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SDMS

U.S. Army
Corps of Engineers

New England District
Concord, Massachusetts

SPECIFICATIONS FOR PHASE 2
STATIONS 522+29 TO 527+60
1.5-MILE REACH REMOVAL ACTION

DCN: GE-102403-ABVZ

October 2003

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

Contract No. DACW33-00-D-0006
Task Order 0005

03P-1254-2

WESTON SOLUTIONS

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31 October 2003

Mr. Peter Hugh
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

Work Order No. 20125.257.103.1641

Re: Contract No. DACW33-00-D-0006
Specifications for Phase 2
Stations 522+29 to 527+60
1.5-Mile Reach Removal Action
DCN: GE-102403-ABVZ

Dear Mr. Hugh:

Please find attached four sets of the Specifications for Phase 2, Stations 522+29 to 527+60, of the 1.5-Mile Reach Removal Action at the GE/Housatonic River Site in Pittsfield, Massachusetts. Additional copies of this submittal are being sent simultaneously to the following:

- Holly Inglis, EPA Boston
- Dean Tagliaferro, EPA Pittsfield
- Darrell Moore, USACE Pittsfield (3 copies)

Copies of the drawing set for Phase 2, Stations 522+29 to 527+60, of the 1.5-Mile Reach Removal Action are being sent simultaneously to all the above recipients from WESTON's Manchester, New Hampshire office.

It is important to note that this specification set is a modified version of the Phase 1/Phase 2 Transition Specifications, with specific changes and additions made as necessary to describe and guide the work from Station 522+29 to Station 527+60. As outlined in the Table of Contents, certain specification sections that did not change from the Transition Area are not being re-issued.

This submittal has undergone WESTON's technical and quality control review and coordination procedures to ensure: (1) completeness for each discipline commensurate with the level of effort required for the submittal; (2) elimination of conflicts, errors, and omissions; (3) compliance with project criteria; and (4) overall professional and technical accuracy of the submittal.

Please feel free to contact me at (978) 779-8904 if you have any questions.

Very truly yours,

Weston Solutions, Inc.

Joel S. Lindsay
Task Manager

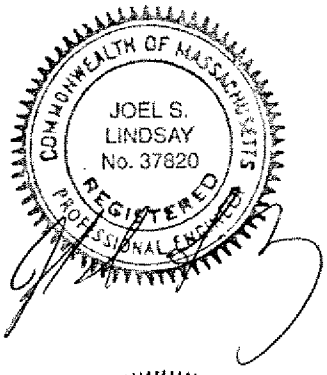
JSL/wp

Enclosure

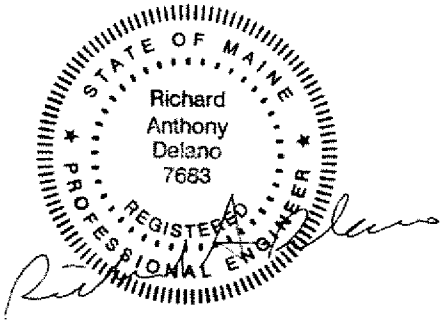
cc: H. Inglis
D. Tagliaferro
D. Moore (3 copies)
L. dePersia
Sevenson (2 copies)
Woodlot (2 copies)
DCN Files

Final Specifications for Phase 2
Stations 522+29 to 527+60
1.5-Mile Reach Removal Action
Site-Specific Environmental Remediation Contract
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts
Stamp Sheet

Specifications Sections: **01010, 01015, 01025, 01330, 01340, 01355, 01410, 01451, 02111, 02230, 02370, 02372, 10100, 11800**

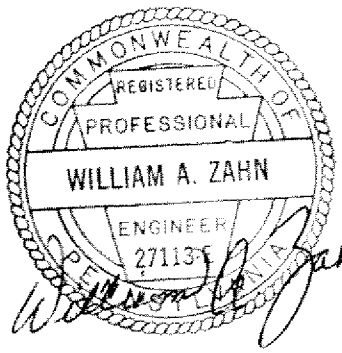


Weston Solutions, Inc.
Joel S. Lindsay, P.E.



Weston Solutions, Inc.
Richard A. Delano, P.E.

Specifications Sections: **02300, 02360, 02367, 02369, 02382, 02464, 02832**



Weston Solutions, Inc.
William A. Zahn, P.E.

SPECIFICATIONS FOR PHASE 2
STATIONS 522+29 TO 527+60
1.5-MILE REACH REMOVAL ACTION

Contract No. DACW33-00-D-0006
Task Order No. 0005
DCN: GE-102403-ABVZ

Prepared for

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 Virginia Road
Concord, Massachusetts 01742-2751

Prepared by

WESTON SOLUTIONS, INC.
One Wall Street
Manchester, New Hampshire 03101-1501

October 2003

W. O. No. 20125.257.103.1641

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The Specifications noted as being in the April 2003 Specs are contained in *Final Specifications for the Phase 1/Phase 2 Transition Area of the 1.5-Mile Reach Removal Action,* April 2003, SDMS 43133.

DIVISION 1—GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SCOPE OF WORK

These Drawings and Specifications describe a portion of Phase 2 of a Removal Action to be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The work is to be conducted within the 1.5-Mile Reach of the Housatonic River in Pittsfield, MA, from approximately Station 522+29 (downstream end of the Elm Street Bridge) to Station 527+60. The general work activities included in the Drawings and specifications include site preparation, surveying, monitoring, river diversion, dewatering and water treatment, crib wall restoration, soil and sediment excavation and disposal, river channel restoration, site restoration, and gravel walkway (part of the "river walk") construction.

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, a temporary dam installed at Station 514+00 will impound the river during relatively low flows (approximately 200 cfs as measured at the Coltsville USGS gauging station).

The existing river diversion system consists of a removable stop log dam and a piping system consisting of 54-inch HDPE pipe, and associated valves, controls, and other appurtenances. This work scope includes the operation and maintenance of these items.

The temporary dam/piping system, including all necessary equipment and structures will be operated and maintained by the Excavation Subcontractor. While the dam is in place, the river water upstream of the dam will be diverted into pipes around the downstream work area and returned to the river downstream. Diversion of river water will be accomplished using gravity flow. In general, each work cell or excavation will be segregated from the river both at the upstream and downstream ends by secondary, movable dams as necessary throughout Phase 2. Once an excavation area is prepared, it will be dewatered and subsequently surveyed, and soil and sediment within the area will be excavated and removed. Because the gravity diversion pipes will rest in the riverbed, half of the riverbed will be completed before it is necessary to move the pipe to the restored portion of the river. In areas where access is limited, ramps constructed of earth, concrete blocks, and large timbers or other suitable means will be used to allow equipment to cross the pipes. In general, when river flows exceed or are expected to exceed the capacity of the diversion system, excavation will be suspended, the work areas will be secured and prepared for flooding, and the temporary dam or a portion of it will be removed.

In general, soil and sediment will be excavated to a depth of 1 to 3 feet in layers of 1-foot minimum thickness 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 area, the removed soil and sediment will be replaced with appropriate backfill materials and hard structures and restoration of the banks via replanting and installation of slope reinforcing structures will be conducted. Riverbed habitat enhancement structure installation will follow the completion of Phase 2 and is not included as part of this Scope of Work. Excavated materials will be segregated at the soil staging areas before disposal in accordance with their pre-excavation classification (TSCA or non-TSCA). TSCA materials will be disposed of on-site at the Building 71 Landfill. Non-TSCA materials will be disposed of on-site at the Hill 78 Landfill or re-characterized as necessary for off-site disposal. In general, work will proceed sequentially down the river, with each area being successively isolated, remediated, backfilled, and restored. For the work between Stations 522+29 and 527+60, two cells consisting of separate excavations for each side of the river are anticipated.

1.2 DIVISION OF WORK

The General Contractor for the work is WESTON. WESTON has formed a team of subcontractors with differing specialties to accomplish the project. Table 01010-1 provides a breakdown of the major construction work tasks and entities that are expected to conduct them. WESTON and each of its subcontractors is responsible for complying with all contract Quality Control/Quality Assurance and Safety and Health requirements.

Table 01010-1

1.5-Mile Removal Action—Phase 2
Station 522+29 to Station 527+60
Division of Major Work Tasks

Work Task	Executing Party
Out-of-River Site Preparation	Sevenson (Excavation Subcontractor)
River Diversion System Operation and Maintenance	Sevenson
Crib Wall Restoration	Sevenson
Soil/Sediment Excavation	Sevenson
Material Transport from Excavation to Stockpile Area, Stockpile Area Management, and Material Transport from Stockpile Area to On-Plant Consolidation Areas (OPCAs)	Sevenson
Off-Site Transportation and Disposal of Excavated Materials	Charter
Water Treatment	Sevenson
Restoration–Revegetation and Hard Structures	Sevenson
Restoration – Plant Installation	WESTON/Planting Subcontractor
Gravel Walkway	Sevenson
Surveying	WESTON
Site Monitoring	WESTON or Subcontractor

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. Site Preparation—This activity will include, but not be limited to, clearing (and grubbing as necessary) for access roads and staging areas (not shown on plans, to be determined following submittal of Excavation Subcontractor's Excavation Plan); clearing on riverbanks; building of access roads and staging areas/stockpile areas, including truck wash pads and decontamination pads; out-of-river erosion control measures; and coordination and maintenance of traffic control and details. (Excavation Subcontractor)

b. River Diversion System Operation and Maintenance—The temporary dam/piping system will be operated and maintained (including removal and restoration of stop

logs, monitoring of river levels, and emergency response activities related to high flow events). This activity will include operation and maintenance of the removable dam and other associated support equipment and systems for the river diversion system. (Excavation Subcontractor)

c. Crib Wall Restoration—This activity includes all work related to restoring the existing timber crib wall at the golf shop located between Station 522+30 and Station 523+00 along the east bank. This work includes installation and grouting of soil nails to stabilize the crib wall, installation of micropiles to support pre-cast concrete wall façade sections, installation of gunite at the base of the crib wall, installation of associated anchoring and drainage systems, backfilling of the area, installation of drainage structures, and restoration of the area. (Excavation Subcontractor shall perform these items of work; ancillary items such as paving, fencing, curbing, and guard rail installation will be completed by the General Contractor.)

d. 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/excavator pad construction and removal); secondary dam installation and removal (includes on-site handling of removed material); temporary and permanent outfall relocation/redirection 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; moving of 54-inch HDPE pipes as necessary to accomplish excavation; testing (excluding chemical analyses, which will be performed by the General Contractor) and supply of backfill; backfilling excavated areas; and placement of bank and riverbed armor and walls. (Excavation Subcontractor)

e. Material Transport from Excavation to Stockpile Area, Stockpile Area Management, and Material Transport from Stockpile Area to OPCAs—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, maintenance and management of the stockpile areas, transport of contaminated material from stockpile areas to GE's OPCAs, load-out of material for off-site transport, and transport of clean backfill from borrow locations to the river work areas for placement. (Excavation Subcontractor)

f. Off-Site Transportation and Disposal of Excavated Materials—This activity includes off-site transportation and disposal of materials classified as non-TSCA. All required manifesting and other paperwork, coordination with disposal facilities, and coordination with the Excavation Subcontractor and the General Contractor are included in this task. (Charter)

g. Water Treatment—This activity includes, but is not limited to, operation and maintenance to treat water pumped from the excavation cells to meet applicable discharge standards, and return of treated water to the river. Includes installation and maintenance of discharge structure(s) to minimize erosion in accordance with

Applicable or Relevant and Appropriate Requirements (ARARs). (Excavation Subcontractor)

h. Restoration (Revegetation and Hard Structures)—This activity includes, but is not limited to, installation of sheet pile retaining wall systems and seeding and erosion control measures for upper bank areas as shown on the Drawings and Specifications. (Excavation Subcontractor)

i. Restoration (Plant Installation)—This activity includes, but is not limited to, providing, installing, and maintaining all containerized plants and cuttings as required. (General Contractor/Planting Subcontractor)

j. Gravel Walkway—This activity includes all work associated with installing a gravel river walkway (Note: the gravel walkway is a part of the "river walk" that also includes a boardwalk, which is not included in this contract) along the top of the east bank. (Excavation Subcontractor)

k. 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 areas, 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. (General Contractor)

l. Site Monitoring—This activity includes, but is not limited to, a number of different types of monitoring activities to be conducted before, during, and following construction. Includes air monitoring; water column monitoring; vibration monitoring; settlement monitoring; water treatment system testing; all chemical testing of backfill, NAPL-impacted material, and other material generated during the work; and conditions monitoring, as described in detail in the specifications. (General Contractor)

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
15 U.S.C. §2601 et seq.	Toxic Substances Control Act

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 (Weston Solutions, Inc.) – Contractor with overall responsibility for the design and construction of the 1.5-Mile Removal Action, and direct execution of construction tasks as defined in the drawings and specifications (see Specification Section 01010 – SUMMARY OF WORK). 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, timber crib wall excavation and replacement, and gravel "river walk" construction as defined in the drawings and specifications.

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

Surveying Subcontractor – Contractor responsible for all construction surveys.

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 Excavation Subcontractor shall handle, haul, and distribute all materials and all surplus materials for the different portions of the Work, as necessary. Areas available for storage of materials and equipment are shown on the drawings. Within these areas the Excavation Subcontractor 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 Excavation Subcontractor will be responsible for ties to and all elevations of all property disturbed by his forces during the execution of this Contract. The Excavation Subcontractor 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 DEMOBILIZATION

Initial mobilization to the site has already been conducted under Phase 1. Final demobilization from the site at the end of the project will not be conducted under this contract. Therefore there are no separate pay items included for mobilization or 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

Based on historical river flows, and flow capacity of the diversion system, it is expected that the work area will be flooded from time to time and work will be stopped. Stand-by due to flooding and other issues 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 other than flooding:

- Delay caused by presence of nonaqueous phase liquid (NAPL) that requires further assessment and supplemental remediation activities.
- Obstructions to driving of sheet piles that require significant revisions to the sheet pile cell configuration and/or sheet pile 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 MATERIAL BROUGHT ON-SITE

The Excavation Subcontractor shall be bringing clean material on-site for use for staging area pads, access roads, earthen berms and other items. Prior to being brought on-site, it will be necessary for this material to be tested by the General Contractor to determine compliance with the limits for TPH, PCBs, VOCs, SVOCs, and Metals. The Excavation Subcontractor will be required to provide prior justification and description of the use of such material via the plan submittals required by these specifications, and shall be required to minimize the amount of material used to the fullest extent practicable. All on-site handling of this material shall be the responsibility of the Excavation Subcontractor.

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

1.12 "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 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.

1.13 WORK HOURS

a. Work hours shall be a maximum of five 10-hour days per week, Monday through Friday, with a 10-hour day worked every other Saturday. These work hours shall be extended only upon Government approval. During periods of extended low flow the Government may allow longer work hours and/or extended work weeks.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 BASIS OF PAYMENT

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

b. 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 unit price will be made until the original quantities installed are varied by more than 25% and a hardship exists for the Excavation Subcontractor or the Owner. Payment will be made monthly only for the actual number of units or work performed, and at the contract unit price for each such unit with measurement for payment made as defined in the following paragraphs.

1.1.1 Bonds and Insurance

a. Unit of Measure: Bonds and Insurance will be paid as a lump sum.

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.

1.1.2 Site Preparation at Project Startup

a. Unit of Measure: 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 clearing and grubbing; access/haul roads and staging areas; and all associated appurtenances and controls.

1.1.3 River Diversion System Gravity Operation

a. Unit of Measure: River Diversion System Gravity Operation will be measured on lump sum basis.

b. Payment shall be at the Contract lump sum, which shall constitute full compensation for all labor, materials, equipment, and tools required to complete all work associated with operation and maintenance of the gravity diversion system including monitoring of system controls (staff gauges at various locations), removal of accumulated debris, operation of slide gate valves, etc. Removal and replacement of stop logs is not included in this item and will be paid as an extra work item for each event.

1.1.4 Relocation of 54-inch HDPE Pipes

a. Unit of measure: Relocation of 54-inch HDPE Pipes will be measured as one unit for each event.

b. Payment shall be made at the Contract fixed unit price for each complete relocation of the 54-inch HDPE pipes and shall constitute full compensation for all labor, materials, equipment, and tools required to complete all work associated with the pipe relocation, including detaching and re-attaching the pipes to the pipe anchoring system as required.

1.1.5 Water Treatment System Operation

a. Unit of measure: Water Treatment System Operation will be measured on a lump sum basis.

b. Payment shall be made at the lump sum for complete operation of the water treatment system, including all labor, materials, equipment, and tools required to complete all work associated with successful operation (meeting the specified treatment standards) of the system. Influent and effluent testing (performed by the General Contractor) is not included in this item. Prior to beginning the work the Excavation Subcontractor shall submit a payment schedule for this item.

1.1.6 Drop Inlets (Including 18-inch HDPE Pipe)

a. Unit of measure: The drop inlets to be installed at the parking areas behind the golf shop and at the adjacent parking lot shall be measured and paid on an each basis.

b. Payment shall be made at the lump sum price for installation of each drop inlet completed as required on the plans and by the specifications. Payment shall constitute full compensation for all labor, materials, equipment, and incidentals required to install the drop inlet (including subgrade preparation, placement of pre-cast manhole

structures, installation of HDPE pipe including penetrations through segmental block and sheet pile retaining walls, and gratings) in accordance with the plans and specifications.

1.1.7 Alternate Item—Crib Wall Restoration with Soil Nailing and Gunite

a. Unit of measure: Payment for the golf shop crib wall restoration will be measured and paid on a lump sum basis. Partial payments shall be based upon mutual agreement between the Excavation Subcontractor and the General Contractor of the percentage complete of the work.

b. Payment shall include payment for furnishing, installing, and maintaining soil nails, micropiles, pre-cast concrete façades, drainage materials, gunite and related components, and any other incidentals associated with the crib wall restoration work (from Station 522+30 to 523+00), and all related temporary (as required) and permanent bracing components. Payment for crib wall restoration under this item will include all work required to furnish all materials, labor, and equipment for installation of the restoration system including submittals, testing, and connections/transitions to adjacent existing or proposed structures.

1.1.8 Soil/Sediment Excavation and Transport (includes stumps and debris)

a. The unit of measurement for excavation, stockpiling, handling, and transport (not including off-site transport) of soil and sediment will be the cubic yard, computed by the average end area method or other appropriate method from elevation surveys taken before and after the excavation operations.

b. Payment will be made for the number of cubic yards of material measured in situ and removed from the excavation areas, including the excavation for required ditches, gutters, and channel changes. Volumes excavated beyond the neatline and outside of the limits of excavation will not be paid, with the exception of volumes removed beyond the neatline as part of stump removal. (Penalties for excavation beyond neatline are discussed in Specification Section 02300, EARTHWORK.) Payment will be made for the volume occupied by stumps below the surrounding existing grade, 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).

c. Measurement for payment will not include the volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed grade. Payment includes careful placement of excavated materials into trucks. Payment includes segregation of materials in accordance with the requirements of Specification Section 02111, HANDLING OF EXCAVATED MATERIAL AND BACKFILL and placement into separate trucks; transport by truck from the excavation to the staging area; stockpiling, dewatering, and handling (testing of the material will be performed by the General Contractor); loading of materials into

trucks for transport to the GE On-Plant Consolidation Areas (OPCAs) and off-site facilities; and transport from the staging area to the OPCAs. (Transport to off-site disposal facilities will be performed by other subcontractors. Payment for transport to the OPCA will be held as a percentage of the item until the transport is complete.) Transport will include handling of all necessary manifesting and associated coordination with the General Contractor and the Government to obtain manifest authorization.

d. Payment will include installation and removal of all temporary dams at upstream and downstream ends of the work cells and all dewatering (including stormwater) required of work cells and other areas to maintain a dry excavation. Payment includes all labor, equipment, and materials required for excavation and backfill of ditches, swales, and sumps, and setup of pipes, hoses, generators, and pumps etc. to provide a fully functioning dewatering system. No separate payment will be made for excavations and fill materials required for installing dewatering systems.

e. Payment will include excavation of soil, sediment, tree stumps, loose rocks and boulders, and all debris collected within the limits of excavation.

f. The measurement for payment 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.

1.1.9 Ordered Overexcavation and Transport

a. Unit of Measure: Ordered overexcavation will be measured to the nearest 0.1 cubic yard, computed by the average end area method or other appropriate method from elevation surveys taken before and after the excavation operations. Ordered overexcavation will be 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.

b. Payment for overexcavation at the unit price shall constitute full compensation for excavation of material; loading excavated material onto trucks for disposal or stockpile of excavated material temporarily prior to backfill; or transport by truck from the excavation to the staging area, stockpiling, dewatering, and handling (testing of the material to be performed by the General Contractor); and 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.

1.1.10 Articulating Concrete Block Mats

a. Unit of measure: Articulating Concrete Block Mats used for permanent erosion control shall be measured by the square yard of surface area as measured by survey and corrected for area perpendicular to the slope covered to the nearest 0.1 square yard.

b. Payment will be made for installation of articulating concrete block mats in accordance with the manufacturer's specifications and these plans and specifications. Payment shall be made for placement of mats at locations shown on the Drawings and shall include payment for all labor, equipment, materials, tools and incidentals (including concrete infills at webs of sheet pile where mats are adjacent to sheet pile and anchoring).

1.1.11 Backfill Materials (Items 1.1.11a through 1.1.11f on Bid Schedule)

a. Unit of measure: The unit of measure for supply, testing, placement, and compaction of backfill will be to the nearest 0.1 cubic yard of compacted backfill in place as computed by the average end area method or other suitable calculation method.

b. Payment is limited to backfill supplied and placed to the thicknesses shown on the plans or specified. No additional payment shall be made for placing excess fill or for providing and placing fill needed for the Excavation Subcontractor dewatering system (including trenches, sumps, and other components of the system). The contractor shall remove or regrade fill placed to a greater thickness than shown or specified, unless otherwise directed by the Engineer.

c. Backfill shall not be measured until tests conducted by this Subcontractor and approved by the Engineer demonstrate that it has been compacted as specified. The Engineer shall provide all surveying required for measurement of backfill.

d. 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 (Bid Schedule Items 1.1.13a through 1.1.13e). This unit price shall include all labor, equipment, materials, and any other items necessary or incidental to provide, place, grade, compact as specified, and test backfill materials and any incidentals necessary to complete backfilling.

e. Supply and delivery of the backfill materials are specified in Sections 02111, HANDLING OF EXCAVATED MATERIAL AND BACKFILL and Section 02300, EARTHWORK. All supply and testing of backfill will be conducted by the Excavation Subcontractor, except for chemical testing, which will be conducted by the General Contractor.

1.1.12 Cantilevered Sheet Pile Retaining Wall – Provide and install to 10 feet embedment

a. Unit of measure: Payment for furnishing, installing, and maintaining the cantilevered sheet pile retaining wall (from approximately Station 525+75 to Station 527+60 along the East bank), and all related excavation support system components (excluding bracing) will be measured and paid on a unit price basis, per linear foot of sheet pile as measured horizontally. Measurements will be based on the straight-line distance measured between field-verified points that designate the corners, endpoints, and intersections.

b. Payment for sheet pile wall under this item will include all work required to furnish all materials, labor, and equipment for installation, maintenance, and driving to an embedment depth of 10 feet as required by the specifications.

1.1.13 Cantilevered Sheet Pile Retaining Wall – Driving below 10 feet embedment

a. Unit of measure: Payment for installing sheet pile used to construct the cantilevered sheet pile retaining wall (from approximately Station 525+75 to Station 527+60 along the East bank), 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 as measured and driven below 10 feet embedment. Measurements will be based on the straight-line distance measured between field-verified points that designate the corners and endpoints of the wall.

b. Payment for sheet pile under this item will include all work required to furnish all materials, labor, and equipment for driving sheet piles to embedment depths below 10 feet as required by the specifications and directed by the General Contractor.

1.1.14 Anchored Sheet Pile Retaining Wall – Provide and install to 10 feet embedment

a. Unit of measure: Payment for furnishing, installing, and maintaining the anchored sheet pile retaining wall (from approximately Station 523+00 to Station 524+00 along the East bank), and all related excavation support system components (excluding anchoring) will be measured and paid on a unit price basis, per linear foot of sheet pile as measured horizontally. Measurements will be based on the straight-line distance measured between field-verified points that designate the corners, endpoints, and intersections.

b. Payment for sheet pile wall under this item will include all work required to furnish all materials, labor, and equipment for installation, maintenance, and driving to an embedment depth of 10 feet as required by the specifications.

1.1.15 Anchored Sheet Pile Retaining Wall – Driving below 10 feet embedment

a. Unit of measure: Payment for installing sheet pile used to construct the anchored sheet pile retaining wall (from approximately Station 523+00 to Station 524+00 along the east bank), including all tieback anchors and related excavation support system components will be measured and paid on a unit price basis, per square foot of sheet pile as measured and driven below 10 feet embedment. Measurements will be based on the straight-line distance measured between field-verified points that designate the corners and endpoints of the wall.

b. Payment for sheet pile under this item will include all work required to furnish all materials, labor, and equipment for driving sheet piles to embedment depths below 10 feet, providing a final design for the tieback anchor system, and installing tieback anchors as required by the specifications and directed by the General Contractor.

1.1.16 Wood Façades for Sheet Pile Retaining Walls (Items 1.1.16a and 1.1.16b on Bid Schedule)

a. Unit of measure: Wood façades for sheet pile retaining walls shall be measured by the square foot of retaining wall surface area covered in accordance with the plans and specifications, as measured along the length of the finished sheet pile wall to the nearest 1.0 square foot.

b. Payment shall be made at the unit price for all wood façades for sheet pile retaining walls acceptably placed in areas as required on the plans and by the specifications. Payment shall constitute full compensation for all labor, materials, equipment, and incidentals required to install the wood façades to the required limits. Payment shall be made for the cantilevered and anchored sheet pile wall façades under Items 1.1.16a and 1.1.16b, respectively.

1.1.17 Railing for Sheet Pile Retaining Wall

a. Unit of measure: Railing for sheet pile retaining wall shall be measured by the lineal foot of railing acceptably installed along the top of retaining wall in accordance with the plans and specifications, as measured along the length of the finished railing to the nearest 0.1 foot.

b. Payment shall be made at the unit price for all wood railing for sheet pile retaining wall acceptably placed in areas as required on the plans and by the specifications. Payment shall constitute full compensation for all labor, materials, equipment, and incidentals required to install the wood railing to the required limits.

1.1.18 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 measured to the nearest 0.1 foot.

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 constitute full compensation for all labor, materials, equipment, and incidentals required to install the geotextile in accordance with the specifications to the limits shown.

1.1.19 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 to the nearest 0.1 foot.

b. Payment shall be made at the unit price for all erosion control blanket acceptably placed in areas as required on the plans and by the specifications. Payment shall constitute full compensation for all labor, materials, equipment, and incidentals required to install the erosion control blanket in accordance with the specifications to the limits shown.

1.1.20 Temporary Erosion Control – Riprap

a. Unit of measure: Riprap temporary erosion control shall be measured by the cubic yard placed. The riprap will be measured prior to installation in the delivery vehicle to the nearest 0.25 cubic yard.

b. Payment will be for riprap placed for temporary erosion control at the direction of the Engineer at the unit price bid and shall constitute full compensation for providing, installing, and removing riprap; cleaning sediment from riprap; and reinstalling to the next location shown, as directed by the Engineer. No separate payment shall be made for subgrade preparation or installation of underlying geotextile fabric. Riprap materials will be provided by the Excavation Subcontractor initially and as needed to supplement the materials recovered.

c. Payment at the unit price bid will constitute full compensation for all labor, equipment, and incidentals to remove/replace/relocate riprap as needed for work to progress. No separate payment shall be made for subgrade preparation.

1.1.21 Seed

a. Unit of measure: The unit of measure will be the area of acceptably seeded surface in units of square yards. Measurements will be made parallel to the surface to the nearest 0.1 foot.

b. Seeding will be paid for at the contract price per unit area of acceptably seeded surface of the riverbank surface. Payment shall constitute full compensation for all labor, materials, and equipment to furnish and install the specified seed mix, fertilizer, and lime, and watering until specified plant coverage is established.

1.1.22 Gravel River Walkway

a. Unit of measure: The unit of measure will be the area of acceptably completed gravel river walkway surface in units of square yards. Measurements will be made parallel to the surface to the nearest 0.1 foot.

b. The gravel river walkway will be paid for at the contract price per unit area of acceptably completed walkway. Payment shall constitute full compensation for all labor, materials, and equipment to prepare the walkway area and furnish and install the specified gravel.

1.2 INCIDENTAL WORK

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

1. Submittals.

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

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

4. Cleanup.

5. Restoration of property outside the limits of payment.

6. Cooperation with other contractors and others as required.

7. Minor items such as replacement of fences, guardrails, rock walls, etc.

8. 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.

9. Dewatering not specifically included in the above payment items.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SPECIFICATION 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
EXCAVATION SUBCONTRACTOR BID ITEMS (1 THROUGH 33)			
1.1.1	Bonds and Insurance _____ Lump Sum	_____	1 L.S.
1.1.2	Site Preparation at Project Startup _____ Lump Sum	_____	1 L.S.
1.1.3	River Diversion System Gravity Operation _____ Lump Sum	_____	1 L.S.
1.1.4	Relocation of 54-inch HDPE Pipes _____ Each	_____	3 EA
1.1.5	Water Treatment System Operation _____ Lump Sum	_____	1 L.S.

ITEM NUMBER	BRIEF DESCRIPTION OF ITEM WITH UNIT BID IN WORDS	UNIT BID PRICE IN FIGURES	QUANTITY
1.1.6	Drop Inlets (including 18" HDPE Pipe) Each		2 EA
1.1.7	Alternate Item - Crib Wall Restoration with Soil Nailing and Gunite Lump Sum		1 L.S.
1.1.8	Soil/Sediment Excavation and Transport (includes stumps and debris) Riverbed and Riverbank Excavation Cubic Yard		5300 C.Y.
1.1.9	Ordered Overexcavation and Transport Cubic Yard		500 C.Y.
1.1.10	Articulating Concrete Block Mats Square Yard		1400 S.Y.
1.1.11 a.	Backfill Materials Common Fill Cubic Yard		1100 C.Y.

