U.S. Army Corps of Engineers

New England District
Concord, Massachusetts

FINAL DESIGN SPECIFICATIONS
1.5-MILE REMOVAL ACTION – FIRST PHASE

DCN: GE-112801-AATR

November 2001

Environmental Remediation Contract
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

Contract No. DACW33-00-D-0006

Task Order No. 0001

01M-0007

WESTON® MANAGERS DESIGNERS/CONSULTANTS

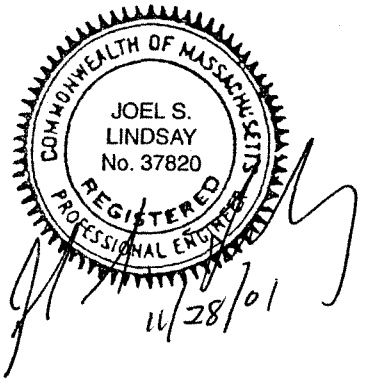
Final Specifications

1st Phase of 1.5-Mile Reach Removal Action

General Electric (GE) – Housatonic River Project Site, Pittsfield, Massachusetts

Stamp Sheet

Specifications Sections: **01010, 01015, 01025, 01300, 01330, 01340, 01355, 01410, 01451, 01500, 01562, 02111, 02371, 02630, 10100, 11800, 02230**



Roy F. Weston, Inc.
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Specifications Sections: **02300, 02370, 02372, 02464**

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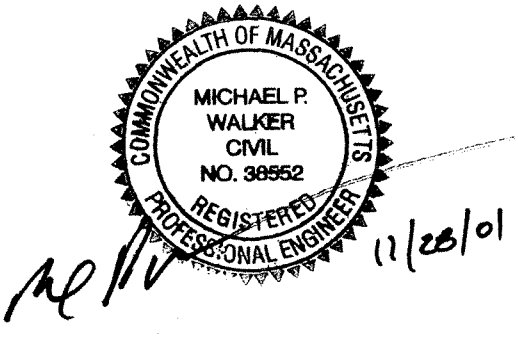
Specifications Sections: **03100, 03200, 03250, 03300, 03400**



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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

These drawings and specifications describe the 1st Phase of a Removal Action to be conducted under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in the first 1400 linear feet (Lyman Street Bridge to Station 514+00) of the 1.5 Mile Reach of the Housatonic River in Pittsfield, MA. The general work activities included in the drawings and specifications include site preparation, surveying, water diversion, dewatering and treatment, soil and sediment excavation, removal, and consolidation/disposal, river channel restoration, and site restoration.

The removal action addresses polychlorinated biphenyl (PCB) contaminated riverbank soil and riverbed sediments that have been determined to exceed allowable risk levels. To accomplish excavation and removal of these materials, sheet pile cells will be sequentially installed in the river to temporarily divert river flow. Once a cell is installed (centerline, upstream, and downstream walls driven) it will be dewatered and subsequently surveyed, and soil and sediment within the cell will be excavated and removed. In general, soil and sediment will be excavated to a depth of 2-3 feet in layers by disposal category (TSCA or Non-TSCA) as noted on the drawings. Specific excavation depths for each area are indicated on the drawings. After excavation and removal is completed within a particular cell, the removed soil and sediment will be replaced with appropriate backfill materials, riverbed habitat enhancement structures will be installed, and restoration of the banks via re-planting and installation of bioengineered structures will be conducted. Work will proceed sequentially down the river, with each cell being successively isolated, remediated, backfilled, and restored.

1.2 DIVISION OF WORK

The design/build contractor for the work is Roy F. Weston, Inc. (WESTON). WESTON has formed a team of contractors with differing specialties to accomplish the project. Work tasks are to be divided up on the basis of maximizing efficiency and minimizing cost and risk to the Government. Table 1 below provides a breakdown of the major construction work tasks and entities that are expected to conduct them.

TABLE 1

1.5 MILE REMOVAL ACTION – 1ST PHASE
Division of Major Work Tasks

WORK TASK	EXECUTING PARTY	METHOD OF PAYMENT
Out of River Site Preparation (includes stockpile area construction)	Weston (General Contractor)	CPFF
Soil/Sediment Excavation	Sevenson (Excavation Subcontractor)	Fixed price and fixed unit price based on in-place surveyed amount (cy); time and materials and fixed unit price for contingent items
Stockpile Area Management	WESTON	CPFF
Material Transport to Stockpile Area	Sevenson	Included in fixed unit price per cy for excavation
Material Transport to OPCA	Sevenson	Included in fixed unit price per cy for excavation
Water Treatment	WESTON	CPFF
Restoration – Bioengineering Structures/Hard Structures	Sevenson	Fixed Unit Price per sq. yard for Bioengineering Structures /Hard Structure
Restoration – Plant Installation	Planting Subcontractor	Fixed unit price per plant
Surveying	WESTON	CPFF
Site Monitoring	WESTON	CPFF

CPFF = Cost Plus Fixed Fee

Note: The total effort will be a CPFF contract between the Corps of Engineers and Weston (General Contractor). Subcontractors will be procured on a Firm Fixed Priced basis unless specifically noted.

The work division depicted above forms part of the basis for the structure of the drawings and specifications, and in particular, the Measurement and Payment specification section.

1.3 MAJOR WORK TASK DESCRIPTIONS

a. Out of River Site Preparation – This activity will include but not be limited to clearing (and grubbing as necessary) for access roads and staging areas, clearing on river banks, fence relocation and installation, building of access roads and staging areas/stockpile areas, including truck wash pads and decontamination pads, out-of-river erosion control measures, and traffic control and details.

b. Soil/Sediment Excavation – This activity will include, but not be limited to in-river site preparation (including those activities incidental to providing adequate access to the river, e.g., crane pad construction and removal), sheet pile installation and removal, temporary and permanent outfall relocation/re-direction as described in the drawings and as necessary, cell dewatering and conveyance of water to the water treatment plant, in-river erosion control measures, soil and sediment excavation and removal and loading into trucks for transport, backfilling in excavated areas, placement of bank and riverbed armor, and installation of riverbed habitat enhancement structures.

c. Stockpile Area Management and Material Transport and Handling – These activities include, but are not limited to, transport of material from the excavation area (via direct loading from in-river excavating equipment) to stockpile areas, sampling and analysis of contaminated material and backfill, transport of contaminated material from stockpile areas to GE's On-Plant Consolidation Areas (OPCAs), transport of clean backfill from borrow locations to the river work areas for placement, and stockpile area management.

d. Water Treatment – This activity includes but is not limited to siting, construction, operation and maintenance of the water treatment system to treat water pumped from the excavation cells to meet applicable discharge standards, and discharge of treated water back to the river. Includes installation and maintenance of discharge structure(s) to minimize erosion in accordance with Applicable or Relevant and Appropriate Requirements (ARARs).

e. Restoration (Bioengineering) – This activity includes but is not limited to restoration of certain bank areas using bioengineered structures.

f. Restoration (Revegetation) – This activity includes but is not limited to replanting of upper bank areas as shown on the drawings and specifications, as well as installation of vegetative materials as part of the bioengineered structure installation.

g. Surveying – This activity includes but is not limited to surveying of riverbed and riverbank elevations and locations of relevant structures at several junctures during the construction work. This will include pre-excavation survey of dewatered cell, interim surveys to determine excavated amounts as a basis for payment and respective amounts of TSCA and non-TSCA regulated materials, and final survey after backfilling and restoration.

h. Site Monitoring – This activity includes but is not limited to a number of different types of monitoring activities to be conducted before, during and post-construction. Includes air monitoring, water column monitoring, vibration monitoring, settlement monitoring, and conditions monitoring as described in detail in the specifications.

END OF SECTION

SECTION 01015

GENERAL CONDUCT OF WORK

PART 1 – GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by their basic designation only.

CODE OF FEDERAL REGULATIONS

29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 264, Subpart D	RCRA Contingency Plan and Emergency Procedures
40 CFR 280, Subpart E	Release Reporting, Investigation, and Confirmation
40 CFR 110, 112	Clean Water Act – Spill Prevention Control and Countermeasures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

CODE OF MASSACHUSETTS REGULATIONS

310 CMR 40, Subpart C	Massachusetts Contingency Plan – Notification of Releases and Threats of Release of Oil and Hazardous Material
314 CMR 15.00	Massachusetts Rules for the Prevention and Control of Oil Pollution
310 CMR 30.000	Massachusetts Hazardous Waste Regulations
310 CMR 30.520	Massachusetts Hazardous Waste Rules – Contingency Plan, Emergency Procedures, Preparedness, and Prevention

U.S. ARMY CORPS OF ENGINEERS

EM 385-1-1 Safety and Health Requirements Manual

PROJECT PLANNING AND GUIDANCE DOCUMENTS

Final Quality Assurance Project Plan (QAPP), Roy F. Weston, Inc., General Electric/ Housatonic River Project, Volumes I, II, IIA, and IV, Contract No. DACW33-00-D-0006, DCN: GE-021601-AAHM, March 2001.

Final Quality Assurance Project Plan (QAPP), Roy F. Weston, Inc., General Electric/ Housatonic River Project, Volume III, Contract No. DACW33-94-D-0009, DCN: GEP2-123098-AAET, January 1999.

Draft Field Sampling Plan (FSP), Roy F. Weston, Inc., Environmental Remediation Contract General Electric/ Housatonic River Project, Pittsfield, MA, Contract No. DACW33-00-D0006, Task Order No. 0002, DCN: GE-091200-AADI, November 2000.

1.2 PROJECT ROLES

a. The principal parties to be involved in the execution of the project are described below along with a general description of their roles in the project:

Government, Contracting Officer, or Contracting Officer's Representative (Army Corps of Engineers) – Federal Agency responsible for direction and oversight of the SSERC Contract and the 1.5 Mile Removal Action. Government representatives to provide input and direction as indicated in the specifications.

Engineer/General Contractor (Roy F. Weston, Inc.) – Contractor with overall responsibility for the design and construction of the 1.5 Mile Removal Action, and direct execution of out-or-river construction tasks as defined in the drawings and specifications. All other contractors mentioned below and in the specifications are subcontractors to the General Contractor.

Excavation Subcontractor (Sevenson Environmental Services, Inc.) – Contractor responsible for execution of in-river construction tasks as defined in the drawings and specifications.

Planting Subcontractor (To Be Determined) – Contractor responsible for all plant installation related to the project.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

Record Drawings; G

1.4 HANDLING AND STORAGE

a. The General Contractor shall handle, haul, and distribute all materials and all surplus materials for the different portions of the Work, as necessary. He shall provide suitable and adequate storage room for materials and equipment during the progress of the Work and be responsible for loss of, or damage to, materials and equipment furnished by him, until the final acceptance of the Work.

b. All excavated materials, construction equipment, materials and equipment to be incorporated in the Work shall be placed so as not to injure the Work and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work.

1.5 WORK ON PUBLIC AND PRIVATE RIGHTS-OF-WAY

a. All rights-of-way for construction and access will be provided by the Government unless otherwise stated elsewhere.

b. Before any work is commenced on public rights-of-way, the General Contractor shall obtain all necessary working permits from the appropriate departments. All work on public rights-of-way shall be performed in conformance with the requirements of the appropriate City of Pittsfield department.

1.6 RESTORATION OF DISTURBED PROPERTY

The General Contractor will be responsible for ties to and all elevations of all property disturbed by his forces during the execution of this Contract. The General Contractor will also be responsible for recording the ties to the elevations prior to disruption and for reestablishing the disturbed areas accurately and completely to its preconstruction condition or better.

1.7 DAMAGE TO THE WORK

Until the final acceptance of the Work by the Government, it shall be under the care and charge of the General Contractor and he shall take every precaution necessary against injury or damage to the Work by the action of the elements or any other causes whatsoever.

1.8 MOBILIZATION AND DE-MOBILIZATION

Initial mobilization to the site for project start-up and final demobilization from the site at the end of the project will be conducted by the General Contractor and Excavation Subcontractor in accordance with the drawings and specifications. Separate pay items are provided for the Excavation Subcontractor for initial mobilization and final demobilization. During execution of the project, it is possible that an extended shutdown period(s) will be required due to high river flows or other adverse conditions. In such situations, the Excavation Subcontractor may be directed by the General Contractor to temporarily demobilize from the site. Payment for temporary demobilization/remobilization of selected equipment and personnel will be based on a change order prepared by the Excavation Contractor and approved by the General Contractor and the Government for actual demobilization/remobilization costs.

1.9 STAND-BY TIME

Stand-by time will be paid to the Excavation Subcontractor in accordance with a determination by the General Contractor and the Government of in-river construction equipment and personnel required to go on stand-by. Stand-by time for equipment and/or personnel could be granted in association with the following general conditions/occurrences:

- Flooding of a containment cell.
- Delay caused by presence of NAPL which requires further assessment and supplemental remediation activities.
- Obstructions to driving of sheet piles that require significant revisions to the sheetpile cell configuration and/or sheetpile installation method, and thereby delay the progress of the work.

Payment for stand-by time will only be granted based on direction provided to the Excavation Subcontractor by the General Contractor and the Government to go on Stand-by. In obtaining payment for stand-by time, the Excavation Subcontractor will provide to the General Contractor for approval a change order including a list of equipment and personnel placed on stand-by and associated costs.

1.10 SAFETY PROVISIONS

a. The General Contractor and all of his/her subcontractors (Excavation Subcontractor, Planting Subcontractor, and any other subs) shall be responsible for complying with the Site Specific Health and Safety Plan (SSHASP) that will be developed for the work in accordance with the Site Specific Environmental Restoration Contract (SSERC) contract and associated Contract Management Procedures (CMPs), and these specifications.

b. The General Contractor shall be held liable for any property damage or personal injury resulting from failure by the General Contractor to take the required or adequate safety precautions.

1.11 "RECORD" DRAWINGS

a. The General Contractor shall maintain one record copy of all Specifications, Drawings, Addenda, Change Orders and Shop Drawings at the site. The documents shall be kept in good order and annotated to show all changes made during the construction process.

b. The General Contractor shall submit to the Engineer and Government within 30 days after the completion of contract, one set of blue-line prints of the Drawings which have been marked "As-Built Drawings" and shall contain all changes, additions or deviations from the original set of Drawings that have been incorporated into the Work. Record prints shall accurately reflect locations, depths and character of all buried and covered works.

1.12 WORK HOURS

a. Work hours shall be a maximum of 50 hours (five 10-hour days) per week, Monday through Friday. These work hours shall be extended only upon Government approval.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

The measurement and payment items described in this Section under Subsections 1.4, 1.5, and 1.6 are payment items applicable to the Excavation and Planting Subcontractors. Work to be conducted by the General Contractor will be performed under a CPFF contract, and is not included in this Section. Subsection 1.4 constitutes the base bid and each item has a defined number of units associated with it. Items in Subsection 1.4 are all firm fixed price or fixed unit price items. Items listed in Subsection 1.5 are incidental items for which no separate payment will be made. Items in Subsection 1.6 are contingency items that may or may not be exercised. The items in Subsection 1.6 are both fixed unit price items and time and materials items. The number of units of each of these items cannot be determined at this time.

1.1 REFERENCES (NOT APPLICABLE)

1.2 SUBMITTALS (NOT APPLICABLE)

1.3 RELATED REQUIREMENTS

a. CONTRACT CLAUSES:

b. (1) "Payments under fixed price construction contracts.

1.4 BASIS OF PAYMENT – BASE BID

The following paragraphs describe the measurement and payment for work to be done under the respective items listed in the Bid.

Each unit or lump sum price stated in the Bid shall constitute full compensation for each completed item of the work as indicated on the Drawings and as specified.

The actual number of units of each unit price item of work may be more, less or never stated in the bidding schedule of the Bid or included in the Contract. No variation in the contract price will be made until the original quantities installed are varied by more than 25% and a hardship exists for the Excavation Subcontractor, Planting Subcontractor, or the Government. Payment will be made only for the actual number of units or work performed, and at the contract unit price for each such unit with measurement of payment made as defined in the following paragraphs.

Items 1 through 22 apply to the work to be conducted by the Excavation Subcontractor.

Item No. 1 "Excavation Subcontractor Mobilization and Site Preparation at Project Startup"

a. Unit of Measure: Excavation Subcontractor Mobilization and Site Preparation at Project Startup will be paid as a lump sum.

b. Payment shall be at the Contract lump sum price, which shall constitute full compensation for all labor, materials, equipment, and tools required to complete all work associated with mobilization of materials, personnel and equipment to the project site; preparation and execution of the Excavation Subcontractor's Health and Safety Plan; the amount bid for this item shall not exceed 7 percent (7%) of the total Contract base bid price.

Item No. 2 – "Bonds and Insurance"

a. Unit of Measure: Bonds and Insurance will be paid as a lump sum once the Excavation Subcontractor has submitted acceptable bonds to the General Contractor.

b. Payment shall be at the Contract lump sum price, which shall constitute full compensation for all costs associated with providing the required performance and payment bonds and insurance as specified in the General Conditions.

Item No. 3 – "Excavation Subcontractor Demobilization at Completion of Excavation and Restoration Work"

a. Unit of Measure: Excavation Subcontractor Demobilization will be paid as a lump sum.

b. Payment shall be at the Contract lump sum price, which shall constitute full compensation for all labor, materials, equipment, and tools required to complete all work associated with site cleanup, demobilization of materials, personnel and equipment for the project site. The amount bid for this item shall not be less than 50% nor more than 75% of the bid price of Item No. 1, "Mobilization."

Item No. 4 - "Soil/sediment Excavation and Transport (includes stumps and debris)"

a. The unit of measurement for excavation and transport will be the cubic yard, computed by the average end area method from elevation surveys taken before and after the excavation operations. The volume to be paid for will be the number of cubic yards of material measured in situ and removed from the excavation areas, including the excavation for required grubbing, ditches, gutters, and channel changes, when the material is acceptably utilized or disposed of as herein specified. Volumes excavated beyond the neatline and outside of the limits of excavation will not be paid, with the exception of volumes removed as part of stump removal. Separate

payment will not be made for stumps, which shall be considered part of the soil and sediment excavation volume (stumps will be required to be separated from soil and sediment for disposal purposes and "shaken" of all loose soil at the time and location of removal). The volume will not include boulder and concrete volumes, which will be paid for under a separate payment item. Payment will not include the volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed grade. Transport will include transport by truck from the excavation to the staging area, and after dewatering and testing of the material by the General Contractor, transport from the staging area to the GE OPCAs. Transport will include handling of all necessary manifesting and associated coordination with the General Contractor and the Government to obtain manifest authorization.

b. The measurements to be paid will include authorized excavation of soil, sediment, tree stumps, and the excavation of loose, scattered rocks and boulders less than two feet in diameter, and concrete and masonry debris less than 1 cy in volume collected within the limits of excavation. The unit price for this item includes careful placement of excavated materials into trucks on the temporary access roads located along the top of bank on both sides of the river. Segregation of materials (soil, sediment, TSCA, non-TSCA, stumps, boulders, concrete, and debris) and placement into separate trucks is also included under this pay item, as well as transport to the staging area from the excavation, and transport from the staging area to the GE OPCAs. Volumes of boulders and concrete to be paid for under separate items will be subtracted from the total volume as determined through survey measurements. The measurement will not include the volume of subgrade material or other material that is scarified or plowed and reused in-place, and will not include the volume excavated without authorization (excavations beyond the neat line) or the volume of any material used for purposes other than as directed.

Item No. 5 – "Boulder Excavation and Transport"

a. Unit of Measure: The unit of measure for payment of boulder excavation and transport will be the cubic yard. For purposes of measurement, only boulders having a smallest dimension of two feet (as measured along three perpendicular axes) shall be eligible for payment under this item. Volumes will be calculated based on measurements taken for each boulder. Size measurements will be taken along three perpendicular axes that represent the average dimension in each of the directions. Transport will include transport by truck from the excavation to the staging area, and after processing by the General Contractor, transport from the staging area to the GE OPCAs or back to the excavation for re-use. Transport will include handling of all necessary manifesting and associated coordination with the General Contractor and the Government to obtain manifest authorization.

b. Payment will be made for acceptably excavated boulders with a nominal diameter of 2 ft. The calculated volumes of boulders will be the basis for payment and will also be subtracted from the volume of sediment and soil excavated as determined by survey measurements. Backfill replacing boulder excavation will not be paid for

separately, but will be included in payments made under the appropriate payment item for backfill placement.

Item No. 6 – "Ordered Excavation and Transport"

a. Unit of Measure: Ordered excavation and transport will be paid for at the contract unit price per cubic yard as measured in place by survey.

b. Ordered excavation is excavation that is performed at the direction of the Engineer for the purposes of removing unsuitable material found at the proposed subgrade or for the purposes of exploration. The unit price shall include excavation of material, loading excavated material onto trucks for disposal or stockpile of excavated material temporarily prior to backfill, transport by truck from the excavation to the staging area, and after dewatering and testing of the material by the General Contractor, transport from the staging area to the GE OPCAs. Transport will include handling of all necessary manifesting and associated coordination with the General Contractor and the Government to obtain manifest authorization. If additional requirements for sheeting and bracing, pumping, bailing, cleaning, and other incidentals are necessary to complete the work, a change order will be negotiated for these items.

Item No. 7 – "Concrete Excavation and Transport"

a. Unit of Measure: The unit of measure for payment of concrete excavation and transport will be the cubic yard. For purposes of measurement, only concrete pieces having a minimum size of 1 cubic yard (as measured by taking appropriate measurements of the concrete structure prior to excavation) shall be eligible for payment under this item. Volumes will be calculated based on measurements taken for each concrete structure. Size measurements will be taken along appropriate dimensions of the concrete structure to be excavated. Transport will include transport by truck from the excavation to the staging area. Transport will include handling of all necessary manifesting and associated coordination with the General Contractor and the Government to obtain manifest authorization.

b. Payment will be made for acceptably excavated concrete or masonry pieces having a minimum size of 1 cubic yard. Concrete or masonry pieces that are less than 1 cubic yard shall be considered part of Soil/Sediment Excavation or Ordered Excavation. The calculated volume of concrete will be the basis for payment and will also be subtracted from the volume of sediment and soil excavated as determined by survey measurements. Backfill replacing concrete excavation will not be paid for separately, but will be included in payments made under the appropriate payment item for backfill placement.

Item No. 8a – 8o "Backfill Material"

8a. Common Fill – cy
8b. Structural Fill – cy

8c. Filter Material A – cy
8d. Filter Material B – cy
8e. Bank Run Gravel – cy
8f. Select Gravel – cy
8g. Sand – cy
8h. Processed Gravel – cy
8i. Screened or Crushed Stone – cy
8j. Broken Stone – cy
8k. Topsoil – cy
8m. Riprap Layer C1 – cy
8n. Riprap Layer C2 – cy
8o. Riprap Layer C3 – cy

a. Unit of measure: The unit of measure for placement and compaction of backfill will be the cubic yard of compacted backfill in place.

   All backfill shall be placed to the thicknesses shown on the plans or specified. No additional payment shall be made for placing excess fill. Excavation Subcontractor shall remove or regrade fill placed to a greater thickness than shown or specified, unless directed by the Engineer.

   Backfill shall not be measured until tests conducted by the Excavation Subcontractor and approved by the Engineer show that it has been compacted as specified. The Engineer shall accomplish all surveying for measurement of backfill.

b. Payment shall constitute full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete the work. Payment for backfill shall be based on a unit price, per cubic yard as measured in place after grading and compaction, for each material specified (Items 8a – 8o). This unit cost shall include all labor, equipment, materials, and any other items necessary or incidental to place, grade, compact as specified, test, and any incidentals necessary to complete backfilling. Supplying and hauling the backfill materials are specified in Section 02111 - Handling of Excavated Material and Backfill and will be conducted by the General Contractor.

   Separate measurements will be made for completing specified backfilling operation for each type of backfill.

Item No. 9 "Mulch"

a. Unit of measure: Mulch shall be measured by the square yard of surface area covered to the depth specified, regardless of whether applied by hand spreading or by pneumatic or hydraulic spraying, as measured parallel to the ground surface.

b. Payment shall be made at the unit price for all mulch acceptably placed to the depths required and in areas as required on the plans and by the specifications. Payment shall not be made beyond the limits defined in the plans and specifications. No measurement for payment shall be made for fine grading, binder, dye or other miscellaneous materials or equipment necessary for placement of the mulch.

Item No. 10 "Geotextile Fabric"

a. Unit of measure: The geotextile shall be measured by the square yard of surface area covered, as measured parallel to the ground surface.

b. Payment shall be made at the unit price for all geotextile fabric acceptably placed in areas as required on the plans and by the specifications. Payment shall not be made beyond the limits defined in the plans and specifications. No separate payment shall be made for trenching as part of installation, or for stakes or other miscellaneous materials necessary for placement of the fabric.

Item No. 11 "Erosion Control Blankets"

a. Unit of measure: The erosion control blankets shall be measured by the square yard of surface area covered, as measured parallel to the slope along the finished surface.

b. Payment will be made for erosion control blankets installed in accordance with the manufacturer's recommendations and the plans and specifications, and accepted by the Engineer. No measurement for payment shall be made for trenching, furnishing and installing staples or stakes, overlap in the blankets, or for other miscellaneous materials necessary for placement of the erosion control blankets.

Item No. 12 "Temporary Erosion Control around Sheetpile Cells – Rip Rap"

a. Unit of measure: Rip Rap temporary erosion control shall be measured by the square yard of surface area covered parallel to the slope.

b. Payment will be made for Rip Rap temporary erosion control placed around the Sheetpile Containment Cells as shown on the plans. Payment shall constitute full compensation for installing and removing rip rap, and cleaning sediment from riprap to allow its reuse. No separate payment shall be made for subgrade preparation or installation of underlying geotextile fabric. Rip Rap materials will be provided by the General Contractor.

Item No. 13 "Temporary Erosion Control around Sheetpile Cells – Articulated Concrete Mats"

a. Unit of measure: Articulated Concrete Mats used for temporary erosion control shall be measured by the square yard of surface area covered.

b. Payment will be made for installation and removal of articulated concrete mats in accordance with the manufacturer's specifications and cleaning sediment from the mats to allow their reuse. Payment shall be made for placement of mats at locations shown on the Drawings. No separate payment shall be made for subgrade preparation or installation of underlying geotextile fabric. Articulated concrete mats will be supplied by the General Contractor.

Item No. 14 "Temporary Erosion Protection - Rip-Rap Placed at Overland Flow and Erosion Points and Containment Cell Discharge Points"

a. Unit of measure: The unit of measure will be the cubic yard of finished erosion protection. The unit rate shall include all labor and equipment required to construct the erosion protection, remove it, and relocate it as required by the specifications, plans, and as directed.

b. Payment will be made for rip-rap placed to protect areas identified as overland flow and erosion areas based on a site walk to be conducted with the Engineer prior to construction. Payment shall be made for rip-rap placed for the discharge points created at each cell for the initial dewatering of the sheetpile containment cells. The unit price paid will include costs to remove/replace/relocate rip-rap as needed for work to progress. No separate payment shall be made for subgrade preparation. Rip-rap will be supplied by the General Contractor.

Item No. 15 "Sheetpile Containment Cells – Provide and install/remove to 10 feet embedment"

a. Unit of measure: Payment for furnishing, installing, dewatering, maintaining, and removing sheet pile containment cells, including all related excavation support system components (excluding bracing) and crane pads, will be measured and paid on a unit price basis, per lineal foot of sheet pile cofferdam as measured along the waterline. Sheet piles common to one or more cofferdam cells shall not be measured more than once. Typically, measurements will be based on the straight line distance measured between field verified points that designate the corners, endpoints, and intersections of containment cells.

b. Payment for sheet pile containment cells under this item will include all work required to furnish all materials, labor and equipment for installation, dewatering, maintenance, use, reuse and driving and removal to an embedment depth of 10 ft as required by the specifications.

No separate payment will be made for dewatering the completed containment cells. Dewatering includes designing, furnishing, installing, operating, maintaining, and removing all necessary, pumps, sumps, pipelines, sediment filters, sedimentation basins, and other equipment of collection, removal, and disposal of surface and groundwater within each containment cell as required to complete the work. Dewatering includes piping all removed water from the containment cells to the river or to the treatment system.

Item No. 16 "Sheetpile Containment Cells – Driving and removing below 10 feet embedment"

a. Unit of measure: Payment for installing and removing sheet pile containment cells, including all related excavation support system components (excluding bracing), will be measured and paid on a unit price basis, per square foot of sheet pile cofferdam as measured along the waterline and driven below 10 feet embedment. Sheet piles common to one or more cofferdam cells shall not be measured more than once. Typically, lateral measurements will be based on the straight line distance measured between field verified points that designate the corners, endpoints, and intersections of containment cells.

b. Payment for sheet pile containment cells under this item will include all work required to furnish all materials, labor and equipment for driving (and removing) sheetpiles to embedment depths below 10 ft as required by the specifications and directed by the General Contractor.

No payment will be made under this item for dewatering the completed containment cells. Dewatering of the cells is paid under Item 16

Item No. 17 “Stormwater Bypass of Sheet Pile Cells”

a. Unit of measure: Stormwater Bypass of Sheet Pile Cells will be paid for on a lump sum basis.

b. Payment made will be made as a lump sum for all equipment, labor, and materials associated with controlling and re-routing stormwater around excavation containment cells from outfalls, drainage ditches, swales, and other sources along the river, including driving of sheetpiles to isolate each source, placement of rip-rap, construction of sumps, and use of pumps, heavy equipment, and other miscellaneous materials and equipment. These areas include the Silver Lake Outfall, the drainage swale located near STA 504+25, and other miscellaneous drainage structures that are anticipated to require diversion and/or pumping around the containment cells. This item includes stormwater bypass that will be required during the construction of the box culverts at the Silver Lake Outfall.

Item No. 18 "Seed"

a. Seeding will be paid for at the contract price per unit area of acceptably-seeded surface, including furnishing and spreading the specified seed mix, fertilizer, and lime, and watering until specified plant coverage is established.

b. Unit of measure: Seeding, to include the application of seed, fertilizer, lime (as needed) and watering, will be measured for payment by the area of acceptably-seeded surface in units of square yards. Measurements will be made parallel to the surface.

Item No. 19 "Vegetated Geogrid"

a. Unit of measure: The construction of vegetated geogrid bioengineering bank treatments will be measured for payment by the linear feet of each geogrid layer installed as required and accepted, as measured parallel to the river.

b. The construction of vegetated geogrid bioengineering bank treatments will be paid at the contract unit price for each linear foot of geogrid layer installed as required and accepted, including all materials, labor, equipment, and other incidentals.

Item No. 20 "Silver Lake Outfall Extension"

a. Unit of measure: Payment will be made as a lump sum for the Silver Lake Outfall Extension.

b. Payment will be made for costs associated with construction of the Silver Lake Outfall Extension as required by the plans and specifications. Payment will be full payment for preparation of the area, providing and placing pre-cast concrete structures for box culvert, concrete form work, concrete reinforcing, cast-in-place concrete, construction of the outfall extension, and other miscellaneous incidental work associated with the Silver Lake outfall extension not otherwise covered by other payment items. Work items associated with the Silver Lake Outfall Extension such as excavation, backfilling, stormwater and groundwater control, and restoration of the area, shall be paid for separately under the appropriate items as defined in this section.

Item No. 21 "Excavation Cells 1 And 3 Construction, Excavation and Dewatering, and Backfilling"

a. Payment will be made for costs associated with excavation of cells 1 and 3, located partially beneath the Lyman Street bridge, as required by the plans and specifications. Payment will be full payment for preparation of the area, including placement of jersey barriers or other approved water diversion structures, dewatering, removal of contaminated soils and sediments to the limits shown on the plans and as required by the specifications, backfilling of the

riverbed and river bank armor and filter layers, and any other incidental work associated with excavation and backfilling of cells 1 and 3 not otherwise covered by other payment items. If employed as an alternative to jersey barriers/sand bags, sheetpile used to isolate these cells will be paid for separately under Items 15 and 16. Bank restoration activities will be paid for separately under the appropriate items.

b. Unit of measure: Payment will be made as a lump sum for the excavation of contaminated sediments and soils located within cells 1 and 3. If used, sheetpile installation and removal and restoration of the riverbank will be paid for separately under the appropriate payment items.

Item No. 22 "Riverbed Enhancement Structures"

a. Payment will be made on a lump sum basis for costs associated with placement and construction of riverbed enhancement structures, including boulder clusters, wing deflectors, and rock spurs, as required by the plans and specifications. Payment will be full payment for placement and compaction as necessary of materials provided by the General Contractor.

b. Unit of measure: Payment will be made as a lump sum for placement and construction of riverbed enhancement structures.

Items 23 and 24 apply to the work to be conducted by the Planting Subcontractor.

Item No. 23 "Containerized Plants"

a. Unit of measure: The quantity of containerized plants to be measured for payment will be the number of individual plants furnished and planted as required and accepted.

b. Each containerized plant item will be paid for at the contract unit price for each accepted containerized plant furnished and planted. Payment shall constitute full compensation for furnishing and placing plants, storing plants (if needed), digging plant pits, installing, fertilizing, backfilling, mulching, watering, and pruning plants, clean-up of planting area, furnishing other necessary materials, and all labor, equipment, tools and other incidentals necessary to complete the work as specified. No payment will be made for required replacements.

Item No. 24 "Dormant Cuttings"

a. Unit of measure: The quantity of dormant cuttings to be measured for payment will be the number of specific type of dormant planting, installed in accordance with requirements.

b. Each dormant cutting stake will be paid for at the contract unit price for each accepted dormant plant type. Payment shall constitute full compensation for furnishing and placing plants as specified, furnishing other necessary materials, and all labor, equipment, tools and other incidentals necessary to complete the work as specified. No payment will be made for required replacements.

1.5 INCIDENTAL WORK

The following incidental work items will not be measured for separate payment and should be included in the above payment items:

a. Submittals.

b. Grubbing, stump excavation, and metallic debris excavation.

c. Temporary Construction Facilities, including electrical power and other utilities and construction and office trailers and storage containers.

d. Clean-up.

e. Restoration of property outside the limits of payment.

f. Cooperation with other contractors and others as required.

g. Minor items such as replacement of fences, guard rails, rock walls, etc.

h. Temporary erosion controls such as silt fence, straw bale, rock check dam installation and other miscellaneous controls not otherwise paid for directly under the above items.

i. All dewatering.

1.6 BASIS OF PAYMENT – ADDITIONAL PAYMENT ITEMS

The following payment items are items that may or may not be exercised depending on the site conditions encountered. Therefore, the number of units to be paid under each of these items is unknown. In accordance with the payment requirements of these items, the Excavation Subcontractor shall submit a rate schedule for all equipment, labor classes and grades, and materials anticipated to be necessary to execute these work items. Each item on the rate schedule shall have appropriate rates for various circumstances where applicable, including standby rates and level D, C, and B personnel protection. This rate schedule shall be submitted along with the base bid for approval before the start of work. Payment for these items will be made based upon Excavation Subcontractor Daily Reports, which shall be submitted and agreed upon daily sign-off with the General Contractor.

Item No. 25 "NAPL Isolation with Sheetpile"

25a NAPL Isolation – square feet at Level D Personnel Protection
25b NAPL Isolation – square feet at Level C Personnel Protection
25c NAPL Isolation – square feet at Level B Personnel Protection

a. Unit of Measure: The unit of measure for this item will be the square foot of sheet pile cofferdam as measured along the waterline that is driven to the depths as required by the Engineer. Each sheetpile isolation unit shall be measured around its perimeter, in straight lines from points of intersections, corners of cells, and endpoints of the center line of the sheetpile walls except that sheet piles common to one or more cofferdam cells shall not be measured more than once. In the event that a cell must be divided into smaller cells, the new sheets used in subdividing the original cell shall be measured in the same way.

b. Payment will be made for furnishing, installing, maintaining and removing sheet piles used for NAPL isolation, including all related excavation support system components and dewatering activities. Payment shall be measured and paid on a unit price basis. Dewatering includes designing, furnishing, installing, operating, maintaining, and removing all necessary pumps, sumps, pipelines, sediment filters, sedimentation basins, and other equipment of collection, removal, and pumping of surface and groundwater within each containment cell for transport to the treatment system as required to complete the work. Dewatering includes piping all removed water from the containment cells to the treatment system, along with use of absorbents, skimmers, and/or other necessary materials to manage NAPL in accordance with the NAPL Management Plan. Payment will be made to reflect costs incurred due to increased levels of personal protection required as site conditions dictate in accordance with the above payment items.

Item No. 26 "NAPL Excavation and Transport"

26a. NAPL Excavation and Transport – cubic yards at Level D Personnel Protection
26b. NAPL Excavation and Transport – cubic yards at Level C Personnel Protection
26c. NAPL Excavation and Transport – cubic yards at Level B Personnel Protection

a. Unit of measure: The unit of measure will be the cubic yard, as measured in place by survey.

b. Payment under this item will be full compensation for all labor, equipment, and materials to perform excavation and transport to the on-site stockpile area of NAPL- contaminated soils/sediments. Payment will be made to reflect costs incurred due to increased levels of personal protection required as site conditions dictate in accordance with the above payment items.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01025 ATTACHMENT

BID SCHEDULE

BID SCHEDULE FORM

The following Bid shall be completed in ink or typewritten. The amount of each Bid total shall be shown in both words and figures. The successful Bidder will be required to furnish a Bid breakdown in accordance with the following:

BID SCHEDULE

The BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following lump sum and unit prices:

ITEM NUMBER	BRIEF DESCRIPTION OF ITEM WITH UNIT BID IN WORDS	UNIT BID PRICE IN FIGURES	QUANTITY	TOTAL AMOUNT IN FIGURES
EXCAVATION SUBCONTRACTOR BID ITEMS (1 THROUGH 21)				
1	Excavation Subcontractor Mobilization and Site Preparation at Project Startup			
	_____ Lump Sum	_____	1 L.S.	$_____
2	Bonds and Insurance			
	_____ Lump Sum	_____	1 L.S.	$_____
3	Excavation Subcontractor Demobilization at Completion of Excavation and Restoration Work			
	_____ Lump Sum	_____	1 L.S.	$_____
4	Soil/sediment Excavation and Transport (includes stumps and debris)			
	_____ Per Cubic Yard	_____	19,400 C.Y.	$_____

5	Boulder Excavation and Transport			
	_____ Per Cubic Yard	_____	100 C.Y.	$_____
6	Ordered Excavation and Transport			
	_____ Per Cubic Yard	_____	1,000 C.Y.	$_____
7	Concrete Excavation and Transport			
	_____ Per Cubic Yard	_____	500 C.Y.	$_____
8	Backfill Material (Items 8a through 8o below are all measured and paid on the basis of cubic yards)			
8a	Common Fill			
	_____	_____	5,950 C.Y.	$_____
8b	Structural Fill			
	_____	_____	100 C.Y.	$_____
8c	Filter Material A			
	_____	_____	2,370 C.Y.	$_____
8d	Filter Material B			
	_____	_____	610 C.Y.	$_____
8e	Bank Run Gravel			
	_____	_____	100 C.Y.	$_____
8f	Select Gravel			
	_____	_____	100 C.Y.	$_____

8g	Sand			
	_____	_____	100 C.Y.	$_____
8h	Processed Gravel			
	_____	_____	100 C.Y.	$_____
8i	Screened or Crushed Stone			
	_____	_____	100 C.Y.	$_____
8j	Broken Stone			
	_____	_____	100 C.Y.	$_____
8k	Topsoil			
	_____	_____	1300 C.Y.	$_____
8l	Riprap Layer C1			
	_____	_____	1,540 C.Y.	$_____
8m	Riprap Layer C2			
	_____	_____	3,520 C.Y.	$_____
8n	Riprap Layer C3			
	_____	_____	2,440 C.Y.	$_____
	Per Cubic Yard			
9	Mulch			
	_____	_____	700 S.Y.	$_____
	Per Square Yard			
10	Geotextile Fabric			
	_____	_____	1000 S.Y.	$_____
	Per Square Yard			

11	Erosion Control Blankets			
	_____	_____	5,140 S.Y.	$_____
	Per Square Yard			
12	Temporary Erosion Control around Sheetpile Cells – Rip Rap			
	_____	_____	2,000 S.Y.	$_____
	Per Square Yard			
13	Temporary Erosion Control around Sheetpile Cells – Articulated Concrete Mats			
	_____	_____	2,000 S.Y.	$_____
	Per Square Yard			
14	Erosion Protection – Rip rap Placed at Overland Flow and Erosion Points and Containment Cell Discharge Points			
	_____	_____	1,000 S.Y.	$_____
	Per Square Yard			
15	Sheetpile Containment Cells, Driving and Removing to 10 ft embedment			
	_____	_____	2,140 L.F.	$_____
	Per Lineal Foot			
16	Sheetpile Containment Cells, Driving and Removing Below 10 ft embedment			
	_____	_____	53,500 S.F.	$_____
	Per Square Foot			
17	Stormwater Bypass of Sheet Pile Cells			
	_____	_____	1 LS	$_____
	Lump Sum			

18	Seed			
	_____	_____	4,700 S.Y.	$_____
	Per Square Yard			
19	Vegetated Geogrid			
	_____	_____	100 L.F.	$_____
	Per Linear Foot			
20	Silver Lake Outfall Extension			
	_____	_____	1 L.S.	$_____
	Lump Sum			
21	Excavation Cells 1 And 3 Construction, Excavation and Dewatering, and Backfilling			
	_____	_____	1 L.S.	$_____
	Lump Sum			
22	Riverbed Enhancement Structures			
	_____	_____	1 L.S.	$_____
		TOTAL BASE BID, EXCAVATION SUBCONTRACTOR		$_____
23	Containerized Plants			
	_____	_____	1,425 EA	$_____
	Per Each			
24	Dormant Cuttings			
	_____	_____	6,800 EA	$_____
	Per Each			
		TOTAL BASE BID – PLANTING SUBCONTRACTOR		$_____

ADDITIONAL PAYMENT ITEMS

Payment items 25 and 26 are items that may or may not be exercised depending on the site conditions encountered.

25	NAPL Isolation with Sheetpile			
25a	NAPL Isolation with Sheetpile – square feet at Level D Personnel Protection			
	_____ Per Square Foot	_____	17,500 S.F.	$_____
25b	NAPL Isolation with Sheetpile – square feet at Level C Personnel Protection			
	_____ Per Square Foot	_____	17,500 S.F.	$_____
25c	NAPL Isolation with Sheetpile – square feet at Level B Personnel Protection			
	_____ Per Square Foot	_____	17,500 S.F.	$_____
26	NAPL Excavation and Transport			
26a	NAPL Excavation and Transport – cubic yards at Level D Personnel Protection			
	_____ Per Cubic Yard	_____	500 C.Y.	$_____
26b	NAPL Excavation and Transport – cubic yards at Level C Personnel Protection			
	_____ Per Cubic Yard	_____	500 C.Y.	$_____
26c	NAPL Excavation and Transport – cubic yards at Level B Personnel Protection			
	_____ Per Cubic Yard	_____	500 C.Y.	$_____

SECTION 01080

CODES AND STANDARDS

PART 1 - GENERAL

1.1 CODES, STANDARDS AND SPECIFICATIONS

a. Published standards, codes, or standard specifications referenced shall be the latest standard code, specification, or tentative specification of the technical society, organization or body referred to which is in effect on the date of printing of the Drawings, unless otherwise specified. Where specific articles, sections, paragraphs, or subsections of referenced publications are not specified, the full referenced publication shall apply.

b. Satisfactory evidence that materials and methods comply with referenced standards and codes shall be furnished when required.

