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TECHNICAL MEMORANDUM

TO: Mr. Peter Delaney, Chair Town of Boxford Conservation Commission
FROM: Bree D. Sullivan, P.E.
DATE: August 8, 2019
RE: **NOI# 114-1283 - Lockwood Lane Bridge Replacement**

This memorandum has been prepared to provide additional information requested in a August 8, 2019 email from Ross Povenmire, director of conservation.

Questions:

Q: I assume the ConsCom is being asked to approve the project pursuant to 310 CMR 10.53(8), in addition to the sections referenced in the NOI. This section applies to "any person proposing the replacement of an existing stream crossing," and requires a demonstration that the project "complies with the Massachusetts Stream Crossing Standards to the maximum extent practicable." I offer the standards at this link: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StreamRiverContinuity/MA_RiverStreamCrossingStandards.pdf. It seems clear that the proposed span complies with the 1.2 X bank full width included in the standards, but it is not clear from the NOI or the Hydraulic Study Report how the project complies with the various other standards, including the "openness" ratio and construction of banks for wildlife passage.

A: As a replacement crossing, the project is required to meet the general standards to the maximum extent practicable; the proposed design meets all of the general crossing standards, and several of the optimum standards (standards 1-4)

The project will meet the "General Standards" as follows:

1. *Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) that preserve the natural stream channel are strongly preferred.*
2. *If a culvert, then it should be embedded: - a minimum of 2 feet for all culverts, - a minimum of 2 feet and at least 25 percent for round pipe culverts - When embedment material includes elements > 15 inches in diameter, embedment depths should be at least twice the D84 (particle width larger than 84 % of particles) of the embedment material*
3. *Spans channel width (a minimum of 1.2 times the bankfull width)*
4. *Natural bottom substrate within the structure.*
5. *Designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows.*



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The proposed structure is a bridge span that spans the channel a minimum of 1.2x the channel width as described in the Hydraulic Report. The bedform gradation was developed by performing a pebble count of the stream material in the reference reach. The reference reach is a section of stream located beyond the influence of the existing crossing. At the Lockwood Lane site, the reference reach is located approximately 300 feet downstream. Because the proposed bridge spans the bank, the anticipated stream velocity will be comparable to the reference reach. This has been confirmed in the hydraulic study.

6. Openness > 0.82 feet (0.25 meters)

Existing stream openness:	area/length = 115/27 = 4.25
Proposed crossing openness:	area/length = 137/27 = 5.07

Despite a slightly lower superstructure elevation for the proposed bridge, the openness ratio will increase under the proposed conditions.

7. Banks should be present on each side of the stream matching the horizontal profile of the existing stream and banks.

The proposed channel geometry/grading includes continuous bank resource area (bank elevation = 51.2) through the proposed bridge structure. This provides for terrestrial wildlife passage through the crossing during the Mean Annual High Water (MAHW) flow. The bank H:W ratio does not exceed 1:2, which exceeds the standard of 1:1.5.

Q: It appears the bottom of the stream channel will be raised significantly to undo the effects of past scour, and the proposed lower chord elevation of the bridge will be lowered. The net result of these changes will be to reduce the freeboard in a 10 year storm to 0.05 feet instead of the 2.0 feet normally required, if I understand the Hydraulic Study Report Conclusions correctly. I would appreciate understanding why this should not be a concern.

A: The MassDOT standards (in pertinent part) are as follows:

“Optimally, new and replacement bridge superstructures should be configured so as to provide 2 feet of freeboard between the hydraulic design flood water surface elevation and the proposed superstructure low chord to allow for the passage of debris and ice. Where this is not feasible, the clearance should be established by the Designer based on a level of bridge flood damage protection approved by MassDOT”

The design storm for this structure is the 10 year storm, which is approximately ½-inch below the proposed lower chord. To provide a structure that meets statutory loading, we needed to use leger structural elements to span the widened channel. Because of the resource area proximity upstream and downstream and in consideration of the increased costs, we are unable to raise the proposed bridge to meet the optimal requirement of 2 feet of freeboard. The bridge design includes allowances for hydrostatic and hydrodynamic forces associated with inundation from flooding up to the 500 year event.



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Q: The proposed plan does not provide details on dewatering of the work area, and instead refers to a plan for “channeling water, bypass pumping or blocking streamflow” to be provided by the contractor to the engineer. I anticipate the ConsCom will want to understand the dewatering process prior to issuing an Order of Conditions, and suggest that the project plans be more specific with regard to this crucial step.

A: Control of water procedures will be determined by the contractor based on their experience and their field investigation. The plans are clear about construction occurring “in the dry” and in a manner that minimizes sediment deposition in the stream. The contractor is required to develop and submit a complete control of water and dewatering plan prior to commencement. The possible different types that can be used are driven sheet cofferdams, portable temporary dam structure(s), and channelization structures. The project will likely be constructed in stages – excavation and construction of the westerly abutment behind the existing abutment (in part), then disassembly of the existing abutments and excavation and construction of the easterly abutment. Dewatering will include pumping to a filtration bag. The filtration bag detail and approximate location is shown on sheets E-6 and E-5, respectively. Optionally, the commission could require submittal of the approved control of water plan as part of the Order of Conditions. See attached selected Special Provisions for additional detail.

Q: The method by which the stream channel is raised and reconstructed, and the upland banks made suitable for wildlife passage, are not clearly defined in the application package. Sufficient detail on the selection and placement of material should be offered to ensure the success of future fish and wildlife passage.

A: The stream reconstruction methods and materials are provided on sheet E-4. The cross-section detail and grading plan is included on sheet E-5, lower left hand corner. The existing stream cross-section is shown by the dashed line. The contractor will be required to meet these grades using the materials and construction sequencing provided on the plans. The stream bed material requirements include reusing the existing abutment stones as channel fill. The existing stones are already in the channel and therefore already part of the habitat. Please note that scour holes upstream and downstream will not be filled because they are located outside the existing right-of-way. Because the proposed bridge will span the banks of the stream, the velocity that caused scour will be eliminated. These scour holes will fill in over time through the natural fluvial process. See attached selected Special Provisions for additional detail.

Q: There is a reference made to “Special Provisions” in the plan relating to the design of the wetland replication area. I could not find these provisions. A vegetation monitoring plan should be offered for the reconstructed wetland area and to ensure that invasive species do not colonize disturbed areas of the site.

A: The pertinent special provisions are attached. The wetland replication specification includes establishment, monitoring and performance period(s). Please note that due to the small size of replication area (53 s.f.), a wetland restoration seed mix combined with the existing seed bank in translocated soils should be adequate to provide sufficient coverage.