ITEM NUMBER	BRIEF DESCRIPTION OF ITEM WITH UNIT BID IN WORDS	UNIT BID PRICE IN FIGURES	QUANTITY
b.	Filter Material		
	_____ Cubic Yard	_____	560 C.Y.
c.	18-inch Riprap		
	_____ Cubic Yard	_____	400 C.Y.
d.	12-inch Riprap		
	_____ Cubic Yard	_____	1300 C.Y.
e.	Structural Fill - Riverbed and Riverbanks		
	_____ Cubic Yard	_____	950 C.Y.
f.	Topsoil		
	_____ Cubic Yard	_____	290 C.Y.
1.1.12	Cantilevered Sheet Pile Retaining Wall - Provide and install to 10 feet embedment		
	_____ Linear Foot	_____	194 L.F.
1.1.13	Cantilevered Sheet Pile Retaining Wall - Driving below 10 feet embedment		
	_____ Square Foot	_____	1746 S.F

ITEM NUMBER	BRIEF DESCRIPTION OF ITEM WITH UNIT BID IN WORDS	UNIT BID PRICE IN FIGURES	QUANTITY
1.1.14	Anchored Sheet Pile Retaining Wall - Provide and install to 10 feet embedment		
	_____ Linear Foot	_____	119 L.F.
1.1.15	Anchored Sheet Pile Retaining Wall - Driving below 10 feet embedment		
	_____ Square Foot	_____	1964 S.F.
1.1.16	Wood Façades		
a.	Wood Façade for Cantilevered Sheet Pile Wall		
	_____ Square Foot	_____	1100 S.F.
b.	Wood Façade for Anchored Sheet Pile Wall		
	_____ Square Foot	_____	1500 S.F.
1.1.17	Railing for Cantilevered Sheet Pile Wall		
	_____ Lineal Foot	_____	194 L.F.
1.1.18	Geotextile Fabric		
	_____ Square Yard	_____	1400 S.Y.

ITEM NUMBER	BRIEF DESCRIPTION OF ITEM WITH UNIT BID IN WORDS	UNIT BID PRICE IN FIGURES	QUANTITY
1.1.19	Erosion Control Blankets Square Yard		2500 S.Y.
1.1.20	Temporary Erosion Control – Riprap Cubic Yard		250 C.Y.
1.1.21	Seed Square Yard		2500 S.Y.
1.1.22	Gravel River Walkway Square Yard		185 S.Y.

SPECIFICATION 01330 ATTACHMENT

SUBMITTAL REGISTER

	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																										CONTRACT NO.
2	TITLE AND LOCATION: Draft Design Submittal, 1.5 Mile Removal Action - Phase 1/2 Transition Area GE/Housatonic River Project, Pittsfield, Massachusetts																	CONTRACTOR									SPECIFICATION SECTION
3					TYPE OF SUBMITTAL											CLASSIFI-CATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
4	TRANSMITTAL 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	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
5			01015, 1.3	Record Drawings											X		X										
6			01300, 1.3	Project Schedules	X											X											
7			01300, 1.3	Monthly Project Report						X							X										
8			01300, 1.3	Final Project Report											X		X										
9			01340, 1.3	Cell by Cell Survey Updates						X							X										
10			01355, 1.5	Environmental Protection Plan	X												X										
11			01410, 1.4	Monitoring Plan Supplement	X												X										
12			01410, 1.4	Air Monitoring Daily Report						X						X											
13			01410, 1.4	Monthly Project Report						X							X										
14			01410, 1.4	Water Column Monitoring Daily Report						X						X											
15			01410, 1.4	Final Project Monitoring Report											X		X										
16			01451, 1.2	Contractor Quality Control Plan Supplement	X												X										
17			01451, 1.2	Daily CQC Report										X		X											
18			02111, 1.1	Excavation Plan	X												X										
19			02111, 1.1	Analytical Test Reports for Backfill Materials						X							X										
20			02111, 1.1	Paint Filter Test Results						X						X											
21			02111, 1.1	Geotechncial Test Reports for Backfill Materials						X							X										
22			02111, 1.1	Wipe Sampling Data						X						X											
23			02230, 1.2	Materials Proposed for Off-Site Disposal	X												X										
24			02300, 1.2	Excavation Plan	X												X										
25			02300, 1.2	In-place compaction testing data						X						X											
26			02300, 1.2	Visual Inspection Reports						X						X											
27			02360, 1.2	Experience Certification	X											X											
28			02360, 1.2	Schedule	X											X											
29			02360, 1.2	Excavation Plan	X											X											
30			02360, 1.2	Drill Shaft Test Reports						X						X											
31			02369, 1.3	Experience Certification	X											X											
32			02369, 1.4	Temporary and permanent grouted tieback anchorage systems including design calculations, shop drawings, details, and schedule	X												X										
33			02369, 1.4	Tieback Performance Testing						X							X										
34			02370, 1.3	Mulch, Geotextile Farric, Erosion Control Fabric, Fertilize			X									X											
35			02370, 1.3	Synthetic Soil Binders						X						X											
36			02370, 1.3	Installer's Qualifications						X						X											
37			02370, 1.3	Mulch						X						X											
38			02370, 1.3	Asphalt Adhesive						X						X											
39			02370, 1.3	Tackifier						X						X											
40			02370, 1.3	Wood Byproducts						X						X											
41			02370, 1.3	Certificate Form for Erosion and Sediment Controls							X					X											
42			02370, 1.3	Daily Forecast Reports										X		X											
43			02370, 1.3	Average Daily Flow - Newell Street										X		X											
44			02370, 1.3	Rainfall Snowpack Measurements										X		X											
45			02370, 1.3	Daily Records for limitation of storm/high flow damage										X		X											
46			02370, 1.3	Monthly Inspection Report for E&S Controls										X		X											

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47			02372, 1.4	NAPL Management Plan Addedndum (Submitted in Excavation Plan)	X												X											
48			02382, 1.4	ACB Design		X											X											
49			02382, 1.4	ACB Installation Details		X											X											
50			02382, 1.4	ACB and Geotextile Data			X										X											
51			02382, 1.4	Anchor Pullout Capacity			X									X												
52			02382, 1.4	ACB Sample				X								X												
53			02382, 1.4	Flume Test for Critical Shear Stress						X						X												
54			02464, 1.1	Sheet Pile Installation Plan	X											X												
55			02464, 1.1	Metal Sheet Piling		X										X												
56			02464, 1.1	As-Built Drawing - Permanent Sheet Pile Walls											X		X											
57			02930, 1.2	Planting Subcontractor Oversight Personnel Qualifications	X												X											
58			02930, 1.2	Equipment for revegetation			X									X												
59			02930, 1.2	Delivery Schedules			X									X												
60			02930, 1.2	Plant Establishment Period			X									X												
61			02930, 1.2	Maintenance Record			X									X												
62			02930, 1.2	Invasive Plant Control			X										X											
63			02930, 1.2	Plant Material						X							X											
64			02930, 1.2	Seed Mix						X							X											
65			02930, 1.2	Erosion Control Blankets						X							X											
66			02930, 1.2	Mulch Mats						X							X											
67			02930, 1.2	Fertilizer						X							X											
68			02930, 1.2	Compost						X							X											
69			02930, 1.2	Herbicide						X							X											
70			02930, 1.2	Maintenance Instructions										X		X												
71			02930, 1.2	Planting Record Drawings											X		X											
72			03100, 1.2	Concrete Formwork Details		X										X												
73			03100, 1.2	Form Releasing Agents			X									X												
74			03100, 1.2	Design and calculations for form design					X							X												
75			03200, 1.2	Concrete Reinforcement Systems		X										X												
76			03200, 1.2	Reinforcing Steel						X						X												
77			03250, 1.2	Waterstops		X										X												
78			03250, 1.2	Pre-formed Compressible Joint Filler, Sealant and Waterstops			X									X												
79			03250, 1.2	PVC and Expanding Waterstops and Splices				X								X												
80			03250, 1.2	Pre-formed Compressible Joint Filler, Sealant and Waterstops						X						X												
81			03300, 1.2	Mixture Proportions					X							X												
82			03300, 1.2	Testing and Inspection for Contractor Quality Control						X						X												
83			03410, 1.7	Pre-Cast Concrete Shop Drawings, layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items		X										X												
84			03410, 1.7	Product Data, indicating standard component configurations, design loads, deflections, cambers, and bearing requirements			X									X												
85			03410, 1.7	Design Data, including design loads, deflections, cambers, bearing requirements, and special conditions					X							X												

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86			03410, 1.7	Installation Instructions								X				X											
87			10100, 1.2	Sign Materials, Sign Supports			X									X											
88			10100, 1.2	Traffic Control Police Detail Invoices											X		X										
89			11800, 1.3	Operations and Maintenance Manual Addenda										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 shall be performed at required depth intervals starting at the existing grade, down to intermediate excavation depths, final excavation grade, and final restored grade both within the river and on the riverbanks. Excavation Subcontractor shall check cut grades as necessary to allow progression of excavation, and shall coordinate with the General Contractor to acquire verification of cut grades by the General Contractor's surveyor.

1.1 REFERENCES

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

1.2 DESCRIPTION OF WORK

For each distinct work cell, the survey tasks listed in the paragraphs below shall be conducted.

1.2.1 The General Contractor shall conduct an existing conditions survey on the banks and in the riverbed in each cell. The survey shall be conducted as cross sections at a minimum frequency of 25 feet and at obvious topographic anomalies. Stake out surveys to be conducted include limits of excavation, limits of TSCA/non-TSCA areas of excavation, retaining wall locations and the limits of containment cells as necessary. These points are shown on the Drawings. Generate CAD generated cross sections every 25 feet showing the bank from limit of excavation across the riverbed to the limit of excavation on the opposite side of the river. Provide corresponding map of the work area and table with all points and elevations. The General Contractor shall survey the banks and riverbed, before the cell is completely dewatered to the extent practicable, and generate the cross sections. Once the cell is dewatered, any areas which could not be surveyed prior to dewatering shall be surveyed and these data added to complete the cross sections.

1.2.2 The General Contractor shall review the cross sections and existing condition data, and confirm the required cut and fill elevations. The General Contractor shall generate new cross sections and a table showing existing grade, proposed cut, and proposed final

restored grade. This information shall be submitted to the Government for review and approval.

1.2.3 Once proposed cuts and restored grades are approved, the General Contractor shall identify cut lines in the field for the excavation, including delineation of TSCA and non-TSCA areas. The Excavation Subcontractor shall check conformance with the identified cut grades as the excavation is progressing using a laser level or other similar equipment. When these areas are excavated, the Excavation Subcontractor shall notify the General Contractor, and the General Contractor shall field survey cut grades at the original survey points in the cell. The General Contractor shall then provide an updated table with the surveyed cut grades for the cell for review by the Government. This shall include selected interim surveys where TSCA material is being removed as part of the excavation, to verify complete removal.

1.2.4 Upon approval of the final cut elevations by the General Contractor and the Government, the General Contractor shall immediately stake out backfill grades to allow backfilling to commence. As with the excavation, the Excavation Subcontractor shall check conformance with the identified backfill grades as the backfilling is progressing using a laser level or other similar equipment. Once backfilling is complete, the General Contractor shall survey the final elevations at the same point grid used for the original existing conditions survey for approval by the General Contractor and the Government. The General Contractor shall then provide the updated table for the cell showing actual final elevations. The Excavation Subcontractor must allow for a review period of 1 work day between completion of all surveys and Government approval of those surveys.

1.2.5 The General Contractor shall 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 OPCA disposal requirements. The General Contractor shall 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.

1.2.6 General Contractor shall set cut and fill stakes or provide markings on installed sheet pile sections for the 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 shall review the submittal for the

Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES AND REGISTER:

SD-06 Test Reports

Work Area Survey Reports –For each work area, provide 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 work area.

3.1.2 Survey mapping shall be presented in the form of drawing sheets (24-inch by 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 (or latter version) 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 of Engineers Safety and Health Requirements Manual

U.S. 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, MA. 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, MA. 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 that 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; and radiant energy and radioactive material as well as other pollutants.

1.2.3 Excavation Subcontractor-Generated Hazardous Waste

Excavation Subcontractor-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 Excavation Subcontractor 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 that 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, the Excavation Subcontractor, and all other subcontractors 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 in Attachment 1 to these Specifications) 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, the Excavation Subcontractor, and all other subcontractors shall comply with all applicable environmental Federal, State, and local laws and regulations. Pursuant to Section 121(e) of CERCLA, the General Contractor, the Excavation Subcontractor, and all other subcontractors will not be required to obtain any Federal, State, or local permits for work conducted on-site.

1.4 SUBCONTRACTORS

The Excavation Subcontractor 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 (EPP) for the project. The plan will be a supplement to the Phase 1 EPP and will include a description of how the General Contractor and his subcontractors will meet, to the extent practicable, the substantive portions of all the applicable or 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 on-site 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 and his subcontractors' assigned storage area and access route(s), as applicable. The General Contractor and his subcontractors 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 and his subcontractors' work under the Contract.

1.7 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Excavation Subcontractor, from the Drawings, plans, and specifications that may have an environmental impact will be subject to approval by the General Contractor 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 by the General Contractor or any subcontractor on the site 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, which will include actions to be taken by subcontractors, 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 or his subcontractors 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 and his subcontractors 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 and his subcontractors will not be required to obtain any Federal, State, or local environmental permits for work conducted on-site. Any applicable permits shall be required for off-site work.

3.2 LAND RESOURCES

The General Contractor and his subcontractors 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 and his subcontractors 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 and his subcontractors 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 Excavation Subcontractor.

3.2.1 Work Area Limits

Prior to commencing construction activities, the General Contractor shall inform the Excavation Subcontractor of areas that need not be disturbed under this contract. Temporary easements obtained by the Government are shown on the Drawings and

indicate where work can be performed. Isolated areas within the general work area that 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 and the Excavation Subcontractor'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 High Street, Elm Street from High Street to "Harry's Supermarket" (parcel I8-24-1), Cove Street, a section of East Street from Cove Street to Lyman Street, and a section of Lyman Street from East Street to the entrance to GE's Lyman Street Parking Lot. If contaminated soils or sediments are transported on public ways, manifesting and/or other shipping papers may be required. Contaminated material transported on East Street shall require hazardous waste licensed trucks and drivers. Contaminated soil and sediment will be transported to a staging area, then to the GE OPCAs, or as approved by the Government or its representative, directly to the GE OPCAs from the excavation point. Transport to the GE OPCAs and the staging areas will be on roads as indicated in a Traffic Control Plan to be prepared by the General Contractor. 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 Excavation Subcontractor shall be responsible for providing erosion and sediment control measures that are, to the extent practicable, in accordance with Federal and 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 Excavation Subcontractor 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 Excavation Subcontractor'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 Excavation Subcontractor Facilities and Work Areas

The Excavation Subcontractor'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 Excavation Subcontractor 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 and the Excavation Subcontractor 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 Excavation Subcontractor 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 Excavation Subcontractor 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 that would cause the Federal and State air pollution standards to be exceeded or that would cause a hazard or a nuisance (see attached ARARs table). The Excavation Subcontractor 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 Excavation Subcontractor shall keep construction activities under surveillance and control to minimize environmental damage by noise. The Excavation Subcontractor shall comply with the provisions of the Commonwealth of Massachusetts rules and applicable City of Pittsfield ordinances.

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 that 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 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 and all of his subcontractors 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 personal protective equipment (PPE) generated by the removal action. The General Contractor and his subcontractors shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The General Contractor and, as applicable, his subcontractors 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 and his subcontractors 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 and his subcontractors shall transport project-generated hazardous waste off the site within 90 days in accordance with USEPA and DOT 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 and his subcontractors shall dispose of hazardous waste in compliance with Federal, State, and local laws and regulations. The Excavation Subcontractor shall dispose of all wastes generated from the water treatment system in accordance with project ARARs. 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 (and, as applicable, his subcontractor'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 stored in marked corrosion-resistant containers and recycled or disposed of in accordance with 40 CFR 279, State, and local laws and regulations.

3.6 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

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

3.7 BIOLOGICAL RESOURCES

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

3.8 PREVIOUSLY USED EQUIPMENT

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

3.9 TRAINING OF PERSONNEL

The General Contractor and his subcontractors' 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 and the Excavation Subcontractor shall conduct environmental protection/pollution control meetings for all General Contractor and all subcontractor 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 and pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; and recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.10 POST-CONSTRUCTION CLEANUP

The Excavation Subcontractor shall conduct post-construction cleanup in accordance with the requirements of the Drawings and Specifications and the Consent Decree. The Excavation Subcontractor shall, unless otherwise instructed in writing by the General Contractor 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) 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)

PROJECT PLANNING AND GUIDANCE DOCUMENTS

Final Quality Assurance Project Plan (QAPP), Weston Solutions, Inc., General Electric (GE) Housatonic River Project, Pittsfield, Massachusetts, DCN: GE-022803-ABLZ, May 2003.

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.

Monitoring Plans, 1.5-Mile Removal Action – Phase 1, Roy F. Weston, Inc., Environmental Remediation Contract General Electric/Housatonic River Project, Pittsfield, MA, Contract No. DACW33-00-D0006, Task Order No. 0005, DCN: GE-060302-ABAU, June 2002.

Final Quality Assurances Project Plan (QAPP), Volumes I, II, IIA, and IV, Roy F. Weston, Inc., DCN: GE-021601-AAHM, March 2001.

Final Quality Assurance Project Plan (QAPP), Volume III, and IV, Roy F. Weston, Inc., DCN: GEP2-123098-AAET, January 1999, and DCN: GEP2-060499-AAIY, October 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.

Final Field Sampling Plan (FSP), Roy F. Weston, Inc., DCN: GE-053001-AAMA, 30 July 2001.

Field Sampling Plan (FSP) Addendum, Weston Solutions, Inc., DCN: GE-081203-ABSP, 12 August 2003.

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

On-Site Meteorological Program Guidance for Regulatory Modeling Applications, USEPA, June 1987, EPA-450/4-87-013.

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 environmental and conditions monitoring during the construction work being performed in Phase 2 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:

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

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

- Noise Monitoring: Monitoring the noise created by construction activities directly adjacent to work areas.

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

- 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.

- 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. Provide two copies of the initial and final video surveys to the Government.

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 Preconstruction Submittals

Monitoring Plan Supplement; G
Include any changes or additions to the existing Monitoring Plans in memorandum format for expedited review and approval.

SD-06 Test Reports

Air Monitoring Daily Report
Monthly Project Report – Includes Air, Water Column, Noise, and Vibration Monitoring Results; G.
Water Column Monitoring Daily Report

SD-11 Closeout Submittals

Final Project Monitoring Report – Summary of Air, Water Column, Noise, Settlement, Vibration and Conditions Monitoring Program Results; G.

1.5 AIR MONITORING

1.5.1 Ambient Air Monitoring Plan Supplement

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

- A brief description of the sampling locations, schedule and frequency of sample collection, and the methods of sample collection and analysis.
- Where applicable, references to methods and procedures outlined in the Project FSP and the Project QAPP.
- 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:

- Map of the site detailing the location of the PM_{10} ambient air monitors. The site map shall also include the forecasted wind direction, comments on excursions, and any problems with sampling equipment.
- Wind rose for the sample period obtained from the United States Weather Page on the Internet for the Pittsfield area, navigate to http://www.uswx.com/us/wx/MA/01201/
- Summary graph of sample results for the sample period for each location. Summary table of the maximum instantaneous reading, the maximum 15-minute average, hourly average readings for the entire sampling period, and the overall sampling period average for each location.

For monthly PCB Air Monitoring, copies of the sample attribute forms completed shall be included in the daily report on the day the samples are collected.

An Air Monitoring section shall be included in the Monthly Project 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 including the date of sampling, comments on excursions, problems with sampling equipment, site activities, laboratory problems, and results of samples.
- Site map detailing the location of sampling locations
- Summary table of results received in a given month.

PM_{10} Monitoring

- Summary of PM_{10} data for the month including daily average PM_{10} concentrations and total hours monitored for each PM_{10} monitoring location.

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 average readings, and meteorological data summary). In addition, the sample dates, PCB analytical results and PM_{10} 10-hour average readings 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 be a supplement to the Phase 1/2 Transition Water Column Monitoring Plan, and shall include, but shall not be limited to, the following:

- A brief description of the sampling locations, schedule and frequency of sample collection, and the methods of sample collection and analysis.
- Manufacturer's cut sheets and a brief description of the automated sampling device to be utilized.
- Where applicable, references to methods and procedures outlined in the Project FSP and the Project QAPP.
- 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

1.6.2.1 Daily and Monthly Reports

A Daily Water Column Monitoring Report shall be submitted summarizing calculated flow based on a rating curve correlated to the Coltsville gauge, hourly water temperature from each turbidity monitoring location, and turbidity measurements including daily averages for each location (upstream and downstream of construction activities). The daily report shall also note when turbidity levels exceeded applicable action levels, notification steps taken, and additional water column monitoring conducted. Sample attribute forms and a summary

table for water column samples shall be submitted as part of the daily report on the day the samples are collected.

A Water Column Monitoring section shall be included in the Monthly Project 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 on specific events) and daily monitoring activities including the date of sampling, comments on excursions, problems with sampling equipment, site activities, laboratory problems, and results of samples).

- Summary table of results for turbidity measurements for the month including daily average, maximum, and minimum turbidity measurements for each location (upstream and downstream), and daily flow from the Coltsville gauging station,

- Summary table of PCB/TSS sampling including any results available at the time of submittal; date samples were collected; flows from Coltsville location and each of the sampling locations; water temperatures from each sampling location; correlated turbidity measurements including high, low, and average readings from the day of each sampling event; and any additional PCB/TSS sampling conducted during the period.

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

- The initial laboratory reports.

1.6.2.2 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, 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 NOISE MONITORING

1.7.1 Noise Monitoring Plan

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

- A brief description of the monitoring locations and the monitoring methods to be used.
- Shop drawings of the noise monitoring devices.
- An example spreadsheet layout of the data deliverable.

1.7.2 Noise Monitoring Data Deliverables

1.7.2.1 Monthly Reports

A Monthly Noise Monitoring Report shall be prepared as a section of the Monthly Project Report, and shall summarize the results of noise monitoring. The report shall contain the following information:

- Summary of the monitoring events including problems with sampling equipment and site activities.
- Summary table and/or graph of noise monitoring results reported as daily averages.

1.7.2.2 Final Noise Monitoring Report

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

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

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

1.8 SETTLEMENT MONITORING

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

1.8.2 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 be presented in spreadsheet 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, these data shall be summarized in an electronic data deliverable (EDD) as described in Subsection 5.4 of the QAPP.

1.9 VIBRATION MONITORING

1.9.1 Vibration Monitoring Data Deliverables

1.9.1.1 Monthly Reports

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

- Summary of the sampling events including problems with sampling equipment, exceedances of action levels, and site activities.

- Summary table of vibration monitoring results for each structure being monitored including the maximum particle velocity in inches per second every 6 hours.

1.9.1.2 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 of vibration monitoring results for the duration of the construction activities.

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

1.10 CONDITIONS MONITORING

1.10.1 Initial Conditions Survey Deliverables

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 frame showing the contract title and number, and the name and address of the structure or location 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).

- An audio and video recording record of exterior of the structure and surrounding grounds, outbuildings, pools, and fences shown 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 provide 2 copies to the Government.

1.11 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.

1.12 FINAL PROJECT MONITORING REPORT

The Final Project Monitoring Report will include summaries of all of the project monitoring data as described in the previous 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 revised and submitted in final form within 30 days of receipt of comments on the draft report from the Government.

1.13 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.

1.14 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 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 PDR-1200 real time PM_{10} monitor 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 NOISE MONITORING

An Extech Model 407764 Sound Level Meter or equivalent shall be used to monitor noise levels adjacent to the areas of construction. 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.

2.4 SETTLEMENT MONITORING

Standard land surveying equipment shall be used to monitor elevations of designated points 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 1½-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 1½-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.

2.5 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% 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 1 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

2.6 CONDITIONS MONITORING

A standard VHS video camera and VHS videotape shall be used to document the structural and environmental conditions of the structures and areas identified in Part 3. A digital camera shall be used to produce digital photographs of site and structural features.

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 on-site 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 average 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 off-site; 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 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 PDR-1200 real time PM_{10} monitor 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 aerosols PM_{10} concentrations.

3.1.5.3 Meteorological Monitoring

Meteorological data shall be obtained from the United States Weather Page on the Internet (http://www.uswx.com/us/wx/MA/01201/) for the Pittsfield area. Decoded observations for wind speed and direction shall be utilized in constructing daily wind rose diagrams.

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 ongoing 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 sections of this specification.

3.2.1 Parameters of Concern

PCBs – Total and Dissolved
Turbidity
Total Suspended Solids (TSS)
Temperature
Water Flow
Stage Height

3.2.2 Action Levels

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

- PCBs-Total (10 hour composite or 4 part grab): Downstream (Pomeroy Avenue) $\geq$ Upstream (Lyman Street)+ 5 ug/L.

- Turbidity: Downstream (Pomeroy Avenue) $\geq$ Upstream (Lyman Street) + 50 NTU (13 Hour Daily Average.

3.2.3 Sampling/Monitoring Locations and Frequencies

A total of three 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 plus water temperature and stage height measurement.

- Lyman Street Bridge – Daily turbidity; twice monthly PCB and TSS sampling plus water temperature.

- Pomeroy Avenue Bridge – Daily turbidity; twice monthly PCB and TSS sampling plus water temperature and stage height measurement.

In addition, monitoring shall be performed at the Newell Street, Lyman Street, and Pomeroy Avenue monitoring stations for PCBs and TSS during approximately three specific events. For example, monitoring will be performed during the following: a high flow event, excavation of NAPL-impacted sediments, and installation or removal of sheet pile, 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 Standard Operating Procedure SW-6 of the Addendum to the Final FSP dated September 2002 (DCN: GE-091102-ABES), revised September 2002. 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 event. Rating curves for each location will be used to determine the flows during that sampling event. River cross-sections and rating curves currently exist for both the Pomeroy Avenue and Newell Street location.

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 Operating Procedure SW-6 of the Field Sampling Plan November 2000 (DCN: GE-091200-AADI), revised July 2001. However, in the event of extreme cold weather conditions or conditions that do not allow for normal sampling procedures to be utilized, four manual grab samples will be collected over the course of the work day and composited into one sample for PCB and TSS analysis.

Turbidity will be measured according to procedures outlined in Standard Operating Procedure SW-6 of the FSP.

Sample processing will follow the procedures outlined in Standard Operating Procedure SW-6 of the FSP. Any deviations from the procedures outlined in the FSP shall be noted in 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 Total PCBs or Turbidity are exceeded, the Government shall be notified immediately. The General Contractor shall: (1) perform an evaluation of ongoing 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 Final Water Column Monitoring Report.

3.3 NOISE MONITORING

Noise monitoring will be conducted to meet the standards established in the City of Pittsfield Noise Ordinance. Noise levels produced by construction activities will be kept at or below a 65-decibel average (dBA) over the course of a workday. Instantaneous noise levels will also be monitored. Noise readings will be obtained at property boundaries adjacent to work areas as necessary.

3.3.1 Action Levels

Readings indicating exceedances of the 65-decibel daily average will be reported immediately to EPA, and an evaluation of construction activities will be conducted to determine potential corrective measures. Instantaneous exceedances or complaints from nearby residents will be evaluated accordingly.

3.3.2 Monitoring Locations

The purpose of this monitoring program is to monitor noise levels that may affect property owners adjacent to construction activities; therefore, monitoring stations shall be located at the perimeter of the site, on or near the property boundary. Monitors will be moved to new locations as construction-related activities progress. The specific locations for these monitors will be determined at a later date.

3.3.3 Frequency of Sampling

Real-time noise monitoring shall be conducted only as necessary or when noise levels created by construction-related activities are considered to be excessive per the Engineer. When noise monitoring is deemed necessary, monitoring shall be performed for approximately 10 hours per day or as the length of the workday dictates. Noise level data shall be recorded and averaged by a datalogger for each hour of the day.

3.3.4 Monitoring Instruments/Sampling and Analysis Methods

An Extech Model 407764 Sound Level Meter or equivalent shall be used to monitor noise levels adjacent to the areas of construction. 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.

3.3.5 Notification of Action Level Exceedances

If action levels for noise levels are exceeded, the Government shall be notified immediately. The General Contractor shall: (1) perform an evaluation of ongoing 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 monitoring, 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 monitoring in response to exceedances will be handled separately on a case-by-case basis.

3.4 SETTLEMENT MONITORING

3.4.1 Structures to be Monitored

Three 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 and In-Ground Pool.
- Lyman Street Bridge.
- 37 Elm Street, Harry's Supermarket and Billboards.
- 103 Elm Street, Elm Street Self-Car Wash, including three vacuums at the top of bank.
- 41 Root Place.
- 48 Root Place.
- 50 Root Place.
- 50-60 Elm Street
- Elm Street Bridge.
- Flow Deflection Structure for Culvert downstream of the Elm Street Bridge.
- Utilities along High and Deming Streets (to be identified on a site walk to be conducted by the General Contractor prior to the start of work.

3.4.2 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.

3.4.3 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.

3.5 VIBRATION MONITORING

3.5.1 Structures to be Monitored

- 103 Elm Street, Elm Street Laundromat.

- 103 Elm Street, Elm Street Self Car Wash.
- Elm Street Bridge.
- 50-60 Elm Street.
- Utilities along High and Deming Streets (to be identified on a site walk to be conducted by the General Contractor prior to the start of work).

3.5.2 Scheduling of Vibration Monitoring Activities

Vibration monitoring shall be completed during any sheet piling or other heavy or intrusive construction activities completed within 200 feet of the structures listed above.