1.2 ORGANIZATIONS

The following is a partial listing of organizations and their abbreviations which publish codes and/or standards that may apply in the execution of the work:

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway & Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AHA	American Hardboard Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISE	American Iron and Steel Engineers
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AISI	American National Standards Institute
APA	American Plywood Association
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating and Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers Bureau

AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
BOCA	Building Officials and Code Administration International
CABO	Council of American Building Association
CBM	Certified Ballast Manufacturers
CMAA	Crane Manufacturers Association of America
CPSI	Consumer Products Safety Commission
CRSI	Concrete Reinforcing Steel Institute
DOC	United States Department of Commerce
DHUD	U.S. Dept. of Housing and Urban Development
EIA	Electronic Industries Association
EPA	US Environmental Protection Agency (USEPA)
ETL	Electrical Testing Laboratories, Inc.
FM	Factory Mutual Laboratories
FmHA	Farmers Home Administration, U.S. Dept. of Agriculture
FS	Federal Specification
GA	Gypsum Association
HPMA	Hardwood Plywood Manufacturers Association
IBR	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers
IMIAWC	International Masonry Industry All Weather Council
IPCEA	Insulated Power Cable Engineers Association
MBMA	Metal Building Manufacturers Association
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFIPA	National Fire Protection Association
NFOPA	National Forest Products Association
NHDOT	New Hampshire Department of Transportation
OSHA	U.S. Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
RCSHSB	Red Cedar Shingle and Hand Split Shave Bureau
SCS	U.S. Soil Conservation Service
SDI	Steel Door Institute
SFES	Southeastern Forest Experiment Station
SJI	Steel Joist Institute
TFS	Texas Forest Service
TPI	Truss Plate Institute Inc.
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.

USD	United States Diving, Inc.
WWPA	Western Wood Products Association

1.2 STANDARD SPECIFICATIONS

a. Construction methods and materials for applicable items of work shall be in accordance with the "Standard Specifications for Highways and Bridges" and "Construction Standards" of the Commonwealth of Massachusetts, Department of Highways for this project, unless otherwise specified.

END OF SECTION

SECTION 01090

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.1 DESCRIPTION

a. The following is a listing of common abbreviations and symbols which may be found in the Contract Documents. Since this is a general listing, it is to be expected that not all abbreviations will appear.

b. Abbreviations for published codes, standards, and regulations of organizations and federal agencies are defined in Section 01080 "Codes and Standards".

c. Additional Abbreviations and symbols can be found in Drawing Legends.

d. Abbreviations and/or symbols not specifically defined will be industry-accepted standard definitions. Clarification of symbols and/or abbreviations shall be forwarded to the Engineer, who will furnish definitions in writing.

1.2 ABBREVIATIONS

The following is a partial listing of abbreviations and meanings which may apply in the Specifications:

A.C. or ac	Alternating Current
a or A	Amperes
AFF	Above Finished Floor
amp or AMP	Amperes
Alum.	Aluminum
ARARs	Applicable or Relevant and Appropriate Requirement
Asph.	Asphalt
Aux.	Auxiliary
AWG	American or Brown and Sharp Wire Gage
Bit. Conc.	Bituminous Concrete
Btu	British Thermal Unit
CB	Circuit Breaker
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
Cl.	Class
cm	Centimeter
CMPs	Contract Management Procedures
C.O.	Clean Out
Conc.	Concrete

Cont.	Continuous
Cu.	Cubic
cc	Cubic Centimeters
C.F.	Cubic Feet
CFM or cfm	Cubic Feet Per Minute
CFS or cfs	Cubic Feet Per Second
C.Y.	Cubic Yards
CT	Current Transformer
D.C. or dc	Direct Current
Dia.	Diameter
DWG. or dwg	Drawing
Dr.	Drive
Ea. or ea.	Each
EF	Each Face
EW	Each Way
Eff. or eff	Efficiency
El. or Elev.	Elevation
Fin. Gr.	Finished Grade
fps	Feet Per Second
Ft. or ft	Feet
ftg.	Footing
g.	Grams
Ga. or ga	Gauge
Gal. or gal.	Gallon
Galv.	Galvanized
GPD or gpd	Gallon Per Day
GPM or gpm	Gallons Per Minute
H-O-A	Hand-off-automatic
Hz. or hz.	Hertz
I.D.	Inside Diameter
Inv.	Invert
IP	Instrument Panel
KVA or kva	Kilovolts-amperes
KW or kw	Kilowatt Hours
Lbs. or lbs	Pounds
L.F. or lf	Linear Feet
LPA	Lighting Panel "A"
L.S.	Lump Sum
m.	Meters
mA.	Milliamperes
Max. or max.	Maximum
MCC	Motor Control Center
mg.	Milligrams
MGD or mgd	Million Gallons Per Day
mi.	Miles
Min. or min.	Minimum

mm	Millimeters
No. or no.	Number
nom.	Nominal
NPT	National Pipe Thread
N.T.S.	Not To Scale
O.D.	Outside Diameter
OS&Y	Outside Screw and Yoke
Oz. or oz.	Ounce
pb	Pushbutton
PPD	Pounds Per Day
P/B	Pullbox
pri.	Primary
psf	Pounds Per Square Foot
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch, Gauge Pressure
PT	Potential Transformer
Pvt. or Pvmt.	Pavement
R.	Radius
R.O.W.	Right-Of-Way
Sch.	Schedule
sec.	Secondary or Seconds
Sq. or sq.	Square
S.F.	Square Feet
SSERC	Site-Specific Environmental Restoration Contract
SSHASP	Site-Specific Health and Safety Plan
S/S/P	Stop-Start-Pilot Station
Std. or std.	Standard
S.Y.	Square Yard
T&B	Top and Bottom
Typ.	Typical
U.O.N.	Unless Otherwise Noted
V or v	Volts
VAC or vac	Alternating Current Voltage
VDC or vdc	Direct Current Voltage
V.F.	Vertical Feet
Vol.	Volume
W or w	Watts
w.c.	Water Column
WSP	Working Steam Pressure
Yd. or yd	Yard

1.3 SYMBOLS

The following is a list of commonly used symbols and meanings which may be found in the Drawings and Specifications:

ϕ	Phase, Diameter, or Round (as applicable)
^{o}F, ^{o}C	Degrees (F. = Fahrenheit C. = Centigrade)
'	Feet or Minutes
"	Inches or Seconds
#	Number or Pound
/	Per or Divided By
3:1	3 horizontal to 1 vertical (slope)
1 on 3	1 vertical on 3 horizontal (slope)

END OF SECTION

01300

CONSTRUCTION PROGRESS AND SCHEDULES

PART 1 – GENERAL

1.1 PRE-CONSTRUCTION CONFERENCE

a. Prior to issuance by the Government to the General Contractor of the Notice to Proceed with the work, a conference will be held to discuss the construction schedule, to establish procedures for handling vendor drawings and other submissions, for processing applications for payment and to establish a working understanding between the parties as to the Project.

b. Present at the pre-construction conference will be the General Contractor's project manager, site manager and quality assurance manager, the Excavation Subcontractor and his Superintendent and quality assurance manager, a GE representative, the U.S. Environmental Protection Agency (USEPA) representative and the Corps of Engineers project manager. Duties will be defined and minutes of the meeting will be prepared and distributed to all parties in attendance.

1.2 NOTICE TO PROCEED

a. The General Contractor will deliver to the Excavation Subcontractor a written Notice to Proceed, stating a date on which the Excavation Subcontractor shall start the work. Contract time shall commence on this date.

1.3 SUBMITTALS

The following submittals shall be provided in accordance with Section 01330 – Submittal Procedures:

SD-01 Pre-Construction Submittals

Construction Schedule – see description under Products below.

PART 2 - PRODUCTS

2.1 CONSTRUCTION SCHEDULE

a. Within fifteen days after the execution of this Contract, the Excavation Subcontractor shall submit to the General Contractor for approval a construction schedule and network diagram consisting of the activities and events which must be accomplished to complete the work within the contract completion time and shall show the planned sequence of accomplishment, interdependencies and interrelationships. For initial scheduling, the Contractor shall allot 15 working days from Engineer's receipt for the time necessary for review and approval by the Engineer of all shop drawings and items requiring the approval of the Engineer.

b. The construction schedule, as submitted to the General Contractor, shall include the following items:

   1. A list of the event numbers, their description, the expected and latest allowable start and finish dates, slack or float time, schedule date and actual completion date.
   2. The data, as mentioned above, shall be plotted on a graph of activity versus calendar days.

c. The graphic network diagrams, network, illustrations or other pertinent material shall be fully legible and capable of being folded over to 8-1/2 x 11 inches so that they may be unfolded while inserted in a standard three-ring binder with a maximum sheet size being 24 x 36 inches.

d. The construction schedule and network, as described herein, shall be Critical Path Method (CPM), Program Evaluation and Review Techniques (PERT), or similar approved construction scheduling.

e. The Construction Schedule will not show any accounting for the probable shut down of the work due to “spring run off” nor will it account for potential standby time due to flood preparation, standby during flooding, clean up after flooding, or delays related to the presence of NAPL. Extension of contract completion date will be granted in a change order for each of these activities as they occur.

f. The Contractor shall also submit a schedule of anticipated amounts of each monthly payment that will be due the Contractor based upon the construction schedule.

2.2 REVIEW MEETING

a. A meeting will be held within 21 calendar days after the awarding of the contract to discuss the construction schedule. The Excavation Subcontractor shall submit to the General Contractor, a proposed schedule for procurement of materials and equipment at this meeting. The schedule network and diagram will be adjusted to reflect mutually agreed upon events, activities, and time elements to assure that the method of accomplishing the work as displayed thereon is in conformance with the overall plan and that the entire project is broken into manageable segments which will permit realistic progress analysis.

b. This revised network will serve as the first network for management and control of the project and shall be submitted to the General Contractor for approval within 60 calendar days after the awarding of the contract. Firm shipping dates for all equipment shall be included.

2.3 MONTHLY SCHEDULE UPDATES

a. Two copies of the construction schedule shall be submitted each month to the Engineer, marked to show the progress of the various activities and noting any delays on progress. If delays are encountered because of changes in plans or in the quantity of work, or if the Excavation Subcontractor has failed to comply with the approved schedule, he shall submit to the Engineer for his approval, a revised schedule and network diagram with a suitable explanation indicating his proposed changes and shall prosecute the balance of the work so as to complete the project in the time specified. Only after approval of the revised schedules shall the Excavation Subcontractor proceed with his proposed changes in the execution and scheduling of the work.

b. Monthly estimates for payment will <u>not</u> be processed if the Excavation Subcontractor fails to submit the initial construction schedule and network diagram or any revisions or updating as noted herein. These reasons shall be sufficient cause for certification that the rate of progress is not satisfactory and/or that the Excavation Subcontractor's personnel directly responsible for maintaining progress of the work are not performing their work in a proper and skilled manner.

PART 3 - EXECUTION

3.0 MONTHLY MEETINGS

a. Meetings between the General Contractor, Excavation Subcontractor, GE, and Government will be held monthly for the purpose of reviewing the progress of the contract and the upcoming month's work. The General Contractor shall have the Site Manager and the Project Manager attend these meetings.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers as follows:

SD-01 Preconstruction Submittals

SD-02 Shop Drawings

SD-03 Product Data

SD-04 Samples

SD-05 Design Data

SD-06 Test Reports

SD-07 Certificates

SD-08 Manufacturer's Instructions

SD-09 Manufacturer's Field Reports

SD-10 Operation and Maintenance Data

SD-11 Closeout Submittals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the General Contractor of the responsibility for any error that may exist, as the General Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no re-submittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS

The General Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the General Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The General Contractor and his subcontractors shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings;

descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all-inclusive and additional submittals may be required.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 14 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

Submit eight (8) copies of each submittal item with an attached ENG FORM 4025 Transmittal Form. Send all submittals to Roy F. Weston, Inc., Attn: Submittal Clerk, 10 Lyman Street, Suite 2, Pittsfield, MA 01201. Additional copies of each submittal shall be maintained on-file by the General Contractor on-site.

3.5.2 Deviations

For submittals that include proposed deviations requested by the General Contractor, the column "variation" of ENG Form 4025 shall be checked. The General Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS

The General Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the General Contractor scheduled submittal date shown on the approved "Submittal Register."

3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two (2) copies of the submittal will be retained by the Contracting Officer and six (6) copies of the submittal will be returned to the General Contractor. An additional copy will be provided by the General Contractor to GE.

3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the General Contractor to resubmit any item found not to comply with the contract. This does not relieve the General Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the General Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. Where submittals are being required by subcontractors to the General Contractor, the above described requirements will flow down to the subcontractors.

3.9 STAMPS

Stamps used by the General Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

APPROVED ( )
APPROVED AS CORRECTED ( )
REVISE AND RESUBMIT ( )
NOT APPROVED ( )
NO ACTION REQUIRED ( )

Checking is only for conformance with the design concept and functional result of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

ROY F. WESTON, INC.

Date_____ By_____

END OF SECTION

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1	SUBMITTAL REGISTER (ER 415-1-10)																										CONTRACT NO.
2	TITLE AND LOCATION: 95% Design Submittal, 1.5 Mile Removal Action - First Reach - GE/Housatonic River Project, Pittsfield, Massachusetts																	CONTRACTOR									SPECIFICATION SECTION
3					TYPE OF SUBMITTAL											CLASSIFI-CATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
4	TRANSMIT-TAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NO.	DESCRIPTION OF ITEM SUBMITTED	SD-01 PRECONSTRUCTION SUBMITTALS	SD-02 SHOP DRAWINGS	SD-03 PRODUCT DATA	SD-04 SAMPLES	SD-05 DESIGN DATA	SD-06 TEST REPORTS	SD-07 CERTIFICATES	SD-08 MANUFACTURER'S INSTRUCTIONS	SD-09 MANUFACTURER'S FIELD REPORTS	SD-10 OPERATION AND MAINTENANCE DATA	SD-11 CLOSEOUT SUBMITTALS	FOR INFORMATION ONLY	GOVERNMENT APPROVAL	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATEIRAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
5			01015, 2.1	Record Drawings											X		X										
6			01300, 2.1	Project Schedules	X											X											
7			01340, 1.3	Cell by Cell Survey Updates						X							X										
8			01355, 1.5	Environmental Protection Plan	X												X										
9			01410, 1.5	Ambient Air Monitoring Plan	X												X										
10			01410, 1.5	Water Column Monitoring Plan	X												X										
11			01410, 1.5	Settlement Monitoring Plan	X												X										
12			01410, 1.5	Vibration Monitoring Plan	X												X										
13			01410, 1.5	Conditions Monitoring Plan	X												X										
14			01410, 1.5	Manufacturer's Cut Sheets for Vibration Monitoring Devices		X											X										
15			01410, 1.5	Air Monitoring Daily Report						X							X										
16			01410, 1.5	Monthly Project Monitoring Report						X							X										
17			01410, 1.5	Water Column Monitoring Daily Report						X							X										
18			01410, 1.5	Final Project Monitoring Report											X		X										
19			01451, 1.2	Contractor Quality Control Plan Supplement	X												X										
20			01451, 1.2	Daily CQC Report										X			X										
21			02111, 1.3	Decontamination and Truck Wash Pad Details	X											X											
22			02111, 1.3	Analytical Test Reports for Backfill Materials						X							X										
23			02111, 1.3	Paint Filter Test Results						X							X										
24			02111, 1.3	Geotechncial Test Reports for Backfill Materials						X							X										
25			02111, 1.3	Wipe Sampling Data						X							X										
26			02300, 1.2	Excavation Plan	X												X										
27			02300, 1.2	In-place compaction testing data	X											X											
28			02370, 1.3	Storm Damage and High Flow Damage Prevention Plan	X												X										
29			02370, 1.3	Mulch, Geotextile Farbric, Erosion Control Fabric			X									X											
30			02370, 1.3	Synthetic Soil Binders						X						X											
31			02370, 1.3	Construction Work Sequence Schedule						X						X											
32			02370, 1.3	Installer's Qualifications						X						X											
33			02370, 1.3	Mulch						X						X											
34			02370, 1.3	Asphalt Adhesive						X						X											
35			02370, 1.3	Tackifier						X						X											
36			02370, 1.3	Wood Byproducts						X						X											

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1	SUBMITTAL REGISTER (ER 415-1-10)																										CONTRACT NO.
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37			02370, 1.3	Certificate Form for Erosion and Sediment Controls							X					X												
38			02370, 1.3	Daily Forecast Reports										X		X												
39			02370, 1.3	Rainfall Snowpack Measurements										X		X												
40			02370, 1.3	River Stage and Discharge Data										X		X												
41			02370, 1.3	Daily Records for limitation of storm/high flow damage										X		X												
42			02370, 1.3	Monthly Inspection Report for E&S Controls										X		X												
43			02371, 1.3	Out of River Erosion and Sedimentation Control Plan	X												X											
44			02372, 1.4	NAPL Management Plan	X												X											
45			02464, 1.2	Dewatering Plan (Submitted as Part of Excavation Plan, Section 02300)	X												X											
46			02464, 1.2	Containment Cell Plan		X										X												
47			02464, 1.2	Metal Sheet Piling		X										X												
48			02464, 1.2	Wipe sample results for sheets						X							X											
49			02630, 1.3	Pipe			X										X											
50			02630, 1.3	Pre-cast Inlet Structures			X										X											
51			02630, 1.3	Frames and Grates			X										X											
52			02930, 1.2	Planting Subcontractor Personnel Qualifications	X												X											
53			02930, 1.2	Bioengineering Materials			X									X												
54			02930, 1.2	Equipment for revegetation and bioengineering operations			X									X												
55			02930, 1.2	Delivery Schedules			X									X												
56			02930, 1.2	Plant Establishment Period			X									X												
57			02930, 1.2	Maintenance Record			X									X												
58			02930, 1.2	Plant Material							X					X												
59			02930, 1.2	Seed Mix							X					X												
60			02930, 1.2	Erosion Control Blankets, Bioengineering Fabrics, and Geotextiles							X					X												
61			02930, 1.2	Fertilizer							X					X												
62			02930, 1.2	Maintenance Instructions										X		X												
63			02930, 1.2	Planting Record Drawings											X		X											
64			03100, 1.2	Concrete Formwork Details		X										X												
65			03100, 1.2	Form Releasing Agents			X									X												
66			03200, 1.2	Concrete Reinforcing Systems		X										X												

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1	SUBMITTAL REGISTER (ER 415-1-10)																										CONTRACT NO.
2	TITLE AND LOCATION: 95% Design Submittal, 1.5 Mile Removal Action - First Reach - GE/Housatonic River Project, Pittsfield, Massachusetts																	CONTRACTOR									SPECIFICATION SECTION
3					TYPE OF SUBMITTAL											CLASSIFI-CATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
4	TRANSMIT-TAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NO.	DESCRIPTION OF ITEM SUBMITTED	SD-01 PRECONSTRUCTION SUBMITTALS	SD-02 SHOP DRAWINGS	SD-03 PRODUCT DATA	SD-04 SAMPLES	SD-05 DESIGN DATA	SD-06 TEST REPORTS	SD-07 CERTIFICATES	SD-08 MANUFACTURER'S INSTRUCTIONS	SD-09 MANUFACTURER'S FIELD REPORTS	SD-10 OPERATION AND MAINTENANCE DATA	SD-11 CLOSEOUT SUBMITTALS	FOR INFORMATION ONLY	GOVERNMENT APPROVAL	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATEIRAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
67			03200, 1.2	Reinforcing Steel							X					X											
68			03250, 1.2	Waterstops		X										X											
69			03250, 1.2	Pre-formed Compressible Joint Filler, Sealant and Waterstops			X									X											
70			03250, 1.2	PVC and Expanding Waterstops and Splices				X								X											
71			03250, 1.2	Pre-formed Compressible Joint Filler, Sealant and Waterstops							X					X											
72			03300, 1.2	Mixture Proportions					X							X											
73			03300, 1.2	Testing and Inspection for Contractor Quality Control						X						X											
74			03400, 1.2	Precast Box Culverts		X										X											
75			03400, 1.2	Precast Concrete Design Calculations; Mix Design					X							X											
76			03400, 1.2	Quality Control Procedures							X					X											
77			10100, 1.2	Sign Materials, Sign Supports			X									X											
78			10100, 1.2	Traffic Control Police Detail Invoices											X		X										
79			11800, 1.3	Treatment System Component Shop Drawings		X											X										
80			11800, 1.3	Treatment System Component Product Data			X										X										
81			11800, 1.3	Foundation Evaluation and Design					X								X										
82			11800, 1.3	Acceptance Testing						X							X										
83			11800, 1.3	Factory Tests						X							X										
84			11800, 1.3	Operations and Maintenance Manual										X			X										
85			16010, 1.10	Electrical Distribution System		X										X											
86			16010, 1.10	Electrical Distribution System Components			X									X											

SECTION 01340

CONSTRUCTION SURVEYS

PART 1 GENERAL

General Contractor shall conduct construction layout surveys and elevation surveys as required to facilitate the progress of excavation, verify that appropriate excavation depths have been reached to ensure the removal of contaminated material (TSCA and non-TSCA) and restoration of excavated areas in accordance with project requirements, and document volumes of material removed and replaced for purposes of payment. Surveys will be performed at required depth intervals starting at the existing grade, down to intermediate excavation depths, final excavation invert, intermediate backfill layers, and final restored grade both within the river and on the river banks.

1.1 REFERENCES

Section 6.03 Construction Layout Surveys, Massachusetts Board of Registration of Professional Engineers and Land Surveyors

1.2 DESCRIPTION OF WORK

1.2.1 Stake out the limits of excavation, stake out the limits of TSCA/non-TSCA areas of excavation, and stake out the limits of the containment cells. These points and their coordinates are shown on the drawings in plan and tabular format, respectively. The points for the containment cells and excavation limits are labeled CC-XX and EX-XX, respectively, where "XX" designates the point number. Post cut stakes that clearly label separate areas and depths of excavation (TSCA and non-TSCA).

1.2.2 Provide cross-sections at a minimum frequency interval of once every 25 ft and at obvious break points for all excavated areas and post cut stakes along cross-sections as needed.

1.2.3 Determine if pre-excavation elevations of the dewatered excavation cell and associated riverbank agree with elevations previously determined. These elevations shall be reviewed by the General Contractor in consultation with the Government. Determine final excavation elevations and depths. If elevations vary from original survey, revise excavation depth and prepare documentation.

1.2.4 Verify that TSCA and non-TSCA materials are removed to appropriate depths (within the identified tolerances) as indicated on the plans or as modified by the General Contractor in consultation with the Government based on the most recent survey data.

1.2.5 Verify that appropriate thicknesses of various restoration materials are backfilled into the excavations and that the finish grade conforms to those grades shown on the plans or the grades as modified by the General Contractor in consultation with the Government based on the most recent survey data.

1.2.6 Collect sufficient survey data to allow accurate calculation of in-place volumes of TSCA and non-TSCA material for purposes of payment and verification of OCPA disposal requirements. This method differs from GE's proposal to calculate volumes as stated in their letter dated 26 July 2001. Collect sufficient survey data to allow accurate calculation of in-place volumes of each type of backfill material used for restoration for purposes of payment.

1.2.7 It is anticipated that the work will proceed in a sequence similar to the sequence described below:

- Stake out containment cells as identified on the plans in an appropriate manner.
- Stake out of limits of excavation and bank TSCA/non-TSCA areas based on the points provided on the drawings.
- Perform topographic survey along 25-foot transects along bank and dewatered excavation cell (following sheetpile installation and initial dewatering of cell) and at other breaks in bathymetry and topography. Elevations shall be collected on the transects at key points (such as "CC" and "EX" points) and significant breaks in slopes. Excavation depths will be finalized following this survey.
- Stake out limits of TSCA/non-TSCA areas within sediment excavation cell.
- Survey intermediate depths of TSCA/non-TSCA areas (river bed and river bank) to verify sufficient material has been removed to depths within defined tolerances and that areas have not been overexcavated.
- Survey final excavation depth to verify that sufficient material has been removed and that material has not been overexcavated.
- Survey intermediate backfill elevations for each type of material used in the restoration.
- Survey final grade of restored cells.

General Contractor shall set cut and fill stakes with appropriate markings for Excavation Subcontractor. Excavation Subcontractor is required to protect stakes. Elevation information shall be collected at the same points for all surveys conducted starting with the initial topographic survey, the final excavation survey, the final restoration survey, and intermediate elevation surveys as appropriate.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Cell by Cell Survey Reports – Cell by Cell reports for pre-excavation elevations, post-excavation/pre-restoration elevations, and post-restoration elevations; G

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

3.1 DELIVERABLES

3.1.1 Survey data shall be compiled and presented in the form of mapping and tabular data and provided to the Engineer for each excavation cell.

3.1.2 Survey mapping shall be presented in the form of drawing sheets (24 x 36 inch sheets) at a scale of 1 inch to 20 or 30 feet. In addition, details shall be provided as necessary to document intricate or critical features.

3.1.3 Survey mapping shall also be provided as a seamless electronic drawing file as well as electronic files for each drawing sheet. The electronic files shall be generated in AutoCAD Release 14 (AutoCAD 2000 is acceptable but not required.) Drawing entities shall have x,y,z coordinates coinciding with actual State Plane/NAVD northing, easting, and elevation coordinates. Entities shall be placed on descriptive layers coinciding with the type of data. Drawings generated using Softdesk 8 through Land Development Desktop 2 are preferred and, if this software is used, the supporting project files shall be provided.

3.1.4 Survey point data shall be delivered in two forms: photocopies of applicable pages of field books and as electronic tabular files. Electronic files shall provide the adjusted northing, easting, elevation, and description of each survey point. These files shall be comma delimited ASCII or Excel 97 files.

3.2 STANDARDS

Work shall reference the Massachusetts State Plane Coordinate System. Horizontal control shall be in accordance with NAD 1983 and vertical control shall be in accordance with NAVD 1988 and based on USGS benchmarks as necessary.

Work shall conform to professional standards for Land Surveyors and applicable local and state laws, standards and regulations. Unless noted otherwise all other survey efforts shall be performed to a minimum accuracy of plus or minus 0.10 feet vertical and 1 in 10,000 horizontal.

To the extent possible, survey work shall be performed based on the existing horizontal and vertical control points as identified on the drawings. Electronic files containing this information are available.

END OF SECTION

SECTION 01355

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations

CODE OF MASSACHUSETTS REGULATIONS (CMR)

310 CMR 30	Hazardous Waste Regulations
310 CMR 40	Massachusetts Contingency Plan

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual

US ARMY CORPS OF ENGINEERS TECHNICAL REPORT

WETLAND MANUAL	Corps of Engineers Wetlands Delineation Manual Technical Report Y-87-1

PITTSFIELD SSERC DOCUMENTS

REPORT	Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River (February and July 2000)
REPORT	Addendum to the Engineering Evaluation/Cost Analysis for the Upper Reach of Housatonic River (October 2000)
REPORT	USEPA, Combined Action and EE/CA Approval Memorandum Addendum. Re: Request to Conduct a Removal Action at the GE-Housatonic River (Upper Reach Removal Action), Pittsfield, Massachusetts. May 26, 1998
REPORT	USEPA, Action Memorandum and Exemption from the Statutory $2,000,000 and 12-Month Limits on Removal Actions. Re: Request for Removal Action, Housatonic River 1.5-Mile Reach at the GE-Housatonic River Site, Pittsfield, Mass. November 21, 2000.

1.2 DEFINITIONS

1.2.1 Environmental Pollution and Damage

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

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.3 General Contractor Generated Hazardous Waste

General Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would

typically consist of material brought on site by the General Contractor or his subcontractors to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and contaminated equipment rinse water.

1.2.4 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and discharges shall comply with project ARARs.

1.2.5 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.6 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with applicable federal, state, and local regulations.

1.3 GENERAL REQUIREMENTS

For all on-site activities, the General Contractor shall, to the extent practicable, comply with the substantive portions of all applicable and relevant and appropriate Federal and State environmental laws and regulations (ARARs) as described in the ARARs table (included in the Final EE/CA and provided at the end of this section) for all on-site activities and meet all requirements of all applicable environmental Federal, State, and local laws and regulations for off-site activities. For ARARs that are encountered during the Removal Action that are not specifically addressed in the attached ARARs table, a similar process will be followed. For all off-site activities, the General Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. Pursuant to Section 121(e) of CERCLA, the General Contractor will not be required to obtain any Federal, State or local permits for work conducted on-site.

1.4 SUBCONTRACTORS

The General Contractor shall ensure compliance with this section by Subcontractors.

1.5 SUBMITTALS

The following submittals will be made in accordance with Section 01330, Submittal Procedures:

SD-01 Preconstruction Submittals:

Environmental Protection Plan- The General Contractor shall submit an Environmental Protection Plan for the project. The plan will include a description of how the General Contractor will meet, to the extent practicable, the substantive portions of all the applicable and relevant and appropriate Federal and State environmental laws and regulations (ARARs) as described in the ARARs table for all on-site activities and meet all requirements of all applicable environmental Federal, State, and local laws and regulations for off-site activities.

1.6 PROTECTION FEATURES

Prior to start of any onsite construction activities, and in association with the video survey described in Section 01410, the General Contractor and the Contracting Officer shall make a joint condition survey. The General Contractor shall include in the Environmental Protection Plan a section describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection, along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the General Contractor's assigned storage area and access route(s), as applicable. The General Contractor shall protect those environmental features included in the plan and any indicated on the drawings, regardless of interference which their preservation may cause to the General Contractor's work under the contract.

1.7 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the General Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.8 NOTIFICATION

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

The General Contractor shall be responsible for complying with, to the extent practicable, substantive portions of all environmental commitments as described in the attached ARARs table. Pursuant to Section 121(e) of CERCLA, however, the General Contractor will not be required to obtain any Federal, State, or local permits for work conducted on-site. Any applicable permits shall be required for off-site work.

3.2 LAND RESOURCES

The General Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the General Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the General Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized by the Government. The General Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the General Contractor.

3.2.1 Work Area Limits

Prior to commencing construction activities, the General Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The General

Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

Unless authorized by the Government, no transport of contaminated soil or sediment generated from work on the project will be permitted on public ways other than a limited section of Lyman Street in the vicinity of the Lyman Street Bridge. If contaminated soils or sediments are transported on public ways, manifesting and/or other shipping papers may be required. Contaminated soil and sediment will be transported to a staging area, thence to the GE OPCAs, or as approved by the Government or their representative, directly to the GE OPCAs from the excavation point. Transport to the GE OPCAs and the staging areas will be on access roads as shown on the drawings and as established on GE property. Transport of project related contaminated material or solid waste off-site will be conducted only upon authorization by the Government.

3.2.2 Erosion and Sediment Controls

The General Contractor shall be responsible for providing erosion and sediment control measures that are, to the extent practicable, in accordance with Federaland State laws and regulations (see attached ARARs table). The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The General Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. The General Contractor's best management practices shall be in accordance with the requirements outlined in the attached ARARs table. Any temporary measures shall be removed after the area has been stabilized.

3.2.3 General Contractor Facilities and Work Areas

The General Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of General Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas.

3.3 WATER RESOURCES, STREAM CROSSINGS, AND WETLANDS

The General Contractor shall monitor construction activities to prevent or minimize, to the extent practicable, pollution of surface and ground waters. All on-site construction activities, including those in the Housatonic River and associated stream crossings and wetlands, shall be performed in accordance with the attached ARARs table.

3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the General Contractor shall be in accordance with, to the extent practicable, substantive portions of all Federal and State air emission and performance laws and standards (see attached ARARs table).

3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The General Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal and State air pollution standards to be exceeded or which would cause a hazard or a nuisance (see attached ARARs table). The General Contractor shall comply with all State visibility regulations.

3.4.2 Odors

Odors from construction activities shall, to the extent practicable, be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.4.3 Sound Intrusions

The General Contractor shall keep construction activities under surveillance and control to minimize environmental damage by noise. The General Contractor shall comply with the provisions of the State of Massachusetts rules.

3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste.

3.5.2 Chemicals and Chemical Wastes

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

3.5.3 General Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The General Contractor shall, at a minimum, manage and store hazardous waste in compliance with the substantive requirements of 40 CFR 262 (see attached ARARs table). Hazardous wastes/materials as defined in this section do not include soil and sediment removed from the excavation areas or other remediation wastes such as concrete, debris, stumps, wood chips, wastewater treatment residuals and PPE generated by the removal action. The General Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The General Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The General Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 – 178 and State regulations. The General Contractor shall transport General Contractor generated hazardous waste off the site within 90 days in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. On-site, the General Contractor shall dispose of all hazardous waste in accordance with the attached ARARs table. Off-site, the General Contractor shall dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills shall be the General Contractor's responsibility. The disposition of General Contractor generated hazardous waste and excess hazardous materials are the General Contractor's responsibility. The General Contractor shall coordinate the disposition of hazardous waste with the Government.

3.5.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be storedin marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations.

3.6 BIOLOGICAL RESOURCES

The General Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants outside the excavation areas including their habitat. The General Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with the attached ARARs table.

3.7 PREVIOUSLY USED EQUIPMENT

The General Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The General Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The General Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.8 TRAINING OF GENERAL CONTRACTOR PERSONNEL

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

3.9 POST CONSTRUCTION CLEANUP

The General Contractor shall conduct post construction cleanup in accordance with the requirements of the drawings and specifications and the Consent Decree. The General Contractor shall, unless otherwise instructed in writing by the Contracting Officer or indicated in the drawings, specifications or the Consent Decree, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Disturbed areas shall be graded, filled and the entire area seeded unless otherwise indicated. Specific requirements relative to restoration of disturbed areas may be imposed by the Government based on negotiations with individual property owners.

END OF SECTION

SECTION 01410

ENVIRONMENTAL AND CONDITIONS MONITORING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced.

CODE OF FEDERAL REGULATIONS (CFR)

33 CFR 328	Definitions
40 CFR 50, Appendix B	USEPA Reference Method for the Determination of Suspended Particulates (TSP) in the Atmosphere (High Volume Method)

40 CFR 300.430(e)(9) of the National Contingency Plan.

40 CFR 355	Emergency Planning and Notification

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual
EP 1110-1-21	Air Pathway Analysis (APA) for the Design of HTRW Remedial Action Project.

EPA Technical Documents (TO)

EPA/625/R-96/010b	Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Second Edition - Compendium Method TO-4A Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)

Final Quality Assurance Project Plan (QAPP), Roy F. Weston, Inc., General Electric Housatonic River Project, Contract No. 68-W7-0026, DCN: RFW033-2E-AEOQ, November 2000.

Draft Field Sampling Plan (FSP), Roy F. Weston, Inc., Environmental Remediation Contract General Electric/ Housatonic River Project, Pittsfield, MA, Contract No. DACW33-00-D0006, Task Order No. 0002, DCN: GE-091200-AADI, November 2000.

Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), USEPA, May 1987.

On-Site Meteorological Program Guidance for Regulatory Modeling Applications.

Summary of Structural Conditions and Utility Survey from Lyman St. Bridge to Elm St. Bridge along Housatonic River, Pittsfield, Massachusetts, Hart Crowser, September 28, 2000.

1.2 GENERAL REQUIREMENTS

The General Contractor shall perform monitoring during the construction work being performed in the first phase of the 1.5 Mile reach of the Housatonic River and surrounding area to identify and mitigate conditions that may result in increased risks to the local community, the ecological receptors, or the environment. In addition, the General Contractor shall perform monitoring of buildings and structures in the vicinity of the construction work to identify any adverse affects that may have resulted from the construction activities. This specification is not intended to address health and safety of the construction workers. Construction worker health and safety shall be addressed in the Site Safety and Health Plan for the project.

The monitoring activities that shall be performed include:

1. Air Monitoring: Sampling and analysis of ambient air for PCBs and PM_{10} (particulates 10 microns and less).

2. Water Column Monitoring: Sampling and analysis of surface water upstream and downstream of the work area in the Housatonic River.

3. Settlement Monitoring: Monitoring the elevations of designated points on the foundations of local buildings and structures.

4. Vibration Monitoring: Monitoring of the intensity of vibrations in local buildings and on local structures as the result of sheet pile driving and other construction activities.

5. Conditions Monitoring: Video documentation of the conditions of local structures and environmental conditions before commencement of construction work and at the conclusion of the construction work. Maintain one working copy and one archive copy of the initial and final video surveys.

1.3 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

All work included in the specification shall comply with Volume I (Sections A-D) and Appendices A and B of the SSERC Project QAPP.

Standard Operating Procedures (SOPs) for field screening instruments, decontamination, documentation, sampling, sample identification, sample packing and shipping, and surveying are included in the FSP. The following is a list of SOPs that shall be followed for Environmental and Conditions Monitoring:

SOP No.	Task
G-1	Calibration of Field Screening Instruments
G-2	Decontamination
G-3	Field Documentation
G-4	Field Filtration
G-5	Field Measurements
G-6	Field Sample Numbering
G-7	Management of Investigation Derived Wastes (IDW)
G-9	Quality Assurance/ Quality Control Sampling
G-10	Sample Documentation
G-11	Sample Packing and Shipping
G-12	Surveying

Additional SOPs for specific activities are referenced in the sections below.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Ambient Air Monitoring Plan; G
Water Column Monitoring Plan; G
Settlement Monitoring Plan; G
Vibration Monitoring Plan; G
Conditions Monitoring Plan; G

SD-02 Shop Drawings

Manufacturer’s Cut Sheets of Vibration Monitoring Devices; G

SD-06 Test Reports

Air Monitoring Daily Report: G

Monthly Project Monitoring Report – Includes Air, Water Column, Settlement, Vibration, and Conditions monitoring results; G.

Water Column Monitoring Daily Report; G

SD-11 Closeout Submittals

Final Project Monitoring Report – Summary of Air, Water Column, Settlement, Vibration and Conditions monitoring program results; G.

1.5 AIR MONITORING

1.5.1 Ambient Air Monitoring Plan

Prior to commencing monitoring activities, the General Contractor shall submit an Ambient Air Monitoring Plan for review and approval by the Contracting Officer. The Ambient Air Monitoring Plan shall include, but shall not be limited to, the following:

a. A brief description of the sampling locations, schedule and frequency of sample collection, and the methods of sample collection and analysis.

b. Where applicable, references to methods and procedures outlined in the Project FSP and the Project QAPP.

c. Any variations from the methods and QA/QC presented in the FSP and QAPP shall be noted in the Ambient Air Monitoring Plan.

1.5.2 Air Monitoring Data Deliverables

Daily and Monthly Reports

A Daily Data Report shall be prepared summarizing each of the PM_{10} ambient air monitoring sampling events. The reports shall contain the following information:

- Summary of the sampling event (comments on excursions, problems with sampling equipment, and site activities).
- Wind rose for the sample period obtained from the nearby meteorological station.
- Summary graph of sample results for the sample period. Summary table of the maximum/minimum instantaneous readings, the maximum/minimum hourly averages, and the 10-hour Time Weighted Average (TWA).

An Air Monitoring section shall be included in the Monthly Project Monitoring Report, and will summarize the PM-10 and PCB ambient air sampling results. Each monthly Air Monitoring Report shall contain the following information:

PCB Monitoring

- Summary of PCB sampling events (comments on excursions, problems with sampling equipment, site activities, laboratory problems, and results of QA samples).
- Wind rose for the 24-hour sample period for PCBs obtained from the nearby meteorological station.
- Printed hourly meteorological data for all measured parameters for the PCB sample period.
- Summary table of results for the PCB sampling period.
- The initial laboratory report for PCB analysis.
- Sample data sheets.

PM_{10} Monitoring

- Compilation of daily PM_{10} data.
- Summary of PM_{10} data for the month.

Final Air Monitoring Report

The Final Air Monitoring Report shall be a section of the Final Project Monitoring Report and shall include both PCB and PM_{10} ambient air monitoring data. The report shall contain the following information:

- Summary of the PCB and PM_{10} sampling events for the duration of the construction work (date and time of sampling, sampling locations, number of samples collected, PCB analytical results or PM_{10} 10-hour TWAs, and meteorological data summary). In addition, the sample dates, PCB analytical results and PM_{10} 10-hour TWAs shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.
- Calibration and Maintenance Activities.
- Discrepancies noted in the data.
- Summary of all notification level and action level excursions for both PCB and PM_{10} ambient air monitoring including date and time of sampling, sampling locations, and results.

1.6 WATER COLUMN MONITORING

1.6.1 Water Column Monitoring Plan

Prior to commencing monitoring activities, the General Contractor shall submit a Water Column Monitoring Plan for review and approval. The Water Column Monitoring Plan shall include, but shall not be limited to, the following:

a. A brief description of the sampling locations, schedule and frequency of sample collection, and the methods of sample collection and analysis.

b. Manufacturer's cut sheets and a brief description of the automated sampling device to be utilized.

c. Where applicable, references to methods and procedures outlined in the Project FSP and the Project QAPP.

d. Any variations from the methods and QA/QC presented in the FSP and QAPP shall be noted in the Water Column Monitoring Plan.

1.6.2 Water Column Monitoring Data Deliverables

Daily and Monthly Reports

A Daily Water Column Monitoring Report shall be submitted summarizing stage height, calculated flow based on a rating curve correlated to the Coltsville gauge, and turbidity measurements. The daily report shall also note when turbidity levels exceeded applicable action levels, notification steps taken, and additional water column sampling conducted.

A Water Column Monitoring section shall be included in the Monthly Project Monitoring Report, and will summarize the water column monitoring sampling events. The reports shall contain the following information:

- Summary of the PCB/TSS sampling events (conducted twice per month) and daily monitoring activities (comments on excursions, problems with sampling equipment, site activities, laboratory problems, and results of QA samples).

- Summary table of results for the sampling period which includes: hourly grab sample turbidity, daily composite sample turbidity, daily water depth and flow, twice monthly composite sample PCBs and TSS, and any additional PCB/TSS sampling conducted during the period based on daily data.

- Summary of all action level excursions for PCBs and turbidity including date and time of sampling, sampling locations, and results.

- The initial laboratory reports.
- Sample data sheets.

Final Water Column Monitoring Report

The Final Water Column Monitoring Report shall be prepared which summarizes the water column monitoring sampling events. The report shall contain the following information:

- Summary of the water column monitoring sample events for the duration of the construction work (date and time of sampling, sampling locations, number of samples collected, water quality results, river characteristic results, and PCB and TSS analytical results). In addition, the sample dates and analytical results shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.
- Calibration and Maintenance Activities.
- Discrepancies noted in the data.
- Summary of all action level excursions for PCBs and turbidity including date and time of sampling, sampling locations, and results.

1.7 SETTLEMENT MONITORING

1.7.1 Settlement Monitoring Plan

Prior to commencing monitoring activities, the General Contractor shall submit a Settlement Monitoring Plan for review and approval. The Settlement Monitoring Plan shall include, but shall not be limited to, the following:

a. A brief description of the survey locations and the survey methods to be used.

b. Manufacturer's cut sheets on the Deformation Monitoring Points (DMPs).

c. An example of the data deliverable format.

1.7.2 Settlement Monitoring Initial Report

An Initial Settlement Monitoring Report shall be prepared summarizing the initial survey results. The report shall contain the following information:

- Name and description of the structure surveyed.
- Physical location description of the survey point.
- Coordinates and elevation of the survey point.

In addition, this data shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.

1.7.3 Settlement Monitoring Final Report

A Final Settlement Monitoring Report section shall be included in the Final Project Monitoring Report, and shall summarize the final survey results. The report shall contain the following information:

- Name and description of the structure surveyed.
- Physical location description of the survey point.
- Coordinates and elevation of the survey point.
- Location discrepancies between the initial and final survey points.

The surveyed elevation data shall presented in spread sheet format and shall be clearly catalogued by the name of the structure surveyed, the location on the structure (i.e. middle of east foundation wall, 2 feet from ground surface, etc.) and the x and y coordinates of the specific survey point. Data shall be provided in State Plane Coordinates. In addition, this data shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.

1.8 VIBRATION MONITORING

1.8.1 Vibration Monitoring Plan

Prior to commencing monitoring activities, the General Contractor shall submit a Vibration Monitoring Plan for review and approval. The Vibration Monitoring Plan shall include, but shall not be limited to, the following:

a. A brief description of the monitoring locations and the monitoring methods to be used.

b. Shop drawings of the vibration monitoring devices.

c. An example spreadsheet layout of the data deliverable.

1.8.2 Vibration Monitoring Data Deliverables

Monthly Reports

A Monthly Vibration Monitoring Report shall be prepared as a section of the Monthly Project Monitoring Report, and shall summarize each weekly vibration monitoring event. The report shall contain the following information:

- Summary of the sampling events (problems with sampling equipment and site activities).
- Summary table and/or graph of vibration results for the one-week monitoring period.

Final Vibration Monitoring Report

A Final Vibration Monitoring Report section shall be included in the Final Project Monitoring Report, and shall summarize the vibration monitoring data for all construction activities. The report shall contain the following information:

- Description of the monitoring locations.
- Summary table and/or graph of vibration results for the duration of the construction activities.

