



**Final
Technical Specifications**

**Habitat Restoration Design Projects
St. Clair River Area of Concern**

Cuttle Creek Restoration

**Great Lakes Architect-Engineer Services
Contract: EP-R5-11-10
Task Order: 0011**

Prepared for

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TABLE OF CONTENTS

DIVISION 01 – GENERAL REQUIREMENTS

01 10 00	SUMMARY
01 20 00	PRICE AND PAYMENT PROCEDURES
01 25 00	SUBSTITUTION PROCEDURES
01 30 00	ADMINISTRATIVE REQUIREMENTS
01 31 13	PROJECT COORDINATION
01 33 00	SUBMITTAL PROCEDURES
01 35 44	ENVIRONMENTAL PROTECTION AND MANAGEMENT
01 45 00	QUALITY CONTROL
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 57 00	TEMPORARY EROSION AND SEDIMENT CONTROL
01 70 00	EXECUTION AND CLOSEOUT REQUIREMENTS

DIVISION 02 – EXISTING CONDITIONS

02 41 19	DEMOLITION
----------	------------

DIVISION 03 – CONCRETE

03 20 00	CONCRETE REINFORCING
03 30 00	CAST-IN-PLACE CONCRETE
03 40 00	PRECAST CONCRETE

DIVISION 10 – SPECIALTIES

10 14 00	SIGNAGE
----------	---------

DIVISION 31 – EARTHWORK

31 11 00	CLEARING AND GRUBBING
31 23 16	EXCAVATION
31 23 23	FILL

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 01 00	MAINTENANCE PERIOD
32 34 13	FABRICATED PEDESTRIAN BRIDGES
32 80 00	IRRIGATION
32 90 00	PLANTING
32 92 19	TURF ESTABLISHMENT
32 92 30	BIOSWALES
32 97 00	INVASIVE SPECIES CONTROL
32 98 00	NESTING BOXES



DIVISION 33 – UTILITIES

33 05 16 PROTECTION AND RELOCATION OF UTILITIES

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTION

35 32 17 ROCK STRUCTURES

35 32 19 WOODY HABITAT STRUCTURES

ATTACHMENT A – SCHEDULE OF SUPPLIES AND SERVICES



SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Submittals
 - 2. Project Description
 - 3. Habitat Restoration Objectives
 - 4. Definitions
 - 5. Engineer's Authority
 - 6. Work by Owner or Others
 - 7. Contractor's Use of Site and Premises
 - 8. Work Sequence
 - 9. Permits
 - 10. Site Safety
 - 11. Specification Conventions
 - 12. Superintendent
 - 13. Health and Safety Officer
 - 14. Quality Control Officer
 - 15. Work Schedule
 - 16. Order of Precedence
 - 17. Green and Sustainable
 - 18. Weekly Reports

1.2 SUBMITTALS

- A. Weekly Reports
- B. Contractor obtained permits. Submit at schedule approved by owner.
- C. Site Safety and Health Plan

1.3 PROJECT DESCRIPTION

- A. This Specification section provides a general description of the work. The Contractor shall refer to the appropriate detailed Specification sections for project specifics.
- B. Work for the Project includes a Habitat Restoration to improve stream physical habitat for fish, macro invertebrates, and herpetofauna; as well as, reduce the non-point-source erosion that results from sedimentation.
- C. All work items are to be conducted according to the design Specifications included with these Contract Drawings and Bid Documents.

- D. The work shall be planned, scheduled, and performed in stages to complete the work within the requirements of this Contract Document. Work shall be conducted in such a manner to have as little impact on existing land use as possible.

1.4 HABITAT RESTORATION OBJECTIVES

- A. The purpose of the Habitat Restoration includes:
 - 1. The establishment of riparian buffer, where compatible with golf course uses, through the project site.
 - 2. Restoration of fish passage from the St. Clair River through to the railroad culvert at the upper boundary of the study area (Restoration of fish passage through the railroad culvert is not feasible).
 - 3. The restoration of benthic habitats and substrates through the study reach area for the purpose of improving physical riffle habitat and long-term uplift of Index of Biotic Integrity scores.
 - 4. The restoration of a connected floodplain and associated wetland habitats with an emphasis on herpetofauna.
 - 5. The installation of upland bioswales and connected wetland habitats for the purpose of improving water quality by treating golf course runoff, and increasing connectivity of the upland and riparian habitat communities.
 - 6. The reduction of sedimentation to the St. Clair River through restoration of a stable, self-forming and maintaining stream facet sequence which maintains its dimension, plan form, pattern and profile in dynamic equilibrium with its bedload sediment loading and flow regime.

1.5 DEFINITIONS

- A. Definitions of contractual or associated parties, referenced herein on the Contract Drawings and in the Specifications, are listed below:
 - 1. Owner—City of Marysville.
 - 2. Project Coordination Team—U.S. Environmental Protection Agency (EPA) with project agreement with The Michigan Department of Environmental Quality (MDEQ), and City of Marysville.
 - 3. County—St. Clair County representative.
 - 4. Engineer—Owner’s on-site representative.
 - 5. Biologist—Owner’s on-site representative.
 - 6. Contractor—A person, company, or organization who has contracted with the Owner and is directly responsible for performance of the Work referenced in the Specifications, Contract Drawings, or as included herein.
 - 7. Subcontractor—A person, company, or organization who has contracted with the Contractor for the purpose of supplying services, materials, assemblies, or other items as required to perform the work referenced in the Specifications, Contract Drawings, or as included herein.

1.6 ENGINEER’S AUTHORITY

- A. Engineer does not have contractual authority between the Owner and Contractor.
- B. Engineer will review submittals and make recommendations to Owner for approval, rejection, or approval as noted.

C. Engineer will observe Contractor's field activities and report activity to Owner.

1.7 WORK BY OWNER OR OTHERS

A. Coordinate Work with utilities owners.

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limit use of Site and premises to areas shown on the Contract Drawings. Additional area may be available with prior approval of landowner and Owner.

B. Maximum limits of disturbance (LOD) are shown on the Contract Drawings. Contractor shall not disturb areas within LOD unless necessary and with prior approval of Owner.

1.9 WORK SEQUENCE

A. Construct work in phases to minimize construction schedule and floodplain impacts. Contractor may propose an alternate work sequence subject to Owner and regulatory approval.

1.10 PERMITS

A. Owner will provide the following documents/permits:

1. Joint MDEQ and U.S. Army Corps of Engineers Permit

B. Contractor shall obtain all additional permits necessary for construction of work including, but not limited to, the following. If any of the permits listed below are determined by the Contractor to not be needed, the Contractor shall provide written documentation from the permitting authority that they are not needed.

1. Michigan Department of Transportation Move Permit

2. Michigan Department of Transportation Right of Way Permit

3. Erosion and Sediment Control Permit

4. St. Clair County Road Commission Move Permit

5. City of Marysville Right of Way Permit

6. Aquatic Nuisance Permit

C. Contractor shall comply with and execute requirements in all permits.

1.11 SITE SAFETY

A. Health and Safety. The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act, as set forth in Title 29, Code of Federal Regulations. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue N.W., Washington, DC 20013; or at the following web address: www.osha.gov. The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act, as amended.

1.12 SPECIFICATION CONVENTIONS

- A. Some of these Specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

1.13 SUPERINTENDENT

- A. Contractor shall provide an onsite representative hereafter referred to as the Contractor superintendent. The Contractor’s superintendent is responsible for implementation of the habitat restoration consistent with the Contract Documents, Contract Drawings, and Specifications. The Contractor’s superintendent has the following responsibilities and authority:
 1. The Contractor’s superintendent or approved alternate shall be onsite whenever work is in progress. If the Contractor’s superintendent must be absent when work is in progress, he/she shall notify the Owner in advance and arrange for or appoint an alternate acceptable to the Owner.
 2. Maintain and enforce safety regulations and emergency procedures required by the Contractor’s Site Safety and Health Plan (SSHP).
 3. Represent the Contractor onsite.
 4. Make decisions concerning Contractor’s work including sequencing and quality of work.
 5. Answer questions from Engineer and Owner.
 6. Attend weekly progress meetings, and provide updated schedule and cost information at the request of Owner.
 7. Receive and inspect materials, and supervise the work of the Contractor personnel.
 8. Order additional manpower, equipment, materials, and other resources, if necessary, to meet schedules and complete the work as described herein.

1.14 HEALTH AND SAFETY OFFICER

- A. Contractor shall provide a full time, onsite representative, hereafter referred to as the Health and Safety Officer (HSO), with authority to maintain and enforce safety regulations and emergency procedures contained herein and the Contractor’s SSHP, answer questions from Engineer and Owner, provide written documentation of activities to Owner, and attend weekly progress meetings. The HSO is an employee of the Contractor and reports to the Contractor superintendent. The Contractor superintendent may also act as the HSO with approval of the Owner.
- B. The Contractor’s HSO or approved alternate shall be onsite whenever work is in progress. If the Contractor’s HSO must be absent when work is in progress, he/she shall notify the Owner in advance and arrange for or appoint an alternate acceptable to the Owner. The Contractor shall perform health and safety responsibilities in accordance with the submitted SSHP.

1.15 QUALITY CONTROL OFFICER

- A. Contractor shall provide a full time, on-site representative, hereafter referred to as the Quality Control Officer (QCO), with authority to ensure work is conducted in compliance with the Contract Documents and attend weekly progress meetings. The QCO is an employee of the Contractor and reports to the Contractor superintendent. The Contractor superintendent or HSO may act as the QCO.

- B. The QCO has the following responsibilities and authority to include, but not be limited to:
 - 1. Review all submittals for compliance with Contract Documents prior to submittal.
 - 2. Inspect completed work and/or work in progress to determine whether the work meets Specifications and plan requirements.
 - 3. Monitor overall construction performance with regards to technical quality and compliance with design and Specification requirements.
 - 4. Note and report on work that does not meet requirements.
 - 5. Educate workers on the required standards and Contract Documents.
 - 6. Provide update at weekly progress meetings on quality control measures being implemented.
- C. Contractor shall discuss quality control issues and concerns in daily reports and in the next weekly meeting or sooner if Contractor believes they are time critical.

1.16 WORK SCHEDULE

- A. The Contractor shall complete Work in accordance with Owner approved work schedule.

1.17 ORDER OF PRECEDENCE

- A. In the event of a conflict in the execution of work, the following order of precedence shall apply.
 - 1. Technical Specifications
 - 2. Contract Drawing Details
 - 3. Contract Drawing Sections or Elevations
 - 4. Contract Drawing Plan Views

1.18 GREEN AND SUSTAINABLE

- A. Green and sustainable materials and practices shall be utilized to the extent practicable that they provide a reasonable value to the Owner and meet Contract Documents.

1.19 WEEKLY REPORTS

- A. Contractor shall submit a Contractor weekly report to Owner via. Reporting shall commence upon mobilization to the site and continue through Contractor demobilization.
- B. Report shall:
 - 1. Discuss what work related to a specific pay item was performed.
 - 2. Discuss QCO actions and inspections, issues identified, corrective action taken to resolve issue and prevent reoccurrence in the future.
 - 3. Identify all issues and concerns with construction and existing conditions.
 - 4. Be signed by the Superintendent, HSO and QCO.
- C. Contractor shall discuss those issues and concerns in the next weekly meeting or sooner if Contractor believes they are time critical.
- D. Submit photographs in accordance with Section 01 70 00 – Execution and Closeout Requirements.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 SITE SAFETY AND HEALTH PLAN

- A. Shall be submitted within 14 days after Notice of Award.
- B. The document shall meet contract document requirements and recent versions of guidance documents.

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Submittals
 - 2. Schedule of Supplies and Services
 - 3. Application for Payment
 - 4. Change Procedures
 - 5. Unit Prices
 - 6. Schedule of Supplies and Services Items

1.2 SUBMITTALS

- A. Revised Schedule of Supplies and Services
- B. Applications for Payment

1.3 SCHEDULE OF SUPPLIES AND SERVICES

- A. Revise schedule to list approved Change Orders with each Application for Payment.

1.4 APPLICATION FOR PAYMENT

- A. Submit electronic file of each Application for Payment on form approved by Owner.
- B. Content and Format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule and progress report with each Application for Payment.
- D. Payment Period: Submit at intervals stipulated in the Agreement or as directed by Owner.
- E. Submit submittals with transmittal letter as specified in Section 01 33 00 - Submittal Procedures.
- F. Substantiating Data: When Owner requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Current construction photographs specified in Section 01 70 00 - Execution and Closeout Requirements.
 - 2. Record Documents as specified in Section 01 70 00 - Execution and Closeout Requirements, for review by Owner, which will be returned to Contractor.
 - 3. Construction Progress Schedule, current.
 - 4. Survey data and calculations of quantities.
 - 5. Geotechnical data.
 - 6. Subcontractor invoices or vendor invoices.
 - 7. Overdue submittals.

1.5 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Owner of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Owner; establish procedures for handling queries and clarifications.
 - 1. Use Owner approved form for requesting interpretations.
 - 2. Owner may respond with a direct answer on the Request for Interpretation form.
- D. The Owner may issue a Change Order to the Contractor, including a detailed description of proposed change with supplementary or revised quantities, Drawings, and specifications, and a change in Contract Time for executing the change. Contractor will prepare and submit estimate within 30 days. Owner will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- E. Contractor may propose changes by submitting a request for change to Owner, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation.
- F. Correlation of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise Progress Schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of Work affected by the change, and resubmit.
 - 3. Promptly enter changes in Record Documents.

1.6 UNIT PRICES

- A. Unit Quantities: Quantities and measurements indicated on Schedule of Supplies and Services are for Contract purposes only. Actual quantities of work done in accordance with Contract Documents shall determine payment.
- B. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services, and incidentals; erection, application, or installation of item of the Work; overhead; and profit.
- C. Final payment for work governed by unit prices will be made on basis of actual measurements and quantities accepted by Owner multiplied by unit sum/price for work incorporated in or made necessary by the work.
- D. Measurement of Quantities:
 - 1. Weigh Scales: Inspected, tested, and certified by applicable State weights and measures department within past year.

2. Measurement by Volume: Measured by cubic dimension using survey data and a computer-aided design software package.
3. Measurement by Area: Measured by square dimension using survey data and a computer-aided design software package.
4. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.
5. Lump Sum: Measured by percent complete of work completed.
6. Daily or Hourly: Measured by onsite time, of work conducted in accordance with Contract Documents, documented in daily reports and verified by Owner
7. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the work.

1.7 SCHEDULE OF SUPPLIES AND SERVICES ITEMS

A. Mobilization

1. Description

- a. This item consists of all materials, labor, and equipment to complete Work activities for mobilization. Mobilization Work shall include, but not be limited to, obtaining of all permits; moving onto the site of all equipment and personnel; transportation to and from the site; traffic control; temporary buildings, and other construction facilities; utilities; Contract Drawing preparation; construction/installation plans; construction quality control plans; site safety and health plans; submittals, administration; detailed construction layouts; field offices and requirements; procurement and installation of temporary project identification sign; and coordination necessary for the Contractor to provide and maintain a construction force at the project site complete and ready to perform all work required under the Contract. Mobilization costs shall also include providing personal protective equipment to all site personnel.

2. Measurement and Payment

- a. Item No. 1 Mobilization will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

B. Erosion and Sediment Controls, Flow Diversions, Dewatering, Staging and Laydown Areas

1. Description

- a. This item consists of all materials, labor, and equipment to complete work activities for construction of stormwater pollution prevention, and erosion and sediment control as well as flow diversions, dewatering, staging and laydown areas. The work shall include, but not be limited to, all preparation, excavation, dewatering, backfill, and incidental items necessary to construct and maintain sediment control barriers and best management practices; access roads; silt fence; construction entrances; and to remove and dispose of items after vegetation is established. Flow diversions and dewatering Work includes pumps, pipes, and effort needed to divert flow and dewater stream where construction activities are occurring. The staging and laydown Work will include prepping those areas needed to stage material.

2. Measurement and Payment

- a. Item No. 2 Erosion and Sediment Controls, Flow Diversions, Dewatering, Staging and Laydown Areas will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- C. Temporary Stream Crossings
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of temporary stream crossings. Work shall include, but not be limited to the installation, use, and removal of temporary stream crossings, including the geotextile, pipe, fill, and excavation, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 3 Temporary Stream Crossings will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- D. Log Vane/Root Wads
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of installing log vane/root wads in accordance with the Contract Documents including furnishing anchor rocks, hauling, stockpiling, excavation, grading, backfill, removal of excess material, cutting and/or trimming log vane/root wads to appropriate size, placement of log vane/root wads and anchor rocks, and tamping.
 - 2. Measurement and Payment
 - a. Item No. 4 Log Vane/Root Wads will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- E. Cross Vane Structures
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of installing cross vane structures. Work shall include but not be limited to furnishing rocks, hauling, stockpiling, excavating, grading, backfill, removal of material, and final placement of rocks in the cross vane structure including footer stones.
 - 2. Measurement and Payment
 - a. Item No. 5 Cross Vane Structures will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- F. J-Hook Vane Structures
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of installing j-hook vane structures. Work shall include but not be limited to furnishing rocks, hauling, stockpiling, excavating, grading, backfill, removal of material, and final placement of stones in the j-hook vane structure including footer stones.
 - 2. Measurement and Payment
 - a. Item No. 6 J-Hook Vane Structures will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

G. Riffle Grade Controls

1. Description

- a. This item consists of all materials, labor, and equipment necessary to complete the work of installing riffle grade control in accordance with the Contract Documents. Work shall include but not be limited to furnishing stones, hauling, stockpiling, excavating, grading, backfill, removal of material, and final placement of rocks, geotextile, channel bed fill material, channel sand and gravel, geotextile, and soil wrap topsoil in riffle grade controls.

2. Measurement and Payment

- a. Item No. 7 Riffle Grade Controls will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

H. Random Boulder

1. Description

- a. This item consists of all materials, labor, and equipment necessary to complete the Work or random boulder placement including preparation of subgrade, supplying, loading, hauling, placing, and for all materials, labor, equipment, tools, and incidentals necessary to install the random boulders in accordance with the Contract Documents.

2. Measurement and Payment

- a. Item No. 8 Random Boulder will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

I. Bioswales

1. Description

- a. This item consists of all materials, labor, and equipment necessary to complete the installation of bioswales including but not limited to preparation of subgrade, excavation, permeable fill, grading, seeding, planting, and incidentals necessary to install bioswales in accordance with the Contract Documents.

2. Measurement and Payment

- a. Item No. 9 Bioswales will be measured on a linear foot basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

J. Demolition

1. Description

- a. This item consists of all materials, labor, and equipment necessary to complete demolition of existing pipe and manhole structures onsite. This includes but is not limited to excavators, hauling, and disposal of removed materials.

2. Measurement and Payment

- a. Item No 10 Demolition will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- K. Excavation
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the excavation in accordance with the Contract Documents. The Work shall include, but not be limited to loading, hauling, stockpiling, and disposing of all excess material.
 - 2. Measurement and Payment
 - a. Item No. 11 Excavation will be measured on an in place cubic yard basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- L. Fill
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of compacted fill in accordance with the Contract Documents. The Work shall include, but not be limited to loading, hauling; subgrade preparation, benching and keying; stockpiling; backfilling; compacting; and density testing.
 - 2. Measurement and Payment
 - a. Item No. 12 Fill will be measured on an in place cubic yard basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- M. Channel Bed Fill Material
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to place channel bed fill material choked with channel sand and gravel in accordance with the Contract Documents, including but not limited to long reach excavators, rakes, and other equipment necessary to evenly spread channel bed fill material throughout the restored creek. This item also consists of obtaining and placing the leaf mold layer in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 13 Channel Bed Fill Material will be measured on a square yard basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- N. Irrigation Improvements
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to improve irrigation in accordance with Contract Documents. This includes but is not limited to new piping, cleanout, bends, fittings, backflow preventer, riprap scour protection, and incidental work to restore irrigation system to working order as discussed in Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 14 Irrigation Improvements will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- O. Culvert for Fish Passage and Coordination of Sanitary Sewer Pipe Replacement
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to install a pre-cast concrete box culvert for fish passage and coordinate sanitary sewer replacement. The City of Marysville will complete the sanitary sewer replacement. The proper notification and scheduling with the City is included in this item.
 - 2. Measurement and Payment
 - a. Item No. 15 Culvert for Fish Passage and Coordination of Sanitary Sewer Pipe Replacement will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- P. Cart and Pedestrian Bridge and Cart Path
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the Work of installing a pre-fabricated cart and pedestrian steel bow-truss bridge as well as fixing the associated cart path. This includes but is not limited to excavation, backfill, cast in place concrete abutments, rebar support, supplying the owner approve pre-fabricated bridge, coordination with pedestrian bridge manufacturer, placement and securing of pedestrian bridge upon delivery, imbricated riprap, class C riprap, crushed stone bedding, concrete cart path, and incidentals necessary to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 16 Cart and Pedestrian Bridge and Cart Path will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- Q. Interpretive Sign
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the Work of obtaining and installing interpretive signs in accordance with the Contract Documents including mounting structure, the sign panel, graphics production, the concrete footing, the stone bedding, and all necessary incidentals. Graphic content and final sign locations will be provided by the Owner.
 - 2. Measurement and Payment
 - a. Item No. 17 Interpretive Sign will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

- R. Nesting Boxes
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the Work of producing and installing nesting boxes. This Work includes but is not limited to the production of boxes as well as the installation according to Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 18 Nesting Boxes will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

- S. Woven Fiber Matting
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the Work of installing woven fiber matting and woven fiber matting for soil wrap. This includes but is not limited to purchasing of matting, installation of matting, placement of staples, and securing the woven fiber matting in place in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 19 Woven Fiber Matting will be measured on a square yard basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

- T. Clearing and Grubbing
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of clearing and grubbing cut and fill areas within the pond and channel as needed and required in the Specifications. Work shall include, but not be limited to, grubbing, clearing, and tree and stump removal upon Owner approval.
 - 2. Measurement and Payment
 - a. Item No. 20 Clearing and Grubbing will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

- U. Invasive Species Control
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of invasive species control as needed and required in the Specifications. Work shall include, but not be limited to spraying and removal of invasive species.
 - 2. Measurement and Payment
 - a. Item No. 21 Invasive Species Control will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

- V. Open Water Planting
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of open water planting including preparation of the soil, planting, vegetation establishment, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 22 Open Water Planting will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.