3.5.3 Security and Coordination with Property Owners

Based on proximity to the work, and an evaluation by the Project Engineer, monitoring devices shall be placed on each of the structures listed above at appropriate times and shall be secured from theft and protected from the weather. The location of the monitoring device on each structure shall be approved by the appropriate parties of interest (owners, City of Pittsfield).

3.5.4 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.

3.5.5 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.
- 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.

3.6 CONDITIONS MONITORING

3.6.1 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 Dawes Avenue 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 and In-Ground Pool.
- Lyman Street Bridge.
- 37 Elm Street, Harry's Supermarket and Billboards.
- 103 Elm Street, Elm Street Self-Car Wash, including three vacuums at the top of bank.
- 41 Root Place.
- 48 Root Place.
- 50 Root Place.
- 50-60 Elm Street.
- Elm Street Bridge.
- Flow Deflection Structure for Culvert downstream of the Elm Street Bridge.
- Utilities along High and Deming Streets (to be identified on a site walk to be conducted by the General Contractor prior to the start of work).

3.6.2 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.

3.6.3 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 videotape (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 on-site and off-site, 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 are subject to removal by the Contracting Officer for noncompliance 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, no later than 30 days after receipt of notice to proceed, a proposed Contractor Quality Control (CQC) Plan Supplement for Construction Work in the second 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 second phase of the 1.5-Mile Reach, and shall include, as a minimum, the following to cover

all operations, both on-site and off-site, 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 that describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work that 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, off-site 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 on-site and off-site 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 that 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 assure 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 assure 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 for maintaining 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 on-site 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 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 4 years of environmental engineering experience; or an experienced construction person with a minimum of 8 years of 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 2 years of 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; and 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 of experience in the type of work being performed on this project or technician with 5 years of related experience
b.	Mechanical	Graduate Mechanical Engineer with 2 years of experience or person with 5 years of related experience
c.	Electrical	Graduate Electrical Engineer with 2 years of related experience or person with 5 years of related experience
d.	Structural	Graduate Structural Engineer with 2 years of experience or person with 5 years of related experience
e.	Environmental	Graduate Environmental Engineer with 3 years of experience
f.	Submittals	Submittal Clerk with 1 year of experience
g.	Concrete, Pavements, and Soils	Materials Technician with 2 years of 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 assure 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 assure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to assure 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 on-site, 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 that 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 ongoing work is unacceptable; there are changes in the applicable CQC staff, on-site production supervision, or work crew; work on a definable feature is resumed after a substantial period of inactivity; or 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 that 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 USACE-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; assure 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 off-site 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 GE/Housatonic River Site VPN, 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 On-Site 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 that 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. Off-site 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 p.m. 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

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 (material regulated under the Toxic Substances Control Act) and non-TSCA (material not regulated under the Toxic Substances Control Act) soils and avoid mixing either with uncontaminated backfill or other materials. Handling excavated material shall include haulage and placement in stockpiles at appropriate locations. 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. In addition, the Excavation Subcontractor 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 OPCAs will be accomplished by GE and is not included in this contract. Material scheduled for off-site disposal shall be arranged by the General Contractor as necessary.

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 riverbanks and backfill materials to be delivered to the site as specified or as directed by the Government. Excavation of contaminated materials, placement of those materials in trucks, and supply, testing, and placement and in situ physical testing of backfill material will be performed by the Excavation Subcontractor. Chemical testing of backfill materials will be performed by the General Contractor.

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

1. Operation and maintenance of the contaminated materials staging area located in the vicinity of and within Buildings 63, 65, and 68, and potentially on the Lyman Street parking lot on the GE property for the purposes of dewatering and characterizing contaminated materials prior to disposal at the OPCAs and at off-site disposal facilities. This also includes handling of debris in accordance with this specification.

2. Operate and maintain truck wash pads to be located near the active excavation to eliminate the deposition of construction related materials from the trucks onto roadways while on route to the contaminated materials staging areas. Operate and maintain decontamination wash pads at each of the contaminated materials staging areas for purposes of decontaminating trucks hauling contaminated materials (soils, sediments, stumps, and other construction and incidental debris) from the contaminated materials staging area. Trucks shall be decontaminated or washed to the satisfaction of the QC Manager before leaving the exclusion zones established along the perimeter of the contaminated materials staging area or the excavation areas.

3. Manage and control surface water run-on and runoff 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 will be coordinated between the General Contractor and the Excavation Subcontractor.

1.1 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

Excavation Plan

Proposed procedures addressing the handling of materials excavated from the riverbed and riverbanks that have high moisture contents, including locations for interim storage, and any other procedures that shall be utilized to eliminate the distribution of water from saturated sediments within the active excavation and adjacent areas of excavation and the possible contamination of support areas and haul roads. Excavation plan should include location of decon pad and plan. No equipment that enters the riverbed will be allowed to exit the site without thorough decontamination. The sediment subgrade in the riverbed, following excavation to required grade, shall be presumed to be contaminated.

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 for on-site work. All on-site work performed shall conform to the regulations specified in the attached project ARARs table. For the on-site transportation of contaminated materials, all substantive requirements, such as the use of tarps and placarding, shall be followed. Administrative requirements, including, but not limited to manifesting and the use of trucks and drivers licensed to transport hazardous waste need not be fulfilled. Haul roads, including those constructed during Phase 1 of the 1.5-Mile Removal Action along private property (properties adjacent to the 1.5 Mile Reach) and the perpendicular crossing at Lyman Street into GE's Lyman Street parking lot, as well as perpendicular crossings of Elm Street from High Street into Parcel I8-24-1, East Street, Tyler Street, and New York Avenue, are considered to be "on-site" for purposes of this evaluation. Manifesting may 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 chemical sampling and analysis of backfill and contaminated material. 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 be required for off-site disposal purposes. Off-site disposal shall be coordinated by the General Contractor. 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 decontaminating trucks, temporarily storing contaminated materials, providing testing (geotechnical only, see also Specification Section 02300 - EXCAVATION), delivering, storing, and placing of backfill, hauling contaminated materials from the active excavation, hauling contaminated materials to the GE OPCAs for final disposal, and loading of trucks for off-site 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 with polyethylene liners or watertight seals 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 at the OPCAs or an off-site disposal facility.

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 by the General Contractor. Characterization sampling of excavated materials to be conducted by the General Contractor will be required for materials sent for off-site disposal. Materials sent to the GE OPCAs shall not require characterization sampling.

1.5 BACKFILL MATERIALS TESTING

Backfill materials shall be tested for geotechnical and chemical parameters and fully approved by the General Contractor and the Government 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. However, for stockpile areas located within buildings, tarp covers shall not be necessary.

2.4 POLYETHYLENE LINER MATERIAL

Polyethylene liners shall be used to line the areas for stockpiling contaminated materials. HDPE liner material shall be used for outdoor stockpiles and shall be a minimum of 40-mil thickness. For indoor contaminated material stockpiles, a minimum 6-mil thickness

polyethylene liner shall be used. Use of thinner gauge HDPE liner for lining of stockpile areas outdoors 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 when 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 Excavation Subcontractor 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 General Contractor.

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 or to off-site disposal facilities. 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. . Materials considered to have excessive moisture content (i.e., such that leakage of free liquids from trucks would be a concern) shall be handled in such a manner to eliminate the possibility of contamination of areas outside the limit of excavation, including haul roads to the contaminated

materials staging areas. Materials with excessive moisture content shall be allowed to dewater until an acceptable moisture content is reached as approved by the General Contractor. Saturated materials that have been dewatered to an acceptable moisture content for transport shall be moved to the appropriate contaminated materials staging area as soon as possible.

Materials shall not be hauled to the OPCA or off-site facilities until they have been determined to be devoid of free liquids (via paint filter test). 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. The time required to dewater materials to an acceptable moisture content shall also be considered when sizing the staging areas.

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 Excavation Subcontractor shall appropriately size staging areas to allow the continued accumulation of materials during the periods when GE is not operating the landfill. The Excavation Subcontractor shall ensure the delivery of 30 truckloads of material to the OPCA each day the OPCA is open for additional consolidation (excluding the final day of hauling).

Similarly, loading (by Excavation Subcontractor) and hauling (by off-site Transportation and Disposal Subcontractor) of materials from the contaminated materials stockpile to off-site disposal facilities will be limited to certain days and shall be performed as batch operations. The Excavation Subcontractor shall coordinate with the General Contractor and the off-site disposal subcontractor to schedule the days on which off-site transportation and disposal will occur. The Excavation Subcontractor shall appropriately schedule his work activities so that labor and equipment are made available to load off-site hauling trucks when they arrive on site, minimizing any down time.

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, and stockpiled in the staging area located on the GE property near and within Buildings 63, 65, and 68. However, for saturated soils and sediments, an interim dewatering measure shall be implemented to allow for transport to the contaminated materials stockpile areas on GE Property as described in Section 3.2.

Segregation of soils/sediments will focus on three major criteria or characteristics–total PCB concentrations, NAPL, and particle size (presence of cobbles and boulders) as described below.

a. 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 (including those materials that are classified as coarser grained) shall ultimately be consolidated in the Building 71 Cell GE OPCA, and all non-TSCA soils and sediments shall be disposed of at an appropriate off-site facility or consolidated on-site in the Hill 78 GE OPCA.

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

c. Cobbles and Boulders—Soils and sediments classified as non-TSCA materials (as indicated in item a above and shown on Drawing No. 1002) shall be further segregated based on the content of coarser grain material within the materials being excavated. The nature of the sediment of the Housatonic River is impacted by the presence of bedrock at or just below the river bottom from the Elm Street Bridge downstream to the Dawes Avenue Bridge. The surface of the river bottom in this reach predominantly consists of cobbles, with finer grain material in the voids between the cobbles, and some boulders. It has been estimated that out of the total of approximately 10,000 yd^3 of material scheduled to be excavated from this reach, approximately 2,000 yd^3 of material will have a grain size greater than 2 inches. This quantity will vary depending on the nature of the soils and sediments encountered. To minimize disposal costs and potentially backfill material acquisition costs and future site preparation costs, non-TSCA sediments and soils that consist of coarser grain material shall be stockpiled separately from finer grain soils and sediments by the Excavation Subcontractor for possible future screening and washing. The material to be segregated shall be selected by visual inspection during excavation activities. The Excavation Subcontractor shall select the material in coordination with the General Contractor and the Government.

3.4 SAMPLING

The General Contractor shall perform free liquids testing of excavated material on a frequency of one test per 100 yd^3 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 and by EPA in the 1.5-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 of stockpiles will be performed for materials to be transported for off-site disposal. This sampling will supplement existing in-place chemical data and will be implemented to meet the specific requirements of the off-site disposal facility to receive the material.

Geotechnical testing of backfill materials shall be performed by the Excavation Subcontractor and chemical testing will be conducted by the General Contractor. 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 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 yd^3 of material

VOCs, SVOCs, Metals: 1 sample per 2,000 yd^3 of material

TPH: 1 sample per 500 yd^3 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, VOCs, SVOCs, and metals , 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. In general, MCP S-1 Standards will be used for non-PCB compounds. Chemical testing shall be performed on suitable materials with an anticipated quantity of 200 - 500 yd^3 or greater.

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

The Excavation Subcontractor shall handle separately various types of waste (TSCA materials, non-TSCA materials, non-TSCA cobbles and boulders, NAPL-containing materials, and oversize 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 and off-site disposal facilities in accordance with the Consent Decree. All material excavated shall be characterized by the area from which it was excavated.

Therefore, stumps, concrete, metal, and other debris excavated from sediments and soils delineated as TSCA shall be classified as TSCA, and all materials excavated from sediments and soils delineated as non-TSCA shall be classified as non-TSCA and disposed of accordingly. Debris scheduled for on-site disposal at the OPCAs that is larger than 4 feet in any dimension, including stumps, metal, concrete, etc., shall be segregated by the Excavation Subcontractor for purposes of size reduction before transport to the OPCAs. Similarly, debris scheduled for off-site disposal shall be segregated for purposes of size reduction. The selected off-site disposal facility has a maximum particle size requirement of 3 feet and does not accept any metallic debris. In addition, materials shall be sized appropriately so as not to damage trucks used for off-site disposal.

3.6 DECONTAMINATION AND TRUCK WASH PADS

A decontamination pad has been constructed at the contaminated materials staging area for Phase 1/2 Transition. Additional decontamination pads shall be constructed at each contaminated materials staging area when in use by the Excavation Subcontractor. Truck wash pads shall be operated as necessary 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 has been constructed to allow sufficient room for truck decontamination as described in this section. The pad is 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, tailgates) 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 by the General Contractor on equipment to document PCB levels below 10 $\mu g/100\ cm^2$, 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 Buildings 63, 65, and 68 on GE property and the Lyman Street parking lot is available for staging of soil and sediment. The areas shall be operated and maintained in such a manner by the Excavation Subcontractor 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.

3.8 SOIL AND SEDIMENT STORAGE

a. The Excavation Subcontractor shall store separately materials (not including debris that must be stored separately) classified as TSCA, non-TSCA, non-TSCA cobbles/boulders, and NAPL-impacted. In general, and if practicable, water-releasing materials shall be kept inside buildings and non-water releasing materials shall be stored at designated outside stockpiling areas. Additionally, materials excavated from areas beyond the limits of remediation shall be stockpiled separately for characterization if required by the Engineer.

b. 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 runoff 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. In addition, any standing water that accumulates on the working surface of the staging areas not captured by sumps shall be vacuumed on a daily basis and consolidated into storage tanks.

c. Soil and sediment piles located outside shall be covered using heavy-duty tarps or other acceptable material as necessary 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 buildings.

d. Soil piles shall be shaped to encourage the proper flow of rainwater off 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, and other material larger than 4 feet in size for OPCA disposal or 3 feet in size for off-site disposal) removed from the excavation area. Metallic debris is not permitted at the off-site disposal facility and shall be consolidated in the OPCA. This area shall be located within a specified area on GE property. The debris shall be considered contaminated, and as such, the debris storage area shall be underlain by polyethylene 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. All debris shall be reduced in size to a maximum size of 4 feet in any dimension before transport to the OPCA or to a maximum size of 3 feet before off-site disposal.

3.10 BACKILL MATERIAL STORAGE

Backfill materials shall be stored on-site in Government-approved areas. 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 areas and the decontamination and truck wash pads. Activities or events which will generate contaminated wastewater include steam/high-pressure washing at the decontamination and truck wash pads, gravity dewatering of sediments, and rainwater infiltration through soil and sediment piles.

b. At the Excavation Subcontractor'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 Excavation Subcontractor shall notify the General Contractor immediately. The General Contractor shall report any spill or release immediately to the Government. 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 General Contractor.

END OF SECTION

Table 02111-1

Backfill Testing Frequencies and Methods

EARTHEN MATERIALS	TEST METHODS WITH TEST FREQUENCY REQUIREMENTS BASED ON CUBIC YARDS										
	C136	D75	D421/422	D1557	D2216	D2974	D4318	D4253	D4254	D5519	EM-1110-2-2302
Common Fill			500	1000	500	500	500				
Structural Fill			500	1000	1000	1000	1000				
Filter Material	500			1000	500	500	500				
Bank Run Gravel			500	1000	500	500	500				
Select Gravel	500			1000	1000	1000	1000				
Sand	500	1000									
Processed Gravel		1000	500	1000	1000	1000	1000	see note 4			
Screened or Crushed Stone		1000	500	1000	1000	1000	1000	see note 4			
Topsoil (See note 6)			500		500	500	500				
9-inch Riprap										2000	500
12-inch Riprap										2000	500
18-inch Riprap										2000	500

Notes:
1) Two pre-construction samples of each material from each borrow source shall be tested prior to the use of that material.
2) If the pre-construction test results satisfy the specification requirements, the pre-construction test results may be counted as part of the frequency testing requirements.
3) If a material is obtained supplied as generated from a quarrying operation, i.e., the material is crushed and screened to achieve a specified gradation, the testing frequency may, at the discretion of the Engineer, be reduced to 1 test per 1,000 cubic yards of material.
4) ASTM D4253/4254 shall be performed on materials that are too granular to be compacted using ASTM D1557.
5) ASTM D4318 is not required for materials that are predominantly granular in composition based on visual inpsection.
6) Topsoil testing shall also include pH at the same frequency.

ASTM Test Methods and Descriptions

C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

D75 Standard Practice for Sampling Aggregates, ASTM C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

D422 Standard Test Method for Particle Size Analysis of Soils

D1557 Moisture-Density Relationship by Modified Proctor Compaction

D2216 Laboratory Determination of Water (Moisture) Content

D2974 Organic Content

D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

D4253 Maximum Index Density and Unit Weight of Soil Using a Vibratory Table

D4254 Minimum Index Density and Unit Weight of Soil and Calculation of Relative Density

D5519 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials, Method A

USACE Test Methods and Descriptions

EM-1110-2-2302 Field Visual and Index Testing

SECTION 02230

CLEARING AND GRUBBING AND SITE PREPARATION

PART 1 GENERAL

1.1 DESCRIPTION

The subsections below provide a detailed description of the clearing, grubbing, and site preparation activities covered under this section. In general, this section covers work to be conducted by the Excavation Subcontractor, 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. Site preparation activities shall include the construction of haul roads and the necessary provisions for the placement of materials and equipment associated with construction activities.

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 downed 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 equipment to meet the following requirements, 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 Disposal, Chipping, and Hauling

Material cleared from within contaminated areas will not be allowed for resale or reuse off-site. This material will be used on-site or disposed of off-site at a wood-burning generating facility or other approved off-site disposal facility.

All material cleared from areas outside the contamination zone that do not come into contact with soil within contaminated areas will be available for sale by the Excavation Subcontractor. If possible, this material will be sold to an approved off-site buyer as usable timber to reduce the cost of the clearing effort.

All trees and brush cleared from areas outside the contamination zone that cannot be sold shall be chipped into box trailers for disposal at a wood-burning generating facility or other approved off-site disposal facility. In addition, chips from this material 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

Site Preparation Plan; G

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

3.1.1 Clearing

Clearing activities shall be sequenced concurrent with excavation activities. Mass clearing of the site is not permitted. 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, 6 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. Clearing outside the limits of excavation shall be limited to a distance of 2 feet beyond the

limit of excavation except that dead vegetation, overhanging limbs, or trees that are deemed to be leaning excessively toward the work area shall be cleared. Clearing shall be minimized to areas necessary for the progression of construction activities. Cut trees and branches shall not be permitted to come into contact with contaminated soils or sediments. The Excavation Subcontractor shall use appropriate measures to prevent such contact.

The General Contractor shall clearly flag or mark trees to be left standing and trees and limbs outside the limit of excavation that are to be removed for approval by the Government. The Excavation Subcontractor shall clear only those trees identified in areas necessary for work to progress. 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.

The Excavation Subcontractor shall take all precautions necessary to protect existing trees scheduled to remain such that they will be free from any damage or injury, including cutting, breaking, or skinning of roots, trunks or branches or smothering by stockpiled construction materials, excavated materials, or vehicular traffic within branch spread. Interfering branches of trees scheduled to remain may be removed when acceptable to the General Contractor. Trees scheduled to remain that are damaged due to construction operations shall be repaired by the Excavation Subcontractor in a manner acceptable to the General Contractor.

Should an existing tree be damaged to the extent that it is deemed to be a complete loss by the General Contractor, or if, due to the negligence of the Excavation Subcontractor, a tree on the construction site dies within 1 year of project completion, the Excavation Subcontractor shall replace the tree according to the following requirements:

- Tree Replacement Formula—One square inch of caliper lost will equal 1 square inch of caliper replaced. This formula is based on tree trunk diameter at breast height.

- The Excavation Subcontractor will be responsible for planting the replacement tree(s) at a location designated by the General Contractor. The replacement tree(s) shall be of the same species and variety as the tree(s) lost. If the species and variety is not available, a substitute must be proposed by the Excavation Subcontractor and approved by the General Contractor. The minimum caliper of replacement tree(s) shall be 2.5 to 3 inches.

3.1.2 Grubbing

Grubbing activities shall be sequenced concurrent with excavation activities. Mass grubbing of areas intended for excavation is not permitted. 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.

3.2 DISPOSAL OF MATERIALS

3.2.1 Selling of Material

All trees and brush cleared from areas outside contaminated areas that have not come in contact with the ground surface of contaminated areas or the river and considered to be usable timber shall be available for sale to an approved off-site buyer. The Government shall approve the buyer for the sale of usable timber. All material cleared from within contaminated areas shall not be available for resale or reuse.

3.2.2 Chippable Material

Trees and brush cleared from areas outside contaminated areas that could not be sold and that have not come in contact with the ground surface of contaminated areas 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. In addition, chips from material cleared outside contaminated areas shall be available for use as mulch at off-site locations. Material cleared from within contaminated areas shall be available for chipping to be used on-site for site preparations purposes.

3.2.3 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 reduced in size to a maximum 4-foot size and subsequently transported to an OPCA specified by GE for disposal. Alternatively, this material could be sent off-site for disposal. Material sent for off-site disposal would need to meet the specific size requirements and other restrictions of the selected off-site disposal facility (currently debris larger than 3 feet in any dimension and metallic debris is not allowed). Concrete debris generated during site preparation and excavation activities shall be stockpiled for later size reduction (4-foot maximum size for disposal at OPCAs).

3.3 SITE PREPARATION

Site preparation shall include the construction of haul roads and staging areas for storing and transferring materials and equipment. A Site Preparation Plan shall be submitted by the Excavation Subcontractor detailing the implementation of installation, materials to be used

for the construction, and the locations of staging areas and equipment, including office trailers and designated equipment storage locations, and access roads. The Excavation Subcontractor shall minimize the amount of material used to construct the haul roads and staging areas. At a minimum, all haul roads, support areas, and staging areas shall be lined with a geotextile fabric prior to the placement of any material on the existing ground surface to minimize the contact between any construction related equipment and the existing ground surface and to allow for the removal of this material at project completion as necessary.

3.3.1 Haul Roads

Haul roads shall be constructed by the Excavation Subcontractor to allow for the efficient transfer of construction-related equipment, excavated materials, and backfill material. Access roads shall have a minimum width to allow for the safe passage of all construction equipment to and from the areas of construction. In general, access roads shall be constructed to meet the needs of the Excavation Subcontractor to complete work but shall meet the following minimum requirements: (1) Geotextile fabric shall be placed over the existing ground surface in all areas where access roads are constructed; and (2) Clean material shall be placed over the geotextile fabric to construct the access roads at a minimum 8-inch thickness to ensure that construction equipment does not come in contact with the existing ground surface.

3.3.2 Staging and Support Areas

Staging and support areas shall be constructed by the Excavation Subcontractor to allow for the storage of construction-related materials including backfill and equipment. The area used for staging material and equipment shall be kept to a minimum and shall only include areas necessary to complete the work. All areas used for staging material and equipment shall have geotextile fabric placed on the existing ground surface and clean material placed over the fabric such that construction equipment and materials shall not come in contact with the existing ground surface.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

Work covered by this section includes measures to support remediation work within the Transition Area and restoration construction along the riverbed and riverbank (see Section 02930 BANK REVEGETATION TRANSITION AREA) and as shown on the drawings. The work consists of excavation of TSCA and non-TSCA materials (see Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL), subgrade preparation, backfilling of the riverbed, retaining wall construction 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 C33	Concrete Aggregates
ASTM C97	Absorption and Bulk Specific Gravity of Natural Building Stone
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM D422	Particle-Size Analysis of Soils
ASTM D1140	Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D1556	Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D2167	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D2974	Moisture, Ash, and Organic Matter of Peat and Other Organic Materials

ASTM D3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D5519 Particle Size Analysis of Natural and Man-Made Soils

COMMONWEALTH OF MASSACHUSETTS,
DEPARTMENT OF HIGHWAYS

State Specifications (1995) 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 Laboratory Soils Testing

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals: G

Excavation Plan

a. Proposed construction sequence shall address the following: Protection of utilities and structures; excavation of channel sediment and bank soil; method to minimize conveyance of contaminated material over remediated areas; sequence for drilling caissons, if required; and installing soldier piles, lagging, and anchors and permanent steel sheet pile retaining walls and anchors. Means, methods, and sequence for the backfill placement methods and equipment shall be specified. 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.

b. The method for coordinating survey control (real-time) 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.

c. A dewatering plan that shows the location of all temporary dams, pumps, sumps, pipelines, filters, sedimentation basins, and other equipment necessary to handle leakage through and around the dam and infiltration of groundwater into the work area. The plan shall address the installation of a temporary dam at the downstream (discharge) end of the by-pass pipes to prevent the flow of water into the work

area. 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 work areas 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.

d. A schedule for all specified earthwork and riverbank 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.

e. See additional requirements for the Excavation Plan listed in Specification Section 02111 – HANDLING OF EXCAVATED MATERIAL AND BACKFILL.

SD-06 Test Reports

In-place compaction testing data.

Visual inspection reports.

1.3 SUBSURFACE DATA

Subsurface soil boring logs are available in the Pre-Design Summary, 1.5-Mile Removal Action - Phase 2. 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, embedded debris, or ordered excavation. Soil and sediment excavation shall include earthen and fill material located within the Limit of Excavation shown on the Drawings, except those specified below. As indicated on the subsurface investigation logs available in the Pre-Design Summary, 1.5-Mile Removal Action - Phase 2, 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 5 feet or more in nominal diameter, measured along the narrowest portion of the boulder. Boulders that are less than 5 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, sidewalk, 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 embedded 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 have classified the materials as oversized.

1.4.4 Embedded Debris

Embedded debris shall include the removal of materials (concrete, miscellaneous debris, etc.) protruding from the riverbank or riverbed whose removal by conventional excavation may cause slope instability, result in the formation of a void, or require over-excavation, shall be considered embedded debris. Removal of embedded debris shall require the use of hydraulic hammers, saws, etc. to allow the removal of the debris to within 4 inches of the existing ground surface or flush with the subgrade in areas that are to be excavated. Embedded debris shall be considered any embedded debris over 1 cy in nominal volume. The General Contractor shall be notified by the Excavation Subcontractor when potentially embedded debris is encountered. The Excavation Subcontractor shall not proceed with the excavation of this material until the General Contractor has classified the materials and has taken field measurements as required.

1.4.5 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 General Contractor shall be 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 and has taken samples and field measurements as required.

1.4.6 Crib Wall Excavation

Crib wall excavation will consist of two components as described below.

1.4.6.1 Timber and Fill Material

Timber and fill material excavation will include the removal of all timber, fill material, concrete slabs, walls and curbing, fencing, utilities, etc.

1.4.6.2 Native Soil (Till or Bedrock)

Native soil excavation will include the removal of any native materials (till or bedrock) encountered below the fill material down to a minimum elevation of 966.5.

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 sealed trucks provided by the Excavation Subcontractor such that contamination of the outside of the vehicle and leakage from 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. Unless otherwise approved by the Engineer, 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.

Material	Deviation (feet)
Excavation/Subgrade	-0.15 to 0
Filter Material	-0.15 to +0.15
Common/Structural Fill	-0.15 to +0.15
Riprap	$-25\%d_{max}$ to $+15\%d_{max}$
Topsoil	0 to +0.15

d_{max} is the maximum nominal riprap size in feet

Due to the shape and size of riprap and the inherent difficulties associated with fine-grading riprap, a range of surface tolerance has been provided. Measurements of finished elevations for riprap shall be taken within a 12-inch radius of the horizontal location established on the subgrade.

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 tested, procured, and delivered to the worksite by the Excavation Subcontractor in accordance with this specification and with Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL. Physical/geotechnical testing shall be performed by the Excavation Subcontractor. Chemical testing shall be performed by the General Contractor. 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 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, SP-SM, 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 and 5% gravel-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 an organic content less than 6% as measured by ASTM D2974.

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 placed on riverbanks shall contain no rocks or rock fragments larger than one-half of the compacted thickness of the lift (refer to Paragraph 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 shall be adjusted to provide the specified compaction and ensure a stable embankment.

2.2 STRUCTURAL FILL

Structural fill shall meet the quality, durability, and composition, i.e., gradation requirements for State Specification M2.01.7 Dense Graded Crushed Stone.

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 C33 and the gradational requirements specified in the following tables.

2.3.1 Filter Material

Filter material shall conform to the following gradational requirements and shall satisfy the State Specification for quality, durability, etc. as specified in Section M2 of the State Specifications:

Sieve Size	Percent Finer by Weight
7-inch	100
4-inch	80-100
2½-inch	65-95
½-inch	20-50
No. 4	5-40
No. 40	0-15

2.4 STONE

Stone protection materials shall consist of hard, durable and sound quarried rock fragments furnished by and at the expense of the Excavation Subcontractor. Each stone shall have a density of not less than 165 pcf based on the saturated surface dry specific gravity determined in accordance with ASTM C97. 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 to produce a material without "skip gradation" with stone sizes within the limits specified. 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 165 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.

In the following tables, 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. Approximate stone size is provided for information only and is based on a specific gravity of 2.65.

9-inch Riprap

Approximate Stone Size in inches	Limits of Stone Weight in lb.	Percent Lighter by Weight
6.7 to 9.0	15 to 36(max)	100
5.2 to 6.0	7 to 11	50
3.4 to 4.6	2(min) to 5	15

12-inch Riprap

Approximate Stone Size in inches	Limits of Stone Weight in lb.	Percent Lighter by Weight
8.9 to 12.0	35 to 86(max)	100
7.0 to 8.0	17 to 26	50
4.6 to 6.0	5(min) to 13	15

18-inch Riprap

Approximate Stone Size in inches	Limits of Stone Weight in lb.	Percent Lighter by Weight
13.3 to 18.0	117 to 292(max)	100
10.5 to 12.0	58 to 86	50
7.1 to 9.5	18(min) to 43	15

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.

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

2.7 TOPSOIL

Replacement topsoil as specified on the Drawings will be derived from approved off-site sources. Topsoil sources shall include, but not be limited to, those created by natural geological processes or those manufactured by the addition of compost to a base soil. 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, weeds, sticks, leaves, paper, or any other deleterious materials.