In addition, this data shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.

1.9 CONDITIONS MONITORING

1.9.1 Conditions Monitoring Plan

Prior to commencing monitoring activities, the General Contractor shall submit a Conditions Monitoring Plan for review and approval. The Conditions Monitoring Plan shall include, but shall not be limited to, the following:

a. A brief description of the organizational outline of the videotape and locations to be videotaped.

1.9.2 Initial Conditions Survey Deliverable

An Initial Conditions Survey videotape shall be prepared. The video shall document the condition of the local structures and locations along the river as described in Part 3. The video shall incorporate notes, labels, or signs to clearly indicate the location or structure being videotaped. The General Contractor shall keep a chain-of-custody of the Initial Conditions Survey videotape.

The format for the taping shall be as follows:

Title on film showing the contract title and number, and the name and address shown on the film.

A general view of the structure with a reference point established (i.e., right or left hand corner of the structure) audio and video recording record exterior of the structure and surrounding grounds outbuilding, pools, and fences. This record shall be maintained in the same direction in each case from the established reference point.

The interior portions of the structure shall then be recorded in the same fashion from the same reference point. Every effort shall be made not to record personal property. A written log shall be maintained to pinpoint areas of interest such that it shall not be necessary to review the entire tape to view information on a particular structure.
When the survey is complete, the General Contractor shall keep a copy in his files and provide 2 copies to the Government.

1.10 FINAL CONDITIONS SURVEY DELIVERABLE

A Final Conditions Survey videotape shall be prepared. The video shall document the condition of the local structures and locations along the river included in the Initial Conditions Survey. The video shall incorporate notes, labels, or signs to clearly indicate the location or structure being videotaped. The format for the taping shall be as described above for the initial video survey.

1.11 FINAL PROJECT MONITORING REPORT

The Final Project Monitoring Report will include summaries of all the project monitoring data as described in the above sections for the entire construction project. The Final Project Monitoring Report will be submitted in Draft form to the Government within 60 days of receipt of the final construction monitoring data. The Final Project Monitoring Report will be submitted in revised and submitted in final form within 30 days of receipt of comments on the draft report from the Government.

1.12 SECURITY

The General Contractor shall be responsible for security of all sampling equipment and sampling stations. Control of all persons performing maintenance of the sampling equipment and operating the sampling equipment shall be provided by the General Contractor.

The General Contractor shall maintain security provisions to assure that system failure, vandalism, or other incident will be addressed in a timely fashion.

1.13 APPENDICES

Copies of all raw data, certifications, calibration logs, and other pertinent documents shall be attached, as an appendix, to the plans and final reports, as appropriate.

PART 2 PRODUCTS

2.1 AMBIENT AIR MONITORING

2.1.1 PCB Monitoring

A high volume polyurethane foam (PUF) sampler utilizing sample media consisting of a glass fiber filter with a PUF backup absorbent cartridge drawing air at a rate of 0.20-0.280 m^3/min.

(General Metal Works Model GPS-1 or equivalent) shall be used for monitoring PCB concentrations in ambient air. Sampling will be conducted based on USEPA's Organic (TO) Compendium of Methods for Air Toxics – Method TO-4A and SOP A-1.

Calibrations and maintenance shall be conducted at the frequency and in accordance with the procedures in the FSP SOP A-1. All calibration and maintenance activities shall be documented.

2.1.2 PM_{10} Monitoring

A MIE data RAM Model DR-2000 or Rupprecht & Patashnick DustScan Sentinel™ real time PM_{10} monitor equipped with a temperature conditioning heater and in-line impactor head shall be used to monitor and record particulate concentrations with a mean diameter of 10 microns or less (PM_{10}). These instruments are not designated as USEPA reference methods for the collection and determination of PM_{10} as specified under 40CFR, Part 50, Appendix J. These instruments provide approximate measurement of the sum of particulates and aerosol PM_{10} concentrations.

Calibrations and maintenance shall be conducted at the frequency and in accordance with the procedures recommended by the manufacturer. All calibrations and maintenance activities shall be documented.

2.2 WATER COLUMN MONITORING

Surface water sampling equipment appropriate for automated grab and composite sampling of river water shall be utilized. The sampling shall utilize the techniques described in the FSP and relevant WESTON SOPs.

2.3 SETTLEMENT MONITORING

Standard land surveying equipment shall be used to monitor elevations of designated points (DMPs) on structures as described in Part 3. Deformation Monitoring Points (DMPs) shall be used to monitor vertical and/or horizontal deformation of various facilities at selected locations as described in Part 3. The DMPs shall include a 5/16-inch diameter by 1-1/2 inch long stainless steel socket-head cap bolt, screwed into a 1 inch long by 5/16-inch diameter tamp-in screw anchor. A 4-inch (or longer) bolt may be used at locations where overhanging obstructions prevent the placement of the level rod on the DMP. A 5/16-inch diameter by ¾ inch long carriage bolt shall replace the 1-1/2 inch long socket-head bolt when readings are not being taken. These tamp-in screw anchors shall typically be installed into vertical surfaces of buildings and structures.

2.4 VIBRATION MONITORING

BlastMate Series III vibration monitoring equipment manufactured by Instantel, Inc., or equivalent, shall be used for the vibration monitoring described in Part 3.

- Seismic range: 0.01 to 8 inches per second with an accuracy of 5 percent and no more than a 3 dB roll off at the low frequency end.
- Flat frequency response: 2 to 200 Hz.
- Three component sensor.
- Two power sources: Internal rechargeable battery and charger and 115 volts AC. Battery shall be capable of supplying power to monitor vibrations continuously for up to 1 week.
- Sufficient memory to allow vibration data to be collected continuously for a minimum of one week before downloading.
- Capable of internal dynamic calibration.
- Direct writing to printer and electronic storage media. Instruments shall be capable of producing strip chart recordings of readings on site within 1 hour of obtaining the readings. Provide computer software to perform frequency analyses of data obtained on electronic storage media.
- Continuous monitoring mode shall be capable of recording peak velocities

2.5 CONDITIONS MONITORING

A standard VHS video camera and VHS video tape shall be used to document the structural and environmental conditions of the structures and areas identified in Part 3.

PART 3 EXECUTION

3.1 AMBIENT AIR MONITORING

For the protection of public health, the General Contractor shall monitor and control contaminant emissions to the air from HTRW remedial action area sources to minimize short term risks that might be posed to the community during implementation of the remedial alternative in accordance with the FSP, the QAPP and the following requirements. Results from perimeter air monitoring shall supplement onsite health and safety information in order to determine the need for and type of response actions. Results will also be used to determine the need for and evaluate corrective actions to address exceedances of applicable ambient air standards.

3.1.1 Perimeter Air Contaminant of Concern

Polychlorinated biphenyls (PCBs) and PM_{10}.

3.1.2 Time Averaged Perimeter Action Levels

Any excursions of either the notification levels or the action levels listed below shall be reported immediately to the Government who will discuss the need for and type of response actions.

3.1.2.1 PCBs

Notification Level (Time Weighted Average)

a. Concentration: 0.05 ug/m^3
b. Time: 24 hours

Action Level (Time Weighted Average)

a. Concentration: 0.1 ug/m^3
b. Time: 24 hours

3.1.2.2 PM_{10}

Notification Level (Time Weighted Average, 80% of 24-hour National Ambient Air Quality Standard (NAAQS) for PM_{10})

a. Concentration: 120 ug/m^3
b. Time: 10 hours

Action Level (Time Weighted Average, 24-hour NAAQS for PM_{10})

a. Concentration: 150 ug/m^3
b. Time: 10 hours

These levels are more conservative than the NAAQS for PM_{10} which averages the instantaneous concentrations over a 24-hour period, rather than a 10-hour period. This level has been selected to allow notice to the Government before concentrations reach the level of the 24-hour NAAQS.

3.1.3 Sampling/Monitoring Locations

The purpose of this sampling program is to monitor levels of PCBs and particulates that migrate offsite; therefore, sampling stations shall be located at the perimeter of the site, on or near the property boundary. Samplers will be moved to new locations as construction-related activities progress. An additional monitor will be operated at an appropriate location in Pittsfield that is representative of background PCB concentrations. The specific sampling locations for these monitors will be determined at a later date.

3.1.4 Frequency of Sampling

Ambient air monitoring for PCBs shall be conducted for one 24-hour period prior to commencement of construction work, and for one 24-hour period every month during construction activities in the Housatonic River.

Real-time ambient PM_{10} monitoring shall be conducted during all construction related activities. Monitoring shall be performed for approximately 10 hours per day or as the length of the workday dictates. PM_{10} data shall be recorded and averaged by a datalogger for each hour of the day.

3.1.5 Monitoring Instruments/Sampling and Analysis Methods

3.1.5.1 PCBs

Method:	USEPA Compendium Method TO-4B, Method for the Determination of Organochlorine Pesticides and Polychlorinated Biphenyls in Ambient Air
Analytical Method:	USEPA Method 608/8088, with analysis for the following PCB Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260.
Sampling Rate:	0.25 – 0.26 m^3/min.
Average Sample Volume:	370 m^3

3.1.5.2 PM_{10}

A MIE data RAM Model DR-2000 or Rupprecht & Patashnick DustScan Sentinel™ real time PM_{10} monitor equipped with a temperature conditioning heater and in-line impactor head shall be used to monitor and record particulate concentrations with a mean diameter of 10 microns or less (PM_{10}). These instruments are not designated as U.S. EPA reference methods for the collection and determination of PM_{10} as specified under 40CFR, Part 50, Appendix J. These instruments provide approximate measurement of the sum of particulates and aerosols PM_{10} concentrations.

3.1.5.3 Meteorological Monitoring

Meteorological data from the Climatronics Weather Station operated at the GE facility in Pittsfield, Massachusetts by GE subcontractors can be utilized if access to retrieve data from the instrument data logger can be obtained. This access is required to evaluate data and generate reports in the allotted time period. The weather station operates continuously at the GE facility in East Street Area 2 and measures and records wind speed, wind direction, precipitation, temperature, relative humidity, and integrated solar radiation. The siting of the meteorological station was established with the approval of MADEP. The station was installed and continues to operate in accordance with USEPA On-site Meteorological Program Guidance for Regulatory Modeling Applications and a Site Specific Meteorological Monitoring Quality Assurance Project Plan (prepared by GE). If access to the GE weather station cannot be obtained, an equivalent meteorological system will be installed.

3.1.6 Notification of Action Level Exceedances and Sampling for Evaluation of Corrective Actions

If action levels for PCBs or PM_{10} are exceeded, the Government shall be notified immediately. The General Contractor shall: 1) perform an evaluation of on-going remediation activities to determine if engineering controls were properly implemented; 2) attempt to determine the cause of the exceedance; 3) consult with the Government in developing a plan of action for additional sampling and analysis, and in identifying corrective actions to be implemented in construction activities to address the issue. Development and implementation of the plan of action is not included in the scope of this specification. Scope and funding for plan of action development, corrective action implementation, and additional sampling in response to exceedances will be handled separately on a case-by-case basis.

3.2 WATER COLUMN MONITORING

The purpose of the Water Column Monitoring program shall be to identify, evaluate, and remedy any potential negative impacts to the Housatonic River that may result from remedial activities. The Water Column Monitoring shall be performed in accordance with the project FSP and QAPP, and the following.

3.2.1 Parameters of Concern

PCBs – Total and Dissolved
Turbidity
Total Suspended Solids (TSS)
Water Velocity
Water Depth

3.2.2 Action Levels

Any excursions of either the action levels listed below shall be reported to the Government immediately.

PCBs: Downstream (Pomeroy Avenue) $\geq$ Upstream (Lyman Street)+ 5 ug/L

Turbidity: Downstream (Elm Street) $\geq$ Upstream (Lyman Street) + 50 NTU

3.2.3 Sampling/Monitoring Locations and Frequencies

A total of four sampling locations shall be included in the Water Column Monitoring Program as follows (with frequencies and types of sampling):

- Newell Street bridge – Monthly PCB and TSS sampling
- Lyman Street bridge – Daily turbidity and stage monitoring; twice monthly PCB and TSS sampling
- Elm Street bridge – Daily turbidity and stage monitoring
- Pomeroy Avenue bridge – Twice monthly PCB and TSS sampling

In addition, monitoring shall be performed at the Newell Street, Lyman Street, and Pomeroy Avenue monitoring stations for PCBs and TSS during approximately five specific events. For example, monitoring will be performed during the following: a high flow event, an excavation of NAPL impacted sediments, sheetpile installation, sheetpile removal, etc.

Water column monitoring shall be initiated once the first intrusive activities have commenced in the Housatonic River and shall continue to be performed for the duration of the removal and replacement activities in the river.

3.2.4 Sampling Procedures

Sample collection activities shall include standard methods for collection and analysis of samples at an off-site laboratory for total and dissolved PCBs. Activities shall follow the procedures outlined in the *Field Sampling Plan* dated November 2000 (DCN: GE-091200-AADI), revised July 2001. Flows shall be downloaded during each day of construction from the Coltsville records on the USGS web site.

Staff gage readings will be measured at the Newell Street and Pomeroy Avenue locations and converted to elevations during the beginning and end of each sampling events. Rating curves for each location will be used to determine the flows during that sampling event. River cross-section and rating curve currently exists for Pomeroy Avenue, but must be developed for Newell Street location prior to the first sampling event.

Composite samples shall be collected monthly at each location. At each station per sampling event, an ISCO sampler shall be utilized to collect a 10-hour (during construction) composite surface water sample. Sample collection shall be conducted according to procedures outlined in standard operation procedure , Field Sampling Plan November 2000 (DCN: GE-091200-AADI), revised July 2001.

Turbidity will be measured according to procedures outlined in Standard Operating Procedure for Field Measurements, Appendix C.13 of the FSP.

Sample processing will follow the procedures outlined in standard operation procedures of the FSP. Any deviations from the procedures outlined in the FSP shall be noted in the Water Column Monitoring Plan and the Final Water Column Monitoring Report.

3.2.5 Notification of Action Level Exceedances and Sampling for Evaluation of Corrective Actions

If action levels for PCBs or Turbidity are exceeded, the Government shall be notified immediately. The General Contractor shall: 1) perform an evaluation of on-going remediation activities to determine if engineering controls were properly implemented; 2) attempt to determine the cause of the exceedance; 3) consult with the Government in developing a plan of action for additional sampling and analysis, and in identifying corrective actions to be implemented in construction activities to address the issue. Development and implementation of the plan of action is not included in the scope of this specification. Scope and funding for plan of action development, corrective action implementation, and additional sampling in response to exceedances will be handled separately on a case-by-case basis.

3.2.6 Analytical Methods

The General Contractor shall follow the procedures for sample analysis and QA/QC as outlined in the Project QAPP. Any deviations from these procedures shall be noted in the Water Column Monitoring Plan and the Final Water Column Monitoring Report.

3.3 SETTLEMENT MONITORING

3.3.1 Structures to be Monitored

Three (3) survey points shall be established on each of the following structures:

Building A: 10 Lyman Street
Building B: 55 Root Place
Building F: 103 Elm Street, Elm Street Laundromat
Building G: 14 Hathaway Street, Residence & in-ground pool
Lyman Street Bridge

3.3.2 Scheduling

Two elevation surveys shall be performed to identify settlement in the structures listed above. The first elevation survey shall be conducted prior to commencement of construction work. The second elevation survey shall be conducted at the completion of the construction work.

3.3.3 Methods

The locations of the survey points (DMPs) on the structures listed above shall be designated by the Government and a representative will accompany the General Contractor on the initial elevation survey. During the initial elevation survey, the General Contractor shall survey the locations (X and Y coordinates) of each of the survey points, as well as the elevations. The X and Y coordinates shall be within 0.1-foot accuracy and the elevations shall be within 0.01-foot accuracy.

3.4 VIBRATION MONITORING

3.4.1 Structures to be Monitored

Lyman Street Bridge

3.4.2 Scheduling of Vibration Monitoring Activities

Vibration monitoring shall commence when GE's removal actions upstream in the Housatonic River encroach within 200 feet of the Lyman Street Bridge and shall continue throughout the construction activities.

3.4.3 Security and Coordination with Property Owners

The monitoring device placed on the Lyman Street Bridge shall be secured from theft and protected from the weather. The location of the monitoring device on the Lyman Street Bridge shall be approved by the City of Pittsfield Public Works Department.

3.4.4 Collection and Downloading of Data

Data from the vibration monitoring devices shall be downloaded on a weekly basis. The monitoring devices shall have sufficient memory to record data on a continuous basis and sufficient battery life to operate for 10 days without battery replacement or recharging.

3.4.5 Action Levels

A maximum vibration limit of 0.5 inch per second peak particle velocity is suggested for sensitive structures where:

- The foundation type is unknown,
- The foundations are known to be wood piles but the condition is poor or unknown, or
- The foundations or foundation walls are in poor condition.

For structures with reinforced concrete foundation walls and steel or concrete foundations structurally connected to the walls, it is suggested that a maximum vibration limit of 1.0-inch per second for all other structures be used.

3.5 CONDITIONS MONITORING

3.5.1 Structures and Areas to be Monitored

The following structures and areas shall be included in the conditions monitoring survey:

- The east and west banks of the Housatonic River from the Lyman Street Bridge to the Elm Street Bridge.
- Building A: 10 Lyman Street
- Building B: 55 Root Place
- Building F: 103 Elm Street, Elm Street Laundromat
- Building G: 14 Hathaway Street, Residence & in-ground pool
- Lyman Street Bridge

3.5.2 Scheduling of Conditions Monitoring Surveys

Prior to commencement of construction work, and after completion of the construction work, the General Contractor shall be notified to conduct a conditions survey.

3.5.3 Methods

Prior to the performance of any construction work, the General Contractor shall discuss with the Government the property and structures to be surveyed by video tape (VHS Format) and the extent of the survey, but generally all structures within 100 feet of the work area will be completely surveyed as herein defined.

The Government will obtain permission from the property owners and provide contacts with which the General Contractor shall coordinate monitoring activities. Each property owner shall then be contacted by the General Contractor and informed as to the reason for the survey and an appointment requested with every reasonable effort made to accommodate the property owner schedule. If the General Contractor is refused entry, he will notify the Government and request direction.

The foundation of each structure shall be videotaped by the General Contractor with special attention to any cracking or structural defects in the foundations or walls of the structures including but not limited to binding doors and windows, cracked or broken glass, etc. The conditions of the riverbanks shall be videotaped from the water to the top of the bank, with special attention to areas of erosion, retaining walls, riprap, vegetation, and other features requested by the Government. The video shall incorporate some type of notes, labels, or signs to clearly indicate the location or structure being videotaped. Rulers or gauges shall be placed next to cracks or structural defects to provide a semi-quantitative indication of size of these features. Videotaping of the riverbanks shall be conducted from a boat in the Housatonic River.

END OF SECTION

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1998a) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

U.S. ARMY CORPS OF ENGINEERS

CEGS 01451	(May 2000) Contractor Quality Control
CEGS 01330	(May 2000) Submittal Procedures

ROY F. WESTON, INC. (WESTON)

(September 2001) Contractor Quality Control Plan – General Electric/Housatonic River Project, Pittsfield, Massachusetts, DCN GE-090701-AAQY, Ref. No. 00-0528

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 PreConstruction Submittals

CQC Plan Supplement; G

SD-10 Operation and Maintenance Data

Daily CQC Report

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The CQC System Managers will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent and CQC System Managers, or designated alternate shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 CONTRACTOR QUALITY CONTROL PLAN SUPPLEMENT

The General Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, a proposed Contractor Quality Control (CQC) Plan Supplement for Construction Work in the first phase of the 1.5 Mile Reach to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan addendum shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan Supplement or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan Supplement or another interim plan containing the additional features of work to be started**.**

3.2.1

Content of the CQC Plan Supplement

The CQC Plan Supplement shall be written to cover the construction activities specific to the first phase of the 1.5 Mile Reach, and shall include, as a minimum, the following to cover all

operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with described SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

3.2.2 Acceptance of Plan

Acceptance of the CQC Plan Supplement is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the General Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan Supplement, the General Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan Supplement, the General Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the General Contractor's quality control system. The CQC Plan Supplement shall be submitted for review a minimum of 5 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of General Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the General Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the General Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The General Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The General Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the General Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The General Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the General Contractor. The minimum qualifications of the ERC CQC System Manager are as listed below. The CQC System Manager and Alternate will either satisfy the following target qualifications or satisfy CENAE that his/her education and experience are appropriate to conduct the duties of CQC System Manager:

1. A college degree from an accredited school in civil engineering or construction management, with a minimum of four years environmental engineering experience; or an experienced construction person with a minimum of 8 years experience in related work.

2. Nine semester hours, 12 continuing education units (or a combination thereof) education in an area relevant to HTRW removal, and two years experience in specialized areas, e.g., Remedial Investigation (RI), Remedial Design (RD), and Removal Action (RA).

3. Working knowledge of applicable federal, state, and local laws, regulations, and guidance.

4. Completion of CENAE Construction Quality Management Course.

5. Formal education and training in field sampling at HTRW sites.

The CQC System Manager has QC as a principal duty, but may be assigned other duties when the level of QC activity does not warrant full-time dedicated service, and the other assigned duties do not conflict with the QC Duties. The CQC System Manager, or Designated Alternate, is responsible for reviewing and approving all site submittals. He/she is responsible for overall QC management related to the TO.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the General Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, civil, structural, environmental, materials technician, submittals clerk. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

Experience Matrix

	Area	Qualifications
a.	Civil	Graduate Civil Engineer with 2 years experience in the type of work being performed on this project or technician with 5 yrs related experience
b.	Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 yrs related experience
c.	Electrical	Graduate Electrical Engineer with 2 yrs related experience or person with 5 yrs related experience
d.	Structural	Graduate Structural Engineer with 2 yrs experience or person with 5 yrs related experience
e.	Environmental	Graduate Environmental Engineer with 3 yrs experience
f.	Submittals	Submittal Clerk with 1 yr experience
g.	Concrete, Pavements and Soils	Materials Technician with 2 yrs experience for the appropriate area

3.4.4 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed (within the last 5 years) the course entitled "Construction Quality Management For Contractors".

3.4.5 Organizational Changes

The General Contractor shall maintain the CQC staff at appropriate levels as approved by the Government. When it is necessary to make changes to the CQC staff, the General Contractor shall revise the CQC Plan Supplement to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in SUBMITTAL PROCEDURES and in Section 1 of the ERC Project CQCP. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the General Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the General Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The General Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The General Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The General Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the General Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The General Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The General Contractor shall perform the following activities and record and provide the following data:

- Verify that test facilities are available and comply with testing standards and certifications, as required (e.g., USACE Northwest Division [NWD] certified):
  - Confirm with the test facility that they are available to conduct subject tests; document the test facility's availability. Determine the testing standards from the plan or contract, and confirm that the laboratory can comply with the standards; document the laboratory's ability to comply.
- Verify that test equipment is available and complies with testing standards, if required:
  - If on-site or off-site testing is conducted, determine the testing equipment required from the test plan or contract; document that it is available . Determine that the test equipment can comply with test standards; document that the test equipment can comply.
- Check test instrument calibration data against certified standards.
  - Conduct and document an equipment calibration.
- Verify that appropriate recording forms are available:
  - Determine those parameters that must be recorded from the test plan or contract; ensure that recording forms contain this information.

- Verify that a test identification control number system is prepared (e.g., test number assigned, sample numbers assigned, etc.):

  - Prepare a checklist based on the test plan or contract for required parameters such as test number and sample numbers (along with acronyms).

- Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2. TEST RESULTS

A summary of tests completed each day will be documented on the Daily Contractor QC Report. Pertinent information will be provided for test results (e.g., location where tests were taken, sequential control number identifying the test, etc.)

The General Contractor will submit test results to CENAE. Due to the volume of results that may be generated, CENAE may exercise the option of requesting duplicate copies of only specific tests. During an initial meeting, the General Contractor and the Contracting Officer's Representative will agree on which tests will require duplicate copies, if any. Test results may also be posted on ProjectNet, as appropriate.

3.7.3 Testing Laboratories

3.7.3.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.3.2 Capability Recheck

If the selected laboratory fails the capability check, the General Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the General Contractor.

3.7.4 Onsite Laboratory

The Government reserves the right to utilize the General Contractor's control testing laboratory and equipment to make assurance tests, and to check the General Contractor's testing procedures, techniques, and test results.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the General Contractor shall notify the Government that the work site is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the excavation and restoration is complete. A Government Pre-Final Punch List may be developed as a result of this inspection. The General Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The General Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the General Contractor's assurance that all specific items previously identified to the General Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the General Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the General Contractor for

the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The General Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. General Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

g. Offsite surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. General Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily by 2 PM after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period.

All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. Reports will be provided on standard Daily Construction Quality Control Report (DCQCR) forms provided in Appendix L of the CQCP. Documentation of QC inspections will be provided in standardized format included in Appendix I of the CQCP. Inspections, deficiencies, and corrective actions will be reported and tracked using forms provided in Appendices I (Inspection Check List), J (Deficiency and Corrective Action Log), and K (Deficiency Report Form). The report from the CQC System Manager shall also include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms are included in the final CQCP.

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the General Contractor of any detected noncompliance with the foregoing requirements. The General Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the General Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the General Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the General Contractor.

END OF SECTION

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The items described below will be considered incidental to the work conducted by the Excavation Subcontractor, and separate payment from the General Contractor will not be granted. Space will not be available at the existing project office at 10 Lyman Street for use by the Excavation Subcontractor. The Excavation Subcontractor shall provide temporary facilities as needed for his use during construction in accordance with the drawings and specifications.

1.1.1 Site Plan

The Excavation Subcontractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Excavation Subcontractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas that may require placement of gravel to prevent the tracking of mud shall also be identified. The General Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

Excavation Subcontractor and other subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

General Contractor and Subcontractor employees shall park privately owned vehicles in an area designated by the Contracting Officer and as indicated on the drawings. This area will be at the Lyman Street parking lot, which is within reasonable walking distance of the construction site. General Contractor and Subcontractor employee parking shall not interfere with existing and established parking requirements of the municipality.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

The following subsections describe requirements for the Excavation Subcontractor's temporary construction facilities.

1.2.1 Payment for Utility Services

The Excavation Subcontractor and its subcontractors shall make all necessary applications and arrangements and pay all fees and charges for utilities necessary for the proper completion of the Work during its entire progress, except when the specifications particularly

state that the Government shall pay for the utility used in making tests. The Excavation Subcontractor and its subcontractors shall provide and pay for all temporary wiring, switches, connections, and meters as appropriate.

1.2.2 Meters and Temporary Connections

The Excavation Subcontractor shall provide and maintain necessary temporary connections, distribution lines, and meters (subject to approval of the General Contractor and applicable utility) required to measure the amount of each utility used for the purpose of determining charges.

1.2.3 Final Meter Reading

Before completion of the work and final acceptance of the work by the General Contractor, the Excavation Subcontractor shall arrange for termination of utility services. Upon termination, the Excavation Subcontractor shall then remove all the temporary distribution lines, meters, and associated paraphernalia. The Excavation Subcontractor shall pay all outstanding utility bills before final acceptance of the work by the General Contractor and the Government.

1.2.4 Sanitation

The Excavation Subcontractor shall provide adequate sanitary conveniences for the use of those employed on the Work. Such conveniences shall be made available when the first employees arrive on the Work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable number and at such points and in such manner as may be required or approved. The Excavation Subcontractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. The Excavation Subcontractor shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Government, or on adjacent property.

1.2.5 Telephone

The Excavation Subcontractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately upon beginning of work, the General Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the

aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the General Contractor.

1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the drawings. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the General Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The General Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The General Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The General Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The General Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The General Contractor shall construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The General Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed and the property restored to an equal or better condition.

1.4.2 Barricades

The General Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades

shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 EXCAVATION SUBCONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The Excavation Subcontractor shall provide and maintain administrative field office facilities based on his determined needs during construction activities.

1.5.2 Storage Area

The General Contractor will construct a temporary 6-foot high chain link fence around the entire work zone. In addition, the Lyman Street parking lot, which is fenced, is available for placement of trailers, materials, and equipment. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer. Trailers, equipment, or materials shall not be open to public view with the exception of those items that are in support of ongoing work on any given day.

1.5.3 Supplemental Storage Area

Upon Excavation Subcontractor's request, the Contracting Officer will designate another or supplemental area for the Excavation Subcontractor's use and storage of trailers, equipment, and materials. Fencing of materials or equipment will not be required at this site; however, the Excavation Subcontractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area.

1.5.4 Appearance of Trailers

Trailers utilized by the Excavation Subcontractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers that, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the project site.

1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Excavation Subcontractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with an appropriate geotextile and a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Excavation Subcontractor’s discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.6 Security Provisions

Adequate outside security lighting shall be provided at the General Contractor's temporary facilities. The General Contractor and its Subcontractors shall be responsible for the security of their respective equipment; in addition, the General Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.6 GOVERNMENT FIELD OFFICE (NOT SUPPLIED UNDER THIS CONTRACT)

1.7 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud that is tracked onto paved or surfaced roadways shall be cleaned away immediately. Materials resulting from demolition activities that are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.8 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, any fence installed by the Excavation Subcontractor shall be removed and will become the property of the Excavation Subcontractor. Areas used by the Excavation Subcontractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including topsoil and seeding as necessary.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 GENERAL

a. Furnish all labor, material, tools, and equipment to apply water on roads, traveled surfaces, excavation areas, stockpile areas, and other work areas within the construction site when directed by the Government and/or as necessary to control dust.

b. When dust control is not included as a separate item in the Contract, the Work shall be considered incidental to the appropriate items of the Contract.

PART 2 PRODUCTS

2.1 WATER

a. Water for sprinkling shall be clean, free of salt, oil, and other injurious materials.

PART 3 - EXECUTION

3.1 WATER APPLICATION

a. Water shall be applied by equipment approved by the Government. As a minimum, it shall consist of a tank, a spray bar, and a gauge equipped pump. Water shall be dispersed through nozzles at a minimum pressure of 20 psi.

b. The site area shall be monitored by the General Contractor for visible dust. Based upon this monitoring, the General Contractor shall implement dust control measures as necessary to minimize generation and migration of dust.

END OF SECTION

DIVISION 2

SITE WORK

SECTION 02111

HANDLING OF EXCAVATED MATERIAL AND BACKFILL

PART 1 GENERAL

Excavated material shall be handled so as to avoid mixing of TSCA and non-TSCA soils and avoid mixing either with uncontaminated backfill or other materials. Handling excavated material shall include haulage and placement in stockpiles at appropriate locations as shown on the Drawings. Handling also includes removal of stockpiled soils that meet specified criteria, and haulage to end dump at the GE landfills (referred to as the OPCAs). All haulage, both from the excavation to stockpiles, and from the stockpiles to the OPCAs, shall be conducted by the Excavation Subcontractor. The General Contractor shall maintain stockpiled soils at the staging area as specified and load the stockpiled soils into trucks provided by the Excavation Subcontractor for haulage to the OPCAs. Spreading and compacting at the landfill will be accomplished by GE and is not included in this contract.

Furnish all labor, materials, tools and equipment, and perform all operations necessary for sampling, field testing, laboratory analysis (of backfill materials), and handling of excavated sediment and soil removed from the riverbed and river banks and backfill materials to be delivered to the site as indicated on the Drawings, and as specified or as directed by the Government. Excavation of contaminated materials, placement of those materials in trucks operated by the General Contractor, and placement and in-situ testing of backfill material delivered by the General Contractor will be performed by the Excavation Subcontractor.

Furnish all labor, material, tools, and equipment to construct or accomplish the following:

1. A contaminated materials staging area located in the vicinity of and within Building 68, and potentially on Lyman Street parking lot on the GE property for the purposes of dewatering and characterizing contaminated materials prior to disposal at the OPCAs. This also includes handling of debris in accordance with this specification.

2. Truck wash pads located one on each side of the river near the active excavation and one at the contaminated materials staging area for purposes of decontaminating trucks hauling contaminated materials (soils, sediments, stumps, and other construction and incidental debris) to and from the contaminated materials staging area. Trucks shall be decontaminated to the satisfaction of the QC Manager before leaving the exclusion zones established along the perimeter of the contaminated materials staging area and the excavation areas.

3. Manage and control surface water run-on and run-off occurring at the staging area such that the amount of rainwater that becomes contaminated through contact with contaminated sediments and soils is minimized.

4. Contain contaminated wastewater resulting from the dewatering of soils and sediments and the decontamination of trucks and equipment. Transport contaminated wastewater to the water treatment system as frequently as is necessary.

Backfill materials shall be delivered to the site, stored, and handled in such a way as to minimize the potential for contact with contaminated materials on the site. In general, backfill materials shall be brought to the site as needed to minimize the amount stored on site; however, it is recognized that storage of some backfill material will be necessary. Locations available for storage of backfill are shown on the plans.

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Decontamination and Truck Wash Pad Details – Submit plans for construction of the temporary decontamination pad to be located at the contaminated materials staging area and the truck wash pads.

SD-06 Test Reports

Analytical Test Reports for all backfill materials; G

Analytical Test Reports for paint filter testing of excavated sediment and soil; G

Geotechnical Test Reports for backfill materials; G

Wipe Sampling Data; G

1.2 REGULATORY REQUIREMENTS

As a CERCLA removal action, permits for hauling and storage of contaminated material are not required. All work performed shall conform to the regulations specified in the attached project ARARs Table. Manifesting will be required for vehicles transporting contaminated material on public roads.

1.3 DESCRIPTION OF WORK

The work conducted by the General Contractor shall consist of decontaminating trucks, temporarily storing contaminated materials, delivering backfill materials to the Excavation Subcontractor, and storing backfill materials on-site as necessary. Chemical analysis of contaminated soil material performed by the Government is the basis for the limits of excavation and areas of TSCA- and non-TSCA-classified soils and sediments shown on the drawings. Additional chemical characterization of excavated materials will not be required for

disposal purposes. Sampling of materials for free liquids (paint filter test) by the General Contractor will be necessary before disposal in the OPCAs.

Work conducted by the Excavation Subcontractor shall consist of hauling contaminated materials from the active excavation, and hauling contaminated materials to the GE OPCAs for final disposal. Trucks hauling contaminated materials from either the active excavation or the contaminated soil and sediment staging area shall be off-road trucks or road-worthy trucks lined with polyethylene to eliminate the release of liquids from saturated soils and/or sediments.

The primary purpose of the contaminated materials staging area and decontamination pad is to provide an area which isolates contaminated materials within an exclusion zone while the material is being gravity dewatered, characterized, and/or accumulated for disposal. During Phase 1 of the 1.5-Mile Removal Action, all materials except those indicated for off-site disposal in other specification sections shall be transported to and disposed of at the OPCAs.

Trucks entering the soil and sediment staging area to either deposit contaminated materials or receive contaminated materials shall be decontaminated prior to leaving the exclusion zone at the decontamination pad. Decontamination of trucks at the GE OPCAs following delivery of contaminated materials at these facilities is not included in this contract.

1.4 CONTAMINATED MATERIALS TESTING

Testing of contaminated materials for free liquids using the paint filter test shall be performed at the staging area. No characterization sampling of excavated materials is required, unless materials are sent for off-site disposal (e.g., NAPL-impacted materials, spent carbon).

1.5 BACKFILL MATERIALS TESTING

Backfill materials shall be tested for geotechnical and chemical parameters and approved before being brought on site.

PART 2 PRODUCTS

2.1 SEDIMENT BARRIERS

a. Sediment barriers shall be hay or straw bales, geotextile fabric, stone or other approved materials that will prevent the release of sediment from the exclusion zone.

b. Sediment barriers shall be used to minimize the amount of sediment that is contained in wastewater to be collected and stored on site in storage tanks prior to transport to the wastewater treatment system.

2.2 WATER STORAGE TANKS

Tanks of sufficient size shall be used to store water generated and collected from decontamination operations and soil and sediment gravity dewatering prior to transport to the treatment plant.

2.3 TARPS AND POLYETHYLENE SHEETING

In general, heavy-duty tarps shall be used to cover contaminated materials stockpiles to prevent the generation of excess contaminated run-on and the infiltration of precipitation into contaminated materials. Polyethylene sheeting shall be used to protect trucks during loading activities from becoming contaminated and to minimize the potential for intermingling of contaminated materials with uncontaminated materials.

2.4 HIGH DENSITY POLYETHYLENE (HDPE) LINER MATERIAL

HDPE liner material shall be a minimum of 40-mil thickness. Use of thinner gauge HDPE liner for lining of stockpile areas or other uses shall only be allowed upon approval by the Government.

2.5 MUNICIPAL WATER CONNECTION

Connections shall be made to the municipal water supply where necessary (near the active excavation area and at the contaminated materials staging area located on GE property) using temporary flexible hoses, backflow preventers, and meters in accordance with City of Pittsfield requirements and GE requirements as appropriate. During freezing conditions, care shall be taken to prevent freezing up of hoses, fittings, meters, etc. and development of unsafe icy conditions. Use of river water for deconning, watering and dust suppression is permitted.

2.6 SPILL RESPONSE MATERIALS

The General Contractor shall provide spill response materials including, but not limited to the following: containers, adsorbents, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of materials and contaminants being handled.

PART 3 EXECUTION

3.1 EXISTING STRUCTURES AND UTILITIES

The General Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without written approval from the Contracting Officer.

3.2 LOADING AND HAULING OF CONTAMINATED MATERIAL

The Excavation Subcontractor shall take precautionary measures as necessary while loading to minimize the steps needed to decontaminate hauling vehicles at the active excavation site and at the contaminated materials staging area when loading for transport to the OPCAs. Trucks hauling contaminated materials from either the active excavation area or the stockpile/staging area shall be loaded in such a way as to prevent contamination of vehicles tires, tailgates, and the outside of the vehicle.

The Excavation Subcontractor shall provide hauling trucks at the site of active excavation. Hauling of materials from the contaminated materials stockpile to the GE OPCA by the Excavation Subcontractor will be limited to the days on which GE is operating the landfill and therefore shall be performed as batch operations. Therefore, the General Contractor shall appropriately size staging areas to allow the continued accumulation of materials during the periods when GE is not operating the landfill. In addition, materials shall not be hauled to the OPCA until they have been determined to be devoid of free liquids (via paint filter test). The time required to dewater materials to an acceptable moisture content shall also be considered when sizing the staging areas.

3.3 SOIL AND SEDIMENT SEGREGATION

Immediately following excavation and loading (which will be performed by the Excavation Subcontractor), soil and sediment shall be carefully placed in trucks, hauled along the temporary access roads, and stockpiled in the staging area located on the GE property near and within Building 68.

Segregation of soils/sediments will focus on three major criteria or characteristics: total PCB concentrations and free liquids as described below.

1. Free Liquids - All bank soils shall be sampled for free liquids after removal, and all sediments shall be tested for free liquids after removal and gravity draining of free liquids. Soils and sediments shall be tested using EPA Method 9095A (Paint Filter test) as appropriate or by an equivalent method approved by the Engineer.

2. PCBs – PCB concentrations for bank soils and sediments to be excavated and removed have been pre-determined through in-place testing. Based on these data, soil and sediment have been pre-classified as either TSCA- or non-TSCA-regulated as indicated on the Drawings and must be kept separate based on these classifications. TSCA-regulated soils and sediments shall ultimately be consolidated in the Building 71 Cell GE OPCA and all non-TSCA soils and sediments shall be consolidated in the Hill 78 Cell GE OPCA.

3. NAPL – NAPL impacted soil and sediment will be stockpiled separately, pending characterization and off-site disposal.

3.4 SAMPLING

The General Contractor shall perform free liquids testing of excavated material on a frequency of one test per 100 cubic yards of material to determine whether material is suitable for transport to the OPCAs. The paint filter test results and whether the material meets the acceptability criteria, shall be recorded in a written log. If the material does not meet the acceptability criteria, additional time for gravity dewatering and air drying shall be provided to reach an acceptable moisture content. Based on activities performed by GE at the ½ mile Removal Action, dewatering activities other than gravity dewatering and air drying will not be required. The sample log shall be reviewed at least once per week by the CQC Systems Manager or representative.

In-situ confirmation sampling and sampling from stockpiles is not required for excavated materials to be disposed of at the GE OPCA.

Sampling and testing of backfill materials shall be performed by the General Contractor, and approval of those materials by the Government must be received before the material is delivered to the site. Backfill materials must meet the requirements as specified in Specification Section 02300 – EARTHWORK. At least one sample shall be collected for each material proposed for use. If more than one source is identified for a particular material, at least one sample from each source must be collected. Chemical and geotechnical analysis requirements and methods are described below.

a. Chemical Testing

Samples for chemical analysis shall be collected at the following approximate frequencies (based on the as measured in place volume of backfill materials upon completion of restoration):

PCBs samples:	1 sample per 500 cy of material
Appendix IX:	1 sample per 2,000 cy of material
TPH:	1 sample per 500 cy of material

The number of samples to be collected from each source for a particular backfill material shall be estimated based on these frequencies and available information at the time of sampling. Samples must be analyzed for the parameters above using the approved methods included in the Project QAPP for PCBs and APPIX compounds, and for TPH using SW-846 method 8100 (GC/FID). Backfill materials must not contain chemical concentrations equal to or greater than 0.1 mg/kg for total PCBs and 200 mg/kg for TPH. Backfill material standards for the Appendix IX compounds will be determined prior to construction. In general, MCP S-1 Standards will be used for Appendix IX compounds.

Laboratory test reports for the backfill material must be submitted to and approved by the government before material can be brought on site.

b. Geotechnical Testing

Geotechnical testing will be conducted on backfill materials based on the methods and frequencies included in the attached Table 02111-1. Geotechnical test reports for the backfill material must be submitted to and approved by the government before material can be brought on site.

3.5 SEGREGATION, STOCKPILING, AND DISPOSAL OF OTHER MATERIALS

Debris, including boulders, stumps, metal, concrete, etc., will be segregated by the Excavation Subcontractor and placed in separate trucks to maintain segregation for purposes of disposal or payment. The Excvation Subcontractor shall provide an appropriate number of trucks to handle separately various types of waste (soil, sediment, stumps, concrete, boulders, or other debris) generated as excavation progresses. Segregation of these materials shall be maintained at the staging area to allow for appropriate disposal practices at the OPCAs in accordance with the Consent Decree.

3.6 DECONTAMINATION AND TRUCK WASH PADS

A decontamination pad shall be constructed at the contaminated materials staging area. Truck wash pads shall be constructed near the active excavation area. Each of the truck wash pads shall be constructed in such a manner as to be easily removed and disposed of. Both the truck wash pads and the staging area decontamination pad shall be used to prevent the release of contamination beyond the limits of the exclusion zones through transport on heavy vehicles, including dump trucks, heavy equipment, and other vehicles that enter the exclusion zones.

3.6.1 Contaminated Materials Staging Area Decontamination Pad

a. The staging area decontamination pad shall be constructed to allow sufficient room for truck decontamination as described in this section, and shall be lined with minimum 40-mil HDPE or other suitable material to provide a barrier between the decontamination activities and wastes and existing ground. The pad will be constructed to collect accumulated decontamination water in a central collection sump for subsequent removal.

b. Before entering the decontamination pad, equipment requiring decontamination shall be decontaminated using dry decontamination methods to remove gross material adhering to the surfaces of the equipment (e.g., treads, tracks, tail gates) to prevent excessive buildup of contaminated materials in the decontamination pad. Dry decontamination methods may include the use of such equipment as brooms, brushes, shovels, or other appropriate means as necessary to remove a majority of materials before entering the decontamination pad.

c. Following dry decontamination methods, equipment shall be decontaminated on the decontamination pad using a high pressure water or water/steam spray to remove remaining material adhering to equipment surfaces. Areas of particular concern include truck tires, treads, and tailgates. Vehicles being decontaminated shall be inspected before leaving the pad such that the condition of the vehicle is considered acceptable to the QC Manager or QC Manager's Representative and the potential for the spread of contamination beyond the exclusion zone is minimized.

d. Accumulating solid materials shall be removed from the decontamination pad as frequently as is necessary to prevent the recontamination of vehicle treads before leaving the decontamination pad and to encourage free flow of wash water to a central collection point.

e. The central collection point for the decontamination pad shall be cleaned on a regular basis to prevent excessive buildup of sediments that could interfere with normal wash water flow or reduce the storage capacity at that point.

f. With the exception of the truck wash pads, water generated from the decontamination area shall be pumped into a storage tank as frequently as is necessary to prevent the release of water from the decontamination pad system.

g. Wipe sampling of heavy equipment and sheet piles will be required at the end of the work following final cleaning, and prior to sending equipment off the site. Wipe sampling will be conducted on equipment to document PCB levels below 10 μg/100 cm^2, in accordance with 40 CFR 761.79.

3.6.2 Truck Wash Pads

At the Truck Wash Pads, truck tires shall be washed using a pressure washer to remove materials (e.g. material from uncontaminated access roads) adhering to tire treads and sidewalls. Therefore, the wash water will not be collected. These pads shall be temporary pads that can easily be moved as necessary.

3.7 SOIL AND SEDIMENT STAGING AREA

The area in the vicinity of Building 68 and within Building 68 on GE property, and Lyman Street parking lot, as indicated on the plans is available for staging of soil and sediment. The areas shall be prepared and operated in such a manner by the General Contractor as to accomplish the following:

a. The grades of the area shall be such that surface run-off will be directed towards specific areas so that sediment barriers can be used to minimize the amount of sedimentation which leaves the exclusion zone with exiting run-off. Although precautions shall be taken to prevent the buildup of materials on the working surfaces of the staging area where heavy equipment must operate, this area will require cleaning using heavy equipment (e.g., loader bucket or street sweeper) on a frequent basis, especially immediately prior to anticipated storm events to minimize this potential.

b. Sediments accumulated at the sediment barrier shall be removed on a regular basis so that normal surface flow from the area is not impeded.

For materials stored inside Building 68, the area of storage shall also be prepared to prevent the migration of contaminated water that seeps out of saturated or nearly saturated contaminated materials. If necessary, appropriate measures shall be taken in this area to allow pumping of accumulated water to a storage tank.

3.8 SOIL AND SEDIMENT STORAGE BAYS

a. Individual storage bays shall be constructed using concrete bin blocks on three sides or other appropriate materials to allow for adequate stockpile capacity and to segregate materials. A minimum 40-mil HDPE liner or other suitable material shall be placed on the bottom of the storage bays to serve as a barrier between underlying soil and stored material. A minimum 6-inch thick sacrificial sand layer shall be placed on top of the liner prior to placement of contaminated material in a storage bay. In general, water-releasing materials such as sediments shall be kept in a separate area from non-water releasing materials, such as soils, and non-TSCA materials shall be kept segregated from TSCA materials.

b. Contaminated material storage bays shall be sloped and bermed so that contaminated water draining from the materials or water that enters the piles through precipitation infiltration is isolated and can be pumped to a storage tank. The storage bays shall be constructed to minimize run-on which is generated from adjacent uncontaminated areas.

c. Sumps or other appropriate structures shall be located at the corners or other strategic locations of the staging area to allow the efficient pumping of contaminated run-off to a storage tank. Water accumulating in the sumps shall be pumped to storage tanks as frequently as necessary to prevent overflow beyond the exclusion zone and to maintain the normal gravity flow of water from the contaminated materials piles. Sediment accumulating in the sumps or other low points shall be removed as necessary to maintain normal flow of water.

d. Soil and sediment piles shall be covered using heavy-duty tarps or other acceptable material to minimize the potential for rainwater infiltration. Covers shall be placed so that the amount of uncontaminated rainwater flowing off the covers and coming in contact with contaminated soils or sediments is minimized. Covers shall not be required for materials stored inside Building 68.

e. Soil piles shall be shaped to encourage the proper flow of rainwater off of the covers without excessive contact with contaminated materials. Uncontaminated runoff from the covers shall be directed beyond the exclusion zone.

3.9 DEBRIS AREA

Areas shall be maintained for the accumulation of debris (including stumps, concrete larger than 1 cy and boulders larger than 2 feet) removed from the excavation area. This area shall be located within the specified area on GE property. The debris shall be considered contaminated and as such, the debris storage area shall be underlain by poly and surrounded with haybales to prevent the migration of contaminated sediments from this area. The debris shall be covered with heavy-duty tarps to minimize contaminated materials migration from the debris. Disposal and size reduction of stumps shall be in accordance with Section 02230, Clearing and Grubbing to allow for disposal at the OPCAs. Concrete shall be crushed to a maximum size of 1 foot before transport to the OPCA. Segregated boulders shall be disposed of in the OPCA or washed and used as part of site restoration. As directed by the Government, the General Contractor shall, in cases of significant metallic debris, separate metallic debris for off-site disposal as scrap.

3.10 BACKILL MATERIAL STORAGE

Backfill materials shall be stored on site at the areas indicated on the drawings. The areas shown for storage of backfill materials shall be prepared so that uncontaminated backfill materials do not come into contact with the existing ground surface, which is considered contaminated. In addition, preparation of the areas for storage of backfill materials shall not involve any intrusive disturbance of the existing ground surface.

3.11 WASTEWATER MANAGEMENT

a. Contaminated wastewater requiring transport to the temporary wastewater treatment system will be generated at several locations within the soil and sediment staging area and the decontamination pad. Activities or events which will generate contaminated wastewater include steam/high pressure washing at the decontamination pad, gravity dewatering of sediments, and rainwater infiltration through soil and sediment piles.

b. At the General Contractor's option, water generated from these activities can be managed in separate storage tanks or within a larger central storage tank to facilitate transfer to the wastewater treatment facility. Wastewater generated from the contaminated materials staging area operations shall be transported via truck to the wastewater treatment system.

3.12 SPILLS

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the General Contractor shall notify the on-site Government representative immediately. Immediate containment actions shall be taken to minimize the effect of any spill or leak. Cleanup shall be in accordance with applicable federal, state, and local regulations and shall be conducted in consultation with the Government.

END OF SECTION

TABLE 02111-1

BACKFILL TESTING FREQUENCIES AND METHODS

Earthen Material	Test Methods	Test Frequency
Common Fill	ASTM D422 Standard Test Method for Particle-Size Analysis of Soils	one test per 500 cubic yards
Structural Fill	ASTM D422 Standard Test Method for Particle-Size Analysis of Soils	one test per 500 cubic yards
Filter Layer A	ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	one test per 500 cubic yards
Filter Layer B	ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	one test per 500 cubic yards
Riprap Layer C1	Field visual and index testing in USACE EM-1110-2-2302, ASTM D5519-94 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials, Method A	one field visual test per 500 cubic yards, one ASTM D5519-94 test per 2,000 cubic yards
Riprap Layer C2	Field visual and index testing in USACE EM-1110-2-2302, ASTM D5519-94 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials, Method A	one field visual test per 500 cubic yards, one ASTM D5519-94 test per 2,000 cubic yards
Riprap Layer C3	Field visual and index testing in USACE EM-1110-2-2302, ASTM D5519-94 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials, Method A	one field visual test per 500 cubic yards, one ASTM D5519-94 test per 2,000 cubic yards
Bank Run Gravel	ASTM D422 Standard Test Method for Particle-Size Analysis of Soils	one test per 500 cubic yards
Select Gravel	ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	one test per 500 cubic yards
Sand	ASTM D422 Standard Test Method for Particle-Size Analysis of Soils	one test per 500 cubic yards
Processed Gravel	ASTM D75-97 Standard Practice for Sampling Aggregates, ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	one test per 500 cubic yards
Screened or Crushed Stone	ASTM D75-97 Standard Practice for Sampling Aggregates, ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates	one test per 500 cubic yards
Topsoil	ASTM D422 Standard Test Method for Particle-Size Analysis of Soils , Recommended Soil Testing Procedures for the Northeastern United States, 2nd edition. 1995 University of Delaware Agricultural Experiment Station, Bulletin #493	one test per 500 cubic yards

SECTION 02230

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DEFINITIONS

The subsections below provide a detailed description of the clearing and grubbing activities covered under this section. In general, this section covers work to be conducted by the General Contractor, including all clearing on the site, and grubbing outside the river channel for access roads, staging areas, etc. Grubbing of stumps within the river channel will be conducted as part of the excavation work by the Excavation Subcontractor.

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared, which include areas within and outside of the limits of excavation.

All trees shall be cut using a shear or Timco saw and will be staged on plastic liner. The trees shall not be allowed to fall into the river or on the ground. They are to be cut, carried, and placed on polyethylene sheeting or heavy-duty tarps before they are chipped.

1.1.2 Chipping and Hauling

All trees and brush shall be chipped into box trailers for disposal at a wood burning generating facility or other approved off-site disposal facility. In addition, chips can be used on-site as mulch upon approval by the Government.

1.1.3 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from designated grubbing areas, such as access roads, support areas, and staging areas, as necessary. Surplus soil adhering to the surfaces of removed stumps and roots shall be removed using an appropriate method (e.g. shaking). The areas to be grubbed shall be identified in the field at the time of construction. This section does not include removal of stumps within the excavation limits, which will be removed by the Excavation Subcontractor at the time of excavation.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Materials Proposed for Off-Site Disposal; G

Written permission to dispose of such waste materials at off-site facilities shall be filed with the Contracting Officer. Provide the name, address, and contact person proposed off-site disposal facilities.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off to the following heights: within the limits of excavation, six inches or less above the original ground surface; and outside of the limits of excavation, as close to the original ground surface as possible without causing contamination of cut wood or equipment. Cut trees and branches shall not be permitted to come into contact with contaminated soils or sediments. The contractor shall use appropriate measures to prevent such contact.

Trees designated to be left standing within the cleared areas shall be trimmed of branches as required. Trees and vegetation to be left standing shall be protected from damage incidental to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground or proposed finish grade, whichever is lower, in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground. Disturbance to the ground surface outside of the limits of excavation must be minimized to comply with project objectives and TSCA.

3.3 DISPOSAL OF MATERIALS

3.3.1 Chippable Material

Trees and brush that have not come in contact with the ground surface or the river shall be chipped into box trailers and hauled for disposal at an approved off-site disposal facility. Chips may be used as mulch on-site as part of site restoration activities. Chips shall not be used as mulch at off-site locations.

3.3.2 Materials Other Than Chippable Material

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations that have come into contact with the ground surface, shall be stockpiled in the designated stump stockpile areas and disposed of at the GE OPCA. These materials shall be sliced or chipped to a maximum six-inch size and subsequently transported to an OPCA specified by GE for disposal. Alternatively, this material could be sent off-site for disposal. Concrete debris generated during these activities shall be stockpiled for later crushing along with other concrete debris to be generated by bank excavation activities.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

Work covered by this section includes measures to support remediation work within the sheet pile containment cells [see Specification Section 02464 SHEET PILE CONTAINMENT CELL CONSTRUCTION AND DEWATERING] and restoration construction along the riverbed and riverbank [see Specification Section 02930 BANK REVEGETATION AND BIOENGINEERING TREATMENTS] as shown on the drawings. The work consists of excavation of TSCA and non-TSCA materials [see Specification Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL], subgrade preparation, backfilling of the riverbed, and other measures required to complete the work. Earthwork shall be accomplished by means selected and designed by the Excavation Subcontractor and acceptable to the General Contractor and the Government.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999) Concrete Aggregates
ASTM C 97	(1983; R 1998) Absorption and Bulk Specific Gravity of Natural Building Stone
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 5519	(1994) Particle Size Analysis of Natural and Man-Made Soils

COMMONWEALTH OF MASSACHUSETTS,
DEPARTMENT OF HIGHWAYS

State Specifications	(1988, R 1998) Standard Specifications for Highways and Bridges, as amended. The publication will be referred to as the "State Specifications"

ENGINEERING MANUALS (EM)

EM 1110-2-1906	(1986) Laboratory Soils Testing

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 Submittal Procedures:

SD-01 Pre-Construction Submittals

Excavation Plan

- Proposed construction sequence, including the order for driving, pulling, and removing steel sheet piling to construct Temporary Containment Cells (02464 - SHEET PILE CONTAINMENT CELL CONSTRUCTION AND DEWATERING). The order for excavating channel sediment and bank soil shall be listed in the proposed construction sequence, with the conveyance of contaminated material over remediated areas minimized to the maximum extent practicable. The means and methods for incorporating and sequencing the temporary erosion control measures specified in 02370 STORMWATER AND EROSION CONTROL: IN-RIVER WORK shall be included.

- The method for coordinating survey control with the General Contractor during construction, and minimizing excavation volumes while ensuring that the work conforms to excavation grades shown in the Plans in accord with the tolerances listed in this Specification, shall be described.
- A dewatering plan that shall show the location of all pumps, sumps, pipelines, filters, sedimentation basins, and other equipment necessary. The plan shall include a list of the products to be used for dewatering, subject to the approval of the Engineer. The piping materials, route to discharge to the river, and route to the water treatment system shall also be included in the plan. The plan shall include methods to minimize leakage into the containment cells and to prevent the discharge of suspended sediment to the treatment system. The plan may be modified and resubmitted as work proceeds in the event the Excavation Subcontractor elects to revise the work or materials described in the plan.
- A sequence for excavation and excavation support for the riverbank in Containment Cells 1 and 2 to prevent destabilizing of the slope adjacent to the Amuso property identified on the PLANS.
- A schedule for all specified earthwork and containment cell inspections that includes inspection frequencies and reporting, the names and addresses of all testing/inspection firms, qualifications of their personnel, and applicable permits and licenses.

SD-06 Test Reports

In-place compaction testing data

1.3 SUBSURFACE DATA

Subsurface soil boring logs are available in the Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River. These data represent the subsurface information available; however, variations may exist in the subsurface between boring locations.

1.4 CLASSIFICATION OF EXCAVATION

Excavation specified shall be done on a classified basis, in accordance with the following designations and classifications.

1.4.1 Soil and Sediment Excavation

Soil and sediment excavation shall include the satisfactory removal of all materials not classified as boulder excavation, concrete excavation, or ordered excavation. Soil and sediment excavation shall include earthen and fill material located within the Limit of Excavation shown on the PLANS, except those specified below. As indicated on the subsurface investigation logs available in the Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River, soil and sediment includes: boulders and debris less

than 2 feet in nominal diameter, concrete of less than 1 cubic yard volume, alluvial cobbles, gravel, sand, silt, clay, glacial till, and fill. Additionally, stumps and roots are considered incidental to the excavation of sediment and soil and are, therefore, included in this classification of excavation, but must be kept segregated from soil and sediment. Metallic debris is considered incidental to soil and sediment excavation.

1.4.2 Boulder Excavation

Boulder excavation shall include excavating boulders 2 feet or more in nominal diameter, measured along the narrowest portion of the boulder. Boulders that are less than 2 feet in diameter shall be considered part of soil and sediment excavation. If at any time during excavation, the Excavation Subcontractor encounters material that may be classified as boulder excavation, such material shall be uncovered and the General Contractor notified by the Excavation Subcontractor. The Excavation Subcontractor shall not proceed with the excavation of this material until the General Contractor has classified the materials as soil and sediment excavation or boulder excavation and has taken field measurements as required.

1.4.3 Concrete

Concrete debris excavation shall include excavation of miscellaneous materials that are greater than 1 cy in nominal volume. The removal of concrete, pavement, and masonry pieces greater than 1 cy that may be encountered in the work shall be included in this classification. If at any time during excavation, the Excavation Subcontractor encounters material that may be classified as debris excavation, such material shall be uncovered and the General Contractor notified by the Excavation Subcontractor. The Excavation Subcontractor shall not proceed with the excavation of this material until the General Contractor and Contracting Officer has classified the materials as oversized.

1.4.4 Ordered Excavation

Ordered excavation shall include excavating materials determined unsuitable or otherwise ordered by the Engineer. If upon reaching specified subgrade, the Excavation Subcontractor encounters material that may be unsuitable for foundation of proposed structures or other proposed work, the Engineer shall be notified by the Excavation Subcontractor. The Excavation Subcontractor shall not proceed with the excavation of this material until the Engineer has classified the materials and has taken samples and field measurements as required.

1.5 BLASTING

Blasting will not be permitted.

1.6 UTILIZATION OF EXCAVATED MATERIALS

Unless otherwise directed, materials removed from excavations shall be carefully placed in trucks provided by the General Contractor such that contamination of the outside of the vehicle does not occur. Segregation of the various types of materials (TSCA and non-TSCA soil and sediment, stumps, boulders, and concrete) shall be maintained by placing these materials in designated trucks. No excavated material shall be reused on site for fill of any sort, or disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

1.7 CONSTRUCTION TOLERANCES

The finished excavation surface and fill/stone layer thickness shall not deviate from the lines and grades shown on the drawings unless directed by the Engineer. Excavation beyond the neatline will not be paid. The Excavation Subcontractor will be responsible for off-site transport and disposal of contaminated material resulting from unapproved over-excavation beyond the neatline tolerances provided below, as well as associated additional backfill costs. Tolerances are measured perpendicular to the indicated neatlines. Extreme limits of the tolerances given shall not be continuous in any direction for more than five times the nominal stone dimension nor for an area greater than 1,000 square feet of the surface.

NEATLINE TOLERANCES

MATERIAL	**ABOVE NEATLINE in Inches**	**BELOW NEATLINE in Inches**
Excavation/Subgrade	0	1 ½
Filter Material A	1 ½	1 ½
Filter Material B	1 ½	1 ½
Riprap in Channel	0	2
Riprap on Slopes	0	2

The work shall be built to the required elevations, slope, and grade and the outer surfaces shall be even and present a neat appearance. Placed material not meeting these limits shall be removed or reworked as directed by the Engineer. Payment will not be made for excess material that the Engineer leaves in-place.

Excavation shall conform to the grades shown on the drawings. In the event of overexcavation beyond the neatline, the work shall be stopped.

PART 2 PRODUCTS

The backfill materials will be procured, tested, and delivered to the worksite by the General Contractor in accordance with this specification and with Section 02111 Handling of Excavated Material and Backfill. Test samples shall be representative samples taken in the presence of the Contracting Officer. The Excavation Subcontractor shall place the backfill materials in accordance with the drawings and specifications.

2.1 COMMON FILL

Common fill shall be obtained or produced from approved sources and shall consist of durable (non-calcareous) mineral soil and rock products. Common fill shall be substantially free of organic materials, loam, wood, trash, or other objectionable materials which may be decomposable, compressible, or which cannot be properly compacted.

Material shall classify as CL, ML, CL-ML, SC, SM, SW, GC, GM, or GW according to the Unified Soil Classification System (USCS), unless otherwise approved by the Engineer for use to construct a specific work element. Soils classified as CL or ML shall contain at least 20% sand-size particles per USCS.

Liquid limit shall not exceed 40 percent and plasticity index shall not exceed 10 percent.

Maximum clod size shall not exceed 4 inches.

Material shall have a maximum dry density not less than 110 pounds per cubic foot (pcf) as determined by ASTM D1557, Method C, except for manufactured topsoil.

Common fill used as embankment fill shall contain no rocks or rock fragments larger than one-third of the compacted thickness of the lift (refer to Section 3.5 for lift thickness requirements) in which the material is placed and shall be such that no voids are left in the fill as constructed. Common fill shall have physical properties which permit its ready spreading and compacting. The moisture content of common fill being placed as fill shall be sufficient to provide the specified compaction and ensure a stable embankment.

2.2 STRUCTURAL FILL

Structural fill shall be natural mineral soil consisting of hard, durable, granular aggregate and shall be free from roots, sod, rubbish, and other frozen, organic, or deleterious material. It shall conform to the following gradation requirements:

Sieve Size	**Percent Finer by Weight**
3 inch	100
2 inch	75 to 100
No. 4	40 to 100
No. 40	10 to 45
No. 200	0 to 12

2.3 FILTER MATERIAL

The filter material shall be well-graded and composed of hard, durable particles, and shall not contain organic matter, thin, flat and elongated pieces, or soft, friable particles in quantities considered objectionable by the Engineer. The aggregate shall meet the quality requirements of ASTM C 33 and shall conform to the tables below.

2.3.1 Filter Layer A

Filter Layer A shall conform to requirements of State Specification for material M1.03.0, modified as follows:

Sieve Designation	Percent Lighter by Weight
3/4-inch	100
1/2-inch	50 to 85
No. 4	40 to 75
No. 50	10 to 30
No. 200	0 to 5

2.3.2 Filter Layer B

Filter Layer B shall conform to the following gradation requirements:

Sieve Designation	Percent Lighter by Weight
3-inch	100
2-1/2-inch	95 to 100
1-inch	30 to 60
3/4-inch	0 to 25

2.4 STONE

Stone protection materials shall consist of hard, durable and sound quarried rock fragments furnished by and at the expense of the General Contractor. Each stone shall have a density of not less than 155 pcf based on the saturated surface dry specific gravity determined in accordance with ASTM C 97. The stones shall be irregular and angular in shape and shall be free from open or incipient cracks, seams, structural planes of weakness, or other defects that would tend to increase unduly their deterioration from natural causes and from handling and placing. No stone in the material shall have its long dimension exceeding 3 times its short dimension. Stone protection material shall be well-graded between the maximum and minimum stone sizes furnished. The maximum and minimum sizes furnished shall be selected by the General Contractor and shall produce a material without "skip gradation" with stone sizes within the limits specified. The selection will depend on the General Contractor's processing operations, shapes of stones, and other factors. All stones for the production of stone protection material shall be obtained from one general rock type in one quarry. The rock shall be selected and placed so that the entire finished surface of stone protection will be of uniform appearance.

2.4.1 Riprap

Only quarried stone shall be used. The minimum stone density shall be 155 pcf. Stone shall be hard, durable, and angular in shape, resistant to weathering and shall conform to the tables below. Material shall be well-graded and free of overburden, spoil, shale, and organic material.

2.4.1.1 9-inch Riprap (Riprap layer C1)

Limits of Stone Weight in lb.	Percent Lighter by Weight
14 to 39(max)	100
7 to 11	50
2(min) to 6	15

In the above table, the "(max)" size stone is the permissible maximum stone size and the "(min)" size stone is the permissible minimum size stone. Stone protection materials may contain up to 10 percent, by weight, of air-dried rock fragments, spalls, and dust with each particle weighing less than the permissible minimum stone size. No particles weighing less than the permissible minimum stone size shall be defined as a stone in stone protection materials. In computing percentages by weight of stone in the above table, the weight of particles weighing less than the permissible minimum stone size shall not be included in the total weight.

2.4.1.2 12-inch Riprap (Riprap layer C2)

Limits of Stone Weight in lb.	Percent Lighter by Weight
32 to 92(max)	100
16 to 27	50
5(min) to 14	15

In the above table, the "(max)" size stone is the permissible maximum stone size and the "(min)" size stone is the permissible minimum size stone. Stone protection materials may contain up to 10 percent, by weight, of air-dried rock fragments, spalls, and dust with each particle weighing less than the permissible minimum stone size. No particles weighing less than the permissible minimum stone size shall be defined as a stone in stone protection materials. In computing percentages by weight of stone in the above table, the weight of particles weighing less than the permissible minimum stone size shall not be included in the total weight.

2.4.1.3 18-inch Riprap (Riprap layer C3)

Limits of Stone Weight in lb.	Percent Lighter by Weight
110 to 309(max)	100
55 to 92	50
17(min) to 46	15

In the above table, the "(max)" size stone is the permissible maximum stone size and the "(min)" size stone is the permissible minimum size stone. Stone protection materials may contain up to 10 percent, by weight, of air-dried rock fragments, spalls, and dust with each particle weighing less than the permissible minimum stone size. No particles weighing less

than the permissible minimum stone size shall be defined as a stone in stone protection materials. In computing percentages by weight of stone in the above table, the weight of particles weighing less than the permissible minimum stone size shall not be included in the total weight.

2.5 SELECT GRANULAR FILL

Select granular fill shall be natural mineral soil consisting of durable (non-calcareous) granular aggregates. The gradation of the soil shall conform to the limits specified in the tables below and the maximum size of any stone or fragment shall not exceed two-thirds of the compacted thickness of the layer being placed. The material shall be obtained from sources approved by the Engineer.

2.5.1 Bank Run Gravel

Sieve Size	Percent Finer by Weight
6-inch	100
No. 4	25 to 70
No. 200	0 to 12

2.5.2 Select Gravel

Material shall conform to requirements of Massachusetts Highway Department (MHD) State Specification for material M1.03.0, Type b.

Sieve Size	Percent Finer by Weight
3 inch	100
1/2-inch	50 to 85
No. 4	40 to 75
No. 50	8 to 28
No. 200	0 to 10

2.6 PROCESSED AGGREGATES

Processed aggregates shall be obtained or produced from sources approved by Engineer, and shall consist of granular mineral soils having gradations as specified below:

2.6.1 Sand

Sieve Size	Percent Finer by Weight
3/8-inch	100
No. 200	0 to 10

2.6.2 Processed Gravel

Material shall conform to requirements of State Specification for material M1.03.1 Processed Gravel for Sub-base. (Material meeting State Specification M2.01.7 Dense Graded Crushed Stone for Sub-base will also be acceptable for gravel roadway applications.)

Sieve Size	**Percent Finer by Weight**
3-inch	100
1-1/2-inch	70 to 100
1/4-inch	50 to 85
No. 4	30 to 60
No. 200	0 to 10

2.6.3 Screened or Crushed Stone

Screened or crushed stone shall consist of clean, durable fragments of either ledge, rock, or boulders, or both, of uniform quality, reasonably free from thin or elongated pieces. Material shall conform to the gradation requirements of Massachusetts Highway Department (MHD) State Specification for material M2.01.1, M2.01.2, and M2.01.4

	Percent Finer by Weight	
Sieve Size	**3/4-Inch Crushed Stone**	**1 1/2-Inch Crushed Stone**
2-inch	100	100
1 1/2-inch	100	95 to 100
1-inch	100	35 to 70
3/4-inch	90 to 100	0 to 25
1/2-inch	10 to 50	0 to 5
3/8-inch	0 to 20	0 to 5
No. 4	0 to 5	0 to 5
No. 8	0 to 5	0 to 5
No. 50	0 to 5	0 to 5
No. 200	0 to 5	0 to 5

2.7 TOPSOIL

Existing topsoil shall be placed in trucks provided by the General Contractor. Replacement topsoil as specified in the Project Drawings will be derived from approved off-site sources. Topsoil shall have a texture of a loose friable loam with no admixture of refuse or material toxic to plant growth. Topsoil shall be free of stones, lumps, stumps, or similar objects larger than 2 inches in greatest diameter, subsoil, roots, and weeds.

The minimum and maximum pH value shall be from 5.5 to 7.0. It shall contain a minimum of 5 percent and a maximum of 12 percent of total organic matter as determined by standard methods (i.e., Recommended Soil Testing Procedures for the Northeastern United States, 2nd edition. 1995 University of Delaware Agricultural Experiment Station, Bulletin No. 493).

The total organic matter content can be amended with compost or other organic material from approved reused sources (compost shall be preferred). The fraction passing the No. 10 sieve shall contain from 7 to 15 percent clay, 35 to 50 percent silt, and 30 to 50 percent sand.

PART 3 EXECUTION

3.1 GENERAL EXCAVATION

The Excavation Subcontractor shall perform excavation of each type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified. Unsatisfactory materials encountered within the limits of the work shall be stabilized in-place or excavated below grade and replaced as directed by the Engineer. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times.

3.1.1 Excavation of Riverbanks and Channel

Excavation of riverbanks and channel shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown, or as directed. Riverbanks and channel shall not be excavated below grades shown. Excessive excavation shall be backfilled to grades shown with compacted common fill at the Excavation Subcontractor's expense. The Excavation Subcontractor shall maintain excavations free from detrimental quantities of water, leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.1.2 Excavation for Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Excavations shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed.

3.2 SELECTION OF FILL MATERIAL

Fill material shall be selected to meet the requirements and conditions of the particular fill for which it is to be used. Fill material will be provided by the General Contractor as described in Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL.

3.3 OPENING AND DRAINAGE OF EXCAVATION

The Excavation Subcontractor shall notify the General Contractor sufficiently in advance of the opening of any excavation to permit elevations and measurements of the undisturbed ground surface to be taken.

In-river work will be divided into cells as shown on the plans, and shall proceed from one cell to the next as indicated by numbering of the cells. Riverbank work shall proceed in coordination with in-river work to limit migration or erosion of existing bank soil into the cells. Additionally, the work shall be coordinated such that conveying of contaminated material over restored areas is minimized to prevent releases of contaminated material to restored areas. Limits of riverbank work and final grades shall conform to the contract drawings.

The Excavation Subcontractor shall remove river water and provide adequate dewatering to prevent standing water in the excavation

3.4 PREPARATION OF GROUND SURFACE FOR BACKFILL

3.4.1 General Requirements

Ground surface on which fill is to be placed shall be free of standing water; live, dead, or decayed vegetation; rubbish; debris; other unsatisfactory material; and compacted to firm and non-yielding surface.

3.4.2 Frozen Material

Backfill to support structures shall not be placed on a foundation that contains frozen material. All material below structures that freezes or has been subjected to freeze-thaw action during the construction work shall be thawed, dried, reworked, and recompacted to the specified criteria before additional fill material or the structure is placed.

3.5 BACKFILL PLACEMENT AND COMPACTION

The Excavation Subcontractor shall obtain approval for each cell excavation prior to backfilling. Common fill shall be used except where other materials are directed, specified, or shown on the plans. Compaction shall be accomplished with equipment acceptable to the Engineer. Backfill material shall not contain frozen clumps of soil, snow, or ice. Minimum compaction requirements expressed as a percentage of maximum density for various backfill types are as indicated in the following table and below:

Backfill Type	Compaction in Percent Maximum Density	Lift Thickness in Inches
Common fill	85	12
Filter layers A and B	90	6
Structural fill	95	6

Common fill shall be placed in lifts and uniformly compacted to at least 85 percent of maximum density according to the ASTM D 1557 Method C. Common fill placed on slopes may be accepted if the surface density is less than 90 percent, at the discretion of the Engineer.

Filter layer soils shall be placed in lifts and uniformly compacted to at least 90 percent of maximum density according to ASTM D 1557 Method C. Filter layer soils placed on slopes may be accepted if the surface density is less than 90 percent, at the discretion of the Engineer.

Where common fill or filter layer soils that conform to specified gradations are too coarse to permit testing with ASTM D1557 Method C, the Excavation Subcontractor shall develop a compaction method that achieves a uniformly dense, non-yielding condition acceptable to the Engineer.

Backfill to support structures shall be placed in lifts and uniformly compacted to at least 95 percent of maximum density according to ASTM D1557 Method C. Backfill adjacent to all types of structures shall be placed uniformly and compacted with light equipment to prevent eccentric loading upon or against the structure.

Riprap and topsoil shall be spread in uniform layers conforming to the limits shown on the plans. Placing and spreading equipment shall be used to eliminate voids, but no specific minimum compaction is required. Compaction of topsoil shall be avoided except light tamping or rolling as needed for placement on slopes.

3.6 TESTING

In-place compaction testing shall be performed by the Excavation Subcontractor. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the Excavation Subcontractors and that the results are representative of the materials or conditions being certified by the tests. The General Contractor will provide the Excavation Subcontractor with proctor test results.

Field in-place density shall be determined in accordance with ASTM D 2922. ASTM D 1556 or ASTM D 2167 shall be used to check ASTM D 2922 calibration curves and may govern in the case of a discrepancy depending on test conditions and as directed by the Engineer. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using Annex A1 of Method D 2922. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of the job and at intervals as directed by the Engineer.

When test results indicate, as determined by the Engineer, that compaction is not as specified, the material shall be reworked or removed, replaced, and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements

3.6.1 Optimum Moisture and Laboratory Maximum Density

The General Contractor shall transport the fill material to the work area for installation by the Excavation Subcontractor. The Excavation Subcontractor shall install the fill material such

that the specified *in-situ* densities are achieved. The Excavation Subcontractor shall condition the backfill materials to the approximate optimum moisture contents as necessary to achieve specified *in-situ* densities.

3.6.2 In-Place Density

a. One test per 7,500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines; but not less than two tests per day when less than 7,500 square feet per day or lift is placed.

b. One test per 1,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

3.6.3 Riprap Testing and Approval

The samples shall be subjected to such tests as are necessary to determine the quality of the material unless suitable test reports or service records are available that are satisfactory to the Contracting Officer. The Contracting Officer shall be the sole judge as to the acceptability of a material. Tests to determine the suitability of the rock and gravel materials may include, as applicable, petrographic analysis, specific gravity, abrasion, absorption, sulfate soundness, wetting and drying, and freezing and thawing. All testing of the initially proposed source of material will be made by or under supervision of the Contracting Officer. The approval of a material by the Contracting Officer, based on test results, examination of the material exposed at the source and service records, shall not relieve the Excavation Contractor, in any way, of the responsibility of placing a material which meets the requirements specified herein. Approval of a sample of material for soundness and durability from a source shall not be construed as approval of all material from that source. The right is reserved to reject, at any time, any or all portions of the materials in a source or products using the materials from that source when such materials are unsuitable in the opinion of the Contracting Officer.

3.7 FINISHING

The surface of excavations, backfilled slopes, and subgrades shall be finished to a smooth and compact surface in accordance with the specified tolerances and the lines and grades shown on the plans.

3.8 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly and graded to a depth sufficiently greater than that shown on the plans so that after natural settlement the completed work will conform to elevations shown on the plans.

Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from off-site areas.

3.9 STONE PROTECTION

3.9.1 Demonstration

Prior to placement of stone, the Excavation Subcontractor shall construct a section of stone protection consisting of riprap to demonstrate his proposed operations for production placement. The section shall demonstrate procedures and capability of grading, placing stone and bank protection within the tolerances specified. The demonstration section shall be 100 feet in length and shall conform to all applicable specifications.

3.9.1.1 Methods and Equipment

Methods and equipment employed for placement shall demonstrate the adequacy for use in placement of riprap and shall conform to the requirements specified. The quantities of all materials placed within the section will be calculated by the Engineer for comparison with computed quantities.

3.9.1.2 Demonstration Section Evaluation

The Excavation Subcontractor shall not proceed with placing stone protection prior to the approval of the demonstration section. Within a period of 72 hours after completion of the section, the Engineer shall determine the adequacy of the section to function as part of the permanent construction. The Excavation Subcontractor shall be notified as to the acceptability of the section and may be directed to modify methods of construction and remove the section if necessary.

3.9.1.3 Removal of Demonstration Section

If removal of the demonstration section is required, it shall be conducted in such a manner as to maintain the integrity of the underlying subgrade. The removed material shall be placed in trucks provided by the General Contractor or stockpiled adjacent to the work area as directed by the Engineer.

3.9.2 Base Preparation

Areas on which filter layers and riprap are to be placed shall be graded and/or dressed to conform to cross sections shown on the contract drawings within the specified tolerance from the theoretical slope lines and grades. The Engineer shall approve the prepared base. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by fill with earth similar to the adjacent material and then compacted to a density equal to the adjacent in place material. Immediately prior to placing the filter layers, the Engineer will

inspect the prepared base and no material shall be placed thereon until that area has been approved.

3.9.3 Placement of Filter Layers

3.9.3.1 Placement of Filter Layer Material on Prepared Base

Filter material shall be spread uniformly on the prepared base to the slope lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the prepared base. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Placing of sand, gravel, and crushed stone by methods that tend to segregate the particle sizes within the filter layers or cause mixing of the separate layers will not be permitted. Each layer shall be finished to present an adequately even surface, free from mounds or windrows. Any damage to the surface of the prepared base during placement of the material shall be repaired before proceeding with the work. Compaction of the filter layer material shall be as described above.

3.9.4 Placement of Riprap

3.9.4.1 General

Riprap shall be placed on the filter layers within the limits shown on the contract drawings.

3.9.4.2 Placement

Riprap shall be placed in a manner that will produce a well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed, within the specified tolerances, to the lines and grades shown on the contract drawings or staked in the field.

Riprap shall be placed by means of truck, crane-operated skip-pan (box), dragline bucket, clamshell, rock-bucket, hydraulic excavator ("Gradall"), trackhoe, or other approved equipment. Pneumatic tired front-end loaders also may be used provided that in the opinion of the Engineer no degradation of the rock occurs.

Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing the filter material. The large stones shall be well distributed and the entire mass of stones in their final position shall be graded to conform to the gradation specified.

Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones.

Placing riprap in layers will not be permitted. Placing riprap by dumping it into chutes, or by similar methods likely to cause segregation of the various sizes, shall not be permitted.

Placing riprap by dumping it at the top of the slope and pushing it down the slope shall not be permitted. Care shall be used if equipment is operated on the completed stone protection system.

The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing; or by other methods of placement that will produce the specified results. Each truckload shall be representative of the gradation requirements.

Rearranging of individual stones shall be required to the extent necessary to obtain a well-graded distribution of stone sizes as specified above. However, manipulating stone by means of dozers or other blade equipment shall not be permitted.

The Excavation Subcontractor shall maintain the stone protection until accepted by the Engineer and any material displaced prior to acceptance shall be replaced at the Excavation Subcontractor's expense to the lines and grades shown on the contract drawings.

END OF SECTION

SECTION 02370

STORMWATER AND EROSION CONTROL: IN-RIVER WORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS Seed Act	(1995) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 648	(1998c) Deflection Temperature of Plastics Under Flexural Load
ASTM D 698	(1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb f/cu. ft. (600kN-m/cu. m))
ASTM D 1248	(1998) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1560	(1992) Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus
ASTM D 1682	Tensile Strength and % Strength Retention of material after 1000 hours of exposure in Xenon Arc Weatherometer
ASTM D 1777	(1996) Thickness of Textile Materials
ASTM D 2844	(1994) Resistance R-Value and Expansion Pressure of Compacted Soils
ASTM D 3776	(1996) Mass per Unit Area (Weight)of Fabric
ASTM D 3787	(1989) Bursted Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 3884	(1992) Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double Head Method)

ASTM D 4355	(1992) Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4439	(1997) Standard Terminology for Geosynthetics
ASTM D 4491	(1999) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoidal Tearing Strength of Geotextiles
ASTM D 4595	(1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1998; R 1996el) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls
ASTM D 4972	(1995a) pH of Soils
ASTM D 5035	(1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5268	(1996) Topsoil Used for Landscaping Purposes

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF HIGHWAYS

State Specifications	(1988, R 1998) Standard Specifications for Highways and Bridges, as amended. The publication will be referred to as the "State Specifications"

1.2 DESCRIPTION OF WORK

The work shall consist of furnishing and installing soil surface erosion and sediment control materials, stormwater control materials, and stormwater pollution prevention control materials including silt fence, hay bale barriers, diversion swales, fine grading, blanketing,

stapling, mulching, and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work shall include all necessary materials, labor, supervision, and equipment for installation of a complete system.

Areas requiring stormwater and temporary erosion control protection include:

a. Riverbanks after restoration at elevations above the top-of-armor (riprap).

b. The work area within the Containment Cells.

c. Areas around the Containment Cells as shown on the Plans.

d. Areas where riverbank overtopping may occur because of local increases in river stage associated with flow constriction caused by the Containment Cells.

e. Areas where overland flow into the river from areas outside the top of the riverbanks has resulted in local erosion.

The Excavation Subcontractor shall be responsible for a, b, c, and e. The General Contractor shall be responsible for d. Additionally, the Excavation Subcontractor shall implement procedures to minimize stormwater flow damage to the site, remedial installations and appurtenances, and construction equipment. The Excavation Subcontractor shall be responsible for placement of all erosion control blankets as specified in this Section and in Section 02930 BANK REVEGETATION AND BIOENGINEERING TREATMENTS.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Storm Damage and High Flow Damage Prevention Plan; G

a. Action levels for taking storm prevention measures.

b. Expected measures in the event a storm is predicted, including protection of work area and equipment.

SD-03 Product Data

a. Mulch; Geotextile Fabric; Erosion Control Blankets.

b. Manufacturer's literature including physical characteristics, application and installation instructions.

SD-06 Test Reports

a. Provide certification for synthetic soil binders showing USEPA registered uses, toxicity levels, and application hazards.

b. Provide the Construction Work Sequence Schedule including the installation of Temporary Erosion Controls around Containment Cells where necessary.

c. Provide Installer's Qualifications. Include the installer's company name and address; training and experience; and/or certification.

d. For Mulch, provide composition and source.

e. For Asphalt Adhesive, provide composition.

f. For Tackifier, provide composition.

g. For Wood By-Products, provide composition, source, and particle size. Products shall be free from toxic chemicals or hazardous material.

SD-07 Certificates

Certification Form for Erosion and Sediment Controls

SD-10 Operation and Maintenance Data

a. Daily forecast reports for a period of 72 hours from the time of the forecast from a qualified weather forecasting service.
b. Rainfall/snow pack depth measurement/river stage and discharge data from the previous day.
c. Daily records of equipment, labor, and materials used to limit storm damage and high flow damage, and for implementing corrective action associated with storm damage and high flow damage.
d. Monthly Inspection Report for Erosion and Sediment Controls.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required for the Excavation Subcontractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include limiting the area of disturbance at any given time, installation of silt fences and/or hay bale berms and/or diversion swales and berms, and/or mulching, and/or erosion control mats.

On his daily CQC Report, the Excavation Subcontractor shall record the dates when the major grading activities occur (e.g., clearing and grubbing, excavation, backfilling, grading, and revegetation); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in Paragraphs Unsuitable Conditions and No Activity for Less Than 21 Days, stabilization practices shall be initiated as soon as practicable, but after no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

The Excavation Subcontractor shall maintain hay bale berms and/or rock check dams until revegetation is established to the satisfaction of the Engineer.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit erosion/runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices:

a. Silt fences;
b. Straw bales; and/or
c. Temporary erosion controls around containment cells.

1.4.2.1 Silt Fences

The Excavation Subcontractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g., clearing and grubbing, excavation, embankment, and grading). Final removal of silt fence barriers shall be upon approval by the Engineer.

1.4.2.2 Straw Bales

The Excavation Subcontractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in an area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage

area). Areas where straw bales are to be used are shown on the drawings. Final removal of straw bale barriers shall be upon approval by the Engineer.

Rows of bales of straw shall be provided as follows:

a. Along the downhill perimeter edge of all areas disturbed.

b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.

c. Along the toe of all cut slopes and fill slopes of the construction areas.

d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced as shown on the drawings.

e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced as shown on the drawings.

f. At the entrance to culverts that receive runoff from disturbed areas.

1.4.2.3 Temporary Erosion Control Around Containment Cells

Temporary Erosion Controls shall be placed around the Containment Cells as shown on the Plans when the portion of the river opposite the Containment Cells has not yet been restored and is, therefore, subject to increased flow velocity because of the constriction posed by the Containment Cell. Temporary Erosion Controls are not necessary around Containment Cells when the portion of the river opposite the Containment Cells has been restored and is, therefore, protected from increased flow velocities.

Temporary Erosion Control may be constructed in accord with the following options, or a suitable alternative may be used, subject to the approval of the Engineer:

a. Placement of Riprap Layer C3 in the areas shown on the Plans. This will require installing the riprap, removing the riprap after the Containment Cell has been removed, and cleaning sediment from the riprap so that the riprap can be reused; and/or
b. Placement of Articulated Concrete Mats. This will require installing the articulated concrete mats in accordance with the manufacturer's specifications, removing the articulated concrete mats, and cleaning sediment from the articulated concrete mats so that the articulated concrete mats can be reused.

1.5 DELIVERY, INSPECTION, STORAGE, AND HANDLING

Materials shall be stored in designated areas and protected from the elements, direct exposure, and damage as recommended by the manufacturer. Containers shall not be

dropped from trucks. Material shall be free of defects that would void required performance or warranty. Geosynthetic binders and synthetic soil binders shall be delivered in the manufacturer's original sealed containers and stored in a secure area.

a. Erosion control blankets, silt fences, and geotextile fabric shall be furnished in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Erosion control blanket and geotextile fabric rolls shall be labeled to provide identification sufficient for inventory and quality control purposes.

b. Articulated concrete mats shall be handled in accord with the manufacturer's requirements.

1.6 SUBSTITUTIONS

Substitutions will not be allowed without written request and approval from the Engineer.

1.7 INSTALLER'S QUALIFICATION

The installer shall be certified where recommended by the manufacturer for training and experience installing the material.

1.8 TIME LIMITATIONS

Backfilling the openings in synthetic grid systems and articulated cellular concrete block systems shall be completed a maximum 7 days after placement to protect the underlying geotextile material from ultraviolet radiation.

1.9 WARRANTY

Erosion control material shall have a warranty for use and durable condition for project specific installations. Temporary erosion control materials shall carry a minimum 18-month warranty. Permanent erosion control materials shall carry a minimum three-year warranty.

PART 2 PRODUCTS

2.1 RESTORED RIVERBANK EROSION PROTECTION COMPONENTS

2.1.1 RECYCLED PLASTIC

Recycled plastic shall contain a minimum 85 percent of recycled post-consumer product. Recycled material shall be constructed or manufactured with a maximum 1/4 inch deflection or creep in any member, according to ASTM D 648 and ASTM D 1248. The components shall be molded of ultraviolet (UV) and color stabilized polyethylene. The material shall consist of a minimum 75% plastic profile of high-density polyethylene, low-density polyethylene, and polypropylene raw material. The material shall be non-toxic and have no discernible contaminants such as paper, foil, or wood. The material shall contain a

maximum 3% air voids and shall be free of splinters, chips, peels, buckling, and cracks. Material shall be resistant to deformation from solar heat gain.

2.1.2 BINDERS

2.1.2.1 Geosynthetic Binders

Geosynthetic binders shall be manufactured in accordance with ASTM D 1560, ASTM D 2844; and shall be referred to as products manufactured for use as modified emulsions for the purpose of erosion control and soil stabilization. Emulsions shall be manufactured from all natural materials and provide a hard durable finish.

2.1.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.1.3.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.1.3.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.1.3.3 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: a minimum 9 to a maximum 15 percent moisture, and between a minimum 4.5 to a maximum 6.0 pH.

2.1.3.4 Paper Fiber

Paper fiber mulch shall be recycled newsprint that is shredded for the purpose of mulching seed.

2.1.3.5 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

2.1.3.6 Wood Chips and Ground Bark

Locally chipped or ground material shall be treated to retard the growth of mold and fungi. Gradation: A maximum 2-inch wide by 4-inch long.

2.1.3.7 Mulch Control Netting

Mulch control netting may be constructed of lightweight recycled plastic, cotton, or paper or organic fiber. The recycled plastic shall be a woven or non-woven polypropylene, nylon, or polyester containing stabilizers and/or inhibitors to make the fabric resistant to deterioration from UV, and with the following properties:

a. Minimum grab tensile strength (TF 25 #1/ASTM D 4632), 180 pounds.
b. Minimum Puncture (TF 25 #4/ASTM D 3787), 75 psi in the weakest direction.
c. Apparent opening sieve size of a minimum 40 and maximum 80 (U.S. Sieve Size).
d. Minimum Trapezoidal tear strength (TF 25 #2/ASTM D 4533), 50 pounds.

2.1.3.8 Hydraulic Mulch

Hydraulic mulch shall be made of 100 percent virgin aspen wood fibers. Wood shall be naturally air-dried to a moisture content of 10.0 percent, plus or minus 3.0 percent. A minimum of 50 percent of the fibers shall be equal to or greater than 0.15 inch in length and a minimum of 75 percent of the fibers shall be retained on a 28 mesh screen. No reprocessed paper fibers shall be included in the hydraulic mulch. Hydraulic mulch shall have the following mixture characteristics:

CHARACTERISTIC (typical)	VALUE
pH	5.4 $\pm$ 0.1
Organic Matter (oven dried basis)	99.3 percent within $\pm$ 0.2
Inorganic Ash (oven dried basis)	0.7 percent within $\pm$ 0.2
Water Holding Capacity	1,401 percent

2.1.3.9 Tackifier

Organic tackifier shall be derived from natural organic plant sources containing no growth or germination inhibiting materials. Inorganic tackifier shall be a blended polyacrylimide material or equivalent approved by Engineer. When combined with fiber and water it shall have the property of even dispersion and suspension. After it has dried, the binder shall not dissolve or disperse upon rewetting.

2.1.3.10 Dye

Dye shall be a water-activated, green color. Dye shall be pre-packaged in water dissolvable packets in the hydraulic mulch.

2.1.4 GEOTEXTILE FABRICS

Geotextile fabrics shall be woven of polypropylene filaments formed into a stable network so that the filaments retain their relative position to each other. Sewn seams shall have strength equal to or greater than the geotextile itself. Fabric shall be installed to withstand maximum velocity flows as recommended by the manufacturer.

The geotextile shall conform to the following minimum average roll values:

Property	Performance	Test Method
Weight		ASTM D 3776
Thickness		ASTM D 1777
Permeability		ASTM D 4491
Abrasion Resistance,	58 percent X	
Type (percent strength	81 percent	ASTM D 3884
retained)		
Tensile Grab Strength	1,467 N X 1, 933N	ASTM D 4632
Grab Elongation	15percent X 20 percent	ASTM D 4632
Burst Strength	5,510 kN/m^2	ASTM D 3787
Puncture Strength	733 N	ASTM D 4833
Trapezoid Tear	533 N X 533 N	ASTM D 4533
Apparent Opening Size	40 US Std Sieve	ASTM D 4751
UV Resistance @ 500 hr	90 percent	ASTM D 4355

2.1.5 EROSION CONTROL BLANKETS

Requirements for Erosion Control Blankets are specified in Specification Section 02930 BANK REVEGETATION AND BIOENGINEERING TREATMENTS.

2.1.5.1 Staking

Stakes shall be 100% biodegradable manufactured from recycled plastic or wood and shall be designed to safely and effectively secure erosion control blankets for temporary or permanent applications. The biodegradable stake shall be fully degradable by biological activity within a reasonable time frame. The bio-plastic resin used in production of the biodegradable stake shall consist of polylactide, a natural, completely biodegradable substance derived from renewable agricultural resources. The biodegradable stake must exhibit ample rigidity to enable being driven into hard ground, with sufficient flexibility to resist shattering. The biodegradable stake shall have serrations on the leg to increase resistance to pull-out from the soil. The biodegradable stake shall be at least 12-inches in length or as recommended by the manufacturer of the net or matting with which the stakes are to be used.

2.1.6 SYNTHETIC GRID AND SHEET SYSTEMS

Synthetic grid and sheet systems shall be formed of recycled plastic in accordance with Paragraph RECYCLED PLASTICS and have interlocking components to form a uniform under-layment or strata to receive fill.

2.1.7 COMPONENTS FOR SILT FENCES

2.1.7.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements, listed in TABLE 02370-1.

TABLE 02370-1 - FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile Elongation (%)	ASTM D 4632	100 lb. min. 30 % max.
Trapezoid Tear	ASTM D 4533	55 lb. min
Permittivity	ASTM D 4491	0.2 sec to1
AOS (U.S. Std Sieve)	ASTM D 4751	20 to 100

2.1.7.2 Silt Fence Stakes and Posts

The Excavation Subcontractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5-feet.

2.1.7.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Excavation Subcontractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.2 COMPONENTS FOR TEMPORARY EROSION CONTROL AROUND SHEET PILE CONTAINMENT CELLS

Riprap and Articulated concrete mats will be provided by the General Contractor.

2.2.1 C3 Riprap

Only quarried stone shall be used. Stone shall be hard, durable, angular in shape, resistant to weathering, and shall conform to the table. Material shall be well-graded and free of overburden, spoil, shale, and organic material. The required gradation is shown in the table below:

Limits of Stone Weight in lb., minimum density of 155 pcf	**Percent Lighter by Weight**
110 – 309 (max)	100
55 – 92	50
17(min) - 46	15

This material is C3 Riprap and the testing requirements described in Section 02300 EARTHWORK apply.

2.2.2 Articulated Concrete Mat Components

2.2.2.1 Articulated Concrete Block Mats

Use Armortec ArmorFlex Articulating Concrete Block Revetment System with 30s concrete blocks, or an equivalent subject to the approval of the Engineer.

Concrete Block Specifications are listed in the table below:

Concrete block class: 30s Open cell Block dimensions: Length: 13.0 inches Width: 11.6 inches Height: 4.75 inches Gross Area: ~ 1 square foot Block weight: 31 to 36 lb Open area: 20%
Minimum Physical Requirements: Compressive strength of 4,000 psi Max absorption of 12 pcf Specific weight of 130 to 150 pcf

The concrete blocks will be linked together with flexible cable that runs through the entire block.

2.2.2.2 Geotextile

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Armortec 70/20, or a suitable alternative subject to the approval of the Engineer shall be used. The filter fabric shall meet the following requirements, listed in the TABLE 02370-2.

TABLE 02370-2 - FILTER FABRIC FOR ARTICULATED CONCRETE BLOCK MAT SYSTEM

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile Elongation (%)	ASTM D 4632	275 lb. min. 30 % max.
Trapezoid Tear	ASTM D 4533	105 lb. min
Permittivity	ASTM D 4491	0.506 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	50

2.3 LOCAL EROSION AREAS PROTECTION

Local erosion areas protection backfill includes placing C3 Riprap in locations as required by the Engineer. When directed by the Contracting Officer to place the erosion protection as a temporary measure, the Excavation Contractor shall first place geotextile over the area to be protected, followed by placing the C3 riprap over the geotextile.

PART 3 EXECUTION

3.1 CONDITIONS

The Excavation Subcontractor shall submit a construction work sequence schedule in the Excavation Plan referenced in Section 02300 EARTHWORK. The work schedule shall coordinate the timing of land disturbing activities with the provision of erosion control measures. Erosion control operations shall be performed under favorable weather conditions; when excessive moisture, frozen ground, or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, a revised construction schedule shall be submitted for approval. Erosion control materials shall not be applied in adverse weather conditions (e.g., during storms, when ground is frozen, etc.), which could affect their proper installation and performance.

3.2 SITE PREPARATION

3.2.1 Existing Grade

The Excavation Subcontractor shall verify that existing grades are as indicated on the drawings; prior to the commencement of the work. The location of underground utilities and

facilities in the area of the work shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Excavation Subcontractor's expense.

3.2.2 Layout

Erosion control material locations may be adjusted to meet field conditions. When soil tests result in unacceptable particle sizes, a shop drawing shall be submitted indicating the corrective measures.

3.2.3 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the drip-line. Damage to existing trees, shrubs, and plant beds shall be mitigated by the Excavation Subcontractor at no additional cost to the Government. Damage shall be assessed by a state-certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

3.3 EXECUTION

3.3.1 RESTORED RIVERBANK EROSION PROTECTION

3.3.1.1 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones, or other foreign matter. Vehicles shall not be permitted directly on the blankets.

3.3.1.2 Installation of Silt Fences

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6-inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Engineer.

3.3.1.3 Installation of Straw Bales

Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), 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. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

3.3.1.4 Mulch Installation

Mulch shall be installed in areas indicated by the Engineer. Mulch shall be applied evenly at a uniform coverage thickness of approximately 3 inches.

3.3.1.5 Non-Hydraulic Mulch Installation

Mulch shall be applied in the areas indicated. Straw or hay mulch shall be applied evenly at a rate of 2 tons per acre. Wood chips shall be applied at a rate of 6 tons per acre. If wood chips are used, mulch application must include 10 pounds of nitrogen per ton of wood chips in addition to other fertilizer requirements. The mulch shall be anchored by application of a commercially available tackifier at the rate recommended by the manufacturer, a mechanical anchor, or mulch netting.

3.3.1.6 Mechanical Anchor

Mechanical anchor shall be a V-type wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

3.3.1.7 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

3.3.1.8 Asphalt Adhesive-Coated Mulch

Hay or straw mulch may be spread simultaneously with asphalt adhesive applied at a rate between 10 to 13 gallons per 1,000 square feet, using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly over the surface. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.1.9 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydraulic mulch operation.

3.3.1.10 Hydraulic Mulch Application

a) Unseeded Area

Hydraulic mulch shall be installed as indicated and in accordance with manufacturer's recommendations. Hydraulic mulch shall be mixed with water at the rate recommended by the manufacturer for the area to be covered. Mixing shall be done in equipment manufactured specifically for hydraulic mulching work, including an agitator in the mixing tank to keep the mulch evenly disbursed. Hydraulic mulch applications shall be anchored by application of a commercially available tackifier at the rate recommended by the manufacturer.

b) Seeded Area

Hydraulic mulch shall be applied evenly at the rate of 1.5 tons per acre or as recommended by the manufacturer. For hydraulically seeded areas, mulch shall be applied at a rate of 1 ton per acre with the seed and fertilizer, and at a rate of 0.5 tons per acre in the second application of mulch only. Hydraulic mulch applications shall be anchored by application of a commercially available tackifier at the rate recommended by the manufacturer.

3.3.1.11 Erosion Control Blankets

a. Erosion control blankets shall be installed as indicated and in accordance with manufacturer's recommendations.

b. Erosion control blankets shall be oriented in vertical strips and anchored with staples, as indicated. Adjacent strips shall be abutted to allow for installation of a common row of staples. Horizontal joints between erosion control blankets shall be overlapped sufficiently to accommodate a common row of staples with the uphill end on top.

c. Where exposed to overland sheet flow, a trench shall be located at the uphill termination. The erosion control blanket shall be stapled to the bottom of the trench. Backfill and compact the trench as required.

d. Where terminating in a channel containing an installed blanket, the erosion control blanket shall overlap installed blanket sufficiently to accommodate a common row of staples.

3.3.2 STORMWATER DAMAGE PREVENTION MEASURES, MONITORING, AND SITE RESTORATION

3.3.2.1 Preparation for Storm Events

The Excavation Subcontractor shall perform the following duties to prepare for storm events to minimize the potential for damage to the site, installations, equipment, and appurtenances:

a. Provide necessary instrumentation and personnel to monitor rainfall and flow in the river.

b. Monitor 72-hour weather forecasts from a qualified private firm, or from a governmental agency that provides weather forecast services (e.g., weather forecasts available through the National Weather Service [NWS] from the Pittsfield Municipal Airport) to aid in determining that a flood is likely to occur.

c. Monitor river stage twice daily at a minimum, at the beginning and end of each day, using the USGS 01197000 East Branch Housatonic River at Coltsville, MA gage station by (a) obtaining provisional real-time stream flow data from the USGS web site [http://water.usgs.gov/ma/nwis/uv?01197000]; and/or (b) by contacting the USGS office in Northboro, MA at (508) 490-5058. During times of high flow (i.e., during and after storms and snowmelt), stage shall be monitored every 4 hours at a minimum.

d. Implement appropriate flood contingency actions, as described in the Storm Damage and High Flow Damage Prevention Plan to minimize damage and construction delays.

e. Restore the active work area following the flood.

Note: The Excavation Subcontractor will need to monitor rainfall and river flow during the normal work week, and also during times not included in the normal work week (e.g., evenings, weekends, holidays).

3.3.2.2 Stormwater Damage Prevention Measures

Elements of the design are specifically intended to maintain the site in a condition that minimizes the negative impacts of flooding the active in-river work area. These design elements include setting the elevation of the top of the sheet pile wall at the downstream end of the work area at least 12 inches lower than the top of the upstream and center-line sheet pile wall. This will reduce high-energy turbulent flows within the work area by forcing water to flood the work area from the downstream end first.

In addition to the specific design elements, the Excavation Subcontractor shall observe the following minimum practices:

a. Remove all equipment from the in-river work area and any area subject to flooding prior to an expected flood.

b. Maintain a clean work area. Do not store material or equipment that may be damaged or lost during a flood within the in-river work area.

c. When the work, including stormwater damage prevention and/or repair, cannot proceed because of stormwater and/or high flows, the Excavation Subcontractor shall notify the General Contractor. If the General Contractor and Engineer agree that the work cannot proceed, they will approve Stand-by status for the Excavation Subcontractor. Stand-by status shall not apply to normally occurring seasonal high river flows associated with precipitation and/or snowmelt, nor shall it apply to prolonged periods of precipitation that significantly exceed seasonal averages.

3.3.2.3 Monitoring to Anticipate a Flood Event

The Excavation Subcontractor shall monitor rainfall and river flow to determine whether a flood is likely to occur. The Excavation Subcontractor shall begin preparing the work area to be inundated by implementing the actions identified above if directed to do so by the Government or the General Contractor, or if the following condition is met:

a. The water level rises to within 6 inches of the top of the lowest sheet pile wall while it continues to rain or during a time where the snow pack is melting.

3.3.2.4 Preparing The Project For A Flood Event

Once the Excavation Subcontractor has determined that a flood event is likely, there is a limited period of time in which to prepare for the flood. Depending on the intensity of rainfall, preparation time may be as little as a few hours. If any of the alert conditions identified in Paragraph Monitoring to Anticipate a Flood Event is met, the Excavation Subcontractor shall immediately implement the following actions:

a. Remove all equipment and materials from all areas that may be subject to damage or loss during a flood event.

b. Upon approval of the Engineer, cease dewatering the active in-river work area and allow it to flood from within before the rising floodwaters overtop the sheet pile walls.

c. Inform the General Contractor in the event further work cannot proceed.

3.3.2.5 Restoring the Site after a Flood Event

After a flood event, the Excavation Subcontractor shall inspect the work area to identify and assess the extent of damage. The integrity of the sheet pile wall will be evaluated prior to dewatering the work area. Dewatering of the work area will be necessary to complete the inspection of the riverbed within the work area. The inspection shall include the following specific observations:

a. Inspection of the sheet pile walls and surrounding soil/sediment to determine if they have been deformed, weakened, are potentially compromised due to scour near the base of the wall, or rendered ineffective as a result of the flood.

b. Inspection of the riverbank on both sides of the river to document the extent of scour or erosion that occurred adjacent to or within the active work area during the flood event.

c. Inspection, or if deemed necessary by the Contracting Officer, a bathymetric survey of the riverbed within the active work area to determine if scour or deposition has affected the results of excavation accomplished prior to the flood event.

Upon completion of the inspection, deposited sediment will be excavated from the work area, and scoured areas within the work area will be backfilled as directed subject to the approval of the Engineer.

When conditions prevail that do not allow the Excavation Subcontractor to access the work area and perform excavation, backfill, flood damage prevention, and/or flood damage correction activities, the Excavation Subcontractor shall go on Stand-by status, subject to the approval of the Engineer.

The Excavation Subcontractor may resume excavation work after the work area has been dewatered, resurveyed by the General Contractor if necessary, and any necessary repairs have been made to ensure the integrity of the sheet pile walls.

3.3.3 TEMPORARY EROSION PROTECTION FOR AREAS AROUND THE CONTAINMENT CELLS

Depending upon expected seasonal flow conditions at the time of Containment Cell construction and during work in the Containment Cell, temporary erosion protection controls may be constructed in accord with the options described below, or a suitable alternative may be used, subject to the approval of the Engineer and the Contracting Officer.

3.3.3.1 Installation and Removal of Riprap around Containment Cells

Upon specific direction from the Engineer on a cell-by-cell basis, the Excavation Subcontractor shall place riprap around the cells as shown on the plans, prior to completing the sheet pile enclosure and constricting the river. The riprap shall be placed in such a way and from a drop height to minimize disturbance of riverbank soil and riverbed sediment, and

to prevent damaging the sheet pile walls. Handwork is expected to be necessary to place the riprap against the sheet pile. Riprap may be moved to allow for installation or removal of adjacent sheet pile enclosures.

The riprap located within the river shall be removed after the adjacent sheet pile cell is installed, from within the newly constructed sheet pile. After the riprap is removed, it shall be placed in trucks provided by the General Contractor for transport to the decontamination area and pressure-washing to remove adhered soil and sediment. The Excavation Subcontractor shall reuse the riprap, after inspection and approval by the Engineer.

3.3.3.2 Installation and Removal of Articulated Concrete Block Mats around Containment Cells

Upon specific direction from the Engineer on a cell-by-cell basis, the Excavation Subcontractor shall place articulated concrete block mats around the cells as shown on the plans, within 24 hours of completing the sheet pile enclosure. The Excavation Subcontractor shall first place geotextile over the existing ground surface. The Excavation Subcontractor shall then place the mats on the geotextile, using a lifting beam that lifts the mats from both ends, per the manufacturer's instructions, minimizing disturbance of riverbank soil and riverbed sediment, and preventing damage to the sheet pile walls. Temporary anchorage can be accomplished by driving wooden stakes along the top of the mat.

The mats may be moved to allow for installation or removal of adjacent sheet pile enclosures. The mats shall be lifted from both ends, using the lifting beam. After the mats are removed, they shall be placed in trucks provided by the General Contractor for transports to the decontamination area and pressure-washing to remove adhered soil and sediment. The Excavation Subcontractor shall reuse the mats, after inspection and approval by the Engineer.

3.3.4 Temporary Erosion Protection for Areas of Construction-Related Riverbank Overtopping

These areas shall be identified in the field by the General Contractor, and include areas on the riverbank opposite the Containment Cells where flooding may occur due to increased local stage associated with the constriction to river flow posed by the Containment Cell.

The General Contractor shall place and maintain sand bags in these areas to an elevation equal to the surrounding topography to minimize overtopping due to local increases in river stage.

3.3.5 Erosion Protection for Areas Eroded by Overland Flow

Prior to preparing the Request for Bid from the Excavation Subcontractor, the General Contractor shall identify these areas. The Excavation Subcontractor shall place quarry spalls in these areas to restore the elevation of these areas to approximate the surrounding topography, and to provide increased resistance to future erosion.

3.4 CLEANUP

Excess material, debris, and waste materials shall be disposed of off site at an approved landfill or recycling center. Adjacent paved areas shall be cleared. Immediately upon completion of the installation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed. Signage shall be in accordance with the specifications.

3.5 WATERING SEED

Watering shall be started immediately after installing erosion control blankets. Water shall be applied to supplement rainfall at a sufficient rate to ensure 1½ inches of rainfall equivalent per week and to maintain moist soil conditions to a minimum 1-inch depth. Runoff and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.6 MAINTENANCE RECORD

A record shall be furnished describing the maintenance work performed, record of measurements and findings for product failure, recommendations for repair, and products replaced.

3.6.1 Maintenance

The Excavation Subcontractor shall maintain erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness and by repair of erosion and sediment control measures and other protective measures. Maintenance shall include protecting embankments and ditches from surface erosion and protecting installed areas from traffic.

The Excavation Subcontractor shall maintain the temporary and permanent vegetation by restoration of destroyed vegetative cover. Maintenance shall include eradicating weeds and protecting installed areas from traffic.

The following procedures shall be followed to maintain the protective measures.

3.6.1.1 Maintenance Instructions

Written instructions containing drawings and other necessary information shall be furnished, describing the care of the installed material; including, when and where maintenance should occur, and the procedures for material replacement.

3.6.1.2 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Material not meeting the required performance as a result of placement, seaming or patching shall be removed from the site. The Excavation Subcontractor shall replace the unacceptable material at no additional cost to the General Contractor.

3.6.1.3 Silt Fence Maintenance

Silt fences shall be inspected in accordance with Paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall receive erosion control and shall be seeded as directed by the Engineer.

3.6.1.4 Straw Bale Maintenance

Straw bale barriers shall be inspected in accordance with Paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs, and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with the specifications.

3.6.1.5 Rock Outfall Protection Maintenance

Rock outfall protection shall be inspected in accordance with Paragraph INSPECTIONS. Close attention shall be paid to erosion of the quarry spalls during dewatering of containment cells and after every rainfall event. If outlet protection fails, the Excavation Subcontractor shall repair the failed section and replace the Modified Rockfill with an 18-inch-thick layer of 12-inch riprap, as directed by the Engineer.

3.7 SATISFACTORY STAND OF GRASS PLANTS

When erosion control blankets are installed, the grass plants shall be evaluated for species and health when the grass plants are a minimum 1-inch high. A satisfactory stand of grass plants from the revegetation mat area shall be a minimum 10 grass plants per square foot. Grass plant areas will be accepted only upon attainment of a reasonably thick, uniform stand of the grasses and herbaceous plants from the specified seed mix and from volunteer growth, free from sizable thin or bare areas.

3.8 INSPECTIONS

3.8.1 General

The Excavation Subcontractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inch or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

3.8.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Environmental Protection Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of off-site sediment tracking.

3.8.3 Inspection Reports

For each inspection conducted, the Excavation Subcontractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Environmental Protection Plan, maintenance performed, and actions taken. The report shall be furnished to the General Contractor within 24 hours of the inspection as a part of the Excavation Subcontractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.8.4 Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

On the first working day of each month the Excavation Subcontractor shall complete, sign, and submit a monthly Inspection Report and Certification Form for Erosion and Sediment Controls to the Engineer. The report shall include the inspection reports from Paragraph Inspection Reports and include a description of the damage, corrective measures, and actions taken to the erosion and sediment control measures during the previous month.

END OF SECTION

SECTION 02371

EROSION CONTROL – SUPPORT AREAS, ACCESS ROADS, AND STAGING AREAS

PART 1 GENERAL

1.1 SCOPE

a. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion control work indicated on the Drawings, as specified or as directed by the Government.

1.2 PROJECT CONDITIONS

a. Earthmoving activities shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.

b. The General Contractor shall design, implement and maintain erosion and sedimentation control measures which effectively prevent accelerated erosion and sedimentation.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Out of River Erosion and Sedimentation Control Plan; G

a. The Government reserves the option to require that the General Contractor submit an erosion and sedimentation control plan for staging and support areas, prepared by a person trained and experienced in erosion and sedimentation control methods and techniques, to the Government for approval. The absence of the Government's requirement for submittal of an erosion and sedimentation control plan shall not be interpreted as a dismissal of the other conditions and requirements of this section.

1.4 GENERAL METHODOLOGY

a. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:

1. Topographic features of the Project area.

2. Types, depth, slope and areal extent of the soils.

3. Proposed alteration of the area.

4. Amount of run-off from the Project area and the upstream watershed area.

5. Staging of earthmoving activities.

6. Temporary control measures and facilities for use during earthmoving and soil handling and stockpiling.

7. Permanent control measures and facilities for long term protection.

8. Maintenance program for the staging and support areas including disposal of materials removed from the staging areas or Project area.

PART 2 PRODUCTS

2.1 SEDIMENT BARRIERS

a. Sediment barriers shall be hay or straw bales, geotextile fabric, stone or other approved materials that will prevent sedimentation.

2.2 MULCH

a. Mulch shall be in accordance with the requirements of Table 1 attached to this section.

PART 3 EXECUTION

3.1 DIVERSION TERRACES

a. Diversion terraces shall be used as a temporary measure installed on the uphill side of the disturbed areas to divert surface runoff away from unstabilized slopes, and the Project area.

b. Recommended Minimum Dimensions:

Height	1.5 feet
Top Width	2.0 feet
Side Slopes	2:1 or flatter
Material	Soil

3.2 INTERCEPTOR CHANNELS

a. Interceptor channels shall be used across disturbed areas where the slope is running parallel to the direction of trenches.

b. Interceptor channels reduce erosion by intercepting storm runoff and diverting it to outlets on the lower side of the disturbed area where it can be disposed of having minimum erosion impact.

c. Recommended Dimensions and Materials:

Depth	0.5 feet
Width	2.0 - 4.0 feet
Side Slopes	2:1 or flatter
Spacing	As required
Material	Stable on-site material

3.3 TRENCH BARRIERS

a. Trench barriers shall be used when the slope exceeds 15 percent or when the Government deems necessary.

b. Trench barriers shall be earth-filled sacks or piled stone, stacked to the top of the trench after installation of the sewer and prior to backfill, if backfill is delayed.

c. Trench barriers shall act as an erosion check by preventing the washout of the trench.

d. Recommended Dimensions and Materials:

Height	To top of trench
Spacing	Approximately every 150 ft.
Material	Earth-filled sacks or piled stones

3.4 SEDIMENT BARRIERS

a. Sediment barriers shall be used at storm drain inlets; across minor swales and ditches; and at other applications where the structure is of a temporary nature and structural strength is not required. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering storm runoff.

b. Recommended Materials and Dimensions

1. Stone:

Height	1.5 - 2.0 feet uniform top elevation)
Top Width	3.0 - 5.0 feet
Side Slope	3:1 or flatter
Required Cross-Sectional area:	20 SF/Tributary Acre
Material:	Coarse rock or stone

2. Geotextile Fabrics

a. Supported by stakes/posts as required and further supported by a netting of industrial polypropylene, if required.

b. Height: As required to restrain sediment.

c. Fabric: Mirafi 100 or equal.

d. Toe of fabric to be buried six inches in native soil.

3. Hay or Straw Bales:

a. Bales should be bound with twine.

b. Bales should be anchored to the ground with fence posts, wood pickets or any naturally decomposable material. Two anchors per bale are required.

c. Bales shall be installed so that runoff cannot escape freely under bales.

d.

Height	1.5 feet
Width	1.5 - 3.0 feet
Cross Sectional area:	50 SF/Tributary Acre

3.5 TEMPORARY STREAM CROSSINGS

a. Temporary stream crossings shall be used at locations where construction equipment crosses a stream, allowing these vehicles to cross the stream with minimal disturbance of the stream bed. Temporary stream crossings shall consist of an embankment of rock, or soil with riprap, with a pipe or combination of pipes placed on the stream bed to minimize interruption of flow.

b. Recommended Dimensions and Materials:

Height	Greater than or equal to the stream banks
Side Slopes	2:1 or steeper
Material	Rock or compacted soil with rock rip-rapped.
Other	Installation of energy dissipaters at the outflow of the pipes to prevent erosion of stream bottom.

3.6 MULCH

a. Used alone or in conjunction with other structural or vegetative erosion control measure, mulch is applied on any disturbed area which is subject to erosion, for protection of disturbed soil or newly reseeded areas.

b. Recommended Methods and Materials:

Material	Hay, straw, woodchips.
Methods	Spread by hand tools on small plots and by mechanical blower on larger areas. Tacked by passing a tracked construction vehicle over the mulched area.
Rates	See Table 1.

TABLE 1

MULCH MATERIALS, RATES AND USES

Mulch Material	Quality Standards	Application Rates		Depth of Application	Remarks
		per 1,000 sq. ft	Per acre		
Straw or Hay	Air-dried. Free from coarse materials	75-100 lbs. 2-3 bales	1.5-2.5 tons 90-120 bales	Lightly cover 75 to 90% of surface	Use straw where mulch effect is to be maintained for more than 3 months. Subject to wind blowing unless kept moist or tied down. Most common and widely used mulching material. Good for erosion control in critical areas.
Wood Chips	Green or air-dried.	500-900 lbs.	10-20 tons	2"-7"	If intensive foot or vehicle traffic is anticipated, the application rate may be increased. Resistant to wind blowing. Decomposes slowly.

END OF SECTION

SECTION 02372

CONTINGENCY PLAN SPECIFICATION FOR MANAGING NAPL CONTAMINATION ENCOUNTERED DURING CONSTRUCTION ACTIVITIES

PART 1 GENERAL

The objectives of this contingency plan include identifying measures to be implemented in the event non-aqueous phase liquids (NAPL) are encountered during construction. Short-term measures are included to manage NAPL releases, limit further migration of NAPL, and to restore the work area to the extent practicable to allow the work to proceed.

1.1 REFERENCES

PHYSICAL PROCESSES AFFECTING THE MOVEMENT AND SPREADING OF OILS IN INLAND WATERS, R. Overstreet and J.A. Galt, NOAA / Hazardous Materials Response and Assessment Division Seattle, Washington HAZMAT Report 95-7, September 1995, *prepared for* The U.S. Environmental Protection Agency, Region V Chicago, Illinois

United States Coast Guard Incident Management Handbook, U.S. Coast Guard COMTDPUB P3120.17

Method for the Determination of Extractable Petroleum Hydrocarbons (EPH), FINAL Laboratory Standard Operating Procedure (SOP), January 1998, Massachusetts Department of Environmental Protection.

1.2 POTENTIAL AREAS OF CONCERN

The Excavation Subcontractor shall be prepared to manage NAPL wherever encountered. Areas of concern where NAPL may be encountered include the former oxbows along the river between the Lyman and Elm Street bridges. In this area, 52 borings were advanced approximately 10 feet below the river bottom at roughly 50-foot spacing. Information on these explorations and existing conditions available to the Excavation Subcontractor includes the following:

a. Final Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River. Roy F. Weston, Inc. July 2000. GEP4-071400-AACY.

b. Final Addendum to the Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River. Roy F. Weston, Inc. October 2000. GE-092800-AADP.

Based on existing sampling data, the potential areas of concern for NAPL deposits most likely include the riverbanks. However, based on previous remediation work upstream of the project site, the potential for NAPL deposits located beneath the sediments in the river bed also exists. The areas where NAPL may be present include the following:

a. Station 501+50 to 503+50 on the north bank of the river. NAPL was observed in the boring logs.
b. Station 503+50 to 507+00 on the north bank of the river. Hydrocarbon odor was detected and occasional sheens were observed in the boring logs.
c. Station 509+50 to 512+00 on the west bank of the river. Hydrocarbon odor was detected in the boring logs.
d. Station 514+00 to 517+00 on the east and southern banks of the river. Hydrocarbon odor was detected and occasional sheens were observed in the boring logs.

Consistent with standards of practice for subsurface exploration programs, the information included in the EE/CA and EE/CA Addendum reports is not expected to comprehensively and completely identify all locations where NAPL or NAPL source areas may be encountered.

1.3 CRITERIA FOR NAPL IDENTIFICATION

NAPL will be identified on the basis of visual observation of free phase liquid, or associated with seepage in the work area. The General Contractor shall confirm the NAPL by collecting a sample of the material and submitting it to an analytical laboratory certified by the Massachusetts Department of Environmental Protection (MADEP) for extractable petroleum hydrocarbons (EPH) and PCB analyses.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

NAPL Management Plan; G

a. Notification requirements.
b. Plan for isolating NAPL where encountered, including a list and details for equipment and materials planned for use, and details for installing and removing structural units to isolate and contain NAPL.

c. Minimize NAPL conveyed to treatment system.

d. On-site management of NAPL sediment and soils.

e. On-site management of collected NAPL, equipment, and materials.

1.5 DESCRIPTION OF WORK

1.5.1 NAPL Isolation and Limiting NAPL Releases

In general, sheet pile shall be used to isolate NAPL from the work area, allowing work within the larger containment cell to proceed to the extent practicable. A cell may be divided into smaller cells to further isolate NAPL. For smaller releases of NAPL, sorbent materials and/or sandbags may be used to limit the release extent prior to excavation of NAPL-contaminated materials. The means and methods for NAPL management are subject to the approval of the Engineer. The primary objective of the work associated with NAPL management is to first limit the release of NAPL, and then to manage and isolate the NAPL release such that the work can proceed.

Sheet pile isolation units shall include all work required to furnish all materials, labor, and equipment for installation, dewatering, maintenance, use and removal of the sheet pile. Dewatering may be necessary to remove accumulated water from within the sheet pile isolation units. Dewatering includes designing, furnishing, installing, operating, maintaining, and removing all necessary wells, well points, pumps, sumps, pipelines, filters, sedimentation basins, and other equipment of collection, removal, and disposal of surfacewater, and groundwater within each containment cell as required to complete the work. Dewatering includes piping all removed water from the containment cells to the treatment system, after NAPL has been removed using absorbents, skimmers, etc.

No payment shall be made to the Excavation Subcontractor for delays or inconvenience, or any extra work, in the event the Excavation Subcontractor dewatering system does not work adequately or does not meet the specified requirements.

1.5.2 Related Labor, Equipment, and Materials

Labor, materials, and equipment such as skimmers, sorbents, sealants, and any other equipment and materials used by the Contractor to manage NAPL shall be provided in the NAPL Management Plan.

1.5.3 Excavation and Transport

The Excavation Subcontractor shall excavate NAPL-contaminated soil and sediment and carefully load the material into trucks for transport to the on-site stockpile area. The General Contractor will subsequently perform off-site transport, and off-site disposal of excavated NAPL-contaminated soil and sediment.

PART 2 PRODUCTS

The Excavation Subcontractor shall maintain a sufficient supply of materials and equipment for NAPL management, including, but not limited to, sheet pile and associated connectors, sorbent materials of different types (e.g., pads, sheets, booms), piping, skimmers, and containment booms. A list of equipment and materials expected to be stored on site shall be included in the NAPL Management Plan.

PART 3 EXECUTION

3.1 RESPONSIBILITIES

The Excavation Subcontractor is responsible for immediately reporting the observation of NAPL to the Engineer. The Excavation Subcontractor may then, subject to the approval of the Engineer, implement the NAPL Management Plan to isolate and contain NAPL. The Contracting Officer and the Engineer will develop a long-term plan to incorporate NAPL remediation in the project.

3.2 NAPL ISOLATION AND CONTAINMENT

NAPL may be encountered in the river bank subsurface and in the river bed subsurface. In general, the observation of NAPL in these respective areas shall require isolation of the area using appropriate structural means to minimize migration of NAPL to other portions of the work area within the containment cell. Excavation beyond the limits shown on the Plans is likely to be required and is subject to the approval of the Engineer. Groundwater shall be removed from the excavation, after NAPL in the groundwater has been contained using sorbents, skimmers, or other methods, subject to the approval of the Engineer.

Visible NAPL shall be removed from the groundwater to the extent practicable before the groundwater is conveyed to the treatment system. Conveyance to the treatment system shall be in accord with Section 02464 SHEET PILE CONTAINMENT CELL CONSTRUCTION AND DEWATERING with additional steps taken to minimize transport of NAPL to the treatment system.

3.3 EXCAVATION AND TRANSPORT OF NAPL-CONTAMINATED SOIL AND SEDIMENT

Excavation and transport shall include excavating and transport to the on-site stockpile area of materials determined unsuitable due to NAPL contamination after notification is provided to the Engineer by the Excavation Subcontractor. The Excavation Subcontractor shall not proceed with the excavation and transport of this material until the Engineer has classified the materials and has taken samples and field measurements as required. Failure on the part of the Excavation Subcontractor to uncover such material, notify the Engineer, and allow ample time for classification and measurement of such material will cause the forfeiture of

the Excavation Subcontractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

3.4 ON-SITE MANAGEMENT OF NAPL-CONTAMINATED EQUIPMENT, MATERIALS, SEDIMENT, AND SOIL

NAPL-contaminated materials that will require management include equipment that contacts NAPL-contaminated sediment and soil, excavated sediment, excavated soil, materials used to absorb NAPL, and NAPL collected using mechanical means.

The Excavation Subcontractor will carefully load NAPL-contaminated materials and equipment into trucks for transport to the on-site stockpile area. Materials used to absorb NAPL, and collected NAPL shall be placed in storage that are approved for use for containing liquid oily wastes and transported to the on-site stockpile area. The General Contractor will transport. NAPL-contaminated materials from the site for off-site disposal.

Others shall clean the contaminated equipment in the on-site stockpile area. After inspection and approval by the Engineer, the equipment may be returned to the work area, or stored temporarily on site.

The General Contractor will construct and maintain a separate NAPL-impacted soil and sediment stockpile area on the GE property. Off-site transport and disposal of NAPL-contaminated sediment and soil will be arranged by the General Contractor.

3.5 STAND-BY TIME

When the work, including NAPL Management, cannot proceed because the presence of NAPL impedes the work, the Excavation Subcontractor shall notify the General Contractor. If the General Contractor and Contracting Officer agree that the work cannot proceed, they will approve Stand-by status for the Excavation Subcontractor, to be paid on the basis of a change order provided by the Excavation Subcontractor. Stand-by status shall not apply when work can proceed in other areas within the Containment Cell and outside the NAPL-containment area, and/or in areas outside the Containment Cell.

END OF SECTION

SECTION 02464

SHEET PILE CONTAINMENT CELL CONSTRUCTION AND DEWATERING

PART 1 GENERAL

Work covered by this section includes furnishing, installing, dewatering, maintaining, and removing sheet pile containment cells (or "cofferdams") as shown on the drawings. The containment cells shall be constructed and dewatered to enable remediation work within the cell and bank restoration construction along the riverbank to be accomplished in dry conditions.

Dewatering shall be accomplished with sumps and pumps for accumulated ground water and surface water leakage, and sheet pile isolation units, sumps, and pumps for stormwater outfalls that discharge to the containment cells, and/or such other means selected and designed by the Excavation Subcontractor and acceptable to the Engineer. Excavation Subcontractor shall be solely responsible for all measures needed to remove water and maintain dry conditions inside each cell for the duration of work within each containment cell so that the work is not impeded. Dewatering shall include pumping water from each cell to discharge to the river or the water treatment system as specified. All dewatering activities are incidental to containment cell construction, with the exception of the management of stormwater entering excavation cells through swales, ditches, outfalls, etc. This item is a separate payment item as defined in the Section 01025 MEASUREMENT AND PAYMENT.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M	(2000) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 328/A 328M	(2000) Steel Sheet Piling
ASTM A 572/A 572M	(2000) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 690/A 690M	(1994) High-Strength Low-Alloy Steel H-Piles and Sheet Piling for Use in Marine Environments
ASTM A 857/A 857M	(1997) Steel Sheet Piling, Cold Formed, Light Gage

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Dewatering Plan

A dewatering plan shall be submitted as part of the Excavation Plan (see Section 02300 EARTHWORK) prior to the start of dewatering for each containment cell. The plan shall show the location of all pumps, sumps, pipelines, sediment filters, sedimentation basins, and other equipment necessary. Based on available information and observations made of the Removal Action being performed by GE in the half mile of the river just upstream of Lyman Street, a steady state flow rate of 300 gpm can be expected from typical size excavation cells. The plan shall include the locations of all stormwater outfalls that terminate within the limits of excavation, including the elevation of the outfall terminus. The plan shall include a list of the products to be used for dewatering, subject to the approval of the Engineer and the Government. The piping materials, route to discharge to the river, location of the outfalls and sheet pile isolation units around the outfall, and route to the water treatment system shall also be included in the plan. The plan shall include methods to minimize leakage of river water into the containment cells and to prevent the collection and discharge of suspended sediment to the treatment system. The plan may be modified and resubmitted as work proceeds in the event the Excavation Subcontractor elects to revise the work or materials described in the plan.

SD-02 Shop Drawings

Metal Sheet Piling

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions, properties, details, driving sequence, and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling.

SD-03 Containment Cell Plan

A plan shall be submitted prior to the start of driving sheets for each containment cell. The plan shall show the schedule for driving, proposed cell layout, sequence of pile installation, installing and removing temporary erosion control as specified in Section 02370 STORMWATER AND EROSION CONTROL: IN-RIVER WORK, and location of “Y”, “T” or “+” intersection piles. The plan may be modified and resubmitted as work proceeds in the event the Excavation Subcontractor elects to revise work described in the plan.

SD-06 Test Reports

PCB wipe sample results for sheet piles

1.3 SUBSURFACE DATA

Logs of test borings and observation wells are included in the Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River. Excavation Subcontractor shall use this information at his sole risk. The available information on subsurface conditions applies only to the locations of the borings. The subsurface conditions elsewhere on the site or during construction may be different, and should be considered in the development of plans for constructing and dewatering the sheet pile containment cells.

1.4 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be undamaged and shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities.

1.5 QUALITY ASSURANCE

All elements of the rigging equipment and system shall be in accordance with the general requirements of OSHA safety and health standards, health and safety requirements defined in this contract, and manufacturers recommendations. All aspects of work shall comply with OSHA regulations regarding commercial driving as contained in CFR 29, Sections 1910.401 through 1910.441.

Where OSHA or other project standards conflict with the contract drawings or specifications, the more stringent standard applies.

Excavation support systems shall allow unobstructed construction of structures and backfill material. Furnish sufficient lateral reaction to maintain stability of soil and adjacent structures. Pre-stress bracing system to predetermined loads until the necessary lateral reaction is produced, or by such other methods as may be necessary to control displacement of ground and movement of adjacent structures. Do not use existing structures to provide reaction against lateral pressure.

1.6 USE OF WATER TREATMENT SYSTEM

The water treatment system will be sized for 400 gpm capacity. Excavation Subcontractor shall adjust containment cell size or make other work modifications to avoid delivering water to the treatment system at any greater rate.

Excavation Subcontractor shall take reasonable care to prevent collecting and discharging water containing suspended sediment to the treatment system using methods identified in the Dewatering Plan.

PART 2 PRODUCTS

2.1 METAL SHEET PILING

The grade and type of metal sheet piling required are shown on the drawings. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. Standard measures shall be used to limit seepage through the interlocks. Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirement and the piling manufacturer's recommendations for fabricated sections.

Fabricated sections connecting sheet pile cells and adjacent arcs composed of pilings from different manufacturers shall be “Y”, “T” or “+” sections fabricated from the respective manufacturer's pilings. Fabricated tees, wyes and cross pieces shall be fabricated of piling sections with a minimum web thickness of 1/2 inch. Sheet piling shall be provided with standard pulling holes. Pulling holes located below Design Elevation shall be plugged temporarily to prevent infiltration of river water to the work area.

2.2 APPURTENANT METAL MATERIALS

Metal plates, shapes, bolts, nuts, rivets, and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and to the requirements specified.

2.3 DEWATERING SYSTEM

The dewatering system shall consist of pumps, sumps, pipelines, sediment filters, sedimentation basins, and other equipment necessary for the collection, removal, and disposal of surface water and groundwater within each containment cell. Dewatering shall be accomplished with sumps and pumps, and/or such other means selected and designed by the Excavation Subcontractor and acceptable to the Engineer.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

Requirements for material tests, workmanship, and other measures for quality assurance shall be as specified.

2.4.1 Pipeline Tests and Inspection

The Excavation Subcontractor shall test all piping prior to dewatering each containment cell under the direction of the Engineer. The Excavation Subcontractor shall initiate dewatering of each containment cell upon approval of the Engineer.

Piping shall be inspected in accordance with Paragraph INSPECTIONS. Close attention shall be paid to leakage of the pipes. The Excavation Subcontractor will conduct daily inspections of the piping system and necessary repairs shall be accomplished promptly at the direction of the Engineer. Damages caused by construction traffic or other activity must be

repaired before dewatering continues. When the piping is no longer required for the containment cell, the pipes shall be removed, transported to the decontamination area, and pressure-washed subject to the approval of the Engineer. After inspection and approval by the Engineer, the pipes shall be returned to the work area, or stored in a designated on-site area. The soil disturbed by the piping shall be seeded and mulched as directed by the Engineer in accordance with the specifications.

PART 3 EXECUTION

3.1 CONTAINMENT CELL INSTALLATION

Containment cells shall be installed in the sequence shown on the plans to reduce risk of contaminated sediment from being conveyed into and recontaminating an area that has already been remediated. This proposed sequence can be revised with Government approval. The sequence is summarized in the table below:

Cell 12	Cell 9	Cell 8	Cell 5A	Cell 5	Cell 4	Cell 3
Cell 11	Cell 10	Cell 7	Cell 6A	Cell 6	Cell 2	Cell 1

The cells are constructed in the same chronology as they are numbered, i.e., 1-2-3-4-5-5A-6-6A-7-8-9-10-11-12. A detailed proposed construction sequence is included in Appendix 02464-A. This detailed sequence can be revised with approval of the Engineer.

After contaminated sediment has been removed and a cell has been backfilled, dewatering within the cell shall be stopped thus allowing water to fill up the cell. If the next cell to be constructed is a cell on the other side of the river (i.e. after cells 2, 5A, 7, 9, and 11 in the sequence shown), then the downstream sheets shall be driven to the mudline followed by the removal of the upstream sheets. If the next cell to be constructed is the downstream cell on the same side of the river (i.e. after cells 1, 3, 4, 5, 6, 6A, 8, and 10 in the sequence shown), then the cell shall be allowed to fill with water and the upstream sheets shall be removed; the downstream sheets shall remain in place to form the upstream wall of the next cell. Do not remove piles along the center of the river until cells on both sides have been cleaned and backfilled. Piles on the downstream side of a cleaned cell, that have been driven to the mudline, may be pulled up to form the upstream wall of the adjacent downstream cell on the same side (i.e. prior to excavation within cells 6, 8, 10, and 12). Dewatering duration and removal of the sheet piles for these cells shall follow the same procedure as described above.

Relative to the sheet pile installation, the term "design elevation" refers to the general elevation of the top of the sheet pile wall at the upstream and centerline sheet pile walls that form two sides of the containment cell. The design elevation is typically 1 foot higher than the elevation of the controlled flooding gap, located in the downstream sheet pile wall, as shown on the Drawings. The containment cell is configured to first flood through the controlled flooding gap in the downstream wall. The design elevation is currently 976 ft and has been selected based upon jointly minimizing both work stoppages due to flooding and wall construction costs. The design elevation may be revised by the Engineer, subject to the approval of the Contracting Officer, prior to or during construction based on availability of additional data on subsurface conditions, progress of sheet pile installation, the potential for NAPL, cost considerations, schedule impacts, and in consideration of the time of the year the containment cells are expected to be utilized in conjunction with a review of historic flows for that time of the year.

3.1.1 Pile Driving Equipment

Pile driving equipment shall be selected by the Excavation Subcontractor as needed to complete the job.

3.1.2 Placing and Driving

The Excavation Subcontractor will determine locations of existing piping and manholes prior to installation of the containment cells. Except for the abandoned sewer at Station 511+85, existing structures shall be protected and the Excavation Subcontractor shall repair any damage incurred during the work at no additional cost to the General Contractor.

3.1.2.1 Placing

Pilings to be placed in containment cells and connecting arcs shall be inspected before driving to identify defects that may prevent free sliding in interlocks. Pilings shall be carefully located as shown. Pilings shall be placed plumb and true to line. Temporary wales, templates, master pilings current deflectors, or guide structures shall be provided as needed to facilitate pile placement and correct alignment. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

3.1.2.2 Driving

Prior to driving pilings in water, a horizontal line shall be painted on both sides of each piling at a fixed distance from the bottom so that it shall be visible above the water line after installation. This line shall indicate the profile of the bottom elevation of installed pilings, and potential problem areas can be identified by abrupt changes in its elevation.

If the Excavation Subcontractor determines that driving the pilings to the specified embedment depth is not possible due to subsurface conditions that include frequent obstructions or high bedrock, the Excavation Subcontractor will note the embedment depth achieved and determine the Factor of Safety from the Plans. If a Factor of Safety of 1.3 or

higher cannot be achieved for a given embedment depth at a river water surface elevation corresponding to the design elevation , the Contractor shall try to remove obstructions using, e.g., a spud or heavier driving sheet.

If the sheet piles cannot be driven to the necessary embedment depth to achieve a Factor of Safety of 1.3 or greater for the given design elevation, the Excavation Subcontractor shall immediately notify the Engineer. The Engineer, subject to the approval of the Contracting Officer, may develop a revised design elevation to allow shallower embedment depths. If the sheet piles cannot be driven to the embedment depth necessary to achieve a minimum Factor of Safety of 1.3 while preventing overtopping at a flow acceptable to the Engineer based on a revised design elevation, then the Contractor will cease work and notify the Engineer. The Engineer, subject to approval by the Contracting Officer, shall direct the Excavation Contractor in implementing a revised design. Delays resulting from the cessation of work will be compensated as standby time, subject to the approval of the Contracting Officer.

On each side (upstream, along river "centerline," and downstream), a minimum of two sheet piles shall be driven the required top-of-sheet pile design elevation as directed by the Engineer. The purpose of this elevation control is to allow controlled flooding of a containment cell in the event of a storm and to prevent sheet pile failure. The Excavation Subcontractor may adjust the location of the "controlled flooding gap" within the limits shown on the plans.

Sheet piles shall not be driven within 100 feet of concrete less than 7 days old.

3.1.3 Splicing

Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be either pulled back up or extended by splicing as required reach the top elevation by splicing when directed at no additional cost to the Government.

If directed, pilings shall be spliced as required to drive them to depths greater than shown and extend them up to the required top of sheet pile design elevation.

3.1.4 Inspection of Driven Piling

The Excavation Subcontractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings that do not interlock shall be repaired subject to the approval of the Engineer.

3.2 DEWATERING AND CONVEYING

The initial dewatering sequence shall include the following tasks:

a. Pump the water from within the containment cells using a pump intake and flow rate to minimize suspending and entraining solids.

b. Water pumped from within the containment cells shall be discharged to the river until 6 inches of water remains in the containment cell near the pump intake.

c. Water pumped from the containment cells shall be routed to the treatment system when the water depth in the containment cell is decreased to 6 inches, or if the Engineer determines that excess turbidity or sheens are visible in the water discharged from the containment cell.

d. The Excavation Subcontractor shall isolate the terminus of outfalls from the work area within the containment cells using sheetpile, sumps and pumps as shown on the PLANS. Accumulated storm water may be discharged to the river. This work will be paid for separately under a lump sum item, Stormwater Management, as described in Section 01025 MEASUREMENT AND PAYMENT.

e. The Excavation Subcontractor shall provide temporary rock outlet protection at the terminus of all dewatering discharge lines that discharge to the river and other erosion-sensitive areas. This work will be paid for separately on a unit price basis as described in Section 01025 MEASUREMENT AND PAYMENT.

The dewatering system shall conform to the following general guidelines:

a. Design dewatering system to maintain water levels such that excavation is generally dry so that the work is not impeded, to limit movement of soil fines, and to allow excavation and placement of fill without damaging subgrade, subject to approval of the Engineer.

b. Grade and ditch the site as necessary to direct surface runoff away from open excavations and subgrade surfaces.

c. Provide and maintain temporary trenches, drain pipes, sumps, pumps, and other equipment to keep all excavations generally dry. The Excavation Subcontractor is responsible for collecting and removing all groundwater seepage, surface water runoff, and wastewater from construction activities to the wastewater treatment facility.

d. Provide means to minimize silt and fine sand from being transported with the water to the treatment system.

e. Provide stormwater runoff control to prevent upland runoff from entering containment cell during remediation.

f. After initial dewatering of the containment cell to within 6 inches of the riverbed, pumped surface water and groundwater shall be conveyed to the water treatment system. A steady-state flow rate of 300 gpm is anticipated based on flow rates encountered during similar operations being conducted by GE in the upper half mile just upstream of Lyman Street.

g. On-site groundwater recharge pits will not be permitted.

h. Under no circumstances place fill, place concrete, or install piping and appurtenances in excavations containing standing water without permission to proceed from the Engineer.

i. The Excavation Subcontractor shall control groundwater so as to prevent softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation. The Excavation Subcontractor shall design, install, maintain, and operate dewatering systems so as to minimize removal of the natural soils (e.g., by "piping").

j. The Excavation Subcontractor shall operate dewatering pumps in the containment cells so as to minimize noise and in compliance with applicable State of Massachusetts provisions for noise control.

3.3 DRIVING SHEET PILINGS TO MUDLINE

Driving the pilings to the mudline shall conform to the following general guidelines:

a. Pilings shall be driven to the mudline in the sequence described earlier in this Section and as shown on the Plans.

b. Pile driving equipment shall be selected by the Excavation Subcontractor as needed to complete the job.

c. After contaminated sediment has been removed and a cell has been backfilled, dewatering shall stop thus allowing water to fill up in the cell. At cells where the next cell in the sequence is on the opposite side of the river, the Excavation Subcontractor shall drive the downstream side pilings down to within approximately a foot of the mudline.

d. Prior to driving pilings, the Excavation Subcontractor shall note the profile of the bottom elevation (see 3.1.2.2 Driving) and report to the Engineer the driving depth for the pilings.

e. The upstream sheet pilings shall be removed after the downstream sheet piles have been driven to the mudline.

f. Maintain continuity of interlocks between the sheeting driven to the mudline and sheeting left as part of the cell where work is occurring. Provide restraint at the transition between cells to prevent the sheeting designated to remain at full height from being driven deeper by the adjacent sheet driven to the mudline.

g. If sheeting can not be driven to within 1 foot of the mudline, the Engineer will determine if sheeting can be left at a higher elevation, if obstruction removal is required, or if the sheets need to be removed and re-installed later.

3.4 PULLING SHEET PILINGS FROM MUDLINE

Pulling the sheet pilings from the mudline shall conform to the following general guidelines:

a. Pilings shall be pulled from the mudline in the sequence described earlier in this Section and as shown on the Plans.

b. Pile pulling equipment shall be selected by the Excavation Subcontractor as needed to complete the job.

c. Pilings shall be pulled from the mudline to the elevation shown on the plans after all pilings on the opposite side of the river are either removed or driven to the mudline.

d. Prior to pulling pilings, the Excavation Subcontractor shall note the profile of the bottom elevation (see 3.1.2.2 DRIVING) and report to the Engineer the required pulling distance for the pilings.

e. Maintain continuity of interlocks between the sheeting pulled from the mudline and sheeting driven to the mudline. Provide restraint at the transition between cells to prevent the sheeting driven to the mudline from being raised up by the sheeting being pulled from the mudline.

f. For containment cells 6, 8, 10, and 12, the Excavation Subcontractor shall pull the upstream pilings to the design elevation prior to installation of the downstream pilings to the design elevation.

g. After the pilings have been pulled to the elevation shown on the plans, the Excavation Subcontractor shall inspect the interlocked joints of pulled pilings extending above ground. Pilings that do not interlock shall be repaired or replaced upon approval by the Engineer.

3.5 REMOVAL AND DECONTAMINATION/REUSE OF SHEET PILINGS

Removal of the sheet pilings shall conform to the following general guidelines:

a. Pilings shall be removed from the river in the sequence described in Appendix 02464-A and as shown on the Plans.

b. Pile pulling equipment shall be selected by the Excavation Subcontractor as needed to complete the job.

c. Pilings along the centerline of the river shall be removed after the containment cells on both sides of the river are excavated and backfilled.

d. Maintain integrity of sheeting left in place during removal. Provide restraint as required to prevent upward or downward movements of the sheets designated to remain during removal of sheeting.

e. At the end of the project and prior to being taken off site, the sheet piles shall be removed, transported (by the General Contractor) to a decontamination area established by the General Contractor, and pressure-washed subject to the approval of the Engineer. Wipe testing of the sheets for PCBs will be conducted as described in Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILLING by the General Contractor, and testing results documenting compliance with the established PCB standard will be provided to the Government by the General Contractor.

3.6 MAINTENANCE RECORD

A record shall be furnished describing the maintenance work performed, record of measurements and findings for product failure, recommendations for repair, and products replaced.

3.6.1 Maintenance

The Excavation Subcontractor shall maintain the temporary sheet pile containment cells, necessary pumps, sumps, pipelines, sediment filters, sedimentation basins, and other equipment of collection, removal, and disposal of surface water and groundwater within each containment cell by performing routine inspections to determine condition and effectiveness, by repair of damaged or non-working sheet pile containment cells (including all related excavation support system components), and other protective measures.

3.7 INSPECTIONS

3.7.1 Inspection Reports

For each inspection conducted, the Excavation Subcontractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Environmental Protection Plan, maintenance performed, and actions taken. The report shall be furnished to the General Contractor within 24 hours of the inspection to be incorporated into the General Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.7.2 Monthly Inspection Report and Certification Form for Sheet Pile Containment Cells

On the first working day of each month the Excavation Subcontractor shall complete, sign, and submit a monthly Inspection Report and Certification Form for Sheet Pile Containment Cells to the Engineer. The report shall include the inspection reports from Section 3.7.1 Inspection Reports and include a description of the damage, repairs, and actions taken to modify or improve the containment cells or dewatering process during the previous month. When submitted to the General Contractor, the Monthly Inspection Report will be incorporated into the General Contractor’s Daily CQC Report.

Appendix 02464-A
Containment Cell Construction Sequence

STEP 1	INSTALL UPSTREAM (US) CELL #1 SAND BAGS AND/OR BIN BLOCKS
STEP 2	INSTALL CENTER (C) CELL #1/CELL #3 JERSEY BARRIERS WITH SANDBAGS TO SEAL
STEP 3	INSTALL DOWNSTREAM (DS) SHEETPILES FOR CELL #1 (ALSO US CELL #2)
STEP 4	INSTALL C SHEETPILES FOR CELL #2/CELL #4
STEP 5	INSTALL DS SHEETPILES FOR CELL #2 (ALSO US CELL #6)
STEP 6	INSTALL SUMP PUMP AND DEWATER CELL #1
STEP 7	EXCAVATE CELL #1 RIVERBED INTO CELL #2
STEP 8	RESTORE CELL #1 RIVERBED
STEP 9	INSTALL SUMP PUMP AND DEWATER CELL #2
STEP 10	REMOVE US CELL #1 SAND BAGS AND/OR BIN BLOCKS
STEP 11	EXCAVATE CELL #2 RIVERBANK
STEP 12	EXCAVATE CELL #2 RIVERBED
STEP 13	RESTORE CELL #2 RIVERBED/RIVERBANK
STEP 14	DRIVE DS SHEETPILES FOR CELL #2 (ALSO US CELL #6) TO MUDLINE
STEP 15	REMOVE US SHEETPILES FOR CELL #2
STEP 16	INSTALL UPSTREAM (US) CELL #3 SAND BAGS AND/OR BIN BLOCKS
STEP 17	INSTALL DS SHEETPILES FOR CELL #3 (ALSO US CELL #4)
STEP 18	INSTALL DS SHEETPILES FOR CELL #4 (ALSO US CELL #5)
STEP 19	INSTALL SUMP PUMP AND DEWATER CELL #3
STEP 20	EXCAVATE CELL #3 RIVERBED INTO CELL #4 AND EXCAVATE RIVERBANK
STEP 21	RESTORE CELL #3 RIVERBED AND RIVERBANK
STEP 22	REMOVE US CELL #3 SAND BAGS AND/OR BIN BLOCKS
STEP 23	REMOVE C CELL #3 JERSEY BARRIERS AND SANDBAGS
STEP 24	INSTALL SUMP PUMP AND DEWATER CELL #4
STEP 25	EXCAVATE CELL #4 RIVERBANK
STEP 26	EXCAVATE CELL #4 RIVERBED
STEP 27	RESTORE CELL #4 RIVERBED/RIVERBANK
STEP 28	REMOVE US, C SHEETPILES FOR CELL #4
STEP 29	INSTALL C SHEETPILES FOR CELL #5 AND CELL #5A
STEP 30	INSTALL DS SHEETPILES FOR CELL #5 (ALSO US CELL #5A)
STEP 31	INSTALL DS SHEETPILES FOR CELL #5A (ALSO US CELL #8)
STEP 32	INSTALL SUMP PUMP AND DEWATER CELL #5
STEP 33	EXCAVATE CELL #5 RIVERBANK
STEP 34	EXCAVATE CELL #5 RIVERBED
STEP 35	RESTORE CELL #5 RIVERBED/RIVERBANK
STEP 36	REMOVE US SHEETPILES FOR CELL #5
STEP 37	INSTALL SUMP PUMP AND DEWATER CELL #5A
STEP 38	EXCAVATE CELL #5A RIVERBANK
STEP 39	EXCAVATE CELL #5A RIVERBED
STEP 40	RESTORE CELL #5A RIVERBED/RIVERBANK
STEP 41	DRIVE DS SHEETPILES FOR CELL #5A (ALSO US CELL #8) TO MUDLINE
STEP 42	REMOVE US SHEETPILE FOR CELL #5A
STEP 43	PULL US SHEETPILE FOR CELL #6 (ALSO DS CELL #2) TO EL. 976
STEP 44	INSTALL DS SHEETPILE FOR CELL #6 (ALSO US CELL #6A)
STEP 45	INSTALL DS SHEETPILES FOR CELL #6A (ALSO US CELL #7)
STEP 46	INSTALL SUMP PUMP AND DEWATER CELL #6
STEP 47	EXCAVATE CELL #6 RIVERBANK
STEP 48	EXCAVATE CELL #6 RIVERBED
STEP 49	RESTORE CELL #6 RIVERBED/RIVERBANK
STEP 50	REMOVE US, C SHEETPILES FOR CELL #6

Appendix 02464-A (continued)
Containment Cell Construction Sequence

STEP 51	INSTALL SUMP PUMP AND DEWATER CELL #6A
STEP 52	EXCAVATE CELL #6A RIVERBANK
STEP 53	EXCAVATE CELL #6A RIVERBED
STEP 54	RESTORE CELL #6A RIVERBED/RIVERBANK
STEP 55	REMOVE US, C SHEETPILES FOR CELL #6A
STEP 56	INSTALL C SHEETPILES FOR CELL #7/CELL #8
STEP 57	INSTALL DS SHEETPILES FOR CELL #7 (ALSO US CELL#10)
STEP 58	INSTALL SUMP PUMP AND DEWATER CELL #7
STEP 59	EXCAVATE CELL #7 RIVERBANK
STEP 60	EXCAVATE CELL #7 RIVERBED
STEP 61	RESTORE CELL #7 RIVERBED/RIVERBANK
STEP 62	DRIVE DS SHEETPILES FOR CELL #7 (ALSO US CELL #10) TO MUDLINE
STEP 63	REMOVE US SHEETPILES FOR CELL #7
STEP 64	PULL US SHEETPILES FOR CELL #8 (ALSO DS CELL #5A) TO EL. 976
STEP 65	INSTALL DS SHEETPILES FOR CELL #8 (ALSO US CELL #9)
STEP 66	INSTALL SUMP PUMP AND DEWATER CELL #8
STEP 67	EXCAVATE CELL #8 RIVERBANK
STEP 68	EXCAVATE CELL #8 RIVERBED
STEP 69	RESTORE CELL #8 RIVERBED/RIVERBANK
STEP 70	REMOVE US, C SHEETPILES FOR CELL #8
STEP 71	INSTALL C SHEETPILES FOR CELL #9 AND CELL #10
STEP 72	INSTALL DS SHEETPILES FOR CELL #9 (ALSO US CELL #12)
STEP 73	INSTALL SUMP PUMP AND DEWATER CELL #9
STEP 74	EXCAVATE CELL #9 RIVERBANK
STEP 75	EXCAVATE CELL #9 RIVERBED
STEP 76	RESTORE CELL #9 RIVERBED/RIVERBANK
STEP 77	DRIVE DS SHEETPILES FOR CELL #9 (ALSO US CELL #12) TO MUDLINE
STEP 78	REMOVE US SHEETPILES FOR CELL #9
STEP 79	PULL US SHEETPILES FOR CELL #10 (ALSO DS CELL #7) TO EL. 976
STEP 80	INSTALL DS SHEETPILES FOR CELL #10 (ALSO US CELL #11)
STEP 81	INSTALL SUMP PUMP AND DEWATER CELL #10
STEP 82	EXCAVATE CELL #10 RIVERBANK
STEP 83	EXCAVATE CELL #10 RIVERBED
STEP 84	RESTORE CELL #10 RIVERBED/RIVERBANK
STEP 85	REMOVE US, C SHEETPILES FOR CELL #10
STEP 86	INSTALL C SHEETPILES FOR CELL #11 AND CELL #12
STEP 87	INSTALL DS SHEETPILE FOR CELL #11
STEP 88	INSTALL SUMP PUMP AND DEWATER CELL #11
STEP 89	EXCAVATE CELL #11 RIVERBANK
STEP 90	EXCAVATE CELL #11 RIVERBED
STEP 91	RESTORE CELL #11 RIVERBED/RIVERBANK
STEP 92	REMOVE US SHEETPILES FOR CELL #11
STEP 93	REMOVE DS SHEETPILES FOR CELL #11
STEP 94	PULL US SHEETPILES FOR CELL #12 (ALSO DS CELL #9) TO EL. 976
STEP 95	INSTALL DS SHEETPILES FOR CELL #12
STEP 96	INSTALL SUMP PUMP AND DEWATER CELL #12
STEP 97	EXCAVATE CELL #12 RIVERBANK
STEP 98	EXCAVATE CELL #12 RIVERBED
STEP 99	RESTORE CELL #12 RIVERBED/RIVERBANK
STEP 100	REMOVE US, C SHEETPILES FOR CELL #12
STEP 101	REMOVE DS SHEETPILES FOR CELL #12

Notes:

1. Temporary erosion control may be installed once center sheet piles for the active cell have been installed.
2. Temporary erosion control shall not be removed until work has been completed in remediated cell and cell has been stabilized.
3. See Plans for Containment Cell Layout.

END OF SECTION

SECTION 02630

DRAINAGE SWALE RETENTION STRUCTURE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 198	(1998) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 76	(1999) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 478	(1997) Precast Reinforced Concrete Manhole Sections
ASTM C 789	(1998) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C 850	(1998) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 Ft. of Cover Subjected to Highway Loadings
ASTM C 923	(1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Materials
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-03 Product Data

Pipe.
Precast Inlet Structure.
Frames and Grates.

Printed copies of the manufacturer's literature of the products being placed, prior to installation.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

ASTM C 76, Class II.

2.2 DRAINAGE STRUCTURES

2.2.1 Precast Reinforced Concrete Box

For highway loadings with 2 feet of cover or more or subjected to dead load only, ASTM C 789; for less than 2 feet of cover subjected to highway loading, ASTM C 850.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 3000 psi concrete under Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

2.3.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C 139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.3.4 Brick

Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II; or ASTM C 32, Grade MS. Mortar for jointing and plastering shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be

smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

2.3.5 Precast Reinforced Concrete Manholes

Precast reinforced concrete manholes shall conform to ASTM C 478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

2.3.6 Frame and Cover for Gratings

Frame and cover for gratings shall be cast gray iron, ASTM A 48, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12; or cast aluminum, ASTM B 26/B 26M, Alloy 356.OT6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

2.3.7 Joints

2.3.7.1 Flexible Watertight Joints

a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Factory-fabricated resilient joint materials shall conform to ASTM C 425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

b. Test Requirements: Watertight joints shall be tested and shall meet test requirements as specified for the product in use. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C 443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.4 MANHOLE STEPS

a. Manhole steps shall be used in all manholes over five feet in depth. Steps shall be manufactured of 7/8 inch threaded or knurled stainless steel, forged aluminum alloy or copolpropylene plastic, steel reinforced and be of the drop type with a depressed section for handhold, with an approximate dimension of 14 x 10 inches.

b. Manhole steps shall be cast into the walls of the risers and conical top sections, and shall be aligned vertically and spaced so as to be on equal centers in the assembled manhole at a maximum distance apart of twelve inches. Steps shall be located a minimum of six inches from the ends of riser and top sections, and shall be securely embedded in manhole risers and cones. Portions of aluminum steps which will be embedded in the wall of the manhole shall be coated with a standard thickness of bituminous paint.

2.5 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C 923.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 02300 "Earthwork" and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 12 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified.

3.1.2 Removal of Rock

Rock in boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe.

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, and compacted as provided in paragraph BACKFILLING.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. In general, water present in the drainage swale will be handled through the use of temporary dikes and by pumping the water to the river.

3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.3.2 Multiple Culverts

Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 3 feet apart, whichever is less.

3.4 JOINTING

3.4.1 Concrete Pipe

3.4.1.1 Cement-Mortar Bell-and-Spigot Joint

The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be thoroughly cleaned with a wet brush and the lower portion of the bell filled with mortar as required to bring inner surfaces of abutting pipes

flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.

3.4.1.2 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.5 DRAINAGE STRUCTURES

3.5.1 Manholes and Inlets

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete, precast concrete segmental blocks, prefabricated corrugated metal, or bituminous coated corrugated metal; complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated. Pipe studs and junction chambers of prefabricated corrugated metal manholes shall be fully bituminous-coated and paved when the connecting branch lines are so treated. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.6 LADDER INSTALLATION

Ladders shall be adequately anchored to the wall by means of inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.7 BACKFILLING

3.7.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted

under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 18 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.7.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 18 inches.

3.7.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be minimized. Any damaged pipe shall be repaired or replaced.

3.7.4 Compaction

3.7.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.7.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

a. Under paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

c. Under non-traffic areas, density shall be not less than that of the surrounding material.

3.7.5 Determination of Density

Testing shall be the responsibility of the General Contractor. Testing shall be performed by an approved commercial testing laboratory or by the General Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph CALIBRATION of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished to the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

END OF SECTION

SECTION 02930

BANK REVEGETATION AND BIOENGINEERING TREATMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

This Section includes specifications for restoring the riverbanks at the Project Site subsequent to excavation, including those portions of the bank extending from the upper limit of bank armor and hard structures to the top of bank. Restoration methods include a combination of straight revegetation and bioengineering treatments. Revegetation shall follow the completion of topsoiling and final bank grading, and shall include: seeding; installation of erosion control blankets; planting of trees, shrubs, and woody vines; and mulching at the base of planted materials. Bioengineering treatments shall include construction of vegetated geogrids (i.e., fiber-encapsulated soil lifts) and preparation of the upper slope for revegetation. Vegetated geogrids shall be constructed prior to final grading. Specific areas to receive revegetation and bioengineering treatments are indicated on the Project Drawings. This work shall include furnishing all necessary SUBMITTALS, plants, seeds, bioengineering fabrics and erosion control blankets, materials, equipment, and labor, as well as the care and replacement of plants and seeded areas during the PLANT ESTABLISHMENT PERIOD, all in accordance with the plans and specifications and the directions of the Engineer. All work required in this Specification will be performed by the Planting Subcontractor except for work related to erosion control blankets, vegetated geogrids and seeding, which will be performed by the Excavation Subcontractor. Additional requirements for erosion control blankets are specified in Section 02370 - STORM WATER AND EROSION CONTROL: IN-RIVER WORK.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Statement of qualifications (resume) for the personnel directing and overseeing the riverbank planting work; G.

SD-03 Product Data

Bioengineering Materials

Manufacturers literature including physical characteristics, application and installation instructions, and specifications of bioengineering fabrics and materials.

Equipment

A listing of equipment to be used for the revegetation and bioengineering operations.

Delivery

Delivery schedules.

Plant Establishment Period

Calendar time period for the plant establishment periods. When there is more than one establishment period, the boundaries of the planted areas and bioengineering treatments covered for each period shall be described.

Maintenance Record

Maintenance work performed, locations and quantities of plant losses and replacements, and diagnosis of unhealthy plant material.

SD-07 Certificates

Plant Material
Seed Mix
Erosion Control Blankets, Bioengineering Fabrics, and Geotextiles
Fertilizer

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

a. Plant Material: Classification, botanical name, common name, stock type, size, quantity by species, date harvested, and location where grown.

b. Seed Mix: Species list with botanical name, common name, and percent by weight of each species in the mix.

c. Erosion Control Blankets, Bioengineering Fabrics, and Geotextiles: Technical specifications and product performance data.

d. Fertilizer: Chemical analysis and composition percent.

SD-10 Operation and Maintenance Data

Maintenance Instructions

Instruction for year-round care of installed plant material.

SD-11 Closeout Submittals

Planting Record Drawings; G

Scale drawings indicating the recorded number and locations of each plant installed and the areas seeded. Also, in red line on a print of the Project Drawings, record any changes made to the planting layout during installation.

Scale drawings indicating the locations of vegetated geogrids and joint plantings installed. Also, in red line on a print of the bank restoration Drawings, record any changes made during installation to the bioengineering design or locations.

1.3 SOURCE INSPECTIONS

The nursery or source of plant materials, and the source of delivered topsoil and compost shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery of plants, seed, erosion control blankets, and bioengineering materials. A delivery schedule shall be provided for each batch of materials if phased construction and planting occur.

1.4.1.1 Plant and Seed Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical (i.e., Latin) plant name and size. Seed mixes shall be clearly marked to identify the contents of the mix in regard to species (botanical names), percent of each species, and place of origin (i.e., state) of each species.

1.4.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation, heat stress, and damage to the branches, trunk, bark, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport. Seed shall be protected during delivery to prevent wetting, water damage, or exposure to high temperatures (> 90^{o}F).

Live branch cuttings (for use in vegetated geogrids) shall be kept refrigerated or otherwise protected during delivery to prevent physical damage, desiccation, exposure to wind and sun, or release from dormancy.

1.4.1.3 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries. For the purpose of this specification, soil amendments shall include fertilizer, lime, and peat.

1.4.2 Inspection

Plant materials shall be inspected upon delivery and checked for species, size, quantities, and unauthorized substitution, and to establish nursery-grown status or harvesting location. Plant material showing desiccation, abrasion, sun-scald injury, disease, disfigurement, or unauthorized substitution shall be rejected.

Containerized plant material shall be: well shaped; vigorous and healthy with a healthy, well-branched root system; and free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion. Containerized plant material shall exhibit typical form of branch to height ratio, and shall meet the caliper or height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Containerized plant material shall show new fibrous roots, and the root mass shall contain its shape when removed from the container. Plant material with broken or cracked balls, or broken containers, shall be rejected.

Live branch cuttings that are not dormant (e.g., if buds swollen or opened) shall be rejected. Other materials shall be inspected for compliance with paragraph PRODUCTS. Open soil amendment containers or wet soil amendments shall be rejected. Unacceptable material shall be removed from the job site immediately.

1.4.3 Storage

1.4.3.1 Plant Material Storage

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Containerized plant material shall not be stored longer than 30 days, and shall be watered as necessary to promote survival during the storage period. Live branch

cuttings may be stored for longer than 30 days, but must be kept refrigerated at 34° F and 90% humidity to prevent desiccation or release from dormancy. All plant material shall be protected from direct exposure to wind and sun.

1.4.3.2 Other Material Storage

Storage of other material shall be in designated areas. Seed, soil amendments, erosion control blankets and geotextile fabrics shall be stored in dry locations out of the sun and away from contaminants.

1.4.4 Handling

Plant material shall not be injured in handling. Containerized plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles or otherwise mishandled.

1.4.5 Replacements

In the event of damage or rejection, repairs or replacements shall be made.

1.4.6 Time Limitations

The time limitation between shipping and installing of containerized plants shall not be more than 30 days. Live branch cuttings may be kept longer than 30 days in refrigerated storage. The time limitation between installing the containerized plant material and placing the mulch shall be a maximum of 24 hours.

1.5 WARRANTY

Each responsible Subcontractor shall warrantee installed plant materials, seeded areas, and bioengineering treatments against defects, including death, disease, unsatisfactory growth or coverage, settling of soils that adversely affects grading and site stability, and dislodgement or failure of erosion control blankets and geogrid fabrics, except for defects resulting from abuse or damage by others or unusual phenomenon such as storms greater than a 50-year event. Plants and seeded areas shall be warranteed to be in a healthy and vigorously-growing condition for the calendar time period specified in paragraph PLANT ESTABLISHMENT PERIOD. The warranty period shall coincide with the Plant Establishment Period, and shall commence at the completion of each planting phase, seeding phase, or bank restoration section. During the warrantee period, the Planting Subcontractor shall replace the dead, dying, or unhealthy installed plants as directed by the Engineer. A minimum 12-month warranty of plant survival and growth shall be provided regardless of the contract time period. When such plant material is determined to be dead or unhealthy in accordance with paragraphs PLANT MATERIAL and PLANT ESTABLISHMENT PERIOD, it shall be replaced one or more times under this warranty.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

2.1.1 Plant Material Classification

All plant material shall be derived from stock native to the Northeast (i.e., New England and New York), and shall be the species specified. Botanical and common names of supplied plants shall conform to *The Vascular Plants of Massachusetts: A County Checklist*[1]. Containerized plant material shall be nursery-grown stock obtained from New England nurseries. Live branch cuttings shall be either from nursery-grown stock obtained from New England nurseries, or from stock harvested at an approved New England or New York location.

2.1.2 Plant Species

2.1.2.1 Containerized Plants

Table 1 below contains a list of the tree, shrub, and vine species to be installed where containerized plant material is specified. Each of the indicated species is native to the Project Area/region. The species listed shall be installed in the various flood stage or elevation zones of the revegetation areas as specified below. For a given bank revegetation planting area, approximately 75% of the tree and shrub species planted shall be primary species and 25% shall be associate species. Containerized shrubs may be installed in the vegetated geogrids, depending on the construction timing (i.e., if the geogrids are constructed in the non-dormant season from April 1 through November 15). Planting details are further described in the Project Drawings.

2.1.2.2 Live Branch Cuttings

Live branch cuttings to be used in bioengineering applications shall be limited to pussy willow (*Salix discolor*), erect willow (*Salix eriocephala*), and red-osier dogwood (*Cornus sericea*).

[1] Sorrie, B. and P. Somers. 1999. The Vascular Plants of Massachusetts: A County Checklist. Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program, Westborough, MA 01581.

Table 1. Tree, shrub, and vine species to be used for containerized plantings.

Elevation Zones	Trees	Shrubs	Vines
Bank Armor (973'-975')	No Tree Plantings	No Shrub Plantings	No Vine Plantings
Lower Bank (975'-978')	Primary: Black willow (*Salix nigra*) and silver maple (*Acer saccharinum*). Associates: Eastern cottonwood (*Populus deltoids*) and box elder (*Acer negundo*).	Primary: Silky dogwood (*Cornus amomum*) and red osier dogwood (*Cornus sericea*). Associates: Northern arrowwood (*Viburnum dentatum*) and winterberry holly (*Ilex verticillata*).	River grape (*Vitis riparia*)
Upper Bank (978' to Top)	Primary: Eastern cottonwood and box elder. Associates: Black willow and silver maple.	Primary: Northern arrowwood and winterberry holly. Associates: Silky dogwood, red osier dogwood, and choke cherry (*Prunus virginiana*)	Virgins bower (*Cleamatix virginiana*)
Vegetated Geogrid[2]	No Tree Plantings	Mixture of pussy willow (*Salix discolor*), erect willow (*Salix eriocephala*), and red-osier dogwood (*Cornus sericea*), or as directed by the Engineer	No Vine Plantings

2.1.3 Types, Sizes, and Planting Distribution

2.1.3.1 Containerized Plants

Table 2 below provides details on the containerized plant sizes and installation densities and distribution for the bank revegetation areas. Planting locations are further detailed on the Project Drawings.

Table 2. Types, sizes, installation densities, and distribution for containerized plantings installed in bank revegetation areas.

Specification	Trees	Shrubs	Vines
Plant Type	Container-Grown	Container-Grown	Container-Grown
Size at Planting	4 to 6 feet in height	2 to 3 feet in height	Plant at least 2 years old
Planting Distribution	Unevenly-spaced rows parallel to river, with plants placed approximately 8' on center.	Unevenly-spaced rows and/or clumps within 15'x50' oblong patches spaced 40 feet apart. Installed shrubs spaced at approximately 4' on center.	On 8' centers within 15'x30' oblong clumps that are spaced approximately 150 feet apart.
Overall Planting Density	700 plants per acre	730 plants per acre	40 plants per acre

As noted in Table 1 above, containerized shrubs may also be installed in the vegetated geogrids, depending on the construction timing (i.e., if the geogrids are constructed in the

[2] Containerized plants will be planted between the soil lifts only during certain seasonal time periods as described in Subsection 3.3.2 below. Otherwise, live branch cuttings will be installed between the soil lifts.

non-dormant season from April 1 through November 15). These plants shall be grown in standard 1-gallon containers, and shall be 18 to 36 inches in height at time of planting. When containerized plantings are used in the vegetated geogrids, they shall be installed between the soil lifts at a spacing of approximately 1 foot between the plants. Planting details are further described in the Project Drawings.

2.1.3.2 Live Branch Cuttings

Live branch cuttings shall be installed in the vegetated geogrids as specified in the Project Drawings. The type, size, and planting density of dormant plant materials are detailed in Table 3 below and on the Project Drawings.

Table 3. Type, size, and installation density of live branch cuttings used in the bioengineering application.

Bioengineering Application	Type of Dormant Plant	Size of Dormant Plant	Installation Density
Vegetated Geogrid	Live Branch Cuttings	0.25"–0.5" diameter by 5'– 6' long	15–20 per linear foot, per lift

2.1.4 Plant Schedule

The plant schedule shall provide botanical (i.e., Latin) names, common names (if available), classification, height/size, method of handling or shipping, and special characteristics as applicable. Botanical and common names shall conform to *The Vascular Plants of Massachusetts: A County Checklist*.

2.1.5 Substitutions

Substitutions will not be permitted without written request and approval from the Engineer.

2.1.6 Quality

2.1.6.1 Containerized Plants

Well-shaped, well-grown, vigorous containerized plant material having healthy and well-branched root systems shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment, method of shipment, or shipment. Rejected plants may not be used on the Project, will not be paid for, and shall be replaced with approved plants. Plants with communicable diseases shall be removed or destroyed immediately upon discovery of disease. Plants that are left in contact with diseased plants will also be rejected.

2.1.6.2 Live Branch Cuttings

Live branch cuttings shall be harvested only during the dormant season, which is typically from November 15 to March 15 in western Massachusetts and eastern New York. Plants shall be of the size specified and shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Rejected plants may not be used on the Project, will not be paid for, and shall be replaced with approved plants. Plants with communicable diseases shall be removed or destroyed immediately upon discovery of disease. Plants that are left in contact with diseased plants will also be rejected.

2.1.7 Growing Conditions

Plant material shall be well-adapted to the growing conditions of the Project site. Plant material shall be grown under climatic conditions similar to those at the Project site.

2.1.8 Shipment and Handling

2.1.8.1 Containerized Plants

Plant material shall be grown in a container over a duration sufficient for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. The container shall be sufficiently rigid to protect root mass during shipping. Plants shall be handled carefully to protect leaves, stems, branches, bark, and roots, and shall be protected from wind and sunlight during shipment.

2.1.8.2 Live Branch Cuttings

Live branch cuttings must be moved immediately after harvesting to the Project site or to a refrigerated, climate-controlled storage facility. These dormant plants shall be treated as living material, and shall be handled and transported carefully to prevent damage to bark and buds, and to protect from dormancy release. Plants shall be kept cool and covered during transport to protect them from wind and desiccation. Upon harvesting, cuttings shall be arranged in bundles or piles so that all bases and tops are oriented in the same direction and marked so that the top and base ends can be easily identified.

2.1.9 Growth Form of Containerized Plants

2.1.9.1 Deciduous Trees

Height of branching shall bear a relationship to the size and species of tree specified, with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there shall be no division of the trunk that branches more than 6 inches from ground level.

c. Specimen: The tree provided shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

2.1.9.2 Deciduous Shrubs

Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the Project.

2.1.9.3 Vines

Acceptable vine plants shall have well-developed and balanced crowns with vigorous, well-developed root systems, and shall be furnished in containers.

2.1.10 Live Branch Cutting Requirements

All live branch cuttings shall have their side branches cleanly removed and the bark intact so that the cutting is one single stem. Care should be also taken to make clean cuts at the top and bottom ends so that the bark is not separated from the wood. Cuttings shall be cut so that there is a terminal bud scar within 1–4 inches of the top, and so that at least two bud scars will be above the ground after planting. The cuttings shall be kept moist and cool after being prepared to the specified lengths, and shall be installed the same day that they are prepared.

2.1.11 Plant Material Size

Plant material shall be furnished in sizes indicated. Containerized plant material larger in size than specified may be substituted with approval from the Engineer.

2.2 TREE PROTECTORS

Tree protectors shall be installed on each tree to reduce or eliminate damage from herbivores and other physical damage. Tree protectors shall be the foldable, open type rather than the rigid tube type, and shall be adjustable to allow for tree growth. Protectors shall: be 24 inches high or taller as needed to offer adequate protection for the size of the tree being planted; prevent constriction and bark damage by fitting loosely around the stem or trunk; and allow for air circulation to buffer against high temperatures and excessive moisture. Wooden stakes for tree protector anchoring shall be of sufficient length and diameter to hold the protector in place for at least 3 years.

2.3 SEED

2.3.1 Seed Classification

Seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material.

2.3.2 Seed Mixture

The seed mixture for permanent seeding of the bank revegetation and bioengineering areas shall be proportioned by weight as follows:

Botanical Name	Common Name	Percent by Weight
Elymus riparius	stream bank wild rye	25
Elymus canadensis	Canada wild rye	15
Panicum clandestinum	deer-tongue	15
Poa palustris	fowl bluegrass	10
Agrostis stolonifera	creeping bentgrass	10
Desmodium canadense	showy tick-trefoil	5
Polygonum pensylvanicum	Pennsylvania smartweed	5
Asclepias syriaca	common milkweed	2
Rubus allegheniensis	common blackberry	2
Solidago canadensis	Canada goldenrod	2
Solidago gigantea	smooth goldenrod	2
Solidago rugosa var. *rugosa*	wrinkled goldenrod	2
Aster puniceus	bristly aster	2
Aster lateriflorus	calico or golden aster	1
Aster macrophyllus	big-leaved aster	1
Verbena hastata	blue vervain	1
		100

2.3.3 Maintenance and Acceptance

Seeded areas will be accepted only upon attainment of a reasonably thick, uniform stand of the grasses and herbaceous plants from the specified seed mix and from non-invasive volunteer growth[3], free from sizable thin or bare areas.

2.4 FERTILIZER

The nutrient ratio of fertilizer applied to the installed plants shall be as recommended by a soil test at the time of planting. Fertilizer shall be controlled release commercial grade;

[3] Non-invasive plants are those not listed in Weatherbee, P.B., P. Somers, and T. Simmons. 1998. A Guide to Invasive Plants in Massachusetts. Massachusetts Division of Fisheries and Wildlife.

tablet or stake form; uniform in composition; and consist of a nitrogen-phosphorus-potassium ratio suitable for the plant material being installed.

The nutrient ratio of fertilizer applied to the seeded areas shall be as recommended by a soil test at the time of seeding. Fertilizer shall be a slow-release commercial grade, uniform in composition; and consist of a nitrogen-phosphorus-potassium ratio. The use, type and/or amount of fertilizer shall be carefully considered due to the proximity to the river. It should be used only if the topsoil's nutrient content is clearly deficient, which shall be determined through a soil test prior to the topsoil being spread.

2.5 MULCH

Mulch shall be of the organic type only, and shall be free from weeds, mold, and other deleterious materials. The preferred mulch materials shall be native to the Project site, and shall consist of wood chips and shredded or chipped bark from trees and shrubs cut from the Project site during clearing operations. Commercially-available mulch may be used as a substitute if the quantity or quality of on-site material is insufficient. Neither hay, straw, nor rotted manure shall be used as mulch.

2.5.1 On-Site Wood Chips and Bark

Wood chip mulch derived from on-site clearing and chipping may be used to mulch installed plants if a test prior to spreading indicates that the material is free from PCBs and other contaminants. Such mulch shall consist of chipped or ground woody plant material, free of chunks and pieces of wood thicker than 1/2 inch thick by 4 inches long. To avoid potential contamination when using on-site material, only those chips originating from the above-ground portions of plants shall be used as mulch (i.e., no chips from roots, stumps, or ground cover shall be used).

2.5.2 Commercial Bark Mulch

Commercially-available bark mulch shall be uniform in size, free of chunks and pieces of wood thicker than 1/2 inch thick by 4 inches long. The mulch shall be free of mold and other substances deleterious to plant growth.

2.6 WATER

Unless otherwise directed, water shall be the responsibility of the Planting Subcontractor. The source of water shall be the Housatonic River adjacent to the specific planting area(s) being watered.

2.7 EROSION CONTROL BLANKETS

2.7.1 Erosion Control Blanket Material

Following final grading and seeding, extended-use erosion control blankets shall be installed in the revegetation and bioengineering restoration areas to protect the soil surface from erosion and scour. The purpose of the erosion control blanket specified herein is to provide long-term (as opposed to temporary) soil stabilization.

The product specifications shall be as follows:

Fiber Type:	High quality mattress-grade coir
Functional Longevity	2 – 3 years in place
Blanket Type	Stitched and netted
Stitching	Stitched at 1.5" centers
Stitching Material	Strong, biodegradable filament
Width of Roll	Minimum 7.5'
Length of Roll	Minimum 60'
Top Netting Type	Natural, biodegradable, 0.5"x 0.5" mesh
Bottom Netting Type	Natural, biodegradable, 0.5"x 0.5" mesh
Recommended Slope	1H:1V or steeper
ASTM Standards	
D3776 Mass/Unit Area Minimum	11.2 oz/sy
D1777 Minimum Thickness	0.35 inches
D4595 Minimum Tensile Strength	220 x 140 lbs/ft
D4595 Maximum Elongation	34% x 20%
D4491 Flow Velocities, Short Term	14 ft./sec (minimum)
Maximum Permissible Shear Stress	2.25 lbs/sq. ft.

2.7.2 Blanket Anchors

Ground anchors used to secure extended-use erosion control blankets shall consist of heavy-duty steel staples with a minimum length of 8 inches (200 mm).

2.8 BIOENGINEERING MATERIALS

The specified bioengineering bank stabilization treatment will include the construction of vegetated geogrids (also known as fiber-encapsulated soil lifts). Specifications for plant materials used in this treatment are contained in Subsection 2.1 above. Additional materials needed for construction of the geogrids are specified below.

2.8.1 Foundation and Drain Material for Vegetated Geogrids

Materials for the foundation of the vegetated geogrids shall consist of bank armor stone and gravel (i.e., the filter layer), which are described in Section 02300 EARTHWORK and detailed on the Project Drawings. As shown on the Project Drawings, a non-woven filter

fabric shall be installed on top of the geogrid foundation to prevent topsoil loss through the armor stone and gravel filter.

The fabric shall meet the following ASTM standards:

Properties	Test Method	Units	Minimum Value
Unit Weight	ASTM D-5261	oz/sy	6
Grab Tensile Strength	ASTM D-4632	lb	150
Grab Tensile Elongation	ASTM D-4632	percent	50
Mullen Burst	ASTM D-3786	psi	350
Puncture	ASTM D-4833	lb	90
Trapezoid Tear	ASTM D-4533	lb	65
UV Resistance	ASTM D-4355	percent**	70
Apparent Opening Size	ASTM D-4751	US Sieve	70
Permittivity	ASTM D-4491	sec^{-1}	17
Flow Rate	ASTM D-4491	$gal/min/ft^2$	90

Where seeps are present, drains shall be installed in the back of the vegetated geogrids to collect groundwater seepage and direct it to the geogrid foundation, which is designed to functions as a drainage layer. Drains shall be constructed of gravel, as described in Section 02300 EARTHWORK.

2.8.2 Soil Lift Fabric Wrap

The fabric for the geogrid soil wraps shall be a double-layered fabric made up of an outer layer of high strength coir fabric and an inner layer of lightweight biodegradable fabric to trap fines. The outer layer shall be a continuously woven, un-seamed fabric of spun coir yarn. The inner fabric shall be a uniformly-woven, un-died, un-bleached jute fabric. The two layers shall be tied together uniformly using biodegradable ties along the longitudinal and transverse directions as well as in the interior of the fabric. In addition, the fabric shall meet the following ASTM standards:

Soil Lift Fabric Standards

ASTM Standards	Average Value
D5261 Mass/Unit Area	29.5 oz/sy
D5199 Minimum Thickness	0.30 inches
D4595 Wide Width Tensile Strength	95 x 65 lbs/in (Machine x Transverse)
D4595 Maximum Elongation	40% x 33% (Machine x Transverse)
D1388 Stiffness/Flexibility	0.0112 x 0.0071 lbs-in

2.8.3 Fill For Vegetated Geogrid

Fill used within and between the soil lifts of the vegetated geogrid shall be Topsoil, as defined and described in Section 02300 EARTHWORK.

2.8.4 Backfill

Backfill used in the construction of the vegetated geogrids above the 975-foot elevation contour shall be Common Fill, as defined and described in Section 02300 EARTHWORK.

2.8.5 Dead Stout Stakes

Dead stout stakes used in the construction of the vegetated geogrids shall be 2" x 2"x 18" tapered hardwood stakes cut from 2" x 4" dimension lumber, as illustrated in the Project Drawings. Stakes shall be free from knots, rot, or other defects that would impair their strength.

2.9 PESTICIDE

The use of pesticides shall be prohibited during the construction and plant establishment periods covered under this specification. For the purpose of this specification, pesticide is defined as: insecticide, herbicide, fungicide, nematocide, rodenticide, miticide, or soil fumigant. The prohibition of pesticide use during the Construction and Plant Establishment Periods shall not preclude the use of herbicides for control of invasive species during the Long Term Maintenance Period.

PART 3 EXECUTION

3.1 GENERAL

Planting and bioengineering operations shall be performed in accordance with the specifications and Project Drawings, and as directed by the Engineer. The Planting Subcontractor shall be responsible for the performance and completion of the work, and shall retain a competent foreman at the site at all times when the work is in progress. In addition, the Planting Subcontractor shall provide a sufficient number of experienced and capable persons to carry out the work effectively and efficiently. In addition to the foreman, the Planting Subcontractor shall have on the job a sufficient number of persons experienced in plant identification, handling and installation of plants, construction of the bioengineering measures specified, and other tasks required to perform the specified work correctly.

3.2 BANK REVEGETATION

Bank revegetation measures shall take place in areas where the bank stabilization type is designated as "Revegetation" on the Project Drawings. The revegetation measures specified herein are to commence after finish grading of the topsoil, and shall include seeding, installation of erosion control blankets, plant installation, and plant and seeding maintenance during the Plant Establishment Period.

3.2.1 Site Conditions

Prior to planting, the Planting Subcontractor shall examine the subgrade and topsoil, observe the conditions under which the work is to be performed, and notify the Engineer of unsatisfactory conditions. Planting work shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer. Commencement of work shall signify the Planting Subcontractor's acceptance of site conditions as satisfactory.

3.2.2 Seeding and Planting Time Periods

Seeding of revegetation areas within completed bank sections shall take place directly after finish grading and prior to installation of erosion control blankets. Actual seeding time will therefore be dependent on the construction schedule, and seed may be spread during any time of the year. Seed shall also be installed within the outer, exposed portions of the vegetated geogrid. This seeding may also be done at any time of the year, depending on when the geogrids are constructed.

Planting of containerized plants associated with bank revegetation shall be performed only during periods when beneficial results can be obtained, based on seasonal and climatic factors or the type of plant. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed by the Engineer. When special conditions warrant a variance to the planting or seeding operations, proposed revised planting/seeding times shall be submitted for approval. Seasons for planting, unless otherwise directed, shall be within the following dates:

- Spring: April 1st to June 1st
- Fall: September 1st to November 15th

3.2.3 Seeding

Prior to installing seed, any previously-prepared surface shall be reworked to meet the finish grade, topsoil, and fertilizer requirements. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution. To prevent excessive runoff of fertilizer into river, fertilizer shall not be spread during late fall or winter when the ground is frozen.

3.2.3.1 Seeding Method

The seeding method shall be broadcast seeding. Seed shall be uniformly broadcast at a rate of 1-lb/1,000 square feet of surface area, or as directed by the Engineer at the time of seeding. Half the total rate of seed application shall be broadcast in one direction, with the remainder of the seed rate broadcast at 90 degrees from the first direction. Broadcast seed shall be raked lightly to provide proper contact with the soil. After seed is broadcast, the seeded area shall be covered with erosion control blanket as specified in the Project Drawings and outlined in Subsection 3.2.4 below.

3.2.3.2 Watering

When seed is applied during the growing season, watering shall start immediately after the seeded areas are covered with erosion control blanket. Then, for the remainder of the growing season, water shall be applied to supplement natural rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1-inch depth (approximately 1 inch of water per week). Excessive runoff and puddling shall be prevented.

When seed is applied during the winter or dormant season, the seeded areas shall not be watered until the growing season starts, at which time water shall be applied to supplement natural rainfall as described above.

3.2.4 Installation of Erosion Control Blankets

Extended-use erosion control blankets shall be installed on the bank revegetation areas immediately following finish grading and seeding, but before planting. The type of erosion control blanket shall be as specified in Subsection 2.6 above, and it shall be installed as indicated on the Project Drawings. All seed shall be sown prior to installation of erosion control blankets.

3.2.5 Installation of Containerized Plants

3.2.5.1 Underground Utilities

The Planting Subcontractor shall verify the location of underground utilities and facilities in the area of the planting operation. Damage to underground utilities and facilities shall be repaired by the Planting Subcontractor.

3.2.5.2 Layout

Plant material locations shall be marked with stakes or pin flags before any plant pits are excavated. Plant locations may be adjusted to meet field conditions at the direction or approval of the Engineer.

3.2.5.3 Protecting Existing Vegetation

When there are established lawns adjacent to the planting area, the turf shall be covered and/or protected during planting operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline to protect them during planting operations.

3.2.5.4 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, type of plant and planting method shall be submitted for approval.

3.2.5.5 Plant Pits

Excavate plant pits as shown on the Project Drawings.

3.2.5.6 Setting Plant Material

In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown, as detailed in the Project Drawings. Plant material shall be set plumb and straight, and held in position until sufficient soil has been firmly placed around root system or ball.

3.2.5.7 Fertilizing

The containerized plants shall be fertilized at the time of planting, if necessary, based on the results of a soil test. The fertilizer shall be added at the time of planting to the upper 4 inches of the planting pit, and at the manufacturer's specified rate corresponding with the plant size (e.g., stem caliper) and soil requirements at the time of planting.

3.2.5.8 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments (e.g., peat, compost) suitable for the plant material specified. The backfill shall generally consist of the excavated soil from the plant pit, with amendments added as needed based on soil test results.

3.2.5.9 Backfill Procedure

Prior to backfilling, plastic pots or containers shall be removed from the root system, avoiding damage to the root system. For plant material in biodegradable containers, the container shall be split prior to setting the plant with container. Prior to setting the plant in the pit, a maximum 1/4 depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. Backfill mixture shall be added to the plant pit in 4 to 6-inch layers with each layer tamped. The backfill soil mixture shall be carefully worked in amongst the roots. Air pockets shall be removed from around the root system, and root-to-soil contact shall be provided.

3.2.5.10 Watering

Plant pits shall be watered immediately after backfilling, until completely saturated.

3.2.5.11 Herbivore Control

To protect trees from potential herbivore damage, tree tubes or similar protectors shall be installed on all planted trees. The protectors shall extend from the base of the tree (i.e., at the mulch level) up the stem for a minimum length of 24 inches. They shall , provide sufficient space for stem growth, and allow for air circulation and heat dissipation along the stem. Tree

protectors shall remain on the trees during the Plant Establishment Period, and shall be left in place at the end of the Plant Establishment Period.

3.2.5.12 Placing Mulch Around Plant

The placement of mulch shall occur no later than 24 hours after planting. Mulch shall be placed in accordance with the planting details in the Project Drawings. The mulch shall be placed to a thickness of 3-4 inches to form a shallow saucer. Mulch shall be kept away from the trunk or stem as shown in the Project Drawings. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines, and shall be kept off buildings, sidewalks and other facilities.

3.2.5.13 Pruning

Pruning will be conducted only if directed by the Engineer and the Government and will be accomplished by trained and experienced personnel. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, and dead or broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off". Wound dressing or pruning paint shall not be applied.

3.3 CONSTRUCTION OF VEGETATED GEOGRIDS

3.3.1 Construction

Vegetated Geogrids shall be constructed by the Excavation Subcontractor and will require coordination with the Planting Subcontractor for installation of individual plants or live branch cuttings in the vegetated geogrids. Vegetated geogrids shall be constructed in accordance with the details and construction sequence contained in the Project Drawings. If seeps are encountered in the portion of bank where geogrids are to be installed, a drain system will be incorporated into the design as directed by the Engineer at the time of construction.

3.3.2 Construction Time Period

Though vegetated geogrids may be constructed at any time of year, the type of plant material used between the soil lifts will depend on the season in which the geogrids are constructed. Either dormant or containerized plants will be installed, depending on the time periods outlined in Table 4 below:

Table 4. Installation time periods for live branch cuttings and containerized plants within vegetated geogrids.

Plant Type	Installation Window
Live Branch Cuttings	November 15 to April 1 (dormant season)
Containerized Plants (1-gallon, 18"–36")	April 1 to November 15 (non-dormant season)

3.4 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation, and shall continue until the Plant Establishment Period commences. The maintenance of containerized plants shall include maintaining the mulch, watering, and adjusting settled plants. Mulched areas at the base of the installed containerized plants shall be kept free of weeds, grass, and other undesired vegetation. Maintenance of live branch cuttings during the planting operation shall include watering and protection from physical damage.

3.5 RESTORATION AND CLEAN UP

3.5.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition.

3.5.2 Clean Up

Excess and waste material shall be removed from the bank restoration and material storage areas and shall be disposed or recycled offsite. Adjacent paved areas shall be cleared.

3.6 PLANT ESTABLISHMENT PERIOD

3.6.1 Commencement

Upon completion of the last day of the planting operation for that planting or seeding phase, the Plant Establishment Period for maintaining installed plant material and seeded areas in a healthy growing condition shall commence, and shall be in effect for a period of 12 months or at least one full growing season, whichever is greater. Immediately following the Plant Establishment Period, the growth and survival of the plants and seed will be monitored under a LONG-TERM MAINTENANCE PERIOD specification (not defined or included herein). Written calendar time period shall be furnished for the plant establishment period(s). In the likely event that there is more than one plant establishment period, the boundaries of the planted and seeded area covered for each period shall be described and marked on a print of the Project Drawings. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for the individual planting areas or planting phases.

3.6.2 Maintenance During Plant Establishment Period

Maintenance of plant material shall include: straightening plant material, protecting from girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant material labels; watering; reseeding bare or sparsely-seeded areas, eradicating noxious weeds, insects, and disease; and removing and replacing unhealthy or dead plants.

3.6.2.1 Watering Plant Material

The plant material and seeded areas shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 1 inch absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

3.6.2.2 Weeding

The mulched areas at the base of the installed plants shall be kept substantially free of weeds and grass during the Plant Establishment Period to reduce competition for nutrients and water. Weeds and grass shall be completely removed, including the root systems.

3.6.2.3 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown shall requires replanting in accordance with Subsection 3.2.5, Installation of Containerized Plants.

3.6.2.4 Maintenance Record

A record shall be furnished describing the maintenance work performed, locations of maintenance activity, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

3.6.2.5 Unhealthy Plant Material

A tree or shrub shall be considered unhealthy or dead when the main leader has died back, or more than 50 percent of the crown has died. This condition shall be determined by scraping on a branch an area 1/16-inch square (maximum) to determine if there is a green cambium layer below the bark. A vine shall be considered unhealthy or dead when more than 50 percent of the stem length or 50 percent of the areal coverage of stems and foliage have died, as determined by examination of the stems. The Planting Subcontractor shall determine the cause for unhealthy or dead plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall

be replaced as soon as seasonal conditions permit. Dead or unhealthy plants installed within the vegetated geogrid shall be replaced at the direction of the Engineer.

3.6.3.6 Replacement Plant Material

Unless otherwise directed, new plant material shall be provided for replacement of unhealthy or dead plants in accordance with paragraph 1.5 WARRANTY. Replacement plant material in the revegetation areas shall be installed in accordance with Subsection 3.2.5, Installation of Containerized Plants. Replacement of plant materials in the soil lifts and joint planting areas will be done at the direction of the Engineer. An extended plant establishment period shall be not required for replacement plant material unless the Engineer determines that more than 50 percent of the replacement plants have failed.

3.6.3.7 Maintenance Instructions

Written instructions shall be furnished to the Engineer containing drawings and other necessary information for year-round care of the installed plant material, including when and where maintenance should occur, and the procedures for plant material replacement.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

Work covered by this section includes designing, furnishing, installing, and removing formwork for structural concrete.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347R (1988) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 578 (1992) Rigid, Cellular Polystyrene Thermal Insulation

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1983) Construction and Industrial Plywood

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

Design;

Design analysis and calculations for form design and methodology used in the design.

Concrete Formwork;

Concrete Formwork;

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

SD-02 Shop Drawings

Concrete Formwork;

Drawings showing details of formwork including, dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-03 Product Data

Form Releasing Agents;

Manufacturer's recommendation on method and rate of application of form releasing agents.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

All formed concrete surfaces shall be Class D finish. Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.2 FORM TIES

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter..

2.3 FORM RELEASE AGENTS

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. Form releasing agents shall not adversely affect the color or texture of the textured concrete on the exposed face of the dam stem.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects, which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.2 COATING

Forms for Class D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.3 REMOVAL OF FORMS

Forms shall be removed in a manner that will prevent injury to the concrete and ensure the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. In no case will supporting forms or shores be removed before the concrete strength has reached 70 percent of design strengths as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

Work covered by this section includes designing, furnishing, installing, and removing formwork for structural concrete.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1994) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 184	(1990) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615	(1994) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1992) Structural Welding Code - Reinforcing Steel

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI MSP-1	(1990) Manual of Standard Practice

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Drawings

Concrete Reinforcement System;

Detail drawings showing reinforcing steel schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-07 Certificates

Reinforcing Steel;

Certified copies of mill reports attesting that the reinforcing steel furnished meets the requirements specified, prior to the installation of reinforcing steel.

1.3 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 DOWELS

Dowels shall conform to ASTM A 615, Grade 60.

2.2 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615 or grade 60. Sizes shall be as shown on the contract drawings.

2.3 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.3 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete.

Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete.

3.2 DOWELS

Dowels shall be installed in the base as shown on the contract drawings. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement.

END OF SECTION

SECTION 03250

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1 GENERAL

Work covered by this section includes activities to be conducted by the Excavation Subcontractor including designing, furnishing, and installing expansion joints, contraction joints and water tops for the Silver Lake Outfall Extension.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 109 (1993) Steel, Strip, Carbon, Cold-Rolled

ASTM A 167 (1993) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 480 (1994b) General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

ASTM A 570 (1992; R 1993) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality

ASTM C 920 (1987) Elastomeric Joint Sealants

ASTM D 412 (1992) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

ASTM D 624 (1991) Test Method for Rubber Property - Tear Resistance

ASTM D 1190 (1974; R 1980) Concrete Joint Sealer, Hot-Poured Elastic Type

ASTM D 1191 (1984) Testing Concrete Joint Sealers

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 5249 (1992) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

CORPS OF ENGINEERS (COE)

COE CRD-C 513 (1974) Corps of Engineers Specifications for Rubber Waterstops

COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

FEDERAL SPECIFICATIONS (FS)

FS TT-S-230 (1970) Sealing Compound: Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures)

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Waterstops;

Shop drawings and fabrication drawings provided by the manufacturer or prepared by the Contractor for each type used.;

SD-03 Product Data

Preformed Compressible Joint Filler; Sealant; and Waterstops;

Manufacturer's literature, including safety data sheets, for preformed fillers and the lubricants used in their installation; field-molded sealants and primers (when required by sealant manufacturer); preformed compression seals; and waterstops.

Preformed Compressible Joint Filler; Sealant; Waterstops;

Manufacturer's recommended instructions for installing preformed fillers, field-molded sealants; preformed compression seals; and waterstops; and for splicing non-metallic waterstops.

SD-04 Samples

PVC and Expanding Waterstops and Splices;

Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 12 inch long from each type used. One splice sample of each size and type. The splice samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each splice shall be not less than 12 inches long.

SD-07 Certificates

Preformed Compressible Joint Filler; Sealant; Waterstops;

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 PREFORMED COMPRESSIBLE JOINT FILLER

Compressible joint filler shall be preformed material conforming to ASTM D 1751 or ASTM D 1752. Unless otherwise indicated, filler material shall be 3/4 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.2 SEALANT

Joint sealant shall conform to the following:

2.2.1 Polyurethane Elastomeric Sealant

Polyurethane elastomeric sealant shall be a one-component, polyurethane base material applicable for use in horizontal, vertical, and overhead joints. Sealant shall cure under the influence of atmospheric moisture to form an elastomeric substance. Sealant color shall match that of the concrete surface.

2.2.2 Sealant Performance Criteria

2.2.2.1 Tensile Properties

Tensile properties (ASTM D 412) at 21 days

a. Tensile Strength 140 psi, min.
b. Elongation at Break 600%, min.
c. Tensile Stress @ 100% Elongation 65 psi, min.
d. Tensile set after break 15%, max.

2.2.2.2 Shore Hardness

Shore hardness (ASTM D 2240) @ 21 days: 50, max (Shore A)

2.2.2.3 Tear Strength

Tear strength (ASTM D 624) @ 21 days: 60 lbf/inch, min.

2.2.2.4 Adhesion in Peel

Adhesion in peel (FS TT-S-230) @ 28 days

a. Concrete 20 lb., min.
b. Aluminum 20 lb., min.
c. Glass 20 lb., min.

2.2.2.5 Service Range

Service Range - 40 F to 167 F, min.

2.2.2.6 Sealant

a. Sealant shall conform to FS TT-S-230, Type II, Class A.
b. Sealant shall conform to ASTM C 920, Type S, Grade NS, Class 25.
c. Sealant shall be non-staining.

2.2.2.7 Acceptable Product

Acceptable product shall be Sikaflex 1A as manufactured by Sika Corporation, or approved equal.

2.3 PRIMER AND BACKER ROD

Primer and backer rod for elastomeric sealant shall be as shown or recommended by the sealant manufacturer.

2.4 WATERSTOPS

Intersection and change of direction waterstops shall be shop fabricated.

2.4.1 PVC Waterstops

PVC waterstops shall be manufactured from a prime virgin resin; the compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Polyvinylchloride waterstops shall conform to COE CRD-C 572.

2.4.2 Expanding Waterstop

Expanding waterstop system shall consist of a hydro-active, expansive, closed cell polyurethane foam that is injected into the joint after the concrete has cured. Acceptable product shall be "Injecto-System" as manufactured by De-Neef Construction Chemicals, P.O. Box 1219, Waller, Texas 77484, or approved equal.

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated and as shown on the contract drawings.

3.1.1 Expansion Joints

Preformed compressible joint filler shall be used in expansion joints as shown on the contract drawings. The edges of the joint shall be neatly finished with an edging tool of ⅛-inch radius. The filler strips shall be installed at the proper level beneath the finished surface with a slightly tapered, dressed and oiled wood strip temporarily secured to the top thereof to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

3.1.2 Joint Sealant

Construction joints and expansion joints in the Dam shall be filled with elastomeric joint sealant and backer rod. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.1.2.1 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.2 WATERSTOPS, INSTALLATION AND SPLICES

The Silver Lake outfall waterstop shall be fabricated from galvanized steel as shown on the drawings and welded around the entire circumference of the Silver Lake outfall pipe.to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstop during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified trained personnel using approved equipment and procedures.

3.2.1 Quality Assurance

Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following: 1) Tensile strength less than 80 percent of parent section. 2) Free lap joints. 3) Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch. 4) Misalignment which reduces waterstop cross section more than 15 percent. 5) Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness. 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of ½-inch in 10 feet. 7) Visible porosity in the weld area, including pin holes. 8) Charred or burnt material. 9) Bubbles or inadequate bonding. 10) Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

END OF SECTION

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

Work covered by this section includes activities to be conducted by the Excavation Subcontractor including designing, furnishing, and installing cost-in-place structured concrete for the Silver Lake Outfall Extension.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182 (1991I) Burlap Cloth Made From Jute or Kenaf

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117/A117R (1990; Errata) Standard Tolerances for Concrete Construction and Materials

ACI 211.1 (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 214.3R (1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete

ACI 305R (1991) Hot Weather Concreting

ACI 318/318R (1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33 (1993) Concrete Aggregates

ASTM C 39 (1993a) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 94 (1994) Ready-Mixed Concrete

ASTM C 143 (1990a) Slump of Hydraulic Cement Concrete

ASTM C 150 (1994) Portland Cement

ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1991) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

CORPS OF ENGINEERS (COE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 513	(1974) Corps of Engineers Specifications for Rubber Waterstops
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA-01	(1992) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards of the Truck Mixer Manufacturers Bureau

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Mixture Proportions;

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control;

Certified copies of laboratory test reports, including mill tests and all other test data, for Portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

1.3 GENERAL REQUIREMENTS

1.3.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/A117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.3.2 Strength Requirements and w/c Ratio

1.3.2.1 Strength Requirements

Specified compressive strength (f'c) for all concrete shall be 4,000 pounds per square inch (psi) at 28 days.

1.3.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for all concrete shall be 0.40 by weight.

1.3.3 Air Entrainment

All concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 4.5 and 7.5 percent. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

1.3.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be 1 to 4 inches. Slump shall be determined in accordance with ASTM C 143.

1.3.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F. When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

1.3.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.3.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.4 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.4.1 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement or portland cement in combination with pozzolan and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type I with a maximum 15 percent amount of tricalcium aluminate, or Type II.

2.2 AGGREGATE

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33. Maximum coarse aggregate size shall be 3/4 inch.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.2 Accelerating Admixture

ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.4 High-Range Water Reducer

ASTM C 494, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.3.5 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.7 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

2.8 JOINT MATERIALS

2.8.1 Joint Fillers, Sealers, and Waterstops

Materials for joints shall be in accordance with Section 03250 EXPANSION JOINTS, CONSTRUCTION JOINTS, AND WATERSTOPS.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Joints shall be installed at locations indicated and as shown on the contract drawings. Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Preparation of Subgrade

Subgrade upon which concrete is to be placed shall be excavated and prepared in accordance with Section 02300 EARTHWORK.

3.2 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers or by approved pumping equipment. Non-agitating equipment, other than pumps, shall not be used for transporting lightweight aggregate concrete.

3.3 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.3.1 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Non-agitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of non-agitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded

corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.3.2 Chutes

When concrete can be placed directly from a truck mixer, agitator, or non-agitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.3.3 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.4 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.4.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until

concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.4.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segration or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.4.3 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature	
Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature, Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.4.4 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.4.5 Placing Flowable Concrete

If a plasticizing admixture conforming to ASTM C 1017 is used or if a Type F or G high range water reducing admixture is permitted to increase the slump, the concrete shall meet all requirements of paragraph GENERAL REQUIREMENTS in PART 1. Extreme care shall be used in conveying and placing the concrete to avoid segregation. Consolidation and finishing shall meet all requirements of paragraphs Placing Concrete, Finishing Formed Surfaces, and Finishing Unformed Surfaces. No relaxation of requirements to accommodate flowable concrete will be permitted.

3.4.6 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03250 EXPANSION JOINTS, CONSTRUCTION JOINTS, AND WATERSTOPS.

3.4.7 Waterstops

Waterstops shall be installed in conformance with the locations and details shown on the drawings using materials and procedures specified in Section 03250 EXPANSION JOINTS.

3.4.8 Dowels

Dowels shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein.

END OF SECTION

SECTION 03400

PRECAST CONCRETE BOX CULVERTS

PART 1 GENERAL

Work covered by this section includes designing, furnishing, and installing precast box Culverts and end sections at the Silver Lake Outfall.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 850	(1990) Precast Reinforced Box Culverts, Storm Drains, and Sewers with less Than 2 ft Cover Subjected to Highway Loadings

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(1985) Quality Control for Plants and Production of Precast Prestressed Concrete Products
PCI MNL-120	(1992) Design Handbook - Precast and Prestressed Concrete

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop drawings for precast box culverts.

SD-05 Design Data

Precast concrete design calculations
Mix Design

SD-07 Certificates

Quality control procedures

1.3 QUALITY CONTROL

1.3.1 PCI Quality Certifications

ACI 318/318M and the PCI MNL-120. Design members (including connections) for the design load conditions and spans indicated, and for additional loads imposed by a 150-ton crane.

1.4 DELIVERY, STORAGE, AND HANDLING

Lift and support prestressed members at the lifting and supporting points indicated on the detail drawings. Store prestressed members off the ground. Separate stacked prestressed members by battens across the full width of each bearing point. Protect from weather, marring, damage, and overload.

PART 2 PRODUCTS

2.1 PRECAST BOX CULVERTS

Concrete in conformance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Minimum 28-day Compressive Strength 5,000 psi.

2.2 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615 or grade 60.

PART 3 EXECUTION

3.1 SURFACE REPAIR

Prior to erection, and again after installation, check members for damage, such as cracking, spalling, and honeycombing. Repair damage prior to backfilling structures.

3.2 ERECTION

Erect culverts after the concrete has attained the specified compressive strength. Place members level, plumb, and square within tolerances. Align member ends.

Box culvert sections shall be joined such that the inner surfaces are reasonably flush and even, using equipment and methods recommended by the box culvert manufacturer.

Inspect the installed box culvert and accessories before any backfill is placed. Any component found to be substantially out of alignment, unduly settled, or damaged shall be relaid or replaced.

Backfill and place materials in accordance with Section 02223: Earthwork. The backfill shall be brought up evenly on both sides of the conduit for the full length.

3.3 BEARING SURFACES

Shall be flat, free of irregularities, and properly compacted place prestressed members at right angles to the bearing surface, unless indicated otherwise, and draw-up tight without forcing or distortion, with sides plumb.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10100

TRAFFIC CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

COMMONWEALTH OF MASSACHUSETTS,
DEPARTMENT OF HIGHWAYS

State Specifications	(1988, R 1998) Standard Specifications for Highways and Bridges, as amended. The publication will be referred to as the "State Specifications."

U.S. DEPARTMENT OF TRANSPORTATION

MUTCD	(2000) Manual of Uniform Traffic Control Devices, as amended, including Part 6. The publication will be referred to as the "MUTCD."

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sign Material.
Sign Supports.

Provide printed copies of the manufacturer's literature of the products proposed for use, prior to installation.

SD-11 Closeout Submittals

Traffic Control Police Detail Invoices; G

Submit copies of invoices from police agencies for traffic control police officers. Invoices must include officer's name, date and time of duty, unit rates and application of overtime rates.

PART 2 PRODUCTS

2.1 SAFETY SIGNING

Materials shall conform to paragraph 850.42 of the State Specifications. Sign legends shall conform to standard legends specified in the MUTCD and as indicated on the drawings.

2.2 UNIFORMED POLICE OFFICERS

Uniformed police officers from the City of Pittsfield Police Department shall be used to the extent they are available, when necessary. To arrange for traffic details, the General Contractor shall contact the Detail Officer at (413) 448-9723 with sufficient lead-time.

2.2.1 Uniform

Officers shall be clothed in a suitable and characteristic uniform that will readily distinguish them from all other employees. Officers shall be attired with regulation caps and blaze orange vests with or without white stripes. Extra reflectorization and lighting may be necessary at night.

2.2.2 Police Powers

Officers shall have police powers granted by the proper authorities and shall wear an exposed badge.

2.2.3 Qualifications and Responsibilities

Officers for traffic control shall have had previous experience directing traffic for construction operations. Officers shall have been given specific instructions from the Contractor as to their duties and responsibilities, both to the public and to their fellow workers on the job. They shall handle the movement of the traveling public and shall do all that is reasonable to expedite that movement in a safe manner. They shall have authority to direct the actions of the construction vehicles as well as vehicles of the traveling public.

PART 3 EXECUTION

3.1 Allowable Traffic Routes

For materials being disposed of at the OPCA, use of public roads shall be limited to the stretch of Lyman Street from Hathaway Street to the GE-owned Lyman Street parking lot.

Trucks delivering equipment, supplies, and materials to the site shall use appropriate public roads as indicated in the following:

- On the south (or east) side of the river, under no circumstances should Ashley Street be used. The use of Day Street can be used for access by personal vehicles of construction personnel. Any other use of Day Street shall require Government approval.
- Use of Hathaway Street is permitted.
- On the north (or west) side of the river, the use of Cove Street is permitted, and the use of Lyman Street to access the project via lot I9-4-201 is permitted.

END OF SECTION

DIVISION 11

EQUIPMENT

SECTION 11800

PERFORMANCE SPECIFICATION FOR TREATMENT SYSTEM

PART 1 GENERAL

1.1 SYSTEM OVERVIEW

This specification for the temporary water treatment system is performance based. The system will be required to treat wastewater generated from the following activities: initial dewatering of excavation cells, ongoing dewatering of excavation cells, dewatering of saturated sediments and soils conducted at the contaminated materials staging area, contaminated run-on collected at the contaminated materials staging area, and decontamination of trucks and other equipment conducted at various staging areas. The General Contractor shall determine equipment sizing, select equipment, and prepare design drawings as necessary and requested by the Government for construction, including electrical, lighting, mechanical process and piping, HVAC, plumbing, fire protection, geotechnical, and instrumentation for the temporary water treatment system. The General Contractor shall design the structural foundation for the temporary water treatment system, if required.

The electrical power service (3 phase, 440 volt, 600 amp) will be provided by the Western Massachusetts Electric Co. Electrical power shall be installed by the General Contractor via underground conduit to a location adjacent to the treatment system. An emergency power supply will not be provided for operation of the treatment system. However, the General Contractor shall be responsible for coordinating with the Excavation Subcontractor to curtail the cell dewatering operations in the event that the storage capacity of the treatment system will be exceeded.

The work covered by this specification includes the handling and treatment of water from the point where it enters the storage tank to the discharge point in the river. It does not include conveyance piping from the discharge of the excavation cell dewatering system to the treatment system as described in Section 02464.

1.2 SYSTEM DESCRIPTION

The temporary water treatment system shall be designed, constructed, installed, and operated to comply with the design conditions described below. The General Contractor shall supply auxiliary systems and equipment required to maintain a complete and workable treatment system including, but not limited to, required piping between units, auxiliary equipment for plumbing, and controls and interfaces between auxiliary equipment and the treatment system. Chemical additives will be allowed to enhance the treatment system. The installation shall be constructed to prevent freezing of system components.

The system shall include a 500,000-gallon minimum storage tank, Modutank or equivalent, to be located within the general area available as shown on the drawings. The system shall include processes for particulate settling, oil/water separation (LNAPL and DNAPL, if encountered), filtration, granular activated carbon treatment, and discharge into the Housatonic River. Periodic shutdown and/or modification of the treatment system will be necessary to remove accumulated sediment from the large storage/equalization tank. The system shall include discharge piping. Effluent shall be discharged at the concrete headwall for the 24" steel drain located near STA 516+00 along the south bank of the river. Discharge shall be such that it does not result in scouring of the riverbed or riverbank. A Schedule 80 steel 12-inch diameter pipe sleeve shall be installed by the General Contractor under the haul road to the edge of the treatment system as shown on the drawings to protect the discharge pipe from damage by heavy equipment. The General Contractor shall install the discharge pipe within this sleeve.

1.2.1 Influent Characteristics

Treatment plant influent will be generated from dewatering of the excavation cells located within the river, decontamination of site materials and equipment, contaminated runon collected at the contaminated materials staging area, and dewatering of soil and sediments in the contaminated materials staging area. The most significant volume of water is anticipated to be generated from excavation cell dewatering. Initially, the Excavation Subcontractor will pump down river water within the cells before the start of excavation in that cell until six inches of water remain in the cell. During this initial dewatering, water will be discharged directly back the river. The final six inches of water and all subsequent water pumped from the cell will then be pumped to the treatment system. Water that must be pumped by the Excavation Subcontractor from an active excavation cell following a flooding event will either be pumped directly back to the river until six inches of water remains or it will be pumped to the treatment system based on the conditions present following consultation with the Government. Once the excavation cell is dewatered, the Excavation Subcontractor will be required to maintain the cell in a generally dry condition to facilitate excavation and restoration. It is anticipated that pumping will be required 24 hours per day while excavation and restoration of each cell is occurring.

Other sources of water to be generated during the Removal Action such as water draining from saturated soils and sediments, contaminated run-on, and decontamination wash water will be delivered to the treatment system periodically as necessary via truck in batches.

The General Contractor shall design the system to accommodate the following general parameters:

Design Flow:	400 gallons per minute
Minimum Available Head:	0 feet
Flow Conditions:	Intermittent

Additional influent characteristics describing the potential concentrations of contaminants in the groundwater at the areas of excavation are included in Table 11800-1. The influent data provided in this table are based on three pore water samples collected where groundwater discharges to the river bed in the first reach. The quality of the water removed by the dewatering system is expected to vary depending on the location of the work being performed in the Housatonic River. The influent data included in Table 11800-1 represent the highest result of three pore water samples collected from the reach of the river to be excavated in Phase I.

1.2.2 Design Criteria

Water treatment system effluent shall meet the discharge limits included in Table 11800-1. Finalization of these discharge criteria is contingent on U. S. Environmental Protection Agency (USEPA) approval of the NPDES Permit Exclusion.

1.2.3 System Location

The water treatment system, including the discharge piping and the Modutank, shall be located as shown on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Treatment System; G.

Shop drawings shall contain complete wiring and schematic diagrams; field wiring and piping diagrams and point-to-point wiring diagrams including interconnections between field devices, panels, control stations, lighting panels, and motor starters; equipment layout and anchorage; and any other details required to demonstrate that the system has been coordinated and will properly function as a unit to meet the performance criteria. Shop drawings shall include a plan showing equipment layout.

SD-03 Product Data

Treatment System; G.

Product data shall include:

a. Qualifications of the installer, and the manufacturer's and supplier's representatives.

b. Catalogue cuts and other pertinent information on treatment units, pumps, tanks, mixers, piping and flow elements.

c. Detailed description of the proposed control system, if applicable.

d. A complete list of equipment and materials, including manufacturer's descriptive and technical literature; performance charts and curves; catalog cuts; and installation instructions.

SD-05 Design Data

Foundation Evaluation and Design; G.

The General Contractor shall evaluate the structural stability of the temporary water treatment system location and design a suitable foundation for the temporary water treatment system, if required. Submittals shall include site evaluation methods and findings, design criteria, including equipment loads and soil bearing pressures, and foundation construction drawings

SD-06 Test Reports

Acceptance Testing; G.

Test reports in booklet form showing field tests performed to adjust each component and to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

Factory Tests; G.

Test reports in booklet form showing results of factory tests performed.

SD-10 Operations and Maintenance Data

Operations and Maintenance Manual; G.

General Contractor shall submit for government approval a streamlined O&M manual for the treatment system. A draft of the plan shall be submitted before delivery of

equipment to the site. Revisions to the plan shall be made as necessary to include changes to O&M procedures as they become evident during the progress of the work.

1.4 QUALIFICATIONS

A Licensed Professional Engineer shall review all system design submittals, including but not limited to the temporary water treatment plant processes and layout design, the electrical line drawing, the piping layout, and the foundation/support system design.

1.5 FIELD MEASUREMENTS

The General Contractor shall verify all dimensions in the field and shall advise the Government of any discrepancy before performing the work.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use. Equipment shall be supported by a service organization that is, in the opinion of the Government, reasonably convenient to the site.

For the purposes of this specification, it is assumed that the treatment system shall include processes for particulate settling, oil/water separation (LNAPL and DNAPL), filtration, and granular activated carbon treatment. However, this is a performance specification and the General Contractor shall select unit processes, as appropriate, to meet the discharge criteria. The General Contractor shall not be bound to the particular processes identified in this specification.

2.2 GENERAL REQUIREMENTS

2.2.1 Electrical Work

Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices, shall be provided.

Electrical wiring for the treatment system shall meet the electrical requirements for wet environments, including GFI protection.

2.2.2 Access Walkways, Platforms, Ladders, and Handrails

Walkways, platforms and ladders shall be provided for access to equipment for operation and maintenance. They shall be designed and constructed in accordance with 29 CFR 1926 and 29 CFR 1910.

2.2.3 Utilities

All utilities shall be brought to the site by the General Contractor.

2.2.4 Secondary Containment

Secondary containment shall be provided for each treatment unit and all auxiliary systems of the temporary water treatment system, or secondary containment shall be provided for the entire treatment system. This includes but is not limited to the 500,000 gallon Modutank, filters, activated carbon units, storage tanks or equalization basins, pumps, and piping. Sump(s) and pumps shall be provided as needed to transfer water out of the secondary containment areas to the head of the temporary water treatment system.

PART 3 EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

Equipment delivered and placed in storage shall be protected from the weather, excessive humidity, excessive temperature variation, and dirt, dust, or other contaminants.

3.2 SAMPLING AND ANALYSIS

The General Contractor shall perform sampling and analysis, for all compounds listed in Table 11800-1, of the influent to the activated carbon treatment and the system effluent every other day during the first week of operations, weekly for the balance of the first month, and once every other week for the balance of the water treatment system operation. The General Contractor shall perform sampling and analysis of the water between carbon units in series (if applicable) at the same frequency; however, these samples will be analyzed for only the organic compounds in Table 11800-1. Monthly analytical reports, with quality control information, shall be submitted to the Government by the 28th of the month. The Government shall be notified immediately of any exceedances. Appropriate corrective actions as determined in consultation with the Government shall be implemented.

All sampling, analysis, and quality control procedures shall follow the project QAPP as referenced in the specifications.

3.3 SYSTEM STARTUP

When construction of the temporary water treatment system has been completed, the General Contractor shall startup the treatment system and make any necessary modifications to ensure that the plant is fully operable and meets the requirements of the performance specifications prior to initiation of normal plant operations. Criteria for completion of startup include steady state operation of the facility with all system components and effluent quality meeting the performance criteria for a two week period. The General Contractor shall provide 48 hours notice of system start-up to the Government.

3.4 PROCESS RESIDUALS

Residuals generated from the operation of the temporary water treatment system shall be collected, contained, segregated, sampled, and disposed of by the General Contractor in accordance with project ARARs. All residuals, except for spent activated carbon and NAPL-saturated residuals, can be disposed of in the appropriate OPCA cell. Spent activated carbon shall be sent off-site for regeneration or disposal, and shall be sampled, if necessary, to verify whether or not the material is regulated under TSCA. NAPL-saturated residuals will also be disposed off-site in accordance with ARARs and applicable regulations.

3.5 SPILL RESPONSE AND DISCHARGE CONTROL

The General Contractor shall provide onsite equipment and materials for spill response for any spills that are generated in the temporary water treatment system or generated as a result of water treatment system construction, operation, or maintenance activities. The General Contractor shall develop, implement, maintain, supervise, and must be responsible for a comprehensive Spill and Discharge Control Plan as described in Subsection 1.3 Submittals.

The General Contractor shall comply with all federal, state, and local oil and hazardous waste regulations, including but not limited to: 40 CFR 264 Subpart D, 40 CFR 280 Subpart E, 40 CFR 110 112, 310 CMR 40 Subpart C, 314 CMR 15.00, 310 CMR 30.000, and 310 CMR 30.520 or as indicated in the ARARs table in. The General Contractor shall provide methods, means, and facilities required to prevent contamination of soil, water, atmosphere, uncontaminated structures, equipment, or material by the discharge of wastes from spills due to the General Contractor's operations. The General Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillages and to remove spilled materials and soils or liquids that become contaminated due to spillage. The General Contractor shall provide equipment and personnel to perform decontamination measures that may be required to remove spillage from previously uncontaminated structures, equipment, or material. All spilled material, all decontamination residues, and all contaminated soils, absorbent materials, solvents, and other materials resulting from

the cleanup of spilled or discharged substances shall be properly stored, labeled and disposed of by the General Contractor.

No discharge of oil, sufficient to cause a sheen (as defined in 40 CFR 112) shall occur to the Housatonic River. The discharge of a sheen of oil shall constitute an oil spill and must be reported, immediately to the USEPA, the MADEP Emergency Response Section, and the National Response Center [(800) 424-8802].

Table 11800-1

PERFORMANCE SPECIFICATION FOR TREATMENT SYSTEM
DISCHARGE CRITERIA AND POREWATER QUALITY

Compound	**CAS Registry #**	**Discharge Criterion (ppb)**	**Pore Water (Influent) Quality[1] (ppb)**
Organics			
1,2,4,5-Tetrachlorobenzene	95-94-3	100	11 U
1,2,4-Trichlorobenzene	120-82-1	70	11 U, 0.78 J
1,2-Dichlorobenzene	95-50-1	75	11 U
1,3-Dichlorobenzene	541-73-1	100	11 U
1,4-Dichlorobenzene	106-46-7	100	11 U
2-Butanone	78-93-3	100	2.5 R
Acetone	67-64-1	100	21 J
Benzene	71-43-2	5	3.9 J
Bis(2-ethylhexyl) phthalate	117-81-7	100	11 U
Chlorobenzene	108-90-7	100	1.6
Chloroform	67-66-3	100	0.5 U
Cis-1, 2-Dichloroethylene	156-59-2	70	Not Available
Diethyl phthalate	84-66-2	100	11 U
Ethylbenzene	100-41-4	*	0.5 U
Polychlorinated biphenyls	1336-36-3	0.5	**2.4**
Polynuclear Aromatic Hydocarbons (PAHs)	various	100	1 J, 11 U[2]
Pentachlorobenzene	608-93-5	100	11 U
Phenol	108-95-2	100	11 U
Tert-butyl methyl ether (MTBE)	1634-04-4	70	Not available
Toluene	108-88-3	*	0.5 U
Trichloroethylene	79-01-6	5	0.5 U
Xylene(s)	1330-20-7	*	0.5 U

Table 11800-1 (continued)

PERFORMANCE SPECIFICATION FOR TREATMENT SYSTEM
DISCHARGE CRITERIA AND POREWATER QUALITY

Inorganics			
Arsenic	7440-38-2	50	4.6 U
Barium	7440-39-3	100	55.9
Beryllium	7440-41-7	4	0.56
Chromium (total)	7440-47-3	100	2.2 U
Cobalt	7440-48-4	100	3 U
Copper	7440-50-8	100	5.8 J
Lead	7439-92-1	50	3.7 U
Nickel	7440-02-0	100	2.9 U
Thallium	7440-28-0	2	**3.9 U**
Tin	7440-31-5	100	3.8 UJ
Vanadium	7440-62-2	100	2.9 U
Zinc	7440-66-6	100	**656**

* Total BTEX cannot exceed 100 ppb.

U - Compound was not detected in the sample above the reported detection limit

J - Concentration stated represents an estimated value

R - Result was rejected during data validation

Not Available – Data not available

Bold - Indicates result exceeds one of the stated criteria

[1] Highest results of three pore water samples collected from the reach of the river to be excavated in Phase I.

[2] Based on highest results for individual PAH compounds.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16010

ELECTRICAL GENERAL

PART 1 GENERAL

1.1 SECTION INCLUDES

a. Basic electrical requirements specifically applicable to Division 16 Specifications.

1.2 GENERAL REQUIREMENTS

These electrical specifications are intended to govern the general project electrical requirements. Electrical work is comprised of temporary services and distribution for the following:

- Soil and Sediment Staging Areas
- Treatment Plant Site

Additional electrical distribution and work will likely be required throughout the project duration, as necessary to extend service to new locations or extend/modify work at existing locations.

For new electrical work not shown on the Contract Documents, separate submittals detailing the work, complete with Drawings, Supplemental Specifications, and supporting data will require submission and approval prior to proceeding with the work.

1.3 WORK INCLUDED

a. The electrical work shall include, but is not limited to, the following:

1. Power distribution systems
2. Lighting systems
3. Motor control systems
4. Ground systems

1.4 REFERENCES

a. ANSI/NFPA 70 - National Electrical Code (NEC)
b. IEEE - Institute of Electrical and Electronics Engineers
c. ISA - Instrument Society of America
d. NEMA - National Electrical Manufacturers Association
e. National Fire Protection Association (NFPA)
f. National Institute for Occupational Safety and Health (NIOSH)
g. Factory Mutual (FM)
h. Underwriters Laboratory (UL)
i. Local, state and national agencies having jurisdiction.

1.5 REGULATORY REQUIREMENTS

a. The work manufactured and furnished under this specification shall conform to the following:

1. Applicable federal, state and local codes, ordinances and regulations in force in the locality of the project.

2. Regulations of local utility and telephone companies.

3. Applicable standards of ANSI, IEEE, ISA, NEMA, UL and NEC.

b. Where standards differ, the General Contractor shall state which standard applies. Unless modified by provisions of this specification, these standards apply, whether mentioned in the text or not. The General Contractor shall also note where existing standards are not satisfied or only partially satisfied. Where non-standard hardware, or services are offered, the General Contractor shall defend their adequacy in relation to the functions to be performed, and the cost of fully satisfying existing standards.

c. All materials, equipment and lighting fixtures shall bear a UL label or shall be UL listed, unless UL does not have an examination service for the item in question.

1.6 ELECTRICAL WORK

a. In addition to requirements specified under other sections of electrical work, the following work shall be included:

1. Furnish all labor; and furnish, install, connect, test and adjust all equipment and materials to form a complete operating installation, including without limiting the generality of the foregoing: lights, panels, motor controls, transformers, hangers, supports for equipment, cables, conduits, pull boxes, anchors and inserts; identification plates; signs and tags for equipment, conduits, wiring, and wire labels.

2. Wire and connect all electrical equipment which has been split or sectionalized for shipping purposes.

3. Provide all wiring during testing and trials, for all required corrections, changes, additions, completions and adjustments until final acceptance of the work.

4. Coordinate numbers and label all field wiring between equipment of the various electrical equipment suppliers.

5. Install the electrical work in a manner and at times to minimize cutting and patching of existing and new facilities.

6. Repair any damage to work already in place, as a result of electrical work at no expense to the government.

7. Provide all sleeves, inserts, and other embedded items required in the work.

8. Provide all conduit, wiring, wiring devices and connections for the instrumentation and control.

9. Provide all conduit, wires, and switches necessary for heating, air conditioning, ventilating fans, lighting fixtures and ballasts, motors, and other electrical loads.

10. Provide all wires, cable, wiring devices, conduits, pole lines, trench systems, manholes, ductbanks and ducts, including excavation and backfill for underground conduits.

11. Provide all starters, contactors, circuit breakers, pushbuttons, limit switches, float switches, relays, including structural supports as shown on the drawings, specified herein, and as required.

1.7 QUALITY ASSURANCE

a. All personnel employed by the manufacturer, supplier, and/or General Contractor shall be experienced in their respective trades and tasks.

b. The General Contractor shall be properly licensed in accordance with all state, federal, and local requirements.

c. Journeyman shall have completed an apprenticeship program or have equivalent experience.

1.8 DESIGN CRITERIA

a. The work site is located Pittsfield, Massachsuetts

b. Ambient temperatures are as listed in ASHRAE for the location of the project, outdoors.

1.9 DELIVERY, STORAGE, AND HANDLING

a. Receive, unload, and store all equipment.

b. The General Contractor shall inspect all incoming material for damage and compliance with the specifications and drawings. Defective or improper material shall not be allowed to be incorporated into the work.

c. Store the provided equipment and materials in an environmentally safe location to preserve the quality and operation condition.

1.10 SUBMITTALS

a. Government approval is required for submittals with a "G" designation. Submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identified the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

1. Electrical Distribution System

a. If departures from the Contract Drawings are deemed necessary or new work that is not shown on the Drawings is required, detail drawings shall be provided to show how components are assembled, function together and how they will be installed on the project. Data and drawings for components parts of an item or system shall be coordinated and submitted as a unit.

b. Detail drawings showing physical arrangement, schematics, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned.

SD-03 Product Data

1. Submit data in accordance with Section 01330 giving performance data, physical size, wiring diagrams, and materials, on following items:

- Lighting fixtures
- Motor controllers
- Panelboards
- Pushbutton stations
- Dry type transformers
- Conduit and duct
- Cable and wire
- Handholes/manholes

2. Identify requirements of each electrical system before submission of shop drawings. Identify all necessary accessory parts required between items of electrical equipment (on separate drawings, if necessary, showing the particular system) in sufficient detail to prove that the total equipment furnished and installed will operate as specified and shown on the drawings.

1.11 FINAL ACCEPTANCE

a. Final acceptance of the power and control systems will not be considered complete until each system functions and operates all connected electrical equipment in the manner as required by the detailed specifications and drawings. Complete the following before acceptance:

1. Motors shall be connected to protective devices and control panels to provide proper motor acceleration, and correct motor rotation as shown on the drawings and as required by the driven equipment.

2. Control wiring shall be connected to all the control devices associated with a machine or a group of machines to produce the correct operating, timing and sequencing necessary for the proper functioning of the mechanical equipment as set forth by the specifications.

3. All necessary adjustments and alterations necessary from start of operations.

1.12 GUARANTEE

a. The manufacturer and/or General Contractor shall guarantee in writing that the materials and workmanship of all equipment furnished by him, regardless of manufacturer, be new and free of defect for a period of one year from the date of acceptance or eighteen months from delivery of the last component whichever is reached first.

b. Defective materials and/or installation shall be replaced or repaired at no cost to the government.

1.13 REGULATORY REQUIREMENTS

a. Conform to applicable Massachusetts Building Code.
b. Electrical: Conform to NFPA 70, The National Electrical Code.
c. Obtain permits, and request inspections from authority having jurisdiction.

1.14 PROJECT/SITE CONDITIONS

a. Install work in locations shown on drawings, unless prevented by project conditions.

b. Prepare drawings for approval showing new work or proposed rearrangement of work to meet project conditions, including changes to work specified in other sections.

PART 2 PRODUCTS

2.1 MATERIALS

a. All of the material shall be suitable for the listed environment.

b. All materials shall be heavy duty industrial type as manufactured by a principal industrial equipment manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

a. Prior to initiating field work or procurement of materials, the General Contractor shall inspect the site to insure compatibility with the Work as shown on the drawings and in the specifications.

3.2 PREPARATION

a. The General Contractor shall verify all locations in the field and make minor adjustments to the Work to suit existing conditions.

b. Adjustments to dimensioned items on the drawings not indicated as being approximate shall be submitted for approval.

c. All changes shall be accurately recorded on the "as-built" drawings and other related documents.

3.3 INSTALLATION

a. Install all equipment in strict accordance with the manufacturer's requirements.
b. Verify the performance of all equipment.

3.4 QUALITY CONTROL

a. Perform such tests as are required to insure the integrity of the system.

b. The General Contractor shall verify that all connections are complete and correct, and that all grounds are in place and tested.

c. Submit all test and inspection reports as required by the individual sections and in accordance with Section 01330.

d. Maintain accurate As-Built Drawings throughout the project duration and transmit the final set of as-built drawings the completion of the Project.

3.5 ADJUSTMENTS AND CLEANING

a. All components shall be properly set and adjusted.

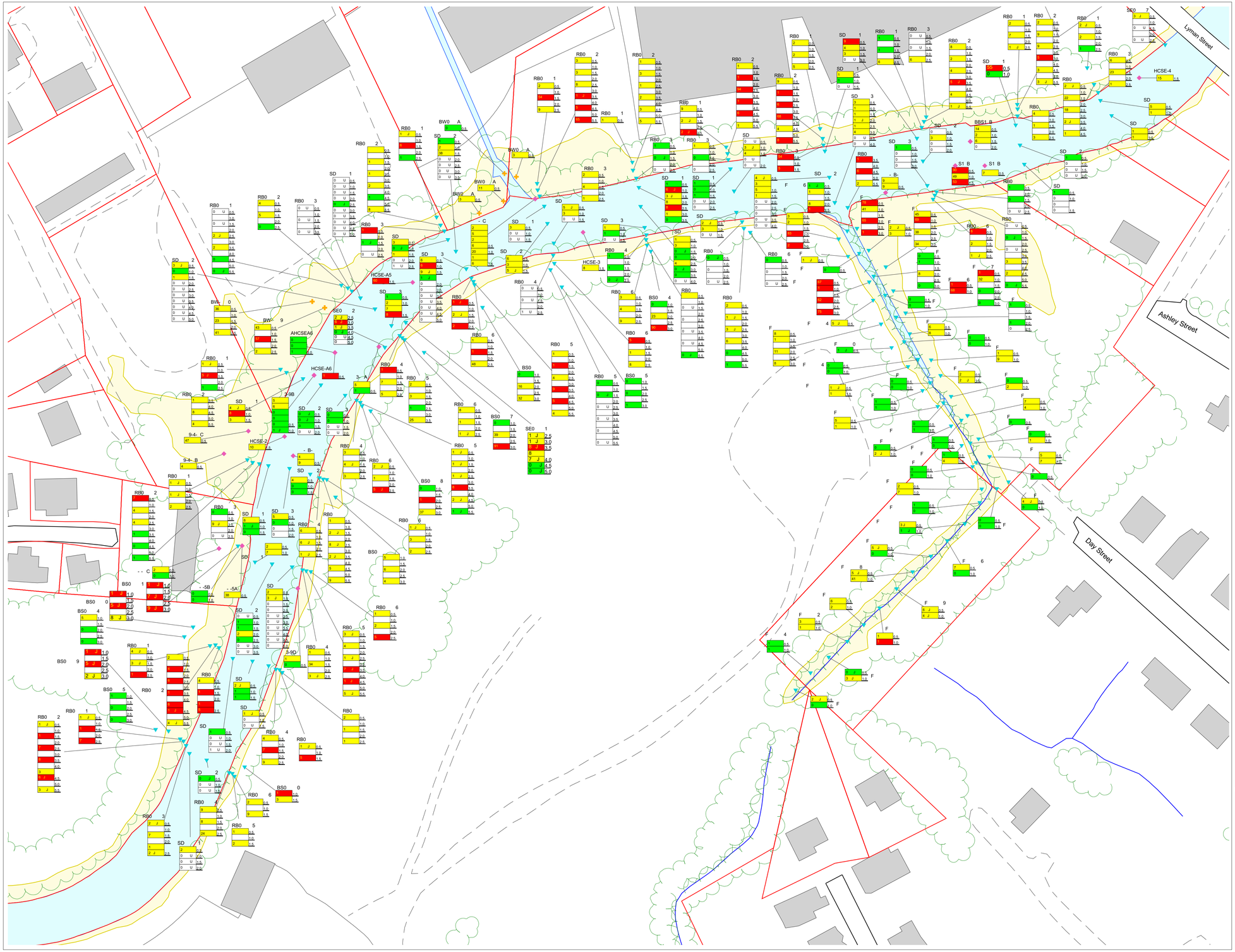
b. All fuses, overloads, lamps, etc. shall be furnished and installed.

c. All equipment shall be cleaned, paint retouched, and have all covers installed prior to start-up.

END OF SECTION

ATTACHMENT 1

STACK BAR MAP



WESTON MANAGERS DESIGNERS/CONSULTANTS

LEGEND:

- EPA - Corp of Engineers Sample ocation
- EPA_REG1/EPA_START Sample ocation
- GE Sample ocation
- Surface Water
- -year oodplain
- Buildings
- Property Boundary

PCB Concentration (ppm)

result value

no sample			0.5
non-detect	0	U	1.0
< 2	0	1	1.5
-0	1		2.0
> 0	87	U	2.5

lower depth value

result flag

NOTE: Result flag indicates -
U = not detected at reported value
J = estimates at or below reported value
UJ = estimated at or below reported value

Base features derived from BBL drawings.

N

Scale in eet

50 0 50 100 150

Site Specific Environmental Restoration Contract (SSERC)
GE/Housatonic River Project
Pittsfield, Massachusetts

STACK BAR MAP LYMAN STREET BRIDGE TO STATION 514+00

ATTACHMENT 2

PROJECT ARARs TABLE

Table C-1

Chemical-Specific ARARs

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
Federal ARARs				
Clean Water Act, Ambient Water Quality Criteria	33 USC 1314 40 CFR 131.36(b)(1) 63 Fed. Reg. 68359	National recommended criteria for surface water quality. PCB Criteria: For protection of freshwater aquatic life due to chronic exposure: 0.014 ppb For protection of human health from consumption of water and organisms: 0.00017 ppb Various numerical criteria for other constituents.	Relevant and appropriate for in-stream evaluation.	Removal of contaminated banks and sediments, together with the Removal Action for ½-Mile Reach and source control and floodplain soil removal performed pursuant to the Removal Actions Outside the River, should mitigate any existing PCB AWQC exceedances and reduce any PCB surface water contamination.
State ARARs				
Mass. Water Quality Standards	314 CMR 3.10(3) 314 CMR 4.05(5)(e)	Establishes federal water quality criteria as allowable water quality concentrations. Allows for site-specific criteria where federal criteria are invalid due to site-specific characteristics.	Relevant and appropriate for in-stream evaluation.	See above discussion of federal water quality criteria.

Table C-1

Chemical-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
Guidances Considered				
Cancer Slope Factors (CSFs)	---	Guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	To be considered.	EPA considered this guidance in the development of this Removal Action.
Reference Doses (RfDs)	---	Guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants.	To be considered.	EPA considered this guidance in the development of this Removal Action.
PCBs: Cancer Dose - Response Assessment and Application to Environmental Mixtures	EPA/600/P-96/001F (September 1996)	Guidance regarding EPA's reassessment of the carcinogenicity of PCBs. It includes revised cancer slope factors for PCBs based upon the exposure pathway.	To be considered.	EPA considered this guidance in the development of this Removal Action.

Table C-2

Action-Specific ARARs

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
A. Excavation of Bank Soils and River Sediments (including river diversion to re-route river) and Covering/Restoration of Excavated Areas				
Federal ARARs				
TSCA Regulations re PCB Remediation Waste	40 CFR 761.61(c)	Establishes cleanup options for PCB remediation waste, including PCB-contaminated soils and sediments. Options include risk-based approval by U.S. EPA. Risk-based approval option must demonstrate that cleanup plan will not pose an unreasonable risk of injury to health or the environment.	Applicable.	Will be attained. The EE/CA work will not pose an unreasonable risk of injury to health or the environment.
TSCA Regulations re Decontamination	40 CFR 761.79	Establishes decontamination standards and procedures for removing PCBs from non-porous surfaces.	Applicable to decontamination of equipment and sheetpiling used in excavation and restoration activities.	Will be attained.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
A. Excavation of Bank Soils and River Sediments (including river diversion to re-route river) and Covering/Restoration of Excavated Areas (cont'd)				
Federal ARARs (cont'd)				
RCRA Hazardous Waste Regulations (Identification and Listing of Hazardous Wastes; Toxicity Characteristics)	40 CFR 261.24	Identifies concentration of contamination which, if present, make a waste hazardous due to toxicity. The analytical test set forth in Appendix II of 40 CFR part 261 is referred to as the Toxicity Characteristic Leaching Procedures.	Relevant and Appropriate.	Will be attained. After application of a conservative screening test, if exceedances are suspected, TCLP will be used to determine whether soils and sediments are characteristic hazardous waste. Soils that exceed allowable concentrations will either be placed in the appropriate On-Plant Consolidation Area (e.g., Building 71) or sent to an appropriate off-site disposal facility. Soils below allowable concentrations, as determined either through the screening tool or TCLP testing, will either be placed in the Hill 78 or Building 71 Consolidation Areas or sent to an appropriate off-site facility.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
A. Excavation of Bank Soils and River Sediments (including river diversion to re-route river) and Covering/Restoration of Excavated Areas (cont'd)				
Federal ARARs (cont'd)				
Clean Water Act NPDES Regulations (Stormwater Discharges)	40 CFR 122.26(c)(1) (ii)(C) 40 CFR 122.44(k) 40 CFR 125.100-.104	Best management practices to control pollutants in stormwater discharges during construction activities.	Applicable.	Best management practices for erosion and sedimentation control will be adopted to minimize the potential for rainfall or flood-induced migration of soils and sediments from disturbed areas.
State ARARs				
Mass. Air Pollution Control Requirements	310 CMR 7.09	Prohibition against creating condition of air pollution in connection with dust-generating activity.	Applicable.	Will be attained. Air monitoring for particulates will be conducted and any exceedances will be addressed.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
B. Discharge of Treated Waters to Housatonic River				
Federal ARARs				
Clean Water Act, NPDES Regulations	33 USC 1342 40 CFR 122, esp. 122.44(a), (e) 40 CFR 125.1-125.3	Best Available Technology (BAT) effluent limits for toxic and non-conventional pollutants; Best Conventional Technology (BCT) limits for conventional pollutants; water-quality based effluent limitations. Discharges in accordance with instructions of On-Scene Coordinator acting pursuant to NCP are exempt from NPDES permit requirements. See 40 CFR 122.3(d).	Applicable to point source discharges of treated waters to Housatonic River.	Will be attained. The discharge of treated waters will either be from a portable treatment plant, and will meet emergency limits identical to those established for the Building 68 removal action (0.5 ppb PCBs), or will be from GE's existing Groundwater Treatment facility, in which case discharges will meet GE's NPDES permit limits.
	40 CFR 125.100-.104	Best management practices to prevent release of toxics to surface water from ancillary areas or spills.	Same as above.	Same as above.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
B. Discharge of Treated Waters to Housatonic River (cont'd)				
Federal ARARs (cont'd)				
TSCA Regulations	40 CFR 761.50(a)(3)	Prohibits discharge of water containing PCBs to navigable waters unless PCB concentration is less than approximately 3 ppb or in accordance with discharge limits of NPDES permit.	Relevant and Appropriate to discharge of treated waters to Housatonic River.	Will be attained. See discussion of federal Clean Water Act NPDES regulations above.
State ARARS				
Mass. Clean Water Act - Discharge Regulations and Water Quality Standards	314 CMR 3.10 314 CMR 3.19 314 CMR 4.04 (1) 314 CMR 4.05(3)(b) 314 CMR 4.05(5)	Effluent limitations and other conditions for point source discharges; state water quality standards.	Applicable to point source discharges of treated waters to Housatonic River.	For effluent discharges, see discussion of federal Clean Water Act NPDES regulations above. For in-stream attainment, see Table C-1.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
C. Temporary On-Site Storage/Accumulation of Excavated Sediments and Soils and Temporary On-Site Storage/Accumulation of Free Product, Drums, and Equipment that Will be Disposed of Off-Site.				
Federal ARARs				
TSCA Regulations (Storage for Disposal)	40 CFR 761.61(c)	Provides for risk-based approval to store PCB-remediation waste based upon demonstration that storage plan will not pose an unreasonable risk of injury to health or the environment.	Applicable.	Will be attained. Temporary storage areas will be lined with synthetic material and stored material will be covered by impermeable material. Temporary storage requirements for marking and inspections will be met.
TSCA Regulations (PCB Marking Requirements)	40 CFR 761.40	Requirements regarding the marking of PCB containers and PCB storage areas.	Applicable.	Will be attained.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
C. Temporary On-Site Storage/Accumulation of Excavated Sediments and Soils and Temporary On-Site Storage/Accumulation of Free Product, Drums, and Equipment that Will be Disposed of Off-Site (cont'd)				
Federal ARARs (cont'd)				
RCRA Hazardous Waste Regulations (Storage of Hazardous Waste)	40 CFR Part 264, Subparts I and J 40 CFR 262.34(a).	Subparts I and J of Part 264 identify design, operating, monitoring, closure, and post-closure care requirements for long-term storage of RCRA hazardous waste in containers and tank systems, respectively. However, Section 262.34(a) allows accumulation of RCRA hazardous wastes for up to 90 days in containers or tanks provided generator complies with requirements of Subparts I and J of Part 265.	Applicable.	Will be attained. Any free product, drums, or contaminated equipment will be managed and stored in accordance with the substantive requirements of the cited regulations prior to being sent off-site for disposal.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
C. Temporary On-Site Storage/Accumulation of Excavated Sediments and Soils and Temporary On-Site Storage/Accumulation of Free Product, Drums, and Equipment that Will be Disposed of Off-Site (cont'd)				
State ARARs				
Mass. Hazardous Waste Regulations (Storage of Hazardous Waste)	310 CMR 30.680, 30.690 310 CMR 30.340	Sections 30.680 and 30.690 identify requirements for long-term storage of RCRA hazardous waste in containers and tank systems similar to federal RCRA storage requirements identified above. Section 30.340 allows on-site accumulation of hazardous waste for up to 90 days and is also similar to federal RCRA storage requirements identified above.	Applicable to the accumulation and storage of Mass. Hazardous waste (other than PCBs).	See discussion of federal RCRA Hazardous Waste Regulations above.

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
D. Permanent On-Site Consolidation of Excavated Sediments and Soils				
ARARs are listed in EPA approved Supplemental Addendum (dated September 8, 1999) to GE *Detailed Work Plan for On-Plant Consolidation Areas*.				

Table C-2

Action-Specific ARARs
(Continued)

Regulation	Citation	Criterion/Standard	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
E. Other				
Federal ARARs				
TSCA PCB Spill Cleanup Policy	40 CFR 761, Subpart G (§761.120 et seq.)	Policy used to determine adequacy of cleanup of spills resulting from the release of materials containing PCBs at concentration of 50 ppm or greater.	TBC for PCB spills or leakage from cleanup.	This cleanup policy will be considered for any new PCB spills that occur during the work.

Table C-3

Location-Specific ARARs

Regulation	Citation	Requirements	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
Federal ARARs				
Fish & Wildlife Coordination Act Requirements	16 USC 662, 663 40 CFR 6.302(g)	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent possible.	Applicable.	Will be attained. Appropriate agencies will be consulted regarding potential mitigation measures. In-stream work includes restoration of river and aquatic habitat and precautions against erosion and scour of river sediments and bank soils.
Preservation of Historical and Archaeological Data Act and National Historic Preservation Act	16 USC 469 et seq. 36 CFR Part 65 16 USC 470 et seq. 36 CFR Part 800	Establishes requirements for the recovery and preservation of historical and archaeological data. Also requires measures to minimize harm to historic resources.	Potentially applicable.	No archaeological or historic resources are believed to exist in the 1.5 Mile Reach. This assumption was verified (see attachment of State Register of Historic Places, 1998, pages 213-214). If historic or archaeological resources are discovered, such objects will be recovered in accordance with the substantive requirements of the cited regulations, to the extent practicable. If historic properties are identified, mitigation measures will be taken to minimize harm to historic properties, to the extent practicable.

Table C-3

Location-Specific ARARs
(Continued)

Regulation	Citation	Requirements	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
Federal ARARs (cont'd)				
Endangered Species Act	16 USC 1531 et seq. 50 CFR Part 402 50 CFR Part 17.11-17.12 40 CFR 6.302(h)	This Act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or destruction or adverse modification of critical habitat. Also must consult with Department of Interior.	Potentially applicable.	Threatened or endangered species are not believed to exist in the 1.5 Mile Reach. This assumption was verified; see attached letter from John Lorties of Woodlot Alternatives, Inc. to Joel Lindsay of Roy F. Weston, Inc. dated October 19, 2001. If endangered species are present, substantive provisions of the cited regulation will be complied with, to the extent practicable.
Executive Order for Wetlands Protection	Exec. Order 11990 (1977) 40 CFR 6.302(a) 40 CFR Part 6, App. A	Federal agencies are required to avoid adversely impacting wetlands whenever possible, minimize wetland destruction, and preserve the value of wetlands.	Applicable.	Will be attained. There is no practical alternative to work in wetlands with less adverse impact and all practicable measures will be taken to minimize and mitigate any adverse impacts. Erosion and sedimentation control measures will be adopted during removal and restoration activities. The riverbank, river, and associated habitat will be restored and enhanced.

Table C-3

Location-Specific ARARs
(Continued)

Regulation	Citation	Requirements	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
Federal ARARs (cont'd)				
Executive Order for Floodplain Management	Exec. Order 11988 (1977) 40 CFR Part 6, App. A. 40 CFR 6.302(b)	Federal agencies are required to reduce the risk of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial values of floodplains.	Applicable.	Will be attained. There is no practical alternative to work in floodplains with less adverse impact and all practicable measures will be taken to minimize and mitigate any adverse impacts. Erosion and sedimentation control measures will be adopted during removal and restoration activities. The riverbank, river, and associated habitat will be restored and enhanced.
Clean Water Act § 404 Requirements	33 USC 1344 33 CFR Parts 320-323 40 CFR 230	For discharge of dredged or fill material into water bodies or wetlands, there must be no practical alternative with less adverse impact on aquatic ecosystem; discharge cannot cause or contribute to violation of state water quality standard or toxic effluent standard or jeopardize threatened or endangered (T&E) species; discharge cannot significantly degrade waters of U.S.; must take practicable steps to minimize and mitigate adverse impacts; must evaluate impacts on flood level, flood velocity, and flood storage capacity.	Applicable.	Will be attained in part because (a) there is no practical alternative with less adverse impact; (b) all practical measures will be taken to minimize and mitigate any adverse impacts from the work; (c) there is no likely impact on T&E species; (d) actions will be taken to minimize impact of hydrologic changes during the work; (e) after completion of the work, there will be no significant net loss of flood storage capacity, and no significant net increase in flood stage or velocities; and (f) river and riverbanks will be restored and habitat will be improved.

Table C-3

Location-Specific ARARs
(Continued)

Regulation	Citation	Requirements	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
State ARARs				
Mass. Clean Water Act - Water Quality Certification Regulations	314 CMR 9.06	For discharge of dredged or fill material, there must be no practicable alternative with less adverse impact on aquatic ecosystem; must take practicable steps to minimize adverse impacts on wetlands or land under water; stormwater discharges must be controlled with BMPs; must be no substantial adverse impact to physical, chemical, or biological integrity of surface waters.	Relevant and Appropriate.	Will be attained because (a) there is no practicable alternative with less adverse impact on the aquatic ecosystem; (b) all practical measures will be taken to minimize adverse impacts on wetlands and land under water; (c) stormwater discharges will be controlled through BMPs; and (d) there will be no substantial long-term adverse impacts to integrity of river waters.
	314 CMR 9.07	Hydraulic or mechanical dredging allowed; must avoid fisheries impacts.	Relevant and Appropriate.	Will be attained. There are no significant fisheries in area at present and aquatic habitat will be restored.
Mass. Wetlands Protection Regulations Regarding Endangered Species	310 CMR 10.59	Actions must be conducted in a manner that minimizes the impact on Massachusetts listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	Potentially Applicable.	Threatened or endangered species are not believed to exist in the 1.5 Mile Reach. This assumption was verified; see attached letter from John Lortie of Woodlot Alternatives, Inc. to Joel Lindsay of Roy F. Weston, Inc. dated October 19, 2001. If endangered species are present, substantive provisions of the cited regulation will be complied with, to the extent practicable.

Table C-3

Location-Specific ARARs
(Continued)

Regulation	Citation	Requirements	Applicability/Appropriateness	Actions to be Taken to Attain ARARs
State ARARs (cont'd)				
Mass. Historical Commission Act and Regulations	MGL c. 9 § 27C 950 CMR 71.07	Adoption of prudent and feasible measures to eliminate, minimize, and mitigate impacts on historic properties.	Potentially Relevant and Appropriate.	No historic resources are believed to exist in the 1.5 Mile Reach. This assumption was verified (see attachment of the State Register of Historic Places, 1998, pages 213-214). If historic data are discovered, such objects will be recovered in accordance with the substantive requirements of the cited regulations, to the extent practicable. Mitigation measures will be taken to minimize harm to historic properties, to the extent practicable.
Mass. Wetlands Protection Act and Regulations	MGL c. 131 § 40 310 CMR 10.00	Regulations restrict dredging, filling, altering, or polluting inland wetland resource areas and impose performance standards for work in such areas. Protected resource areas include: 10.54 (Bank); 10.55 (Bordering Vegetated Wetlands); 10.56 (Land under Water); 10.57 (Bordering Land subject to Flooding); and 10.58 (Riverfront Area).	Applicable.	Will be attained because (a) there is no practicable alternative that would be less damaging to resource areas; (b) all practical measures will be taken to minimize adverse impacts on wetlands; (c) stormwater discharges will be controlled through best management practices (BMPs); (d) actions will be taken to minimize impact of hydrologic changes during the work to the extent practicable; (e) after completion of the work, there will be no significant net loss of flood storage capacity and no significant net increase in flood storage or velocities; and (f) disturbed vegetation, river, and riverbank will be restored.

WOODLOT
ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

October 19, 2001

Joel Lindsay
R.F Weston, Inc.
1 Wall Street
Manchester, NH 03101-1501

RE: Absence of Threatened and Endangered Species in the 1 ½ Mile Reach

Dear Joel:

Woodlot Alternatives, Inc. has not observed any Threatened or Endangered (T&E) species in the 1 ½ Mile Reach. In this letter I briefly describe the process we used to search for T&E species in the 1 ½ Mile Reach, and refer to other documents that have been prepared supporting our observations.

T&E species are those plants or animals identified by either the State of Massachusetts Natural Heritage and Endangered Species Program (MNHESP) or the United States Fish and Wildlife Service that are in danger of extinction throughout all or part of their range, or are likely to become endangered in the foreseeable future. Lists and descriptions of federally listed and Massachusetts-listed T&E species can be found at http://www.state.ma.us/dfwele/dfw/nhesp/nhrare.htm.

Before performing field surveys, we collected and reviewed available information on T&E species from the MNHESP to see if there were any known occurrences in or near the 1 ½ Mile Reach. There were no known sites in the Reach, but there were some downstream that contained black maple (*Acer nigrum*), foxtail sedge (*Carex alopecoidea*), Gray's sedge (*Carex grayi*), bur oak (*Quercus macrocarpa*), bristly crowfoot (*Ranunculus pennsylvanicus*), eastern black currant (*Ribes americanum*), wapato (*Sagittaria cuneata*), hoary willow (*Salix candida*), culver's root (*Veronicastrum virginicum*), American bittern (*Botarus lentiginosus*), bald eagle (*Haliaeetus leucocephalus*), and the common moorhen (*Gallinula chloropus*). Information on T&E species that could occur in or near the 1 ½ Mile Reach can be found in the *Housatonic River Ecological Characterization Report - Preliminary* (TechLaw, Inc., February 4, 1999).

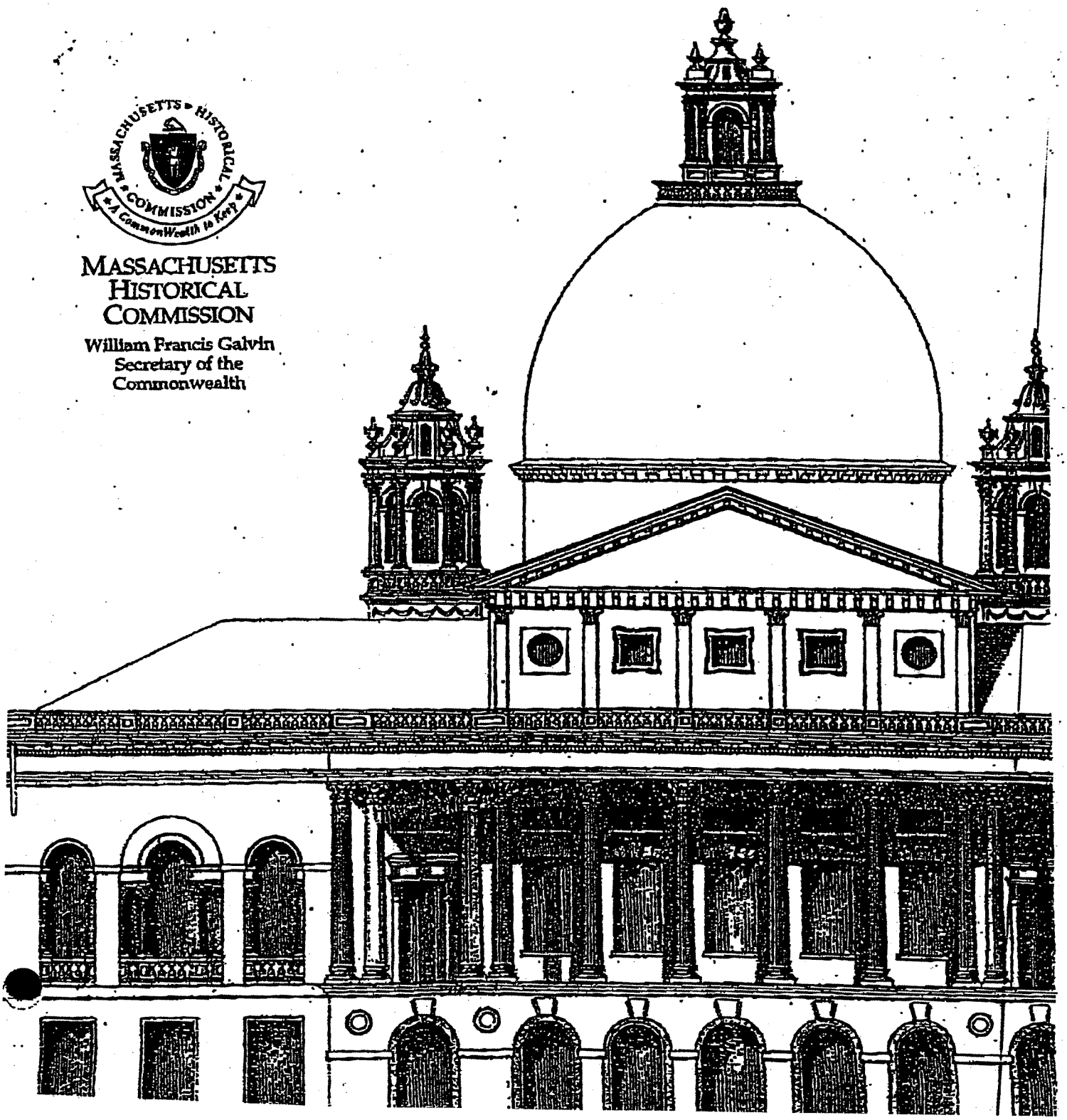
We reviewed the life history characteristics and habitat preferences for each of these species to determine if there was potentially suitable habitat present in the 1 ½ Mile Reach. This was done by reviewing published technical literature, information from occurrence records at the MNHESP, aerial photos of the project area, and by our familiarity with most of these species. We next reviewed habitat found in the 1 ½ Mile Reach during on-site surveys to see if there are any T&E species present, or potential habitat for T&E species. We did not observe any T&E species, and because of the large amount of historical habitat alteration and existing development, it is unlikely that any T&E species occur in this area. Information on the habitat found in the 1 ½ Mile Reach is contained in Appendix K of the *Final Draft, Engineering Evaluation/Cost Analysis for the Upper Reach of the Housatonic River* (Roy F. Weston, Inc., February 11, 2000).

Sincerely,
Woodlot Alternatives, Inc.

John P. Lortie
President

122 MAIN STREET NO. 3, TOPSHAM, MAINE 04086 PHONE: 207-729-1199 FAX: 207-729-2715
E-mail: mail@woodlotalt.com Web Site: http://www.woodlotalt.com

STATE REGISTER OF HISTORIC PLACES 1998



MASSACHUSETTS HISTORICAL COMMISSION

William Francis Galvin
Secretary of the Commonwealth

Town/Name/Address	Designation	Date	# Props
Petersham (cont.)			
Petersham Common Historic District Common, North and South Main and North Sts and Athol Rd	NRDIS	05/18/1982	45
Petersham Craft Center 8 North Main St	NRDIS PR Exp:	05/18/1982 10/02/1995	1 1
Petersham Historic District Common, North and South Main and North Sts and Athol Rd	LHD NRDIS	04/27/1966 05/18/1982	29 29
Prescott Town House Rt 32	NRIND	02/21/1989	1
Phillipston			
Massachusetts State Hospitals and State Schools Multiple Property Submission, 14 districts and one DOE in 19 towns	NRMPS	01/21/1994	12
Templeton Farm Colony (Phillipston/Templeton) Mass. State Hospitals and State Schools MPS, 126 Royalston Rd, Templeton	NRDIS NRMPS	01/21/1994 01/21/1994	12 12
Pittsfield			
Allen Hotel Wendell Ave Extension	NRIND NRDIS	09/01/1983 12/23/1991	1 1
Allen, William Russell House 359 East St	NRIND	05/07/1980	1
Berkshire Life Building 5-7 North St	NRIND NRDIS	02/27/1986 12/23/1991	1 1
Bush - Melville House (Arrowhead) 780 Holmes Rd	NHL PR Exp:	10/15/1966 05/30/1996	1 1
Eaton, Crane and Pike Company Factory 75 South Church St	NRDIS	08/03/1990	9
First Baptist Church 88 South St	NRDIS PR Exp:	12/23/1991 09/22/1998	1 1

Town/Name/Address	Designation	Date	# Prop
Pittsfield (cont.)			
First Church of Christ 27 East St	NRDIS PR Exp:	07/24/1975 02/25/1998	1 1
Hancock Shaker Village (Hancock/Pitsfield) Lebanon Mount Rd	MA/HL NRDIS NHL PR Exp:	04/01/1966 11/24/1968 11/24/1968 02/10/1977 02/10/2007	3 3 3 3
Morewood School South Mountain Rd	PR Exp: NRIND	05/16/1984 05/31/1984	1 1
North Street Commercial Block 15-83 North St	NRDOE	12/06/1978	4
Old Central Fire Station 66 Allen St	NRIND NRDIS PR Exp:	01/02/1977 12/23/1991 07/02/1998	1 1 1
Old Central High School First St	NRIND	08/06/1980	1
Park Square Historic District (See also Boundary Increase) At the intersection of North, South, East and West Sts	NRDIS	07/24/1975	11
Park Square Historic District (Boundary Increase) Roughly bounded by East Housatonic, South, North and Penn Sts and Wendell Ave	NRDIS	12/23/1991	49
Pines Archeological Site	PR Exp:	01/28/1988	1
Pittsfield Town Hall 43 East St	NRIND NRDIS	04/26/1972 07/24/1975	1 1
Power, Charles Whittlesey House 575 South St	NRIND	08/08/1997	4
Providence Court 379 East St	NRIND	11/20/1987	1
South Mountain Concert Hall South St	NRIND NRDOE	08/14/1973 03/25/1985	1 1
Wollison - Shipton Building 152 North St	NRIND NRDIS	09/30/1982 12/23/1991	1 1