 to 53 inches:* loam  
*C - 53 to 72 inches:* loam

##### Properties and qualities

*Slope:* 0 to 3 percent  
*Depth to restrictive feature:* 18 to 30 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)  
*Depth to water table:* About 18 to 24 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 10 percent  
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water capacity:* Low (about 4.9 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2w  
*Hydrologic Soil Group:* D  
*Ecological site:* F139XY006OH - Moist Till Highlands  
*Hydric soil rating:* No

## Minor Components

### Venango

*Percent of map unit:* 14 percent  
*Landform:* Till plains  
*Landform position (two-dimensional):* Summit, footslope  
*Landform position (three-dimensional):* Interfluve, base slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## CaB—Cambridge silt loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 2vzq0  
*Elevation:* 590 to 1,970 feet  
*Mean annual precipitation:* 33 to 52 inches  
*Mean annual air temperature:* 43 to 52 degrees F  
*Frost-free period:* 135 to 215 days  
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Cambridge and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Cambridge

#### Setting

*Landform:* Till plains, moraines  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Interfluve, side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Till

#### Typical profile

*Ap - 0 to 8 inches:* silt loam  
*Bw - 8 to 24 inches:* silt loam  
*Btx - 24 to 53 inches:* loam  
*C - 53 to 72 inches:* loam

#### Properties and qualities

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* 18 to 30 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)  
*Depth to water table:* About 18 to 24 inches  
*Frequency of flooding:* None

## Custom Soil Resource Report

*Frequency of ponding:* None  
*Calcium carbonate, maximum content:* 10 percent  
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water capacity:* Low (about 4.9 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* D  
*Ecological site:* F139XY006OH - Moist Till Highlands  
*Hydric soil rating:* No

### Minor Components

#### Venango

*Percent of map unit:* 10 percent  
*Landform:* Till plains  
*Landform position (two-dimensional):* Summit, footslope  
*Landform position (three-dimensional):* Interfluve, base slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

#### Valois

*Percent of map unit:* 5 percent  
*Landform:* Kame moraines, end moraines, till plains, kames  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Crest, interfluve, side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

## CM—Carlisle muck

### Map Unit Setting

*National map unit symbol:* 9y5j  
*Elevation:* 690 to 1,610 feet  
*Mean annual precipitation:* 27 to 49 inches  
*Mean annual air temperature:* 45 to 54 degrees F  
*Frost-free period:* 110 to 180 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Carlisle and similar soils:* 95 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Carlisle

#### Setting

*Landform:* Kettles on outwash terraces



## Custom Soil Resource Report

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Organic material

### Typical profile

*Oa - 0 to 80 inches:* muck

### Properties and qualities

*Slope:* 0 to 1 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Very poorly drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.20 to 6.00 in/hr)

*Depth to water table:* About 0 inches

*Frequency of flooding:* None

*Frequency of ponding:* Frequent

*Available water capacity:* Very high (about 23.9 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 5w

*Hydrologic Soil Group:* A/D

*Ecological site:* F139XY013OH - Mucky Depression

*Hydric soil rating:* Yes

### Minor Components

#### Terric haplosaprists

*Percent of map unit:* 2 percent

*Landform:* Till plains, lake plains

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Dip

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### Red hook

*Percent of map unit:* 1 percent

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Holly

*Percent of map unit:* 1 percent

*Landform:* Flood plains

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Talf

*Down-slope shape:* Concave

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

**Halsey**

*Percent of map unit:* 1 percent  
*Landform:* Outwash terraces  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Tread  
*Microfeatures of landform position:* Open depressions  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* Yes

**Hz—Holly silty clay loam**

**Map Unit Setting**

*National map unit symbol:* 9y6c  
*Elevation:* 600 to 3,800 feet  
*Mean annual precipitation:* 36 to 46 inches  
*Mean annual air temperature:* 45 to 50 degrees F  
*Frost-free period:* 120 to 160 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Holly and similar soils:* 95 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Holly**

**Setting**

*Landform:* Flood plains  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Parent material:* Recent alluvium

**Typical profile**

*A - 0 to 12 inches:* silty clay loam  
*Bg - 12 to 20 inches:* silt loam  
*BC - 20 to 36 inches:* loam  
*C - 36 to 62 inches:* stratified gravelly sand to silt loam

**Properties and qualities**

*Slope:* 0 to 3 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Very poorly drained  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.20 to 2.00 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* FrequentNone

## Custom Soil Resource Report

*Frequency of ponding:* None  
*Available water capacity:* High (about 9.7 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4w  
*Hydrologic Soil Group:* B/D  
*Ecological site:* F139XY009OH - Wet Floodplain  
*Hydric soil rating:* Yes

### Minor Components

#### Carlisle

*Percent of map unit:* 2 percent  
*Landform:* Kettles  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

#### Halsey

*Percent of map unit:* 2 percent  
*Landform:* Depressions on outwash terraces  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* Yes

#### Philo

*Percent of map unit:* 1 percent  
*Landform:* Flood plains  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## Rh—Red Hook loam

### Map Unit Setting

*National map unit symbol:* 9y6h  
*Elevation:* 400 to 3,800 feet  
*Mean annual precipitation:* 36 to 46 inches  
*Mean annual air temperature:* 45 to 50 degrees F  
*Frost-free period:* 120 to 160 days  
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Red hook and similar soils:* 90 percent

## Custom Soil Resource Report

*Minor components: 10 percent*  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Red Hook

#### Setting

*Landform: Outwash terraces*  
*Landform position (two-dimensional): Toeslope*  
*Landform position (three-dimensional): Tread*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Parent material: Coarse-loamy outwash*

#### Typical profile

*Ap - 0 to 6 inches: loam*  
*Bw - 6 to 32 inches: gravelly sandy loam*  
*C - 32 to 60 inches: very gravelly sandy loam*

#### Properties and qualities

*Slope: 0 to 5 percent*  
*Depth to restrictive feature: More than 80 inches*  
*Drainage class: Somewhat poorly drained*  
*Runoff class: Very high*  
*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high*  
*(0.20 to 2.00 in/hr)*  
*Depth to water table: About 6 to 18 inches*  
*Frequency of flooding: None*  
*Frequency of ponding: None*  
*Available water capacity: Moderate (about 6.1 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*  
*Land capability classification (nonirrigated): 3w*  
*Hydrologic Soil Group: B/D*  
*Ecological site: F139XY002OH - Moist Calcareous Till Flats*  
*Hydric soil rating: No*

### Minor Components

#### Halsey

*Percent of map unit: 5 percent*  
*Landform: Depressions on outwash terraces*  
*Landform position (two-dimensional): Toeslope*  
*Landform position (three-dimensional): Tread*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Hydric soil rating: Yes*

#### Wyoming

*Percent of map unit: 1 percent*  
*Landform: Outwash terraces*  
*Landform position (two-dimensional): Toeslope*  
*Landform position (three-dimensional): Tread*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Hydric soil rating: No*

## Custom Soil Resource Report

### **Chenango**

*Percent of map unit:* 1 percent  
*Landform:* Outwash terraces  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### **Caneadea**

*Percent of map unit:* 1 percent  
*Landform:* Lakebeds (relict)  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### **Carlisle**

*Percent of map unit:* 1 percent  
*Landform:* Kettles  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

### **Braceville**

*Percent of map unit:* 1 percent  
*Landform:* Outwash terraces  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## **W—Water, census and small**

### **Map Unit Setting**

*National map unit symbol:* 9y71  
*Mean annual precipitation:* 36 to 50 inches  
*Mean annual air temperature:* 46 to 59 degrees F  
*Frost-free period:* 120 to 214 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Water:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Water

### Setting

*Parent material:* Rivers streams ponds

### Properties and qualities

*Runoff class:* Negligible

*Frequency of ponding:* Frequent

## WyA—Wyoming gravelly sandy loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 9y72

*Elevation:* 400 to 1,800 feet

*Mean annual precipitation:* 36 to 46 inches

*Mean annual air temperature:* 45 to 50 degrees F

*Frost-free period:* 120 to 160 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Wyoming and similar soils:* 95 percent

*Minor components:* 5 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Wyoming

### Setting

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Gravelly outwash

### Typical profile

*Ap - 0 to 9 inches:* gravelly sandy loam

*Bw - 9 to 25 inches:* gravelly sandy loam

*2C - 25 to 62 inches:* extremely gravelly coarse sand

### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat excessively drained

*Runoff class:* Very low

*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (6.00 to 20.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Low (about 3.2 inches)

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3s

*Hydrologic Soil Group:* A

*Ecological site:* F139XY006OH - Moist Till Highlands

*Hydric soil rating:* No

### Minor Components

#### Braceville

*Percent of map unit:* 2 percent

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Chenango

*Percent of map unit:* 1 percent

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Haven

*Percent of map unit:* 1 percent

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

#### Red hook

*Percent of map unit:* 1 percent

*Landform:* Outwash terraces

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

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