- W. Riparian Planting
 - 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of riparian planting including preparation of the soil, planting, watering, vegetation establishment, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment

- a. Item No. 23 Riparian Planting will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- X. Live Stakes
- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to install and secure live stakes in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 24 Live Stakes will be measured on per each basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- Y. Forested Enhancement Seeding and Planting
- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of forested enhancement seeding and planting including preparation of the soil, seeding, planting, watering, vegetation establishment, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 25 Forested Enhancement Seeding and Planting will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- Z. Wetland Planting
- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of wetland planting including preparation of the soil, planting, watering, vegetation establishment, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 26 Wetland Planting will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- AA. Turf Seeding
- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of seeding of the disturbed areas including preparation of the soil, seeding, mulching, watering, vegetation establishment, and incidentals to complete the work in accordance with the Contract Documents.
 - 2. Measurement and Payment
 - a. Item No. 27 Turf Seeding will be measured on an acreage basis and payment made at the Contract unit price proposal in accordance with the Contract Documents.
- BB. Maintenance Period
- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to complete the work of re-planting vegetation, control of weeds and invasive species in accordance with the Contract Documents and Maintenance Plan approved by Owner.
 - 2. Measurement and Payment

- a. Item No. 28 Maintenance Period will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

CC. Demobilization

- 1. Description
 - a. This item consists of all materials, labor, and equipment to complete Work activities for demobilization. Demobilization Work shall include, but not be limited to, removing all equipment, materials, temporary buildings, other construction facilities, temporary utilities, temporary fencing, field offices; and development, submittal, revisions, and obtaining final Owner approval of the Record Documents. Demobilization costs shall also include demolition, loading for disposal, and restoring existing structures including cart path and asphalt road repair. Stakeout Work shall include placement of stakes along Cuttle Creek to visualize where structures will be placed and to use as visual indicators to construction activities. As-builts will be produced when all construction activities are completed.
- 2. Measurement and Payment
 - a. Item No. 29 Demobilization will be measured on a lump sum basis and payment made at the Contract lump sum price proposal in accordance with the Contract Documents.

DD. Bonds

- 1. Description
 - a. This item consists of all materials, labor, and equipment necessary to obtain bonding and surety in accordance with the Contract Documents.
- 2. Measurement and Payment
 - a. Item No. 30 Bonds will be measured on a lump sum basis and payment made to the Contract lump sum price proposal in accordance with the Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Section includes administrative and procedural requirements for substitutions. This Section does not apply to equipment specifications that state “or equivalent”. Under that condition, the Contractor should submit an equivalent product using the submittal process defined in Section 01 33 00 - Submittal Procedures.

1.2 SUBMITTALS

A. Value Engineering or Substitution Requests: Submit one electronic copy of each request for consideration. Identify product of fabrication or installation method to be replaced. Include Specification section numbers and titles, and Contract Drawing numbers and titles.

1. Documentation: The more information provided, the better chance of adoption:
 - a. Statement explaining why specified product or fabrication or installation cannot be provided, or why Contractor wants to provide a substitution.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by other separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant characteristics of proposed substitution with those of the work specified. Include annotated copy of applicable Specification section. Significant characteristics may include attributes such as performance, weight, size, durability, visual effect, warranties, specific features, purchase price, and any environmental benefits. Indicate all deviations from the work as specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, as required by the Specification.
 - f. Certificates, material test reports, and qualification data, where applicable.
 - g. Research reports evidencing compliance with building code in effect for Project.
 - h. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - i. Cost information that includes purchase, replacement, consumables, and a total cost of Ownership comparison. If the Contract Sum will change, include a change proposal.
 - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Transmission by Contractor: Transmit the request for substitution to the Owner with copy.
3. Owners Action: If necessary, Owner will request additional information or documentation for evaluation within five (5) workdays of receipt of a request for substitution. Owner will

notify Contractor of acceptance or rejection of proposed substitution within ten (10) workdays of receipt of request, or receipt of additional information, whichever is later.

1.3 DEFINITIONS

- A. Substitution: A change proposed by the Contractor to products, materials, equipment, or methods of construction that differ from those required by the Contract Documents and that maintain equal value.
- B. Value Engineering: A systematic method to improve the "value" of goods and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. The goal of Value Engineering is to achieve the desired function at the lowest overall cost consistent with required performance
- C. Specified Product or Manufacturer (SPR): Required product or manufacturer. Because SPR constructs, owns, and maintains its facilities, SPR achieves significant cost savings by standardizing on types and manufacturers of equipment. SPR achieves our savings in training, stocking of parts, and shorter time to repair by standardizing on certain products or manufacturers.

1.4 QUALITY CONTROL BY THE CONTRACTOR

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products, materials, and specification.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for cause: Submit requests for substitution immediately upon discovery of need for change.
- B. Substitutions for convenience: Owner will consider requests for substitution if received within sixty (60) days after commencement of work.

PART 3 EXECUTION – Not Used.

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Submittals
- B. Pre-Construction meeting
- C. Progress meetings
- D. Pre-Installation meetings
- E. Project FTP Site

1.2 SUBMITTALS

- A. Meeting minutes

1.3 PRE-CONSTRUCTION MEETING

- A. Owner will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Owner, Engineer, Project Coordination Team, major Subcontractors, and Contractor's superintendent, Contractor's project manager, Contractor's QCO, Contractor's HSO, and other Contractor's personnel requested by Owner.
- C. Minimum Agenda:
 - 1. Submission of executed bonds and insurance certificates
 - 2. Distribution of Contract Documents
 - 3. Review permit requirements and conditions
 - 4. Submission of Contractor's affidavit of permit requirements
 - 5. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule
 - 6. Designation of personnel representing parties in Contract, and Engineer
 - 7. Communication procedures
 - 8. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures
 - 9. Scheduling
 - 10. Critical Work sequencing
 - 11. Temporary utilities provided by Contractor
 - 12. Security and housekeeping procedures
 - 13. Schedules
 - 14. Procedures for maintaining record documents

- D. Contractor: Record minutes and distribute draft minutes to participants within two days after meeting, to Owner, Engineer and those affected by decisions made. Owner will provide required changes to minutes and Contractor shall submit final minutes to Project FTP site.

1.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of work at weekly intervals.
- B. Contractor shall make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Contractor's superintendent, Contractor's Quality Control Officer, major subcontractors, Contractor, and suppliers; and Owner, Engineer, and additional personnel as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
 - 1. Review minutes of previous meetings
 - 2. Health and Safety
 - 3. Review of work progress
 - 4. Review of weekly reports
 - 5. Review of quality control actions and issues
 - 6. Field observations, problems, and decisions
 - 7. Identification of problems impeding planned progress
 - 8. Review of submittal schedule and status of submittals
 - 9. Review of offsite fabrication and delivery schedules
 - 10. Maintenance of Progress Schedule
 - 11. Corrective measures to regain projected schedules
 - 12. Planned progress during succeeding work period
 - 13. Coordination of projected progress
 - 14. Maintenance of quality and work standards
 - 15. Effect of proposed changes on Progress Schedule and coordination
 - 16. Other business relating to work.
- E. Contractor: Record minutes and distribute draft minutes to participants within two (2) days after meeting, to Owner, Engineer and those affected by decisions made. Owner and Engineer will provide required changes to minutes, and Contractor shall submit final minutes to Project FTP site.

1.5 PRE-INSTALLATION MEETINGS

- A. When required in individual Specification sections, convene pre-installation meetings before starting work of specific section.
- B. Require attendance of parties directly affecting, or affected by, work of specific section.
- C. Notify Owner and Engineer two (2) days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
 - 1. Review conditions of installation, preparation, and installation procedures.

2. Review coordination with related Work.

E. Contractor: Record minutes and distribute draft minutes to participants within two days after meeting, to Owner, Engineer and those affected by decisions made. Owner and Engineer will provide required changes to minutes, and Contractor shall submit final minutes to project website.

1.6 PROJECT FTP SITE

A. Contractor shall provide and maintain a Project FTP site or similar files sharing site available for the Owner, PCT and Engineer to access through the internet.

B. Project FTP site shall allow confidential business information to be visible only to Owner, and Contractor.

C. Contractor shall provide temporary usernames and passwords for use by Owner, PCT, and Engineer. Provide usernames and passwords through Final Completion.

D. Contractor shall assign levels of access to each user as directed by Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01 31 13 - PROJECT COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination of work

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate submittals and work of various sections of Contract Documents to ensure efficient and orderly sequence of installation (within the schedule allowed by the Contract Documents) of interdependent construction elements. Coordinate space requirements for work required by Contract Documents.
- B. Coordinate completion and cleanup of work of separate sections in preparation for substantial and final completion inspections.
- C. Coordination Meetings: In addition to other meetings specified in Section 01 30 00 - Administrative Requirements, hold coordination meetings with personnel and Subcontractors to ensure coordination of work between the Contractor, Owner and City of Marysville.
- D. Coordinate work on and around bridges with the Michigan Department of Transportation.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

- 3.1 Complete work in accordance with Contract Documents.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Definitions
 - 2. Submittal procedures
 - 3. Product data
 - 4. Use of electronic CAD files of Project Contract Drawings
 - 5. Shop Drawings
 - 6. Test reports
 - 7. Certificates
 - 8. Contractor review
 - 9. Owner review

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Owner's responsive action. Unless noted otherwise, submittals shall be classified as Action Submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

- A. Owner has provided a draft submittal list as Attachment A to aid in Contractor's development of the submittal register. Additional submittals may be required to comply with Contract Documents.
- B. With the first submittal or 30 days after Notice of Award (whichever is sooner), submit a Contractor's submittal register, by Specification section number, all submittals required and approximate date the submittal will be forwarded. Submittal register shall identify additional submittals required by other plans as discussed in Section 01 31 13 – Project Coordination.
- C. Contractor's submittal register shall be similar to USACE ER 415-1-10, Engineering Form 4288, or equivalent as approved by Owner.
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_415-1-10.pdf
- D. Transmit each submittal with Owner accepted form.
- E. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

- F. Identify: Project, Contractor, Subcontractor and supplier, pertinent Contract Drawing and detail number, and Specification section number appropriate to submittal.
- G. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is according to requirements of the work and Contract Documents.
- H. Schedule submittals to expedite Project, and post electronic submittals as PDF electronic files to Project FTP site. Coordinate submission of related items.
- I. For each submittal for review, allow fifteen (15) days excluding delivery time to and from Contractor.
- J. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed work.
- K. Allow space on submittals for Contractor, Owner, and Engineer review stamps.
- L. When revised for resubmission, identify changes made since previous submission.
- M. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- N. Submittals not requested will not be recognized nor processed.
- O. Incomplete Submittals: Owner will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Owner.

1.4 PRODUCT DATA

- A. Submit to Owner for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Post electronic submittals as PDF electronic files to Project FTP site.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to Section 01 33 00 - Submittal Procedures and for record documents described in Section 01 70 00 – Execution and Closeout Submittals.

1.5 USE OF ELECTRONIC CAD FILES OF PROJECT CONTRACT DRAWINGS

- A. Electronic CAD Files of Project Contract Drawings: May only be used to expedite production of Shop Drawings, Record Drawings, and to determine coordinates for grid layout and estimated depths/locations for sampling for the project. Use for other projects or purposes is not allowed.
- B. Electronic CAD Files of Project Contract Drawings: Distributed only under the following conditions:
 - 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Contract Drawings and Specifications.
 - 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions, and for incorporating addenda and modifications.
 - 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
 - 4. Receiver shall not hold Engineer responsible for data or file cleanup required to make files usable; nor for error or malfunction in translation, interpretation, or use of this electronic information.
 - 5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
 - 6. Receiver shall not hold Engineer responsible for such viruses or their consequences; and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.6 SHOP DRAWINGS

- A. Action Submittal: Submit to Owner for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification sections, provide Shop Drawings signed and sealed by a Professional Engineer licensed in the State of Michigan responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Post electronic submittals as PDF electronic files to Project FTP site.

- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 – Execution and Closeout Submittals.

1.7 TEST REPORTS

- A. Informational Submittal: Submit reports for Owner's knowledge.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.8 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Owner, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Provide documentation of Buy American Act requirements for materials, if required in Contract Documents.

1.9 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Owner.
- B. Contractor shall be responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers
 - 2. Determination and verification of field measurements and field construction criteria
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents
 - 4. Determination of accuracy and completeness of dimensions and quantities
 - 5. Confirmation and coordination of dimensions and field conditions at Site
 - 6. Construction means, techniques, sequences, and procedures
 - 7. Safety precautions
 - 8. Coordination and performance of work of all trades
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin work for which submittals are required until approved submittals have been received from Owner.

1.10 OWNER REVIEW

- A. Do not make "mass submittals" to Owner. "Mass submittals" are defined as six or more submittals or items in one day, or fifteen (15) or more submittals or items in one week. If "mass submittals" are received, Owner's review time stated above will be extended as necessary to perform proper review. Owner will review "mass submittals" based on priority.

- B. Engineer will review submittals, and provide recommendations and comments to Owner comparing submittals to Contract Documents.
- C. Informational submittals and other similar data are for Owner's information, do not require Owner's responsive action, and will not be reviewed or returned with comment.
- D. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- E. Submittal approval does not authorize changes to Contract requirements unless accompanied by Contract Modification from Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

**DRAFT SUBMITTAL REGISTER
CUTTLE CREEK RESTORATION**

Item:	Specification Section	Description of Submittal
1	01 10 00 – Summary	Weekly Reports
2	01 10 00 – Summary	Contractor obtained permits
3	01 10 00 – Summary	Site Safety and Health Plan
4	01 20 00 – Price and Payment Procedures	Schedule of Supplies and Services
5	01 20 00 – Price and Payment Procedures	Application of Payment (including updated Construction Schedule and Progress Report)
6	01 25 00 – Substitution Procedures	Substitution Requests
7	01 30 00 – Administrative Requirements	Meeting Minutes
8	01 33 00 – Submittal Procedures	Product Data
9	01 33 00 – Submittal Procedures	Test Reports
10	01 33 00 – Submittal Procedures	Certificates
11	01 35 44 – Environmental Protection and Management	Environmental Protection Plan
12	01 35 44 – Environmental Protection and Management	Condition Survey Report
13	01 50 00 – Temporary Facilities and Controls	Project Identification Specifications
14	01 50 00 – Temporary Facilities and Controls	Traffic Control Plan
15	01 57 00 – Temporary Erosion and Sediment Control	Erosion and Sediment Control Inspection Logs
16	01 57 00 – Temporary Erosion and Sediment Control	Sediment Control Plans, Permit, and NOC
17	01 70 00 – Execution and Closeout Requirements	Construction Photographs
18	01 70 00 – Execution and Closeout Requirements	Substantial Completion Certificate and Inspection Request
19	01 70 00 – Execution and Closeout Requirements	Substantial Completion Punch List
20	01 70 00 – Execution and Closeout Requirements	Final Completion Certificate and Inspection Request
21	01 70 00 – Execution and Closeout Requirements	Record Documents
22	02 41 19 – Selective Demolition	Demolition Schedule
23	02 41 19 – Selective Demolition	Contract Drawings
24	03 20 00 – Concrete Reinforcing	Shop Drawings
25	03 20 00 – Concrete Reinforcing	Manufacturers Certificate
26	03 20 00 – Concrete Reinforcing	Mill Test Report
27	03 30 00 – Cast-In-Place Concrete	Abutment Subgrade Bearing Capacity
28	03 30 00 – Cast-In-Place Concrete	Certified concrete mix design
29	03 30 00 – Cast-In-Place Concrete	Manufacturer’s installation instructions
30	03 30 00 – Cast-In-Place Concrete	Testing results
31	03 30 00 – Cast-In-Place Concrete	Certified delivery tickets

Item:	Specification Section	Description of Submittal
32	03 40 00 – Precast Concrete	Product Data
33	03 40 00 – Precast Concrete	Manufacturer’s Certificates
34	03 40 00 – Precast Concrete	Manufacturer’s Installation Instructions
35	10 14 00 – Signage	Sign information
36	31 23 23 – Fill	Product Data
37	31 23 23 - Fill	Materials Source
38	31 23 23 - Fill	Survey
39	31 23 23 – Fill	Sample of imported topsoil
40	31 23 23 - Fill	Sample of imported clay and geotechnical testing
41	31 23 23 - Fill	Geotechnical testing results
42	32 01 00 – Maintenance Period	MSDSs; Material Labels/Data Sheets
43	32 01 00 – Maintenance Period	Inspector Qualifications and Licenses
44	32 01 00 – Maintenance Period	Maintenance Plan
45	32 34 13 – Fabricated Pedestrian Bridges	Bridge Design Drawings
46	32 34 13 – Fabricated Pedestrian Bridges	Bridge Manufacturer’s Certifications
47	32 34 13 – Fabricated Pedestrian Bridges	Welding Operator’s Qualifications
48	32 34 13 – Fabricated Pedestrian Bridges	Certified Weld Inspector Report
49	32 80 00 – Irrigation	Pipe and Accessories Product Data
50	32 90 00 – Planting	Material Labels/Data Sheets
51	32 90 00 – Planting	Planting pattern
52	32 92 19 – Turf Establishment	Data for seed mix, fertilizer, and mulch
53	32 92 30 - Bioswales	Permeable soil supplier and mixture
54	32 92 30 – Bioswales	Geotextile filter fabric
55	32 97 00 – Invasive Species Control	Material Labels/Data Sheets/MSDSs
56	32 97 00 – Invasive Species Control	Applicators License
57	32 98 00 – Nesting Boxes	Construction details for nesting box sizing
58	35 32 17 – Rock Structures	Product Data
59	35 32 17 – Rock Structures	Materials Source
60	35 32 19 – Woody Habitat Structures	Source of log material

SECTION 01 35 44 – ENVIRONMENTAL PROTECTION AND MANAGEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes requirements of a general nature related to the Contractor's responsibility to prevent/control pollution and habitat disruption that may occur to the environment during completion of work.

1.2 SUBMITTALS

- A. Environmental Protection Plan

- 1. The Environmental Protection Plan shall detail the Contractors approach to protect and maintain environmental responsibility required by the Contract Documents while completing the project and providing the best value to the Owner. Contractor shall coordinate different work elements to achieve the project objectives while maintaining environmental integrity.

- B. Condition Survey Report

- C. REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- 1. U.S. ARMY CORPS OF ENGINEERS (USACE)
 - a. WETLAND MANUAL Corps of Engineers Wetlands Delineation Manual Technical Report Y-87-1
 - 2. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
 - 3. Code of Federal Regulations (CFR)
 - a. 33 CFR 328 Definitions of Waters of the United States
 - b. 40 CFR 152 – 186 Pesticide Programs
 - c. 40 CFR 260 Hazardous Waste Management System: General
 - d. 40 CFR 261 Identification and Listing of Hazardous Waste
 - e. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
 - f. 40 CFR 279 Standards for the Management of Used Oil
 - g. 40 CFR 302 Designation, Reportable Quantities, and Notification
 - h. 40 CFR 355 Emergency Planning and Notification
 - i. 40 CFR 68 Chemical Accident Prevention Provisions
 - j. 49 CFR 171 – 178 Hazardous Materials Regulations

1.3 DEFINITIONS

- A. Environmental Pollution and Damage: Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

- B. Environmental Protection: Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material, as well as other pollutants.
- C. Contractor Generated Hazardous Waste: Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.
- D. Land Application for Discharge Water: The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.
- E. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.
- F. Waters of the United States: All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.
- G. Wetlands: Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with Wetland Manual.

1.4 GENERAL REQUIREMENTS

- A. The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this Contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

- B. The Contractor shall ensure that appropriately qualified personnel are present at all critical performance times during the course of work to ensure protection of the environment as well as proper implementation of best management practices. These staff include:
1. The Stream Foreman. The Stream Foreman will be a full-time position fulfilled by the Contractor. All work associated with the execution of this contract will be completed under the direction of a Stream Foreman. The Stream Foreman will be experienced in the construction of wetland and stream restoration measures contained in these Contract Documents. The Stream Foreman shall interface with the Owner, Engineer, and Biologist and lead the equipment operators and laborers in properly implementing the requirements of the Contract Documents. The Stream Foreman shall ensure and be responsible that the direction and guidance given is followed promptly, correctly, and in a safe, efficient, and cooperative manner. In no case will the Owner or Engineer act independently as a foreman or perform the Contractor's duties to execute the work. The Stream Foreman is the person designated by the Contractor as the Contractor's field representative who has previous stream restoration experience in constructing or directing the construction of in-stream work, water diversions, waterway sediment and erosion control measures, j-hooks, cross vanes, imbricated rip rap, riffle grade control measures, restoration plantings, etc in the manner called for, and required on the Contract Drawings. Said Stream Foreman is responsible and qualified to direct all such work including, but not limited to the placement of in-stream structures, diversions, stream grading, riffle grade controls, and bank stabilization structures as necessary for completion of the Project. The Stream Foreman is required to be onsite during all, active Contractor construction activity.
- C. The Contractor shall coordinate all onsite work with the Owner representatives including:
1. The Onsite Engineer (the Owner's Onsite Representative) All work associated with this Contract will be completed under the observation of the Engineer. This work may include the installation of the bank protection, all in-stream structures (cross vanes, J-hook vanes, root wads, step pools, riffle grade controls, etc), sediment and erosion control measures, excavation and grading, grading/placement of all fill to bring the stream to its final grade and all grading completed to bring the stream to its final alignment.
 2. The Onsite Biologist (The Biologist) The Biologist will observe the installation of plant materials as a representative of the Owner, advising the Contractor on planting methods, planting substitutions, and advising the Engineer and Stream Foreman on the removal and avoidance of trees, other vegetation, and valuable habitats encounters on the site throughout the Limit of Disturbance and access routes.

1.5 SUBCONTRACTORS

- A. The Contractor shall ensure compliance with this section by Subcontractors.

1.6 VIOLATION FINES AND FEES

- A. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional, and local laws and regulations.

1.7 ENVIRONMENTAL PROTECTION PLAN

- A. Prior to commencing construction activities or delivery of materials to the site, the Contractor shall coordinate development of and submit an Environmental Protection Plan for review and approval by the Owner. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor shall address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.
1. No work at the site, except items authorized by Owner in writing, shall be performed until the final plan is approved. No adjustment for time or money will be made if resubmittals of the Environmental Protection and Management Plans are required due to deficiencies in the plans.
 2. Compliance
 - a. No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.
 3. Contents
 - a. The Environmental Protection Plan shall include, but shall not be limited to, the following:
 - 1) Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - 2) Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - 3) Description of the Contractor's environmental protection personnel training program.
 - 4) Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
 - 5) Drawings showing the location of borrow areas.
 - 6) The Spill Control Plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. This plan shall include as a minimum:
 - a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Owner in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
 - b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
 - c) Training requirements for Contractor's personnel and methods of accomplishing the training.

- d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
 - e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
 - f) The methods and procedures to be used for expeditious contaminant cleanup.
- 7) Appendix - Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

1.8 PROTECTION FEATURES

- A. Prior to start of onsite construction activities, the Contractor, Owner and Engineer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report of environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the Contractor and the Owner upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the Contract Drawings, regardless of interference which their preservation may cause to the Contractor's work under the Contract.

