

# Attachment B

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Construction Specification

**Construction Specifications  
For  
Broad Branch Stream Restoration and Culvert  
Daylighting Project**

**Washington, DC**

**Prepared For**

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## PROJECT DESCRIPTION

### 1. Scope

- a. The District Department of the Environment (DDOE) proposes to restore approximately 2,000 linear feet of an Unnamed Tributary to Broad Branch in Washington, District of Columbia.
- b. The work outlined in this document consists of excavation and fill to stabilize the existing channel, installation of in-stream structures to provide stream bank protection and grade control, installation of soil bioengineering practices, planting of native plant material, seeding and mulching for stabilization, and all necessary incidentals described and illustrated in this Construction Specification Document.
- c. The work to be performed under this Contract includes, but is not limited to, furnishing all materials, labor, equipment, tools, plants, seed, superintendence, transportation and performing all work in strict accordance with these specifications and drawings.
- d. The work shall be performed under contract to the District Department of the Environment hereafter referred to as DDOE and under the direction of the Project Inspector.
- e. The work shall be completed in all its parts and ready for use in the time specified and in strict accordance with the terms and conditions of the Contract Documents. Any deviation shall be subject to the approval of DDOE and the Project Inspector. The project is estimated to be 120 work days.
- f. The Contractor shall follow the requirements of all the permits issued for the proposed construction.
- g. The Contractor shall be prepared to execute a finished project in every particular without extra charge, unless specifically provided for within the contract.
- h. The Contractor shall be responsible for any damage to existing asphalt. All damages to existing asphalt shall be repaired to original condition. (Full depth paving: 1.5" Hot Mix Asphalt Surface (9.5 mm Superpave, Level 1); 2.0" Hot Mix Asphalt Surface (12.5 mm Superpave, Level 1); 6.0" Graded Aggregate; Geotextile fabric over soil).

## **2. Project Site**

- a. The project site is located in Washington, District of Columbia.
- b. The Contractor shall perform all activities related to this contract within the Limits of Disturbance (LOD) illustrated on the Drawings.
- c. The project site shall be accessed through the designated access points illustrated on the Drawings.
- d. The Contractor shall begin work at the top of the project and work downstream until the project is completed and stabilized in accordance with the Contract Documents.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 1 MOBILIZATION

### 1. Description

This work shall consist of the construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of the Contractor's on-site offices, buildings, and other facilities necessary to begin work.

### 2. Materials

Not Applicable

### 3. Methods

All work performed in providing the facilities and services shall be done in a safe and workmanlike manner.

### 4. Measurement and Method of Payment

**Mobilization will not be measured for payment but will be paid for at the Contract lump sum price.**

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 2 CONSTRUCTION STAKEOUT

### 1. Description

This work shall consist of surveying and establishing a base-line and installing construction layout stakes and benchmarks as specified in the Contract Documents or as directed by the Project Inspector.

The existing elevations and contours shown on the plans, cross-sections reflect topographic survey carried out in early 2010. Existing elevations and grades may have changed since the original survey was completed due to stream erosion, sediment accretion, and fill. It is the Contractor's responsibility to confirm existing grades and adjust earthwork as necessary at no additional cost to DDOE.

### 2. Materials

Not applicable.

### 3. Methods

#### 3.1 Line and Grade

The Contractor will provide the following:

##### a. Limit of Disturbance Stakeout

Utilizing the Baseline Survey and the Construction Plans, the Contractor, in consultation with the Project Inspector will clearly mark the limit of disturbance, for the entire project area including construction entrances and stockpile areas.

##### b. Stream Channel Stakeout

Utilizing the Baseline Survey and the Construction Plans, the Contractor will establish appropriately spaced benchmarks and the necessary references including all P.C.s, and P.T.s for the preservation and control of the center line alignment.

##### c. Structure and Feature Stakeout

Utilizing the Baseline Survey and Construction Plans, the Contractor will set hubs at key points along the floodplain. These hubs will be marked with the center line station and denote the bed feature or structure associated with that stationing.

These hubs will be utilized during construction to verify stationing of bed and structural features (i.e., top and bottom of riffles, runs and pools; rock sills, structure tie-in points, etc.).

### 3.2 Control Markers

The Contractor shall exercise care in the preservation of the hubs and benchmarks. If any are damaged or destroyed the Contractor shall reset them at his/her own expense.

## **4. Measurement and Method of Payment**

The Contractor shall complete the initial construction stakeout. The Contractor shall be responsible for maintaining all hubs and benchmarks. Any hubs and benchmarks damaged or destroyed shall be reset by The Contractor at his/her expense.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 3 POLLUTION CONTROL

### 1. Description

This work shall include furnishing, installing and maintaining all measures necessary for the prevention and/or mitigation of impacts from pollution during construction. The work will prevent or minimize the release of sediment, dust, fuel, hydraulic fluid, oil, wastewater, or any other pollutants into the water or air from the work site.

### 2. Materials

All materials furnished shall meet the requirements as set forth in each of the following subsections. All materials and/or supplies furnished for the purpose of pollution control shall be of new or good condition.

### 3. Erosion and Sediment Control Measures

Control of sediment production and its introduction to the watercourse shall be prevented or minimized during all operations to complete the work under this contract. The following items set forth some, but not necessarily all, techniques which may be required under this contract.

#### 3.1 Silt Fence for Sediment Control

- a. This work shall include furnishing, installing and maintaining silt fence for sediment control as may be required by local or state regulations. Silt fence shall be installed in accordance with the specifications shown on the standard detail on this Erosion and Sediment Control Sheet.
- b. All materials, construction methods, handling, and maintenance shall be in accordance with the Standard Detail shown on this Erosion and Sediment Control Sheet. Silt fence shall be installed prior to the disturbance of stockpiling, staging and construction access areas shown on the Erosion and Sediment Control Sheet.

#### 3.2 Stabilized Construction Entrance

- a. This work shall consist of installing a stabilized construction entrance at all points of ingress and egress from public roads. The stabilized construction entrances shall be installed in accordance with the specifications shown in the standard detail on the Erosion and Sediment Control Sheet. The work will include excavation, furnishing and placing filter cloth and #2 stone necessary

to complete the work, and removal and restoration of area at the completion of the project.

- b. All materials, construction methods and maintenance shall be in accordance with the standard detail shown on this Erosion and Sediment Control Sheet.
- c. Acceptable filter cloths include Mirafi 140N, Dupont Tyvar No. 3341 or 301, Supac 5P or an approved equal. Stone shall meet AASHTO designation M43 Size No. 2 or 24. The Contractor may use a reclaimed or recycled concrete equivalent.
- d. Stabilized construction entrances shall be installed prior to any stockpiling, staging, and/or construction work.

### 3.3 Temporary Mulching

- a. Temporary mulching may be required when permanent vegetated stabilization of the disturbed areas will be delayed. Temporary mulching will be required when stockpiles of topsoil and fill will not be used for an extended period of time.
- b. Temporary mulching will be accomplished by application of cellulose hydro-mulch, chopped straw/hay, tackifiers, burlap, cellulose mat or another acceptable erosion control material.

### 3.4 Erosion Control Blankets

- a. This work consists of installing erosion control blankets on graded stream banks and on adjacent slopes as may be determined to be necessary by the Contractor and Project Inspector.
- b. Erosion control blankets will be utilized on all newly graded/constructed stream banks. They may also be utilized on graded slopes if it is determined they are necessary and appropriate to maintain the stability of the graded slopes. Any erosion control blankets utilized shall be composed of organic geotextile fabric with biodegradable netting. Approved erosion control blankets include Clearfilter 700 Gram and Clearfilter 900 Gram, KoirMat™ 700 and KoirMat™ 900 or an approved equivalent.

### 3.5 Dewatering Diversion System

- a. During construction, temporary diversions will be required to collect and divert stream flow around the work area. The work shall consist of the installation of a system of pumps and pipes/hoses designed to convey base flow pumped from an in-stream cofferdam at the upstream of the construction area to an

outfall-point downstream of the construction area for the purpose of dewatering the construction area.

- b. All materials, construction methods and maintenance shall be in accordance with the standard detail shown on the Erosion and Sediment Control Sheet and as described in Section 4 – Project Dewatering.

#### 4. Equipment Fuels and Lubricants

The Contractor shall take all necessary precautions to prevent the spill of chemical pollutants including, but not limited to fuel, oil, grease, and hydraulic fluid.

##### 4.1 Equipment Leaks

- a. All equipment used on the project shall be free of leaks and excessive deposits of materials such a fuel, hydraulic fluid, oil and other lubricants.
- b. At the start of each workday, the Contractor shall perform a visual inspection of each piece of equipment to check for leaks. During equipment operation, the Contractor shall watch for leaks that may develop.
- c. In the event a piece of equipment develops a leak during construction work, the Contractor shall immediately remove the machine from the stream channel area and shall repair the leak. All excess fluids will be cleaned from the machine prior to its return to the work area.

##### 4.2 Equipment Fueling

- a. The Contractor shall provide for safe fueling of all equipment within the work area.
- b. Under no circumstances shall the equipment be fueled within the stream channel area.