Topsoil for this project is intended for application to well drained side slopes. The presence of the correct nutrients and pH status in the soil is necessary for healthy plant growth. All topsoil shall comply with ASTM D5268 and shall be tested against the following requirements:

- The fraction passing the No. 10 sieve shall contain between 10 and 20% clay, 35 to 50% silt, and 30 to 50% sand, by mass.
- Total organic matter between 4 and 12% by mass.
- pH between 6 and 7.5.

The total organic matter content can be amended with compost from approved sources. If topsoil is to be amended with compost, the compost shall be free of weak seeds and comply with EPA Chapter 40 CFR Part 503 (e.g., pathogens, metals). Compost shall be an organic substance produced by the biological and biochemical decomposition of source-separated compostable materials that may include, but are not limited to, leaves and yard trimmings, food scraps, food processing residues, manure and/or other agricultural residuals, and/or wood chips. The compost shall have a loose and granular texture with the following characteristics or properties:

- 30 to 60 % organic matter content.
- 0.5 to 2.0 % total Kjeldahl nitrogen content.
- 6.5 to 7.5 pH.
- Maximum particle size less than 1 inch.
- Conductivity of less than 5 mmhos/cm.

Samples of the compost must be tested and approved for use by the Engineer prior to blending with soil. After blending is complete, the product shall be tested to ensure it meets the physical and chemical requirements stated herein.

2.8 GEOTEXTILE

Geotextile to be used in conjunction with general site construction (e.g., temporary applications, drainage swales at soldier poles H 1 and H 14, etc.) shall conform to the following mechanical and hydraulic properties. Geotextiles to be used in conjunction with segmental retaining walls and articulating concrete blocks shall be selected consistent with specific site requirements and intended function. The geotextile manufacturer shall furnish a

certificate of compliance (letter) that states that the geotextile manufactured and delivered to the site meets or exceeds the requirements of this specification along with quality control test results and the manufacturer's recommendations for handling, storage, and installation.

Geotextile

Property	ASTM Test Method	Unit	Required Value[1]
Matrix	--		Nonwoven
Unit Weight[2]	D4833	oz/sy	8
Puncture Strength	D4751	lbs	100
Apparent Opening Size	D4632	min.	≤ No.80 sieve
Grab Strength (MD)	D4632	lbs	200
Grab Elongation	D4632	%	> 50
Trapezoidal Tear Strength	D4533	lbs	80
Mullen Burst Strength	D3786	psi	325
Permittivity	D4491	sec^{-1}	≥ 0.8
UV Resistance[3] (@500 hours)	D4355	% strength retained	> 70

NOTES:

[1]Minimum average roll value (MARV).

[2]For information only, not a required property.

[3]Manufacturer's certification required that states product meets or exceeds required value for typical roll values.

2.9 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.

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.

Excavation along the riverbank toe and within the riverbed shall proceed in a manner such that any area that has been excavated can be protected and/or stabilized in advance of an anticipated storm event during which the dam may be overtopped. The Excavation Subcontractor shall have materials, equipment, and personnel on-hand to implement protection and/or stabilization measures if and when directed by the Engineer. Protection and/or stabilization may be in the form of final restoration or in the use of temporary materials such as sacrificial riprap, articulating concrete block, plastic sheeting, etc.

During and following completion of excavation along and in close proximity to the riverbank toe and before final restoration, the Excavation Subcontractor shall implement a riverbank inspection program, which shall consist of visual inspections of the riverbank, roadways, utilities, and structures immediately adjacent to the excavated area at least twice daily, and more frequently if warranted by conditions and as directed by the Engineer.

Due to the potential for snow to accumulate on the riverbanks, both from natural deposition and snow plowing operations on adjacent streets and properties, the Excavation Subcontractor must be particularly vigilant of potential slope instabilities at this time. The snow, acting as a surcharge load, could cause slope instabilities and because the ground will not be visible, it will not be possible to observe the formation or development of tension cracks on the ground surface. The Excavation Subcontractor should also be aware of the potential for snow to slide into the work area from the riverbanks. Based on these conditions and the above-mentioned site inspections, the Engineer may implement additional conditions monitoring activities such as vibration and settling monitoring at specific locations to support slope stabilization implementation decision-making.

If areas of potential instability are observed, the Excavation Subcontractor shall immediately notify the Engineer. It is anticipated that, at a minimum, immediate placement and compaction of structural fill at the toe of the riverbank will be required to stabilize the riverbank. However, required actions will be directed by the Engineer on a case-by-case basis. Temporary closure of roadways, driveways, and parking lots may also be required.

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. Excavation shall be initiated at the top of bank and shall proceed down slope unless otherwise approved by the Engineer. 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.

3.1.3 Excavation to Till or Bedrock

Excavations shall be made to the lines, grades, and elevations shown. If till or bedrock is encountered, the Excavation Subcontractor shall terminate excavation work and notify the Engineer. The Engineer may elect to continue excavation of the material to a specified depth or to terminate excavation activities.

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 Excavation Subcontractor as described in Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL.

3.3 OPENING 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.

The Excavation Subcontractor shall prepare plans detailing the proposed sequence of work. In-river work will be divided appropriately in accordance with these plans and shall proceed from one area to the next as indicated in the plan. Riverbank work shall proceed in coordination with in-river work to limit migration or erosion of existing bank soil into the

work areas. 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.

3.4 DEWATERING AND CONVEYING

The Excavation Subcontractor shall remove river water and provide adequate dewatering to prevent standing water in the excavation. Excavation Subcontractor shall be responsible for water management of all outfall pipes that discharge into the excavation area.

The initial dewatering sequence shall include the following tasks:

a. Pump the water from within the work area using a pump intake and flow rate to minimize suspending and entraining solids.

b. Water pumped from within the work area shall be discharged to the river until 6 inches of water remains in the work area near the pump intake.

c. Water pumped from the work area 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 using sheet pile, sumps and pumps, and other methods as approved in the dewatering plan as shown on the Drawings. Accumulated storm water may be discharged to the river.

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 not be paid for separately and will be included as part of the unit price for Excavation 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 the work area during remediation.

f. After initial dewatering of the work area to within 6 inches of the riverbed, pumped surface water and groundwater shall be conveyed to the water treatment system. The Excavation Subcontractor shall size equipment appropriately based on past experience on the 1.5-Mile Removal Action between Lyman Street and Elm Street and the anticipated conditions for areas of the reach between Elm Street and Dawes Avenue. The current water treatment system is permitted to discharge up to 500 gpm of treated water.

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 work areas so as to minimize noise and in compliance with applicable State of Massachusetts provisions for noise control.

3.5 PREPARATION OF GROUND SURFACE FOR BACKFILL

3.5.1 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 a reasonably firm and stable surface. If excessively soft, yielding, and unstable areas are encountered, the Excavation Subcontractor shall, at the direction of the Engineer, undercut the soft material and replace it with 3-inch processed gravel or other engineer-approved material as required to achieve a stable subgrade surface. This material shall be placed and compacted to return the subgrade surface to the required elevation. Alternately, a soft area may be stabilized using a chocking technique which shall require the placement of gravel, as directed by the Engineer, on the soft area. The gravel shall be pushed into the soft material

until a stable surface is achieved. The stabilized surface shall meet the permissible excavation tolerances.

3.5.2 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.

3.6 BACKFILL PLACEMENT AND COMPACTION

The Excavation Subcontractor shall obtain approval for each work area excavation prior to backfilling. Structural fill and/or 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 Dry Density	Maximum Loose Lift Thickness (inches)	
		Hand-Operated Compaction Equipment	Heavy-Duty Compaction Equipment
Structural fill	95	6	12
Common fill	95	6	12
Filter material	90	6	12

Structural fill and common fill shall be placed in loose, horizontal lifts and uniformly compacted to the percent maximum dry density, based on ASTM D1557 Method C, as required in the table. Fill placed on slopes may be accepted if the surface density is less than 95 percent, at the discretion of the Engineer.

Filter material soils shall be placed in horizontal, loose lifts and uniformly compacted to at least 90 percent of maximum density according to ASTM D1557 Method C. Filter material 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 material 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. Compaction acceptance shall be based on visual approval of the completed lift.

Backfill shall not be placed behind walls until authorized by the Engineer. Backfill behind walls and on slopes shall be placed in horizontal lifts not exceeding 6 inches in loose thickness and uniformly compacted. Failure to place materials in horizontal lifts shall be justification for the Engineer to require the Excavation Subcontractor to remove and replace said materials. Backfill adjacent to walls and on slopes supported by walls shall be compacted with hand-operated equipment to prevent eccentric loading upon or against the wall. Backfill shall be compacted to at least 95 percent of maximum dry density according to ASTM D1557 Method C.

Riprap 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.

Topspoil shall be placed in one uniform loose lift and lightly compacted. No compaction testing is required.

The surface of each completed lift shall be scarified to a depth of approximately 3 inches prior to the placement of a subsequent lift.

3.7 GEOTEXTILES

Geotextile shall be placed between soldier pile H 1 and the Elm Street Bridge wing wall and between H 14 and the segmental retaining wall to prevent loss of aggregate through the "gap" between the walls and the filler plates. Geotextile shall be held in place during aggregate placement.

Geotextile shall be handled, stored, and installed in accordance with the manufacturer's recommendations.

3.8 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 Subcontractor and that the results are representative of the materials or conditions being certified by the tests. The Excavation Subcontractor shall perform proctor test results on the backfill materials as needed.

Field in-place density shall be determined in accordance with ASTM D2922. ASTM D1556 or ASTM D2167 shall be used to check ASTM D2922 calibration curves and may govern in the case of a discrepancy depending on test conditions and as directed by the Engineer. When ASTM D2922 is used, the calibration curves shall be checked and adjusted using Annex A1 of Method D2922. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D3017. 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

3.8.1 Optimum Moisture and Laboratory Maximum Density

The Excavation Subcontractor shall transport the fill material to the work area for installation. 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.

3.8.2 In-Place Density

a. One test per 5,000 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 5,000 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.

3.8.3 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 Engineer. 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 Engineer. The approval of a material by the Engineer, based on test results, examination of the material exposed at the source and service records, shall not relieve the Excavation Subcontractor, 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 Engineer.

3.9 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.

3.10 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 3-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 approved off-site areas.

3.11 PLACING

3.11.1 General

Structural fill, common fill, filter material, and riprap shall be placed and compacted on the riverbed prior to placing restoration materials on banks. Restoration activities must progress from the riverbed to the bank. Bank restoration must proceed form the toe to the top of bank. In areas where retaining walls are to be installed, walls shall be installed prior to initiating restoration of the bank at that location.

3.11.2 Base Preparation

Areas on which filter material 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 material, the Engineer will inspect the prepared base and no material shall be placed thereon until that area has been approved.

3.11.3 Placement of Filter Material

3.11.3.1 Placement of Filter 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 material or cause mixing of adjacent materials will not be permitted. The filter material 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 material shall be as described previously.

3.11.4 Placement of Riprap

3.11.4.1 General

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

3.11.4.2 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. Manipulating stone by means of dozers or other blade equipment may be permitted, if in the opinion of the Engineer, the underlying filter materials are not disturbed.

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.

3.12 EQUIPMENT

No heavy-duty equipment, i.e., dozers, excavators, heavy-duty rollers, shall be operated on slopes. All backfill materials placed behind walls and on slopes behind walls shall be compacted using hand-operated compaction equipment, unless otherwise permitted in specifications.

END OF SECTION

SECTION 02360

DRILLED CONCRETE PIERS (CAISSONS)

PART 1 GENERAL

Work covered by this section includes the drilling of concrete piers (caissons) and the installation of soldier piles for the support of a temporary retaining wall. It should be noted that caissons may not be required at all soldier pile locations if the required embedment depth can be achieved via driving alone and vibrations generated are less than the acceptable value.

1.1 REFERENCES

The International Association of Foundation Drilling – Standards and Specifications

American Concrete Institute - ACI 336.1

1.2 SUBMITTALS

SD-01 Pre-Construction Submittals

Experience Certification

The Installer shall submit documentation supporting experience in successfully performing similar work detailed herein.

Schedule

Schedule estimating duration of drilling for each shaft or for each soil type.

Excavation Plan

Proposed sequence of work, (including sequence in which shafts will be drilled), equipment access to work areas, the type of casing to be used, if any, dewatering method proposed, methods to verify location and depth of shafts, methods to set and temporarily support/brace soldier piles, methods to assure correct alignment and spacing, concrete placement method, methods used to protect completed shafts prior to concrete placement, and temporary/permanent backfill materials. Provide method to establish schedule for removal of temporary bracing (e.g., achievement of specified concrete strength). Provide plan showing locations of caissons and soldier piles.

SD-06 Test Reports

Test Results

The Installer shall submit the results of all tests performed in support of drilled shaft construction.

1.3 SUBSURFACE DATA

Logs of test borings are included in the Pre-Design Summary for the 1.5-Mile Removal Action — Phase 2. The 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 encountered during construction may be different, and should be considered in the development of plans for constructing the caissons.

1.4 CLASSIFICATION OF EXCAVATION

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

1.4.1 Soil Drilling

Soil drilling shall include the drilling of silt; clay; sand gravel; till; and miscellaneous debris such as concrete, brick, etc., using an auger.

1.4.2 Rock Drilling

Rock drilling shall include the drilling of intact bedrock, large boulders, and large debris that cannot be penetrated using an auger. Rock drilling shall not be initiated until approved by the Engineer.

1.5 BLASTING

Blasting will not be permitted.

1.6 QUALIFICATIONS

a. Installer—Company specializing in performing the work of this section with minimum 5 years documented experience in similar soil types. Company shall provide documentation as to type of equipment to be used, type of equipment available should selected equipment not be capable of completing drilled shafts, and experience of site superintendent on similar projects completed in similar soil types along with references.

1.7 CONSTRUCTION TOLERANCES

a. Horizontal location—Drilled shafts and soldier piles shall be set at locations along the alignment of the retaining wall shown on the Drawings such that the center-to-center spacing is no more than 8 feet. Caissons shall be drilled and soldier piles shall be installed as close as practical to the Elm Street bridge wing wall.

b. Top elevation—The top elevation of soldier piles shall be elevation 990 ± 6 inches, or as otherwise described in Specification Section 02367.

1.8 FIELD MEASUREMENTS

a. Verify that field measurements and survey benchmarks are as indicated on Drawings.

1.9 ALIGNMENT

The final alignment of the caissons, if and where required, shall be based on the segmental retaining wall reinforcement length requirements.

PART 2 PRODUCTS

2.1 MATERIALS

a. Shaft Liner—temporary or permanent, material, length and diameter to be selected by the Installer to allow for completion of work.

b. Concrete—Shall have a minimum compressive strength of 3,000 psi at 28 days and shall meet the requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE for 3,000 psi concrete, with the exceptions of Subsection 1.3.2.2 and Subsection 1.3.4. For 3,000 psi, the maximum water-cement ratio shall be 0.58 for no air-entrained concrete, and 0.46 for air-entrained concrete. The 3,000 psi concrete shall have a maximum slump of 3 inches and a minimum slump of 1 inch. Higher strength concrete may be used with approval from the Engineer. An alternate mix design is required for concrete to be placed in water.

c. Soldier Piles—Shall be HP 14+73 ASTM D572 Grade 50 steel or approved equal.

d. Soldier Pile Lengths—Shall be 30 feet.

PART 3 EXECUTION

3.1 PREPARATION

a. Use placement method(s) that will not cause damage to nearby structures.

b. Notify Engineer within a minimum seven (7) days before proceeding with the work.

c. Protect structures near the work from damage. The Installer shall be responsible for any damage caused to adjacent structures as a result of its operations.

3.2 INSTALLATION

a. Drill concentric and vertical pier shafts to 30-inch nominal inside diameter at the locations specified herein. Installer may, at its option and with the approval of the Engineer, drill larger or smaller diameter shafts.

b. Drill shafts to a depth of 30 feet below existing ground surface elevation, i.e., to a tip elevation of 960. If dense soils or competent rock are encountered at an elevation higher than 965, the Contractor shall notify the Engineer prior to drilling more than 5 feet into the stratum. The Engineer may elect to terminate shafts at a depth of 5 feet into the dense soils or competent rock.

c. Place temporary or permanent liners as necessary to maintain open shaft and to allow placement of concrete to the specified elevation. Liners must be removed to allow installation of lagging. The Excavation Subcontractor shall implement measures to prevent loss of soil during and after drilling. The drilled shaft shall be backfilled with competent material that will provide for a stable surface prior to the start of excavation activities. The composition of the backfill material shall allow for the use of conventional excavation techniques.

d. Clean shaft and bottom of loose material. Maintain shaft during installation of concrete and soldier piles. Prevent "boiling" and heaving of shaft bottom using Engineer-approved methods. Maintain shafts free of water unless otherwise approved by the Engineer.

e. Allow inspection of shaft prior to placement of concrete.

f. Set soldier piles at approved locations as specified herein.

g. Install temporary bracing as necessary to secure the soldier piles in location. Remove bracing when concrete has sufficiently cured to support soldier piles.

h. Place concrete in accordance with Section 03300, CAST-IN-PLACE STRUCTURAL CONCRETE with equipment designed for vertical placement of concrete.

i. Progressively fill shaft. Do not permit top of soldier pile to drift from specified finished location.

j. Finish concrete at soldier piles H-4 and H-14 such that surface slopes away from soldier pile approximately 6 inches above the excavated subgrade. Provide a flat surface on which the lagging can be installed.

k. Notch sheet piles immediately adjacent to soldier pile location H-14 to fit around concrete shaft.

l. The Excavation Subcontractor shall be responsible for the disposal of all spoils and cuttings generated from the installation of drilled shafts in accordance with Section 02111 HANDLING OF EXCAVATED MATERIAL AND BACKFILL. Shaft cuttings shall be classified based on the classification of riverbed sediments at the boring location.

m. The Excavation Subcontractor shall be responsible for the handling and treatment of all water generated from the installation of drilled shafts in accordance with the dewatering plan to be prepared under Section 02300 EARTHWORK.

n. Prevent damage to soldier piles during excavation activities .

3.3 FIELD QUALITY CONTROL

a. Accurately record the following:

1. Lengths and locations of shafts.
2. Sequence of placement.
3. Final base and top elevations.
4. Installed locations.
5. Soil type(s) encountered.
6. Description of drilling technique utilized.

3.4 UNACCEPTABLE PILES

a. Unacceptable Soldier Piles—Soldier piles that are placed out of position, are below the required top elevations, are not embedded to the required depth, are damaged and/or do not meet the tolerance requirements specified herein.

b. Removal of Unacceptable Soldier Piles—Remove unacceptable soldier piles and provide replacement drilled shafts and soldier piles at the correct locations and to the top and toe elevations required.

END OF SECTION

SECTION 02367

SOLDIER PILES AND WOOD LAGGING FOR TEMPORARY RETAINING STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

Furnish all labor, equipment, and materials, and perform all construction operations required to install a soldier pile and wood and concrete lagging retaining structure at the locations indicated on the Drawings and as specified herein.

Soldier piles and lagging will be used as a temporary retaining wall structure to support the sidewalls of a deep excavation to be completed adjacent to existing site structures, including bridge wing walls and commercial property. The soldier piles shall be set in drilled shafts (caissons). As shown on the Drawings, the wall will be anchored against excessive deflections using grouted tieback anchors with associated waling systems. Requirements for the grouted tieback anchors are presented in Specification Section 02369. The wall has been designed based on a 25-foot deep excavation.

The Excavation Subcontractor may elect to drive the soldier piles. Driving soldier piles may be acceptable if vibrations associated with the operation are anticipated to be lower than the limiting value specified herein.

One soil boring log (BH000581) is provided with this specification and is included “For Information Only.” The Excavation Subcontractor should thoroughly review this information in preparing his bid. This data is provided to the Excavation Subcontractor to document the subsurface conditions encountered at the site so that he may form his own judgments related to selecting the installation equipment which is necessary to efficiently and effectively install the soldier piles to the required embedment depth, as well as to properly assess other aspects of the specified construction.

The General Contractor shall provide pre-construction and post-construction surveys of existing site structures as well as full-time ground vibrations monitoring of soldier pile installation and grouted tieback anchors construction work. The Excavation Subcontractor may be required to terminate work and/or modify operations based on monitoring results.

Furnish all labor, equipment, and materials, and perform all operations required to detension and cutoff the grouted tieback anchors at the face of the wall, remove the waling/anchor head materials, cut-off the soldier piles at least 3 feet below final grade, except for H 1 and H 14, and remove the top 3 feet of the wood lagging prior to backfilling of this upper portion of the excavation. Concrete lagging shall be extended to within one foot of the final ground surface.

Sequence installation work in accordance with the requirements presented herein, unless otherwise approved by the Engineer.

The Excavation Subcontractor shall employ a grouted tieback anchors installation contractor, subject to approval by the Engineer, to develop a final design and install grouted tiebacks and related waling system/anchor head components between the points shown on the Drawings. The final design shall be completed and sealed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts.

1.2 PERMIT REQUIREMENTS

The Excavation Subcontractor shall comply with all applicable regulatory requirements and all federal, state, and local laws, codes and ordinances which govern the construction of soldier pile and wood lagging retaining walls.

1.3 QUALIFICATIONS

The Excavation Subcontractor shall have previously installed the type of wall specified and shall have a minimum of five years of installation experience and provide evidence of satisfactory completion of at least five retaining wall installation contracts comparable to this in scope and subsurface conditions.

The tieback subcontractor shall meet the qualification requirements of Specification Section 02369.

1.4 SUBMITTALS

The Excavation Subcontractor shall submit to the Engineer for review and approval, written information in accordance with Specification 01330 regarding the Excavation Subcontractor's proposed equipment and methods for completing the installation of the soldier pile and wood lagging retention system. This information shall include:

SD-01 Preconstruction Submittal: G

Phasing plan indicating the staging of work in accordance with the requirements shown on the Drawings.

Description of the proposed equipment to be used to install the soldier piles.

The Excavation Subcontractor shall submit the qualifications and experience of the grouted tiebacks subcontractor to be utilized by the Excavation Subcontractor for that component of the work.

SD-03 Product Data: G

The Excavation Subcontractor shall provide certification that the soldier piles meet or exceed the minimum Steel Grade and Section Modulus requirements as specified herein.

1.5 SOLDIER PILE LOCATIONS, LINES, AND GRADES

The Excavation Subcontractor shall layout/stakeout the retaining wall alignment between soldier piles H 1 and H 14 as shown on the Drawings, as well as the locations of individual soldier piles. The final alignment of the wall between H 4 and H 12 shall be based on the final design of the segmental retaining wall. The Excavation Subcontractor shall install the wall at an alignment, which will minimize the excavation area while allowing for the installation of the segmental retaining wall reinforcing (e.g., geogrid). Assuming a maximum 8-foot spacing of soldier piles along the temporary retaining wall alignment, approximately 14 soldier piles will be required based on the use of single piles at H 4 and H 12 safely supporting and securing the two perpendicular directions of wood lagging which will terminate at these locations. If this is believed to be a concern, the Excavation Subcontractor shall instead propose driving a second pile at each of these locations (i.e., approximately 16 piles total). If required, the Excavation Subcontractor shall adequately brace any tied back exterior corner soldier pile to prevent shifting due to the tieback load pushing toward the perpendicular wall section. At the Excavation Subcontractor's option, this corner soldier pile may be a fabricated soldier pile, oriented at a 45-degree horizontal angle, with a through-pile tieback connection in lieu of a tieback wale. Excavation Subcontractor shall submit design calculations demonstrating the structural adequacy of the fabricated soldier pile and tieback connection.

The Excavation Subcontractor shall be responsible for damage to all buildings and utilities adjacent to the proposed alignment of the retaining wall. Any damage and the costs of subsequent repair to existing utilities or structures (e.g., sidewalks, roads, adjacent buildings, or utilities) due to soldier pile, wood lagging, and grouted tiebacks installation, and the subsequent removal of these materials, or other associated construction activities related to this work shall be the responsibility of the Excavation Subcontractor.

1.6 SOLDIER PILE AND LAGGING INSTALLATION MONITORING

The General Contractor shall perform full-time vibration monitoring of all caisson drilling, soldier pile installation, and grouted tieback anchors construction work. Full-time monitoring of this work shall include, but is not limited to:

1. Prior to caisson drilling and soldier pile installation, the General Contractor shall conduct a pre-construction survey of the existing structures around the site which are within the zone of influence of construction activities vibrations as determined by the Excavation Subcontractor and General Contractor. The survey shall include photos, videotape, written documentation, measurements, etc. of existing cracks, damage and/or other evidence of structural distress to these structures, including but not limited to the sidewalks and roads adjacent to the site and immediately adjacent buildings, tanks, and associated piping/ instrumentation systems. The General Contractor shall prepare a report of the results of the pre-installation survey and submit it to the Engineer prior to the soldier pile driving work.

2. Placement of an appropriate number of ground vibration monitoring instruments at appropriate locations near existing adjacent structures, as determined by the Excavation Subcontractor and General Contractor, to monitor the peak particle velocities (PPV) of ground vibrations due to the construction activities. Peak particle velocity at any monitoring location should not exceed two (2) inches per second at any time during this work. If measured PPV's exceed this limiting value, the work will cease immediately and appropriate remedial measures will be implemented to maintain measured peak particle velocity values at levels below the limiting value.

3. Immediately following the wall abandonment work as specified in Section 3.05 below, the General Contractor shall conduct a post-construction survey of the site area which includes returning to those structures investigated during the pre-construction survey and photographing, videotaping, and generating written documentation of the post-construction condition of these structures. Additionally, the survey shall also note any new damage to these or other structures possibly related to construction activities. The pre- and post-construction surveys will provide a means to assess any possible damage claims. The General Contractor shall prepare a report of the results of the post-construction survey and submit it to the Engineer. The Excavation Subcontractor shall be responsible for repairs to any structures, tanks, piping, utilities, etc., damaged by the specified construction work. The repairs shall be completed, at a minimum, such that the structure(s) is returned to the pre-construction condition noted during the pre-construction survey.

4. Provide daily quality control reports to the Engineer including the maximum measured peak particle velocity values as a function of time and a summary of the soldier pile installation work completed during the day.

5. The General Contractor shall also monitor horizontal and/or vertical displacements of buildings, piping and other structures in close proximity to the work area by survey as required in Section 3.5 below.

PART 2 PRODUCTS

2.1 SOLDIER PILE INSTALLATION EQUIPMENT

The caisson rig, if used, shall be of adequate size and capacity to permit completion of the shafts at the locations shown on the Drawings and to the required axial alignment.

All soldier piles shall be set in drilled shafts and embedded in concrete for a depth of at least 5 feet (± 6 inches). If soldier piles are driven, they shall be driven to a tip elevation based on penetration rate.

The Excavation Subcontractor shall ensure that all lifting cables, chains, and rigging are in compliance with OSHA requirements and that all cables, chains, and rigging bear identification tags, labels, or markings.

2.2 SOLDIER PILES

Soldier piles shall have a minimum delivered length of 30 feet. The soldier piles shall not consist of welded pieces along their length.

Soldier piles shall be HP14x73 (Section Modulus = 108 in^3) H piles manufactured from ASTM A572 steel. Use of a structurally equivalent or heavier alternative soldier pile is subject to approval by the Engineer.

New or used steel soldier piles may be provided for the work. However, used piles are subject to a visual inspection by the Engineer. Should this inspection reveal that these piles are severely damaged, bent, rusted, etc., they may be either rejected immediately based on this inspection or conditionally approved subject to structural testing at the Excavation Subcontractor's expense.

Soldier piles H 1 and H 14 shall be provided with plates and connections as shown on the Drawings.

2.3 TIMBER LAGGING

Timber lagging shall be untreated, mixed hardwood with a nominal thickness of 3 inches.

2.4 CONCRETE LAGGING

Concrete lagging shall be as shown on the Drawings.

2.5 GROUTED TIEBACK ANCHORS

Grouted tieback anchors and their associated waling/anchor head systems shall be as specified in Specification Section 02369.

PART 3 EXECUTION

3.1 SEQUENCE OF CONSTRUCTION

Soldier piles H 1 and H 2 may be installed as excavation progresses. However, these soldier piles must be installed before the level of excavation progresses below the bottom of the wing wall footings immediately adjacent to the location of the soldier pile.

Soldier piles H 3 through H 14 must be installed prior to initiation of major excavation activities. However, H 1 and H 14 may be installed concurrent with excavation activities, i.e., after partial or full removal of the crib wall.

Lagging must be placed within the web between soldier piles H 1 and H 24 and between H 13 and H 14. Lagging at other locations may be placed on the front face of the flange.

Concrete lagging must be installed between soldier piles H 1 and H 2.

Concrete backfill, i.e., caisson backfill, shall be extended to an elevation of no higher than 967 at soldier piles H 1 and H 14.

Although lagging is only required below the wing wall footing elevations between soldier piles H 1 and H 4 to support the wing wall, the Excavation Subcontractor shall install lagging to within 3 feet of the ground surface in order to retain the segmental retaining wall backfill material. This temporary retaining wall is intended to isolate the backfill material from the bridge wing wall so that the bridge may be modified in the future by Massachusetts Highway Department (MHD) with minimal impacts to the segmental retaining wall.

The Excavation Subcontractor shall remove all or a portion of the timber crib wall prior to installation of the permanent sheet pile wall downstream of soldier pile H 14. In order to minimize the impacts of vibrations on the temporary retaining structure, at least 50 feet of sheet pile must be installed starting from H 14 moving in a downstream direction, prior to mass excavation of material from the parking lot area.

The excavation should be advanced until the required elevation is achieved or until a dense and stable stratum is encountered. The bottom elevation of the segmental retaining wall pad will be as shown on the Drawings. The bottom elevation of the excavation shall be no lower than 3 to 6 inches below the elevation of the lowest level of reinforcement (to be determined by the Excavation Subcontractor).

Any void space that develops between the wing wall and retaining structure shall be backfilled with 1½-inch crushed stone.

3.2 SOLDIER PILE LOCATION/ALIGNMENT/INSTALLATION

Soldier piles shall be installed along the alignment shown on the Drawings.

Soldier piles shall be set in drilled shafts.