ITEM 697.2

FLOATING SILT FENCE

FOOT

The work under this section shall consist of furnishing and erecting floating silt fence turbidity barrier with steel posts to act as a silt barrier for work within the Shaw Brook. The floating silt fence shall be installed prior to commencing any work in or above the brook and shall be installed, removed, reset, extended, modified, etc. as necessary to complete the work while minimizing impacts to the environment.

The floating silt fence shall be placed in the brook in reasonable conformity with the locations shown on the contract drawings and as directed by the Engineer. Submit catalog cut and Independent Laboratory test results for full compliance with the properties listed below for the Engineer’s approval prior to application. The floating silt fence shall be in place and approved by the Engineer prior to any contract work that interfaces with the brook.

The Contractor shall maintain the floating silt fence in satisfactory working order until removed, including any necessary replacements of damaged or deteriorated sections, at no additional compensation. The floating silt fence in the Schenob Brook shall be maintained until all work within or above the Schenob Brook has been completed. Sediment deposited into the area enclosed by the floating silt fence shall be removed and lawfully disposed prior to relocating or removal of the floating silt fence barrier(s).

Installation procedures may be varied to comply with manufacturers recommended procedures with the approval of the Engineer. If required, the Contractor shall submit alternate installation and/or staging procedures for approval.

MATERIALS

In-water Floating Silt Fence shall meet the following property specifications:

1. Product Description: An oleophilic siltation curtain with flotation members, tension link in floatation section, a permeable curtain and a ballast chain enclosed in bottom pocket.
2. Length: As required. Provide multiple sections when the length of the work area exceeds 30 feet.
3. Draft: 1 foot to 6 feet. Contractor shall field verify draft requirements.
4. Floatation Element: Cylindrical, internal closed cell foam.
5. Net Buoyancy: 6: dia. 12/lbs/ft 8” dia. 21/lbs.ft
6. Floatation Section Fabric: Fabric shall be impermeable 22 ounce per square yard PVC coated nylon or polyester in international orange or high visibility yellow.
7. Floating Silt Curtain: Floating Silt Fence curtain fabric shall be permeable fabric meeting or exceeding the following properties:

PROPERTY	MIN. REQUIREMENT	TEST
Weight	5.5 oz/yd ²	

Tensile Strength	220 lbs.	ASTM D-4632
Elongation @ Break	15%	ASTM D-4632
Mullen Burst	470 psi	ASTM D-3786
Puncture Strength	100 lbs.	ASTM D-4833
Tear Strength	100 lbs.	ASTM D-4533
Abrasion Resistance	N/A	
EOS US Std. Sieve	#70	ASTM D-4751
Flow Rate	18 gal. /min. /S.F.	ASTM D-4491

8. Tension Cables: 5/16-inch PVC coated galvanized aircraft cable top tension enclosed in top portion of the floatation section. It shall secure to each end of connector of the curtain sections. Cable system shall be tamperproof.
9. Ballast: 5/16-inch 1.1 lbs/ft. or heavier if required, galvanized steel chain enclosed in bottom pocket of the entire length of floating silt fence.
10. Section Connectors: Aluminum universal connectors on each end of floatation section. Below the connectors, the skirts shall be joined by polypropylene rope ties between the grommets on the two skirts. The ballast chains can be shackled.
11. Intermediate Tensioning and Anchoring: Provide additional tensioning and anchoring in order to establish and maintain U shaped or other configuration indicated and to keep the curtain out of the work area and retain sediments within the work area (inside the floating silt fence barrier).
12. Steel posts shall be a minimum of 10 feet in length and 4 inches diameter galvanized fence post or other manufacturer approved supporting device approved by the Engineer.
13. The turbidity curtain shall be fitted with an oil boom.

MEASUREMENT AND COMPENSATION

The floating silt fence will be measured in place by the foot of fence satisfactorily installed. This work will be paid for at the contract unit price per foot of Floating Silt Fence, complete in place. The cost of relocating, resetting, removal and disposal of the floating silt fence shall be included in the cost of the initial installation. The unit price shall include all materials, labor, tools, and equipment incidental and necessary for the installation, relocation, removal and disposal of floating silt fence.

Removal and disposal of built-up silt or debris deposited or accumulated into the enclosed area or at the bottom of the floating silt fence shall also be included in the unit bid price of this item.

Payment for the work under this item will be made at the contract unit price for Item 697.2, Floating Silt Fence. Such payment shall be considered full compensation for all materials, labor, tools and equipment needed to install, maintain, relocate, clean and remove turbidity curtains and remove and dispose of debris as specified herein.

ITEM 698.4

**GEOTEXTILE FABRIC FOR
PERMANENT EROSION CONTROL**

SQUARE YARD

Work under this item shall consist of furnishing and installing geotextile filter fabric at locations shown on Plans and over the entire surface upon which Stone for Erosion Control (Item 984.6) is to be placed and extend a minimum of 4 feet out on each side. The extended edges of the geotextile filter fabric will be folded back over and covered by the stone a minimum of three feet.

When sections of geotextile filter fabric need to be joined, the sections shall be overlapped a minimum of 18 inches in the direction flow and installed per manufacturer's written literature. The geotextile filter fabric shall conform to the relevant provisions of Materials Section M9.50.0. The Geotextile fabric shall be selected from the MassDOT Qualified Construction Materials List.

Traffic or construction equipment will not be permitted directly on the geotextile. Either sewing or overlapping shall join geotextiles sections in accordance to the manufacturer's written literature and the following: sewn seams shall be lapped a minimum of 4 inches and double sewn. The thread used to sew the seam shall be nylon or polypropylene. Overlapped seams shall have a minimum overlap of 18 inches, except where placed under water where the overlap shall be a minimum of three feet. All seams shall be installed in the direction flow. Installation shall be subject to the approval of the Engineer. Geotextile, which becomes torn or damaged, shall be replaced or patched. The patch shall extend 36 inches beyond the perimeter of the tear or damage.

Stone filling (heavy) or stone filling (medium) shall not be dropped onto the geotextile from a height greater than 12 inches. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding 36 inches.

METHOD OF MEASUREMENT

Item 698.4, Geotextile Fabric For Permanent Erosion Control, shall be measured by the Square Yard for the actual surface slope area covered by the fabric, complete in place. Overlap and vertical sections of fabric shall be considered incidental to this item and not measured for payment. The front and back portions of revetment key, as well as the top and side edge limits of revetment slope shall be considered vertical sections.

BASIS OF PAYMENT

Item 698.4, Geotextile Fabric For Permanent Erosion Control, shall be paid for at the Contract unit price per Square Yard, complete in place, which price shall include all equipment, material, labor and tools necessary for a complete installation, as specified above and as directed by the

Engineer. Sewing, vertical edges and overlapping shall be considered incidental to Item 698.4 and no additional compensation made therefore.

ITEM 754. **WETLAND SOIL REHANDLED AND SPREAD** **CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Section 751 of the Standard Specifications, the plan details and the following:

Wetland soil shall be excavated and backfilled to existing lines and grades or as directed by the resident engineer.

Method Of Measurement And Basis Of Payment

Item 754, wetland soil rehandled and spread, shall be paid for at the Contract unit price per cubic yard, complete in place, which price shall include all equipment, material, labor and tools necessary for a complete excavation and installation, as specified above and as directed by the Engineer.

ITEM 755. **WETLAND REPLICATION AREA** **SQUARE YARD**

DESCRIPTION

The work to be done under this section includes excavating, fine grading and installation of wetland soil and plants as shown on the plans and as directed by the Engineer. The work under this item shall conform to the relevant provisions of Sections 120, 770, 771, and the following:

The construction and re-vegetation of the replication areas shall be in accordance with the Plans and Cross Sections. Limits of replication and proposed plantings shown on the plans are approximate and may require adjustment in the field to accommodate actual conditions.

SUBMITTALS

Soils. Contractor shall submit for approval all sources of loam and compost and all other soil amendments prior to ordering. Soils brought in from off-site shall be free of invasive species. Off-site source shall be identified and available for inspection by the Engineer prior to transport of soil to the site.

Photographic Documentation. Prior to any disturbance, clear and legible digital photographs shall be taken by the Contractor of the existing wetland to be impacted and of the proposed wetland replication site. These shall be submitted to the Engineer.

Seed. At least 30 days prior to ordering, the Contractor shall submit to the Engineer seed packing certificates with source and date, as well as material specifications for all mulch materials. No material shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match approved materials. All substitutions shall be approved by the Design Engineer.

Seed shall be brought to the site in unopened bags, whereupon Engineer shall collect certification from bag prior to opening bag and prior to any seeding activity. In addition, a manufacturer's Certificate of Compliance shall be submitted with each seed shipment. These Certificates shall include the guaranteed percentages of Pure Live Seed, based on purity and germination rates, as well as the net weight, harvest, and shipment dates.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

MATERIALS

Wetland Soil

Compost shall be per the requirements of Section M.1.06.0 Organic Soil Additives.

Wetland soil for wetland restoration or replication may be either soil excavated from impacted wetland area or manufactured hydric soil. If using soil from the impacted wetland area, soil shall not be compacted or grubbed. If the proposed mitigation site is in an area free of invasive species, wetland soil from the impacted wetland that is infested with invasive plant species shall not be used so as to avoid bringing invasive species to a new location. If the mitigation is adjacent to the infested area, wetland soils from the impacted site may be used as they will inevitably spread into the mitigation site. Manufactured wetland soil shall consist of on-site borrow from the proposed replication site thoroughly mixed with compost to achieve a target organic content of 10-12% by weight. Where empirical data are lacking, compost to soil ratio shall be 1:2 by volume. Off-site borrow may be used for mixing if approved in advance by the Engineer per these Special Provisions.

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants. No soil or soil amendment shall be brought on site without prior approval of the material source. Soils used in the replication area should be free of rocks greater than 4 inches (100 mm) in diameter.

Seeding

Seed Mix shall be Pure Live Seed and shall be a wetland mix comprised of native New England species from one of the following suppliers or an approved equal: New England Wetland Plants, Amherst, MA (#413) 549-4000; Allen Seed, Exeter, RI (#800-527-3898); or Ernst Conservation Seeds, Meadville PA (#800- 873-3321). Such mix shall be specific to the hydrologic conditions of the site and approved by the Design Engineer or Wetland Specialist.

CONSTRUCTION METHODS

Site Preparation

All trees, stumps, brush and other removed vegetation shall become the property of the Contractor to be legally disposed of off-site or recycled for use.

The Contractor shall plan and execute operations in such a manner that the amount of excavated and exposed fill is minimized and foreign materials are prevented from being washed or otherwise carried into the replication area or into nearby wetland resource areas.

Erosion and Sediment Control

Stake out replication area boundaries in the field prior to excavation. Install siltation barrier of straw bales and silt fence or filter tubes and silt fence (if used) along the edge of the proposed replication site. The siltation barrier shall begin and end in the surrounding upland and shall be placed so that no excavated material or disturbed soil can enter adjacent wetlands or waters. The siltation barrier shall act as a limit of work barrier for all heavy equipment. Siltation fencing needs to be entrenched in soil to prevent sediment transport.

Straw bales shall be a single row and shall be tightly butted to adjacent bales, and staked with two 1" x 1" x 3' (25 mm x 25 mm x 1 m) stakes spaced evenly in the bale and driven solidly into the underlying material.

Engineer shall inspect and approve erosion and sediment control measures prior to excavation work. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition.

Suitable erosion and sedimentation control consisting of a filter berm, compost tube, or siltation fence shall be installed around the replication to control the discharge of water draining into and from the replication area.

Excavation

Final wetland replication area shall be staked for approval prior to clearing and excavation. Environmental protection measures, including straw bales, silt fence, compost filter tubes or berms, shall be in place prior to any construction activities. Limits of replication area shall be adjusted to protect root systems of existing trees: limits shall be a minimum of 6 feet (2 meters) from trunk of trees to the extent possible. However, the total area of wetland mitigation required by permit(s) shall not be reduced.

Unless otherwise directed, the contractor shall excavate replication area to a depth of 12 inches (300mm) below finished grade.

If hydric soil from the impacted wetland is being used and the replication area is not ready for placement, the soil may be temporarily stacked in a site approved by the Engineer. The stockpiled soil shall be placed in the replication area as soon as practicable and with a minimum

of handling. The Contractor shall provide water to keep the soil moist, whether stockpiled or placed in the replication area. All stockpiled soils shall be outside the resource area and at least 100 feet (30 meters) from the edge of resource areas and buffer zones. All material should be covered with plastic or a tarpaulin and watered as necessary to prevent desiccation. Stockpiled soil shall be surrounded by straw bales or filter tubes/berms to prevent migration of sediment.

In the event there is excess borrow, it shall be disposed of without additional compensation.

Backfill and Grading

The Wetland Specialist and the Resident Engineer will oversee all grading activities. The Contractor shall take measures necessary to ensure that the elevations of constructed replication area blend without interruption with those of protected wetland areas.

Sequence and execution of work will ensure minimal compaction and that no heavy equipment travels over placed replication soil.

Following excavation and grading of the site to sub-grade, and after the sub-grade elevations are approved by the Engineer, wetland soils shall be placed in two lifts over the replication area as shown on the Plans and Cross Sections and/or as directed by the Wetland Specialist.

Contractor shall provide sufficient backfill to reach a depth not to exceed 12 inches (300 mm). The finish elevations within the wetland replication area shall be surveyed to ensure that the correct topography and hydrology are met. No breaks in elevation shall result upon removal of siltation barriers and other erosion-control devices. The finished grade shall be at an elevation that will provide a hydrologic connection between the replication area and adjacent wetlands or water source. The Contractor shall verify that this elevation is not at a level that could dewater an adjacent wetland. The hydrologic connection should be in keeping with restoring the intended function of the replication wetland.

After placement of soil is complete, the soil surface shall be raked to a relatively smooth planting surface, except for topography changes around any trees that are selected to remain. If area has been dewatered, natural water levels shall be restored.

Upon completion of the excavating, filling and grading of the replication area, filter berms, filter tubes or a straw bale barrier shall be placed around the entire perimeter to protect it until completion of project construction. The erosion-control devices shall be removed after plants are established and in accordance with performance standards from the Wetlands Protection Act Regulations and applicable permits. The ground under the siltation barriers shall be reseeded with the wetland mix when the barriers are removed.

SEEDING

Once soils have been placed, no heavy equipment shall travel across replication or restoration areas.

All planting and seeding will take place under the supervision of the Wetland Specialist. At least 75 percent of the replication surface area shall be reestablished with wetland plant species within two growing seasons of planting in accordance with the Massachusetts DEP Wetlands Protection Act Regulations, Corps of Engineers mitigation guidance, and applicable permit conditions.

Seeding

Wetland seed mix shall be applied after soil has been raked or after mulch has been applied. Seed shall be sown by hand or by small mechanical lawn seeder unless otherwise approved by the Engineer. No fertilizers are necessary unless otherwise directed by the Wetland Specialist.

Water seeded areas within same day. Spray of water shall not disturb seed on the soil surface. Any seeded area disturbed by watering or other construction activity shall be re-seeded at no additional cost. Watering shall continue as necessary for germination and establishment of seed.

Compost Mulch

Upon completion of seeding and/or planting, all disturbed areas up to the limit of the replication area shall be lightly mulched with 1-2 inches (25-50 mm) of compost and seeded.

Removal of Erosion Protection Measures

Upon completion of all construction and once soils are stabilized with a uniform cover of vegetation, straw bales shall be removed and disposed of off-site. Contractor shall rake out filter berms so that filter material is no greater than 3 inches (75 mm) in depth on soil substrate. If filter has been wrapped in fabric or fabric bags, all bag material shall be cut and removed and disposed of off-site by the Contractor, at no additional cost to the project. Filter material shall then be raked out.

MAINTENANCE AND REPLACEMENTS

Monitoring will be performed in order to ensure satisfactory plant establishment and compliance with the performance standards for Bordering Vegetated Wetland from the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.55 (4)(b) or with any other requirements of the Department of Environmental Protection, Corps of Engineers, and applicable permits..

At the end of each of the growing seasons, the Wetland Specialist shall complete and submit a progress report detailing the relative success or failure of the replication efforts.

Plants shall be inspected for disease and area shall be monitored for invasive species. All invasive species shall be removed as specified by the Wetland Specialist.

Completion Inspection

Area shall be inspected to document that it has been constructed such that it meets the intent of the design with regard to soils, grading, hydrologic connection, erosion control, plant species and

quantities, and quality of plant material. A written report must be submitted to the Resident Engineer which documents construction of the mitigation area, materials, final grades, final total area of mitigation, and digital photographs showing final conditions.

First Inspection

Wetland Specialist will conduct an inspection at the end of the first full growing season or 180 growing season days after planting, whichever comes first. A written report must be submitted to the Resident Engineer documenting viability of the mitigation area, hydrology, condition of vegetation, evidence of invasive plant species, and any other information required by permits, DEP and Corps of Engineers regulations and requirements.

Plants shall show seventy-five percent (75%) healthy foliage to be assumed as having satisfactory evidence of growth after the first growing season. The Contractor is required to remove and replace all plants that have not shown satisfactory evidence of establishment. Replacements shall be with plants originally specified in this contract or as determined by the Wetland Specialist and shall be at no additional cost to the department.

Seeding shall have seventy-five percent (75%) uniform cover by wetland species to be accepted as having satisfactory evidence of growth. Any areas that are unsatisfactory shall be reseeded. All reseeded, together with necessary re-grading, soil amendment and erosion control, shall be done at the expense of the Contractor.

Second Inspection

The Wetland Specialist shall make a second inspection at the end of the second growing season. All written reports shall be provided to the Resident Engineer as described under First Inspection.

Plants shall show seventy-five percent (75%) healthy foliage to be assumed as having satisfactory evidence of growth after the first growing season. Seventy-five percent (75%) uniform cover by wetland species shall be considered satisfactory evidence of growth. Plants that are dead or do not show healthy growth as determined by the Wetland Specialist and the Engineer shall be replaced by the Contractor at no additional cost to the Department.

Seeding shall have ninety percent (90%) uniform cover by wetland species to be accepted as having satisfactory evidence of growth. Any areas that are unsatisfactory shall be reseeded. All reseeded, together with necessary re-grading, soil amendment and erosion control, shall be done at the expense of the Contractor.

COMPENSATION

Wetland replication area shall be measured per square yard (Item 755.) of wetland replication completed and shall be paid for as such. Cost shall be full compensation for the work described above, surveying of areas and existing conditions, evaluation of presence of satisfactory existing

wetland (hydric) soils for reuse in the replication area, excavation, provision and placement of suitable wetland soil materials, grading, and protection of the work and all inspections and reports. The cost shall also be full compensation for seeding, plantings, fertilizers, watering, treatment of invasive species, inspections, and all incidental costs for the satisfactory establishment of the wetland replication area.

Professional Wetland Specialist shall be paid per hour under Item 755.7. Contractor shall submit a breakdown of costs for all activities. Contract quantity is based on estimate of work appropriate for this contract.

The work under this item shall conform to the relevant provisions of Section 765 and the following:

Seeding shall comply with the requirements of Section 765 of the Standard Specifications, including all requirements of the Supplemental Specifications, including Material Specifications in Section M6 of Division III.

Where temporary seeding is required for short-term stabilization of slopes or stockpiles, seeding shall be applied per the requirements stipulated for 765, except that seed blend shall be 70% Slope and Shoulder Mix and 30% annual or winter rye, as directed by Engineer. Blend shall be submitted for approval by Design Engineer.

ITEM 765.44 SEEDING – ROADSIDE RIVERBANK – PART SHADE MIX SY

The work under this item shall conform to the relevant provisions of Section 765 of the Standard Specifications and the following:

The work shall consist of planting and establishing a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

All seeding shall be done by a company having a minimum of five years of experience with native grass establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications includes, if requested, providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and proof of having completed successful native seeding projects.

Seeding shall be done within 48 hours of placement of loam and final grading. Mulch for seed shall be Compost Topdressing or hydromulch as specified below, and shall be incidental to this item.

SEEDING SEASON

Seeding seasons shall be April 1 through May 15 and October 1 through December 1 for dormant seeding. *Seeding that occurs outside of these periods, shall be increased by 50%.*

MATERIALS

Seed

Samples and Submittals

- 1) Certificate of Materials. 60 days prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier's notarized Certificate of Materials. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded, but simply to verify supplier availability of seed listed on the date certified. The species listed shall match those specified on the plans or herein, however, cultivars may vary due to availability. Substantial substitutions or changes in the mix from that specified on the plans or herein shall be approved by the Design Engineer or Wetland Specialist.
- 2) Seed Tag Certification. All seed lots have a seed analysis tag as required by State and Federal law. The contractor shall submit seed tags for each bag of seed used on the project site or ensure that each tag is photo documented by the Engineer. Number of tags shall match number of bags sent by the supplier to meet rate of Pure Live Seed specified on the plans. Tag must include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding may be considered unacceptable for payment if no tags are submitted.
- 3) Certificate of Compliance. Prior to payment, contractor shall submit a bill of lading or a signed, dated and notarized Certificate of Compliance from the Supplier that serves as proof of purchase. This document shall include kind and variety of seed, lot number, net weight shipped, date of sale, invoice number under which seed was purchased, and name and address of Supplier or Manufacturer. All information must be included on the notarized form, including lot number and net weight shipped for specified job. This information shall match Seed Tag Certification and quantity of seed applied on the job. Seeding may be considered unacceptable for payment if information is incomplete.
- 4) Seed Sample. Contractor may be asked, prior to seeding, to submit a seed sample for testing.

Seed mix shall be a custom blend as shown on the plans or shall be as specified below. Seed cultivars shall be those that are as regional to New England or the local ecotype as possible.

Any species substitutions shall be with a species having similar characteristics and native to New England. Substantial changes in the mix shall be approved by the Design Engineer or Wetland Specialist.

Seed mix for Roadside Riverbank – Part Shade Mix - shall be as follows.

	<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
Grass	Elymus virginicus	Virginia Wild Rye	25.00%
	Elymus canadensis	Canada Wild Rye	20.00%
	Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	20.00%
	Festuca rubra	Creeping Red Fescue	12.00%
	Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	8.00%
	Agrostis perennans	Upland Bentgrass	6.00%
	Carex vulpinoidea	Fox Sedge	2.00%
	Juncus tenuis	Path Rush	2.00%
	Juncus effusus	Soft Rush	0.10%
			<hr/> 95.10%
Herb/Forb	Penstemon digitalis	Beard-tongue	2.00%
	Aster novae-angliae	New England Aster	1.00%
	Solidago caesia	Woodland Goldenrod	0.50%
	Aster cordifolius	Blue Wood Aster	0.50%
	Eupatorium maculatum	Joe-pye Weed	0.30%
	Geum canadense	White Avens	0.30%
	Solidago rigida	Rigid Goldenrod	0.20%
	Rudbeckia hirta	Black-eyed Susan	0.10%
			<hr/> 4.90%
			<hr/> 100.00%

Seeding Rate:

Apply this mix at 20 lbs PLS/acre on areas of less than 3:1 slope and 25 lbs PLS on areas of greater than 3:1 slope.

Add 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding item.

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Mulch

Mulch for seeding and topdressing shall be incidental to this item. Mulch shall be:

- Compost Topdressing meeting the material and submittal requirements of Item 751.72, Compost Topdressing and as specified below under Seeding and Mulching.
OR
- Hydromulch per the manufacturer's recommendation. Mulch for hydroseeding shall be wood fiber only.

Photo Documentation

Contractor shall submit photo documentation to the Engineer and Landscape Design Section. Each photo shall be date stamped. Photos shall be submitted after the following stages of construction:

- Soil preparation
- Seed and hydromulch/compost topdressing
- Germination
- Grass establishment after one full growing season (growing season is June-September)

CONSTRUCTION

Surface Preparation

Soil preparation and seeding shall occur only when the bed is in a friable condition, not muddy or hard. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a smooth and even finish corresponding to the required grades.

When seeding over existing or compacted soil, surface will be prepared by raking or tracking to a depth of 2 inches prior to seeding and prior to Compost Topdressing (when applicable).

Surface preparation shall be compensated for under Item 751. Loam Borrow.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 48 hours of site preparation to prevent loss of topsoil. Seeding shall be hydroseeding or broadcast as specified below.

Compost Topdressing: Compost Topdressing shall be applied as specified under that item. Seed should be broadcast at the same time as compost application to ensure a thin cover of compost over seed. *When seeding is done after application of Compost Topsoil the rate shall be increased by 50% and area shall be hydromulched.*

Compost Mulch over Modified Rock: Compost Mulch shall be applied as specified under that item and shall be such that only the voids in the rock are filled so that seed has an organic substrate for germination. Seed shall be broadcast after compost application. No hydromulch is required.

Seeding Methods

No seeding or surface preparation work shall be done if soils are muddy or dry and compacted.

Broadcast Seeding: Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler (e.g., sawdust, rice, kitty litter, or clean damp sand) to achieve an even distribution. Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction.

To ensure seed to soil contact with broadcasting of seed, seed shall be tracked or rolled with a weighted roller.

All broadcast seeding shall be followed by hydromulching unless seeding is done as part of Compost Topdressing and as specified above.

Hydroseeding shall include hydromulch.

Hydromulching shall be per the Standard Specifications and per the manufacturer's directions.

Seed and Grass Care

During Germination: Contractor shall care for seeded areas as determined necessary by the Engineer. Care may include irrigation and weed control as necessary for germination.

During Establishment: Following germination of seeded species, the contractor shall maintain the stand of grasses to ensure healthy growth. Work shall include mowing or weed-whacking for weed control, irrigation if necessary, and monitoring for invasive plants.

Watering shall provide uniform coverage without eroding soil or grassed surfaces. Treatment of invasive plants shall be in accordance with standard practices.

The Contractor shall provide all labor, equipment, materials, and water required for establishment. Contractor shall water all seeded areas as necessary to a depth of 2 inches or greater.

Over-seeding

Areas that are invaded by weeds shall be mowed as low as possible and over-seeded as directed. Soil that is compacted shall be raked or roughened prior to over-seeding. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact.

Over-seeding and mulch for over-seeding shall be incidental to this item.

ESTABLISHMENT

Native upland grasses and forbs will not look like turf grass. Many of the native grasses are bunch type grasses and will not form a uniform growth or have a sod-type appearance. However, seeded area shall show general uniform growth of the seeded species throughout the area. Areas with significant gaps of bare soil, generally greater than 2-3 feet in diameter, will require over-seeding.

A well-established stand of grasses at the end of one full growing season (June-September), as determined by the Engineer, will be required for acceptance. At least 80-90 percent of the grass established shall be the seeded species and any invasive or aggressive weeds (mugwort, ragweed, or knapweed) shall have been cut or otherwise managed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 765.442 will be measured for payment by the square yard after one full growing season (June-September) has elapsed between seed application and inspection and upon approval of establishment by the Engineer.

Item 765.442 will be paid for at the Contract unit price per Square Yard upon receipt of required submittals as specified above and upon approval of established stand of grass as specified above.

This price shall include seeding, rolling to ensure seed-to-soil contact, care during germination and establishment, irrigation, mulching, over-seeding, labor, materials, equipment, photo documentation, and all incidental costs required to complete the work. Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated for under Item 751, Loam Borrow.

ITEM 765.45

SEEDING – UPLAND RESTORATION MIX

SQUARE YARD

The work under this Item shall conform to the applicable requirements of Section 765, SEEDING, in the Standard Specifications except as amended and supplemented as indicated on the drawings and as specified below.

The purpose of this item is to provide an established stand of perennials and grasses in the areas to be seeded. For the purposes of these specifications, the term “grasses” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

This item shall be used for seeding of slopes that are not to be maintained or mowed. Seeding of areas that are maintained and mowed shall be seeded in accordance with Item 765 "Seeding".

All areas disturbed by construction shall be seeded as soon as possible.

The work of this Section consists of all seeding work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:

- A. Surface Preparation
- B. Seeding
- C. Establishment
- D. Maintenance and Monitoring
- E. Inspection and Acceptance of Work

All seeding shall be done by a firm having a minimum of five years' experience with seeding. Prior to beginning work, the Contractor shall furnish proof of qualifications to the Engineer for approval.

Seeding Season

Dormant seeding is preferred for Restoration Mix seeding. Seeding seasons shall be **April 1-May 15** and **October 1-November 15**. For seeding that occurs outside of this period, the rate of seeding shall be increased by 50%. Seeding that fails to establish, as determined by the Engineer, will require over-seeding in the following seeding season at no additional cost to the department.

Materials

Samples and Submittals

- 5) Certificate of Materials/Compliance: At least 30 days prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier's notarized Certificate of Materials/Compliance. This document verifies supplier availability of seed listed on the Certificate. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded. Substantial substitutions or changes in the mix shall be approved by the Design Engineer or Wetland Specialist.
- 6) Seed Certification Tags: All seed lots have a seed analysis tag as required by State and Federal law. Prior to any seeding activity, the Engineer or the Landscape Architect in coordination with the Engineer, shall collect the seed tags from each unopened bag of seed used on the project site. Tag shall include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding without collection of tag from unopened bag may be considered unacceptable for payment.
- 7) Certificate of Purchase: Prior to payment, contractor shall submit a Certificate of Purchase from the Supplier. This document shall include kind and variety of seed, lot

number, net weight shipped, date of shipment, and name and address of Supplier or Manufacturer.

- 8) Seed Sample: Contractor may be asked, prior to seeding, to submit a seed sample for testing. Testing shall be incidental to this item.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

Seed Mixes

The following seed mix shall be used at the locations described in the Construction Plans and as shown in the Detail Sheets. Submittals for approval must list actual percentages.

Seed cultivars should be those that are as regional to New England as possible.

ITEM 767.121

SEDIMENT CONTROL BARRIER

FOOT

The work under this item shall conform to the relevant provisions of Sections 751 and 767 of the Standard Specifications and the following:

This work shall include the furnishing and placement of a sediment control barrier for the purpose of slowing the velocity of and filtering suspended sediments from storm water flow. Control barrier shall be installed prior to disturbing upslope soil. Sediment barrier shall be used as perimeter barriers, to contain stockpile sediments, to break slope length, and to slow or prevent up gradient water from flowing into a work zone.

Sedimentation control shall be a minimum 12 inch diameter compost filter tubes.

With approval from the Engineer the following may be used to control sediments for small disturbed areas with minimal slope and slope length:

- 9 inch diameter compost filter tubes or fiber logs
- Trenched-in 12 inch diameter straw tubes/wattles
- Straw or strawbales provided that runoff is in the form of sheet flow and not concentrated flows (i.e., channels, swales, gullies, etc.).

Where required, by the Engineer, silt fence shall be used in addition to compost filter tubes to contain sediments. Silt fence will be incidental to the item. Where strawbales and silt fence are required by permits, silt fence shall be incidental to the item.

Maintenance of control barriers and removal of accumulated sediment shall be as specified below, as required by the Engineer, and shall conform to the requirements of relevant environmental permits.

Upon completion of work and stabilization of soil, sediment control barriers shall be dismantled and/or removed as specified below for the site context (naturalized or urban). Site shall be restored as specified for specific barrier used.

All non-biodegradable materials, including silt fence, twine, plastic netting, and photodegradable fabric, shall be removed and disposed off-site for all projects.

CONSTRUCTION

Location of sediment barrier shall be based on the site's contours and such that it provides maximum effectiveness. Barriers shall be staked, trenched and/or wedged as specified herein and shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Straw Bales

Straw bales shall conform to the requirements of the Standard Specifications and the following:

Bales should be a minimum size of 12 inch x 16 inch x 36 inches and shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.

The barrier shall be trenched and backfilled. The trench shall be excavated the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (filled by wedging) the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least two 1x1 inch diameter x 4 foot oak stakes or 2x2 inch diameter pine x 4 foot stakes driven through the bale. Stakes of other material of equivalent strength may be used if approved by the Engineer.

Straw bales shall be on upslope side of the silt fence unless specified otherwise by the Engineer.

Silt Fence

Silt fence fabric shall be a minimum of 36" in width. Silt fence shall be trenched in 8 inches deep and 4 inches wide, or a V-trench on the upslope side of the fence line. The bottom 1 foot of fabric shall be placed in the trench, backfilled and compacted with earth or gravel.

Stakes shall be driven 16 inches into the ground on the down slope side of the trench. Spacing of stakes for silt fence may range from a minimum of 10 feet apart where low flow is expected to 3-4 feet apart where water may run over the top of the fence. Sagging fabric will require additional staking or other anchoring. Stakes shall be 2x2 inch diameter oak stakes.

Height of silt fence should be appropriate to the steepness and length of the slope and as specified by the manufacturer.

MAINTENANCE

Barriers shall be inspected after each rainfall and at least daily during prolonged rainfall. Contractor shall remove accumulated sediments when they reach one half the height of the barrier or sediment fence.

The Contractor shall immediately correct all deficiencies, including, washouts, overtopping, clogging due to sediment, and erosion. The contractor shall review location of barriers in areas where construction activity causes drainage runoff so as to ensure that the barriers are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking or additional barriers shall be installed as required by the Engineer.

At specific locations, such as at gully points, steep slopes, or identified failure points in the sediment capture line, barriers shall be reinforced as required by the Engineer. Such reinforcing shall be incidental to the cost of this item and shall not exceed 10 percent of the overall length of barrier required for the project.

Barriers that are decomposing, cut, or otherwise compromised shall be repaired or replaced as directed by the Engineer. Repair and/or replacement shall be incidental to this item.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed when construction work is complete and when site conditions are sufficiently stable to prevent surface erosion and after receiving permission to do so from the Engineer.

For all instances, all non-biodegradable material, including photobiodegradable fabric, plastic netting, nylon twine, and silt fence shall be removed and disposed off-site by the Contractor regardless of site context.

For naturalized areas, biodegradable, natural fabric and material shall be left in place to decompose on-site unless required otherwise by the Engineer. Compost filter tubes may be left as they are with stakes removed. Straw bales shall be broken down and spread evenly. All nylon or non-biodegradable twine shall be removed along with silt fence. Wooden stakes may be left on site, placed neatly and discretely.

In urban or residential locations where aesthetics is a concern the following shall apply:

Filter tube fabric shall be cut and removed and compost shall be raked so as to blend evenly as a soil amendment or mulch and with no areas greater than two inches in depth on soil substrate.

Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with seed matching adjacent grasses with either a lawn or native grass mix.

Silt fence, stakes and other debris shall be removed and disposed off-site. Site shall look neat and clean upon completion.

Dismantling, removal and seeding shall be incidental to this item.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the Contract unit price per foot which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of site, silt fence if required, and incidental costs required to complete the work.

ITEM 983.521

STREAMBED/BANK RESTORATION

CUBIC YARD

DESCRIPTION

The purpose of Item 983.521 is to provide for the excavation, stockpiling, and replacement of natural streambed material from Shaw Brook to restore the streambed and stream bank material to pre- construction conditions to the maximum extent practicable. The intent of this item is to reuse the existing streambed material that must be excavated for riprap installation, and to place the material back in the stream to maintain a high-quality streambed for rare species and to restore/create natural bank along the face of the new abutments.

The work to be done under Item 983.521 shall conform to the relevant provisions of Sections 140, 150, 170, 751, 753, 983 of the Standard Specifications and the following:

The Contractor is advised that compliance with this Item does not relieve compliance with U.S. Army Corps of Engineers (USACE) and Massachusetts Department of Environmental Protection (MassDEP) permit Conditions for this Project which includes, but is not limited to, Conditions for submittals, reviews, and approvals for pre-construction, construction, and post-construction work for streambed and stream bank restoration.

MATERIALS

Materials shall be native streambed materials excavated from on site as described below.

The Contractor shall perform the following:

1. The grade, bedforms, and composition of the existing streambed shall be observed and noted to ensure the material is replaced to match existing conditions as closely as possible;
2. Any boulders shall be identified for use to create hydraulic diversity along the surface of the streambed restoration area;

3. The existing streambed/bank material shall be excavated and stockpiled in separate locations or be separated by double-stacked straw bales or temporary concrete barriers to prevent mixing and allow for reinstallation of the correct material on the bed and banks;
4. Excavation of streambed materials shall only be conducted within impact areas approved by the USACE and MassDEP permits;
5. If there is a shortage of excavated and stockpiled material, the native materials may be supplemented by borrow material, which are described below.

Should the excavated native streambed material volume be too small to restore to provide 6" of cover over the riprap, Item 105.45 will be used to furnish and install additional borrow material. If supplemental borrow materials are used, the Contractor shall notify the Engineer 24 hours in advance of installation of the supplemental borrow materials so that the Engineer can observe the amount of supplemental borrow material installed.

Supplemental borrow material shall not be mixed with native materials prior to installation, and must be handled separately and installed separately for measurement and payment purposes. Mixing and blending of placed materials on the streambed is acceptable and recommended. Supplemental borrow materials are only to be used when stockpiled native materials have been exhausted.

The supplemental borrow for native material is to be installed as depicted on the plans. The elevations and conditions of the existing streambed shall be maintained to the maximum extent practicable.

CONSTRUCTION METHODS

Within the stream channel, an approximate 6" thick layer of streambed material is to be placed over undisturbed soil. Plate compactors shall not be used. A 6" layer of streambed material shall be installed to restore streambed habitat for rare species and other aquatic species. The material shall be installed during dewatered conditions in accordance with the environmental permits. Larger material shall be installed randomly within the channel to maintain a natural level of hydraulic roughness and re-establish fish habitat.

Once all material has been placed in the stream channel and approved by the Resident Engineer, the Contractor shall remove control of water in such a way to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall look like a natural stream, shall match nearby stream reaches, and there shall be minimal to no subsurface flow upon final inspection by the Resident Engineer.

The Contractor shall comply with the following:

1. All heavy equipment shall be located at the road surface or from the top of bank from above and outside of the vegetated wetlands. Excavation of the channel shall be from above on the roadway with no equipment in the channel as defined. Any additional work and equipment required within the wetlands and brook shall consist of workers and hand tools.
2. After bedding and scour protection is installed, a 6" layer of natural streambed material will be replaced over the undisturbed base to completely cover it and to match preconstruction conditions to the maximum extent possible.
3. Excess native materials, if any, shall be disposed of properly.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

There will be no separate measurement or payment for any materials, tools, labor, or equipment stored or used in order to comply with USACE or MassDEP permit conditions or any other local, state, and federal regulations or conditions.

The quantity of this Item measured for payment shall be the Cubic Yard of streambed material excavated as shown on the plans.

Incidental to the work of this Section shall be any tools, labor, equipment, and materials needed to complete the work of this Section, including: stacking, screening, sorting, placement and replacement of materials. Removal and disposal of excess native material, if any, shall be considered incidental.

The work to be done under this Item shall be paid for at the Contract Unit Price per Cubic Yard. Said price shall be considered full compensation for all labor, tools, equipment, materials and incidental costs necessary to rebuild the streambed in accordance with the plans. Removal and disposal of excess native material, if any, shall be considered incidental.

Measurement and payment for supplemental borrow material is described in Item 105.45 Supplemental Borrow for Native Material.

ITEM 984.6 STONE FOR EROSION CONTROL TON

Work under this item shall conform to the relevant provisions of Section 983 and the following:

Placement of the stone shall be in conformance with Section 983.62.

Stone for Erosion Control shall conform to Section M2.02.0 of the Standard Specifications, except that each stone shall not weigh less than 75 pounds, not more than 125 pounds and at least 75% of the volume shall consist of stones weighing not less than 90 pounds.

Erosion Control Fabric shall be placed over the gravel bedding. Erosion Control Fabric shall be paid for under the contract unit price per square meter for Item 698.4 Geotextile Fabric for Permanent Erosion Control, complete in place.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The gravel bedding for the stone shall be paid for under Item 151.

Payment at the contract unit price per TON shall constitute full compensation for all equipment, tools and labor to place the stone, as noted above, complete in place.

ITEM 991.1

CONTROL OF WATER

LUMP SUM

The Contractor shall provide an effective procedure together with all labor, materials and equipment necessary for dewatering any area required to complete construction of the structure so concrete is placed and cured in the dry, including installation of riprap, sedimentation fence, woven wire fence and pumped water filtration bag as indicated on the following Dewatering Settling Basin Detail. Shoring or bracing necessary to complete the work shall conform to the provisions of Section 950.

Temporary provisions will be made to divert the flow of the brook through the work zone along the east side or west side of the brook baseline to facilitate work directed to be performed in the dry (for example, existing pier demolition and proposed streambed riprap installation). Such provisions may include, but are not limited to, driven sheet piles, sandbags and portable dam systems.

The plans and calculations required for such work shall be subject to the approval of the Engineer. These plans and calculations shall be prepared and stamped by a Professional Engineer registered in Massachusetts prior to approval. Approval will not relieve the Contractor of responsibility for adequacy of construction, maintenance, operation and safety of the water control system. Upon completion of the work, the system will be completely removed from the site.

Control of water shall include treatment to remove sedimentation and potential water contaminants in a manner which complies with the water quality requirements of the Massachusetts Department of Environmental Protection (MA DEP), the U.S. Army Corps of Engineers (ACOE) and the U.S. Environmental Protection Agency (EPA). All necessary permitting, documents and fees required for all dewatering work shall be the responsibility of the contractor and shall be included in the cost of this item. **Direct discharge from the settling basin into the river/brook shall not be permitted.**

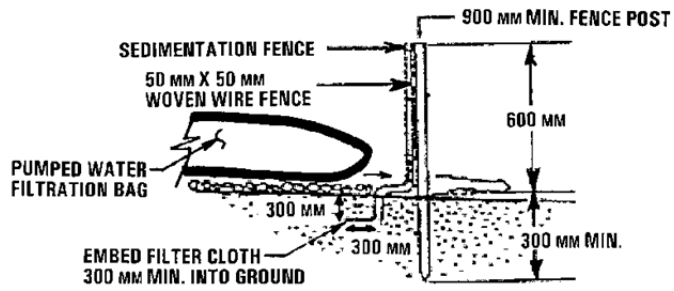
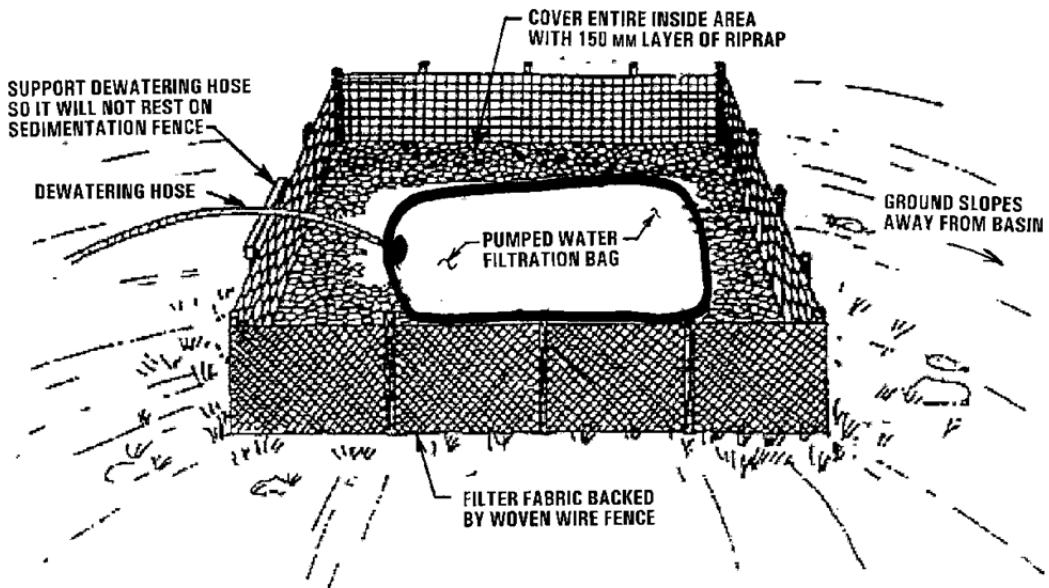
Pumping effluent shall be discharged into an approved pumped water filtration bag to be located inside a dewatering settling basin surrounded by straw bales and silt fence as indicated on the following detail. The location for the dewatering settling basin shall be determined in the field based upon site conditions where needed and shall be approximately where shown on plans and shall be approved by the Engineer. The dewatering settling basin shall be placed on stabilized and reasonably level ground to prevent water from spilling over the sides.

Water pumps and hoses used shall be in good working condition and of adequate power and size to handle the dewatering operation(s). Before installing the dewatering settling basin, all other erosion control measures shall be installed. Dewatering settling basin operations shall be maintained in working condition including periodic removal of accumulated sediment within the basin. Additional erosion control measures shall be employed as required by the Engineer to prevent erosion and sedimentation of the streambed.

BASIS OF PAYMENT

The cost of establishing, maintaining, stabilizing and removal of the water diversion provisions shall be included in the contract unit price.

The cost of establishing, maintaining, stabilizing, backfilling and restoring the dewatering settling basin area(s) shall also be included in the contract unit price. No separate payment will be made for any repairs of damage required due to the failure of a dewatering settling basin to perform its proper function. Compensation for the work described under this item will be made by the contract Lump Sum price for Item 991.1 which will be full compensation for all labor, materials, equipment, tools, permits and fees necessary to complete the work. No other payments will be made for water control other than the Lump Sum price for Item 991.1.



DEWATERING SETTLING BASIN DETAIL
NOT TO SCALE