##### 4.3 Fuel Storage

- a. All fuel stored on site must be in a suitable container. Fuel storage in containers greater than five (5) gallons shall be in a containment tank, which meets or exceeds NFPA Standards or other applicable local, state and federal regulations. Mobile tanks on pickup trucks and service vehicles are exempt from this requirement.
- b. Pumps on fuel storage units must be in good working order and free of leaks. The Contractor shall remove leaking fuel equipment from the work site upon direction of the Project Inspector.

#### 4.4 Equipment Service and Repair

- a. In the event that the Contractor must service or repair equipment during construction, appropriate measures will be taken to prevent contamination of the soil and/or water during the service/repair operations.
- b. Under no circumstances will equipment be serviced in the stream channel area. All equipment must be removed from the channel to the floodplain area for servicing.
- c. All waste lubricants and other chemicals will be disposed of in sealed, watertight tanks. No more than five (5) gallons of waste lubricants will be retained on site.

### 5. Sanitary Facilities

The Contractor shall be required to provide adequate sanitary facilities for their work force as well as for use by the Project Inspector, and Project Observers. Chemical toilets shall be provided in a quality that is consistent with the requirements of state and federal regulations. Chemical toilets will be placed no closer than one hundred (100) feet of the stream edge. The Contractor will provide for routine maintenance and cleaning of the sanitary facilities.

### 6. Other Chemicals

In the event the work requires the use of other chemicals (e.g., herbicides) the Contractor will use the chemicals in a manner that is consistent with the chemicals labeled use and the manufacturer's instructions.

### 7. Air Pollution

#### 7.1 Dust Control

The Contractor shall be responsible for the control of excessive dust on public roads and project access roads. The Contractor shall be prepared, at the request of the Project Inspector, to suppress dust. If chemical dust suppressants are used, the Contractor shall use a commercially available product specifically designed for dust control and shall follow the manufacturer's recommended rates and methods of application.

#### 7.2 Equipment Emissions

The Contractor shall be responsible to insure that all equipment has proper and functioning emissions control equipment. All equipment will have mufflers and will be free of excessive smoke emissions. In the event the Contractor's equipment is

emitting excessive smoke, the equipment will be removed from the work area and repaired or a substitute piece of equipment will be brought to the project site. The Contractor will be solely responsible for the mobilization and demobilization costs associated with replacement of any equipment that is pulled from service.

## **8. Maintenance, Removal and Restoration**

The Contractor shall maintain all pollution control measures in good operating form until such time that the measures are no longer needed. Upon completion of the work, the Contractor shall remove any temporary pollution control measures installed during construction and shall restore the site to original conditions as reasonably practical.

## **9. Measurement and Method of Payment**

### **9.1 Method 1 – Unit Prices**

For items of work, for which unit prices are established in the contract, each item will be measured to the nearest unit applicable. Payment for each item will be made at the contract unit price for that item. Payment for erosion control blankets will be at the unit price per square yard of fabric. Payment for chemical dust suppression items shall not be made for applications that are excessive or unnecessary. Such payment shall constitute full compensation for the completion of the work.

### **9.2 Method 2 – Lump Sum**

For items of work, for which lump sum prices are established in the contract, payment will be made as the work proceeds, after presentation of adequate invoice documentation showing the Contractor's cost. If the total of such payments is less than the lump sum contract price for that item, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price shall constitute full compensation for completion of the work.

### **9.3 Method 3 – Incidental Costs**

For items of work, for which a specific bid price is not requested, the costs shall be considered incidental to the total items of work and no payment shall be made separate and distinct for pollution control. Pollution control costs will be included in the costs of the other work items.

**END OF SECTION**

# CONSTRUCTION SPECIFICATIONS

## SECTION 4 PROJECT DEWATERING

### 1. Description

In order to meet the requirements of state and federal regulatory agencies, stream channel construction generally requires that work be completed in a dry channel condition. During construction, various techniques ranging from construction of passive by-pass channels to installation of pump diversions are utilized to divert stream flow around the work area. Traditional riprap projects generally allow for partial channel dewatering by diverting the flow to one side of the existing channel. However, geomorphic-based restoration often involves significant channel reconstruction requiring stream flows to be diverted completely around the project.

The work described in this section shall consist of the collection and diversion of surface water and groundwater from the stream channel as necessary to perform the construction required by the contract. The work shall involve the installation of a system of cofferdams, pumps, pipes and hoses designed to convey stream flow pumped from an in-stream cofferdam at the upstream of the construction area to an outfall point downstream of the construction area for the purpose of dewatering the construction area.

### 2. Diverting Surface Water

The Contractor shall install, maintain, and operate all cofferdams, pumps, pipes and hoses and all other temporary diversion and protective works needed to divert stream flow and other surface water through or around the project site.

2.1 Diversion of surface water shall be continuous during the period that damage to the construction work could occur. Unless otherwise specified, diverted surface water shall be diverted to the same drainage-way that the water would have reached before being diverted.

2.2 The Contractor is responsible to determine the number and sizes of pumps necessary to complete the dewatering process.

2.3 The Contractor shall furnish the Project Inspector a written detailed plan for meeting the surface water diversion requirements set forth in the contract documents. The Project Inspector prior to the start of work must approve the dewatering plan, and it shall include information on the type, number, sizes of pumps, type and size of pipes and hoses, refueling/service schedules, cofferdam construction techniques, discharge outfall protection, and other relevant information. All proposed activities shall meet the conditions set forth in the Maryland State Sedimentation and Erosion Control Guidelines or another similar,

recognized specification. Acceptance of the dewatering plan or the waiving of the plan requirements shall not relieve the Contractor of the responsibilities related to this activity during the process of completing the work.

2.4 The Contractor must plan the dewatering activities such that increases in water flow due to storms or other events are taken under consideration. No separate payment will be made for dewatering measures that are damaged or overwhelmed by significant and sudden increases in the water flow. The Contractor must plan for such events. In some instances, water flows may exceed those reasonably expected to be dewatered and the Contractor may be required to suspend work until such time that the water flows return to a manageable level. In the event that the work is suspended due to high water, the Contractor will not be compensated for repairs to dewatering measures, but additional days will be added to the schedule, at no additional cost, to offset the days lost due to high water.

### **3. Dewatering the Stream Channel**

All work in the stream area will be performed in a fully dewatered channel. The Contractor shall dewater the Unnamed Tributary channel, as well as provide for diversion of water flows into the work area from secondary channels or drainage-ways.

#### **3.1 Cofferdams and Diversions**

To capture or divert stream flows, cofferdams are used across the stream channel and secondary drainage-ways above (up-slope) from the work site. (See Standard Detail in the Erosion and Sediment Control Plans)

- a. Cofferdams will be constructed of clean, inert materials that will have a minimal impact on the stream system. Cofferdams constructed of soil or material from the stream will not be used unless specifically directed by the Project Inspector.
- b. Acceptable materials shall include sandbag dikes, water structures, plastic barriers, and other comparable items.
- c. The Contractor is responsible to install all cofferdams/diversion structures in a safe and correct manner. Cofferdams must be installed so as to withstand the pressures exerted by the stream flow or ponded water against the cofferdam.
- d. Commercial products used as cofferdams (i.e., water structures, temporary dams) shall be installed according to the manufacturer's instructions.

- e. The Contractor is permitted to make minor disturbances to the streambed or banks as may be required to properly install the cofferdam. All disturbances will be limited to only that disturbance necessary to install the cofferdam. Cofferdam installation must be done in the presence of the Project Inspector.
- f. If the Contractor uses sand bags to assist with the dewatering, the Contractor shall fill the sand bags with clean, washed sand. Soils with fine particles are prohibited. When placed in the flowing water, the sand bags shall not produce visible turbidity.

### 3.2 Pumps

The Contractor shall use pumps and pipes/hoses to divert the water flow. The Contractor shall be responsible for providing all pumps, pipelines, hoses, fuel tanks, and other items required to pump the stream flow around the work site, and for providing supervision of the pumping operation during all hours that the pumps are running.

- a. The Contractor shall be responsible for calculating the required pump capacity to handle the average stream flow in the area of the work.
- b. The Contractor shall provide the pumps required, as well as have available additional pumps in the event that the stream flow increases, a pump becomes disabled, or to cover periods when pumps are out of operation for routine service.
- c. The Contractor shall provide pumps that are in good operating order and free of leaks. Pumps that are leaking fuel, lubricants, or other material, will be removed immediately from the work area, and repaired or replaced as necessary. All pump equipment will be properly equipped with mufflers and other noise suppression equipment to minimize noise impacts on the surrounding residences.
- d. Discharge pipes and hoses shall be reasonably free of leaks at either the fittings or in the discharge pipe/hose. No leaks from discharge lines shall be allowed to create excessively wet spots or to cause erosion.
- e. The Contractor shall provide adequate suction hose length to allow the pumps to be placed back from the immediate edge of the stream.
- f. Supplemental fuel tanks, used to minimize refueling requirements, must be installed in such a manner so as to eliminate any leaks from the fuel lines, and so they are protected from damage in the event of high water or flooding which may occur during the project. Fuel tanks over five (5) gallons in capacity will require a containment system. Supplemental fuel tanks will be placed no closer than twenty-five feet (25') from the stream edge and must be

secured to prevent their movement in the event of high water. Supplemental fuel tanks must be equipped so as to prevent the escape of fuel in the event that they are covered by water during a flood condition. The Contractor is responsible to insure that all supplemental fuel storage facilities meet or exceed National Fire Protection Association (NFPA) standards or other applicable local, state, and federal regulations.