In order to provide a stiff support wall, to control deflections, and to protect adjacent structures, soldier piles shall be spaced at a distance of no greater than 8 feet center-to-center.

The maximum deviation from the required axial (i.e., vertical) alignment of soldier piles shall be 2 percent of the pile length. The Excavation Subcontractor shall be responsible for installing, at his expense, any piles which require extraction and reinstallation due to misalignment, as determined by the Engineer.

Due to health and safety concerns, the height of falsework above the existing ground surface, if used, shall be minimized.

3.3 EMBEDMENT DEPTH

All soldier piles shall be installed to a maximum embedment depth of 30 feet below existing site grades at the pile locations in paved areas. However, if and when a dense stratum is encountered during drilling at or below elevation 973, the Excavation Subcontractor shall notify the Engineer prior to drilling more than 5 feet into the dense stratum. The Engineer may elect to terminate piles at this elevation. If piles are terminated at a tip elevation higher than 960, the Excavation Subcontractor shall cut the piles to achieve a top elevation at or close to elevation 990.

In unpaved areas, piles shall be installed to a tip elevation of 960 and embedded in at least 5 feet of concrete, i.e., H 1 and H 14, soldier pile.

3.4 WOOD LAGGING

Wood lagging shall be installed as the excavation is advanced. Lagging installation shall begin at the existing ground surface.

The Excavation Subcontractor shall ensure that there is intimate contact between the wood lagging and soil.

The Excavation Subcontractor shall install 1½-inch louver spacers between lagging boards.

The Excavation Subcontractor is advised that the excavation adjacent to the retaining structure may be terminated if dense, stable soils are encountered above elevation 960.

If lagging shear studs are to be attached to the soldier pile flange, the flange shall be cleaned of dirt, grease, mill rust, or any other material that might prevent proper welding of the stud to the flange. The studs may be shot or stick-welded to the flange at the Excavation Subcontractor's option.

3.5 SETTLEMENT MONITORING

The General Contractor shall establish settlement control points at various locations on existing site structures in close proximity to the work area. Each control point shall be clearly marked and numbered.

All control points shall be surveyed by an experienced, qualified individual prior to construction (i.e., prior to drilling caissons), and then surveyed at least daily until the excavation has been advanced to a depth of 3 feet below the elevations of the tieback anchors. Thereafter, survey frequency may be reduced to bi-weekly if no significant vertical or lateral movements are observed. The General Contractor shall report the results of each survey to the Engineer on the same day as the survey is completed.

The General Contractor shall perform a final survey of the designated monitoring points at the completion of excavation and backfilling activities along each wall section and submit this data to the Engineer.

3.6 WALL ABANDONMENT

The soldier piles, wood lagging, and grouted tieback anchors behind the front face of the wall will be left in place. However, the Excavation Subcontractor shall remove all waling/anchor head components after safely detensioning and cutting the tieback anchors and shall cut-off the soldier piles approximately 3 feet below finished grade. The Excavation Subcontractor shall also remove the top 3 feet of the wood lagging prior to backfilling of this portion of the excavation.

END OF SECTION

SPECIFICATION 02367 ATTACHMENT 1

SOIL BORING LOG

WESTON	SOIL BORING LOG		PAGE 1 OF 1
Job Name: Housatonic River	Boring No.: GTB-11	Groundwater Level	
Job No.: 20125.001.096	Surface Elev.: ft.	Date	Depth
Date Drilled: 25 Apr 02	Boring Method: Case and wash	Not Measured	
Drilling Co.: TDS	Completion Depth: 27.0 ft bgs		
Drill Foreman: Scott Lombard	Location: BH000581		
Logged By: A. C. Steele	Pittsfield, Massachusetts		

Depth (feet)	Sample No.	Sample Type*	Sample Blow Counts** (per 6 in.)	N Value**	Visual Description	% Rec	% RQD	Laboratory Tests
	1	SS	8-8-8-8	16	0-0.5 Asphalt above FILL, brick, slag, gravel, silt and fine to coarse sand, very loose, dry.	33		
	2	SS	4-3-2-2	5	FILL, brick, slag, gravel, silt and fine to coarse sand, very loose, coal in nose, sl. Moist.	20		
5	3	SS	2-1-2-1	3	No recover, catcher was in use.	0		
	4	SS	3-2-2-2	4	No recover, catcher was in use.	0		
	5	SS	2-3-8-10	11	8-8.6 Predominately gray FILL, coal and ash with gravel and fine to coarse silty SAND, firm. 8.6-9.2 Natural.	60		
10	6	SS	8-33-38-45	71	Mod brown arbie COBBLES and silty fine SAND, firm, sl. Moist.	35		
15	7	SS	100/0"	100/0"	*No recovery - Per driller, rig hit something at 12 feet.*	NA		
20	8	SS	9-18-23-29	41	Mod brown silty fine SAND and GRAVEL, at base silty sandy clay, loose, sl. Moist,	15		
25					*Per driller, this zone is wet based on water on rods when pull them.*			
	9	SS	100/6"	100/6"	Mod grey weathered rock, saturated. *Per driller, tighter as auger down.*	80		
30					End of boring at 27 ft bgs. Auger refusal.			
35								

*Sample type: SS-Split Spoon; ST-Shelby Tube; RC-Rock Core; SC-Soil Core

Laboratory Tests: MC-Moisture Content; AL-Atterberg Limits; S-Sieve Analysis; SH-Sieve/Hydrometer Analysis; SG-Specific Gravity; OC - Organic Content; C-Consolidation; UU-Unconsolidated Undrained Triaxial; CU-Consolidated Undrained Triaxial; UCS-Unconfined Compressive Strength; K-Hydraulic Conductivity; BD - Bulk Density

**ASTM D-1586 Standard Penetration Test

SECTION 02369

FINAL DESIGN AND CONSTRUCTION OF GROUTED TIEBACK ANCHORAGE SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The Excavation Subcontractor shall complete a final design and furnish all labor, materials, equipment, and incidentals necessary to construct temporary and permanent grouted tieback anchorage systems (i.e., grouted tiebacks and associated waling/anchor head systems components) for both the temporary solider pile/lagging and a portion of the permanent steel sheet piling retaining structures to be constructed at the site. The final design of the grouted tieback anchorage systems shall be completed consistent with the design loads and other design criteria presented in this Specification and as shown on the Drawings. The Excavation Subcontractor shall select the method of installation and type of tieback anchor(s) capable of safely supporting the design loads.

Two (2) geotechnical test boring logs (BH000581 and BH000091) are included "For Information Only." The locations of the test borings are shown on the Drawings. The Excavation Subcontractor should thoroughly review this information in preparing his bid. These data are provided to the Excavation Subcontractor to document the subsurface conditions encountered at the site so that he may form his own judgment related to the final designing and detailing of the grouted tieback anchors and their associated waling/anchor head systems and in selecting the installation equipment which is necessary to efficiently and effectively install the anchors.

As part of this scope of work, the Excavation Subcontractor shall complete any additional subsurface investigation, laboratory testing, or engineering analysis work deemed necessary to support the final design of the grouted tieback anchorage systems.

The Excavation Subcontractor shall verify that the grouted tieback anchorage systems do not interfere with any existing site features (e.g., buildings, utilities, etc.).

1.2 PERMIT REQUIREMENTS

The Excavation Subcontractor shall comply with all applicable regulatory requirements and all federal, state, and local laws, codes, and ordinances which govern the construction of the grouted tieback anchorage systems.

1.3 QUALIFICATIONS

The Excavation Subcontractor shall have previously installed similar grouted tieback anchors, have a minimum of five years installation experience, and provide evidence of the satisfactory completion of at least five installation contracts comparable in scope and subsurface conditions.

1.4 SUBMITTALS

The following shall be submitted by the Excavation Subcontractor in accordance with Specification 01330:

SD-05 Design Data: G

Design calculations, shop drawings, and details related to the temporary and permanent grouted tieback anchorage systems and waling system components, including the type of anchors to be installed, the inclination angle at which the anchors will be installed, the diameter and bonded length of the grout bulb, the required number and spacing of anchors, the mix design of the grout, the capacity of each anchor, the structural details of the waling system/anchor head components, and the corrosion protection methods to be employed. The design calculations and associated construction drawings and details shall be reviewed, approved and stamped by a Registered Professional Engineer licensed to practice in the Commonwealth of Massachusetts.

SD-01 Preconstruction Submittal: G

Installation schedule in the form of a narrative or graphical representation of the estimated duration of the work, including final design time, mobilization, installation, testing, and demobilization. The schedule is to include the estimated number of tiebacks that can be installed per day. Work is limited to 5 days per week (Monday through Friday), 8 hours per day.

SD-06 Test Reports: G

Tieback performance and proof test results.

PART 2 PRODUCTS

Not Applicable (to be selected by Excavation Subcontractor).

PART 3 EXECUTION

3.1 FINAL DESIGN OF TEMPORARY AND PERMANENT GROUTED TIEBACK ANCHORAGE SYSTEMS

The Excavation Subcontractor shall develop a final design, detail, and construct temporary and permanent grouted tieback anchors which satisfy the following requirements:

Temporary Tieback Anchors

Soldier Pile and Lagging Retaining Wall Alignment	Design Horizontal Anchor Load (kips/ft of wall)	Location Elevation (ft)
H-1 to H-2	5.5	970
H-2 to H-3	9.1	974
H-3 to H-4	15.6	974
H-4 to H-14	12.6	982

Permanent Tieback Anchors

Sheet Pile Retaining Wall Alignment	Design Horizontal Anchor Load (kips/ft of wall)	Location (ft below top of wall)
Point A to B	6.5	8

The Excavation Subcontractor shall verify that the proposed anchor locations will not interfere or conflict with existing structures, utilities, etc. Anchors should be installed as close as possible to the bottom of the wing wall footings.

The Excavation Subcontractor shall determine the required number of grouted tieback anchors, the design spacing between anchors, the inclination angle of the anchors, the diameter and bonded length of each anchor, and all other structural details of the grouted tieback anchors and their associated waling/anchor head systems consistent with the minimum required design anchor loads listed above and the subsurface conditions depicted on the boring logs.

The Excavation Subcontractor shall also complete a structural design of all waling system/anchor head components that are consistent with the design loads and selected anchor spacing and adequately transfers the design load(s) to the anchors. Finished anchors shall be proof or performance tested consistent with this final design as specified herein.

All temporary tiebacks shall intersect the front face of the retaining wall at a vertical distance of 8 feet below the original ground surface at the tieback location or as soon as practicable below any footings, whichever comes first.

All permanent tiebacks shall intersect the front face of the sheet pile retaining wall at a vertical distance of 8 feet (elevation 980) below the top of the wall.

All design calculations for grouted tieback anchors and waling system components shall be reviewed and sealed by a Registered Professional Engineer licensed to practice in the Commonwealth of Massachusetts.

3.2 INSTALLATION OF GROUTED TIEBACK ANCHORAGE SYSTEMS

Centralizers shall be installed at a center-to-center spacing of no greater than 10 feet in permanent anchors.

To facilitate grouted tiebacks installation, a minimum 3-1/2" diameter hole shall be drilled into the soils behind the retaining wall using rotary or percussion drilling techniques at the inclination angle and to the required length determined by the Excavation Subcontractor. If caving of the drill hole occurs, then a casing shall be installed as necessary to maintain an open borehole. This casing shall be withdrawn during the grouting operation.

The drill hole shall be grouted beginning at the back of the borehole either before or after the tie rod installation. The grout shall be a neat cement grout consisting of Type I, II, or III Portland Cement and potable water with a water-cement ratio of approximately 5 gallons of water per bag of cement. Additives to improve flowability may be used.

If the tieback is to be re-grouted, this should be done within 24 hours of the initial grouting operation.

A given tieback anchor shall be tested no earlier than 5 days after the final grouting of this anchor. This requirement may be reduced to 3 days if Type III Portland cement is used in the grout mix or if the grout is pressure injected into the borehole.

Installation of grouted tieback anchors shall be coordinated with the retaining wall Excavation Subcontractor.

3.3 CORROSION PROTECTION FOR PERMANENT ANCHORS

Permanent anchors shall be provided with double corrosion protection (DCP). The methods of corrosion protection to be utilized are subject to approval of the Engineer. The tieback anchor shall be protected over its entire length, including the anchor head. A trumpet and anchor head cap must be installed.

3.4 WALING SYSTEM FOR PERMANENT TIEBACK ANCHORS

The distance between the front face of the sheet pile wall and the anchor head/anchor head cap shall be minimized to the greatest extent practicable.

The top and bottom elevations of the waling system shall remain constant across the full length of the sheet pile retaining wall.

3.5 FIELD TESTING OF GROUTED TIEBACK ANCHORS

3.5.1 Tieback Testing Procedure

The following tieback testing procedures shall be carefully followed. Each tieback shall be tested as specified below. The maximum test load shall not exceed 80 percent of the guaranteed minimum ultimate tensile strength of the tendon. The test load shall be simultaneously applied to the entire tendon. The tieback testing equipment shall consist of:

1. A dial gauge accurate to 0.001 inches to measure the tieback movement.

2. A hydraulic jack and pump to apply the test load. The calibrated pressure gauge shall be graduated in 100 psi increments or less. The hydraulic pump shall be capable of raising the load from one load increment to another in less than 30 seconds.

3.5.2 Performance Test

The first three temporary tieback anchors, the first three permanent tieback anchors, and 5% of each type of the remaining tieback anchors shall be performance tested in accordance with the following procedures. All other anchors shall be proof tested.

The performance test shall be made by incrementally loading and unloading the tieback in accordance with the following schedule. The tieback movements shall be measured from the initial alignment load and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at subsequent alignment loads and at each increment of load. The test load shall be monitored with a calibrated pressure gauge.

3.5.3 Performance Test Schedule

AL	0.50 DL	AL	0.25 DL
0.25 DL	0.75 DL*	0.25 DL	0.50 DL
AL	AL	0.50 DL	0.75 DL
0.25 DL	0.25 DL	0.75 DL	1.00 DL
0.5 DL*	0.50 DL	1.00 DL	1.20 DL
AL	0.75 DL	1.20 DL*	1.33 DL* (Test Load)
0.25 DL	1.00 DL*	AL	0.75 DL (Lock-off Load)

AL = Alignment Load; DL = Design Load

The maximum test load in a performance test shall be held for 10 minutes. The tieback movement with respect to a fixed reference shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. If the tieback movement between 1 and 10 minutes exceeds 0.04 inches, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the tieback movement shall be recorded at 15, 20, 25, 30, 45, and 60 minutes. The load hold time shall begin when the pump starts to raise the load from the 1.20 DL increment to the 1.33 DL load increment.

The Excavation Subcontractor shall plot the tieback movement versus load for each load increment marked with an asterisk (*) in the performance test schedule and plot the residual movement of the tendon at each alignment load versus the highest previously applied load.

3.5.4 Proof Test

All remaining tieback anchors shall be proof tested. The proof test shall be made by incrementally loading the tieback in accordance with the following schedule. The tieback movements shall be measured from the initial alignment load and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at each increment of load.

AL	0.75 DL	1.20 DL
0.25 DL	1.00 DL	0.75 Lock-off Load
0.50 DL		

AL = alignment load; DL = Design Load

The maximum test load in a proof test shall be held for 10 minutes. The tieback movement with respect to a fixed reference shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. If the tieback movement between 1 and 10 minutes exceeds 0.04 inches, the maximum test load shall be recorded at 15, 20, 25, 30, 45, and 60 minutes. The load hold time shall begin when the pump starts to raise the load from the 1.00 DL load increment to the 1.20 DL load increment.

The Excavation Subcontractor shall plot the tieback movement versus the load for each increment.

3.5.5 Tieback Test Acceptance Criteria

A performance or proof tested tieback with a 10-minute load is acceptable if:

1. The tieback will carry the maximum test load with not more than 0.04 inches of movement between 1 and 10 minutes.

2. The total movement at the maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

A performance or proof tested tieback with a 60-minute hold is acceptable if:

1. The tieback will carry the maximum test load with not more than 0.08 inches of movement in a log cycle of time (e.g. between 6 and 60 minutes).

2. The total movement at the maximum test load exceeds 80% of the theoretical.

Tiebacks which fail to meet the acceptance criteria during testing can be incorporated in the finished wall at a load equal to 50% of their failure load. To determine the failure

load, allow the load to stabilize for 10 minutes after the tieback has failed. When a tieback fails, the Excavation Subcontractor shall modify the design and/or the construction procedures. These modifications may include, but are not limited to, installing additional tiebacks, reducing the tieback design load by increasing the number of tiebacks, modifying the installation methods, increasing the anchor length, or changing the tieback type.

A report summarizing the results of the tieback testing shall be provided to the Engineer. Test results shall be included in the summary report.

END OF SECTION

SPECIFICATION 02369 ATTACHMENT 1

SOIL BORING LOGS

WESTON	SOIL BORING LOG			PAGE 1 OF 1
Job Name	**GE Pittsfield- EE/CA**	**Boring No.**	**BH000091**	**Groundwater Level**
Job No.	**10971-032-007**	**Surface Elev.**	**986.0 ft. (est)**	**Date / Depth**
Date Drilled	10 May 99	Boring Method	HSA	Not Measured
Drilling Co.	NH Boring	Completion Depth	24.1 ft bgs	
Drill Foreman	Kenneth Smith	Location	See Figure 2.1-7	
Logged By	J. Schmidl			

Depth (feet)	Sample No.	Sample Type*	Sample Blow Counts** (per 6 in.)	N Value**	Visual Description	% Rec	% RQD	Laboratory Tests
		SS	5-7-7-6	14	6" Asphalt SAND, some gravel, brown, dry			
		SS	5-3-4-3	7	SAND, some gravel, yellow-brown, dry			
5		SS	4-5-3-1	8				
		SS	2-3-2-2	5	SAND, trace gravel, yellow-brown, wet			
	Sample	SS	3-2-wor-1	2	SAND, some silt, little gravel, white, wet	L		
10		SS	3-3-6-5	9	SAND, little gravel, trace silt, brown, moist			
	Sample	SS	3-5-6-5	11	SAND, brown, moist	L		
15		SS	4-5-4-9	9	SAND, some silt, trace gravel, olive-brown, moist			
	Sample	SS	13-21-22-33	43	SAND and GRAVEL, some silt, yellow-brown, moist	L		
		SS	12-15-28-26	43	SAND, some gravel, some silt, yellow-brown, wet			
20	Sample	SS	8-7-5-50	12	SAND and GRAVEL, some silt, little clay, wet	L		
		SS	60/3"	60/3"	SAND, some silt and clay, little gravel, yellow-brown, moist			
		SS	50/0"	50/0"	GRAVEL, some sand, little clay, wet			
25					End of Boring at 24.1 feet bgs (Split spoon and auger refusal)			
30								
35								

***Sample type:** **SS-Split Spoon** **ST-Shelby Tube** **RC-Rock Core** **SC-Soil Core**

****ASTM D-1586 Standard Penetration Test**

Laboratory Tests: **MC-Moisture Content** **AL-Atterberg Limits** **S-Sieve Analysis** **SH-Sieve/Hydrometer Analysis** **SG-Specific Gravity** **OC - Organic Content** **C-Consolidation** **UU-Unconsolidated Undrained Triaxial** **CU-Consolidated Undrained Triaxial** **UCS-Unconfined Compressive Strength** **K-Hydraulic Conductivity** **BD - Bulk Density**

WESTON	SOIL BORING LOG		PAGE 1 OF 1
Job Name / Job No.	Housatonic River 20125.001.096	Boring No. / Surface Elev.	GTB-11 ft.
Groundwater Level Date / Depth			
Date Drilled	25 Apr 02	Boring Method	Case and wash
Not Measured			
Drilling Co.	TDS	Completion Depth	27.0 ft bgs
Drill Foreman	Scott Lombard	Location	BH000581
Logged By	A. C. Steele	Pittsfield, Massachusetts	

Depth (feet)	Sample No.	Sample Type*	Sample Blow Counts** (per 6 in.)	N Value**	Visual Description	% Rec	% RQD	Laboratory Tests
	1	SS	8-8-8-8	16	0-0.5 Asphalt above FILL, brick, slag, gravel, silt and fine to coarse sand, very loose, dry.	33		
	2	SS	4-3-2-2	5	FILL, brick, slag, gravel, silt and fine to coarse sand, very loose, coal in nose, sl. Moist.	20		
5	3	SS	2-1-2-1	3	No recover, catcher was in use.	0		
	4	SS	3-2-2-2	4	No recover, catcher was in use.	0		
	5	SS	2-3-8-10	11	8-8.6 Predominately gray FILL, coal and ash with gravel and fine to coarse silty SAND, firm. 8.6-9.2 Natural.	60		
10	6	SS	8-33-38-45	71	Mod brown arble COBBLES and silty fine SAND, firm, sl. Moist.	35		
15	7	SS	100/0"	100/0"	*No recovery - Per driller, rig hit something at 12 feet.*	NA		
20	8	SS	9-18-23-29	41	Mod brown silty fine SAND and GRAVEL, at base silty sandy clay, loose, sl. Moist,	15		
25					*Per driller, this zone is wet based on water on rods when pull them.*			
	9	SS	100/6"	100/6"	Mod grey weathered rock, saturated. *Per driller, tighter as auger down.*	80		
30					End of boring at 27 ft bgs. Auger refusal.			
35								

Sample type: SS-Split Spoon; ST-Shelby Tube; RC-Rock Core; SC-Soil Core

Laboratory Tests: MC-Moisture Content; AL-Atterberg Limits; S-Sieve Analysis; SH-Sieve/Hydrometer Analysis; SG-Specific Gravity; OC - Organic Content; C-Consolidation; UU-Unconsolidated Undrained Triaxial; CU-Consolidated Undrained Triaxial; UCS-Unconfined Compressive Strength; K-Hydraulic Conductivity; BD - Bulk Density

**ASTM D-1586 Standard Penetration Test

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 1996) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls
ASTM D 4972	(1995) 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 and at elevations above the top-of-armor or riprap and at the top limit of restoration.

b. Riverbed and riverbank work areas during and after excavation and before restoration which could be flooded during storm events that exceed the capacity of the diversion system.

c. Areas around the outlet ends of diversion piping in successive Phase 2 locations as the remediation progresses.

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

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

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.

In addition to the above erosion control activities, the Excavation Subcontractor will be responsible for preparation for an overtopping event and associated removal and reinstallation of the diversion dam. This will include the following general activities:

a. Monitoring of river flows and real-time communication/coordination with the General Contractor to monitor and report river flow conditions which could indicate an overtopping event.

b. Preparation for an overtopping event and removal and reinstallation of the diversion dam.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

c. Excavation Plan section(s) providing in-river work area erosion control measures in accordance with the requirements described in Subsection 1.4.2.3.

SD-03 Product Data

a. Mulch, Geotextile Fabric, Erosion Control Blankets.

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

c. Fertilizer.

SD-06 Test Reports

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

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

c. For Mulch, provide composition and source.

d. For Asphalt Adhesive, provide composition.

e. For Tackifier, provide composition.

f. 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. Average daily flow based on hourly measurements of river stage at Newell Street Bridge.

c. Rainfall/snow pack depth measurement/river stage and discharge data from the previous day.

d. 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.

e. 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, rock check dams, 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 Subsections

1.4.1.1 and 1.4.1.2, 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 14th 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 14th 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.
c. Other temporary erosion controls as described in Subsection 1.4.2.3.

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 Stormwater and Erosion Control Methods

The Excavation Subcontractor shall prepare, as part of the Excavation Plan, narratives, supporting plans, drawings, and other documentation, as necessary, to adequately present and detail planned methods and procedures to be employed for stormwater and erosion control within the riverbed/channel area during the Phase 2 remediation. At a minimum, the information shall describe and detail the following:

a. The phased sequencing and staging of the stormwater and erosion controls for the remediation throughout the work from Station 522+29 to 527+60 of the 1.5-Mile Reach. This shall include plan drawings depicting the projected work limits for each phase of the work. These plan drawings shall be prepared at a scale that can clearly depict the sequencing of the work within each phased work area to address:

   - Temporary measures (i.e., small dikes/berms, bypass pumping, etc.) to divert extraneous flows entering the work area around excavation limits. These extraneous flows shall include runoff from areas bordering the river upstream and

downstream of the dam, storm sewer outfalls, and incidental leakage flow through the aluminum stop log dam.

- Placement of temporary erosion controls (i.e., 12-inch [or larger] riprap, articulated concrete mats, erosion control blankets, and other engineer-approved controls) for locations within the river which have not fully been restored and are subject to the potential for erosion.

- Placement of temporary stabilization at the twin 54-inch diversion pipe outfall area at its successive, phased locations for the reach as the remediation proceeds downriver. At a minimum, this stabilization will require 12-inch (minimum) size riprap, extending 30 feet downstream of the pipe end.

b. The narrative shall describe the logistics of how the in-river stormwater and erosion controls are to be implemented and placed within each phase work area limit. Specifically, the narrative will address how the measures and controls are to be placed with respect to the remedial excavation, construction of the hard armor walls, and the horizontal relocation of the twin 54-inch diversion pipes to allow for remedial excavation on the opposite side of the river. The narrative will also include description of those activities to be conducted in preparation for an overtopping event, including protection of exposed areas, securing/removal of diversion dikes/berms, removal of construction equipment, and removal/reinstallation of the dam.

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 accordance 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 3-year warranty.

PART 2 PRODUCTS

2.1 RESTORED RIVERBANK EROSION PROTECTION COMPONENTS

2.1.1 Recycled Plastic

Recycled plastic shall contain a minimum 85% of recycled post-consumer product. Recycled material shall be constructed or manufactured with a maximum ¼-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% 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 ultraviolet light, 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% virgin aspen wood fibers. Wood shall be naturally air-dried to a moisture content of 10.0%, plus or minus 3.0%. A minimum of 50% of the fibers shall be equal to or greater than 0.15-inch in length and a minimum of 75% 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% within $\pm$ 0.2
Inorganic Ash (oven-dried basis)	0.7% within $\pm$ 0.2
Water Holding Capacity	1,401%

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% X	
Type (percent strength retained)	81%	ASTM D 3884
Tensile Grab Strength	1,467 N X 1, 933N	ASTM D 4632
Grab Elongation	15% X 20%	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 U.S. Std Sieve	ASTM D 4751
UV Resistance @ 500 hr	90%	ASTM D 4355

2.1.5 Erosion Control Blankets

Requirements for Erosion Control Blankets are specified in Specification Section 02930 BANK REVEGETATION TRANSITION AREA.

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 it to be 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 Subsection 2.1.1 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% 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 6 months of expected usable construction life at a temperature range of 0 to 120^{o} 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 4 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 the 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 CONTROLS FOR IN-RIVER WORK

Riprap and articulated concrete mats will be provided by the Excavation Subcontractor.

2.2.1 Riprap

Material shall be either 12-inch or 18-inch riprap meeting the requirements described in Section 02300, EARTHWORK.

2.2.2 Articulating Concrete Mat Components

2.2.2.1 Articulating Concrete Block Mats

Articulating concrete block mats shall be as specified in Specification Section 02382 - ARTICULATING CONCRETE BLOCK REVETMENTS. The concrete blocks will be linked together with flexible cable that runs through the entire block or designed to be interlocking if an equivalent does not require cables.

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 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 temporary riprap in locations described in the In-River Remediation Area Work Plan and as required by the Engineer. When directed by the Engineer to place the erosion protection as a temporary measure, the Excavation Subcontractor shall first place geotextile over the area to be protected, followed by placing the 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; and 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 (slow release form such as IBDU [isobutylidene diurea]) 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.

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 the Government 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 river flow as measured by USGS Coltsville Gaging Station is observed to exceed the maximum flow of the diversion system, and/or water impounded by the dam is rising. Or, the flow measured at the USGS Coltsville Gaging Station is rising and current or forecasted weather conditions project extended precipitation to cause flooding conditions such that the maximum flow of the diversion system will be exceeded.

The Excavation Subcontractor must consider the current flow in the river (USGS Coltsville Gaging Station), current and forecasted weather conditions, existing flow and stage conditions of the river, saturation levels of the banks and floodplain due to prior or current precipitation, and where current construction activities are taking place when monitoring for anticipated flood events.

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 Subsection 3.3.2.3 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.

d. Based on direction provided by the Government and the General Contractor, remove the stop log dam in accordance with approved removal plan.

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 or other barriers used to create work cells 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 other barriers 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 Engineer, 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. In addition, the Excavation Subcontractor shall re-excavate any other areas as required by 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 or other excavation shoring methods.

3.3.3 Temporary Erosion Protection for In-River Areas

Depending upon expected seasonal flow conditions at the time of construction and during in-river work, 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.

3.3.3.1 Installation and Removal of Riprap

Upon specific direction from the Engineer, the Excavation Subcontractor shall place riprap as shown on the Excavation Plan drawings. 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 diversion pipes or hard armor walls. Handwork is expected to be necessary to place the riprap against these structures.

The temporary riprap located within the river shall be removed after receiving approval from the Engineer. After the riprap is removed, it shall be placed in trucks provided by the Excavation Subcontractor 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 Articulating Concrete Block Mats around Containment Cells and Excavations

Upon specific direction from the Engineer, the Excavation Subcontractor shall place articulating concrete block mats. 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 diversion pipes or hard armor walls. Temporary anchorage can be accomplished by driving wooden stakes along the top of the mat.

The mats may be moved to allow for relocation of the diversion pipes or removal after receiving approval from the Engineer. 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 transport 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 Excavation Subcontractor and include areas on the riverbank where flooding may occur due to increased local stage associated with the remedial work.

The Excavation Subcontractor 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 Subsection 3.8. 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 Subsection 3.8. 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 Subsection 3.8. 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 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 Subsection 3.8.3 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 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 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.

Final Quality Assurance Project Plan (QAPP), Weston Solutions, Inc., General Electric (GE) Housatonic River Project, Pittsfield, Massachusetts, DCN: GE-022803-ABLZ, May 2003.

1.2 POTENTIAL AREAS OF CONCERN

The Excavation Subcontractor shall be prepared to manage NAPL wherever encountered. NAPL may be encountered in the entire stretch of river between Elm St. and Dawes Ave. In this area, a number of test excavations were installed to approximately 2 feet below the river bottom. NAPL was encountered in many of these locations in the river bed. NAPL may also be encountered at the lower bank excavations. 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.

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 characterize the NAPL by collecting a sample of the material and submitting it to the analytical laboratory approved in the QAPP.

1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

NAPL Management Plan Addendum (submitted as a part of the Excavation 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; however, bedrock is anticipated to be too shallow to allow adequate embedment of sheet pile in this area. The Excavation Subcontractor shall propose a different method to isolate NAPL from the work area. Sorbent materials, sandbags, jersey barriers, polyethylene liners, and

other suitable materials shall 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 (or other method) 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 (or other isolation method). 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 surface water and groundwater within each work area as required to complete the work. Dewatering includes piping all removed water from the work area 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.

In the event that NAPL is encountered as an on-going release from bedrock, the Excavation Subcontractor, General Contractor, and the Government will consult on methods to be used to block further release from the rock. Methods to be considered will likely include pressure grouting of the bedrock and hydraulic control of the release.

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 Engineer and the Government 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 riverbank subsurface and in the riverbed 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 02300 EARTHWORK 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 Engineer 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 containers that are approved for use for containing liquid oily wastes and transported to the on-site stockpile area. 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.

The Excavation Subcontractor 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.

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 Government 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 work area and outside the NAPL-containment area, and/or in areas outside the work area.

END OF SECTION

SECTION 02382

ARTICULATING CONCRETE BLOCK REVETMENTS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes requirements for the design, construction, and all related items necessary to install an Articulating Concrete Block (ACB) revetment system for the designated coverage area within Phase 2 of the Housatonic River Project, as shown on the Drawings.

The Excavation Subcontractor shall initially complete a detailed design of the proposed ACB system to determine all requirements for materials, subgrade preparation, bank anchorage, toe aprons and anchorage, and transitions to existing or proposed structures. The design shall be based on the parameters and values listed in Part 1.4 and other requirements described in this specification.

Upon approval of the design by the Engineer, the Excavation Subcontractor shall complete the ACB system construction.

1.2 REFERENCES

The publications listed below form a part of the 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 288 (1999) Geotextiles Used for Subsurface Drainage Purposes

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C42 (1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C140 (2001) Sampling and Testing Concrete Masonry Units and Related Units

ASTM C1262 (1998) Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units

ASTM D4355 (1999) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)

ASTM D4491 (1999a) Water Permeability of Geotextiles by Permittivity

ASTM D4533 (1991; R 1996) Trapezoid Tearing Strength of Geotextiles

ASTM D4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	(1999a) Determining Apparent Opening Size of a Geotextile
ASTM D4833	(2000) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D4873	(2001) Identification, Storage, and Handling of Geosynthetic Rolls

1.3 DEFINITIONS

1.3.1 Articulating Concrete Block (ACB) Revetment System

A matrix of interconnected concrete block units for erosion protection. Units are connected by geometric interlock and/or cables, geotextiles, or geogrids, and typically include a geotextile underlayment for subsoil retention.

1.3.2 Blocks

Articulating concrete block revetment units will be referred to as blocks.

1.3.3 Interlocking Blocks

Each pair of abutting blocks shall have interlocking keys that limit lateral expansion. The key and keyhole shall have an interference fit such that the joint movement has a minimum aperture at closure, and a maximum aperture when pulled apart. The joint freeplay shall allow articulation of each individual block.

1.3.4 Freeplay

Freeplay shall be the maximum lateral joint movement for interlocking blocks (difference between maximum and minimum aperture).

1.4 SUBMITTALS

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

SD-02 Shop Drawings

Design; G

The Excavation Subcontractor shall submit a design for the proposed ACB installation for the coverage area shown on the Drawings. The design will be comprised of plan drawings, cross-sections, and details necessary for the installation, as well as supporting calculations and manufacturer's performance research results demonstrating that the system can meet the hydraulic parameters and values listed below. The design shall be based on the most critical hydraulic

conditions. It should be noted that the ACB will only be extended to the limits shown on the Drawings.

Table 02382-1
Hydraulic Design Parameters[1]

Frequency	Q (cfs)	El (ft)	V (fps)	Shear (lb/sf)	Flow Depth (ft)
1-yr	1670	973.52	6.8	0.76	6.52
1.5-yr	1761	973.68	6.95	0.79	6.68
2-yr	2047	974.15	7.41	0.87	7.18
5-yr	3336	976.21	8.71	1.2	9.21
10-yr	4375	977.83	9.25	1.48	10.83
50-yr	7239	981.74	10.16	2	14.74
100-yr	8721	983.27	10.72	2.29	16.27

Note: [1]Hydraulic design parameters based on HEC-RAS profile developed by Weston Solutions, Inc., September 2003, taken at Station 522+79. Parameters and values derived are for the area immediately downstream of the Elm Street Bridge based on proposed Phase 2 design improvements.

The design shall fully address bank anchorage, toe apron, subgrade preparation (including geosynthetics), and transition details to other proposed or existing structure requirements. This includes rip rap armoring of riverbank in downstream areas. Maximum bank slope inclination shall be no steeper than 2:1 (horizontal to vertical). The bank elevation for the top of the ACB system shall be as shown on the Drawings. In-river geotechnical test boring logs indicate that large areas of the channel bed are comprised of exposed bedrock and dense till. The Excavation Subcontractor shall complete any and all additional subsurface investigations it deems necessary to complete the ACB system design.

The design shall be sealed by a licensed Professional Engineer.

ACB Installation Details; G

Drawings shall be submitted that show details of the ACB installation. The details shall show the block layout patterns in relation to the feature alignment, anticipated locations of cast-in-place concrete joints, and proposed installation methods for void filling materials.

SD-03 Product Data

ACB and Geotextile Data; G

Descriptive technical data shall be submitted on the blocks, and geotextile. The submittal shall include all material properties specified under paragraph PRODUCTS. Catalog cuts, technical data sheets, or test data shall be submitted showing that the products meet the specifications. The submittal shall also include a copy of any standard manufacturer's warranties for the products.

Anchor Pullout Capacity

The Excavation Subcontractor shall submit calculations for the anchor pullout capacity. Tabulated manufacturer's data is acceptable, if the embedment soil conditions are applicable to the project site.

SD-04 Samples

ACB Sample

At the same time as the ACB and geotextile data submittal, the Excavation Subcontractor shall submit two samples of the proposed block. The samples shall be typical of the size, texture, color, and finish. If the Engineer is familiar with the product, this submittal may be waived.

SD-06 Test Reports

Flume Test for Critical Shear Stress

At the same time as the ACB and geotextile data submittal, the Excavation Subcontractor shall submit a report of testing for the ACB. The report shall clearly state if the critical shear stress associated with the stability threshold of the ACB system was derived from laboratory testing that included a sub-block drainage layer as a component of the tested system.

1.5 SCHEDULE

To limit ultraviolet light exposure of the geotextile, the blocks shall generally be placed within 7 days after placing the geotextile, and the void filler shall generally be placed within 14 days after placing the geotextile.

1.6 DELIVERY, STORAGE AND HANDLING

The Excavation Subcontractor shall check products upon delivery to assure that the proper material has been received and is undamaged. For geosynthetics, the guidelines presented in ASTM D4873 shall be followed.

1.6.1 Blocks

All blocks shall be sound and free of defects that would interfere with proper placement or that would impair the strength or longevity of the installation. Blocks with the following defects shall be discarded:

a. Blocks with broken appendages.

b. Blocks with chips larger than 2 inches in any dimension.

c. Blocks with cracks wider than 0.02 inches and longer than 33% of the nominal height.

Minor cracks incidental to the usual method of manufacture, or chipping that results from customary methods of handling in shipping, delivery and placement will not be deemed grounds for rejection.

Blocks shall be stored in a suitable location away from mud, paint, wet cement, and other contamination or disturbance.

1.6.2 Geotextiles

1.6.2.1 Labeling

Each roll shall be labeled with the manufacturer's name, product identification, roll dimensions, lot number, and date manufactured.

1.6.2.2 Handling

Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.

1.6.2.3 Storage

Geotextiles shall be protected from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade its physical properties. If stored outdoors, the rolls shall be elevated from the ground surface. Geotextiles shall be protected with an opaque waterproof cover. Geotextiles shall be delivered to the site in a dry and undamaged condition.

PART 2 PRODUCTS

2.1 ARTICULATING CONCRETE BLOCK

In addition to the requirements resulting from the design described in Part 1.4 of this specification, the ACB shall meet the following criteria:

Table 02382-2
ACB Requirements

Criteria	Required Value	Test Method
Matrix Assembly: Interlocking Blocks / Cabled System		
Thickness, minimum	4 inches	N/A
Net Weight/Area, minimum	30 psf	Note a.
Critical Shear Stress, minimum	3.5 psf	Note b.
Critical Velocity, minimum	15 ft/sec	Note b.
Curvature Radius, maximum	3 feet	Note c.
Surface Void Area Ratio	25% - 40%	Note d.
Drainage Correction Factor (DCF)	20% - 35%	Note e.
Block/Geotextile Interface		
Friction Angle	35 degrees	Note f.

a. The weight of the mattress per unit area shall be determined with the nominal joint spacing, in a non-submerged condition.

b. FHWA RD-89-199 or similar procedure.

c. The curvature radius shall be indicative of the ability of the assembled mattress to conform to one dimensional subgrade curves without binding, such as for anchor trenches and swales. The curvature radius shall be demonstrated, if requested by the Engineer.

d. The surface void area ratio shall be determined at the visible (with filled voids) surface of the blocks, with the joints spaced in a neutral position (50%), and shall be expressed as a percentage of the gross mat area. The void area shall include area between the blocks and open cells within the block.

e. The drainage correction factor shall be the minimum void area ratio (usually taken at the base of the blocks), with the joints spaced in a neutral position (50% freeplay in each direction), and shall be expressed as a percentage of the gross mat area.

f. The concrete surface shall be sufficiently rough to prevent sliding of the blocks on the geotextile. The interface friction must be matched with the selected block and geotextile combination, and shall be included with the ACB and geotextile data submittal. The block/geotextile interface friction angle shall be demonstrated, if requested by the Engineer.

2.1.1 Other Hydraulic Stability Requirements

The ACB product shall have been tested in a flume chamber, except that a drainage layer is not required. If the product was tested with a drainage layer, the installed product shall incorporate a similar drainage layer with adequate filtration design for the site soils. The flume test shall be based on conservative assumptions for field placement of the blocks

(such as block orientation, and joint spacing within construction tolerances). The critical shear stress (and critical velocity) shall be indicated in the test report.

2.1.1.1 Extrapolation of Hydraulic Stability

Extrapolation of critical shear stress for untested blocks within a similar family of ACB shall be subject to limitations. Extrapolation shall only be used for blocks having a similar footprint area and interlock mechanism, but with variable thickness or net weight/area. Extrapolation shall only be accepted if the following conditions are met:

a. The extrapolation is in strict accordance with hydraulic similitude methods commonly accepted by the industry, and includes quantitative treatment for a block overturning failure mode.

b. The tested block is the smaller product size in both thickness and net weight/area, and extrapolation does not extend the critical velocity more than 10 feet per second from the tested product size.

2.1.2 Matrix Assembly – Interlocking Blocks

Interlocking blocks are assumed to function without the use of cables or similar restraints. Void filler shall be placed to inhibit lateral movement and block pullout, cover the geotextile, and increase hydraulic stability.

2.1.3 Matrix Assembly – Cabled Systems

Cable tied concrete block shall be interconnected by flexible cables running through the blocks. Each block shall be penetrated by a cable that allows articulation of the blocks, but restrains removal of individual blocks. Void filler shall be placed to inhibit lateral movement, cover the geotextile, and increase hydraulic stability. Articulating concrete block, cables, and fittings shall be fabricated into mattresses at the manufacturer's plant or at the site with prior approval of the Engineer.

2.1.4 Structural Requirements

Articulating concrete block shall be wet cast using concrete as specified herein, or dry-cast by a vibratory block forming machine. The blocks shall be manufactured to the following requirements:

a. The minimum compressive strength shall be 4000 psi for an average of 3 units, and 3500 psi for an individual unit. Compressive strength shall be determined by ASTM C42 for wet cast blocks, or by ASTM C140 for dry cast blocks.

b. The maximum water absorption for dry cast units shall be a maximum of 5 percent per block or 9 pcf for an average of 3 units, and 12 pcf for an individual unit. Water absorption shall be determined by ASTM C140.

c. The minimum saturated surface-dry density shall be 140 for average of 3 units, and 140 for an individual unit.

d. Wet cast concrete shall be air entrained to contain between 4 and 7 percent total air.

e. For freeze-thaw durability tested in accordance with ASTM C 1262, specimens shall comply with either of the following: (1) the weight loss of each of 5 specimens after 100 cycles shall not exceed 1 percent; or (2) the weight loss of each of 5 specimens after 150 cycles shall not exceed 1.5 percent.

2.2 GEOTEXTILE

The geotextile shall meet the material properties specified in AASHTO M 288 for Class 2 strength property requirements and for permanent erosion control. Filter requirements in AASHTO M 288 shall be based on in-situ soil with less than 15 percent passing the 0.075 mm sieve opening. Geotextile used as a filter below the ACB shall be a non-woven fabric, and shall meet the requirements specified in Table 2 unless otherwise determined by the Excavation Subcontractor. The property values (except for AOS) represent minimum average roll values (MARV) in the weakest principal direction.

Table 02382-3
Geotextile Physical Properties

Property	Test Requirement	Test Method
Grab Tensile, lbs.	160	ASTM D4632
Tear Strength, lbs.	55	ASTM D4533
Puncture Strength, lbs.	55	ASTM D4833
Permittivity, 1/sec	0.5	ASTM D4491
Apparent Opening Size (U.S. Sieve)	70-100	ASTM D4751
Ultraviolet Stability	50%	ASTM D4355

2.3 CABLE

2.3.1 Installation Requirements for Cable

Cable used for preassembled mattresses shall be sufficiently sized and fastened for the size/weight of the assembled mattresses, such that the assembled mattresses can be placed in compliance with OSHA standards. The manufacturer shall be responsible for determining the minimum cable strength compatible with the mattress size for safe

handling. Cable strength shall be based on a minimum factor of safety of 5, and include appropriate reduction factors for mechanically crimped cable and other fasteners. If applicable, loading conditions shall include the use of a spreader bar for placing the mattresses.

2.3.1.1 Fasteners Other Than Cable

Any systems which rely on geotextiles (or other fabric integral with the mattress) to maintain block-to-block interconnection shall meet the applicable portions of this specification for cables. Geosynthetics strength shall include appropriate factors of safety, with particular attention given to the grab points.

2.3.2 Design Requirements for Cable

ACB's that rely on cables to maintain block to block connection shall use ropes manufactured from polyester, stainless steel wire, or galvanized steel wire as recommended by the block manufacturer.

Polyester rope shall be constructed of high tenacity, low elongating, continuous filament polyester fibers; and shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover.

2.3.3 Anchors

Anchors shall be selected with an ultimate vertical pullout resistance for the project site soil conditions as determined by the Excavation Subcontractor. Anchors shall be capable of being attached directly to the articulating concrete block mat in a manner which will achieve little or no slack in the cable system or gaps in the articulating concrete block mattress. Anchors shall be attached to the mat in such a manner that they will not be affected by tampering or vandalism. Anchors shall have the capability of being load-tested to the specified pull-out capacity. Anchors shall consist of hot-dipped galvanized components unless otherwise approved by the Engineer.

2.4 VOID FILLER

Based on the design developed in accordance with Part 1.4 of this specification, the Excavation Subcontractor shall recommend either an aggregate or topsoil/seed void filler (or combination thereof). It is desired that a topsoil/seed void filler be utilized to the fullest extent practical above the average annual water surface elevation. This water surface will be provided by the Engineer. Limits and elevations of the void filler types shall be shown on the Excavation Subcontractor's Design Drawings.

2.4.1 Aggregate

Aggregate for filling the voids in the block shall be as recommended by the Excavation Subcontractor, subject to approval by the Engineer.

2.4.2 Topsoil and Seed

Topsoil for filling the voids in the block and seed for turf establishment shall meet the requirements of Section 02300 EARTHWORK and Section 02930 BANK REVEGETATION.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The ACB revetment shall be placed on undisturbed native soils, or acceptably placed and compacted fill or on the excavated riverbed subgrade. The ACB shall not be placed on surfaces that contain mud, frost, organic soils, embankment that has not met compaction requirements, or where the Engineer determines that unsatisfactory material remains in or under the subgrade.

3.1.1 Clearing

All vegetation shall be completely removed as specified in Section 02230 CLEARING AND GRUBBING.

3.1.2 Bank Grading

Grading shall be finished to a smooth surface, typical of that obtainable with a dozer and blade.

3.1.3 Compaction and Subgrade Finishing

Fill soils shall be compacted to the specified density in Section 02300 EARTHWORK. Incidental grading (where embankment is not otherwise specified) shall be compacted by heavy equipment or by tamping with a bucket to a density characteristic of the surrounding soils. The final surfaces accessible by compaction equipment shall be compacted with a smooth drum roller or vibratory plate tamper until there is no further evidence of consolidation. Where slopes limit operation of compaction equipment, the final surface shall be back-dragged to a dense smooth surface with bladed equipment. Localized loose or soft zones shall be corrected.

3.1.4 Grade Tolerances

The grading tolerance shall be as defined in Specification 02300, with no abrupt variations that would cause unacceptable projections of individual blocks.

3.1.5 Subgrade Surface Tolerances

The subgrade shall be maintained in a smooth condition between installation of the geotextile and the blocks. Windrows, stones, clods of cohesive soil, and irregularities shall be raked smooth. Ruts, rills and gullies resulting from traffic, precipitation runoff, groundwater seepage, etc. shall be corrected prior to installation of blocks.

3.2 GEOTEXTILE INSTALLATION

The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall be free of tension, folds, and wrinkles. The number of seams and overlaps shall be minimized by selective orientation of geotextile panels, within the limitations of maintaining a consistent pattern. Geotextile shall be placed immediately prior to block installation, if necessary to limit damage to the geotextile from equipment or repeated pedestrian traffic and limit disturbance of the subgrade from precipitation or runoff.

3.2.1 Geotextile Seams

Seams shall be overlapped a minimum of 18 inches. Seams on slopes and butt end seams shall be shingled so that runoff and channel flow passes over the fabric. Geotextile panels shall be secured before block placement by adequate sandbags, spare blocks, or pins/staples.

3.3 BLOCK INSTALLATION

All placement of blocks shall be in accordance with the manufacturer's recommendations and the Excavation Subcontractor's approved shop drawings.

3.3.1 Placement of Pre-Assembled Mattresses

Placement of pre-assembled mattresses shall be done with mattresses attached to a spreader bar to aid in lifting, aligning and placing the mattresses. The mattresses shall be placed directly into position, with a maximum space or gap between mattresses of 3 inches in excess of the nominal joint spacing of blocks within the mattress. Mattresses out of alignment shall be lifted and reset. Mattresses shall not be pushed or pulled laterally after they are in contact with the geotextile. No overlapping of mats will be accepted and no blocks shall project vertically more than 1 inch beyond the adjacent blocks. As adjacent mats are placed, they shall be secured to each other by fastening the protruding horizontal and vertical cable connections and end cable loops together along each side of the mats.

3.3.2 Hand Placement of Interlocking Blocks

Hand placed blocks shall be spaced to maximize the ACB ability to articulate. The Excavation Subcontractor shall use adequate alignment control, such as string lines, to keep the block pattern in alignment and the joint spacing consistent and uniform. Initially, no more than two working block rows shall progress simultaneously in the direction of placement. Additional working rows may be added after experience shows that true lines are maintained. The starting position for ACB placement shall be a convenient location for control of the block pattern alignment. The Engineer shall approve of the starting position for placement of the ACB.

3.3.2.1 Target Joint Spacing

Interlocking blocks shall be installed with a uniform aperture in the interlocking connections. The target joint spacing shall be neutrally spaced with equal free-play for the joint to open and close.

3.3.2.2 Correction of Joint Spacing

If the block pattern becomes skewed to an extent that blocks bind, joints close, or blocks stick up, then the placed ACB that is determined to be out of tolerance shall be removed and replaced. Where the nonconformance of the joint spacing is due to project features, such as warped slopes or anchor trenches, then cast-in-place concrete joints shall be field located in concurrence with the Engineer.

3.3.2.3 Maintenance of Joint Spacing

If the block pattern becomes skewed to an extent that the joint freeplay is not acceptable to the Engineer, then cast-in-place concrete joints shall be field located as directed by the Engineer.

3.3.2.4 Block Layout Pattern Dependent on Project Features

If the block pattern is shown to be maintained parallel and perpendicular to selected project features, such as the toe of channel slopes, then field location of cast-in-place concrete joints shall be implemented as needed and as directed by the Engineer.

3.3.3 Tolerances

Maximum acceptable block projections (vertical offset from adjacent blocks) for "installation in the dry" shall not exceed 0.5 inches for interlocking blocks or 1.0 inch for cabled systems. Typical block projections shall be less than half the maximum projections.

3.4 ANCHORS

Anchors shall be carefully positioned for attachment to the articulating concrete block. Rigid shafts shall align with the ACB cables. Flexible anchors (cables, etc.) shall be linear between the ACB fastener and the restraining device before tensioning. Penetrations in the geotextile to allow for penetration of the anchor shall be sealed.

3.5 CONCRETE JOINTS

Use of cast-in-place concrete joints shall be minimized to the extent practicable. The Engineer shall be informed of all concrete joints not shown on shop drawings prior to field placement. Joints that shall require concrete include:

a. Joints between cable tied mattresses where the joint is 3 inches wider than the nominal joint.

b. Joints where block interlock is discontinuous.

c. Abutments where the ACB meets headwalls, pipe penetrations, and/or walls.

d. Any areas where there are partial blocks to avoid small blocks with reduced hydraulic stability.

Field placed concrete shall be proportioned for similar strength and durability properties as the ACB concrete, and shall meet applicable portions of Section 03300 CAST IN PLACE STRUCTURAL CONCRETE. All cable ties and anchoring shall be completed prior to placing concrete.

3.5.1 Abutments

The ACB shall abut pipe outlets, retaining walls, head walls, and other abutments in a neat appearance. Unless a specific detail is indicated on the Drawings, voids shall be filled with partial blocks and the gap shall be filled with cast-in-place concrete. The concrete shall be installed flush with the surface of the blocks, and shall be float finished.

3.6 VOID FILLER

The voids of the articulating concrete block mats shall be filled with aggregate void filler. All cable ties and anchoring shall be completed prior to filling voids.

3.7 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations. Displaced or broken blocks shall be removed and replaced to conform to all requirements of this section. Damaged material shall not be incorporated. Equipment shall not be allowed on the ACB that could crack, cause abrasion, or otherwise damage the blocks.

3.7.1 Construction Equipment

Vehicles shall not operate directly on geotextile, except that rubber tired vehicles may operate directly on short reaches of geotextile that meets or exceeds AASHTO M 288 survivability requirements for Class 1 geotextile, if there is no rutting, if the vehicle access is necessary to accomplish the work, and if the Engineer observes the operation and approves. Vehicles shall not operate on the ACB until (during or after) placement of void filler. Vehicle traffic on the ACB shall be restricted to light weight rubber tired vehicles, and where intermittent access is necessary to accomplish the work. Routine haul routes shall not be established on the ACB. These allowances shall not waive the Excavation Subcontractor's obligation to maintain the installation until acceptance, and verify that vehicle access does not crack, or in any way damage, the ACB.

3.8 QUALITY CONTROL TESTING

The following testing shall be performed independent of the manufacturing process, by an agency other than the manufacturer. The ACB blocks shall be sampled and tested for

compressive strength, water absorption and unit weight. The sample frequency shall be 3 specimens for each 3,000 sy. Test methods shall be consistent with those specified in PART 2 PRODUCTS.

END OF SECTION

SECTION 02464

METAL SHEET PILING

PART 1 GENERAL

Work covered by this section includes furnishing and installing sheet pile as shown on the Drawings to create permanent retaining walls.

1.1 SUBMITTALS

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

SD-01 Preconstruction Submittals: G

A sheet pile installation plan detailing the type of sheet pile to be installed, connections, and sequence of work prior to the start of construction that addresses the installation of permanent sheet pile. The plan shall address methods of installing and removing sheet pile so as to prevent damage to existing structures, completed construction, the fabrication of custom connectors, and the cutting of sheet pile. The plan shall address procedures to be implemented if obstructions are encountered prior to reaching the required termination depth.

SD-02 Shop Drawings: G

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.

Timber Facade

All joints or connections not specifically detailed on the Drawings shall be determined by the Excavation Subcontractor. The Excavation Subcontractor shall submit details and fastener schedules, certificates of compliance, and drawings showing the size, spacing, locations, and quantities of materials.

SD-11 Closeout Submittal: G

As-Built Drawing showing horizontal alignment and top and tip elevations of permanent sheet pile walls.

1.2 SUBSURFACE DATA

Logs of test borings are included in the Pre-Design Summary for the 1.5-Mile Removal Action – Phase 2. The 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 encountered during construction may be different, and should be considered in the development of plans for constructing the retaining walls.

1.3 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.

1.4 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 manufacturer's 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.

1.5 INSTALLATION MONITORING AND INSPECTION

The Excavation Subcontractor shall document structure conditions and monitor vibrations as required in Section 01410. The Excavation Subcontractor shall also monitor vibrations on the Elm Street Bridge, and adjacent private and commercial properties during all sheet pile installation activities. The Excavation Subcontractor shall also consider the location and condition of existing overhead and underground utilities.

1.6 USE OF WATER TREATMENT SYSTEM

All dewatering activities associated with the installation of sheet pile shall be in conformance with the requirements that have been established for Phase 1 construction.

PART 2 PRODUCTS

2.1 METAL SHEET PILING

The grade and type of metal sheet piling required are as specified herein. 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. Cold-formed interlocks are preferred to allow movement of groundwater; however, hot-rolled interlocks are acceptable but will require weep holes to be cut in the sheet pile. Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirements and the piling manufacturer's recommendations for fabricated sections.

Location	**Minimum Required Section Modulus (in^3/ft)**	**Minimum Required Length (Feet)**
Sta. 523+00 to 524+24	8	25 feet
Sta. 525+75 to 527+50	7	19 feet

The minimum section modulus requirements listed above are based on calculated values. It should be noted that a heavier sheet pile section will likely be required to facilitate installation. The Excavation Subcontractor shall review the available subsurface data and determine the minimum sheet pile section that can be installed at the site. The selected sheet pile shall be described in the sheet pile installation plan.

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.

The Excavation Subcontractor shall fabricate a pile section consisting of an HP14x73 wide flange beam as shown on the Drawings (soldier pile H 14). All connections shall be welded full length.

2.3 DEWATERING AND CONVEYING

The initial dewatering sequence shall include the following tasks:

a. Pump the water from within the work area using a pump intake and flow rate to minimize suspending and entraining solids.

b. Water pumped from within the work area shall be discharged to the river until 6 inches of water remains in the work area near the pump intake.

c. Water pumped from the work area 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 using sheet pile, sumps and pumps, and other methods as approved in the dewatering plan as shown on the Drawings. Accumulated stormwater may be discharged to the river.

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 not be paid for separately and will be included as part of the unit price for Excavation 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 the work area during remediation.

f. After initial dewatering of the work area to within 6 inches of the riverbed, pumped surface water and groundwater shall be conveyed to the water treatment system. The Excavation Subcontractor shall size equipment appropriately based on past experience on the 1.5-Mile Removal Action between Lyman Street and Elm Street and the anticipated conditions for areas of the reach between Elm Street and Dawes Avenue. The current water treatment system is permitted to discharge up to 500 gpm of treated water.

g. On-site groundwater recharge pits will not be permitted.

h. Under no circumstances shall fill, concrete, or piping and appurtenances be placed 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 work areas so as to minimize noise and in compliance with applicable State of Massachusetts provisions for noise control.

PART 3 EXECUTION

3.1 INSTALLATION OF PERMANENT RETAINING WALLS

The permanent sheet pile retaining walls shall be installed at the locations shown on the Drawings. The top and tip elevations of the permanent sheet pile walls shall be as specified herein. In lieu of cutting sheet pile to achieve the required top elevation, sheets may be driven deeper than the specified tip elevation.

Location	**Top Elevation (feet)**	**Tip Elevation (feet)**
STA. 523+00 to 524+00	988	963.3
STA. 525+75 to 526+75	987	968
STA. 526+75 to 527+50	986	967

3.1.1 Pile Driving Equipment

Pile driving equipment shall be selected by the Excavation Subcontractor as needed to complete the work.

3.1.2 Placing and Driving

The Excavation Subcontractor will determine locations of existing utilities and structures prior to installation of sheet pile. Existing utilities and 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 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, 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.

3.1.2.2 Driving

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. The Excavation Contractor shall try to remove obstructions using a spud or heavier driving sheet. If the obstructions cannot be penetrated, the Excavation Contractor shall adjust the alignment of the sheet pile, with prior approval of the Engineer, in order to avoid the obstruction. If this is unsuccessful, and the obstruction is at a shallow depth, the obstruction may be removed by excavating the fill materials. The Engineer must approve all excavation of obstructions prior to initiating work. Excavation of material to remove obstructions shall be in accordance with Section 02111. Due to the high potential of encountering obstructions, the use of steel tips is encouraged.

Sheet piles shall not be driven within 50 feet of concrete less than 7 days old.

3.1.2.3 Cutting

The Excavation Subcontractor shall supply all labor and equipment necessary to cut sheet pile to the required configuration. Notch sheet piles immediately adjacent to soldier pile location H 14 to fit around concrete shaft.

3.1.3 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.

3.1.4 Lifting Holes

All lifting holes shall be sealed by welding plates in or over holes.

3.2 SEQUENCE OF WORK

The Excavation Subcontractor shall sequence work in accordance with the following requirements:

a. Initiate sheet pile installation at least 50 feet downstream of soldier pile H 14, i.e., downstream of Station 523+50.

b. When sheet pile is installed within the 50-foot off-set zone between soldier pile H 14 (approximately Station 523+00) and Station 523+50, vibration monitoring shall be increased. If ground motion, as indicated on the vibration monitors located on or adjacent to the crib wall, reaches the threshold value of 2 inches per second, pile driving shall be terminated. A visual inspection of the crib wall shall be performed by the Engineer and the Excavation Subcontractor. If the visual inspection indicates no substantial change in the condition of the wall, pile driving may be resumed with full-time visual monitoring of the wall by both the Engineer and Excavation Subcontractor. If the peak particle velocity exceeds 2 inches per second, pile driving may continue if the crib wall shows no significant change in condition.

c. The Excavation Subcontractor is cautioned and advised that a peak particle velocity between 2 and 4 inches per second for residential-type structures falls in the range of "caution." Between about 4 and 6 inches per second "minor damage" of residential structures can be expected. The Excavation Subcontractor shall be responsible for the stability of the crib wall during installation of the sheet pile and until the crib wall is either stabilized or removed and replaced as part of this contract. Crib wall stabilization or replacement is anticipated in early 2004.

d. Install tieback anchors when the exposed wall face is greater than 8 feet.

e. Maintain equipment at least 10 feet behind sheet pile wall during construction.

3.3 MONITORING

Vibration monitoring of structures immediately adjacent to all sheet pile driving operations shall be implemented by the Excavator Subcontractor. If the peak particle velocity at any monitoring point exceeds 2 inches per second, operations shall be terminated immediately and actions taken to ensure the peak particle velocity remains below the required value or the allowable peak particle velocity is increased by the Engineer.

END OF SECTION

SECTION 02832

SEGMENTAL CONCRETE BLOCK RETAINING WALL

PART 1 GENERAL

This work element includes engineering services in addition to the construction requirements. The Excavation Subcontractor is responsible for engineering services that include design of the wall in accordance with the National Concrete Masonry Association (NCMA) design method and providing shop drawings indicating all features of the complete design. The NCMA design method for segmental retaining walls considers potential failure modes categorized by external, internal, local, compound, and global stability. In addition, the design shall consider hydraulic forces acting on the wall. The Excavation Subcontractor is responsible for engineering services that include analysis of the wall for all modes of stability, and providing shop drawings indicating all features of the complete design.

1.1 REFERENCES

The publications listed below form a part of the 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 252	Corrugated Polyethylene Drainage Tubing
AASHTO M 288	Geotextiles Used for Subsurface Drainage Purposes

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C140	Sampling and Testing Concrete Masonry Units
ASTM C920	Elastomeric Joint Sealants
ASTM C1262	Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
ASTM C1372	Segmental Retaining Wall Units
ASTM D448	Sizes of Aggregate for Road and Bridge Construction
ASTM D1557	Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D1241	Materials for Soil-Aggregate Subbase, Base, and Surface Courses

ASTM D1556	Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2488	Description and Identification of Soils (Visual-Manual Procedure)
ASTM D2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D4355	Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D4491	Water Permeability of Geotextiles by Permittivity
ASTM D4595	Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	Determining Apparent Opening Size of a Geotextile
ASTM D4873	Identification, Storage, and Handling of Geosynthetic Rolls
ASTM D5321	Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA SA-96-071	Mechanically Stabilized Earth Walls and Reinforced Soil Slopes: Design and Construction Guidelines

GEOSYNTHETIC INSTITUTE (GSI)

GSI GRI GG1	Geogrid Rib Tensile Strength
GSI GRI GG5	Geogrid Pullout
GSI GRI GG6	Grip Types for Use in the Wide Width Testing of Geotextiles and Geogrids
GSI GRI GT6	Geotextile Pullout

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

NCMA SRWU-1	Determination of Connection Strength between Geosynthetics and Segmental Concrete Units

NCMA SRWU-2 Determination of Shear Strength between Segmental Concrete Units

NCMA TR-127A Design Manual for Segmental Retaining Walls, 2nd Edition

NCMA TR-160 Segmental Retaining Walls - Seismic Design Manual, 1st Edition

1.2 DEFINITIONS

a. Blocks. Segmental concrete retaining wall units will be referred to as blocks.

b. Drainage Aggregate. Granular soil or aggregate which is placed within, between, and/or immediately behind segmental concrete units.

c. Fill. Soil or aggregate placed in, behind, or below the wall will be referred to as fill.

d. Reinforced Fill. Soil which is placed and compacted within the neat line volume of reinforcement as outlined on the plans.

e. Retained Fill. Soil which is placed and compacted behind the reinforced fill.

f. Reinforcement. Reinforcement shall consist of a geogrid or a geotextile product manufactured for use as reinforcing. Reinforcement shall not include steel products.

g. Long Term Design Strength. The long-term design strength (LTDS) is:

$LTDS = T_{ult} / (RF_D * RF_{ID} * RF_{CR})$

where:

T_{ult} is the ultimate strength
RF_D is the reduction factor for chemical and biological durability
RF_{ID} is the reduction factor for installation damage
RF_{CR} is the reduction factor for creep

1.3 SUBMITTALS

SD-02 Shop Drawings: G

All submittals shall be finished in accordance with Specification 01330.

1.3.1 Shop Drawings

The fabrication and installation drawings shall be submitted. The shop drawings shall include all items described under paragraph SEGMENTAL RETAINING WALL DESIGN.

1.3.2 SD-026 Test Reports: G

As-built drawings for the leveling pad and first course of block shall be provided for review and approval prior to completing remainder of wall. The drawing shall depict at a minimum the location of the front face of the bottom course of block.

1.3.3 SD-03 Manufacturer's and Product Data: G

The Excavation Subcontractor shall submit descriptive technical data on the blocks, wall caps, masonry adhesive, reinforcement, and geotextile filter materials. The submittal shall include all material properties specified under paragraph PRODUCTS. The submittal shall also include a copy of any standard manufacturer's warranties for the products.

1.3.4 SD-01 Preconstruction Submittal

Qualifications: G

The Excavation Subcontractor shall provide documentation showing that the installer and supplier meet the qualifications listed.

1.3.5 SD-06 Test Reports Reinforcement

Testing: G

The Excavation Subcontractor shall submit testing data specific to the blocks and reinforcement to be supplied.

The shear strength between blocks shall be established in accordance with NCMA SRWU-2.

The connection strength between the blocks and the reinforcement shall be established in accordance with NCMA SRWU-1. If the FHWA design method is used, the modifications in FHWA SA-96-071 shall be implemented.

The coefficient for direct shear of the reinforcement on a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with ASTM D5321.

The coefficient of interaction for pullout resistance of the reinforcement in a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with GSI GRI GG5 or GSI GRI GT6.

1.3.6 SD-05 Design Data

Calculations: G

The Excavation Subcontractor shall submit a calculation of the long-term design strength for the reinforcement in accordance with the NCMA or FHWA design method. The

ultimate strength or index strength shall be based on the minimum average roll value tensile strength of the product using the wide width strength test in ASTM D4595 or the single rib test in GSI GRI GG1. The calculation shall itemize each reduction factor and include backup data to justify each reduction factor.

The Excavation Subcontractor shall submit design calculations, including computer output data and program documentation. The calculations shall include all items described under PARAGRAPH: SEGMENTAL RETAINING WALL DESIGN.

1.3.7 SD-04 Samples: G

Segmental Concrete Units

The Excavation Subcontractor shall submit two samples of each proposed block. Each sample shall be typical of the size, texture, color, and finish.

Reinforcement

The Excavation Subcontractor shall submit samples of each type of reinforcement. The samples shall be labeled and have a minimum size of 8 by 10 inches. Geogrid shall include at least 2 apertures (3 junctions) in each direction.

1.3.8 SD-07 Certificates: G

Reinforcement

The Excavation Subcontractor shall submit an affidavit certifying that the reinforcement meets the project specifications. The affidavit shall be signed by an official authorized to certify on behalf of the manufacturer and shall be accompanied by a mill certificate that verifies physical properties were tested during manufacturing and lists the manufacturer's quality control testing. [If the affidavit is dated after award of the contract and/or is not specific to the project, the supplier shall attach a statement certifying that the affidavit addressed to the wholesale company is representative of the material supplied.] The documents shall include a statement confirming that all purchased resin used to produce reinforcement is virgin resin. The mill certificate shall include the tensile strength tested in accordance with either ASTM D4595 or GSI GRI GG1.

1.4 SEGMENTAL RETAINING WALL DESIGN

The Excavation Subcontractor shall complete all stability analyses in accordance with either the NCMA TR-127A, or the Federal Highway Administration/AASHTO method detailed in FHWA SA-96-071. Only one method shall be followed for the complete design, including reinforcement design strength, layout, stability calculations, and seismic effects. The segmental retaining wall system shall be designed under the direction of, and be signed by, a professional engineer registered in the Commonwealth of Massachusetts.

1.4.1 Design

Calculations shall include determination of long-term design strength of reinforcement specific to this project in accordance with the NCMA TR-127A or FHWA SA-96-071. Calculations shall include analysis of all failure modes listed in the NCMA TR-127A. Design calculations shall include a clear outline of material properties and assumptions. The Excavation Subcontractor shall use the following soil parameters for site soils and water elevation for stability analysis, and shall select additional soil parameters as required to complete the analysis.

Soil	**Total Unit Weight (pcf)**	**Internal Friction Angle (degree)**
Existing Fill (Retained Soil) (above el. 973)	104	26
Dense Sand and Gravel (Till) (Foundation Soil) (below el. 973)	130	38

It can be anticipated that the reinforcement anchorage system, if required, will be installed within the foundation soil.

1.4.1.1 External Stability Design Requirements

As a minimum requirement, the length of the reinforcing at the base of the wall shall not be less than 0.7 times the total height of the blocks unless a reinforcement anchoring system is utilized.

1.4.1.2 Seismic Design Requirements

The Excavation Subcontractor shall complete the seismic stability analysis in accordance with NCMA TR-160 or FHWA SA-96-071. The pseudo-acceleration value with a 10 percent probability of exceedance in 50 years (referred to as the A value by NCMA and FHWA) shall be assumed as 0.04g.

1.4.1.3 Hydraulic Requirements

The Excavation Subcontractor shall consider hydraulic forces acting on the wall. The following hydraulic data shall be considered in the design:

1.4.1.4 Surcharge Requirements

The Excavation Subcontractor shall consider surcharge loads from construction equipment or highway traffic, whichever is more critical.

Table 02832-1

Hydraulic Design Parameters[1]

Frequency	Q (cfs)	El (ft)	V (fps)	Shear (lb/sf)	Flow Depth (ft)
1-yr	1670	973.52	6.8	0.76	6.52
1.5-yr	1761	973.68	6.95	0.79	6.68
2-yr	2047	974.15	7.41	0.87	7.18
5-yr	3336	976.21	8.71	1.2	9.21
10-yr	4375	977.83	9.25	1.48	10.83
50-yr	7239	981.74	10.16	2	14.74
100-yr	8721	983.27	10.72	2.29	16.27

Note: [1]Hydraulic design parameters based on HEC-RAS profile developed by Weston Solutions, Inc., September 2003, taken at Station 522+79. Parameters and values derived are for the area immediately downstream of the Elm Street Bridge based on proposed Phase 2 design improvements.

1.4.1.5 Global Stability Design Requirements

The long-term design strength of the reinforcement layers shall equal or exceed the requirements determined by the Excavation Subcontractor.

1.4.2 Layout

Shop drawings shall reflect all information needed to fabricate and erect the walls including the leveling pad elevations; the shape and dimensions of wall elements; the number, size, type, and details of the soil reinforcing system and anchorage; and identification of areas requiring coping. The design and layout of the internal reinforcement shall be subject to the following:

a. All features indicated in the contract documents shall be incorporated in the final design and construction.

b. The leveling pad elevations may vary, but shall be no higher than the elevation shown on the Drawings.

c. Each reinforcement level shall run as continuous as practical throughout the profile unless a reinforcement anchoring system is utilized. If a geotextile filter is present, the reinforcement shall be laid out so that interference with the geotextile is minimized.

d. Any reinforcement not placed with the machine direction as the design reinforcement direction shall be identified on the shop drawings.

e. Reinforcement attached to the wall facing shall not combine geogrid and geotextile, nor products from different manufacturers, within one wall. The number of reinforcement products shall be limited to avoid confusion in placement.

1.5 EXCAVATION SUBCONTRACTOR QUALIFICATIONS

The job foreman or the company directly responsible for the wall installation shall have completed a minimum of 10 segmental concrete retaining wall projects.

1.6 SUPPLIER QUALIFICATIONS

Suppliers of segmental retaining wall system components shall have demonstrated experience in the supply of similar size and types of segmental retaining walls on previous projects.

1.7 MANUFACTURER'S REPRESENTATIVE

The Excavation Subcontractor shall have a qualified and experienced representative from the block or reinforcement manufacturer available on an as-needed basis during the wall construction. The representative shall visit the site for consultation as requested by the Engineer.

1.8 DELIVERY, STORAGE, AND HANDLING

The Excavation Subcontractor shall check products upon delivery to assure that the proper material has been received and is undamaged. For geosynthetics, the guidelines presented in ASTM D4873 shall be followed.

1.8.1 Segmental Concrete Units and Wall Caps

The Excavation Subcontractor shall protect blocks from damage and exposure to cement, paint, excessive mud, and like materials. The Excavation Subcontractor shall check materials upon delivery to assure that the block dimensions are within the tolerances specified.

1.8.2 Geosynthetic Labeling

Each roll shall be labeled with the manufacturer's name, product identification, roll dimensions, lot number, and date manufactured.

1.8.3 Geosynthetic Handling

Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a forklift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.

1.8.4 Geosynthetic Storage

Geosynthetics shall be protected from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade the physical properties. If stored outdoors, the rolls shall be elevated from the ground surface. Geosynthetics, except for extruded grids, shall be protected with an opaque waterproof cover. Geosynthetics shall be delivered to the site in a dry and undamaged condition. Geotextiles shall not be exposed to direct sunlight for more than 7 days.

PART 2 PRODUCTS

2.1 SEGMENTAL CONCRETE UNITS

2.1.1 Architectural Requirements

a. Face Color – earth tone – subject to approval of the Engineer.

b. Face Texture - split face.

c. Face Appearance - Straight, subject to approval of the Engineer.

d. Batter - Blocks shall be engaged to the block below by use of keys, lips, pins, clips, or other reliable mechanism to provide a consistent wall batter between 1H:8V and 1H:12V.

e. Block Size - a minimum of 0.66 square feet of face area, and minimum 6-inch height.

f. Bond Configuration - No bond configuration is required for straight face blocks. Beveled or sculptured face blocks shall be designed to stack with a half-bond (joints located at midpoint of vertically adjacent blocks). The block edges shall be finished so that vertical joints are flush.

2.1.2 Structural Requirements

The blocks shall be manufactured to the requirements of ASTM C1372, except for the following modifications:

a. Minimum 28-day compressive strength of 4500 psi, based on net area in accordance with ASTM C140.

b. A maximum moisture absorption rate of 5% in accordance with ASTM C140.

c. The minimum oven dry density of concrete shall be 125 pcf.

d. The blocks shall provide a minimum of 80 pounds per square foot of wall face area (determined without void filling).

e. For freeze-thaw durability tested in accordance with ASTM C1262, specimens shall comply with either of the following: (1) the weight loss of each of 5

specimens after 100 cycles shall not exceed 1 %; or (2) the weight loss of each of 5 specimens after 150 cycles shall not exceed 1.5 %. [when tested in a 3% saline solution: (1) the weight loss of each of 5 specimens after 40 cycles shall not exceed 1%; or (2) the weight loss of 4 out of 5 specimens after 50 cycles shall not exceed 1.5%.]

2.1.3 Wall Caps

Segmental concrete block units shall be placed as caps on top of all segmental concrete retaining walls. The cap blocks shall have a color and texture on exposed faces to match that of the other blocks and meet the requirements for the other blocks except that the minimum height shall be 3 inches. Each cap block shall have abutting edges saw cut or formed to provide tight, flush, abutting joints with no gaps in the joints when placed end to end in the alignment shown on the drawings.

2.2 REINFORCEMENT

2.2.1 Geogrid Reinforcement

Geogrid shall be a geosynthetic manufactured for reinforcement applications. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport, and installation. The geogrid shall be manufactured with 100% virgin resin consisting of polyethylene, polypropylene, or polyester, and with a maximum of 5% in-plant regrind material. Polyester resin shall have a minimum molecular weight of 25,000 and a carboxyl end group number less than 30. Polyethylene and polypropylene shall be stabilized with long-term antioxidants.

2.2.2 Geotextile Reinforcement

Geotextile shall be a pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95% by weight polyethylene, polypropylene, or polyesters. The geotextile shall be manufactured with 100% virgin resin, and with a maximum of 5% in-plant regrind material. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. Polyester resin shall have a minimum molecular weight of 20,000 and a carboxyl end group number less than 50. Polyethylene and polypropylene shall be stabilized with long-term antioxidants.

For survivability during installation, and in addition to installation damage used in calculating the long-term design strength, the geotextile shall meet the minimum requirements in AASHTO M 288 Class 1, and shall have a minimum mass per unit area of 8 oz/sy.

2.2.3 Reinforcement Properties

Reinforcement properties shall be determined by the Excavation Subcontractor in accordance with the design procedure and shall include the parameters listed in Table 02832-2.

Table 02832-2

Reinforcement Properties

Property	**Test Designation**
Long-Term Design Strength (lb/inch)	NCMA TR-127A, Method A
Permittivity (geotextiles) (per second)	ASTM D4491
UV Resistance (percent after 500 hours)	ASTM D4355
Coefficient of Interaction for Pullout	GSI GRI GG5 or GSI GRI GT6
Coefficient for Direct Shear (degrees)	ASTM D5321

2.2.3.1 Long-Term Design Strength

The long-term design strength shall be based on reduction factors for installation damage and durability that are applicable to the fill that will be used. Minimum reduction factors for durability include 1.1 for polyethylene and polypropylene geosynthetics, 1.15 for coated polyester geogrids, and 1.6 for polyester geotextiles. The creep reduction factor must be consistent with the test procedure used for determining the ultimate strength.

2.2.3.2 Connection Strength

The connection strength, as listed below, between the blocks and reinforcement shall be determined in accordance with NCMA SRWU-1 and the design calculation:

Minimum Peak Connection Strength (lb/ft)
Friction Angle for Peak Connection Strength (degrees)
Minimum Service State Connection Strength (lb/ft)
Friction Angle for Service State Connection Strength (degrees)

2.3 GEOTEXTILE FILTER

Geotextiles used as filters shall meet the requirements specified in Table 02832-3 unless otherwise determined in accordance with the design procedure. The property values (except for AOS) represent minimum average roll values (MARV) in the weakest principal direction. For survivability during installation, the geotextile shall meet the minimum requirements in AASHTO M 288 Class 2, and shall have a minimum mass per unit area of 8 oz/sy.

Table 02832-3

Geotextile Physical Properties

Property	Test Requirement	Test Method
Grab Tensile (lb)	160	ASTM D4632
Apparent Opening Size (U.S. Sieve)	70 – 100	ASTM D4751
Permittivity (sec^{-1})	0.5	ASTM D4491

2.4 SOILS AND AGGREGATES

All material placed as fill shall consist of material classified by ASTM D2487 as GW, GP, GC, GM, SP, SM, or SW. The material shall be free of ice; snow; frozen earth; trash; debris; sod; roots; organic matter; contamination from hazardous, toxic, or radiological substances; or stones larger than 3 inches in any dimension. All materials shall be of a character and quality satisfactory for the purpose intended and as specified below, or as otherwise determined from the design procedure.

a. Drainage Aggregate shall meet the requirements of 3/4-inch crushed stone unless otherwise recommended in the design report.

b. Reinforced Fill—Soil placed in the reinforced fill zone shall consist of MHD M2.01.7 Dense Graded Crushed Stone unless otherwise recommended in the design report.

c. Retained Fill—Soil placed in the retained fill zone shall meet the requirements of MHD M2.01.7 Dense Graded Crushed Stone unless otherwise recommended in the design report.

2.5 MASONRY ADHESIVE

The masonry adhesive shall meet the following requirements:

a. ASTM C920, Type S, Grade NS, Class 25.
b. Expected 30-year life.
c. Meet the recommendations of the block manufacturer.

2.6 DRAINAGE PIPE

The drainage pipe shall be corrugated polyethylene pipe meeting requirements of AASHTO M 252 with a smooth interior and watertight joints meeting the requirements of AASHTO M294 or MP7 and ASTM D3212.

PART 3 EXECUTION

3.1 CLASSIFICATION OF SOIL MATERIALS

Classification of soil materials shall be performed by the Excavation Subcontractor in accordance with ASTM D2488.

3.2 EARTHWORK

The leveling pad and reinforced fill zone shall bear on undisturbed native soils, or acceptably placed and compacted fill. In the event that it is necessary to remove material to a depth greater than specified or to place fill below the leveling pad not otherwise provided for in the contract, the Engineer shall be notified prior to work.

3.2.1 Excavation

Native soil and fill material shall be excavated as required for leveling pad dimensions and reinforcement placement. Due to the potential to encounter very dense and stable soils at elevations above the elevation of the bottom course of block, the Excavation Subcontractor shall excavate to the top of the dense stratum and notify the Engineer when excavation to this stratum has been completed. It is anticipated, based on geotechnical test borings, that dense and stable soils will be encountered at about elevation 975. Based on available data, it is not possible to determine the location of the top of the dense and stable stratum as it approaches the river. If the dense and stable stratum is encountered at or near the face of the proposed wall, sufficient material shall be excavated to allow for the installation of short lengths of reinforcement and the approved reinforcement anchoring system. If an acceptable anchorage system cannot be provided, the Excavation Subcontractor shall excavate the entire area to the elevation required to install the lowest level of reinforcement.

It is not the intent of this work to excavate all native material within the footprint of the reinforced zone.

Excavations shall not undermine the footings of the adjacent bridge wingwall. If the base of a footing is encountered, work should be terminated in the vicinity of the footing and the Engineer notified.

3.3 LEVELING PAD

3.3.1 Leveling Pad Subgrade

The subgrade below the leveling pad shall be compacted using at least 3 passes of a vibratory plate compactor or roller with an operating weight not less than 450 pounds. If the subgrade pumps, bleeds water, or cracks during compaction, the Engineer shall be notified and the subgrade undercut, compacted, and backfilled with structural fill, which shall be compacted to a dense and stable condition.

3.3.2 Concrete Leveling Pad

Tolerances in screening shall be sufficient to place the blocks directly on the leveling pad without mortar, pointing, or leveling course between the blocks and leveling pad. Concrete shall have a compressive strength of no less than 3,000 psi.

3.4 BLOCK INSTALLATION

The wall system components shall be constructed in accordance with the wall supplier's recommendations and construction manual. Damaged blocks shall not be incorporated in the retaining wall.

a. Block placement shall begin at the lowest leveling pad elevation. The blocks shall be in full contact with the leveling pad. Each course of block shall be placed sequentially for the entire wall alignment to maintain a level working platform for layout of reinforcement and placement of fill.

b. The grade and alignment of the first course shall be surveyed and the results furnished to the Engineer prior to placing the second course. Survey control for alignment shall include a string line, offset from a base line, or suitable provisions that can be reproduced for quality assurance.

c. The blocks shall be placed with the edges in tight contact. The vertical joints shall be maintained with a minimum 4-inch overlap on the underlying block. Coping required to keep block alignment shall be done with a full depth saw cut. No splitting shall be allowed.

d. Stacking of blocks prior to filling any lower course of block with drainage aggregate will not be allowed.

e. Cap units and the top (or top two) courses of blocks (if exposed above pavement grade) shall be joined using masonry adhesive. Care shall be taken to keep adhesive from coming into contact with the face of wall units.

3.5 REINFORCEMENT INSTALLATION

a. Before placing reinforcement, the subgrade or subsequent lift of fill shall be compacted and graded level with the top of the blocks. The surface shall be smooth and free of windrows, sheepsfoot impressions, and rocks.

b. Reinforcement shall be placed at the elevations and to the extent shown on the approved shop drawing submittal. Reinforcement shall be oriented with the design strength axis perpendicular to the wall face. Each segment of reinforcement shall be continuous. Spliced connections between shorter pieces of reinforcement will not be allowed. Reinforcement strips shall be placed immediately next to adjacent strips to provide 100% coverage.

c. The reinforcement shall be installed in tension. The reinforcement shall be pulled taut and anchored with staples or stakes prior to placing the overlying lift of fill. The tension shall be uniform along the length of the wall and consistent between layers.

d. All reinforcement shall be 100% covered by soil so that reinforcement panels do not contact in overlapping areas. Where the wall bends, a veneer of fill shall be placed to a nominal thickness of 3 inches to separate overlapping reinforcement.

e. If dense and stable soils are encountered below elevation 975 in close proximity to the rear face of the wall, the Excavation Subcontractor shall excavate this material to the extent required to install the approved reinforcement anchorage system. If an acceptable anchorage system cannot be provided, the Excavation Subcontractor shall excavate the entire area to the elevation required to install the lowest level of reinforcement.

3.6 FILL PLACEMENT

a. Fill placement, including drainage aggregate, shall be completed to the top of each course of facing blocks prior to stacking the subsequent course of blocks.

b. Reinforced fill shall be placed from the wall back toward the fill area to ensure that the reinforcement remains taut. Fill shall be placed, spread, and compacted in such manner that minimizes the development of wrinkles in or movement of the reinforcement.

c. A minimum fill thickness of 6 inches is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Tracked equipment shall not turn within the reinforced fill zone to prevent tracks from displacing the fill and damaging the reinforcement. Construction equipment shall not be operated directly upon the reinforcement as part of the planned construction sequence. Rubber tired equipment may operate directly on the reinforcement if the Excavation Subcontractor submits information documenting testing of equipment operating on a similar geogrid product on similar soils, the travel is infrequent, equipment travels slow, turning is minimized, and no damage or displacement to the reinforcement is observed.

d. Drainage aggregate shall be placed and tamped directly behind, between, and within the cells of the facing units. Compaction of the drainage aggregate shall be achieved by at least two passes on each lift with a vibratory plate compactor. Care shall be taken not to contact or chip the blocks with the compactor. Aggregate placed within the block cores and recesses shall be compacted by hand tamping and rodding.

e. At the end of each day and to the extent practicable, the Excavation Subcontractor shall slope the last lift of fill away from the wall in a manner that will allow drainage and direct runoff away from the wall face.

3.7 COMPACTION

Fill shall not be placed on surfaces that contain mud, frost, organic soils, fill soils that have not met compaction requirements, or where the Contracting Officer determines that unsatisfactory material remains in or under the fill. Fill shall be spread and compacted in lifts not exceeding the height of one course of blocks.

3.7.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557. The maximum density is hereafter abbreviated as the "Modified Proctor" value.

3.7.2 Moisture Control

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced fill zone. Moisture content of cohesive soils shall be adjusted at the borrow source before placement. Adding water directly to the reinforced fill zone shall only be conducted under conditions where the soil has sufficient porosity and capillarity to provide uniform moisture throughout the fill during compaction.

3.7.3 Compaction

Reinforced and retained fill shall be compacted to 95% of the Modified Proctor Density. Care shall be exercised in the compaction process to avoid misalignment of the facing blocks. Heavy compaction equipment (including vibratory drum rollers) shall not be used within 3 feet from the wall face.

3.8 SOIL TESTING

3.8.1 General

All testing expenses shall be the Excavation Subcontractor's responsibility. Prior to sampling and testing the work, testing laboratories shall be inspected and approved in accordance with Section 01451, CONTRACTOR QUALITY CONTROL. The Contracting Officer reserves the right to direct the location and select the material for samples to be tested and to direct where and when moisture-density tests shall be performed. Nuclear density testing equipment shall be used in general accordance with ASTM D 2922.

3.8.2 Transmittal

The Contracting Officer shall be informed of test results daily for direction on corrective action required. Draft copies of field testing results shall be furnished to the Contracting Officer on a frequent and regular basis, as directed.

3.8.3 Corrective Action

Tests of materials which do not meet the contract requirements (failing test) will not be counted as part of the required testing. Each such failing test must be retaken at the same location as the failing test was taken. If testing indicates material does not meet the contract requirements, the material represented by the failing test shall not be placed in the contract work or shall be recompacted or removed. The quantity of material represented by the failing test shall be determined by the Contracting Officer up to the quantity represented by the testing frequency. The Excavation Subcontractor may increase testing frequency in the vicinity of a failing test in order to reduce removal requirements, as approved by the Contracting Officer. Such increases in testing frequency shall be at the Excavation Subcontractor's expense and at no additional cost to the Government.

3.8.4 Testing Schedule

Moisture-Density Relations (ASTM D1557)
In-Place Densities (ASTM D1556 or ASTM D2922)
Sieve Analysis (ASTM C136 or D421/422)

3.9 REINFORCEMENT TESTING

All testing expenses shall be the Excavation Subcontractor's responsibility. Testing shall be performed by a commercial testing laboratory selected by the Excavation Subcontractor and approved by the Engineer or performed by the Excavation Subcontractor if approved by the Engineer.

Table 02832-4

Reinforcement Testing

Property	Test Designation	Frequency
Wide Width Strip Tensile Strength or Single Rib Tensile Strength	ASTM D4595	400,000 sf
	GSI GRI GG1	400,000 sf

ASTM D4595 shall be modified for geogrids considering recommendations in GSI GRI GG6; and the tensile strength shall be expressed on a unit length basis by substituting n*a for Ws, where:

Ws = specimen width (inches)
n = number of ribs in the sample (must be a whole number)
a = nominal rib spacing for the product tested (inches)

At least one test shall be performed on material delivered to the project.

3.10 DRAINAGE PIPE

Drain pipe shall be placed as indicated on the drawings. Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. The interior of the pipe shall be kept clean from soil and debris; and open ends shall be temporarily capped as necessary.

3.11 CONSTRUCTION TOLERANCES

a. Plan location of the front face of the first course of block shall be as shown on the Drawings. The location of soldier pile H1 is critical. The front face of the first course of block shall be flush with the front face of soldier pile H1 unless otherwise approved by the Engineer. If the location of soldier pile H1 is off-set from the design location, the Excavation Subcontractor shall provide a plan indicating the methods to be used to ensure the top course of block will be installed at the plan location shown on the Drawings.

b. Horizontal: The top of wall shall be within 3 inches of the plan location.

c. Vertical: The top of wall elevations shall be within 0.1 feet above to 0.1 feet below the prescribed top of wall elevations shown on the drawings.

d. Plumbness and Alignment: The wall batter and alignment offset measured, as deviation from a straight edge shall be within plus or minus 1.25 inches per 10 feet section. The wall batter may vary between 1H:8V and 1H:12V. However the front face of the first (bottom) course of block and the back face of the top course of block shall be as shown on the Drawings. These control lines shall not be violated unless approved by the Engineer.

e. Block Defects: The blocks will be accepted on the basis of tolerances specified in ASTM C1372.

f. Block Gaps: Gaps between adjacent blocks shall not exceed 1/8 inches.

3.12 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations. Disturbed or displaced blocks shall be removed and replaced to conform to all requirements of this section. Damaged material shall not be incorporated into the wall. Upon completion of wall erection, the Excavation Subcontractor shall clean the wall face to remove any loose soil deposits or stains.

END OF SECTION

SECTION 02930

BANK REVEGETATION
PHASE 2

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes specifications for restoring the riverbank vegetation at the Project Site subsequent to excavation, including those portions of the bank extending from the upper limit of riverbank rock armor to the limit of excavation. Riverbank restoration methods include using a hard structure riverbank toe (e.g., rock armor, concrete blocks) with revegetation treatments occurring upslope to the limit of remediation. As shown on the Project Drawings, sheet pile retaining walls may be installed at the limit of remediation of the riverbank.

Revegetation treatments shall follow the completion of topsoiling and final bank grading, and shall include seeding, installation of erosion control blankets; and planting of trees and shrubs. Specific areas to receive revegetation treatments are indicated on the Project Drawings. This work shall include furnishing all necessary Submittals for plants, seeds, 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 as implemented under the direction of the Engineer.

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

Statement of qualifications (resume) for the personnel directing and overseeing the riverbank planting work.

G. The restoration specialist's qualifications must include at least 5 years of experience in the design and implementation of similar revegetation projects and an under graduate degree in a science pertinent to the proposed restoration work (e.g., hydrology, botany, biology, civil engineering).

SD-03 Product Data

Equipment:

A listing of equipment to be used for the revegetation operations.

Delivery

Delivery schedules.

Plant Establishment Period

Calendar time period for the plant establishment periods. When there are more than one establishment period, the boundaries of the planted areas 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.

Invasive Plant Control; G

The Invasive Plant Control Plan shall describe the sequence of treatment work, species to be treated, and estimated date of implementation during the Plant Establishment Period. If a herbicide is to be used, the plan shall include the herbicide trade name, U.S. Environmental Protection Agency (EPA) registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied, the name and state license number of the state-certified applicator, Spill Prevention Control and Countermeasures Plan, and proposed weather conditions needed for application.

Invasive plants that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems. Invasive plants referred to in this document are those plants listed in a *Guide to Invasive Plants in Massachusetts* (Weatherbee, P.B., P. Somers, and T. Simmons. 1998. Massachusetts Division of Fisheries and Wildlife.) [1]

SD-07 Certificates

Plant Material
Seed Mix
Erosion Control Blankets
Mulch Mats
Fertilizer

[1] Weatherbee, P.B., P. Somers, and T. Simmons. 1998. *A Guide to Invasive Plants in Massachusetts*. Massachusetts Division of Fisheries and Wildlife.

Compost
Herbicide

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements shall be provided. 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 and Mulch Mats: Technical specifications and product performance data.

d. Fertilizer: Chemical analysis and composition percent.

e. Compost: Specifications on source of compost, maximum particle size, pH, percent organic matter, conductivity, and total nitrogen content. Document compost compliance with EPA Chapter 40 CFR Part 503.

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.

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, and erosion control blankets. 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 by weight of each species in the mix, and place (i.e., state) of origin 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).

1.4.1.3 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical, physical, and/or biological analyses. In lieu of containers, soil amendments may be furnished in bulk. The specifications listed in Subsection 1.2 SUBMITTALS shall be provided for bulk deliveries. For the purpose of this specification, soil amendments shall include fertilizer, lime, microbial inoculants, and compost. Natural peat products will not be accepted as a soil amendment.

1.4.1.4 Herbicide Material

Herbicide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

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.

Plant material shall be well-shaped; vigorous and healthy with a well-branched root system; and free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement, or abrasion. Plant material shall exhibit typical form of branch to height ratio, and shall meet the caliper or height measurements specified. 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. Plant material shall show new fibrous roots, and the root mass shall retain its shape when removed from the container. Plant material with broken or cracked balls, or broken containers, shall be rejected.

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. Plant material shall not be stored longer than 30 days and shall be watered as necessary to promote survival during the storage period. 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, and erosion control blankets, and mulch mats 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 plants shall not be more than 30 days.

1.5 WARRANTY

Each responsible Subcontractor shall warrantee installed plant materials and seeded areas against defects, including death, disease, unsatisfactory growth or coverage, herbivory damage, settling of soils that adversely affects grading and site stability, and dislodgement or failure of erosion control blankets, 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 Subsection 3.6, 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 warranty period, the Planting Subcontractor shall replace the dead, dying, or unhealthy installed plants as directed by the Engineer. When such plant material is determined to be dead or unhealthy in accordance with Subsection 2.1, Plant Material, and Subsection 3.6, 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 tree and shrub plants shall be derived from stock native to the Northeast (i.e., New England and New York), and shall consist of nursery-grown stock obtained from Northeast nurseries. Seed mixes shall be derived from stock native to New England, New York, New Jersey, or Pennsylvania.

All plant shall be the species specified. Botanical and common names of supplied plants shall conform to *The Vascular Plants of Massachusetts: A County Checklist*[2].

2.1.2 Plant Species

Table 02930-1 contains a list of the tree, shrub, and vine species to be installed where plant material is specified. Each of the indicated species is native to the Project Area/region and has demonstrated high survivorship rates based on revegetation results upstream of the project area. The species listed shall be installed in two planting zones along the riverbank (i.e., Upper and Lower Planting Zones). These zones have been delineated by various flood

[2] 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.

stage elevations, which vary by station. Table 02930-2 shows the elevations to be utilized for each Planting Zone for the various station ranges.

For a given bank revegetation planting area, approximately 75% of the tree species planted shall be primary species and 25% shall be associate species. Shrub species shall be equally distributed and planted in clumps, except for red-osier dogwood (*Comus sericea*), which shall be planted in a band just upslope of the riverbank armor. Planting details are further described in the Project Drawings.

Table 02930-1
Tree, Shrub, and Vine Species To Be Used for Plantings

Elevation Zones	Trees	Shrubs
Bank Armor	No Tree Plantings	No Shrub Plantings
Lower Bank	Primary: Black willow (*Salix nigra*) and silver maple (*Acer saccharinum*). Associates: Eastern cottonwood (*Populus deltoids*) and box elder (*Acer negundo*).	Band: Red osier dogwood (*Cornus sericea*). Clumps: Silky dogwood (*Cornus amomum*), northern arrowwood (*Viburnum dentatum*), choke cherry (*Prunus virginiana*), and winterberry holly (*Ilex verticillata*).
Upper Bank	Primary: Eastern cottonwood and box elder. Associates: Black willow and silver maple.	Clumps: Northern arrowwood, winterberry holly, silky dogwood, and choke cherry.

Table 02930-2
Range of Elevations for the Lower and Upper Bank Planting Zones By Stations

Station	Lower Bank Elevation Zone (ft)	Upper Bank Elevation Zone (ft)
523+00 to 524+50	974 to 976	>976
524+50 to 526+00	973 to 975	>975
526+00 to 527+75	972 to 974	>974

2.1.3 Types, Sizes, and Planting Distribution

Table 02930-3 provides details on the plant sizes and installation densities and distribution for the bank revegetation areas. Planting distributions are further detailed on the Project Drawings.

Table 02930-2
Types, Sizes, Installation Densities, and Distribution for Plantings Installed In Bank Revegetation Areas

Specification	Trees	Shrubs
Plant Type	Container-Grown (1-gal pot minimum)	Container-Grown (1-gal pot minimum)
Size at Planting	4 to 6 feet in height	2 to 3 feet in height
Planting Distribution	Unevenly-spaced rows parallel to river, with plants placed approximately 8 feet on center.	All shrubs except red-osier dogwood shall be installed in unevenly-spaced rows within 15-ft x 60-ft oblong clumps. Shrubs within clumps are to be spaced on 4-ft centers. Clumps spaced 40 feet apart (minimum). Red-osier dogwoods shall be installed in the lower bank area near the top of the rock armor. Dogwoods shall be spaced 6-ft on center.
Overall Planting Density	700 plants per acre	730 plants per acre

2.1.4 Plant Schedule

The plant schedule shall provide botanical 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 prior written request and approval from the Engineer.

2.1.6 Quality

Well-shaped, well-grown, vigorous 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.

2.1.7 Growing Conditions

Plant material shall be well-adapted to the growing conditions of the Project area. Plant material shall be grown under climatic conditions similar to those at the Project area.

2.1.8 Shipment and Handling

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.

2.1.9 Growth Form

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.

2.1.10 Plant Material Size

Plant material shall be furnished in sizes indicated. 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 galvanized welded wire (19-gauge minimum) that can be wrapped around the tree stem and last for at least 5 years. Protectors shall be 20 inches tall to offer adequate protection for the size of the tree being planted and have a mesh size of ½ to 1 inch. The tree protector shall be installed 5 to 6 inches from the stem to prevent constriction and bark damage and to allow for proper air circulation. As shown on the Project Drawings, a stem protector shall be used with each installed tree protector to prevent scraping of bark against the tree protector during wind-caused movement.

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. Weed content shall be less than 0.40% by weight and shall be free of all invasive plant seeds as listed by the State of Massachusetts.[3]

2.3.2 Seed Mixture

The seed mixture for permanent seeding of the bank revegetation areas shall be proportioned by weight as follows:

[3] Invasive plant seeds are those plants listed in Weatherbee, P.B., P. Somers, and T. Simmons. 1998. *A Guide to Invasive Plants in Massachusetts*. Massachusetts Division of Fisheries and Wildlife.

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	6
Polygonum pensylvanicum	Pennsylvania smartweed	6
Asclepias syriaca	common milkweed	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

If needed for temporary erosion control, a nurse crop of annual rye-grass (*Lolium temulentum*), or equivalent as approved by the Engineer, can be added to the seed mixture. The annual rye-grass shall be added as a separate item to the seed mixture and shall not exceed 10% by weight of the seed mixture applied (0.1 lb/1.000 square feet).

2.4 SOIL AMENDMENTS

2.4.1 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 commercial grade, 12-month minimum slow release, tablet 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, amount, and application 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, as determined from the previously specified soil test prior to the topsoil being spread.

2.4.2 Compost

Compost shall be free of weed seeds and comply with EPA Chapter 40 CFR Part 503 (e.g., pathogens, metals). The compost shall have a loose and granular texture with the following characteristics or properties: 30 – 60% organic matter content, 0.5 – 2.0% total Kjeldahl nitrogen content, 6.5 – 7.5 pH, maximum particle size less than 1 inch, and a conductivity of less than 5 mhos/cm.

2.5 MULCH MAT

A mulch mat shall be placed around all installed plants at the time of installation. The intent is to allow the mulch mat to provide weed and soil moisture control to benefit the installed plant. The mulch mat shall be made of 100% biodegradable material such as coir, wood fiber, or wool, and have a functional longevity of 2 to 3 years. The mulch mat size shall be 20-inch by 20-inch and conform to the following minimum specifications:

ASTM Standards	Specification
D3776 Mass/Unit Area Minimum	1.1 lbs/sy
D1777 Minimum Thickness	0.25 inches

2.6 WATER

Unless otherwise directed, watering of planted stock and seed shall be the responsibility of the General Contractor. 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 bank revegetation 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:

Product	Specification
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	Specification
D3776 Mass/Unit Area Minimum	10.0 oz/sy
D1777 Minimum Thickness	0.35 inches
D4595 Minimum Tensile Strength	220 x 140 lb/ft
D4595 Maximum Elongation	34% x 20%
D4491 Flow Velocities, Short Term	10 ft./sec (minimum)
Maximum Permissible Shear Stress	2.0 lb/sq. ft. (minimum)

2.7.2 Blanket Anchors

Ground anchors used to secure extended-use erosion control blankets shall consist of biodegradable stakes with a minimum length of 6 inches (152 mm). Stakes shall be made of starch- or corn-based material with added polymers for strength, and shall be designed to last a minimum of 9 months before degrading. The shaft of the stake shall have a minimum diameter of ¾ inches and shall have serrations for holding it securely in the soil, and the top of the stake shall have a hook or a head large enough to effectively secure the blanket’s netting to the soil surface.

2.8 HERBICIDE

The use of herbicides shall be allowed during the Construction and Plant Establishment Periods covered under this specification to control invasive plants within planting areas or within 25 ft of planting areas. The herbicide shall be EPA registered and approved.

PART 3 EXECUTION

3.1 GENERAL

Planting 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 foreman experienced in the specified work 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, and other tasks required to perform the work as specified herein.

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, installing erosion control blankets, planting trees and shrubs, installing mulch mats, and maintaining herbaceous cover and plantings 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.

Planting associated with bank revegetation shall be performed only during periods when beneficial results can be obtained, based on seasonal and climatic factors and plant species. When drought, excessive moisture, frozen ground, or other unsatisfactory conditions prevail, the planting work shall be stopped as directed by the Engineer. When special conditions warrant a variance to the planting or seeding operations, proposed revised planting/seeding times shall be submitted in writing to the Engineer for approval prior to implementation. Seasons for planting, unless otherwise directed, shall be within the following dates:

- Spring: April 1 to June 1
- Fall: September 1 to November 15

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 the 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.[4] 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.

If needed for temporary erosion control, a nurse crop of annual rye-grass, or equivalent as approved by the Engineer, can be added to the seed mixture. The annual rye-grass shall be added as a separate item to the seed mixture and shall not exceed 10% by weight of the seed mixture applied (0.1 lb/1,000 square feet).

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 Installation of Erosion Control Blankets.

3.2.3.2 Watering

When seed is applied during the growing season, watering shall start immediately after the seeded areas are covered with an erosion control blanket. Then, for the remainder of the

[4] If a nurse crop of annual rye-grass or equivalent is used, it shall be added in addition to the 1 lb/1,000 sf seed mixture that is applied.

growing season, water shall be applied to supplement natural rainfall at a rate sufficient to ensure moist soil conditions and vigorous root growth and development (approximately 1 inch of water per week). Erosion, excessive runoff, and puddling shall be prevented during supplemental watering.

When seed is applied during the winter or dormant seasons, 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 2.7, EROSION CONTROL BLANKETS, and they 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 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 with the Engineer. 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. Prior to excavating the pit, the erosion control blanket shall be carefully and cleanly cut in an "X" pattern, and the flaps laid back to allow excavation of the pit and placement of the plant.

3.2.5.6 Setting Plant Material

Plant material shall be set plumb and straight, and held in position until sufficient backfill has been firmly placed around root system or ball.

3.2.5.7 Fertilizing

The 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 at the manufacturer's specified rate corresponding with the plant size and soil requirements as determined at the time of planting.

3.2.5.8 Backfill Soil Mixture

The backfill soil mixture may be topsoil or a mix of topsoil and 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. If compost is utilized, the backfill material shall contain 25 to 30% compost.

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 ¼ 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 among the roots. Air pockets shall be removed from around the root system, and root-to-soil contact shall be provided. As shown on the Project Drawings, a soil berm shall be constructed on the downslope side of the installed plant to help retain moisture. The erosion blanket shall be folded back over the soil berm in a position similar to prior to plant installation.

Unless the soil is saturated, the General Contractor shall water plants within 24 hours of backfilling until completely saturated to provide needed moisture and to remove air pockets.

3.2.5.10 Mulch Mats

After backfilling and watering have been completed, mulch mats shall be placed around the base of each installed plant as shown on Project Drawings. A gap of 1 to 2 inches shall be present between the mulch mat and the plant trunk or stem. Metal staples (8-inch minimum length) shall be used to secure the mulch mat to the riverbank while maintaining the structural integrity of the soil berm around the plant.

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 or just below the soil surface) up the stem for a minimum length of 20 inches. The protector shall be wrapped around the tree and be spaced 5 to 6 inches (minimum) from the stem to provide sufficient space for stem growth, and allow for air circulation along the stem. As shown on the Project Drawings, stem protectors shall be installed on each tree protector to prevent scraping of bark against the tree protector. A minimum of three metal staples (minimum length of 8 inches) shall be used to secure the tree protector to the riverbank.

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 Pruning

Pruning shall be conducted only if directed by the Engineer and shall 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 nor the leader removed, nor shall the leader be pruned or “topped off.” Wound dressing or pruning paint shall not be applied.

3.3 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 shall include watering, adjusting settled plants, pruning dead or broken branches, and adjusting tree protectors. Areas at the base of the installed plants shall be kept free of weeds, grass, and other undesired vegetation.

3.4 INVASIVE PLANT CONTROL

Assessments of invasive plants will be conducted to determine the extent of any invasive plants within the Project Area. These assessments will be conducted in the spring of the initial planting year and in following years during the specified Plant Establishment Period. If invasive plants are identified within the Project Area, an invasive plant control plan shall be developed and furnished to the Engineer for approval 2 weeks prior to beginning control treatments. The control plan shall include those items listed in Subsection 1.2 SUBMITTALS. Depending on the time of plant installation and the invasive species present and extent, control work could begin prior to plant installation work. Implementation of invasive plant control measures shall be as specified in the specifications or as otherwise deemed necessary to achieve the project goals.

3.4.1 Technical Representative

A technical representative experienced in invasive plant identification and control shall be present at all meetings and control treatment activities to monitor and assess control efforts. This representative must be experienced in the identification of invasive plants typically encountered in New England and in the proper application of appropriate herbicides.

3.4.2 Implementation

Physical, biological, and chemical methods may be employed as part of the invasive plant control plan. If herbicides are used, topical application of herbicide is preferred over foliar application. For the topical application of a herbicide, wicks, brushes, protective cones, or other contact devices shall be utilized to apply herbicide directly to the cut stems and plant material. Where appropriate, foliar application shall utilize low-pressure sprayers with a concentrated distribution pattern or protective cones to apply the herbicides directly to target invasive plant.

A state-certified applicator shall apply required herbicides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the herbicide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer that meets local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying herbicide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

Throughout the herbicide application activities, care shall be exercised near planted trees and shrubs, as well as non-invasive volunteer to avoid contact and subsequent plant damage. For example, if invasive plants are tall with a large leaf area then these plants shall be cut to reduce the areal extent spraying so that drift effects are minimized.

All biomass that results from any invasive plant cutting and trimming shall be removed and disposed of appropriately following such activities. If a herbicide is applied, the biomass shall also be appropriately removed based on the effectiveness of the herbicide application.

A 48-hour advance notification to the Engineer shall be provided prior to all invasive plant control work.

3.5 RESTORATION AND CLEANUP

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 Cleanup

Excess and waste material, including empty plant containers and other unused items, shall be removed from the bank restoration and material storage areas and shall be disposed or recycled off-site. 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 at least one full growing season (Spring planting shall last 16 months and fall planting shall last 12 months).

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(s) shall be furnished for the Plant Establishment Period(s). In the event that there is more than one Plant Establishment Period (due to a phased planting schedule), the boundaries of the planted and seeded area covered for each period shall be described and marked on a print of the Project Drawings and provided to the Engineer. The Plant Establishment Period shall be modified for inclement weather shutdown 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; adjusting erosion control blanket coverage at the base of plants; pruning dead or

broken branches; maintaining plant material labels; watering; reseeding bare or sparsely seeded areas; controlling invasive plants; and removing and replacing unhealthy, diseased, or dead plants.

Seeded areas will be accepted only upon attainment of 100% coverage of a reasonably thick, uniform stand of the grasses and herbaceous plants from the specified seed mix and from natural regeneration of non-invasive plant growth. Coverage does not include the areas under trees and shrubs covered by mulch or those areas where hard structures are present (e.g., rock swales, outfalls).

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 by natural precipitation and augmented by irrigation, as required. Runoff, erosion, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. The General Contractor shall maintain a rain gage at the project site and shall record precipitation data during the Plant Establishment Period.

3.6.2.2 Weeding

The 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, while keeping the base of the plant stem at the proper height above the ground surface. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown shall require replanting in accordance with Subsection 3.2.5, Installation of 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 during 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% of the crown has died. This condition shall be determined by scraping an area

1/16-inch square (maximum) on a branch to determine if there is a green cambium layer below the bark. 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.

3.6.2.6 Replacement Plant Material

Unless otherwise directed, new plant material shall be provided for replacement of unhealthy or dead plants in accordance with Subsection 1.5, WARRANTY. Replacement plant material in the revegetation areas shall be installed in accordance with Subsection 3.2.5, Installation of Plants. 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.

3.6.2.7 Invasive Plant Control

Treatment for invasive plants shall be in accordance with Subsection 3.4.2, Implementation and the Invasive Species Control Plan.

3.6.2.8 Maintenance Instructions

Written instructions shall be furnished to the Engineer including drawings and other necessary information for year-round care of the installed plant material. Instructions shall include when and where maintenance should occur and the procedures for plant material replacement.

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 AND REGISTER:

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 Excavation Subcontractor shall contact the Detail Officer at (413) 448-9723 with sufficient lead-time. The General Contractor shall be responsible for payment of police details for traffic control.

2.1.1 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.

2.1.2 Police Powers

Officers shall have police powers granted by the proper authorities and shall wear an exposed badge.

2.1.3 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 Excavation Subcontractor 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.

2.1.4 Other Personnel

The Excavation Subcontractor shall arrange for a Sheriff or other approved personnel to be used for flagging construction traffic when uniform police officers are not available upon approval of the Engineer.

PART 3 EXECUTION

3.1 ALLOWABLE TRAFFIC ROUTES

For materials being staged at the contaminated materials staging areas on GE Property and materials being disposed of at the OPCA, the primary disposal route from areas of excavation off High Street shall be north along Elm Street across the Elm Street Bridge into parcel I8-24-1, along access roads constructed adjacent to parcels on the north (or west) side of the river between Lyman Street and Elm Street, to Lyman Street from parcel I9-4-201, to the GE owned Lyman Street parking lot and through the GE facility.

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. 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.
- The preferred route on the north (or west) side of the river shall be via Cove Street. However, as necessary, deliveries are permitted to enter the site through Root Place or Lyman Street via parcel I9-4-201.

END OF SECTION

DIVISION 11—EQUIPMENT

SECTION 11800

WATER 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 excavations, ongoing dewatering of excavations, 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 Excavation Subcontractor shall use the existing on-site treatment plant for treatment of all wastewater generated as part of the remediation work to be conducted in the Phase 1/Phase 2 Transition Area (approximately Station 514+00 to the upstream limit of the Elm Street Bridge) and the next portion of Phase 2 to be contracted (from Station 522+29 to Station 527+60).

Currently, electrical power service (3-phase, 440-volt, 600-amp) is provided by the Western Massachusetts Electric Co. by underground conduit 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 excavation dewatering operations in the event that the storage capacity of the treatment system will be exceeded or if there is an interruption in electrical service.

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 dewatering system to the treatment system and other components of the dewatering system as required by Specification Section 02300, "EARTHWORK."

1.2 SYSTEM DESCRIPTION

The existing temporary water treatment system shall be operated and maintained to comply with the design conditions described below. The Excavation Subcontractor 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 300,000-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. The system discharge shall be limited to 500 gallons per minute as stated in the NPDES Permit Exclusion issued by the EPA to the General Contractor under Phase 1 of the 1.5-Mile Removal Action (EPA, September 2002, 07-0095). Increases in the effluent discharge flow rate shall need Government approval. Effluent shall be discharged at an approved location upstream of the temporary dam at Station 514+00 at a point as close as possible to the inlet of the gravity bypass system to minimize the recontamination of restored areas above the dam. Discharge shall be such that it does not result in scouring of the riverbed or riverbank. The 12-inch-diameter steel pipe sleeve previously installed by the General Contractor under the haul road for the treatment system discharge line shall continue to be used by the Excavation Subcontractor. Alternatively, a new location can be proposed by the Excavation Subcontractor for approval by the General Contractor. The Excavation Subcontractor shall relocate the discharge pipe if a new location is approved.

The Excavation Subcontractor shall man the temporary water treatment system with competent personnel while all dewatering and/or treatment processes are in progress. Therefore, the temporary water treatment system shall be manned 24 hours a day or as necessary if water treatment and/or dewatering processes are completed outside the hours of the normal work day. Security provisions shall be provided as applicable by the Excavation Subcontractor to ensure that any incidents concerning the temporary water treatment system will be addressed in a timely fashion according to the NPDES Permit Exclusion (EPA, September 2002, 07-0095) granted for the project.

1.2.1 Influent Characteristics

Treatment plant influent will be generated from dewatering of the excavation located within the river, decontamination of site materials and equipment, contaminated run-on 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 dewatering. Initially, the Excavation Subcontractor will pump down river water within the excavation before the start of excavation until 6 inches of water remain in the area. During this initial dewatering, water will be discharged directly back to the river. The final 6 inches of water and all subsequent water pumped from the excavation will then be pumped to the treatment system. Water that must be pumped by the Excavation Subcontractor from an active excavation following a flooding event will either be pumped directly back to the river until 6 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 is dewatered, the Excavation Subcontractor will be required to maintain the excavation 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 the Transition Area of Phase 2 is occurring. Under certain conditions, pumping of the active work areas may be temporarily discontinued following review and approval by the General Contractor.

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 by truck in batches.

The existing treatment system was designed to accommodate a design flow of 400 gallons per minute, minimum available head of 0 feet, and intermittent flow conditions. These parameters are also applicable to the Phase 1/Phase 2 Transition Area and the portion of work to be conducted between Station 522+29 and Station 527+60.

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 riverbed in the first reach. Additional data generated during operation of the treatment plant during Phase 1 construction are available and can be provided to the Excavation Subcontractor upon request. 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 1.

1.2.2 Design Criteria

Water treatment system effluent shall meet the discharge limits included in Table 11800-1. These discharge criteria have been approved by the U.S. Environmental Protection Agency (EPA) in the NPDES Permit Exclusion (EPA, September 2002, 07-0095) granted for this project. All criteria established under the NPDES Permit Exclusion shall be followed accordingly.

1.2.3 System Location

The location of the water treatment system, including the discharge piping and the Modutanks, shall not change for the Transition Area.

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 AND REGISTER:

SD-10 Operations and Maintenance Data

Operations and Maintenance Manual Addenda; G.

Excavation Subcontractor shall submit for government approval addenda to the Operations and Maintenance Plan as appropriate to cover any new equipment installed or any proposed changes in operation or maintenance procedures. A draft of an addenda shall be submitted before delivery of any new equipment to the site.

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 Excavation Subcontractor shall verify all dimensions in the field and shall advise the General Contractor 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 Excavation Subcontractor shall select unit processes, as appropriate, to meet the discharge criteria. The Excavation Subcontractor 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 have previously been brought to the site by the General Contractor, and no additional work is anticipated.

2.2.4 Secondary Containment

Secondary containment (previously constructed by the General Contractor) is required for the entire treatment system. This includes but is not limited to the two 150,000-gallon Modutanks, sand filters, activated carbon units, storage tanks or equalization basins, pumps, and piping. Sump(s) and pumps shall be provided by the Excavation Subcontractor 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 will perform sampling and analysis, for all compounds listed in Table 11800-1 on a monthly basis. 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, will be developed by the General Contractor and submitted to the Government by the 28th of each month. The Government shall be notified immediately of any exceedances. Appropriate corrective actions as determined in consultation with the Government and the General Contractor shall be implemented by the Excavation Subcontractor.

All sampling, analysis, and quality control procedures shall follow the project QAPP as referenced in the specifications.

3.3 SYSTEM STARTUP

Although continuous operation of the treatment system from the Phase 1/Phase 2 Transition Area to the portion of Phase 2 from Stations 522+29 to 527+60 is anticipated, if the treatment system is shut down for an extended period following the completion of the Transition Phase, the Excavation Subcontractor shall restart the treatment system. The Excavation Subcontractor shall 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 2-week period. The Excavation Subcontractor shall provide 48-hour notice of system startup 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 Excavation Subcontractor 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 of off-site in accordance with ARARs and applicable regulations.

3.5 SPILL RESPONSE AND DISCHARGE CONTROL

The Excavation Subcontractor shall provide on-site 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 Excavation Subcontractor shall follow the Spill and Discharge Control Plan developed for Phase 1 construction activities.

The Excavation Subcontractor 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 provided as Attachment 1 to these specifications. The Excavation Subcontractor 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 Excavation Subcontractor's operations. The Excavation Subcontractor 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 Excavation Subcontractor 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 Excavation Subcontractor.

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 EPA, the MDEP 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 No.	Discharge Criterion (ppb)	Pore Water (Influent) Quality[a] (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 Hydrocarbons (PAHs)	Various	100	1 J, 11 U[b]
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
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

Table 11800-1

Performance Specification For Treatment System Discharge Criteria And Porewater Quality (Continued)

Compound	CAS Registry No.	Discharge Criterion (ppb)	Pore Water (Influent) Quality[a] (ppb)
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	500	**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.

[a] Highest results of three pore water samples collected from the reach of the river to be excavated in Phase 1.

[b] Based on highest results for individual PAH compounds.

END OF SECTION