1.9 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

- A. Any deviations, requested by the Contractor, from the Contract Drawings and Specifications which may have an environmental impact will be subject to approval by the Owner and may require an extended review, processing, and approval time. The Owner reserves the right to disapprove alternate methods, even if they are more cost effective, if the Owner determines that the proposed alternate method will have an adverse environmental impact.

1.10 NOTIFICATION

- A. The Owner will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection Plan. The Contractor shall, after receipt of such notice, inform the Owner of the proposed corrective action and take such action when approved by the Owner. The Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Owner may take under the Contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 LAND RESOURCES

- A. The Contractor shall confine all activities to areas defined by the Contract Drawings and Specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the Contract Drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.
- B. Contractor Facilities
 - 1. The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the Contract Drawings or as directed by the Owner. Temporary movement or relocation of Contractor facilities shall be made only when approved.

3.2 WATER RESOURCES

- A. The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.
- B. Dewatering Operations
 - 1. Construction operations for dewatering shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body.
- C. Stream Crossings and In-Channel Work
 - 1. The Contractor shall not enter or cross any stream or river with construction equipment unless to perform work within the specific bounds of project permits.
- D. Wetlands
 - 1. The Contractor shall not enter, disturb, destroy, or allow discharge of contaminants into any wetland or wetland buffer limits as shown on the Contract Drawings unless to perform work within the specific bounds of project permits.

3.3 AIR RESOURCES

- A. Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.
- B. Particulates
 - 1. Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.
- C. Odors
 - 1. Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State and local regulations and/or local ordinances.
- D. Sound Intrusions
 - 1. The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

3.4 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

- A. Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the Contract Drawings.
- B. Solid Wastes
 - 1. Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D Resource Conservation and Recovery Act permitted landfill shall be the minimum acceptable offsite solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate.

C. Chemicals and Chemical Wastes

1. Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Owner. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within six (6) inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

D. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

1. Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations. The Contractor shall transport Contractor generated hazardous waste off property within thirty (30) days in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State, and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Owner. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.

E. Fuel and Lubricants

1. Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. There shall be no storage of fuel on the project site. Fuel must be brought to the project site each day that work is performed. Biodegradable hydraulic fluids must be utilized when possible to prevent environmental harm.

3.5 RECYCLING AND WASTE MINIMIZATION

- A. The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.6 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

- A. If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Owner so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.7 BIOLOGICAL RESOURCES

- A. The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.8 PREVIOUSLY USED EQUIPMENT

- A. The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the United State Department of Agriculture jurisdictional office and Michigan Department of Environmental Quality for additional cleaning and bio-security requirements.

3.9 MAINTENANCE OF POLLUTION FACILITIES

- A. The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the Contract or for that length of time construction activities create the particular pollutant.

3.10 MILITARY MUNITIONS

- A. In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Owner.

3.11 TRAINING OF CONTRACTOR PERSONNEL

- A. The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Quality requirements
 - 2. Tolerances
 - 3. References
 - 4. Labeling

1.2 QUALITY REQUIREMENTS

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce work of specified quality.
- B. Comply with specified standards as the minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform work using persons qualified to produce required and specified quality.
- D. Supervise performance of work in such manner and by such means to ensure that work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- E. Contractor's Quality Control Officer shall maintain oversight of work being performed and ensure work is implemented in accordance with Contract Documents as discussed in Section 01 10 00 - Summary.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Owner before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards; comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

- B. Conform to reference standard by date of issue current as of date for receiving bids except where specific date is established by code.
- C. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Owner before proceeding.
- D. Neither contractual relationships, duties, or responsibilities of parties in Contract; nor those of the Owner or Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

- A. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number
 - 2. Serial number
 - 3. Performance characteristics

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. SUMMARY

B. Submittals

1. Project Identification Sign specifications
2. Traffic Control Plan
3. Methods and materials for erosion and dust control.

C. Temporary Utilities:

1. Temporary electricity
2. Temporary lighting for construction purposes
3. Temporary sanitary facilities

D. Construction Facilities:

1. Vehicular access
2. Parking
3. Fire-prevention facilities
4. Progress cleaning and waste removal
5. Project Identification
6. Traffic Regulation
7. Orange Construction Fence

E. Temporary Controls:

1. Security
2. Pest and Rodent control

F. Removal of utilities, facilities, and controls

1.2 SUMMARY

- A. Temporary facilities shown on Drawings are for illustration purposes only. Contractor shall determine the temporary facilities required to execute the Work in addition to those required by the contract documents.

1.3 SUBMITTALS

A. Submit the following for Project Identification Sign approval:

1. Type and grade of materials.
2. Layout, size, trim, framing, supports, and coatings.
3. Size and style of lettering.
4. Samples of colors.

1.4 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from utility source as needed for construction operation.

1.5 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations to continue at work schedule in approved by Owner.
- B. Maintain lighting and provide routine repairs.

1.6 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide facilities from the time of project mobilization, until demobilization.
- B. Contractor is responsible for locating and verifying all existing utilities.

1.7 VEHICULAR ACCESS

- A. Provide unimpeded access for emergency vehicles. Maintain 20-foot wide driveways with turning space between and around combustible materials.
- B. Construct stabilized construction entrances at each intersection of access roads and public roads.
 - 1. Surface water flowing or diverted toward construction entrances shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.
- C. Locate access roads, access ramps and other work as indicated on Contract Drawings. Contractor may re-locate access roads, access ramps and other work with Owner approval. New locations must be approved by jurisdictional approving authority.
- D. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.
- E. Construct temporary bridges (over non-navigable waterways) and culverts to span low areas and allow unimpeded drainage.
- F. Maintain construction entrances in a condition that will prevent tracking or flowing of sediment onto adjacent public roads. This may require periodic topdressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto roads must be removed immediately.
- G. Barricade construction entrance with NCHRP-350 approved Type III barricades while not on site. Anchor barricades with sandbags. Barricades shall be constructed in accordance with Michigan Department of Transportation Manual on Uniform Traffic Control Devices.

- H. Periodic inspection and required maintenance shall be provided after each rain and other times when stone voids have been filled with soil or sediment.
- I. Provide means of removing mud from vehicle wheels before entering streets.
- J. The contractor must keep public roads in the construction area clean and promptly remove all tracked dirt

1.8 PARKING

- A. Provide temporary surface parking areas to accommodate construction personnel
- B. Locate as approved by Owner.
- C. If site space is not adequate, provide additional offsite parking.
- D. Use of existing parking facilities used by construction personnel is not permitted without prior written permission from Owner.
- E. Permanent Pavements and Parking Facilities:
 - 1. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
- F. Parking will not be allowed on grassed or soft areas. Parking shall be on paved surfaces.
- G. Maintenance:
 - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
 - 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.
- H. Removal, Repair:
 - 1. Remove temporary materials and construction before Substantial Completion.
 - 2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as indicated.
 - 3. Repair existing facilities damaged by use, to original condition.
- I. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.9 FIRE-PREVENTION FACILITIES

- A. Prohibit smoking within buildings and field offices. Designate area onsite where smoking is permitted. Provide approved ashtrays in designated smoking areas. Trash shall be disposed of in accordance with all laws, regulations, and codes.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
 - 1. Provide minimum of one fire extinguisher in every field office, construction trailer, and storage shed.

1.10 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Collect and remove waste materials, debris, and rubbish from site periodically and dispose offsite.
- C. All materials spilled, dropped, washed, or tracked from vehicles onto roadways shall be removed immediately.

1.11 PROJECT IDENTIFICATION

- A. Furnish, install, and maintain temporary Project Identification Sign.
- B. No signs, except those specified, shall be displayed unless approved by Owner.
- C. Content:
 - 1. Project number, title, logo, and name of Owner.
 - 2. Titles and logo of Engineer.
 - 3. Name and logo of Prime Contractor.
- D. Graphic Design, Colors, and Style of Lettering: Approved by Owner.
- E. Design signs and supports to withstand a 75 mile per hour wind velocity.
- F. Finishes, Painting:
 - 1. Adequate to withstand weathering, fading, and chipping for the duration of construction. Paint with exterior gloss-finish enamel.
 - 2. Adequate to withstand weathering, fading, and chipping during the duration of the project.
 - 3. Sign painter shall be a professional in the type work required.
- G. Further details of construction and mounting of Project Identification Sign shall be in accordance with the Contract Drawings.
- H. Installation:
 - 1. Install project identification sign at project mobilization.
 - 2. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
 - 3. Install sign surface plumb and level, with butt joints. Anchor securely.
 - 4. Paint exposed surfaces of sign, supports, and framing.
- I. Maintenance:
 - 1. Maintain sign so it is clean, legible, and upright.
 - 2. Keep grass and weeds cut away from sign.

- 3. Repair and repaint damaged or deteriorated sign.
- J. Removal: Remove signs, framing, supports, and foundations at completion of project and restore area.

1.12 TRAFFIC REGULATION

- A. Comply with all regulations and means and methods approved in Traffic Control Plan.
- B. Submit Traffic Control Plan identifying routes and features used to control traffic.
- C. Contractor shall provide all labor, materials, and equipment necessary to maintain vehicular and pedestrian traffic throughout the project duration.
- D. At a minimum, maintenance of traffic operations shall be in accordance with applicable local and State standards.
- E. Contractor shall provide maintenance, sweeping, and dust control on access roadways.
- F. Coordinate necessary lane closures with Michigan Department of Transportation.
- G. The Contractor shall maintain front door and driveway access to all local residences and businesses adjacent to the work site at all times unless approved by the Owner. The Contractor shall contact property owners prior to construction if access to front door and driveway will be restricted.
- H. The required function and visibility of stop signs, yield signs and all other signs affecting driver safety shall be preserved by the Contractor whenever a street is open to traffic.
- I. All excavations and trenches shall be adequately protected for the safety of pedestrian traffic.
- J. Pedestrian sidewalks through the site shall be closed with appropriate signage and NCHRP-350 approved Type II barricades with kick plates. Barricades shall have bottom plates to allow detection by users of walking canes. Anchor barricades with sandbags. Barricades shall be constructed in accordance with Michigan Department of Transportation Manual on Uniform Traffic Control Devices.
- K. Signs, Signals, and Devices:
 - 1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
 - 2. Traffic Control Signals: As approved by local jurisdictions.
 - 3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
 - 4. Flag Person Equipment: As required by authorities having jurisdiction.
- L. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

M. Haul Routes:

1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
2. Obtain Owner approval for haul routes on City or County roads.
3. Provide drawings indicating haul routes designated by authorities having jurisdiction for use by construction traffic.
4. Confine construction traffic to designated haul routes.
5. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

N. Traffic Signs and Signals:

1. Provide signs at approaches to Site and on-Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
3. Relocate signs and signals as Work progresses, to maintain effective traffic control.

1.13 ORANGE CONSTRUCTION FENCE

- A. Orange Construction Fence shall be installed as security fencing around the LOD as shown on the Contract Drawings to prevent unauthorized access, and/or in other areas indicated on the Drawings or as directed by Owner.

1.14 SECURITY

- A. Security will not be provided by Owner. The Contractor shall, at all times, take reasonable precautions in conducting all operations under this contract in a manner to avoid the risk of loss, theft or damage to the equipment and supplies. Owner will not be responsible for the loss, theft, or damage of the Contractor's equipment

1.15 PEST AND RODENT CONTROL

- A. Provide methods, means, and facilities to prevent rodents and pests from accessing or invading premises.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials before Final Construction Inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore areas disturbed during construction to original condition.

PART 2 PRODUCTS

2.1 ORANGE CONSTRUCTION FENCE

A. Fence.

1. Orange Construction Fence shall be Blaze or International Orange colored, mono- oriented laminar polyethylene plastic, U.V. stabilized material with a mesh size of 3 inches by 1.5 inches and porosity of 60%. The fence shall have a minimum height of 4 feet.

B. Posts.

1. Posts for attachment of the fence shall be 2-inch by 2-inch wood posts, a minimum of 6 feet long or 5-1/2 ft high, 2 in. steel U-channel posts.

C. Ties.

1. Ties for attachment of fencing to posts shall consist of plastic or wire of a gauge sufficient enough to bear the weight of the fencing on the posts.

PART 3 EXECUTION

3.1 ORANGE CONSTRUCTION FENCE

- A. Drive posts into the ground to a depth of 12 to 18 inches. Posts shall be spaced every 8 to 10 feet. Roll fence out along the posts and secure fence to the posts using a minimum of three ties per post. Tension wire or rope may be used as a top stringer and woven through the top row of strands of the fence to prevent potential sagging.
- B. The Contractor may elect to install Orange Construction Fence in another manner if approved by the Owner.
- C. At such time that the construction is substantially complete and with the Owner's approval, the Contractor shall remove the fence, fence posts and other materials, which then becomes the property of the Contractor. The Contractor shall maintain fencing throughout the life of the project. The contractor shall repair fallen, damaged, or broken sections of fencing at the end of each work day and shall maintain the security of the site during periods of inactivity. Should construction sequencing allow, and with the approval of the Owner, fencing from a completed section of the project site can be removed and reused on the site.

END OF SECTION

SECTION 01 57 00 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes requirements related to the Contractor's responsibility to furnish all labor, equipment, and materials associated with erosion and sediment control required to complete the work as shown on the Contract Drawings and specified herein.

1.2 SUBMITTALS

- A. Erosion and Sediment Control Inspection logs.

1.3 QUALITY ASSURANCE

- A. All erosion and sediment control work shall comply with applicable requirements of governing authorities having jurisdiction.
- B. Erosion and sediment control measures shall be established at the beginning of construction and maintained during the entire period of construction. Onsite areas that are subject to severe erosion, and offsite areas that are especially vulnerable to damage from erosion and/or sedimentation, shall be identified and receive special attention.
- C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and the length of the time of exposure.
- D. Surface water runoff originating upgrade of exposed areas shall be controlled to reduce erosion and sediment loss during the period of exposure.
- E. All land-disturbing activities shall be planned and conducted to minimize offsite sedimentation.
- F. Same-day stabilization will be required in many locations adjacent to natural resources.

1.4 EROSION AND SEDIMENT CONTROL

- A. A Soil Erosion and Sedimentation Control Plan as required by St. Clair County Health Department will be completed by the Owner. Maintain an approved copy of the Soil Erosion and Sedimentation Control Plan at the construction site and continually update, as regulations require, to reflect current site conditions.
 - 1. Information required by St. Clair County Health Department. Requirements can be located at: <http://www.stclaircounty.org/offices/health/SoilErosion.aspx>
 - 2. Plan and execute construction by methods to control erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

- D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.
- F. Comply with St. Clair County Soil Erosion and Sediment Control Permit and Michigan Department of Environmental Quality Construction Stormwater NOC.

PART 2 PRODUCTS

2.1 GENERAL

- A. All erosion and sediment control materials shall conform to the requirements of the Michigan Department of the Environment and St. Clair County Health Department Permit, and the Contract Drawings.

2.2 WOVEN FIBER MATTING

- A. Brothers Coir Mills EcoMatting 700 or approved equal.
- B. Matting shall consist of a machine produced mat of degradable natural fibers and shall meet the following minimum specifications:

100% coconut fiber twine woven into high strength matrix	
Thickness	0.30 in. minimum
Tensile Strength	1348 x 626 lb/ft minimum
Elongation	34% x 38% maximum
Flexibility (mg-cm)	65030 x 29590
Flow Velocity Observed	11 ft/sec
Weight	700 gr/m ²
Size	6.6 x 164 ft (120 SY)
“C” Factor	0.002
Open Area (measured)	50%

- C. Staples, stakes (wooden or live), or reinforcement bars shall be used as anchors and shall meet the following requirements:
 - 1. Wooden Stakes
 - a. Stakes for securing the matting above the toe trench and for the key-in trench at the top of the slope shall consist of 1.5” x 1.5” hardwood stakes, 18-inches in length, tapered at the bottom end for easy insertion into the soil and flat at the top end for hammering.
 - 2. Staples
 - a. Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

2.3 SILT FENCES

A. Filter Fabric

Provide woven fabric that meets the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE		
<u>PHYSICAL PROPERTY</u>	<u>TEST PROCEDURE</u>	<u>STRENGTH REQUIREMENT</u>
Grab Tensile	ASTM D 4632	100 lbs. min.
Elongation (percent)		30 percent max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

PART 3 EXECUTION

3.1 EXTENT OF WORK

- A. Contractor shall implement additional Erosion and Sediment controls as required by the sediment control inspector, St. Clair County E&S Inspector, or Owner to remain in compliance with applicable local and state regulations and Permit. Field changes and minor adjustments from the Contract Drawings are permissible as long as the installation functions and conforms to this Specification.

3.2 INSTALLATION

A. Silt Fences:

1. Provide silt fences where shown on the Contract Drawings and E&S Plans a temporary structural practice to minimize erosion and sediment runoff.
2. Install silt fences to retain sediment prior to initiating each phase of work where erosion would occur in the form of sheet and rill erosion (e.g., clearing and grubbing, excavation, embankment, and grading).
3. Place silt fence parallel with grading contour.
4. The ends of the fence shall be extended up slope to prevent water from flowing around ends of the fence.

B. Woven Fiber Matting:

1. Matting shall be installed within the first 30 feet of the active stream bed channel on both banks unless undisturbed ground, pavement, or other stable surface is encountered (in which case less than 30 feet is acceptable). Additionally, matting shall be installed on all slopes over 3:1.
2. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the matting with the soil. Place the matting immediately upon final grading. Take care to preserve the required line, grade, and cross section of the area covered.
3. The matting shall be placed within 48 hours after seeding operations have been completed in the work areas. Matting shall be rolled in the direction of water flow. Matting shall be laid smoothly and firmly upon the seeded surface, and stretching shall be avoided.

4. Where more than one width of matting is required, the strips shall overlap at least 2 in. Ends shall overlap at least 6 in.
5. The upgrade end of each strip of matting shall be turned down and buried to a depth of not less than 6 in. with the soil firmly tamped against it.
6. Overlapping shall be done with the upgrade section on top. The Owner may require any other edge exposed to more than normal flow of water to be turned down and buried 6 in. Edges of matting shall be similarly buried around the edges of structures.
7. Matting shall be securely fastened in place with staples driven vertically into the soil and flush with the surface. Staples shall be placed 2 ft apart along the edges and center of the matting. On all overlapping edges, staples shall be placed 18 in. apart. At all ends of the matting, staples shall be placed 6 in. apart.
8. Matting is to remain following construction. Matting must be biodegradable.

3.3 REMOVAL OF MATERIALS

- A. Following completion of the project, all materials shall be removed from the site. The removal of any erosion and sediment control measure shall only be performed upon receiving permission from the Owner. All upstream contributing drainage areas to the individual controls shall be vegetatively stabilized, and healthy and vigorous turf shall be present as described in Section 32 92 19 – Seeding.

3.4 MAINTENANCE

- A. Maintain the erosion and sediment control measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, and repair of erosion and sediment control measures. Use the following procedures to maintain the protective measures.
 1. Silt Fence Maintenance
 - a. Inspect the silt fences in accordance with the paragraph titled "Inspections," of this section. Any required repairs shall be made promptly. Pay close attention to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective when the barrier is still necessary, replace the fabric promptly. Remove sediment deposits when deposits reach one-third of the height of the barrier.

3.5 INSPECTIONS

- A. General
 1. Inspect disturbed areas of the construction site; areas that have not been finally stabilized; areas used for storage of materials; areas exposed to precipitation, stabilization practices, structural practices, other controls; and areas where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Once disturbed areas have been stabilized, the inspection schedule may be relaxed to once every month with the Owner's approval.
- B. Inspections Details
 1. Inspect disturbed areas and areas used for material storage that are exposed to precipitation for evidence of, or the potential for, sediment entering the drainage system. Observe erosion

and sediment control measures identified in the E&S Plans to ensure that they are operating correctly. Inspect discharge locations or points to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Inspect locations where vehicles exit the site for evidence of offsite sediment tracking.

C. Inspection Reports

1. For each inspection conducted, prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the E&S Plans, maintenance performed, and actions taken. A copy of the inspection report shall be maintained on the job site and furnished to Owner upon request.

END OF SECTION

SECTION 01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Submittals
 - 2. Field engineering
 - 3. Construction photographs
 - 4. Restoration
 - 5. Closeout procedures
 - 6. Project record documents
 - 7. Warranty
 - 8. Examination
 - 9. Preparation
 - 10. Execution
 - 11. Protecting installed construction
 - 12. Final Cleaning

1.2 SUBMITTALS

- A. Construction Photographs
- B. Substantial completion certificate and inspection request
- C. Substantial completion punch list
- D. Final completion certificate and inspection request
- E. Record documents

1.3 FIELD ENGINEERING

- A. Employ land surveyor registered in State of Michigan and acceptable to Owner.
- B. Locate and protect survey control and reference points. Promptly notify Owner of discrepancies discovered.
- C. Control datum for survey is indicated on Contract Drawings.
- D. Verify setbacks and easements; confirm Contract Drawing dimensions and elevations.
- E. Contractor shall verify with the Owner locations of site, and reference and survey control points prior to starting work.
- F. Contractor shall promptly notify the Owner of any discrepancies discovered. Contractor shall also verify layouts periodically during work.

- G. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- H. Submit copy of Site Contract Drawing and certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- I. Contractor shall develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, piping layouts, and all other working lines, elevations, and cut sheets.
- J. Contractor shall provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else required. All material shall be of sound professional quality.
- K. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work. Calibration certificates shall be submitted to the Owner prior to use of any instrument.
- L. Contractor shall establish additional control, including baselines, as is required for performance of the work. These shall be tied into the site reference points.
- M. Maintain complete and accurate log of control and survey work as work progresses.
- N. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- O. Promptly report to Owner loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- P. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Owner.
- Q. It shall be the duty of the Contractor to keep the Owner informed of the times and places at which work will be conducted in order that the Owner may have an ample opportunity to furnish and/or check the lines and elevations with a minimum of inconvenience to the Owner or delay to the Contractor.
- R. All surveys shall be plus or minus 0.01 feet, and for horizontal control angles shall be to the nearest 20 seconds plus or minus 10 seconds and measured distances shall be to plus or minus 0.01 feet.
- S. Complete topographic surveys to be used as the basis for measurement of payment quantities for fixed unit price items.
 - 1. Surveys shall be conducted via field survey grid method for work conducted in accordance with the Contract Documents. Points shall include all slope features and perimeter of work being surveyed. A maximum size 25-foot × 25-foot grid shall be used, and the tolerance shall be 0.1-foot or less. Alternative methods may be used as proposed by the Contractor and approved by the Owner.

2. Surveys shall be based on the horizontal and vertical datum as shown in the Contract Drawings.
- T. Final As-Built Survey: Prior to Substantial Completion, prepare final as-built survey illustrating locations, dimensions, angles, and elevations of buildings and site work that have resulted from construction indicating their relationship to permanent bench marks and property lines.
 1. Show significant features (real property) for project.
 2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of project are accurately shown.