- g. When flooding conditions can be reasonably expected, the Project Inspector shall have the authority to require the Contractor to remove the pumps and/or supplemental fuel tanks from the projected flood area. If the Contractor is required to remove pumps and fuel tanks due to flood or storm events, the Contractor shall not receive additional compensation for removal or re-installation of the pumps and/or supplemental fuel tanks. Compensation will be provided in the form of additional time on the project schedule.

### 3.3 Discharge Outfall Protection

During the dewatering operations, the Contractor must provide adequate protection from erosion at the discharge area. The discharge of water from the pumping operation shall be done so as to prevent erosion of soils and the downstream introduction of sediment.

- a. When discharges from the dewatering operation involve large volumes of water, the discharge area will require a concrete and/or stone structure to provide for the dispersion of discharge energy. The Contractor shall use geotextiles as appropriate to provide erosion protection. Discharge structures must be capable of dispersing the energy of the expected discharge from the pumps.
- b. All materials placed for the protection of discharge outfalls are temporary in nature, and shall be removed from the project area upon completion of the dewatering process.

## 4. Maintenance, Removal and Restoration

The Contractor shall maintain all dewatering measures in good operating form until such time that the measures are no longer needed.

- 4.1 In the event that high flows damage or remove dewatering measures, the Contractor shall repair or replace the measures as soon as the water flows allow and prior to commencing work.
- 4.2 Upon completion of the work and approval of the Project Inspector, the Contractor shall remove all dewatering measures. The Contractor shall remove pumps, pipes and hoses from the site, as well as cofferdams from the stream channel.

4.3 Any fill placed in the active channel during the dewatering process shall be removed from the channel upon completion of the work. In the event sand bags are used in the dewatering process, the sand bags will be removed and emptied outside of the active channel area.

4.4 Upon removal of the dewatering measures, the Contractor shall regrade any disturbed surfaces, remove any contaminated soils, and restore all areas consistent with the stabilization of the project site set forth in the Contract Documents.

## **5. Measurement and Method of Payment**

5.1 Payment for dewatering of the project site shall be paid at the Contract lump sum price. The Contractor may make requests for partial payment of dewatering expenses on a monthly basis. Payment request shall include adequate documentation of the Contractor's dewatering expenses, as well as a measurement of the percentage of the dewatering completed to date.

5.2 If the total payments made for dewatering are less than the Contract Lump Sum Price for this item, the unpaid balance will be included in the final contract payment.

5.3 Payment of the Contract Lump Sum Price shall constitute full compensation for completion of the work.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 5 CLEARING AND GRUBBING

### 1. Description

This work shall consist of clearing and grubbing within the limits specified in the Contract Documents.

- a. Clearing within the construction area includes removing and disposing of trees, shrubs, and other vegetation not specified in the Contract Documents for removal and disposal.
- b. Grubbing within the construction area includes removing from the ground and disposing of all stumps, roots, and stubs, brush and debris.
- c.

### 2. Methods

#### 2.1 Project Staging

- a. In order to minimize the potential for erosion, sedimentation and the degradation of water quality, clearing and grubbing will be conducted in stages. The area cleared and grubbed at any one time shall be limited to the area of active construction work.
- b. Unless noted in the Sequence of Construction, no areas will be cleared and grubbed until the areas disturbed during the previous construction stage have been stabilized (i.e., covered by fabric and/or seeded and mulched). The Project Inspector shall have ultimate authority in this determination.

#### 2.2 Damaging or Destroying Vegetation Beyond the Limit of Disturbance.

- a. The Contractor shall not damage or destroy any trees, shrubs, or turf, which exists beyond the limits of disturbance as illustrated on the plans and specified.
- b. The Contractor shall be responsible for any and all damages to trees, shrubs, or turf located beyond the limits of disturbance that occurs from its operations during the life of the Contract. The Contractor shall fully restore, at his/her own expense, and to the satisfaction of the County, any trees, shrubs, or turf that have been damaged or destroyed.

### **3. Measurement and Method of Payment**

Clearing and grubbing will not be measured for payment but will be paid for at the Contract lump sum price. The payment will be full compensation for the removal and disposal of all materials cleared and grubbed, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 6 STREAM CHANNEL EXCAVATION

### 1. Description

#### A. General

Although sections of the original stream valley still exist along this Unnamed Tributary to Broad Branch, historic fill and piping has eliminated most of the stream channel from the valley. In natural channel restoration projects, primary focus is placed on excavation and grading to produce a stream channel with correct geomorphic features. During the implementation of this project, excavation and fill will be required to reconstruct a channel with a stable channel plan form, streambed profile and cross-section. Excavation and fill under this specification also focuses on the restoration of adjacent floodplain and terrace areas. During this project the steeper reaches will be constructed as a boulder step-pool channel and lower gradient reaches as a riffle-pool channel.

#### B. Upper Reach

The outfall of the headwater wetland will be several feet above the existing stream valley elevation. Conveying storm flows from the headwater wetland to the downstream stream reaches in a non-erosive manner will require a transition reach that can accommodate the steep slope resulting from the significant change in elevation over a relatively short distance. Because there is no well-defined channel, this will be accomplished by constructing a new channel along the upper most section of this reach as a B-type channel with a series of boulder step-pools. This will involve selective excavation and backfill. Construction of this reach will require that the floodplain along the reconstructed channel be raised as well.

Because the valley gradient flattens downstream of the step-pool section, a C-type riffle-pool channel will be constructed along this middle section. Because there is no well-defined channel, this will be accomplished by excavating a new channel along the floodplain. Constructed riffles will provide grade control along this section. The new channel is designed to meander around existing mature trees.

Along the downstream section of the upper reach the stream valley drops abruptly. Conveying storm flows in a non-erosive manner will require a second transition reach that can accommodate the steep slope resulting from the significant change in elevation over a relatively short distance. Because there is no well-defined channel, this will be accomplished by constructing a new channel

along this lower section as a B-type channel with a series of boulder step-pools. This will involve selective excavation and backfill.

#### C. Middle Reach

The valley gradient flattens downstream of the upper reach. A C-type riffle-pool channel will be constructed along the middle reach. Because there is no well-defined channel, this will involve constructing a new channel along the existing stream valley by selective excavation and backfill. Constructed riffles will provide grade control along this reach.

#### D. Lower Reach

The valley gradient remains flat along this reach. A C-type riffle-pool channel will be constructed along the lower reach. Because there is no well-defined channel, this will involve constructing a new channel along the existing stream valley by selective excavation and backfill. Constructed riffles will provide grade control along this reach.

## 2. Materials

#### A. Stream bank and Floodplain Select Backfill

The soil utilized to construct the new floodplain and stream banks must be cohesive enough to withstand the storm flows anticipated along the main stem such that these features remain stable. Boring log data indicates that the existing soils in the areas where the new channel will be excavated are non-cohesive loose to medium dense, micaceous fine to medium sands, loose to medium dense gravels, and fill. None of the material is suitable for creating stable stream banks. Therefore, it will be necessary to over-excavate the new channel and construct the new banks with cohesive soils.

Specifications for the select backfill to be utilized for the floodplain and stream banks shall meet the soils characteristics outlined herein. Suitable soils shall include silty fine to medium sand, and sandy loam (USCS Classification – SM; AASHTO Classification A-4) with percent fines greater than or equal to 25% and less than or equal to 45%.

#### B. Streambed Select Backfill

The soil utilized to construct the new streambed must be impermeable enough to prevent the subsurface loss of base flow that will be rerouted from the storm drain system into the new channel. As noted, the boring log data indicates that the existing soils in the areas where the new channel will be excavated are non-

cohesive loose to medium dense, micaceous fine to medium sands or loose to medium dense gravels. None of the material is suitable for creating a streambed that is sufficiently impermeable to maintain a surface flow.

Therefore, it will be necessary to over-excavate the new channel and construct the new streambed with impermeable soils. Specifications for the select backfill to be utilized for the new streambed shall meet the soils characteristics outlined herein. Suitable soils shall include silty or clayey fine sand, micaceous silts (USCS Classification – ML; AASHTO Classification A-4) or low plasticity clays, sandy or silty clays (USCS Classification – CL; AASHTO Classification A-4).

#### C. Top Soil

No topsoil will be utilized for this project. All existing topsoil that is excavated will be hauled for disposal to eliminate the exotic and invasive plant seed bank that is in this soil. It has been determined that the select backfill material will provide a suitable growth media for the grasses and other herbaceous plants, as well as the shrubs and trees that will be planted along the project area. Therefore the Contractor will not be required to provide topsoil from off-site.

#### D. Erosion Control Matting

All graded stream banks along the project will be protected with erosion control blankets as outlined Construction Specification Section 4 - Pollution Control.

#### E. Streambed Structures

The constructed streambed will include boulder grade controls and cobble and gravel as outlined in the construction specification sections applicable to the specific stream reach under construction (i.e., Construction Specification Section 10 – Constructed Riffles and Streambed Material and Construction Specification Section 11 – Boulder Step Pools).

#### F. General

The Contractor is responsible for furnishing and transporting suitable backfill material to the project site.

When the Contractor stockpiles backfill material on-site, the Project Inspectors and/or regulatory agencies may require silt control. The requirement for silt control during the material storage period is determined on a case-by-case basis.

The Contractor should be prepared to provide adequate silt control as provided for in the Construction Specification Section 4 - Pollution Control.

### **3. Construction Methods**

- A. Excavation and fill for the construction of the new channel and adjacent floodplain areas shall be as shown on the plan view, cross sections, and streambed profile drawings.
- B. The existing elevations and contours shown on the plans, cross sections and profile were surveyed in 2009. Grades and elevations may have changed since the original survey was completed, due to erosion, sedimentation, and fill. The Contractor is responsible for confirming existing grades and to adjust the excavation and fill as necessary to produce the desired channel configuration.
- C. In areas where fill is required to establish the design channel, the Contractor shall place the required fill in a manner so as to provide adequate compaction of the material. No fill will be placed in lifts to exceed one foot and each soil lift shall be adequately compacted with heavy equipment before placement of succeeding lifts.
- D. The Contractor shall be responsible for providing permanent stabilization of all graded stream banks and floodplain areas immediately after the completion of grading. The Contractor shall provide stabilization of the immediate stream bank and floodplain areas as set forth in Construction Specification Section 4 – Pollution Control, and Construction Specification Section 13 - Seeding and Mulching.
- E. The Contractor shall transport for disposal soil excavated from the new channel.
- F. The Contractor shall at all times conduct his/her work in full compliance with OSHA regulations and any other applicable local, state, and federal regulations.

### **4. Warranty of Work**

The Contractor shall be responsible for warranting his/her work for a period of three (3) years from the date of completion. The warranty of the stream channel excavation shall begin immediately upon the completion of the project and shall continue in accordance with these specifications for a period of three (3) years. The Contractor, at the request of the DDOE, shall perform all work to repair and/or maintain channel grading, in-stream structures, and vegetative stabilization in accordance with the applicable specification, and at no additional cost to the DDOE.

### **5. Measurement and Method of Payment**

Payment for stream channel excavation along the Unnamed Tributary will be measured and paid for at the Contract unit price per cubic yards of material excavated/placed. Payment will be full compensation for all materials, transport, excavation, and placement, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in these specifications and on the plans.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 7 REGENERATIVE STEP POOLS

### 1. General

- A. Regenerative step pools shall include, but not necessarily be limited to, the construction of a system of step pools, weirs, and plantings to the lines and grades shown on the Plans in accordance with the Contract Documents or as directed by the Engineer.
- B. Relevant Standard Specifications  
DDOT Standards and Specifications for Highway Structures - Excavation:  
Section 202
- C. Quality Assurance
  - 1. The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.
  - 2. For the purpose of visually inspecting stone for sandstone boulders, the terms "flat" and "elongated" shall be defined as follows:
    - a. A flat piece of stone is one for which the ratio of the width to thickness is greater than four to one.
    - b. An elongated piece of stone is one for which the ratio of the length to width is greater than four to one.

### D. Submittals

Certificates of compliance and shop drawings shall be submitted in accordance with the "General Provisions" for all boulder material furnished. The certificate shall state that the stated materials meet the requirements specified herein and list the stone source. Shop drawing submittal shall include product information, handling, installation recommendations, and a tabulation of the physical properties for the filter fabric.

### 2. Materials

#### A. Materials Furnished by DDOE

The DDOE will not furnish any materials for regenerative step pools.

#### B. Contractor's Options

Not applicable.

## C. Detailed Material Requirements

### A. General Requirements for Cobble

The stone shall be silica cobbles.

### B. Cobble Stone for weirs shall meet the following requirements as specified.

#### a. Grading by Class

Class I Cobble: contain individual pieces between 3 and 12 inches in diameter. The total weight of cobble shall contain no more than 10% of the pieces smaller than 1 inch in diameter.

#### b. Grading by $d_{50}$ Size

Cobble shall be composed of well-graded mixture of stone size so that 50% of the pieces, by weight, shall be larger than the  $d_{50}$  size determined using charts prepared by the US Department of Agriculture, Soil Conservation Service. A well graded mixture as used herein is defined as a mixture composed primarily of larger stone sizes but with a sufficient mixture of other sizes to fill the small voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the  $d_{50}$  size. The thickness of the cobble layer shall be 1.5 times the largest stone size.

### C. Cobble shall be graded from the smallest to the largest pieces as specified above and will be controlled by visual inspection.

### D. Sandstone Boulders

#### a. Grading by Weight/Size

Sandstone boulders shall contain individual pieces between 2 and 6 feet in length (500 – 6,000 lbs.). The total weight of boulders shall contain no more than 10% of the pieces smaller than 15 inches in diameter.

### E. Geotextile Fabric

Fabric shall be furnished in accordance with Section 603.02

### F. Sand and bank-run gravel

- a. Sand shall meet the requirements of AASHTO M43 size #57 Section 805.02 Fine Aggregate for Pervious Fill.
- b. Bank-run gravel shall have a plasticity index that does not exceed 9 and shall meet the following gradations:

Sieve Size U.S. Standard	% Passing
2 ½ inch	100
1 inch	85-100
½ inch	60-100
No. 10	35-75
No. 40	20-50
No. 200	3-20

G. Coarse woody debris-Stumps and incidental wood, not exceeding 3 logs of 3” or less in diameter, from onsite can acceptably be placed in each pool. This material shall be placed over finished grades of sand, prior to the placement of wood chips and compost.

H. Wood chips and mulch shall be in accordance with Section 823.04.

I. Compost

- a. Compost shall be screened, and subject to approval by the Engineer. Compost shall have a pH between 5.0 and 7.0. It shall be stable and not reheat upon restacking. Compost shall have moisture content between 30 and 55 percent, a particle size of 0.5” or less.
- b. Compost shall be of the following type:
  - i. Source – Separated Compost (Type B). Source- separated compost will be approved by the Maryland Department of Agriculture (MDA). Compost shall be produced by an MDA certified compost operator. Compost shall have a soluble salt concentration not to exceed 5 dS (mmhos/cm).

Source – separated compost shall be one of the following types:

- 1. Tree leaf compost
- 2. Non - tree leaf compost. When compost is from lawn clippings, it shall be tested for contaminant in conformance with the following:
  - i. pH (range): 6.0—8.0
  - ii. Heavy Metals (Maximum)

Arsenic	41 mg/kg dry wt.
Cadmium	39 mg/kg dry wt.
Chromium	1200 mg/kg dry wt.
Copper	1500 mg/kg dry wt.
Lead	300 mg/kg dry wt.
Mercury	17 mg/kg dry wt.
Molybdenum	18 mg/kg dry wt.
Nickel	420 mg/kg dry wt.
Selenium	36 mg/kg dry wt.
Zinc	2800 mg/kg dry wt.

- iii. PCBs: 5 ppm
  - iv. Man-made inserts (maximum)
    - >4mm, <13mm: 2 percent dry wt.
  - v. Film plastic >4mm: 2 percent dry wt.
  - vi. Process to further reduce pathogens (required for compost from municipal solid waste or manure): pass
- c. Plants – All planting material should be native to the Atlantic Coastal Plain region, and should be planted in appropriate wetness zones on the site. [A planting list and zone are provided]. After 3 years, the planted species must have an 80% survival, or the site must be 80% covered with native non-invasive species. The pool bottoms must be 80% vegetated with native wetland plants or sub aquatic vegetation.

### 3. Construction Methods

- A. Fill the eroded channel to bottom of project with sand (80%) and wood chip (20%) blend to achieve grade necessary for installation of weirs.
- B. Begin construction at downstream/bottom end of tributary. Excavate outlet pool and place outlet boulder outfall. Lay a continuous sheet of geotextile under the sandstone boulders.
- C. Install bottom-most cobble boulder weir and sand berm above outlet pool. Lay a continuous sheet of geotextile under the sandstone boulders along the downstream edge of the weir. The Contractor shall exercise care in the placement of boulders to prevent puncture of the geotextile. If geotextile is punctured, 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 and the cobble stone carefully replaced. No payment will be made for work involved in the repair of Contractor damaged geotextile.

- D. The face of the boulders should be tilted downstream to occupy half of the incline (6" vertical) made up over the length of the entire weir. Once the boulders have been placed, fill behind with silica cobble to form backside of weir. A small cobble apron should be placed where the boulders meet the pool on the downstream side. Excavate next upstream pool from sand bed, using excavated material to blend edges of downstream weir into surrounding grade.
- E. Continue rhythm of pool excavation and weir & berm construction as stated to finished grades shown on plans up the project.
- F. Blow compost over the entire site, including on the tops of the weirs and in the pools.
- G. Seed all disturbed areas with grasses indicated.
- H. Commence site planting as soon as possible to further stabilize the site.

#### **4. Method of Measurement**

##### **A. Pools**

Measurement for shallow, aquatic pools will be made of the area of the finished surface, satisfactorily installed. Area measurements will be made parallel to the foundation on which the pool is placed.

##### **B. Riffle Weir Grade Control Structures**

Measurement for construction the riffle weir grade control structures will be made of the length and width of the weir satisfactorily constructed measure along the surface of the weir.

##### **C. Geotextile**

No separate measurement will be made for filter fabric.