1.4 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of site and construction throughout progress of work produced by an experienced photographer acceptable to Owner.
- B. Each month submit photographs with Application for Payment.
- C. Take photographs as evidence of existing project conditions prior to initiating on-site work.
- D. Progress Photographs. Digital color photographs shall be used to document progress of the work. A minimum of four views of the site showing the location, entrance/exit road, and any other notable site conditions shall be taken before work begins. After work has been started, activities at each work location shall be photographically recorded weekly indicating relative progress of work, one day prior to each progress meeting.
- E. Digital Images: Deliver complete set of digital image electronic files on CD-ROM to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
 1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 12.0 megapixels, and image resolution of not less than 1600×1200 pixels.
 2. Date and Time: Include date and time in filename for each image.

1.5 RESTORATION

- A. Prior to final acceptance of the project, the site shall be restored to its original condition prior to construction, unless otherwise indicated in the Specification and Contract Drawings. This shall include, but not be limited to, staging and stockpiling areas, construction strips, access roads and all areas within the limits of work.
- B. Final restoration shall include seeding and acceptance by the Owner. Disassemble and remove all temporary construction facilities constructed by the Contractor and leave the site in an orderly and restored condition.
- C. Preserve signs, markers, guard rails, bollards, survey control points, and fences in their existing locations and conditions unless written permission is obtained from the Owner for their removal and restoration or their replacement. Upon approval from the Owner, remove such facilities as conflict with the design when grading operations begin and store them to keep them clean and in their existing condition. Restore them to their previous locations or new locations as directed. Repair or replace damaged items as directed by the Owner, at no additional cost to Owner.

- D. Gravel surfaces shall be restored to condition as shown in plans, or as directed by Owner.
- E. All turfed areas disturbed during construction shall be re-seeded in accordance with Section 32 92 19 – Turf Establishment, unless otherwise specified or directed by the Owner.
- F. Temporary berms, roads, and other temporary facilities shall be removed prior to final acceptance of the work, unless otherwise specified or directed by the Owner.
- G. Asphalt or concrete streets, parking lots, sidewalks, or hiker/biker trails shall be returned to preconstruction conditions.
- H. Any fencing or posts removed during construction shall be replaced to its original condition.

1.6 CLOSEOUT PROCEDURES

- A. Substantial and Final Completion as discussed in this Section excludes the Maintenance Period. Maintenance Period completion requirements are discussed in Section 32 01 00 – Maintenance Period.
- B. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire work or for portions of work:
 - 1. Submit maintenance manuals, project record documents, digital images of construction photographs, and other similar final record data in compliance with this section.
 - 2. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
 - 3. Discontinue or change over and remove temporary facilities and services from project site, along with construction tools, mockups, and similar elements.
 - 4. Perform final cleaning according to this section.
- C. Substantial Completion Inspection:
 - 1. When Contractor considers work to be substantially complete, submit to Owner:
 - a. Written certificate that work, or designated portion, is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).
 - 2. Within 10 days after receipt of request for Substantial Completion, Owner and Engineer will make inspection to determine whether work or designated portion is substantially complete.
 - 3. Should Owner determine that work is not substantially complete:
 - a. Owner will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Owner.
 - c. Owner and Engineer will re-inspect work.
 - d. Redo and Inspection of Deficient Work: Repeated until work passes Owner's inspection.
 - 4. When Owner finds that work is substantially complete, Owner will:
 - a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Owner and Engineer (final punch list).

- b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
 - 5. After work is substantially complete, Contractor shall:
 - a. Allow Owner occupancy of project under provisions stated in Certificate of Substantial Completion.
 - b. Complete work listed for completion or correction within time period stipulated.
- D. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
 - 1. The Vegetation Establishment Period shall be complete and approved by the owner as discussed in Section 32 90 00 – Planting prior to the Contractor submitting request for final inspection.
 - 2. When Contractor considers work to be complete, submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
 - 3. Submittals: Submit following:
 - a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
 - d. Accounting statement for final changes to Contract Sum.
 - e. Contractor's affidavit of payment of debts and claims.
 - f. Contractor affidavit of release of liens.
 - g. Consent of surety to final payment.
 - 4. Perform final cleaning for Contractor-soiled areas according to this section.
- E. Final Completion Inspection:
 - 1. Within 5 days after receipt of request for final inspection, Owner and Engineer will make inspection to determine whether work or designated portion is complete.
 - 2. Should Owner consider Work to be incomplete or defective:
 - a. Owner will promptly notify Contractor in writing, listing incomplete or defective work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Owner that Work is complete.
 - c. Owner and Engineer will re-inspect work.
 - d. Redo and Inspection of Deficient Work: Repeated until work passes Owner's inspection.

1.7 PROJECT RECORD DOCUMENTS

- A. Maintain onsite one set of the following record documents; record actual revisions to the work:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other modifications to the Contract
 - 5. Reviewed Contract Drawings, product data, and samples

6. Manufacturer's instruction for assembly, installation, and adjusting
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product section, description of actual products installed, including the following:
 1. Manufacturer's name and product model and number
 2. Product substitutions or alternates used
 3. Changes made by Addenda and modifications
- F. Record Drawings and Contract Drawings: Legibly mark each item to record actual construction as follows:
 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the work, and change orders.
 2. Identify actual excavation and final grades and limits.
 3. Include locations of concealed elements of the work.
 4. Identify and locate existing buried or concealed items encountered during project.
 5. Measured horizontal and vertical locations of any underground utilities and appurtenances encountered, referenced to permanent surface improvements.
 6. Field changes of dimension and detail.
 7. Details not on original Contract Drawings.
 8. Scale Contract Drawings showing limits of each excavation, limits of contamination, sample locations, and sample identification numbers. Onsite stockpile, storage, treatment, loading, and disposal areas shall also be shown on the Contract Drawings.
- G. Final as-built surveys shall include a Surveyor's RLS stamp.
- H. Submit marked-up paper copy documents to Owner before Substantial Completion.
- I. Submit PDF electronic files of final documents to Owner prior to final application of payment (excluding maintenance period payments).

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.
- B. Verify that existing conditions are capable of structural support or attachment of new work being applied or attached.

- C. Examine and verify specific conditions described in individual Specification sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at project site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Owner before proceeding.
- C. Verify that field measurements are as indicated on approved Contract Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
- E. Clean and perform maintenance on installed work as frequently as necessary through remainder of construction period.
- F. After each survey, Contractor shall submit report to Owner indicating observations and results of survey and indicate compliance or non-compliance with Contract Documents. Contractor's independent surveyor shall provide interpretation of survey. Include the following:
 - 1. Date issued
 - 2. Project title and number
 - 3. Names of field personnel
 - 4. Date and time of survey
 - 5. Identification of product and Specifications section
 - 6. Location at the site
 - 7. Description of survey (excavation, final grade, etc.)
 - 8. Electronic survey data in .csv format
 - 9. 3 dimensional lines of slope/grade changes, (AutoCAD)
 - 10. Surveyor estimated work quantities
 - 11. Comparison from actual work to designed work

3.3 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed work and provide special protection where specified in individual Specification sections.
- B. Control activity in immediate work area to prevent damage.

3.4 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.

B. Clean site; sweep paved areas

C. Remove waste and surplus materials, rubbish, and construction facilities from site.

END OF SECTION

SECTION 02 41 19 –DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Demolition includes furnishing all labor, materials, tools, and equipment needed for demolition work as defined on the Contract Documents. This includes but is not limited to demolition of the existing dam and existing pipes and manhole in dam, as well as rubble removal.

1.2 SUBMITTALS

- A. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.
 - 1. Dam demolition should not occur until Phase 1 restorations (from the railroad culvert to the boxcar) are completed as the pond acts as erosion and sediment control.
- B. Contract Drawings:
 - 1. Indicate demolition and removal sequence.
 - 2. Indicate location of items designated for reuse.
 - 3. Indicate location and construction of temporary work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 PREPARATION

- A. Notify affected utility companies before starting work and comply with their requirements.
- B. Mark location and termination of utilities.

3.2 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall perform all demolition activities in accordance with Federal, State, and local standards, where applicable.
- B. Demolition work shall not begin in any portion of the site until all have been dewatered and cleaned to the extent possible with piping and equipment still in place.
- C. Completely demolish and remove portions of structures as defined on the Contract Documents, including all appurtenances related or connected thereto, necessary to accommodate new construction.

- D. Debris removed from creek, including equipment, concrete, metals or other demolished materials shall become property of Contractor and shall be disposed of by Contractor, in accordance with all applicable laws and regulations.
- E. Explosives and Blasting are NOT permitted in performance of demolition work.

3.3 PROTECTION

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Protect existing building components, equipment, and site work from damage except for those portions of the existing facility that are required to be demolished.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.
- C. The Contractor shall adhere to all local and Federal requirements for confined space entry and perform applicable work accordingly.
- D. Prevent spread of flying particles and dust. Rubbish and debris shall be sprinkled with water to keep dust to a minimum.
- E. Do not use water to the extent it causes flooding, contaminated runoff, or icing.
- F. Break concrete into less than 3 feet in any dimension.
- G. Install watertight plugs in ends of abandoned piping and conduit.
- H. All local and federal fire and safety regulations shall be observed in performance of work and include the following:
 - 1. Whenever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. All possible users shall be instructed in use of fire extinguishers.
 - 2. Hydrants shall be accessible at all times. No debris shall be permitted to accumulate within a radius of 15 feet of fire hydrants.
- I. Debris shall not accumulate on golf course as to cause hindrance to play.
- J. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials onsite.
- K. Remove materials as work progresses. Upon completion of work, leave areas in clean condition.
- L. Remove temporary work.

3.4 CLEAN-UP

- A. On completion of work of this section and after removal of all debris, site shall be left in clean condition satisfactory to Owner. Cleanup shall include disposal offsite of all items and materials not required to perform the remainder of the work as all debris and rubbish resulting from demolition operations.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Reinforcing bars.
 2. Reinforcement accessories.

1.2 REFERENCES

- A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
 2. ACI 318 - Building Code Requirements for Structural Concrete.
 3. ACI SP-66 - ACI Detailing Manual.
 4. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
1. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
 2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate bar sizes, spacing, locations, and quantities of reinforcing steel, bending and cutting schedules, and supporting and spacing devices.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store rebar off ground in ventilated and protected manner to prevent deterioration from moisture.

1.5 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions

2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with ACI 318.
- B. Form standard hooks for 90 degree bend.
- C. Form reinforcement bends with minimum diameters in accordance with ACI 318.
- D. Form reinforcement bends with minimum diameters in accordance with ACI 318. Reinforcement shall be cold bent. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete.
- E. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.
- F. Locate reinforcement splices at point of minimum stress. Review location of splices with Engineer. Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
- B. Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other enforcement or embedded items, the resulting arrangement of bars,

including additional bars required to meet structural requirements, shall be approved before concrete is placed.

- C. Accommodate placement of formed openings.
- D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.
 - 1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

3.2 ERECTION TOLERANCES

- A. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth Tolerance	Concrete Cover Tolerance
plus or minus 3/8 inch	minus 3/8 inch

- B. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

- A. Section 01 45 00 - Quality Control.
- B. Perform field inspection in accordance with ACI 318.
- C. Provide free access to Work and cooperate with Engineer.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
1. Footings.
 2. Abutments.
 3. Cart Paths.

1.2 REFERENCES

- A. American Concrete Institute:
1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 2. ACI 301 - Specifications for Structural Concrete.
 3. ACI 305 - Hot Weather Concreting.
 4. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 5. ACI 308.1 - Standard Specification for Curing Concrete.
 6. ACI 318 - Building Code Requirements for Structural Concrete.
 7. ACI 347 - Guide to Formwork for Concrete.
- B. ASTM International:
1. ASTM C33 - Standard Specification for Concrete Aggregates.
 2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 3. ASTM C150 - Standard Specification for Portland Cement.
 4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 5. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
 6. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
 7. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 8. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
 9. ASTM C1582 - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Abutment Subgrade Bearing Capacity
- C. Product Data:
1. Submit certified concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.

2. Identify mix ingredients and proportions, including admixtures.
- D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.
- E. Submit Testing results for concrete slump, air, temperature, and strength.
- F. Submit certified delivery tickets for concrete showing the following information:
 1. Water-Cement ratio (by weight)
 2. Mix proportions
 3. Source and type of cement
 4. Type and name of admixtures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Conform to ACI 305 when concreting during hot weather.
- C. Conform to ACI 306.1 when concreting during cold weather.
- D. Acquire cement and aggregate from one source for Work.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type IA - Air Entraining Portland type.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494
 1. Type A - Water Reducing
 2. Type B - Retarding
 3. Type D - Water Reducing and Retarding
 4. Type F - Water Reducing, High Range
 5. Type G - Water Reducing, High Range and Retarding

2.3 ACCESSORIES

- A. Corners: Chamfer, wood strip type, maximum possible lengths.

- B. Sealant: The holes and exposed steel produced on all surfaces by the removal of form ties, cone-bolts, and she-bolts shall be cleaned, wetted, and filled with a dry-pack mortar as listed below.
 - 1. The mortar will consist of one part portland cement, three parts sand that will pass a No. 16 sieve, and just sufficient water to produce a consistency such that the filling is at the point of becoming rubbery when the material is solidly packed.
 - 2. The asphalt sealant shall be Watchdog Waterproofing, Econolite-T or other equivalent sealant as approved. The sealant must be placed over the exposed metal and extend 4 inches around the metal with a minimum thickness of 1/8 inch and must be approved prior to backfill of the building.
- C. Waterstop: Flexible strip of bentonite waterproofing compound in coil form for joints in concrete construction.
 - 1. Henry, model HF302 – Hydro-Flex Waterstop
 - 2. Or Approved Equal
- D. Non-Shrink Grout: ASTM C1107/C1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.
- E. Bonding Agent: W.R. Meadows Intralok #350 or approved equivalent. Shall not be an epoxy bonding agent.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler Type A: ASTM D994; Asphalt impregnated fiberboard or felt, 1 inch thick; tongue and groove profile.

2.5 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.
- B. Provide concrete to the following mix design:

<u>Unit</u>	<u>Measurement</u>
Compressive Strength (28 day)	4,000 psi
Cement	564 pounds
Water/Cement Ratio (maximum)	0.4 by weight (mass)
Entrained Air %	5-7%
Slump	4 inch max.

- C. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved through submittal process.
 - 1. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 SUBGRADE

- A. Contractor shall prepare subgrade in accordance with Section 31 23 23 – Fill.
- B. Contractor shall verify the subgrade bearing capacity, via geotechnical testing, prior to placing concrete abutments.
- C. Abutment subgrade bearing capacity shall be minimum 2,000 pounds per square inch.

3.3 PREPARATION

- A. Clean previously placed concrete and steel by sand blasting and with steel brush. The existing culvert floor and exposed rebar shall be sand blasted to Brush-Off Blast (Grade SSPC 7). Brush-off blast is defined as one in which all oil, grease, dirt, rust scale, loose mill scale, loose rust and loose paint or coating are completely removed. Tight mill scale and tightly adherent rust and paint or coatings may remain as long as the entire surface has been exposed to abrasive blasting.
- B. Allow inspection of cleaned concrete surfaces prior to applying bonding agent.
- C. Apply bonding agent to the top surface of the existing concrete according to the manufacturer's recommendations. Use the manufacturer's mixing and installation instructions for use as a bonding agent/adhesive/slurry. Bonding agent installation shall be observed, and it shall be inspected by the Owner prior to installation of the new concrete. Conform to galvanic anode requirements when applying the bonding agent.
- D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- E. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- F. Remove water from areas receiving concrete before concrete is placed.
- G. Prepare the subgrade according to Section 31 23 23 - Fill.

3.4 COLD AND HOT WEATHER REQUIREMENTS

- A. Cold Weather: Except with authorization, do not place concrete when the ambient temperature is below 40 °F or when the concrete is likely to be subjected to freezing temperatures within 24 hours.
- B. Hot Weather: the temperature of the concrete as placed shall not exceed 90 °F.

3.5 FORMWORK INSTALLATION

- A. Earth Forms:
 - 1. Earth forms are not permitted.
- B. Formwork - General:
 - 1. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 2. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 - 3. Complete wedging and bracing 24 hours before placing concrete.
- C. Framing, Studding and Bracing:
 - 1. Space studs at 16 inches on center maximum for nominal 2-inch boards and 12 inches on center maximum for plywood.
 - 2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 3. Construct beam soffits of material minimum of 2 inches thick.
 - 4. Distribute bracing loads over base area on which bracing is erected.
 - 5. When formwork is placed on ground, protect against undermining, settlement or accidental impact.
- D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- F. Obtain Owner's approval before framing openings in structural members not indicated on Drawings.
- G. Install chamfer strips on external corners of walls.
- H. Do not reuse wood formwork more than 1 time for concrete surfaces to be exposed to view. Do not patch formwork.
- I. Maximum variation (tolerance) from lines and grades shown in the Drawings: ½ inch.

3.6 FORMWORK INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.

- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install water stops continuous without displacing reinforcement.
- E. Form Ties:
 - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Leave inner rods in concrete when forms are stripped.
 - 3. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- F. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- G. Openings for Items Passing Through Concrete:
 - 1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - 2. Coordinate work to avoid cutting and patching of concrete after placement.
 - 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

3.7 CONVEYING

- A. Concrete shall be delivered to the site and discharged into the forms within 1½ hours after the introduction of the cement to the water and aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.
- B. The Owner may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that prevent segregation of the aggregates and assure no loss of mortar occurs.

3.8 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify Owner a minimum of 24 hours prior to commencement of concrete placement. Concrete shall not be placed until the subgrade, forms, steel reinforcement, and embedded items have been inspected and approved by the Owner. No concrete shall be placed except in the presence of the Owner. Deficiencies are to be corrected before concrete is delivered for placing. On arrival at the job site, no water will be added other than that required initially to adjust to the specified slump.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

- D. The free drop of concrete shall not exceed 5 feet without the use of adjustable length pipes.
- E. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
- F. Deposit concrete at final position. Prevent segregation of mix.
- G. Place concrete in continuous operation for each panel or section determined by predetermined expansion, control, and construction joints.
- H. Consolidate concrete immediately after placement.
- I. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- J. Do not interrupt successive placement; do not permit cold joints to occur.

3.9 CONCRETE FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301.
- B. Steel trowel surfaces which are indicated to be exposed.
- C. Adding dry cement or water to the surface of the screeded concrete to expedite finishing is not allowed.

3.10 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 1. Protect concrete footings from freezing for minimum 5 days.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.11 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and until removal has been approved by Owner.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.12 FIELD QUALITY CONTROL

- A. Section 01 45 00 - Quality Control
- B. Provide free access to Work and cooperate with Owner.
- C. Notify Owner after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork and reinforcing steel inspection before placing concrete.
- E. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
 - 3. Sample concrete and make one set of three cylinders for every 100 yd³ or less of each class of concrete placed each day and for every 5,000 ft² of surface area for slabs and walls.
- F. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: ASTM C173/C173M.
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump and temperature for each compressive strength concrete sample.
 - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- G. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39/C39M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Test one cylinder at 7 days.
 - 4. Test one cylinder at 28 days.
 - 5. Retain one cylinder for testing if specified strength is not achieved at 28 days. Test cylinder when directed by Owner.
 - 6. Dispose of remaining cylinders if testing is not required.

3.13 PATCHING

- A. Allow Owner to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Owner upon discovery.
- C. Patch imperfections in accordance with ACI 318.

3.14 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Owner.

- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner for each individual area.

END OF SECTION

SECTION 03 40 00 - PRECAST CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Box Culvert.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C 1433 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers (AASHTO M259)
- B. American Association of State Highway and Transportation Officials
 - 1. AASHTO M 259 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

1.3 SUBMITTALS

- A. Product Data: Submit data on precast box culverts
- B. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from materials suppliers attesting that precast concrete sumps meet or exceed ASTM Standards and specification requirements.
- C. Manufacturer's Installation Instructions: Submit special procedures for precast concrete box culvert installation.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle precast concrete units with equipment designed to protect units from damage.
- B. Do not place concrete units in position to cause overstress, warp, or twist.

PART 2 MATERIALS

2.1 BOX CULVERT

- A. Manufacturers:
 - 1. Old Castle Precast
 - 2. Rinker Materials
 - 3. Or approved equivalent

- B. Box Culvert Materials:
 - 1. Minimum 28-day Compressive Strength: 4,000 psi.
 - 2. Honeycombed or retempered concrete is not permitted.

2.2 BEDDING MATERIALS

- A. Crushed Rock. See Section 31 23 23 - Fill.

2.3 FABRICATION AND MANUFACTURE

- A. Fabricate precast reinforced concrete structures in accordance with ASTM C 1433, to dimensions indicated on Drawings, and to specified criteria.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify location and elevations are as indicated on Drawings.

3.2 INSTALLATION

- A. Excavate in accordance with Section 31 23 16 - Excavation. Hand trim excavation for accurate placement of vaults to elevations indicated.
- B. Place bedding and backfill material level in one continuous layer not exceeding 6 inches compacted depth.
- C. Backfill around sides of box culvert, tamped in place by hand. Ensure box culvert is level and stable after placement and after each lift.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. The following signs shall be provided:
 - 1. Interpretive signage for public outreach
- B. No signs, except those specified, shall be displayed unless approved by the Owner.

1.2 SUBMITTALS

- A. Submit for approval the following:
 - 1. Type and grade of materials.
 - 2. Layout, size, trim, framing, supports, and coatings.
 - 3. Size and style of lettering.
 - 4. Samples of colors.

PART 2 PRODUCTS

2.1 INTERPRETIVE SIGN

- A. Manufacturer:
 - 1. Fossil Industries, Inc. www.fossilgraphics.com, 1-631-254-9200
 - 2. Pannier Graphics, www.panniergraphics.com, 1-800-544-8428
 - 3. Or equal
- B. Interpretive signage shall highlight the public benefit of the projects.
 - 1. All graphic layouts and designs shall be provided by the Owner. Signs shall be full color and identify project sponsors and partners, Engineer, and the Contractor.
 - 2. Sign shall be 24 × 36 inch panels and have cantilevered mounting structures.
 - 3. Panels shall be exterior grade laminate or similar suitable material.
 - 4. Sign frames shall be either powder coated steel or colored aluminum.
 - 5. Frames and panels shall have a 10 year product warranty.

PART 3 EXECUTION

3.1 INTERPRETIVE SIGN

- A. The interpretive sign shall be installed where shown on the Contract Drawings.
- B. Install with footing as shown on the Contract Documents.

END OF SECTION

SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes requirements of a general nature related to the Contractor's responsibility for the clearing and grubbing of all areas within the proposed cut and fill areas in accordance with the Contract Documents.

1.2 DEFINITIONS

- A. Clearing is the removal from the ground surface and disposal of trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish, and debris, as well as the removal of fences and incidental structures.
- B. Grubbing is the removal and disposal of all stumps, buried logs, roots larger than 2 inches, matted roots, and organic materials.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Examination
- B. Verify existing conditions before starting work.
- C. Verify existing plant life designated to remain is tagged or identified.
- D. Identify invasive species.
- E. Identify waste area for placing removed materials.

3.2 PREPARATION

- A. Call Miss Dig System, Inc. (800) 482-7171, and receive clearance not less than two working days before performing work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect utilities from damage unless Contract Drawings indicate otherwise or Owner approves their removal.

- B. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 GENERAL

- A. Vegetation within the limit of work shall not be removed unless otherwise indicated in the Contract Documents. Do not cut or damage trees outside the limit of work unless so indicated or unless written permission has been obtained. Such permission shall be furnished to the Owner before removal operations commence.

3.5 INVASIVE SPECIES

- A. Control invasive species according to Section 32 97 00 Invasive Species Control.

3.6 CLEARING AND GRUBBING

- A. Clear all items specified herein to the limits indicated to perform the work for the given work day and remove cleared and grubbed material from the site to the areas identified on the approved Clearing and Grubbing Plan. Do not start earthwork operations in areas where clearing and grubbing is not complete, with the exception that stumps and large roots may be removed concurrent with excavation. Contractor shall comply with erosion and sediment control as shown and specified within the Contract Documents. Do not clear and grub beyond that needed for incremental segments of work; limit disturbed area.
- B. Clear and grub areas to be excavated, to receive fill, and areas upon which structures are to be constructed. Remove all trees, stumps, and root mats in these areas and dispose of at locations indicated on the Contract Drawings. Depressions made by the removal of stumps or roots shall be filled with soils material suitable for backfill.
- C. Clear undergrowth and deadwood, without disturbing subsoil
- D. Clear trees for access to site and execution of work to the existing ground surface as directed by Owner. Do not clear trees without Owner approval. The Contractor shall schedule a site walk with the Owner to field-verify the locations of the existing trees identified for removal. Only with the approval of the Owner shall the Contractor proceed with the removal of an existing tree greater than 3 inches in diameter.
 - 1. If the Owner identifies a tree to remain, the Contractor shall modify his/her construction operations to avoid and protect the existing tree at no additional cost to the Owner, or increase in construction schedule.
 - 2. A temporary fence or marking flag shall be installed by the Contractor around trees to remain in place.
 - 3. The Contractor shall take suitable precaution to prevent damage to trees marked for protection, and shall protect root systems and overhead branches from disturbances or damages when possible.
- E. Do not injure vegetation that has been labeled to be preserved. The Contractor will be responsible for all damage or injury to the property during the prosecution of the work, resulting from any act, omission, neglect, or misconduct while executing work including due to defective work materials. Should damage occur, Contractor shall restore, at his own expense, to the

original state or equal. If Contractor does not restore any damage, the procurement officer may, upon 48-hours notice, restore the damaged vegetation and the cost will be deducted from monies due under this Contract.

3.7 REMOVAL

- A. Continuously cleanup and remove waste materials from site. Do not allow materials to accumulate onsite, unless re-use is planned for the material and material is placed in stockpile areas.
- B. Cleared trees and limbs, if any, shall be temporarily stockpiled and used for beneficial purposes on the site as woodchips or woody habitat structures as required by the Contract Documents, or removed from the site.
- C. Do not burn or bury materials onsite, unless specifically stated otherwise. Leave site in clean condition.

3.8 TOPSOIL

- A. Contractor shall strip existing topsoil to be reused prior to commencement of excavating or grading and place in well-drained stockpiles at a location within erosion and sediment controls.
- B. Do not remove topsoil from site.

END OF SECTION

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavation includes
2. Grading
3. Preparation
4. Site clean-up
5. Excavation
6. Use of excavated materials
7. Disposal of unsuitable materials
8. Rock excavation
9. Frozen material
10. Excavation beyond specified limits
11. Unsuitable material and undercuts
12. Placement of salvaged materials
13. Stabilization
14. Protection
15. Conditions

- B. All excavation is specified on the plans and in the Contract Documents. The Contractor shall use all suitable materials, including topsoil, subsoil, and channel bed material as specified in the Contract Documents.

1.2 EXCAVATION INCLUDES

- A. Cut areas within the boundary faces of the cross-sections specified in the Contract Documents, including excavation within the channel, banks, or floodplain for stream channel restoration activities. This shall include excavation for the installation of stone structures, channel bed materials, and bank treatment techniques, as specified on the Contract Documents and in these Specifications.
- B. Demolition and/or removal of debris from the stream channel, including trees indicated for removal; and debris jams, tires, concrete lining, and broken up concrete and other materials as designated by the Owner.
- C. Additional rock encountered within the stream channel that may be handled by the same tools and equipment used for channel or stream excavation under this Contract. Bedrock excavation is not included in this Specification and not anticipated as necessary.
- D. When excavating for stream, wetland, and channel restoration or other facilities indicated on the plans, the Contractor will encounter wet or saturated soils. The Contractor shall be prepared to dewater and transport saturated soil offsite in a manner that prevents discharge or spillage of soils or water onto adjacent properties or roads. Should any discharge occur, the Contractor shall be responsible for immediate and complete cleanup.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 GRADING

- A. The layout of the grading shall be as shown on the Contract Drawings (plans and cross-sections). Grading shall transition smoothly between cross-sections, with no abrupt changes in channel geometry.

3.2 PREPARATION

- A. Identify utilities and perform clearing in accordance with Section 31 11 00 – Clearing and Grubbing.
- B. Identify required lines, levels, contours, and datum.
- C. Protect utilities indicated to remain from damage.
- D. Protect plant life, and other features remaining as portion of final grading.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SITE CLEANUP

- A. Prior to excavation, the site shall be cleaned of all non-desirable items such as waste concrete, metal, vegetation debris, and rubbish prior to stockpiling. The Contractor shall be responsible for removing as much unnatural or undesirable material as possible prior to salvaging and stockpiling of the suitable onsite materials. Disposal of non-desirable material shall be the responsibility of the Contractor.

3.4 EXCAVATION

- A. Excavate to the lines and grades shown on the Contract Drawings.
- B. Notify Owner of unexpected subsurface conditions.
- C. Slope banks with machine to angle of repose or less until shored.
- D. Do not interfere with 45 degree bearing splay of foundations.
- E. Underpin adjacent structures which may be damaged by excavation work.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. Trim excavation. Remove loose matter.
- H. Repair or replace items indicated to remain if they are damaged by excavation.

3.5 USE OF EXCAVATED MATERIALS

- A. No excavated material shall be wasted without prior approval of the Owner. Borrow shall not be used unless provisions have been made for utilizing all available suitable excavated material in embankments.

3.6 DISPOSAL OF UNSUITABLE MATERIALS

- A. Existing debris, concrete, waste, and other unsuitable materials, as determined by these Specifications or by the Owner, shall be removed from the site and shall be disposed of at a site with an approved erosion and sediment control permit.

3.7 ROCK EXCAVATION

- A. Boulders and Rock: Boulders and rock from the excavation may not be broken and used for any of the proposed in structures unless authorized by the Owner or provided for in the Contract Documents.
- B. Blasting: The Contractor shall obtain prior approval from the Owner before performing any rock blasting necessary to complete the excavation to the grades and lines indicated on the plans.
- C. Pre-splitting: The Contractor shall obtain prior approval from the Owner before performing any pre-splitting activities necessary to complete the excavation to the grades and lines indicated on the plans.

3.8 FROZEN MATERIAL

- A. Frozen material shall not be placed in embankments. It shall be stockpiled outside of the construction limits and reserved for future use at a time when its condition is acceptable to the Owner. Re-handling of the excavated material shall be at the expense of the Contractor. Any material which is wasted shall be replaced by the Contractor with approved material at no expense to the Owner.

3.9 EXCAVATION BEYOND SPECIFIED LIMITS

- A. The widening of cut or excavation sections beyond the limits of the cross-sections, as specified in the Contract Documents, is prohibited in all instances except by written order from the Owner.

3.10 UNSUITABLE MATERIAL AND UNDERCUTS

- A. Unstable or other unsuitable material encountered at or below the lowest normal excavation limit, as specified in the Contract Documents, shall be undercut and removed to the extent directed by the Owner. In rock areas, the limit of measurement for excavation will be at the bottom of the normal plan section. All voids created by the removal of unsuitable material and undercuts, except when rock is encountered at subgrade, shall be backfilled to the lines and grades specified in the Contract Documents. Backfill material for undercuts shall conform to materials specified and shall be incidental to the excavation.

3.11 PLACEMENT OF SALVAGED MATERIALS

- A. Salvaged suitable materials meeting the Specifications described in the Contract Documents shall be placed as specified in stockpiles that meet erosion and sediment control requirements.

3.12 STABILIZATION

- A. The Contractor shall be responsible for temporary and permanent stabilization of all excavation areas, immediately after the completion of grading, as specified in the Contract Documents. The Contractor shall perform all care and remediation work required to maintain stable stream banks, including erosion and sediment control.

3.13 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

3.14 CONDITIONS

- A. The Contractor should anticipate adverse excavation conditions. Saturated soils, contact with groundwater, woody debris and organic muck are anticipated. No additional payment shall be made for adverse conditions of excavation, or delay or work associated with those conditions.

END OF SECTION

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Subgrade Preparation
 - 2. Topsoil
 - 3. Compacted Fill
 - 4. Leaf Mold
 - 5. Channel Bed Fill Material
 - 6. Channel Sand and Gravel
 - 7. Crushed Rock
 - 8. Subgrade
 - 9. Final Grading

1.2 SUBMITTALS

- A. Requirements of Submittals: Section 01 33 00 - Submittal Procedures.
- B. Product Data:
 - 1. Submit fill material data and certification that materials are not contaminated.
 - 2. Submit compaction test results.
- C. Materials Source: Submit name of commercial imported fill materials suppliers.
- D. Surveys showing fill does not exceed existing grades as surveyed prior to removal.
- E. Submit minimum 10 oz. sample of imported topsoil proposed.
- F. Submit minimum 10 oz. sample of imported clay proposed and geotechnical testing results.
- G. Geotechnical Testing: The contractor shall submit results of geotechnical testing.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Contractor shall provide fill materials.
- B. Material shall not be transported until Owner has approved geotechnical test results.
- C. Topsoil:
 - 1. Friable loam; free of subsoil, roots, grass, weeds, large stone, and foreign matter.
- D. Compacted Fill:

1. Clay or Silty Clay.
2. Clay shall contain a mixture of silt and clay-sized particles, and exhibit low to moderate plasticity. Minimum requirements for cohesive properties are plasticity index equal to or greater than 15 percent and a liquid limit greater than or equal to 40 percent in accordance with ASTM D4318. Organic-rich fine-grained sources are not permitted.
3. Meet compaction requirements of this section.
4. Material shall have a maximum dry density of not less than 100 lb/ft³ (1600 kg/m³).
5. Frozen material will not be approved for use as subsoil.
6. Free of foreign material larger than 3 inches.
7. Should not contain an appreciable amount of roots, rock, or debris.

E. Leaf Mold

1. Leaf mold shall consist of partially composted leaves, sourced from municipal collection or composting facilities. Leaf mold will be free of plastic, bags, and non-decomposable materials. Leafs should be sourced from deciduous trees and have limited pine straw content. Leaf mold may contain up to 15% woodchips, twigs and other woody debris, and no more than 10% grass clippings, straw. Topsoil, compost, sawdust, ashes or filler shall not be allowed.

F. Channel Bed Fill Material

1. Channel bedfill material shall be furnished to meet the following gradation specifications. Channel bed fill material shall not be composed of Riprap. Stones shall be angular in shape and brown in color, no white or blue rock will be accepted. No limestone shall be accepted; only stone conforming to the native geology of the site shall be accepted. Stone shape shall be preferred to be angular and tabular; rounded or cube-like stone shall be deemed unacceptable. The Owner shall approve the size and composition of all channel bed fill material prior to hauling to the site.

<u>Sieve Size</u>	<u>Percent Passing</u>
18"	100
12"	84
8"	50
6"	35
4"	16
2"	0

G. Channel Sand and Gravel

1. Channel Sand and Gravel shall be furnished to meet the following gradation specifications. Furnished Channel Sand and Gravel shall not be composed of Riprap. Sand and stones shall be brown in color, no white sands or stones will be accepted. No limestone shall be accepted; only stone conforming to the native geology of the site shall be accepted. The Owner shall approve the size and composition of all Furnished Channel Sand and Gravel prior to hauling to the site.

<u>Sieve Size</u>	<u>Percent Passing</u>
2.5"	100
1"	84
0.5"	50
#40	35
#200	16
Pan fines	0

H. Crushed Rock:

1. Crushed Rock for bedding shall consist of clean, well graded, hard particles of crushed limestone, quartzite or dolomite. Sources for crushed rock shall be approved by the Owner.
2. Gradation: Crushed rock for bedding shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4"	100
#10	50-75
#40	25-45
#200	0-10

3. Soundness: Bedding shall have a percent loss of not more than 30 at the end of 16 cycles of freezing and thawing in accordance with AASHTO Method T-103.
4. Abrasion: Bedding, when tested for abrasion by AASHTO Method T-96, Grade B, shall have a percentage of wear of not more than 45 percent.

I. Subgrade: Subgrade shall be considered as the soil surface on which a subsequent layer or layers of base course cobble, gravel surfacing, surface treatment, pavement, or other material is to be placed. Prior to the deposition of any material on the subgrade, it shall be prepared to the satisfaction of the Owner.

J. All imported fill materials shall be certified clean by borrow source provider.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Examination.
- B. Comply with all local, State, and Federal regulations.
- C. Verify structural ability of unsupported walls to support loads imposed by fill.
- D. Verify fill materials have been tested and approved by Owner prior to transporting fill material.
- E. Verify substrate base has been contoured and compacted.

3.2 SUBGRADE EXCAVATION

- A. Subgrade soil or previously existing, failed surfacing materials designated as undesirable by the Owner shall be excavated, removed, and disposed of at a time and place as directed by the Owner. The disposal sites shall be leveled and trimmed to leave a neat and tidy appearance. The excavated areas shall be immediately backfilled with material as designated by the Owner.

3.3 PREPARING SUBGRADE SURFACE

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Compacted Fill of Channel Bed Fill Material and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 3 inch.
- D. When material varies from optimum moisture content, it shall be treated in the following manner. When a deficiency in moisture content exists, the material shall be watered and thoroughly mixed until optimum moisture content is attained. When an excess in moisture content exists, the material shall be worked and aerated until optimum moisture content is attained.
- E. Any large rocks encountered during the subgrade preparation process which constitute as a hazard, due to size or protrusion from the finished subgrade, shall be removed and disposed of as directed by the Owner.
- F. The finished subgrade surface shall be firm and uniform, true to grade and cross-section, and shall be approved by the Owner before placing subsequent material thereon. Subgrade that does not conform to the requirements as to grade, cross section, moisture content or density shall be reworked until such requirements are met.

3.4 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Place material in continuous layers of maximum 8 inches loose depth compacted with a vibratory or sheepsfoot-type roller to a minimum of 95 percent of the maximum dry density (ASTM D698).
- C. Material that is shown to be less than 95 percent of the maximum dry density shall be reworked by the Contractor and retested until the material meets the compaction requirement at no additional cost to the Owner.
- D. Employ placement method that does not disturb or damage other work.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Make gradual grade changes. Blend slope into level areas.
- G. Remove surplus backfill materials from site.

3.5 CHANNEL BED FILL MATERIAL

- A. Suitable channel bed material is to be used in all areas of the stream, including riffle grade controls and preformed scour pools as identified in the Contract Drawings. The limits of channel bed fill material are in areas encompassing at a minimum the wetted width of the design channel, varying in width as directed by the Contract Drawings and typical sections. Tapering the width of channel bed fill material back between stone treatments shall be made gradually without sudden changes in the width. Channel bed fill material shall be placed to a minimum depth of 12-inches under-laying finished channel grade unless specified otherwise in the Contract Documents.

3.6 LEAF MOLD MATERIAL

- A. Leaf mold material will be installed under all channel bed material per the Contract Documents.

3.7 CHANNEL SAND AND GRAVEL

- A. Suitable channel sand and gravel is to be used in all areas of the stream, including riffle grade controls and preformed scour pools, as shown on the Contract Drawings.

3.8 TOPSOIL BACKFILL

- A. Backfill top 6 inches of excavations as shown on Contract Drawings with topsoil to existing grade.

3.9 FINISH GRADING

- A. After earthwork is completed, the disturbed areas shall be finish graded. Any roots, rocks larger than 3 inches in size, or other undesirable material shall be removed from the surface immediately and the surface shall be prepared for vegetative stabilization.
- B. Perform grading operations as shown on the Contract Drawings so that the ground surface will be well-drained at all times. Maintain benching and drainage ditches and keep them open and free from soil, debris, and leaves until final acceptance of the Work. Finish all grading on neat, regular lines conforming to the sections, lines, grades, and contours shown on the Contract Drawings, or if not shown, in accordance with the criteria set forth herein. Perform the grading work in proper sequence with all other associated operations.

3.10 FIELD QUALITY CONTROL

- A. Employ a Professional Geotechnical Engineer licensed in the State of Michigan to perform compaction testing.
- B. Contractor's independent Geotechnical Engineer shall test fill materials in accordance with the following:
 1. Material Classification: ASTM D 2487, 1 per fill site, 1 per 500 cubic yards (CY).
 2. Moisture Tests: ASTM D3017, 1 per fill site, 1 per 500 CY.
 3. Density Tests: ASTM D698, Method A, 1 per fill site, 1 per 500 CY.

- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Compaction testing is not required on topsoil. Avoid over-compacting topsoil.

3.11 TOLERANCES

- A. Surface elevations shall conform to the spot elevations specified on the Contract Drawings or as directed by the Owner. Tolerances of the finished structure are as follows:

Surface Elevation: ± 0.2 ft

Slope: ± 0.1 %

- B. Placed material not conforming to the specified tolerance limits shall be removed and replaced as directed by the Owner at no additional cost to the project.

3.12 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Prohibit construction traffic over finished fill.
- C. Reshape and re-compact fills subjected to vehicular traffic.
- D. Seed finished areas within 7 days in accordance with Section 32 92 19 – Turf Establishment to prevent erosion and dust. Contractor shall apply water to suppress dust until seeded. Contractor shall restore any eroded areas to existing contours and elevations prior to seeding.

END OF SECTION

SECTION 32 01 00 – MAINTENANCE PERIOD

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Maintenance Period requirements.
 - 2. Maintenance Plan.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Material labels/data sheets.
- C. Material Safety Data Sheets (MSDSs).
- D. State of Michigan Department of Agriculture and Rural Development, Commercial Pesticide Applicators license
- E. Inspector qualifications and licenses. Submit updates throughout maintenance period as licenses expire and are renewed.
- F. Maintenance Plan.

1.3 DEFINITIONS

- A. Pesticide includes all of the following: herbicide, insecticide, insect growth regulator, nematicide, termiticide, molluscicide, piscicide, avicide, rodenticide, predacide, bactericide, insect repellent, animal repellent, antimicrobial, fungicide, disinfectant (antimicrobial), and sanitizer.
- B. Pest includes insects, mice and other animals, invasive species, unwanted plants (weeds), fungi, microorganisms such as bacteria and viruses, and prions.
- C. Maintenance includes the actions necessary to establish healthy, viable habitats in accordance with the Contract Documents. This includes erosion repairs, irrigation, weed and invasive species control, pest control, inspections, replanting of vegetation, and other actions necessary during the maintenance period.
- D. Healthy vegetation includes trees and shrubs that have a minimum of 75 percent of plant showing sprouting and/or leaf production, and 90 percent coverage of grassed areas with no bare spots greater than 1 square foot in area.
- E. A growing season shall be from May 1st to October 15th.
- F. Invasive species includes:

1. Invasive species found in Michigan that must be controlled if found on site include:
 - a. Japanese knotweed *Polygonum cuspidatum*
 - b. White mulberry *Morus alba*
 - c. Tree-of-heaven *Ailanthus altissima*
 - d. Tatarian honeysuckle *Lonicera tatarica*
 - e. Phragmites *Phragmites australis*
 - f. Purple loosestrife *Lythrum*
 - g. Eurasian watermilfoil *Myriophyllum spicatum*
 - h. Glossy Buckthorn *Frangula alnus*
 - i. Tatarian honeysuckle *Lonicera tatarica*
 - j. Autumn olive *Elaeagnus umbellata*
 - k. Black locust *Robinia pseudoacacia*
 - l. Common buckthorn *Rhamnus cathartica*
 - m. Japanese Barberry *Berberis* or *Mahonia*
 - n. Oriental Bittersweet *Celastrus orbiculatus*
 - o. Swallow-wort *Cynanchum*
 - p. Annual ragweed *Ambrosia artemisiifolia*
 - q. Hoary Alyssum *Berteroa incana*
 - r. Mustard *Brassica, Sinapis*
 - s. Canada thistle *Cirsium arvense*
 - t. Field bindweed *Convolvulus arvensis*
 - u. Dodder *Cuscuta*
 - v. Queen Anne’s lace *Daucus carota*
 - w. Currant *Ribes*
 - x. Field sowthistle *Sonchus arvensis*
 - y. Atlantic poison oak *Toxicodendron pubescens*
 - z. Poison sumac *Toxicodendron vernix*
 - aa. Poison Ivy *Rhus toxicodendron*

1.4 DURATION

- A. Maintenance Period in accordance with Contract Documents shall begin on the date Owner provides written approval of completion of the Vegetation Establishment Period in accordance with Section 32 92 19 – Turf Establishment.
- B. Maintenance Period in accordance with Contract Documents shall continue for two full growing seasons following date Owner provides written approval of completion of the Vegetation Establishment Period in accordance with Section 32 92 19 – Turf Establishment.

1.5 INSPECTOR

- A. Inspector shall have a valid State of Michigan Department of Agriculture and Rural Development, Commercial Pesticide Applicators license and shall have a minimum of 5 years experience conducting similar work required by this Section.
- B. Inspector shall follow all Federal, State and Local laws and regulations relating to work required by this Section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Tools for Manual Removal. Equipment shall include, but is not limited to hand tools; lever based tools, machetes, power pruners/trimmers, chainsaws, metal blade brush cutters, brush axes/hooks, shovels, spading forks, loppers, hedge shears and associated safety equipment as approved by the Owner. Limited use of wood chippers and mowers may be applicable. For mechanical removal of Phragmites, heavy equipment may be utilized as approved by the Owner in the Maintenance Plan, and all applicable federal, state and local permits.
- B. Glyphosate. Glyphosate consists of aquatic glyphosate (N-(phosphonomethyl) glycine) and surfactant as recommended by the manufacturer's label and approved by the State of Michigan for areas adjacent to wetland and waterway areas. Its primary action is in the application to active growing foliage.
- C. Imazapyr. Imazapyr consists of imazapyr and surfactant as recommended by the manufacturer's label and approved by the State of Michigan for use in near waterways and wetlands. Imazapyr can be absorbed by roots and has a long residual, which must be sufficiently diminished prior to replanting of the areas treated. The Contractor shall coordinate work to ensure that planting does not occur during the concurrent use of Imazapyr.
- D. Additional herbicide materials may include, but are not limited to (*indicates examples of approved Trade Name Products):
 - 1. Aquatic non-ionic wetting agent – Alenza 90*
 - 2. Pathfinder II* (marker dye shall be added)
 - 3. Rodeo Herbicide*
 - 4. Triclopyr – Garlon 3A*, Garlon 4*
- E. All herbicides may be utilized for application as approved by the Owner and appropriate for the species and area of control. Application materials, surfactants, and other materials dependent on application means of execution shall be left to the Contractor to propose in their Maintenance Plan for Owner approval.
- F. The contractor shall not propose the use of Neonicotinoid pesticides, and all products shall be suitable for use adjacent to wetland and aquatic resources.

2.2 ACCESSORIES

- A. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil. Fertilizer containing phosphorus shall not be used unless testing results indicate phosphorus is required to support the specified vegetation. Organic fertilizers (i.e. Milorganite®, compost, etc.) shall be given preference when their application is appropriate.
- B. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.
- C. Trees, shrubs, seed and mulch materials in accordance with Section 32 90 00 – Planting and 32 92 19 – Turf Establishment.

- D. Pesticide Accessories: The Contractor shall use manufacturer recommended wetting agent, basal oil (when appropriate), and marking dye, or equivalents, as approved by the Owner.

PART 3 EXECUTION

3.1 PREPARATION

- A. Pre-Installation Meeting
 - 1. Schedule and hold a pre-installation meeting with the Owner prior to implementing the first invasive species control activities.
- B. Identify locations of invasive species control activities.
 - 1. Review project and regulatory requirements.
 - 2. Review Maintenance Plan.
 - 3. Additional requirements listed in Section 01 30 00 – Administrative Requirements.

3.2 MAINTENANCE PLAN

- A. The maintenance plan shall detail the Contractors technical approach to completing the maintenance period Work required by the Contract Documents while providing the best value to the Owner. Contractor shall coordinate different Work elements to achieve the project remedial action objectives.
- B. The Contractor shall submit and obtain Owner approval of a treatment plan and authorization for herbicide usage within the riparian corridor from the State of Michigan for the invasive species removal and control. Mapping showing the proposed limits of removal and treatment methods shall be included as part of a removal plan to be submitted to the Owner. This plan must be also address the onsite segregation and storage of materials containing invasive species materials, and the disposal plan for these materials offsite. The plan will address ongoing maintenance of the invasive species which may arise in planted and seeded areas, and spot application or otherwise selective removal for those undesirable species. The maintenance plan shall be revised to address all comments provided by the Owner.
- C. Contractor shall submit the Maintenance Plan within 120 calendar days after receiving Notice of Award from the Owner, or prior to 30 days of beginning the Maintenance period; whichever is sooner. No adjustments for time or money will be made if resubmittals of the Maintenance Plan are required due to deficiencies in the plan.
- D. The Maintenance Plan shall coordinate different Work items and address the technical requirements listed in the specifications, drawings, and permits to ensure undesired plan species are not establishing in the Work area and the desired species are maintained and replaced. The maintenance plan shall include, but is not limited to, the following:
 - 1. Means and methods for pest control, watering, inspection, reporting and replacement of plantings.
 - 2. Site inspection forms.
 - 3. Vegetation maintenance log.
 - 4. Pesticide application forms.
 - 5. Inspector license qualifications and experience.

6. Procedure for quantifying invasive species.

3.3 MAINTENANCE INSPECTIONS

- A. Shall be completed by Contractor's inspector on at least a monthly basis during the growing season (1 May – 15 October).
- B. Work shall include biosecurity and equipment cleaning to limit the potential of introduction of invasive species on the project site.
- C. Control of weeds and invasive species shall require manual removal and herbicide application, depending on the time of year, species specific protocol, and as approved by the Owner in the Maintenance Plan.
- D. Invasive species plant material shall require removal and disposal from the treatment areas in accordance with the Owner approved Maintenance Plan.
- E. The Owner may instruct the Contractor to perform invasive species control at any point during the project. Control may require manual removal or herbicide treatment, or both, depending on conditions. The Contractor shall perform the work according to the Contract Documents, regardless of schedule or work load. The Contractor is advised that delays to other components of the restoration project shall not be granted or allowed due to invasive species control management. The Contractor shall provide sufficient manpower to execute all aspects of invasive control work, concurrently with the restoration, whenever necessary.
- F. The Contractor shall be responsible for obtaining all necessary permits prior to initiating herbicide application.
- G. Control pests as needed to maintain vegetation growth.
- H. Immediately reseed areas showing bare spots.
- I. Repair washouts or gullies.
- J. Conduct maintenance and implement Maintenance Plan as approved by Owner.
- K. Conduct maintenance in a manner to minimize the spread of invasive species.

3.4 REPLANTING

- A. Replant trees and shrubs planted by Contractor that have died or are having declining health during the maintenance period.
- B. Contractor shall replant vegetation at areas:
 - 1. Where vegetative cover is less than 95 percent. Each vegetation type shall be measured independently.
 - 2. With bare spots larger than 0.25 square feet. Each vegetation type shall be measured independently.

3.5 REPORTING

- A. A comprehensive report shall be updated and submitted to the Owner following each maintenance inspection. The report shall document all actions conducted by the Contractor during the maintenance period. The report shall include:
1. Summary of inspection and maintenance logs, and pesticide applications.
 2. Summary of pest control measures and schedule of operations.
 3. Map detailing location of maintenance performed.
 4. Summary of correspondence.
 5. Detailed discussion of work completed during maintenance inspection and comparison to work required to be completed during maintenance inspection.
 6. Detailed discussion of work required for the next maintenance inspection.
 7. Quantify the percentage of vegetation planted by Contractor that is healthy and meets Contract Document requirements for closeout of the maintenance period.
 8. Quantify the percentage of invasive species at areas vegetated by Contractor. Estimate monthly and quantify in accordance with Daubenmire Method or other Owner approved method for maintenance period closeout.
 9. Provide rainfall and irrigation during the period.
 10. Provide copies of inspection and maintenance logs, and pesticide application forms in an appendix.
 11. Provide photographs of each area vegetated in accordance with Section 01 70 00 – Execution and Closeout Requirements: Construction Photographs.

3.6 PROGRESS MEETINGS

- A. At the Owner's discretion, progress meetings may be required to be held on-site to review site activities and progression of maintenance activities. Owner will notify Contractor of personnel required to attend.

3.7 MAINTENANCE PERIOD CLOSEOUT REQUIREMENTS

- A. Healthy vegetation of each type of vegetation at completion of maintenance period duration.
- B. Less than 5 percent invasive species at areas vegetated by Contractor at completion of maintenance period duration.
- C. Final comprehensive report documenting maintenance period closeout requirements have been achieved.

END OF SECTION

SECTION 32 34 13 – FABRICATED PEDESTRIAN BRIDGES

PART 1 GENERAL

1.1 SUMMARY

- A. This work shall consist of the purchase and installation of a cart and pedestrian steel bow-truss bridge for Marysville, Michigan, Cuttle Creek Restoration.

1.2 SUBMITTALS

- A. Bridge Design Drawings. Shall consist of construction drawings with sufficient details of bridge components to allow for an evaluation of the bridge structural stability and load capacity, and shall be stamped and sealed by a Professional Engineer registered in the State of Michigan.
- B. Bridge Manufacturer's Certifications.
- C. Welding Operators Qualifications.
- D. Certified Weld Inspector Report.
- E. Subgrade bearing capacity.

PART 2 PRODUCT

2.1 MANUFACTURER

- A. These specifications are for a fully engineered clear span bridge of welded steel construction and shall be regarded as minimum standards for design and construction as manufactured by Art Thureson, Inc; 4000 West Walton Waterford, Michigan 448329; telephone 248-623-8599; fax 248-623-8766.
- B. Manufacturers other than Art Thureson, Inc. may be used provided they are pre-approved by the Owner five (5) days prior to bid and they meet or exceed all the following specifications.
- C. The bridge manufacturer shall have been in the business of design and fabrication of bridges for a minimum of five years and provide a list of ten successful bridge projects, of similar construction, each of which has been in service at least three years.
- D. The bridge manufacturer shall be the designer and fabricator of the bridge and shall not assign, sublet, or subcontract any part of the bridge fabrication.
- E. The specific type bridge required will be a "Steel Bow-truss" style bridge as manufactured by Art Thureson, Inc. or equivalent.

2.2 DIMENSIONS

- A. Width: Inside clear width of bridge shall be 12 feet.
- B. Span: Out-to-out of end verticals of bridge shall be 60 feet.

2.3 DESIGN

- A. In addition to normal dead loads, the bridge shall be designed for the following:
 - 1. Uniform Live Load: Pedestrian bridges shall be designed for an evenly distributed live load of 85 pounds per square foot of deck area.
 - 2. Vehicle Load: Bridges will also be designed to withstand a moving concentrated load of a vehicle weighing 12,000 pounds. The vehicle load shall be distributed such that 80% of the load is on the rear axle (per AASHTO).
 - 3. Wind Load: All bridges shall be designed for a minimum wind load of 35 pounds per square foot. The wind is calculated on the entire vertical surface of the bridge as if fully enclosed. The wind load shall change proportional to the square of the change in design velocity for local requirements.
- B. Structural steel shall be designed in accordance with the "Guide Specifications for Design of Pedestrian Bridges" as published by the American Association of State Highway and Transportation Officials (AASHTO). Welded HSS Connections shall be designed in accordance with the American National Standards Institute / American Welding Society (ANSI/AWS) D1.1, and/or AISC "Specification for the Design of Steel Hollow Structural Sections".
- C. The bridge design shall be stamped and sealed by a Professional Engineer registered in the State of Michigan.
- D. Seismic: All bridges shall be designed for seismic loads of the intensity required by local codes.
- E. Temperature: Bridge shall be designed to accommodate a temperature differential of 120 degrees Fahrenheit. Slip pads of UHMW polyethylene shall be placed between the smooth surface of this setting plate and the smooth bearing plate of the bridge. At least 1" clearance shall be provided between the bridge and concrete abutments.
- F. Deflection: The vertical deflection of the bridge due to pedestrian live load shall not exceed 1/400 of the span length. The maximum deflection due to vehicular loads shall not exceed 1/800 of the span length. For pedestrian comfort, the minimum live load used for the deflection check shall be a minimum of 600 pounds per lineal foot of bridge. The horizontal deflection due to lateral wind load shall not exceed 1/500 of the span length
- G. Railings and Accessories
 - 1. All railings shall have a smooth inside surface with no protrusions or depressions. All ends of angles and tubes shall be closed and ground smooth. In accordance with AASHTO, railings for pedestrian use should be a minimum of 42" above the floor deck
 - 2. Safety Rails: Continuous rails shall be located on the inside of the trusses. The rails will be horizontal safety rails with a maximum opening of 4 inches. Rub rails will also be included.

PART 3 - EXECUTION

3.1 FABRICATION AND QUALITY CONTROL

- A. Bridge manufacturer shall be certified by the American Institute of Steel Construction to have the personnel, organization, experience, capability, and commitment to produce fabricated structural steel for Conventional Steel Structures and Major Steel Bridge Structures with Sophisticated Paint Endorsement as set forth in the AISC Certification Program.
- B. To ensure quality control during bridge fabrication, the bridge manufacturer shall be the designer and fabricator of the bridge and shall not assign, sublet, or subcontract any part of the bridge fabrication.
- C. Workmanship, fabrication, and shop connections shall be in accordance with American Association of State Highway and Transportation Officials Specifications (AASHTO).
- D. Each bridge shall be inspected by a Certified Weld Inspector that is qualified under the AWS QC-1 program. This inspection shall include as a minimum requirement the following: review of shop drawings, weld procedures, welder qualifications and weld testing reports, visual inspection of welds and verification of overall dimensions and geometry of the bridge. A report shall be produced indicating the above items were reviewed. The report shall be signed by the CWI, signifying compliance with AWS D1.1 codes.
- E. All structural elements used in the bridge shall be identified by heat number of the steel member used. Specific mill test reports and individual welder certificates shall be tracked and kept on file to be provided at the request of the Owner.
- F. Welding operators shall be properly accredited experienced operators, each of whom shall submit satisfactory evidence of experience and skill in welding structural steel with the kind of welding to be used in the work, and who have demonstrated the ability to make uniform good welds meeting the size and type of weld required.

3.2 DELIVERY AND ERECTION

- A. Bridge shall be delivered by truck to a location nearest to the site accessible by roads. Hauling permits and freight charges will be the responsibility of the manufacturer.
- B. Contractor shall be responsible for bridge installation. Contractor shall install the bridge per manufacturer's instructions. The manufacturer shall advise the Contractor of the actual lifting weights, attachment points and all necessary information to install the bridge. Unloading, splicing, bolting, and proper lifting equipment is the responsibility of the Contractor.
- C. The delivery of fabricated bridge shall occur after the curing time of all abutments.
- D. Equipment needed to move bridge from nearest road to final location will be the responsibility of the Contractor.

3.3 WARRANTY

- A. The manufacturer shall provide a warranty against defects in material and workmanship for a period of ten years.

END OF SECTION

SECTION 32 80 00 - IRRIGATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. HDPE pipe.
 - 2. Joints and accessories.
 - 3. Bedding.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Pipe Product Data: Submit data on pipe, fittings and accessories.

1.3 HANDLING AND STORAGE

- A. Pipe shall be delivered to the job site and handled by means that provide adequate support to the pipe and do not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges and/or surface or rocks). The manufacturer's special handling requirements shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at a temperature of 40 degrees Fahrenheit or less.
- B. Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically manufactured to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for 15 days or longer.
- C. Accept backflow preventer assemblies, valves, and equipment on site in shipping containers with labeling in place. Inspect for damage.

PART 2 PRODUCTS

2.1 GENERAL MATERIALS

- A. The Contractor shall use materials as specified in Contract Document. Material other than specified shall be permitted only after written application by the Contractor and written approval by the City of Marysville Representative.
- B. All material to be incorporated in this system shall be new, without flaws or defect and of quality and performance as specified. All material overages at the completion of the installation are the property of the contractor and are to be removed from site.

2.2 PIPE AND FITTINGS

- A. Pipe materials and sizes shall conform to those shown on the Contract Drawings.

- B. Smooth interior, AASHTO M294.
- C. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.

2.3 BEDDING AND COVER MATERIALS

- A. Bedding: on site sandy material approved by Owner or crushed rock material, as specified in Section 31 23 23 - Fill.
- B. Cover: Onsite material.

2.4 BACKFLOW PREVENTER

- A. Manufacturer:
 - 1. NIBCO Inc.
 - 2. Zurn Industries, LLC
 - 3. Or approved equal
- B. Double Check Valve Backflow Preventer Assemblies:
 - 1. Size: 6 inches.
 - 2. Comply with ASSE 1015 and AWWA C510.
 - 3. Heavy duty cast iron construction with fusion epoxy coat inside and outside.
 - 4. Stainless steel springs.
 - 5. Two independently operating check valves.
 - 6. Furnish with two resilient seated, flanged, gate valves, and strainer.
- C. Valve Vault: Precast concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Maintain and protect above and below grade utilities indicated to remain.
- C. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 EXCAVATION AND BEDDING

- A. Excavate pipe trench to 6 inches below pipe invert, in accordance with Section 31 23 16 - Excavation for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth, compact in accordance with Section 31 23 23 - Fill.
- C. During installation, the pipe shall be firmly and uniformly bedded throughout its entire length, to the depth and in the manner as shown on the Drawings. Blocking or mounding beneath the pipe to bring the pipe to final grade is not permitted.
- D. The pipe shall be firmly and uniformly placed on compacted bedding or an onsite material bedding of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.
- E. Bedding shall be compacted to a density not less than adjacent undisturbed onsite material. Onsite material used for compacted earth bedding shall be free of rocks or stones greater than 1 inch in diameter and earth clods greater than 2 inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its final approved placement.
- F. When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed 1 inch in diameter. Unless otherwise specified or shown on the Drawings, the bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.5 of the diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.
- G. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION

- A. Install plastic pipe in accordance with manufacturer's installation instructions.
- B. Lay pipes to lines and grades indicated on Drawings.
- C. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- D. The pipe shall be installed so that there is no reversal of grade between joints unless otherwise shown on the drawings.
- E. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.
- F. Just before placement, each pipe section shall be inspected to ensure that all foreign material is removed from inside the pipe. The pipe ends shall be free of foreign material when assembled.

- G. Install cover at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches in accordance with Section 31 23 23 - Fill.
- H. Maintain moisture content of bedding material to attain required compaction density in accordance with Section 31 23 23 - Fill.

3.5 BACKFILL

- A. Minimum depth of cover over all pipe shall be 3 feet.
- B. Initial backfill: Unless otherwise specified, initial backfill to 6 inches above the top of the conduit is required. Initial backfill material shall consist of soil material that is free of rocks, stones, or hard clods more than 1 inch in diameter. Coarse backfill material shall be the specified sand, gravel, or crushed rock.
- C. Initial backfill shall be placed in two stages. In the first stage (haunching), backfill is placed to the pipe spring line (center of pipe). In the second stage, it is placed to 6 inches above the top of the pipe.
- D. The first stage material shall be worked carefully under the haunches of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers that have a maximum thickness of 6 inches and compacted in accordance with Section 31 23 23 - Fill. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.
- E. Final backfill: Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of the trench. Final backfill material within 2 feet of the top of the pipe shall be free of debris or rocks larger than 3 inches nominal diameter. Coarse backfill material shall be the specified sand, gravel, or crushed rock. Final backfill shall be placed in approximately uniform, compacted layers and in accordance with Section 31 23 23 - Fill.
- F. Vehicles or construction equipment shall not be allowed to cross the pipe until a minimum of 2 feet of earth cover and required density has been obtained.

3.6 PIPE END

- A. Place rip rap at pipe end as shown on Drawings.

3.7 ERECTION TOLERANCES

- A. Section 01 45 00 - Quality Control.
- B. Lay pipe to alignment and slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.
- C. Maximum Variation From Intended Elevation of Invert: 1/2 inch.

D. Maximum Offset of Pipe From Indicated Alignment: 5 feet.

E. Maximum Variation in Profile of Structure From Intended Position: 1 percent.

3.8 FIELD QUALITY CONTROL

A. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

3.10 INSTALLATION - BACKFLOW PREVENTER ASSEMBLIES

A. Install backflow preventer of type, size, and capacity indicated.

B. Comply with applicable code and authority having jurisdiction.

C. Install air-gap fitting on units with atmospheric vent connection and pipe relief outlet drain to nearest drain.

D. Do not install bypass around backflow preventer.

E. Perform pressure test on backflow pressure assemblies

END OF SECTION

SECTION 32 90 00 - PLANTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Planting
 - 2. Live staking

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Plant material labels/data sheets.
- C. State of Michigan Department of Agriculture and Rural Development, Commercial Pesticide Applicator License.
- D. Planting pattern.

PART 2 PRODUCTS

2.1 MATERIALS

- A. As shown in Contract Drawings.
- B. Following delivery and inspection at the storage area, all bare root plant material shall be heeled-in and maintained in moist soil or other suitable material until planted. Plants being transported to and from the planting area shall have their roots protected from drying by means of covering with canvas, burlap, or straw and shall be kept moist.
- C. Root balls shall be kept moist at all times. If not planted within seven days after delivery, the root balls shall be covered with mulch or straw and kept watered until removed for planting. Care shall be taken to prevent damage to trunks, branches and roots. The integrity of the root balls shall be carefully preserved.

2.2 LIVE STAKES

- A. Live stakes shall be composed of freshly cut, dormant branches consisting of the species listed on the Contract Drawings. The term "dormant" is used here to describe live cuttings taken in the late fall to early spring approximately November 1 to April 15, after the trees have lost their leaves or before they bud. Live branch cuttings for live stakes shall be 1 to 2 inches in diameter and 4-feet in length. The cuttings may be obtained from a landscape nursery that specializes in production of bioengineering plant materials, with prior approval of the source by the Owner.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 – Execution and Closeout Requirements: Examination.
- B. Verify prepared soil base is ready to receive the work of this section.

3.2 PLANTING

- A. The trees and shrubs shall not be planted in a grid-like pattern, rather they shall follow a random planting scheme where all plants are installed following the overall average spacing. The Owner shall approve the planting patterns as laid out by the Contractor.
- B. Herbaceous plant species will be planted intermittently between shrubs and trees as necessary to provide adequate cover at the indicated spacing.
- C. Bare root plants shall not be planted while in leaf or during periods of freezing weather.
- D. No container grown plant material shall be planted if not acclimated to the current weather conditions.
- E. Plants shall be placed in planting pits in a vertical position with the root collars at the proper height. Topsoil shall be placed under and around roots to stabilize them in position.
- F. The burlap on the tops of plant balls shall be loosened and spread away or cut away from the entire top portion of the plant ball. The roots of bare root plants shall be spread carefully in a natural position and soil shall be worked around roots. Containers shall be removed from the root mass and the fibrous roots loosened around the perimeter of the ball to eliminate possible root-bound conditions. Soil for all plants shall be lightly compressed to eliminate major air pockets. Soil shall be thoroughly saturated with water during the planting process to settle soil, eliminate air pockets and to provide for initial water needs of the plants.
- G. During the planting process, fertilizer tablets or other approved slow release fertilizers shall be placed around plant roots in conformance with the manufacturer's recommendations.
- H. Care shall be taken during the backfilling, soil compressing and watering to avoid injuring the roots.
- I. Individually planted trees and shrubs shall have a 4 in. high berm of excavated soil placed outside the rim of the pit to form a saucer. Plants on slopes 4:1 and steeper shall have soil excavated from the uphill rim of the pit and a berm built on the downhill rim.
- J. Plants in beds, except trees, shall not require berms. A 4 in. high shoulder of excavated soil shall be placed at the lower edge of all beds on slopes 4:1 and steeper.
- K. Berms and shoulders for planting shall be compacted and graded.

3.3 LIVE STAKING

- A. During transport of plant materials to the site, live materials shall be bundled together, covered with a tarpaulin, transported in unheated portions of a vehicle, and moistened to prevent drying-out and plant stress. Once plant materials are transported to the construction site, they shall be stored in a controlled environment and protected from overheating and wind damage (i.e., stored in on-site refrigeration or shaded areas covered with evergreen branches or plastic during periods with freezing daily temperatures) and from drying-out (i.e., placing in moist soil or spraying with anti-transpirant chemicals) until installation is possible. The storage location for plant materials, including any on-site refrigeration, shall be approved by the Owner prior to storing. Where water is available, live stakes shall be sprayed daily or the bundles shall be immersed. Warm water (over 15° C) stimulates plant growth and should be used only upon approval of the Owner.
- B. Live stakes shall be cut to size as specified above. All cuts shall be smooth and the cut surface shall be kept small.
- C. Side branches and brushy limbs shall be cleanly removed. Buds on the stakes shall be oriented towards the top of the stake.
- D. Each stake shall be scarified along the bottom 2/3 of the stake length such that 20% of the bark is abraded. Live stakes that have been girdled during scarification will not be approved for use.
- E. The cut on the bottom end of the stake shall be angled to 30 to 45-degrees for easy insertion into the soil. The cut on the top end of the stake shall be at a 90-degree angle to the stake to ensure a flat surface for hammering into the slope. The use of large pruning shears or power saws may be required with larger branches.
- F. Buds of the stakes shall be oriented upwards during staking. Live stakes shall be tamped into the ground approximately perpendicular to the slope with the tops angled slightly downstream (at approximately 30-degree angle). Stakes shall be tamped into the ground with a dead blow hammer, which is a hammer with a head filled with shot or sand.
- G. Live stakes shall be installed at the spacing shown on the Drawings.
- H. A minimum of 2/3 of the length of the live stake shall be installed into the ground and soil firmly packed around it after installation. Rebar or similar material may be used to make a pilot hole in firm soil.
- I. Stakes that split or are severely damaged during installation shall be trimmed to eliminate the damaged portion or replaced.
- J. Seasonal Limitations: Live stakes shall be planted between November 15 and March 15.

3.4 VEGETATION ESTABLISHMENT PERIOD

- A. Section 32 92 19 - Turf Establishment: Vegetation Establishment Period.
- B. Control growth of weeds. Remedy damage resulting from improper use of herbicides.

C. Repair washouts or gullies.

END OF SECTION

SECTION 32 92 19 – TURF ESTABLISHMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fertilizing.
 - 2. Seeding.
 - 3. Mulching.
 - 4. Vegetation Establishment Period.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Seed Product Data: Contractor shall submit data for seed mix, fertilizer, and mulch.

1.3 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

- 1.5 All areas of golf course disturbed during restoration activities shall be re-seeded to establish turf.

PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Date of application: March 1 – May 15; August 15 – October 10
- B. Winter seeding may be allowed with Owner approval.
- C. Seed suppliers:
 - 1. Carefree Lawn Center; 2805 Vann Horn, Trenton, MI 48183.
 - 2. Or approved equal.

D. Fairway Mixture:

Seed (45 lbs/acre)	Percent (%)
Alpha Bentgrass	100

E. Rough Mixture (also known as Tri Turf General Mix):

Seed (100 lbs/acre)	Percent (%)
Bluegrass	40
Creeping Red Fescue	20
Chewing Fescue	20
Perennial Rye	20

F. Warm Season Grassland Plants (shall be installed for disturbed borders to play areas as directed by Owner):

Seed (40 lbs/acre)	Percent (%)
Big bluestem	25
Purple love grass	10
Indian grass	25
Little bluestem	25
Rough blazing star	5
Stiff goldenrod	5
Purple coneflower	5

G. Upland Pollinator Planting (shall be installed for disturbed borders to play areas as directed by Owner):

Seed (40 lbs/acre)	Percent (%)
Canada Wild Rye	5
Little bluestem	10
Prairie dropseed	10
Wild Columbine	5
Common milkweed	5
Butterfly Weed	5
Smooth Aster	5
Sand tickseed	5
Purple coneflower	5
Closed bottle gentian	5
Rough Blazing Star	10
Wild lupine	5
Wild Bergamot	5
Hairy beardtongue	5
Black-eyed Susan	5
Stiff goldenrod	5
Showy goldenrod	5

H. A temporary grass (*Lolium multiflorum*) shall be applied for over-seeding at a rate of 120 lbs/acre.

2.2 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry, 4,000 lbs/acre. Chopped cornstalks are not acceptable.
- B. Starter Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil. Fertilizer containing phosphorus shall not be used unless testing results indicate phosphorus is required to support the specified vegetation. Organic fertilizers (i.e. Milorganite®, compost, etc.) shall be given preference when their application is appropriate.
- C. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth.
- D. Pesticides: In accordance with Federal, State and Local laws and regulations and Section 32 97 00 – Invasive Species Control.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify prepared soil base is ready to receive the work of this section.
- B. Prepare seeding surface to a smooth and equipment- track-free surface.
- C. Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed times shall be submitted to and approved by the Engineer.

3.2 SEEDING

- A. Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rain, traffic, or other cause, shall be reworked to restore the ground condition previously specified. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.
- B. Seed shall be uniformly drilled to an average depth of 1/2 inch and at the rates specified using equipment having drills not more than 6-1/2 inches apart. Row markers shall be used with the drill seeder.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Do not seed immediately following rain, when ground is too dry, or when winds are over 12 mph.
- E. Immediately following seeding, apply mulch.

3.3 FERTILIZING

- A. Apply fertilizer at application rate recommended by manufacturer.
- B. Apply after smooth raking of topsoil.

- C. Do not apply fertilizer at same time or with same machine used to apply seed. Apply fertilizer before seed.
- D. Do not apply fertilizer to wetland areas or within 50 feet of St. Clair River.
- E. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.4 MULCH

- A. The mulch shall be fixed in place with mechanical anchoring by a V-type-wheel land packer, a scalloped-disk land packer designed to force mulch into the soil surface, or other suitable equipment.
- B. Straw or hay mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of a steep slope and continued uniformly until the area is covered. The mulch shall not be bunched. All seeded areas shall be mulched on the same day as the seeding.

3.5 CRITICAL AREA SEEDING

- A. Critical areas are all areas with a slope greater than 6:1.
- B. Critical areas shall be seeded within 48 hours of final grading.
- C. Seeding on golf course should also be completed as soon as possible to keep golf course in working order.

3.6 SEED PROTECTION

- A. Do not allow equipment on seeded areas unless approved by Owner.

3.7 VEGETATION ESTABLISHMENT PERIOD

- A. Seeded and planted areas shall be watered during the first growing season (1 May – 15 October) at a minimum as follows:
 - 1. Water twice a day (to apply a minimum of ¼ inch per watering event) for 7 days to promote seed germination, then
 - 2. Water once a day (to apply a minimum of ¼ inch per watering event) for 7 days, then
 - 3. Water three times a week to apply a minimum of 1 inch per week for an additional 28 days.
 - 4. Skip the next watering event if a rain event occurs that is greater than the amount to be applied during that water event.
- B. Areas compacted from equipment during watering events shall be repaired and soil density shall be reduced to approximate surrounding soil density.
- C. Control growth of weeds. Apply herbicides to turf grass seeded areas. Remedy damage resulting from improper use of herbicides. Manually or mechanically remove weeds from native and no mow low grow areas or complete weed removal by other methods in these areas as approved by Owner.
- D. Control pests that may hinder vegetation establishment.

- E. Immediately reseed and water areas showing bare spots.
- F. Repair washouts or gullies.
- G. Mow turf grass to 2 inches after turf grass height reaches 3 inches, and mow to maintain turf grass height from exceeding 3.5 inches.
- H. Vegetation Establishment Period execution shall continue until:
 - 1. Minimum watering events have been completed.
 - 2. Vegetative cover is established over 80 percent of seeded areas.
 - 3. Not more than 10 percent of areas with bare spots larger than 1 square foot.
 - 4. Less than 5 percent invasive species are present at turf grass areas vegetated by Contractor.
 - 5. Approval by Land Owners.
 - 6. Written approval by Owner.

END OF SECTION

SECTION 32 92 30 – BIOSWALES

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Bioswales

1.2 DEFINITIONS

- A. A bioswale is a linear, vegetative stormwater runoff conveyance system designed to store and infiltrate water from small storm events back into the ground and direct water from heavy rain events to appropriate storm sewer inlets or other management facilities. The flow of water being conveyed through a bioswale is slowed down, allowing for municipal storm systems to more effectively manage heavier rain events and help reduce the risk of flooding on or off-site. Water is filtered as it infiltrates through a bioswale. Plants are chosen for their ability to withstand moisture extremes and potentially high concentrations of nutrients and sediments that are often found in stormwater runoff

1.3 SUBMITTALS

- A. Permeable Soil supplier and mixture
- B. Geotextile filter fabric

PART 2 PRODUCTS

- 2.1 Geotextile filter fabric shall be MIRAFI 140N or approved equivalent.

- 2.2 Seed and plant mixtures (both wet and dry) are indicated on Contract Drawings.

- A. Seed shall be applied at rate of 40 lbs per acre.
- B. Date of seeding and planting application: March 1 – May 15; August 15 – October 10
- C. Winter seeding may be allowed with Owner approval.
- D. Mulch in accordance with Section 32 92 19 – Turf Establishment.

- 2.3 Bio-Retention Media (permeable soil) shall be obtained from an approved supplier and shall have the following characteristics

- A. 60-70% coarse grained construction sand
- B. 30-40% organic compost material
- C. pH between 5.5 and 6.5

- D. Soil infiltration rates equal to or exceeding 2 inches an hour. Infiltration rate of mixed soil shall be verified with an on-site percolation test performed by a qualified geotechnical engineer.

PART 3 EXECUTION

- 3.1 Installation shall be in accordance with Design documents.
- 3.2 Side slopes shall be 4:1 finish grade.
- 3.3 Geotextile filter fabric shall be installed on top of subgrade native soils, covering the side slopes and bottom.
- 3.4 Prior to backfill with permeable soils the material shall be remixed on site to ensure homogenous consistency under the direction of the Owner. The backfill shall be placed in 4 inch lifts and thoroughly wetted and allowed to settle. Backfill soil shall not be compacted. Areas should be backfilled to approximately 3-4 inches above desired final grade to allow for natural compaction of permeable soils.
- 3.5 Bioswales shall be generously (and appropriately) vegetated according to Contract Documents.

END OF SECTION

SECTION 32 97 00 – INVASIVE SPECIES CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. This work consists of controlling non-native invasive species (NNI) by chemical and physical removal on site as specified in the Contract Documents.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Material labels/data sheets.
- C. Material Safety Data Sheets (MSDSs).
- D. State of Michigan Department of Agriculture and Rural Development, Commercial Pesticide Applicators license

1.3 DEFINITIONS

- A. Invasive Species Control is defined as all work required to control and maintain vegetation onsite and areas specified by Contract Documents. Vegetation control and maintenance may be by mowing, trimming, tree-doctoring, non-chemical spray control, or chemical spray control.
- B. Vegetation is defined as all plant life growing within the site including, but not limited to, grass, weeds, scrub, shrubs, trees, overhanging branches, and invasive species.

1.4 INVASIVE SPECIES

- A. Invasive species found at the site which must be controlled include:
 - 1. Tatarian honeysuckle *Lonicera tatarica*
 - 2. *Glossy Buckthorn* *Frangula alnus*
- B. Additional invasive species found in Michigan that must be controlled if found onsite include:
 - 1. Phragmites *Phragmites australis*
 - 2. Purple loosestrife *Lythrum*
 - 3. Eurasian watermilfoil *Myriophyllum spicatum*
 - 4. Japanese knotweed *Polygonum cuspidatum*
 - 5. White mulberry *Morus alba*
 - 6. Tree-of-heaven *Ailanthus altissima*
 - 7. Tatarian honeysuckle *Lonicera tatarica*
 - 8. Autumn olive *Elaeagnus umbellata*
 - 9. Common buckthorn *Rhamnus cathartica*
 - 10. Japanese Barberry *Berberis* or *Mahonia*
 - 11. Oriental Bittersweet *Celastrus orbiculatus*
 - 12. Swallow-wort *Cynanchum*

13. Annual ragweed	<i>Ambrosia artemisiifolia</i>
14. Hoary Alyssum	<i>Berteroa incana</i>
15. Mustard	<i>Brassica, Sinapis</i>
16. Canada thistle	<i>Cirsium arvense</i>
17. Field bindweed	<i>Convolvulus arvensis</i>
18. Dodder	<i>Cuscuta</i>
19. Queen Anne's lace	<i>Daucus carota</i>
20. Currant	<i>Ribes</i>
21. Field sowthistle	<i>Sonchus arvensis</i>
22. Atlantic poison oak	<i>Toxicodendron pubescens</i>
23. Poison Sumac	<i>Toxicodendron vernix</i>

PART 2 - PRODUCTS

2.1 PHYSICAL REMOVAL

- A. Equipment shall include, but is not limited to, hand tools; lever-based tools, machetes, power pruners/trimmers, chainsaws, metal blade brush cutters, brush axes/hooks, shovels, spading forks, loppers, hedge shears, and associated safety equipment as approved by the Owner. Limited use of wood chippers and mowers may be applicable. For mechanical removal of Phragmites, heavy equipment may be utilized within the constraints of Habitat and Resource Conservation Specifications; and all applicable Federal, State, and local permits.

2.2 CHEMICAL REMOVAL

- A. Anticipated chemicals include Glyphosate and Imazapyr.
1. Glyphosate: Glyphosate consists of aquatic glyphosate (N-(phosphonomethyl) glycine) and surfactant as recommended by the label and approved for areas adjacent to wetland and waterway areas. Its primary action is in the application to foliage.
 2. Imazapyr: Imazapyr consists of imazapyr and surfactant as recommended by the label for use in near waterways and wetlands. Imazapyr can be absorbed by roots and has a long residual, which must be sufficiently diminished prior to replanting of the areas treated. The contractors shall coordinate to ensure that planting does not occur during the concurrent use of Imazapyr.
- B. Additional herbicide materials may include, but are not limited to:
1. Aquatic non-ionic wetting agent – Alenza 90*
 2. Pathfinder II* (marker dye shall be added)
 3. Imazapyr (Habitat*)
 4. Rodeo Herbicide*
 5. Triclopyr – Garlon 3A*, Garlon 4*
- *indicates examples of approved Trade Name Products
- C. All herbicides may be utilized for application as approved by the Owner and appropriate for the species or area of control. Application materials, surfactants, and other materials dependent on application means of execution shall be left to the Contractor to propose for approval by Owner.

- D. It is recommended that for phragmites control a mixture of 3 percent Glyphosate and 1 percent Imazapyr be applied between August 15th and September 31st, but the Contractor may propose a different method for Owner approval.

PART 3 – EXECUTION

3.1 RESPONSIBILITIES

- A. Complete and maintain all invasive species control in accordance with the requirements of this Specification and the Contract Documents for the duration of the Contract.
- B. Report on invasive species control work in accordance with the Contract Documents.
- C. Obtain an Aquatic Nuisance Permit from Michigan Department of Environmental Quality.
- D. Waste or surplus chemicals shall be disposed of in a safe manner.

3.2 CONTRACTOR DOCUMENTATION

- A. The Contractor shall complete documentation detailing all work undertaken including application rates and chemicals used, wind direction and rainfall, and any other relevant information. The documentation sheets are to be submitted to the Owner with each payment claim.

3.3 CONSTRUCTION

- A. Invasive species plant material shall require removal and disposal from the designated treatment areas and additional areas as determined by the Owner, unless otherwise authorized by the Owner.
- B. Control may require physical removal or herbicide treatment, or both, depending on conditions. The Contractor shall perform the work according to the Contract Documents, regardless of schedule or work load. The Contractor is advised that delays to other components of the restoration project shall not be granted or allowed due to invasive species control management. The Contractor shall provide sufficient manpower to execute all aspects of invasive species control work, concurrently with the restoration, whenever necessary.
- C. The areas planned for treatment shall be clearly flagged by the Contractor's personnel in the field and reviewed by the Owner prior to commencement of treatment activities. The Contractor shall be prepared to discuss invasive species control and native plant preservation methodologies during this field review.
- D. Field verification of removal shall be conducted between the Contractor and Owner after completion of the work to determine success. No payment will be made until this verification is complete. The removal shall be completed to the satisfaction of the Owner.

3.4 PHYSICAL REMOVAL

- A. Depending on the species specific protocol (type, size, density) and existing onsite conditions, mechanical/manual removal of invasive species may or may not require a herbicidal application component. Areas of invasive species may only require physical removal treatments; however, subsequent herbicide application may be necessary to control and ultimately avoid re-emergence.

3.5 HERBICIDE APPLICATION - GENERAL

- A. Depending on species-specific protocol (type, size, density), specific area of the site, and the spatial extent of the particular NNI vegetation, three different treatments shall be utilized:
 - 1. Cut-Stem Treatment; two methods, including: a) Cut stump/stem b) Hack and Squirt
 - 2. Basal Bark Treatment
 - 3. Foliar Treatment
- B. All herbicides shall be U.S. Environmental Protection Agency-registered chemicals that are approved for use in forested areas and/or adjacent to waterways to control and prevent re-growth of undesirable vegetation. The Contractor shall use manufacturer recommended wetting agent, basal oil (when appropriate), and marking dye, or equivalents, as approved by the Owner. (NOTE: Garlon 4 and Round-up Pro are not approved for use in and/or directly adjacent to waterways/wetlands; however, Rodeo Herbicide may be used as the alternative in environmentally sensitive areas, when approved by the Owner). The Contractor shall submit a written request to the Owner for use of herbicides other than those listed above and shall not use such chemicals on the project until first receiving written approval. Manufacturer's Specification sheets (labels) for herbicide, wetting agent, basal oil, and dyes shall be submitted to the Owner.
- C. Marking dye shall be from a commercial source, shall be herbicide compatible, and shall be water soluble. Marking dye shall be mixed with all herbicide prior to application at rates necessary to be readily visible in the field for at least 3 days after application.
- D. The Contractor shall be responsible for replacing and/or pruning any native plant material killed or damaged through any act of negligence by the Contractor as determined by the Owner in applying and handling the herbicide. Due to the nature of the treatment area and the density of invasive species, some damage to desired vegetation may occur.
- E. All herbicide applications shall be selective low volume treatments with a backpack sprayer, squirt bottle, injection gun, paint brush or other methods, as approved by the Owner. Broadcast high volume applications and equipment-mounted spray operations shall not be permitted due to the potential for off-target drift.
- F. Extreme caution shall be used when spraying adjacent to off-target, non-invasive vegetation or directly adjacent to any waterways/wetlands. The Contractor shall be responsible for any act of negligence in applying and handling the herbicide on the project. Herbicide application shall only be conducted during appropriate weather conditions as indicated on the product label (e.g., spraying during high winds, rain, high humidity, and/or high temperatures may result in uptake by off-target vegetation due to the volatility of certain herbicides).

- G. Field verification of herbicide application success shall be conducted between the Contractor and Owner after completion of the work and within 2 weeks of application. No payment will be made until signs of invasive species die-back are observed. If initial application is unsuccessful, for any reason, the Contractor shall reapply herbicide treatment at no additional cost to the Owner.
- H. The Contractor shall be responsible for obtaining all necessary permits (i.e., Request for Permission to Use Herbicides for Aquatic Vegetation Management Purposes) prior to initiating herbicide application.

3.6 HERBICIDE APPLICATION – GLYPHOSATE

- A. The Contractor shall apply the initial round of Glyphosate between August 15th and August 31st, after Phragmites has reached the tassel stage and purple loosestrife has reached peak bloom, as determined during the evaluation. The second application of Glyphosate will be applied no sooner than 2 weeks after the first application and no later than September 31st. An additional application of Glyphosate shall occur a minimum of 2 weeks prior to spring planting, if determined necessary by the Owner.
- B. Glyphosate shall be applied following the manufacturer's recommendations and in accordance with the materials safety data sheets which accompany the material. Application shall be made by a commercial applicator registered in the State of Michigan.

3.7 EVALUATION

- A. The limits of invasive species control will be evaluated by the Owner prior to manual removal or herbicide application. Evaluation shall be limited to the work areas as described in the Contract Drawings. No coverage of Phragmites, japenese knotwood, and purple loosestrife shall be permitted, and a maximum of 5 percent of all other invasive species shall be permissible per contiguous acre of the site upon the completion of construction.

END OF SECTION

SECTION 32 98 00 – NESTING BOXES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Nesting Box details for small birds
 - 2. Nesting box details for dwelling fowl

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Construction details for both small bird and dwelling fowl nesting box sizing.

PART 2 PRODUCTS

2.1 SMALL BIRD NESTING BOXES

- A. Nesting boxes should be made of untreated wood that is light in color following designs specified by the North American Bluebird Society. Paint or stain may only be applied if light in color.
- B. Design and sizing should follow recommendations made by the North American Bluebird Society.
- C. Predator guards must be installed on boxes to reduce predator species from entry.

2.2 DWELLING FOWL (WOOD DUCK) NESTING BOXES

- A. Nesting boxes should be made of untreated, rough cut, unfinished wood.
- B. Design and sizing should follow recommendations made by Ducks Unlimited.
- C. Fill nesting box 4 inches with wood shavings to provide nesting material.
- D. Predator guards must be installed on the pole to reduce predator species from entry. Ensure overhanging tree limbs are removed.

PART 3 EXECUTION

3.1 SMALL BIRD NESTING BOXES

- A. Installation according to the North American Bluebird Society. Webpage and specification documents located at <http://nabluebirdsociety.org/Fact/bluebirdfacts.htm>

B. Install small bird nesting boxes inland, at least 5 feet off the ground and away from fences and overhanging branches or other easily accessible locations for predator species.

C. Install in pairs 10-25 feet apart.

3.2 DWELLING FOWL NESTING BOXES

A. Install according to Ducks Unlimited recommendations. Webpage and specification documentation located at www.ducks.org

END OF SECTION

SECTION 33 05 16 – PROTECTION AND RELOCATION OF UTILITIES

PART 1 GENERAL

1.1 SUMMARY

- A. This work shall consist of all work to protect underground utilities which cross under the site within the limit of disturbance.
- B. Section includes:
 - 1. Permits and Notices
 - 2. Miss Dig System, Inc
 - 3. Other Utilities
 - 4. Protection/Relocation of Utilities
 - 5. Sewer Reconstruction

1.2 PERMITS AND NOTICES

- A. Obtain all special permits required for this work and issue all necessary notices required to governmental authorities prior to the initiation of work.

1.3 MISS DIG SYSTEM, INC

- A. Contact Miss Dig System prior to any work around or near utilities and possess a Miss Dig System clearance ticket number for any underground work.

1.4 OTHER UTILITIES

- A. Contact all utilities within the limits of the project that are not a member of Miss Dig System and obtain a stakeout of their representative facilities.

1.5 PROTECTION/RELOCATION OF UTILITIES

- A. Protect and/or relocate utilities (temporarily and/or permanently) that will be affected during the construction.

1.6 SEWER RECONSTRUCTION

- A. A section of sanitary sewer will be replaced and encased in concrete by the City of Marysville.
- B. The Contractor shall coordinate with the City of Marysville to ensure that the sewer reconstruction is completed according to schedule and that the replacement does not delay the project.

PART 2 – PRODUCTS

- 2.1 Flagging will be of color that can be seen from a distance so that equipment operators can avoid and protect utilities.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall notify the appropriate utility agencies a minimum of 72 hours (excluding weekends and holidays) prior to the Contractor's anticipated beginning of any underground work. All utilities on the project site shall be flagged as to protect the utility when possible. When not possible a relocation of that utility will be required.
- B. The Contractor shall furnish to the utility companies or agencies working within the limits of the project, promptly upon request, reference to control points, alignment and grade data, so that they may properly locate and coordinate their work and improvements in relation to the project.
- C. The Contractor is advised of the presence of overhead utility lines and guy wires throughout the project area and shall use caution while working in the area.
- D. The Contractor is responsible for additional coordination for all utility crossings on the project site, including coordination with the owners of those utilities. This includes gas pipelines, sewer crossings, and others shown in the vicinity of or crossing the stream alignment or floodplain grading, as identified in the Contract Documents.
- E. The Contractor shall use caution when accessing and constructing improvements around guy wires on utility poles. Minor field changes in proposed grades, as directed by Owner, may be required to avoid disturbance to guy wires.
- F. The Contractor shall not excavate within 3 feet of the base of any utility pole.
- G. No interruption of utility service shall be permitted.
- H. The Contractor shall be liable for all damage to existing utilities, and shall repair them in-kind at no additional cost to the City of Marysville.

3.2 SEWER RECONSTRUCTION AND CONCRETE ENCASEMENT

- A. The City of Marysville shall replace the sanitary sewer pipe and encase with concrete to meet City of Marysville standards.
- B. During reconstruction of the sanitary sewer, the Contractor shall coordinate with the City of Marysville's workers. In addition the Contractor will ensure that the sewer reconstruction does not affect any previous work completed by the Contractor.
- C. The Contractor shall notify the Owner and City of Marysville immediately upon discovery of deficiencies which would render the existing underground utilities unsuitable for concrete encasement.

END OF SECTION

SECTION 35 31 17 – ROCK STRUCTURES

PART I - GENERAL

1.1 SUMMARY

A. Rock Structures include:

1. Crest Stones.
2. Anchor Stones.
3. Footer Stones.
4. Riprap.
5. Imbricated Riprap.
6. Random Boulders.
7. Geotextile.

B. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
2. Submit Product Data on items used for all structures
3. Materials Source: Submit name of commercial imported fill materials suppliers.

PART 2 - PRODUCTS

2.1 CREST, ANCHOR, AND FOOTER STONES

A. Stones to be used for construction shall consist of angular in shape, tabular with minimum of two parallel sides and blocky, and be of appropriate color (e.g., green, gray, brown/gray, dark gray, and/or dark brown in color). Stone types native to the St. Clair County area are acceptable. No white stone will be allowed. Rounded edges are acceptable so long and rounded edges are not bearing or supporting. All stone shall be free from laminations and weak cleavages. The stone should not disintegrate significantly from the action of air, water, or in handling and placing. Stones with tool marks, drill holes, and other blasting evidence shall not be utilized in exposed locations. Concrete will not be considered as an alternative for stone. The structure stone shall have a density greater than 140 lbs/cubic foot. Stones must be approved by the Owner prior to placement. Minimum dimensions for each stone is shown on the Drawings. The size, number, position, and configuration of pinning and footer stones may vary.

B. Larger sized stone may be used at the discretion of the contractor so long as the capacity to place that material exists.

2.1 CHANNEL BED FILL MATERIAL

A. Refer to Section 31 23 23 - Fill

2.2 CHANNEL SAND AND GRAVEL

A. Refer to Section 31 23 23 - Fill

2.3 RIPRAP

- A. The rock shall be limestone or other approved hard stone of good quality that will not disintegrate under action of air or water. It shall be clean and free from earth, clay or refuse. The rock shall have a density that is not less than 140 pounds per cubic foot.
- B. Determine the bulk specific gravity and absorption in accordance with ASTM D 6473. Ensure the bulk specific gravity is at least 2.25, and the maximum absorption is 6.0 percent. Ensure the loss of soundness after 20 cycles is no greater than 15 percent when tested in accordance with the U.S. Army Corps of Engineers test method CRD-C 144. Provide riprap pieces with a width and thickness at least one-third the length.
- C. Each load of rock shall be reasonably well graded from the largest to the smallest size specified. The rock shall be angular in shape to permit interlocking between the various rock sizes.
- D. Rock riprap shall conform to Type A, B, or C rock riprap as indicated on the Drawings. Control of gradation shall be by visual inspection to verify that the rock is reasonably well graded and does conform to the maximum, mean and minimum weights as specified.

Rock Riprap Gradation Requirements	
Size of Rock (Pounds)	Percent of Total Weight Smaller than the Given Size (%)
Type A	
154.6	100
33.0	50
2.2	Not to Exceed 10
Type B	
308.6	100
77.2	50
4.4	Not to Exceed 10
Type C	
694.4	100
154.3	50
11.0	Not to Exceed 10

2.4 IMBRICATE RIPRAP

- A. Imbricated riprap shall be angular, tabular and blocky in shape (such that they are stackable) and shall be sufficiently large to resist displacement by both the design storm event and the site-specific lateral earth stresses. All individual stones shall be minimum 1,200 pounds in weight and shall meet the sizes in the Contract Drawings and be approved prior to installation by the Owner. The stone shall have an intermediate minimum diameter dimension that ranges from 18 to 24 inches. Rounded stones, partially fractured stones, and stones displaying quarry drill holes or other obviously unnatural features shall not be permitted. Recycled concrete, limestone, or

calcareous stone shall not be used. Stone shall be brown or gray, conforming to the native geology of the site.

2.5 RANDOM BOULDERS

- A. Boulders to be used for construction shall consist of angular, tabular, flat rock with minimum of two parallel sides, and be of appropriate color (e.g., green, gray, brown/gray, dark gray, and/or dark brown in color). Stone types native to the St. Clair County area are acceptable. No white stone will be allowed. Rounded edges are acceptable so long and rounded edges are not bearing or supporting. All stone shall be free from laminations and weak cleavages. The stone should not disintegrate significantly from the action of air, water, or in handling and placing. Stones with tool marks, drill holes, and other blasting evidence shall not be utilized in exposed locations. Concrete will not be considered as an alternative for stone. The structure stone shall have a density greater than 140 lbs/cubic foot. Stones must be approved by the Owner prior to placement. Minimum dimensions for each stone is shown on the Drawings
- B. Larger sized stone may be used at the discretion of the contractor so long as the capacity to place that material exists.
- C. Exposed portions of random boulder stones may be rounded so long as they are not a bearing surface for other stones.

2.6 GEOTEXTILE CLASS SE

- A. Geotextiles shall conform to the class specified in the Contract Documents. The geotextile shall be manufactured from fibers consisting of long chain synthetic polymers, composed of a minimum 85 percent by weight of polyolephins, polyesters or polyamides. The geotextile shall resist deterioration from ultraviolet exposure. Geotextiles shall contain sufficient amounts of ultraviolet ray inhibitors and stabilizers to provide a minimum of 12 months of expected usable construction life at temperature range of 0-120F.
- B. All values specified are minimum or maximum roll values.

Class	Type of Geotextile	Grab Strength (lb) D4632	Puncture Strength (lb) D4833	Permittivity ⁻¹_(sec) D4491	Apparent Opening Size (max mm) D4751	Trapezoid Tear Strength (lb) D4533
SE	Nonwoven	200	80	0.20	0.30	80

PART 3 - EXECUTION

3.1 The Contractor is ultimately responsible for the means and methods of installation of the structures outlined in this specification. All guidance provided is the best recommendation of the Engineer. The Contractor shall institute means and methods as required, to meet the goals and performance criteria specifications outlined herein.

3.2 TOLERANCES

A. Surface elevations and the intermediate slope of the cobble, boulders, stone blocks, structure stones, pool depths and vane arms shall conform to the spot elevations specified on the Contract Drawings or as directed by the Owner. Tolerances of the finished structure are as follows:

Surface Elevation: ± 0.1 ft

Slope: ± 0.1 %

B. Placed material not conforming to the specified tolerance limits shall be removed and replaced as directed by the Engineer at no additional cost to the Owner.

3.3 GEOTEXTILE

A. Geotextile coverings shall be installed on prepared surfaces, with higher layers overlapping lower ones, in roofing fashion. The material must overlap by at a minimum of 8-inches. Torn or damaged geotextile covering shall be replaced or repaired at the Contractor's expense and in a manner acceptable to the Owner.

3.4 INSTALLATION OF STONE VANE STRUCTURES

A. This section includes the installation of cross vanes and J hook vanes using stone as vane arms. For structures with two 'arms' or two bank tie-ins, each arm is referred to as a vane. All structures will be installed in accordance with these specifications here and their respective details and on-drawing specifications on the Contract Drawings.

B. Bank Connection for Stone Vanes: The recommended installation of the natural channel structure will be conducted in accordance with the following guidelines. Foundation stone and vane stone refer to the material specification for structure stone and indicate the location of the stone in relation to the sub-grade as shown on the Contract Drawings.

1. Excavate the bank(s) and the spot for the first foundation stone beneath final grade elevation. Suitable sand, gravel, and rock base material for backfilling may be placed upstream of this excavation for immediate reuse.
2. Unsuitable materials shall be removed from the channel and not reused in backfilling the vane. Unsuitable materials are trash, organic muck, woody debris, clay, and silty soils.
3. If the excavation for the foundation encounters alluvial deposits of sand and gravel, the 6-inch foundation bed of channel sand and gravel need not be installed. If the excavation encounters bedrock, the Contractor shall work with the Owner to adjust the stone sizes and placement to build on this bedrock.
4. Place a layer of base material as bedding on the foundation sub-grade. Place the first foundation stone and backfill around this stone with the upstream material.

5. Re-excavate the spot for the structure stone against the bank. Suitable base material for backfilling may be placed upstream of this excavation for immediate reuse.
 6. Position the structure stone, measure its elevation, and adjust this stone until the elevation is within tolerances. Backfill with shot rock, covered with fine fill from scour pool excavation to within 3 inches from top of vane.
- C. The remainder of the stone vane shall be built from the bank towards the proposed thalweg near the center of the channel. The following steps shall be repeated as required until the placement of all structure stone is completed:
1. Excavate the channel bed for the next foundation stone. Suitable base material for backfilling may be placed upstream of this excavation for immediate reuse. Unsuitable materials shall be removed from the channel and not reused in backfilling the stone vane. If an existing stream boulder is removed during this excavation, place this boulder on the downstream side of the completed portion of the rock vane at least 6 inches below the elevation of the vane stones.
 2. If the excavation for the foundation encounters alluvial deposits of sand and gravel, the 6-inch foundation bed of channel sand and gravel need not be installed. If the excavation encounters bedrock, the Contractor shall contact the Owner for guidance to adjust the stone sizes and placement to build on this bedrock.
 3. Place a layer of base material as bedding on the foundation sub-grade. Place the first foundation stone and backfill around this stone with the upstream material.
 4. Re-excavate the spot for the next structure stone. Suitable material for backfilling may be placed upstream of this excavation for immediate reuse.
 5. The structure stone shall be placed rigidly on top of the foundation stones so that each structure stone rests upon one-half of each foundation stone below, and so the long axis of the structure stone is directed as shown on the Contract Drawings.
 6. Position the structure stone, measure its elevation, and adjust this stone until the elevation is within tolerances for the slope of the stone vane. Backfill around this stone with the base material.
- D. The finished structure shall be backwashed with additional channel sand and gravel materials to further seal the voids in the structure. Any remaining, suitable channel excavation from the installation should be placed in between the vane of a stone structure and the channel bank to a level 6 inches below the top elevation of the stone vane.
- E. A natural channel structure will be deemed installed correctly when the return of stream flow on the natural channel structure is accomplished without damaging piping flows in the structure, and with thalweg in the appropriate position. The Contractor shall rework the structure until the aforementioned conditions are achieved.

3.5 RIFFLE GRADE CONTROL STRUCTURE

- A. Working downstream to upstream, excavate a section of the existing stream channel and associated banks to obtain the necessary sub-grade. Allow room for placement of cobble, boulders, channel backfill, and any associated bank treatments. The downstream boulders shall be placed first prior to cobble installation. Limit the total length of work to that which can be completed and stabilized in a single work day or dry weather period. Excavation for the installation of the riffle grade control shall conform to the dimensions, grades, and details specified in the Contract Documents. Suitable materials for channel sand and gravel may be

placed upstream for reuse within the reach. Unsuitable materials shall be removed from the channel and not reused in backfilling. Unsuitable materials are trash, organic muck, clay and silty soils.

- B. Fill the existing channel with channel backfill as needed to meet sub-grade elevation. The Owner will approve the material placement as shown on the Contract Drawings before work continues.
- C. After the excavation is approved by the Owner, geotextile shall be placed over the prepared surface. Install treatments per Contract Documents. Cobble shall be placed by mechanical or other acceptable methods. The cobble shall be placed to form a neat and uniform surface area. Install random boulders as approved by the Engineer, with a maximum spacing between boulders of six feet. Random boulders should be flush with the finish grade surface of the structure. No mortar is permitted.
- D. Cobble shall be graded from the smallest to the largest pieces as specified by the materials requirements and will be controlled by visual inspection. The minimum thickness of the cobble layer shall be 1.5 times the d50.
- E. Boulders shall be placed by mechanical or other acceptable methods with a minimum of voids. The boulders shall be placed to form a neat and uniform surface area. No mortar is permitted.
- F. If necessary, boulders can be chiseled or broken to achieve improved contact between stones.
- G. If geotextile is punctured during boulder placement, the boulders shall be fully removed for at least three feet outside the limits of the fabric puncture and a new geotextile patch with minimum overlap shall be securely fastened over the puncture with securing pins.
- H. All remaining channel sand and gravel fill areas along the edges and at ends of the placed cobble shall be placed to blend in with contiguous slopes, swales, or existing ground.
- I. The Contractor shall install woven fiber matting soil wrap with topsoil material as defined in the Contract Drawing details.
- J. The finished riffle grade control shall be backwashed until refusal with additional channel gravel, sand, and cobble to seal the voids in structure prior to placement of the soil wrap and the return of flow to the wetted portion of the riffle grade control.
- K. A riffle grade control will be deemed installed correctly when the return of surface stream flow through the reach is accomplished without damaging piping flows in the riffle grade control, and no movement of the cobble or boulders is observed. The Contractor shall rework the structure until the aforementioned condition is achieved.

3.6 RIPRAP PLACEMENT

- A. Place geotextile fabric over substrate as required in Section 31 23 23 Fill.
- B. Place riprap as indicated on Drawings.

- C. Approved material shall be dumped or otherwise placed in a manner as to produce a reasonable solid mass of material within the limits indicated on the Drawings. All material shall be placed and distributed so that there are no large accumulations of either the larger or smaller sizes of rock.
- D. Height of drop onto geotextile shall be limited to 2 feet or less.
- E. Any appreciable variation from the specified thickness of the riprap shall be corrected by redistributing the material.
- F. Finished surfaces shall conform to slope of the subgrade and be reasonably uniform and level. Finished surfaces shall match surrounding surfaces to the extent practical. The thickness of the finished surface shall be as indicated on the Drawings. Any appreciable variation from the specified thicknesses or the specified finished elevations shall be corrected by the Contractor.

3.7 IMBRICATED RIPRAP PLACEMENT

- A. The Contractor is cautioned to limit all bank work to the limits illustrated on the Contract Drawings. All toe excavation shall be made in close conformity with the existing stream slope and bed. Loose material at the toe of the embankment and within the subgrade should be excavated until a stable footer is reached, as approved by the Owner. This may require excavation beyond the design grades specified in the Contract Drawings. This usually occurs within 2 to 3 feet of the corresponding lowest finish grade of the adjacent stream channel. The subgrade should be smooth, firm, and free from brush, trees, stumps and protruding objects or voids that would affect the proper positioning of the first layer of stones, and shall be acceptable to the Owner.
- B. The geotextile fabric shall be placed on the face of the cut slope and channel subgrade as detailed in the contract drawings to prevent the migration of fine materials. The geotextile fabric shall be carefully and loosely placed on the prepared slope and subgrade and secured. Adjacent strips shall overlap a minimum of 8-inches. Torn or damaged geotextile shall be replaced or repaired at the Contractor's expense and in a manner acceptable to the Owner.
- C. The rock layers should be neatly stacked with staggered joints so that each stone rests firmly on two stones in the tier below with a minimum void space. Additionally, smaller stones should be used to fill voids so that each rock rests solidly on the previous rock layer with minimal opportunity for movement. There shall be no pockets of undersized stone. The first layer of stone shall be placed entirely below the channel invert along the wall with the second imbricated stone being exposed. The height of the imbricated revetment is specified in the Contract Drawings and is generally tied into existing grade; the height shall not exceed three times the length of the longest stone axis and should not be greater than 10 feet.
- D. The Contractor shall place any backfill necessary, concurrently with stone placement and geotextile as shown in the Contract Documents. Once all backfill is in place, it should be covered with a layer of topsoil and natural fiber matting, as shown in the Contract Documents, sufficient to support a native vegetative cover.

3.8 RANDOM BOULDERS

- A. Placements are shown for boulders in the Contract Drawings. Each boulder shown shall consist of one footer stone and one boulder on top
- B. Place each footer stone as shown in the Contract Drawings. Footer stones should be placed on stable native material or furnished fill. Footer stones should be tipped lower on their upstream side. Install footer stones at or below finished grade using the tolerances shown in the Contract Drawings details. Place boulders upon the footer stones, varying the orientation of the stones to create diversity of appearance.

3.9 EXCESS MATERIAL DISPOSAL

- A. Contractor shall dispose of all excess material and material not suitable for use onsite, at an appropriate offsite disposal facility, unless directed by the Owner.

END OF SECTION

SECTION 35 32 19 – WOODY HABITAT STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Log Vane/root wads

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal Procedures.
- B. Materials Source: Submit source of log material if not from onsite. Materials salvaged from the site are acceptable so long as meeting this Specification.

PART 2 PRODUCTS

2.1 LOGS FOR LOG VANE/ROOT WADS

- A. Logs are defined as tree trunks with a minimum mean diameter of 10 to 18 inches and minimum length of 25 feet, with the root wad attached and trimmed within a radius of 4 tree diameters measured as diameter at breast height. The root mass be relatively free of large clogs of dirt. Large and fibrous roots being present are preferred.
- B. Log vane/root wads may be trimmed per the Owner's direction to allow installation.
- C. Logs may be salvaged from trees removed as part of the project construction, as approved by the Owner.
- D. All cutting of logs must be with a saw; no ripping, bending, or breaking of logs for the purpose of trimming will be allowed.
- E. Logs may not be degraded or rotted, and must be from trees harvested within the 12 months prior to placement. Trees must be intact with bark still connected; no twisted, fractured, or significantly damaged logs will be permitted.
- F. Logs must be relatively straight, or bent in such a way as to allow pinning by anchor rocks and still meeting proposed elevations and position.
- G. Logs must consist of hardwood (i.e., oaks, maples, gums, locust, hickory, etc.) and may not be utility poles or be chemically treated. Pine, poplar, cottonwood, spruce, and other softwood species may not be used.
- H. This material shall be approved by the Owner prior to placement.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Examination.

3.2 INSTALLATION OF LOG VANE/ROOT WAD STRUCTURES

- A. Place the log vane/root wad prior to meeting the final grades of the channel.
- B. Excavation for each log/root wad consists of digging a trench in the existing channel. Place the log/root wad logs as indicated on the Contract Drawings with the root mass extending into the proposed stream channel.
- C. The logs will be placed against the vane stones as shown on the Contract.
- D. Place root wad end of log tightly against the bank connection with the root end protruding into stream at locations specified on the Contract Drawings.
- E. Place second log tightly against upstream side of placed log with the root end near the bank and opposite end intersecting vane stones.
- F. Place log firmly upon foundation stone, measure its slope and adjust log until slope is within tolerances.
- G. Position structure stones tightly around log, measure its elevation, and adjust this stone until the elevation is within tolerances for the slope of the vane arms. Backfill around this stone with the onsite fill material.
- H. After the log vane/root wad log and stones are installed, properly backfill the excavated trench with material removed during excavation of the trench.
- I. Log vane/root wads and anchor rocks not meeting these Specifications may need to be removed, replaced or adjusted as directed by the Owner.

3.3 TOLERANCES

- A. Surface elevations of log vane/root wads shall conform to the spot elevations specified on the Contract Drawings or as directed by the Owner. Tolerances of the finished structure are as follows:

Surface Elevation:	±0.5 ft
Slope:	±0.5 %

- B. Placed material not conforming to the specified tolerance limits shall be removed and replaced as directed by the Owner at no additional cost to the Owner.

END OF SECTION

**ATTACHMENT A – SCHEDULE OF SUPPLIES AND SERVICES
CUTTLE CREEK RESTORATION**

Item	Description	Measurement for Payment	Unit Price	Total Cost
1	Mobilization	1 LS		
2	Erosion and Sediment Controls, Flow Diversions, Dewatering, Staging and Laydown Areas	1 LS		
3	Temporary Stream Crossings	4 EA		
4	Log Vane/Root Wads	23 EA		
5	Cross Vane Structures	3 EA		
6	J-Hook Vane Structures	1 EA		
7	Riffle Grade Controls	13 EA		
8	Random Boulder	56 EA		
9	BioSwales	360 LF		
10	Demolition	1 LS		
11	Excavation	17,300 CY		
12	Fill	950 CY		
13	Channel Bed Fill Material	6,770 SY		
14	Irrigation Improvements	1 LS		
15	Culvert for Fish Passage and Coordination of Sanitary Sewer Replacement	1 LS		
16	Cart and Pedestrian Bridge and Cart Path	1 LS		
17	Interpretive Sign	2 EA		
18	Nesting Boxes	1 LS		
19	Woven Fiber Matting	17,000 SY		
20	Clearing and Grubbing	7 AC		
21	Invasive Species Control	22 AC		
22	Open Water Planting	0.3 AC		
23	Riparian Planting	6.1 AC		
24	Live Stakes	8,700 EA		
25	Forested Enhancement Seeding and Planting	6.5 AC		
26	Wetland Planting	1.1 AC		
27	Turf Seeding	8.2 AC		
28	Maintenance Period	1 LS		
29	Demobilization	1 LS		
			Subtotal	
30	Bond		1.5%	
			Total	

**ATTACHMENT A – SCHEDULE OF SUPPLIES AND SERVICES
CUTTLE CREEK RESTORATION**

Note: No tax exemption certificate is available. Taxes are incidental to bid items.

LS = Lump Sum
SY = Square Yard
CY = Cubic Yard
EA = Each
AC = Acre
LF = Linear Feet

Written Total Amount

Signed by _____ for _____ Date _____