#### **5. Basis of Payment**

##### **A. Regenerative step pools**

Payment for regenerative step pools will be made at the price bid per square yard. The price bid shall include all excavation, backfill, disposal of surplus materials and furnishing and installing the geotextile, sand, and stone as well as furnishing all materials, tools, labor, equipment, and incidentals necessary to complete the work.

##### **B. Geotextile**

No separate payment will be made for filter fabric.

END OF SECTION

## CONSTRUCTION SPECIFICATIONS

### SECTION 8 PERUVIAN EMBASSY RESIDENCE STREAM CHANNEL RECONSTRUCTION

#### 1. Description

##### A. General

Two small first order streams flow from the Peruvian Embassy Residence property joining the main stem of the Unnamed Tributary to Broad Branch along the lower reach. Both streams have developed severe gully erosion and threaten to continue eroding up slope. In natural channel restoration projects, primary focus is placed on excavation and grading to produce a stream channel with correct geomorphic features. During the implementation of this project, excavation and fill will be required to reconstruct a channel with a stable channel plan form, streambed profile and cross-section. Excavation and fill under this specification also focuses on the restoration of adjacent terrace areas. During this project the steep reaches will be constructed as a boulder step-pool channels.

##### B. Tributary A

Conveying storm flows from the driveway to the residence road to the downstream stream reaches in a non-erosive manner will require an approach that can accommodate the steep slope resulting from the significant change in elevation over a relatively short distance. This will be accomplished by constructing an A-type channel with a series of boulder step-pools. This will involve selective excavation and backfill.

##### C. Tributary B

Conveying storm flows from the driveway to the residence road to the downstream stream reaches in a non-erosive manner will require an approach that can accommodate the steep slope resulting from the significant change in elevation over a relatively short distance. This will be accomplished by constructing an A-type channel with a series of boulder step-pools. This will involve selective excavation and backfill.

## **2. Materials**

### **A. Erosion Control Matting**

All graded stream banks along the project will be protected with erosion control blankets as outlined Construction Specification Section 4 - Pollution Control.

### **B. Streambed Structures**

The constructed streambed will include boulder grade controls and cobble and gravel as outlined in the construction specification sections applicable to the specific stream reach under construction (i.e., Construction Specification Section 11 – Boulder Step Pools).

### **C. General**

The Contractor is responsible for furnishing and transporting suitable backfill material to the project site.

When the Contractor stockpiles backfill material on-site, the Project Inspectors and/or regulatory agencies may require silt control. The requirement for silt control during the material storage period is determined on a case-by-case basis. The Contractor should be prepared to provide adequate silt control as provided for in the Construction Specification Section 4 - Pollution Control.

## **3. Construction Methods**

A. Excavation and fill for the construction of the new channel and adjacent floodplain areas shall be as shown on the plan view, cross sections, and streambed profile drawings.

B. The existing elevations and contours shown on the plans, cross sections and profile were surveyed in 2009. Grades and elevations may have changed since the original survey was completed, due to erosion, sedimentation, and fill. The Contractor is responsible for confirming existing grades and to adjust the excavation and fill as necessary to produce the desired channel configuration.

C. In areas where fill is required to establish the design channel, the Contractor shall place the required fill in a manner so as to provide adequate compaction of the material. No fill will be placed in lifts to exceed one foot and each soil lift shall be adequately compacted with heavy equipment before placement of succeeding lifts.

- D. The Contractor shall be responsible for providing permanent stabilization of all graded stream banks and floodplain areas immediately after the completion of grading. The Contractor shall provide stabilization of the immediate stream bank and floodplain areas as set forth in Construction Specification Section 4 – Pollution Control, Construction Specification Section 13 - Seeding and Mulching, and Construction Specification Section 15 – Planting Live Stakes.
- E. The Contractor shall transport for disposal soil excavated from the new channel.
- F. The Contractor shall at all times conduct his/her work in full compliance with OSHA regulations and any other applicable local, state, and federal regulations.

#### **4. Warranty of Work**

The Contractor shall be responsible for warranting his/her work for a period of three (3) years from the date of completion. The warranty of the stream channel excavation shall begin immediately upon the completion of the project and shall continue in accordance with these specifications for a period of three (3) years. The Contractor, at the request of the DDOE, shall perform all work to repair and/or maintain channel grading, in-stream structures, and vegetative stabilization in accordance with the applicable specification, and at no additional cost to the DDOE.

#### **5. Measurement and Method of Payment**

Payment for stream channel excavation along the Unnamed Tributary will be measured and paid for at the Contract unit price per cubic yards of material excavated/placed. Payment will be full compensation for all materials, transport, excavation, and placement, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in these specifications and on the plans.

END OF SECTION

**CONSTRUCTION SPECIFICATIONS**  
**SECTION 9**  
**CONSTRUCTED RIFFLES AND POOLS**

**1. Description**

Restoration of the Unnamed Tributary to Broad Branch will require the creation of natural streambed features. Installing constructed riffles or excavating pools will provide a means of creating those features and stabilizing the streambed. This work shall consist of transporting, installing and maintaining constructed riffles within the stream channels along the project area.

**2. Materials**

Riffle Rock

The constructed riffles shall consist of boulders and River Jack or cobble and gravel similar in color, texture and density to the native rock in the watershed obtained from an approved source. The dimensions of the boulders will be a minimum of 1.5 foot and maximum of 2.5 feet in diameter. The dry unit weight of the boulders shall be 150 lb. /cu ft. or greater. The dimensions of the cobble will be 5 – 10 inches in diameter and the gravel size material will range from 0.5 inches to 2 inches in diameter. The Contractor will be responsible for identifying a source of rock for the constructed riffles. The Contractor will be responsible for transporting the rock to the project site.

Pool Rock

The streambed in pools shall consist of River Jack or cobble and gravel similar in color, texture and density to the native rock in the watershed obtained from an approved source. The dimensions of the cobble will be 5 – 10 inches in diameter and the gravel size material will range from 0.5 inches to 2 inches in diameter. The Contractor will be responsible for identifying a source of rock for the constructed riffles. The Contractor will be responsible for transporting the rock to the project site.

**3. Construction Methods**

Excavation and fill for the construction of the riffles and pools shall be as shown on the plan view, cross sections, streambed profile, and typical detail drawings.

Streambed material will be placed along the entire length of the new channel.

- a. New riffles and runs will be constructed by installing a boulder grade control structure or at the proposed invert of the channel at the upstream end of the riffle

and the downstream end of the run. For longer riffle-run areas additional grade control features will be installed at intermediate points along the riffle. Small boulders, cobble and gravel sized material will be utilized to fill the voids between the boulders and complete the riffle structures.

- b. The pools and glides will be constructed with cobble and gravel along the length of those features.

#### **4. Measurement and Method of Payment**

Constructed riffles and pool streambed material will be measured and paid for at the Contract unit price per ton of boulders and River Jack installed. Payment will be full compensation for the transport and placement of all materials in the channel, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in these special provisions and on the plans.

END OF SECTION

## CONSTRUCTION SPECIFICATIONS

### SECTION 10 BOULDER STEP-POOLS MAIN STEM AND PERUVIAN EMBASSY RESIDENCE

#### 1. Description

Along several sections of the Unnamed Tributary to Broad Branch, as well as the channels on the Peruvian Embassy Residence property, a series of step pool structures will be constructed. Installation of the step pool structures is intended to provide grade control and dissipate the energy of storm flows along those reaches.

The Contractor shall furnish all labor, material and equipment required to install step-pools, as described in these Specifications and shown on the plans. This work shall consist of transporting, installing and maintaining step-pools within the stream channel, as specified on the plans or as directed by the Project Inspector.

#### 2. Materials

##### Step Rock

Step-pool rocks shall consist of angular flat rock, similar in color, texture and density to the native rock at the site, obtained from an approved source. The dry unit weight of the rock shall be 150 lb. /cu ft. or greater. The dimensions of the rock will be a minimum of 2.5 feet and maximum of 3.5 feet along the long (a) axis, a minimum of 2 feet and maximum of 3 feet along the median (b) axis, a minimum of 0.5 feet and maximum of 1.5 feet along the short (c) axis. Concrete and limestone will not be considered as an alternative to step pool rocks.

##### Pool Bedding Rock

Bedding rock shall consist of angular rock, similar in color, texture and density to the step-pool rock. The dry unit weight of the rock shall be 130 lb. /cu ft. or greater. The rock shall range from 0.5 foot to 1.5 feet along the long (a) and median (b) axes. Concrete and white stone will not be considered as an alternative to the bedding rocks.

##### Step-Pool Cobble and Gravel

Step-Pool Cobble and Gravel shall consist of River Jack or cobble and gravel similar in color, texture and density to the native rock at the site, obtained from an approved source. The dimensions of the cobble will be 5 – 10 inches in diameter and the gravel size material will range from 0.5 inches to 2 inches in diameter. The Contractor will be responsible for identifying a source of rock for the constructed riffles. The Contractor will be responsible for transporting the rock to the project site.

## Geotextile Liner

A geotextile liner shall be installed along the upstream side of the step boulders to prevent piping and structural failure of the steps. Acceptable geotextile liner materials include Mirafi S600 and Mirafi 140N or their equivalent.

## Source of Rock

The Contractor will locate potential sources for the rocks. The Contractor and the Project Inspector will visit the site(s) to determine whether the rocks meet the specified requirements for color, weight and size. If sufficient stream gravel material is not available from the site, the Contractor shall obtain material meeting the specified requirements as outlined above.

### **3. Construction Methods**

Step pools shall be installed according to the Sequence of Construction, the plans and details, and the following specifications. The Contractor shall arrange and construct step pools under the direction and approval of the Project Inspector.

The existing streambed shall be excavated to the general shape of the steps and pools and to a depth sufficient to allow for installation of the foundation rocks, bedding stone, step boulders and gravel.

Step boulders for each step shall be keyed into the streambed and along the edge of stream along both sides of the channel forming a broad "U" pattern to the step. The thalweg of the stream channel shall alternate from off-center left to off-center right and back to off-center left at each step in a downstream direction.

Geotextile liner shall be draped over the upstream edge of the step boulders pulled to cover the streambed in the tail-out of the pool upstream of the boulders and wrapping up along the toe of bank on either side of the channel.

Bedding rock, cobble and gravel shall be installed over top of the geotextile liner.

The top of the step boulders and pool bedding shall be equal to finished grade of the steps and pools, respectively as specified on the cross-sections and profile.

### **4. Measurement and Method of Payment**

Boulder Step-Pools will be measured and paid for at the Contract unit price per ton of boulders and River Jack installed. Payment will be full compensation for the transport of all materials, excavation, installation, and maintenance of step pools, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in these special provisions and on the plans.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 11 STORMWATER WETLANDS

### 1. General

A. Stormwater Wetlands shall include, but not necessarily be limited to, the excavation and construction of best management practices, impervious liner, and stone outfall to the lines and grades shown on the Plans in accordance with the Contract Documents or as directed by the Engineer.

B. Relevant DDOT Standards and Specifications for Highway Structures

Section 202: Roadway Excavation

Section 804: Aggregates for Soils and Base Course Construction

C. Quality Assurance

The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.

D. Submittals

Certificates of compliance shall be submitted in accordance with the "General Provisions" for impervious liner material furnished. The certificate shall state that the stated materials meet the requirements specified herein and list the source.

### 2. Materials

A. Materials Furnished by the DDOE

DDOE will not furnish any materials for Stormwater Wetlands.

B. Contractor's Options

Not applicable.

C. Detailed Material Requirements

a. General Requirements for Impervious Liner

The impervious liner shall meet the requirements of DDOT Standards and Specifications for Highway Structures 804.03.

Impervious liner shall consist largely of clays or mixtures of silts and clays that when compacted will present a relatively impervious surface to

prevent the entrance of water. In no case shall it be principally composed of sands or coarser material. Liquid limit shall be a minimum of 50 and plasticity limit index shall be a minimum of 20. Permeability shall be a minimum of  $10^{-6}$  cm/sec.

### **3. Execution**

- A. The Contractor shall notify the Chief Engineer a sufficient length of time in advance of his/her intent to begin any excavation. The Contractor, as part of the field layout, shall prepare all cross-sections, elevations and measurements of the undisturbed ground needed to compute excavated quantities. Elevations shall be taken prior to the beginning of any stormwater wetland excavation. Quantities for excavation shall be computed using the average end area method and shall be provided to the Chief Engineer before payment for excavation will be made.
- B. Stormwater Wetland Excavation shall be cut accurately to grade and cross-section as required, within the limits designated. All earth slopes shall be finished to neat lines, with toe and top of slopes appropriately rounded. Work shall be done in proper sequence with all other operations involved.
- C. All rocks encountered within the area of the stormwater wetland shall be removed to a depth of at least 1 foot below sub grade and backfilled with suitable material.
- D. All excess and unsuitable material shall be removed from the limits of the work and be disposed of by the Contractor. The Contractor will be required to furnish its own disposal area.
- E. Upon completion of excavation, the Stormwater Wetland's Impervious Liner is to be installed to the lines and grades shown on Contract Drawings.

### **4. Method of Measurement**

#### **A. Stormwater Wetland Excavation**

Measurement for Stormwater Wetland Excavation will be made in accordance with DDOT Standards and Specifications for Highway Structures 202.05.

The unit of measure for STORMWATER WETLAND Excavation will be the cubic yard. The number of cubic yards will be computed by the average end area method; however, at locations where end area measurements cannot be taken that will produce the requisite accuracy. The Chief Engineer may substitute other methods to determine the correct quantities.

Cross sections will be taken of the undisturbed ground. Any materials removed or excavated before these measurements have been taken will not be included in the number of cubic yards measured. Unless it is ordered by the Chief Engineer, material excavated below specified elevations will not be measured. If so ordered, such additional cross-sections as are necessary will be taken.

Any excavation beyond specified limits will not be measured.

The cross-sectional area measured shall not include water or other liquid, but shall include mud, muck or similar semisolid material that has not been disturbed by the Contractor and that cannot be drained away.

**B. Stormwater Wetland Impervious Liner**

The unit of measure for Stormwater Wetland Impervious Liner will be the cubic yard. The number of cubic yards will be computed by the average end area method; however, the Chief Engineer may substitute other methods to determine the exact quantity.

**5. Basis of Payment**

**A. Stormwater Wetland Excavation**

The number of cubic yards of STORMWATER WETLAND Excavation removed will be paid for at the contract unit price per cubic yard, which payment will include the excavation of all material, all grading, draining cut areas, undercutting soft and unstable areas in the roadbed and/or embankment, the removal and disposal of all material, and all labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein.

**B. Stormwater Wetland Impervious Liner**

The Stormwater Wetland Impervious Liner will be paid for at the contract unit price per cubic yard, which payment will include all labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein including furnishing, hauling and compaction.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 12 BEST MANAGEMENT PRACTICES (BMPs)

### 1. General

A. Best Management Practices (BMPs) also known as Stormwater Recharge Facilities in the plan set shall include, but not necessarily be limited to, the excavation and construction of best management practices, impervious liner, and stone outfall to the lines and grades shown on the Plans in accordance with the Contract Documents or as directed by the Engineer.

B. Relevant DDOT Standards and Specifications for Highway Structures

Section 202: Roadway Excavation

Section 804: Aggregates for Soils and Base Course Construction

C. Quality Assurance

The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.

D. Submittals

Certificates of compliance shall be submitted in accordance with the "General Provisions" for impervious liner material furnished. The certificate shall state that the stated materials meet the requirements specified herein and list the source.

### 2. Materials

A. Materials Furnished by the DDOE

The DDOE will not furnish any materials for BMPs.

B. Contractor's Options

Not applicable.

### 3. Execution

A. The Contractor shall notify the Chief Engineer a sufficient length of time in advance of his/her intent to begin any excavation. The Contractor, as part of the field layout, shall prepare all cross-sections, elevations and

measurements of the undisturbed ground needed to compute excavated quantities. Elevations shall be taken prior to the beginning of any BMP excavation. Quantities for excavation shall be computed using the average end area method and shall be provided to the Chief Engineer before payment for excavation will be made.

- B. BMP Excavation shall be cut accurately to grade and cross-section as required, within the limits designated. All earth slopes shall be finished to neat lines, with toe and top of slopes appropriately rounded. Work shall be done in proper sequence with all other operations involved.
- C. All rocks encountered within the area of the BMP shall be removed to a depth of at least 1 foot below sub grade and backfilled with suitable material.
- D. All excess and unsuitable material shall be removed from the limits of the work and be disposed of by the Contractor. The Contractor will be required to furnish its own disposal area.
- E. Upon completion of excavation, BMP Impervious Liner is to be installed to the lines and grades shown on Contract Drawings.

#### **4. Method of Measurement**

##### **A. BMP Excavation**

Measurement for BMP Excavation will be made in accordance with DDOT Standards and Specifications for Highway Structures 202.05.

The unit of measure for BMP Excavation will be the cubic yard. The number of cubic yards will be computed by the average end area method; however, at locations where end area measurements cannot be taken that will produce the requisite accuracy. The Chief Engineer may substitute other methods to determine the correct quantities.

Cross sections will be taken of the undisturbed ground. Any materials removed or excavated before these measurements have been taken will not be included in the number of cubic yards measured. Unless it is ordered by the Chief Engineer, material excavated below specified elevations will not be measured. If so ordered, such additional cross-sections as are necessary will be taken.

Any excavation beyond specified limits will not be measured.

The cross-sectional area measured shall not include water or other liquid, but shall include mud, muck or similar semisolid material that has not been disturbed by the Contractor and that cannot be drained away.

**B. BMP Impervious Liner**

The unit of measure for BMP Impervious Liner will be the cubic yard. The number of cubic yards will be computed by the average end area method; however, the Chief Engineer may substitute other methods to determine the exact quantity.

**5. Basis of Payment**

**A. BMP Excavation**

The number of cubic yards of BMP Excavation removed will be paid for at the contract unit price per cubic yard, which payment will include the excavation of all material, all grading, draining cut areas, undercutting soft and unstable areas in the roadbed and/or embankment, the removal and disposal of all material, and all labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein.

**B. BMP Impervious Liner**

The BMP Impervious Liner will be paid for at the contract unit price per cubic yard, which payment will include all labor, materials, tools, equipment and incidentals necessary to complete the work as specified herein including furnishing, hauling and compaction.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 13 SEEDING AND MULCHING

### 1. Description

Seeding and mulching will be used to provide permanent or temporary stabilization for all disturbed areas along the Unnamed Tributary to Broad Branch. This operation consists of site preparation, soil amendments, seedbed preparation, seeding and mulching.

### 2. Materials

#### Seed Mixture

The Contractor shall apply seed at the mixture and application rates indicated for the areas noted in the following specifications. A conservation seed mix of comparable formulation may be used only if the label is provided to the Project Inspectors for approval prior to seeding.

- a. The Contractor shall apply the following mixture at a rate of 20 lbs. /acre for stream banks as shown in Table 12a.

Common Name	Botanical Name	Percent By Weight in Mix
Annual Ryegrass	<i>Folium multiflorum</i>	20
Bristlebract Sedge	<i>Carex tribuloides</i>	10
Virginia Wild Rye	<i>Elymus virginicus</i>	20
Riverbank Wild Rye	<i>Elymus riparius</i>	20
Deertongue Grass	<i>Panicum clandestinum</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	5
Partridge Pea	<i>Chaemecrista fasciculata</i>	15

Table 12a – Seed Mix and Rates for Stream Banks

- b. The Contractor shall apply the following mixture at a rate of 20 lbs. /acre for Riparian Buffer Areas as shown in Table 12b.

Common Name	Botanical Name	Percent By Weight in Mix
Annual Ryegrass	<i>Lolium multiflorum</i>	20
Canada Wild Rye	<i>Elymus Canadensis</i>	20
Virginia Wild Rye	<i>Elymus virginicus</i>	20
Deertongue Grass	<i>Panicum clandestinum</i>	10
Plains Coreopsis	<i>Coreopsis tinctoria</i>	5
Blackeyed Susan	<i>Rudbeckia hirta</i>	5
Butterfly Weed	<i>Asclepias tuberosa</i>	5
Partridge Pea	<i>Chaemecrista fasciculata</i>	15

Table 12b – Seed Mix and Rates for Riparian Buffer Areas

- c. The Contractor shall apply seed at the mixture and application rate for Headwater Wetland Embankments as shown in Table 12c.

Common Name	Botanical Name	Percent By Weight in Mix
Annual Ryegrass	<i>Lolium multiflorum</i>	20
Canada Wild Rye	<i>Elymus Canadensis</i>	20
Virginia Wild Rye	<i>Elymus virginicus</i>	20
Deertongue Grass	<i>Panicum clandestinum</i>	10
Plains Coreopsis	<i>Coreopsis tinctoria</i>	5
Blackeyed Susan	<i>Rudbeckia hirta</i>	5
Butterflyweed	<i>Asclepias tuberosa</i>	5
Partridge Pea	<i>Chaemecrista fasciculata</i>	15

Table 12c – Seed Mix and Rates for Headwater Wetland Embankments

- d. The Contractor shall apply seed at the mixture and application rate for all disturbed areas outside of the immediate restoration work area (e.g., temporary access roads, dewatering diversion pathways, stockpile and staging areas, etc.) as shown in Table 12d.

Species	Application Rate Lbs/Acre	Application Rate Lbs/1000 Sq. Ft.
Annual Ryegrass	40	.92
Perennial Ryegrass	100	2.3

Table 12d – Seed Mix and Rates for Disturbed Areas Outside of Restoration Work Area

## Soil Amendments

- a. Fertilizer composition and application rate shall be as outlined in Table 12e below. Fertilizers shall be of uniform composition and shall be suitable for accurate application by approved equipment. Fertilizers shall be delivered to the site in the manufacturer's packaging, and shall meet all applicable state or federal laws related to labeling. The manufacturer's name, fertilizer formulation and other required information should be clearly marked on the packaging.
- b. When lime is required, the materials shall be ground limestone, hydrated lime or burnt lime. Lime materials shall contain a minimum of 50% total oxides and shall be ground such that 50% passes a #100 mesh sieve and 98 – 100% shall pass a #20 mesh sieve. Lime shall be incorporated into the top 3 – 6 inches of soil by disking or other suitable methods. If lime is required it shall be applied at the rates indicated in Table 12e below.

Soil Amendment	Application Rate (lbs./acre)
10-20-20 Grade Fertilizer	500
Ground Agricultural Lime	2000

Table 12e – Soil Amendment and Application Rate

## Mulching

### a. Straw

Straw mulch shall consist of well-threshed wheat, rye, or oat straw and shall be reasonably bright. Mulch must be free of mold and noxious seed and shall not be musty, caked, decayed, or excessively dusty.

### b. Wood Cellulose Fiber Mulch (WCFM)

WCFM shall consist of prepared wood cellulose processed into a uniform fibrous physical state, and shall contain a dye to facilitate visual inspection of the uniformity of the application. WCFM shall not contain germination- or growth-inhibiting factors.

## 3. Installation Methods

### Site Preparation

- a. Prior to the start of operations, the Contractor shall install all erosion and sediment control measures as described in the Construction Specifications and shown on the Erosion and Sediment Control Sheets in the Construction Drawings.

- b. The Contractor shall perform all final grading operations at right angles to the slope. Final grading and shaping may not be required for temporary seeding.

#### Seedbed Preparation, Temporary Seeding

- a. For temporary seeding, the Contractor shall prepare a suitable seedbed by loosening the soil to a depth of 3 – 6" by means of suitable equipment.
- b. The area shall not be rolled or smoothed. On slopes greater than 3:1 the surface shall be tracked with heavy equipment such that the surface is irregular with track ridges running parallel to the slope contour.

#### Seedbed Preparation, Permanent Seeding

- a. The Contractor shall loosen all disturbed areas to a depth of 3 – 6". In areas where repeated access by heavy equipment or trucks has caused compaction, the Contractor shall loosen the soil to a depth of 12". The Contractor may use agricultural or construction equipment to perform the task.
- b. The Contractor shall conduct final grading of all disturbed areas in conformance with the Construction Drawings. All surfaces shall be smooth and free of large rocks.
- c. On sloped areas (greater than 3:1), the Contractor shall use track equipment to compact the slope and produce ridges parallel to the slope contour.
- d. When topsoil has been stockpiled during the construction of the project, the Contractor shall spread the topsoil on the disturbed areas after the soil has been loosened and rough grading completed.
- e. Apply soil amendments as described in Section 2.2 of these specifications. Mix amendments into the top 3 – 5" of the topsoil by disking or other suitable means.
- f. In lawn areas as shown on the Construction Drawings, the Contractor shall rake the seedbed surface to remove rocks and other large debris. The surface shall be clear of obstructions and debris and must be suitable for mowing upon establishment of the seeding.

#### Seed Specifications

- a. All seed must meet all applicable state and federal regulations and must include labeling indicating the supplier, formulation, germination rates, and seed date.

Seed may be subject to retesting by a certified lab. The Contractor shall submit a copy of the seed label for approval by the Contracting Officer.

- b. When inoculates are required for legume seed, they shall be provided by the same supplier as the seed. Inoculates shall be fresh and viable and must not have exceeded their expiration date. The Contractor shall apply them in accordance with the manufacturer's recommended application rate and procedures. In hydro-seeding operations, inoculates shall be applied at a rate four times (4x) the recommended rate.
- c. The Contractor shall use a seed mix and application as set forth in Tables 12a – 12e of this specification.

### Methods of Seeding

- a. Hydro-seeding: the application of a combination of seed, fertilizer, and mulch in a slurry mixture.
  - 1) If fertilizer is applied at time of seeding, the application rate will not exceed 100 lbs. /acre nitrogen, 200 lbs. /acre phosphorous, and 200 lbs. /acre potassium.
  - 2) When lime is to be applied by the hydro-seeder, the rate shall not exceed 3 tons/acre burnt and hydrated lime shall not be used.
  - 3) Hydro-seeding mixtures shall be prepared on site and applied immediately. No seed/mulch mix that has been left in the seeder for more than eight (8) hours shall be used.
- b. Dry Seeding: this includes the use of conventional drop or broadcast spreaders.
  - 1) Dry seed applications shall be incorporated into the subsoil at the rates prescribed in Tables 12a – 12e of this specification.
  - 2) Where practical, seed shall be applied in two directions perpendicular to each other. Apply half the seeding rate in each direction.
- c. Drill/Cultipacker Seeding: the use of mechanized spreaders that apply and cover seed with soil.
  - 1) Seeding completed with a cultipacker shall bury the seed to the depth specified in by the supplier and the seedbed must be firm after planting.
  - 2) Where practical, seed shall be applied in two directions perpendicular to each other. Apply half the seeding rate in each direction.

### Mulching Application

- a. All areas shall be mulched immediately upon completion of the seeding operations. Mulch shall be applied so as to provide a uniform cover on all seeded areas.
- b. When straw mulch is specified, the Contractor shall provide for anchoring of the mulch. Anchoring may be accomplished by mechanical equipment designed to punch and anchor mulch or by the use of a liquid binder.
- c. When liquid binders are used, they shall be applied at a uniform rate as provided for in the manufacturer's directions. The Contractor shall provide the Contracting Officer with a copy of the manufacturer's literature prior to the use of any liquid binder.
- d. Permanent mulch shall be applied at the rate shown in Table 12f of this specification.

<b>Mulch Application</b>	<b>Application Rate Lbs/Acre</b>	<b>Application Rate Lbs/1000 Sq. Ft</b>
Temporary Mulching	2000	45.9
Permanent Mulching	1500	34.5

Table 12f – Mulching Application and Application Rate

#### **4. Measurement and Method of Payment**

Seeding and mulching will be measured and paid for at the Contract price per acre of area seeded and mulched. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

#### **5. Special Conditions**

Under this Contract, the Contractor shall use wood cellulose fiber mulch in the hydro-seeding operations. The Contractor may substitute manufactured, recycled paper mulch, if such mulch has been developed specifically for hydro seeding and meets the conditions set forth in this specification.

END OF SECTION

## CONSTRUCTION SPECIFICATIONS

### SECTION 14 PLANTING TREES AND SHRUBS

#### 1. Description

This work shall consist of furnishing and planting trees and shrubs and all plant establishment operations as specified in the Contract Documents and shown on the Planting Plans or as directed by the Project Inspector. Transporting and installation of plant material shall take place when plants are dormant (December 1 through April 1).

Prior to the start of work on this item, the Contractor shall submit a proposed planting schedule, including source of plant material to the City and the Project Inspector for review. No work shall be performed until the DDOE and the Project Inspectors approve this schedule.

#### 2. Materials

##### Plant Material

- a. All plant material shall conform to the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen.
- b. Plant materials must be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to the Project Inspector upon request.
- c. Plant material collected from the "wild" is prohibited.
- d. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil. Roots shall visibly extend to the inside face of the growing container. All container plants shall be grouped and watered daily until they are planted.
- e. The Project Inspector may reject plants damaged in handling or transport.

##### Substitute Plant Material

If a substitute is selected, it must be native to the Maryland Piedmont Region and of the same size, value, and quality as the original plant.

## Preparation

- a. The live plant material shall be transported to the construction site within three (3) days of delivery from the nursery.
- b. Live plant materials must be protected against drying out and overheating before/during transport (e.g., they shall be covered transported in unheated vehicles, moistened, kept in soak pits) and on-site prior to installation (e.g., by storing in controlled conditions, storing in shade, covering with evergreen branches or plastic, placing in moist soil, or spraying with anti-transparent chemicals). Live materials shall receive continuous shade, shall be sheltered from the wind, and shall be continuously protected from drying by being heeled into moist soils. Where water is available, live stakes shall be sprayed or immersed.

### **3. Installation Methods**

#### Planting

- a. Trees shall not be planted in rows of uniformly spaced plants. Trees shall be planted in mixed species clusters of 3 – 5 trees per cluster. Individual trees within clusters shall be spaced 10 – 15 feet apart. Tree clusters shall not be randomly dispersed, instead focusing plantings around and within key landscape features. When specific areas of the site are ready for planting, the Contractor and Project Inspectors will walk the site identifying and staking the locations for tree clusters.
- b. Shrubs shall not be planted in rows of uniformly spaced plants. Shrubs shall be planted in mixed species clusters of 3 – 5 shrubs per cluster. Individual shrubs within clusters shall be spaced 3 - 5 feet apart. Shrub clusters shall not be randomly dispersed, instead focusing plantings around and within key landscape features. When specific areas of the site are ready for planting, the Contractor and Project Inspectors will walk the site identifying and staking the locations for tree clusters.
- c. The Contractor is not required to stake out each individual planting pit. However, upon planting a typical tree and shrub cluster areas within each planting zone, the Contractor shall have the Project Inspectors inspect and approve plant spacing techniques prior to proceeding.
- d. The Contractor shall install measures to protect newly planted material from deer browse and deer rub. The Contractor will have the Project Inspectors approve the proposed protective measures prior to their installation and inspect the measures once installed.

## Clean Up

- a. During planting all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage to existing plants, turf, structures and private property.
- b. Remove all tags, labels, strings, and wire from the plant materials, unless otherwise directed by the Project Inspector.
- c. Final cleanup shall be the responsibility of the Contractor and consist of removing all trash and materials incidental to the project and disposing of them off-site.

## Plant Establishment

- a. The Contractor is responsible for watering all planted material at an interval of every other day for the first three weeks following planting.
- b. Should the stream restoration project be completed during the summer months, the Contractor shall either 1) stabilize completed restoration areas by seeding and watering weekly or 2) from June 15<sup>th</sup> to September 15<sup>th</sup> commit to water all planted trees and shrubs weekly unless the project area receives 1" or greater of rainfall during a particular week.
- c. The Contractor is responsible for maintaining an 80% plant establishment success rate at the end of the one-year plant establishment period. The Contractor is responsible for replanting all areas not meeting 80% survival. The 80% plant success rate shall be based on each of the Planting Sections (Stream Banks and Riparian Buffer of the project's plant material achieving 80%.
- d. The Contractor will not be responsible for plant material that has been damaged by vandalism, fire, flooding, or other activities beyond the Contractors' control.

## 4. Measurement and Method of Payment

Planting trees and shrubs will be measured and paid for at the Contract price per each item specified in the Contract Documents. The payment will be full compensation for all material, labor, equipment, tools, and incidentals (including watering during the construction period) necessary to complete the work.

END OF SECTION

# CONSTRUCTION SPECIFICATIONS

## SECTION 15 PLANTING LIVE STAKES

### 1. Description

This work shall consist of the harvesting, transporting, and installation of Live Stakes into the stream banks as specified in the Construction Specifications and Plans. Installation of Live Stakes shall only occur when the plant material is dormant (Approximately December 1 – April 1).

### 2. Materials

- A. Live Stakes shall be from freshly cut live dormant cuttings (refer to plant schedule on the Construction Plans for species and dimensions). A minimum of three species shall be selected for the brush layering, Live Stakes, and Seedling Plugs.
- B. Live Stakes shall be soaked in water for 48 hours prior to installation.
- C. While keeping the bark of the Live Stakes intact, the side branches shall be cleanly removed, the basal ends angled for insertion, and the tops cut square.
- D. The Project Inspector shall inspect the plant materials and has the right to reject any unsuitable plant materials at the time of installation. The Contractor shall replace any unsuitable materials at his/her own expense and to the Project Inspector's satisfaction.

### 3. Construction

- A. The Contractor shall complete the installation of Live Stakes immediately following the completion of the stream banks.
- B. Live Stakes are to be placed into the stream banks. Pilot holes should be driven into the ground to a depth of  $\frac{2}{3}$  the length of the live stake. Pilot holes should be randomly spaced to obtain an average on-center spacing of 6 feet between Live Stakes.
- C. Live Stakes should be implanted into the pilot holes with the angled basal end down and the buds oriented up. The Live stakes should have  $\frac{2}{3}$  of its length in the ground. Live Stakes should have a minimum of two buds above the ground. Split or otherwise damaged Live Stakes will not be accepted.
- D. Ground should be tamped around the Live Stakes after installation.

E. Live Stakes shall be thoroughly watered immediately after installation and at such intervals during the plant establishment period as needed. Water shall not contain elements toxic to plant life. At each watering, the soil around the plants shall be thoroughly saturated.

#### **4. Measurement and Payment**

Live Stakes shall be measured and paid for at the Contract unit price per Live Stake as specified in the Construction Specifications. The payment will be full compensation for harvesting/furnishing, transport, storage, installation, watering, repair, replacement, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

## CONSTRUCTION SPECIFICATIONS

### SECTION 16 INVASIVE SPECIES REMOVAL

#### 5. Description

- a. The item of invasive species removal shall consist of invasive species removal in all Project Areas to the level of no greater than 3% coverage area (as defined by full leaf-on coverage). This may be accomplished by chemical or mechanical means.
- b. Care must be taken to not harm existing native trees and shrubs that exist in these areas. The area of treatment in these areas is approximately 50 feet on either side of the stream bank.
- c. The existing invasive include (but are not limited to):
  - Porcelain berry (*Ampelopsis brevipedunculata*)
  - English Ivy (*Hedera helix*)
  - Bush Honeysuckles: *Lonicera fragrantissima* (fragrant honeysuckle), *L. maackii* (Amur honeysuckle), *L. morrowii* (Morrow's honeysuckle), *L. standishii* (Standish's honeysuckle), *L. tatarica* (Tartarian honeysuckle), *L. xylosteum* (European fly honeysuckle),
  - Mile-a- minute (*Persicaria perfoliata*)
  - Tree of heaven (*Ailanthus altissima*)
  - Bamboo (*Bambusa*, *Phyllostachys*, *Pseudosassa* species)

#### 6. Construction

- a. The minimum requirements for this task include spring (2013) and one fall session (2013). The fall (2013) removal must take place no later than October 31<sup>st</sup>. The following session must be done in such a way that the work does not extensively harm existing native vegetation or newly planted trees and shrubs. The contractor shall select the timing of the last session in such a way that it has the greatest control effect on the invasive plants. Signage that notifies the public of the spraying of any herbicide must be installed prior to any spraying of herbicides.
- b. The contractor must notify the project inspector 2 days prior to initiating the invasive removal. The project inspector may be onsite to observe the invasive removal and to assess the effectiveness of the work.
- c. All work must be accomplished by technicians that are trained, qualified, and licensed to apply herbicides.

## **7. Measurement and Method of Payment**

This item will not be measured but will be paid for at the individual Contract lump sum. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION