TOWN OF GLASTONBURY

INVITATION TO BID

BID #	ITEM	DATE & TIME REQUIRED
GL-2018-11	Blackledge Dam Removal and River Restoration	January 9, 2018 11:00 A.M.

The Town of Glastonbury will receive Sealed Bids, in duplicate, for removal of the Blackledge Dam and associated river restoration. Bids will be received only at the Office of the Purchasing Agent, Town Hall (second level), 2155 Main Street, Glastonbury, CT 06033, Attention: Mary F. Visone, Purchasing Agent, until January 9, 2018 at 11:00 A.M. (local time), at which time they will be publicly opened and read aloud. No late bids will be accepted.

The Town reserves the right to waive informalities or reject any or all bids when said action is deemed to be in the best interests of the Town.

Bid Forms, Plans, and Specifications may be obtained at no cost from the Town's website at www.glastonbury-ct.gov or the State's website at www.das.state.ct.us.

Prevailing Wages: The contractor must comply with Section 31-53 of the Connecticut General Statutes, as amended, including annual adjustments in prevailing wages.

The Town of Glastonbury is an Affirmative Action/Equal Opportunity Employer. Minority / Women / Disadvantaged Business Enterprises are encouraged to bid.

Mary F. Visone
Purchasing Agent

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1. Sealed bids (**one original and one copy**) on the attached Bid Forms will be received at the Office of the Purchasing Agent, Town Hall, 2155 Main Street, Glastonbury, Connecticut 06033 (second level). At the designated time of opening, they will be publicly opened, read, recorded and placed on file.

2. Whenever it is deemed to be in the best interest of the Town, the Town Manager, Purchasing Agent or designated representative shall waive informalities in any and all bids. The right is reserved to reject any bid when such action is deemed to be in the best interest of the Town of Glastonbury.

3. The award will be on the basis of bid total cost from a qualified, responsible, and responsive Bidder unless otherwise specified. The bid total cost shall be arrived at by the mathematical calculation of the sum of all lump sum items listed on the bid form. In the event that the Town finds computational errors in a respondent's bid proposal, the bid total cost shall be recalculated by the Town based on the unit prices contained in the bid proposal.

4. Bids will be carefully evaluated as to conformance with stated specifications.

5. The envelope enclosing your bid should be clearly marked by bid number, time of bid opening, and date.

6. If a bid involves any exception from stated specifications, they must be clearly noted as exceptions, underlined, and attached to the bid.

7. The Bid Documents contain the provisions required for the requested item. Information obtained from an officer, agent, or employee of the Town or any other person shall not affect the risks or obligations assumed by the Bidder or relieve him/her from fulfilling any of the conditions of the bid.

8. Each Bidder is held responsible for the examination and/or to have acquainted themselves with any conditions at the job site which would affect their work before submitting a bid. Failure to meet this criteria shall not relieve the Bidder of the responsibility of completing the bid without extra cost to the Town of Glastonbury.

9. Any bid may be withdrawn prior to the above-scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No Bidder may withdraw a bid within sixty (60) days after the actual date of the opening thereof. Should there be reasons why a bid cannot be awarded within the specified period, the time may be extended by mutual agreement between the Town and the Bidder.

10. Each bid must be accompanied by a bid bond payable to the Town for ten percent (10%) of the total amount of the bid. The bid bond of the successful Bidder will be retained until the payment bond and performance bond have been executed and approved, after which it will be returned. A certified check may be used in lieu of a bid bond. The Town of Glastonbury will not be liable for the accrual of any interest on any certified check submitted. Cashier's checks will not be accepted.

11. A 100% Performance and Payment Bond is required of the successful bidder. This bond shall cover all aspects of the specification and shall be delivered to the Purchasing Agent prior to the issuance of a purchase order. The Performance and Payment Bond will be returned upon the delivery and acceptance of the bid items.

12. The Bidder agrees and warrants that, in the submission of this sealed Bid, they will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religion, national origin, sex, or physical disability including, but not limited to blindness, unless it is shown by such Bidder that such disability prevents performance of that which must be done to successfully fulfill the terms of this sealed Bid or in any manner which is prohibited by the laws of the United States or the State of Connecticut: and further agrees to provide the Human Relations Commission with such information requested by the Commission concerning the employment practices and procedures of the Bidder. An Affirmative Action Statement will be required by the successful Bidder.

13. Bidder agrees to comply with all of the latest Federal and State Safety Standards and Regulations and certifies that all work required in this bid will conform to and comply with said standards and regulations. Bidder further agrees to indemnify and hold harmless the Town for all damages assessed against the Town as a result of Bidder's failure to comply with said standards and/or regulations.

14. All correspondence regarding any purchase made by the Town of Glastonbury shall reference the Town's purchase order number. Each shipping container shall clearly indicate both Town purchase order number and item number.

15. Bidder is required to review the Town of Glastonbury Code of Ethics adopted July 8, 2003 and effective August 1, 2003 and revised October 29, 2013 and effective November 8, 2013. Bidder shall acknowledge that they have reviewed the document in the area provided on the bid/proposal response page (BP). The selected Bidder will also be required to complete and sign an Acknowledgement Form prior to award. The Code of Ethics and the Consultant Acknowledgement Form can be accessed at the Town of Glastonbury website at **www.glastonbury-ct.gov**. Upon entering the website scroll down to click on **Bids & Proposals Icon** which will bring you to the links for the **Code of Ethics** and the **Acknowledgement Form**. If the Bidder does not have access to the internet, a copy of these documents can be obtained through the Purchasing Department at the address listed within this bid/proposal.

16. **Non-Resident Contractors:** (if applicable)
Upon award, the Town is required to report names of nonresident (out of state) Contractors to the State of Connecticut, Department of Revenue Services (DRS) to ensure that Employment Taxes and other applicable taxes are being paid by Contractors. **A single surety bond for 5% of the entire contract price is required to be filed with DRS by any unverified non-resident prime or general contractor (if awarded) where the contract price for the project is $250,000 or more.** The contractor will be required to promptly furnish to the Town a copy of the **Form AU-968 - Certificate of Compliance** issued by the State of Connecticut, DRS. See State of Connecticut **Notice SN 2012 (2).**

17. Bidder shall include on a sheet(s) attached to its proposal a complete disclosure of all past and pending mediation, arbitration, and litigation cases that the bidder or its principals (regardless of their place of employment) have been involved in for the most recent five years. Please include a statement of the issues in dispute and their resolution. Acceptability of Bidder based upon this disclosure shall lie solely with the Town.

18. Bidder or its principals, regardless of their place of employment, shall not have been convicted of, nor entered any plea of guilty, or nolo contendere, or otherwise have been found civilly liable or criminally responsible for any criminal offense or civil action. Bidder shall not be in violation of any State or local ethics standards or other offenses arising out of the submission of bids or proposals, or performance of work on public works projects or contracts.

19. It is the responsibility of the bidder to check the Town's website before submitting bid for addendums posted prior to bid opening.

20. **State Prevailing Wage Rates:**

Respondents shall comply with State Statutes concerning Employment and Labor Practices, if applicable, and Section 31-53 of the Connecticut General Statutes, as amended (Prevailing Wages). Wage Rate Determination for this project from the State of Connecticut is included in the Bid Documents. Certified payrolls for site labor shall be submitted weekly to the Town's Representative or his designee on the correct State of Connecticut form. The Town reserves the right to, without prior notice, audit payroll checks given to workers on site in order to ascertain that wages and fringe benefits are being paid as required by the State of Connecticut. Please make special note of the State requirement to adjust wage and fringe benefit rates on each July 1st following the original published rates.

NOTE that respondent is to include in its proposal all costs required by such annual increases in the PREVAILING RATES. NO escalation clauses are to be included in the respondent's proposal and NO escalation clauses will be in the Contract Agreement. Respondent is to anticipate any future increases and include these costs in the proposal response.

Contractor's invoices will not be paid if certified payrolls are incomplete, incorrect, or not received in a timely manner.

All Apprentices must be registered with the State of Connecticut and their number shall not exceed the number allowed by law. Otherwise, all workers must be paid at least the Journeyman rate listed, including benefits.

OSHA SAFETY AND HEALTH CERTIFICATION

Effective July 1, 2009: Any Mechanic, Laborer, or Worker who performs work in a classification listed on the prevailing wage rate schedule on any public works project covered under C.G.S. Section 31-53, both on site and on or in the public building, must have completed a federal OSHA Safety and Health course within the last five (5) years.

21. Each bid shall also include a description of at least one (1) dam removal project completed by the Bidder within the last three (3) years with references to demonstrate successful experience with dam removal projects of similar complexity. Similar project should include stream channel restoration.

22. **Compliance with Town Ordinance Prohibiting Natural Gas Waste & Oil Waste From Natural Gas Extraction Activities or Oil Extraction Activities:** If this bid is for the construction, repair, or maintenance of Town-owned and/or maintained roads or real property within the Town related to either (a) the purchase or acquisition of materials by the Town to be used to construct, repair, or maintain any Town-owned and/or maintained road or real property within the Town or (b) the performance of services for the Town to construct, repair, or maintain any Town-owned and/or maintained road or real property within the Town, the Bidder shall provide the following signed statement to the Town in its bid response, which shall be a certification under penalty of perjury by the Bidder:

> "The undersigned Bidder, _____, hereby submits a bid for materials, equipment and/or services for the Town of Glastonbury. The bid is for bid documents titled _____."

The undersigned Bidder hereby certifies under penalty of perjury that in connection with the bid and, if it is awarded the purchase order or contract by the Town, in connection with any purchase order or contract: (a) no materials containing natural gas waste or oil waste from natural gas extraction activities or oil extraction activities shall be provided to the Town or shall be used in providing any services to the Town by the undersigned Bidder or any contractor, sub-contractor, or agent of the undersigned Bidder; (b) nor will the undersigned Bidder or any contractor, sub-contractor, or agent of the undersigned Bidder apply any natural gas waste or oil waste from natural gas extraction activities or oil extraction activities to any publicly-owned and/or maintained road or real property within the Town of Glastonbury in performing its obligations under the purchase order or contract.

The undersigned Bidder hereby agrees and acknowledges that this requirement shall be a term of the purchase order or contract, if it is awarded the purchase order or contract by the Town, and any breach of this provision shall be a breach of the purchase order or contract."

IMPORTANT: Failure to comply with general rules may result in disqualification of the Bidder.

NOTE: Any technical questions regarding this bid shall be made in writing (email acceptable) and directed to Daniel A. Pennington, P.E., Town Engineer/Manager of Physical Services, 2155 Main Street, PO Box 6523, Glastonbury, CT 06033; daniel.pennington@glastonbury-ct.gov; Telephone (860) 652-7736 between the hours of 8:00 a.m. – 4:30 p.m. For administrative questions concerning this bid/proposal, please contact Mary F. Visone, Purchasing Agent, at (860) 652-7588 or email the Purchasing Department at purchasing@glastonbury-ct.gov. All questions, answers, and/or addenda, as applicable, will be posted on the Town's website at www.glastonbury-ct.gov. (Upon entering the website scroll down to click on Bids & Proposals Icon, then scroll down page to see the active bid table. You must click the Bid Title to view all bid details and document links). The request must be received at least five (5) business days prior to the advertised response deadline**. It is the respondent's responsibility to check the website for addenda prior to submission of any bid/proposal.**

01.00 WORKMANSHIP, MATERIALS AND EMPLOYEES

01.01 Wherever in this contract the word “Engineer” is used, it shall be understood as referring to the Town Engineer/Manager of Physical Services of the Town of Glastonbury, acting personally or through any assistants, duly authorized.

01.02 The entire work described herein shall be completed in accordance with the plans and specifications to the full intent and meaning of the same. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and material shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

01.03 The wording “furnish”, “install”, “construct”, “furnish and install”, or any similar terms, unless specifically noted to the contrary, shall include all labor, materials, water, tools, equipment, light, power, transportation, and any other services required for the completion of the work.

01.04 The Contractor shall at all times enforce strict discipline and good order among his employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned to him.

02.00 SUPERINTENDENT

02.01 The Contractor shall keep on the work during its progress, in the absence of the Contractor, a competent Superintendent. The Superintendent shall be acceptable to the Engineer and shall fully represent the Contractor. All directions given to the Superintendent shall be binding as if given to the Contractor.

03.00 PRECONSTRUCTION MEETING

03.01 A Preconstruction Meeting will be held with the Engineer, Contractor, and any private utility company prior to commencing any work. The Engineer shall arrange the meeting based on a mutually convenient time.

04.00 PERMITS

04.01 Other than local permits and State/Federal environmental regulatory permits, all permits, licenses, and fees required for the performance of the Contract work shall be secured and paid for by the Contractor.

05.00 PROPERTY ACCESS

05.01 The Contractor shall take all proper precautions to protect from injury or unnecessary interference, and provide proper means of access to abutting property where the existing access is cut off by the Contractor. Means of work site access are clearly defined on the contract drawings.

05.02 The Contractor shall take all proper precautions to protect persons from injury or unnecessary inconvenience and leave an unobstructed way along the public and private places for travelers, vehicles, and access to hydrants.

05.03 The Contractor shall make arrangements with the adjacent property owners for such trespass as he may reasonably anticipate in the performance of the work. All such arrangements shall be reported, in writing, to the Engineer.

06.00 PROTECTION OF THE PUBLIC AND OF WORK AND PROPERTY

06.01 The Contractor shall continuously maintain adequate protection of all work from damage, and shall take all reasonable precautions to protect the Town from injury or loss arising in connection with the Contract.

06.02 The Contractor shall adequately protect adjacent private and public property as provided by law and the Contract Documents.

06.03 The Contractor shall make good any damage, injury, or loss of his work and to the property of the Town resulting from lack of reasonable protective precautions.

07.00 EXISTING IMPROVEMENTS

07.01 The Contractor shall conduct his work so as to minimize damage to existing improvements. Except where specifically stated otherwise in the specifications, drawings, or as directed by the Engineer, it will be the responsibility of the Contractor to restore to their original condition, as near as practical, all improvements on public or private property. This shall include:

a. Property within and adjacent to the side of installation such as shrubs, walks, driveways, fences, etc.

b. Utility mains, ducts, poles, and services. The Contractor is hereby notified that utilities, if/where shown on the plans, are at approximate locations. These locations are subject to possible errors in the source of information and errors in transcription. The Contractor shall make certain of the exact location of all mains, ducts, poles, and services prior to excavation.

08.00 SEPARATE CONTRACTS

08.01 The Engineer reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. Wherever work being done by the Town of Glastonbury forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Engineer to secure the completion of the various portions of the work.

09.00 INSPECTION OF WORK

09.01 The Town shall provide sufficient personnel for the inspection of the work.

09.02 The Engineer shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.

09.03 If the specifications or the Engineer's instructions require any work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection and, if the inspection is by another authority other than the Engineer, of the date fixed for such inspection. Inspections by the Engineer shall be made promptly. If any work should be covered up without approval or consent of the Engineer, it must, if required by the Engineer, be uncovered for examination and properly restored at the Contractor's expense.

09.04 Reinspection of any work may be ordered by the Engineer. If such work is found to be in accordance with the Contract Documents, the Town shall pay the cost of reinspection and replacement. If such work is not in accordance with the Contract Documents, the Contractor shall pay such cost.

10.00 RIGHT TO INCREASE OR DECREASE WORK

10.01 The Town shall have the right to increase or decrease the amount of work herein specified as may be required.

11.00 RIGHT OF ENGINEER TO STOP WORK FOR WEATHER CONDITIONS

11.01 Should the work, in the opinion of the Engineer, be in danger by reason of inclemency of weather, or could not be finished in time to prevent such danger, the Contractor shall cease operations upon order of the Engineer, and shall not resume them until ordered to do so by the Engineer when the weather conditions are favorable. The Contractor shall, upon such orders, discontinue work, remove all materials or appliances for or in use upon the work, and place the streets in proper condition for use by the public during the time the work is suspended as herein provided, without cost to the Town.

12.00 CONTRACTOR TO BE RESPONSIBLE FOR IMPERFECT WORK OR MATERIALS

12.01 Any faithful work or imperfect material that may be discovered before the acceptance and the payment of the work shall be corrected upon the order of the Engineer. The acceptance and payment of the work does not in any manner relieve the Contractor of his obligation to construct work in the proper manner and the use of materials herein specified.

13.00 TOWN MAY NOTIFY CONTRACTOR IF WORK IS NOT CARRIED ON SATISFACTORILY

13.01 If, in the opinion of the Engineer, the Contractor is not proceeding with the work at a sufficient rate of progress so as to finish in the time specified, or has abandoned said work, or is not complying with the terms and stipulations or the Contract and specifications, the Engineer may serve notice on the Contractor to adopt such methods as will ensure the completion of the work in the time specified.

13.02 If, within five days after the Engineer has notified the Contractor that his work is not being carried on satisfactorily as before mentioned, the Engineer shall have the right to annul the Contract and manage the work under the direction of the Engineer, or re-let, for the very best interest of the Town as a new contract, the work under said new Contract shall be considered the responsibility of the defaulting Contractor.

13.03 Additional costs incurred over and above the original Contract shall be borne by the Performance Bond.

14.00 DEDUCTIONS FOR UNCORRECTED WORK

14.01 If the Engineer deems it inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made therefor.

14.02 The Contractor shall promptly remove from the premises all materials condemned by the Engineer as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Town, and shall bear the expense of making good all work by other contractors destroyed or damaged by such removal or replacement.

14.03 If the Contractor does not remove such condemned work and materials as promptly as possible after written notice, the Engineer may remove them and store the materials at the expense of the Contractor.

15.00 CLEANING UP

15.01 The Contractor must remove all debris of every description as the work progresses and leave the surroundings in a neat and orderly condition to the satisfaction of the Engineer.

15.02 Upon completion, and before acceptance and final payment, the Contractor shall remove from the site all equipment, forms, surplus material, rubbish, and miscellaneous debris and leave the site in a neat and presentable condition.

16.00 ROYALTIES AND PATENTS

16.01 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Town of Glastonbury harmless from loss on account thereof, except that the Town of Glastonbury shall be responsible for all such loss when a particular manufacturer, product, or process is specified by the Town of Glastonbury.

01.00 NOTICE TO CONTRACTOR

01.01 Intent of Contract: The intent of the Contract is to prescribe a complete work or improvement that the Contractor undertakes to do, in full compliance with the specifications, plans, special provisions, proposal, and Contract. The Contractor shall perform all work in close conformity with the lines, grades, typical cross-sections, dimensions, and other data shown on the plans or as modified by written orders, including the furnishing of all materials, implements, machinery, equipment, tools, supplies, transportation, labor, and all other things necessary to the satisfactory prosecution and completion of the project.

01.02 The Contractor is hereby alerted to the fact that the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 817 (Form 817) and supplements thereto dated January 2017 are the governing specifications and are to be considered part of the Contract Documents. The Form 817 shall not be provided by the Town and any cost associated therewith shall be the responsibility of the Contractor. In case of any discrepancy between the Contract Drawings or Specifications and the Form 817, the matter shall immediately be submitted to the Engineer. The Engineer shall have sole authority in resolving any discrepancies.

01.03 Much time and effort has gone into this project in an effort to minimize impact on trees and adjacent properties. Extreme care shall be taken by the Contractor to honor commitments made by the Town. Prior to doing any work, the Contractor should meet with the Engineer to become familiar with the conditions encountered and commitments made.

01.04 Limitations on work hours are described in Special Conditions, Section 17.02. The Contractor shall understand and strictly comply with these limitations.

02.00 COMMUNICATIONS

02.01 All notices, demands, requests, instructions, approvals, proposals, and claims must be in writing.

02.02 Any notice to, or demand upon, the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement (or at such other office as the Contractor may, from time to time, designate) in a sealed, postage-prepaid envelope or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to such office.

02.03 All papers required to be delivered to the Town shall, unless otherwise specified in writing to the Contractor, be delivered to the Town Engineer/Manager of Physical Services, 2155 Main Street, Glastonbury, CT 06033, and any notice to, or demand upon, the Town shall be delivered at the above address in a sealed, postage-prepaid envelope or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to such office or to such other representatives of the Town, or to such other address as the Town may subsequently specify in writing to the Contractor for such purpose.

02.04 Any such notice shall be deemed to have been given as of the time of actual delivery or, in case of mailing, when the same should have been received in due course of post or, in the case of telegrams, at the time of actual receipt, as the case may be.

03.00 PARTIAL USE OF IMPROVEMENTS

03.01 The Town may, at its election, give notice to the Contractor and place in use those sections of the work that have been completed, inspected, and can be accepted as complying with the Contractor Documents and if, in its opinion, each such section is reasonably safe and fit for the use and accommodation for which it was intended, provided:

a. The use of such sections of the work shall not materially impede the completion of the remainder of the work by the Contractor.

b. The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.

c. The use of such sections shall in no way relieve the Contractor of his liability due to having used defective materials or to poor workmanship.

d. The period of guarantee shall not begin until the date of the final acceptance of all work required under this Contract.

04.00 INSURANCE

04.01 The Bidder shall, at its own expense and cost, obtain and keep in force during the entire duration of the Project or Work the following insurance coverage covering the Bidder and all of its agents, employees and sub-contractors and other providers of services and shall name the **Town of Glastonbury and its employees and agents as an Additional Insured** on a primary and non-contributory basis to the Bidders Commercial General Liability and Automobile Liability policies. **These requirements shall be clearly stated in the remarks section on the Bidders Certificate of Insurance.** Insurance shall be written with insurance carriers approved in the State of Connecticut and with a minimum Best's Rating of A-VIII. In addition, all carriers are subject to approval by the Town. Minimum Limits and requirements are stated below:

a. Worker's Compensation Insurance:

- Statutory Coverage
- Employer's Liability
- $500,000 each accident/$500,000 disease-policy limit/$500,000 disease each employee
- A Waiver of Subrogation shall be provided in favor of the Town of Glastonbury and its employees and agents.

b. Commercial General Liability:

- Including Premises and Operations, Products and Completed Operations, Personal and Advertising Injury, Contractual Liability and Independent Contractors
- Limits of Liability for Bodily Injury and Property Damage
  Each Occurrence: $1,000,000
  Aggregate: $2,000,000
  (The Aggregate Limit shall apply separately to each job.)

- A Waiver of Subrogation shall be provided in favor of the Town of Glastonbury and its employees and agents.

c. Automobile Insurance:

- Including all owned, hired, borrowed, and non-owned vehicle
- Limit of Liability for Bodily Injury and Property Damage Per Accident: $1,000,000
- A Waiver of Subrogation shall be provided in favor of the Town of Glastonbury and its employees and agents.

d. Umbrella of Excess Liability:

- State in the Remarks Section that coverage is to follow form.
- Limit of Liability Each Occurrence $1,000,000 Aggregate $1,000,000

04.02 The Bidder shall direct its Insurer to provide a Certificate of Insurance to the Town before any work is performed. The Contractor shall be responsible to notify the Town **60 days** in advance with written notice of cancellation or non-renewal. The Certificate shall evidence all required coverage. The Bidder shall provide the Town copies of any such insurance policies upon request.

04.03 INDEMNIFICATION: To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Town and its consultants, agents, and employees from and against all claims, damages, losses and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, attorneys and other professionals and court and arbitration costs) to the extent arising out of or resulting from the performance of the Contractor's work, provided that such claim, damage, loss or expense is caused in whole or in part by any negligent act or omission by the Contractor, or breach of its obligations herein or by any person or organization directly or indirectly employed or engaged by the Contractor to perform or furnish either of the services, or anyone for whose acts the Contractor may be liable.

05.00 WORK BY OTHERS

05.01 Private utilities, contractors, developers, or other parties may be expected to be working within the Contract area during this Contract. It shall be the responsibility of the Contractor to coordinate his work with the work being done by others in order that the construction shall proceed in an efficient and logical manner. The Contractor shall have no claim or claims whatever against the Town, the Engineer, or other parties due to delays or other reasons caused by the work by others or his failure to coordinate such work.

06.00 CONTRACTOR'S WORK AND STORAGE AREA

06.01 The Contractor shall contact the Town to determine if any specific locations will be designated, or gain its approval prior to using any area for storage of equipment, materials and trailers during the period of this Contract. The Contractor shall confine his work/storage area to the limits as designated or approved and shall be responsible for the security of the work/storage area. Upon completion of the Contract, the Contractor

shall remove all equipment and materials, except as otherwise specified, and restore the site to its original condition as approved by the Engineer and at no cost to the Town.

07.00 DISPOSAL AREA

07.01 The Tryon Street Bulky Waste Facility will be available to the Contractor, at no charge, for disposal of materials that are accepted at that facility. Waste disposal guidelines for the Bulky Waste facility are published on the Town website at the address shown below. Each bidder shall have reviewed and understand these guidelines prior to submitting a bid for the project.

http://www.glastonbury-ct.gov/Modules/ShowDocument.aspx?documentid=699

Acceptable materials generally include such materials as brush, stumps, demolition materials, and excess excavated earth materials. Unacceptable materials generally include such items as carpet, appliances, upholstered furniture; hazardous wastes such as pesticides, oil based paints and thinners; or other wastes as designated by the State Department of Environmental Protection. Demolition material cannot contain asbestos or other hazardous materials.

The Contractor shall obtain a disposal area for all other unsuitable or surplus materials at no cost to the Town.

08.00 DUST CONTROL

08.01 During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use water or calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed, without additional compensation.

09.00 MAINTENANCE / GUARANTEE PERIOD

09.01 The Contractor shall be held responsible to the Town for maintenance for a minimum of one-year following completion of all work under this Contract with respect to defects, settlements, etc.

10.00 PROTECTION OF EXISTING UTILITIES

10.01 Prior to opening an excavation, effort shall be made to determine whether underground installations, (i.e. sewer, water, fuel, electric lines, etc.) will be encountered and, if so, where such underground installations are located. Before starting any excavation, the Contractor shall submit to the Engineer plans or details showing the proposed method the Contractor will use to support and protect all existing utilities during construction. The furnishing of such plans and details shall not serve to relieve the Contractor of any responsibility for the proper conduct of the work.

10.02 When the excavation approaches the estimated location of such an installation, the exact location shall be determined by careful probing or hand digging, and when it is uncovered, proper supports shall be provided for the existing installation. Utility

companies shall be contacted and advised of proposed work prior to the start of actual excavation.

10.03 There will be no extra payment for submitting plans or details for supporting and protecting all existing utilities during construction.

11.00 TIME FOR COMPLETION/NOTICE TO PROCEED

11.01 **It the Town's intent that substantial completion of the work included in this contract be achieved on or before June 30, 2018.** As such, the Town will schedule a pre-construction meeting immediately upon award of this contract and will issue a Notice to Proceed at this meeting. Contractors who submit a bid for this project shall be prepared to respond to this schedule, and include all costs related to this schedule in their bid.

For the purposes of tis contract, substantial completion shall mean the removal of the dam structure and establishment of stream flow through the newly constructed channel.

Within ten (10) business days after the date of the Notice of Award, the Contractor must provide the appropriate bond and insurance certificates to the Town Purchasing Agent and must be issued a Notice to Proceed/Purchase Order for the Project prior to initiating any work.

12.00 LIQUIDATED DAMAGES

12.01 As actual damages for any delay in completion of the work that the Contractor is required to perform under this Contract are impossible to determine, the Contractor and the Sureties shall be liable for and shall pay to the Town the sum of $750.00 as fixed, agreed and liquidated damages for each calendar day of delay from the above-stipulated completion date of June 30, 2018, or other completion dates as modified in writing by both parties, until such work is satisfactorily completed and accepted.

13.00 SCHEDULE OF DRAWINGS

13.01 The Contractor is hereby alerted that the plan set entitled "Blackledge Dam Removal and River Restoration" including 17 sheets prepared by Milone & MacBroom dated October 31, 2017 is to be considered part of these specifications.

14.00 CHANGES IN THE WORK

14.01 The Town reserves the right to perform portions of the work in connection with these plans and specifications. The reduction in the work to be performed by the Contractor shall be made without invalidating the Contract. Whenever work is done by the Town contiguous to other work covered by this Contract, the Contractor shall provide reasonable opportunity for the execution of the work and shall properly coordinate his work with that of the Town.

15.00 LAYOUT OF WORK

15.01 The Contractor shall provide stake-out of the work in accordance with the plans or as directed by the Engineer. The Contractor shall protect all stakes from damage or destruction and shall be responsible to assure that the grade stakes have not been altered prior to actual construction. The Contractor shall replace grade stakes that have been removed, at no cost to the Town.

16.00 REMOVAL AND STORAGE OF MATERIALS AND STRUCTURES FOUND ON THE WORK

16.01 All salvable materials, including spillway stone, topsoil, gravel, fill materials, etc. and structures, including drainage pipes, catch basins and manhole frames and covers, guide railing, etc. that are not to remain in place or that are not designated for use in the work, shall be carefully removed by the Contractor and delivered to the Town Highway Garage located at 2380 New London Turnpike. All salvable materials removed and stored shall remain the property of the Town. The Engineer shall determine the materials or structures to be salvaged.

17.00 PROSECUTION AND PROGRESS

17.01 ADVANCE NOTICE: The Contractor shall give the Engineer a seven (7) day advance written notice of construction activities that will alter traffic patterns that result in lane shifts, detours, temporary closures of lane(s), permanent closure of lane(s), or lane reductions. This advance notification will allow the Town to publish news releases and/or provide public radio announcements to inform the public of revised traffic patterns or possible traffic delays. Failure of the Contractor to provide such timely notice shall be considered a breach of Contract and will subject the Contractor to stop work orders until such time as the seven-day notice has been satisfied.

17.02 ALLOWABLE HOURS OF OPERATION (WORK PERIOD): Normal work hours for construction shall be 7:00 AM to 5:00 PM, Monday through Friday. Work on weekends or holidays may be permitted by the Town with a minimum of 48 hours notice for the Town to schedule inspection staff.

17.03 CONSTRUCTION PHASING: The Contractor must note the construction phasing outlined in the construction drawings. Deviation from said phasing plan is prohibited without the expressed permission of the Engineer.

The Contractor shall ensure that suitable temporary access is provided to all residential and commercial driveways at all times as described in the Special Provision for Maintenance and Protection of Traffic.

18.00 EXTRA WORK AND RETAINAGE

18.01 Extra and cost plus work shall be governed by applicable Articles of the Form 817.

18.02 The retainage shall be withheld in an amount equal to five (5) percent.

19.00 SUBMITTALS AND MATERIALS TESTING

19.01 The Contractor shall provide source and supply information, sieve analysis, and material samples for gravel subbase, process stone base, modified riprap, and other granular materials to the Town for review and approval. The Town shall retain a lab for testing of these materials as required and shall perform in place compaction testing at no expense to the Contractor.

19.02 Shop drawings/catalog cuts shall be provided by the Contractor for all pre-cast concrete structures, pipes and fittings, erosion control products, seed mixes, and other items to be supplied for review and approval by the Engineer as described in the specifications and the Form 817.

19.03 Mix designs for all bituminous and Portland cement concrete materials shall be provided by the Contractor to the Engineer for review and approval.

19.04 Certified Materials Test Reports and Materials Certificates shall be provided for all products and materials to be provided under this contract as described in these specifications and the Form 817.

TOWN OF GLASTONBURY * 2155 MAIN STREET * GLASTONURY * CT

BID / PROPOSAL NO: GL-2018-11 **DATE DUE:** 01-09-18

DATE ADVERTISED: 12-14-17 **TIME DUE:** 11:00 AM

NAME OF PROJECT: Blackledge Dam Removal and River Restoration

In compliance with this Invitation to Bid, the Bidder hereby proposes to provide goods and/or services as per this solicitation in strict accordance with the Bid Documents, within the time set forth therein, and at the prices submitted with their bid response.

It is the responsibility of the Bidder to clearly mark the outside of the bid envelope with the Bid Number, Date and Time of Bid Opening, and it also **THE RESPONSIBILITY OF THE BIDDER TO CHECK THE TOWN'S WEBSITE BEFORE SUBMITTING BID FOR ADDENDA POSTED PRIOR TO BID OPENING.**

THE BIDDER ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDA AS REQUIRED:

Addendum #1 _____(Initial/Date) Addendum #2 _____(Initial/Date) Addendum #3 _____(Initial/Date)

OTHER ITEMS REQUIRED WITH SUBMISSION OF BID PROPOSAL:

The following bid checklist describes items required for inclusion with the above-referenced bid proposal package. It is provided for the convenience of the bidders and, therefore, should not be assumed to be a complete list.

_____ 1. Included Bid Bond as per Section 10 of the Information for Bidders.

_____ 2. Included Disclosure of Past and Pending Mediation, Arbitration, and Litigation cases against the Bidder or its Principals as per Section 17 of the Information for Bidders.

_____ 3. Included Qualifications Statement as per Section 21 of the Information for Bidders.

_____ 4. Checked Town web site for Addenda and acknowledged Addenda on page BP-1.

_____ 5. Acknowledged Non-Collusion Affidavit on page BP-3.

_____ 6. Acknowledged Code of Ethics on page BP-3.

_____ 7. Included signed statement regarding Compliance with Town Ordinance Prohibiting Natural Gas Waste & Oil Waste From Natural Gas Extraction Activities or Oil Extraction Activities per Section 22 of the Information for Bidders.

_____ 8. Clearly marked envelope with Bid Number, Date, Time of opening, Bidder's Company Name and address.

BIDDER'S NAME: _____

LINE NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT COST
1	Site Preparation	L.S.	1	
2	Maintenance and Protection of Traffic	L.S.	1	
3	Water Control	L.S.	1	
4	Demolition and Removals	L.S.	1	
5	Earthwork	L.S.	1	
6	Bank Slope Treatments	L.S.	1	
7	Instream Features	L.S.	1	
8	Site Restoration	L.S.	1	

TOTAL BID AMOUNT: **$**_____

WRITTEN BID AMOUNT: _____

_____

BIDDER'S NAME: _____

NON-COLLUSION AFFIDAVIT:
By submission of this bid, the Bidder certifies, and in the case of a joint bid each party thereto certifies as to their own organization that this bid has been arrived at independently without consultation, communication, or agreement as to any matter relating to this bid with any other Bidder or with any competitor.

CODE OF ETHICS:
I/We have reviewed a copy of the Town of Glastonbury's Code of Ethics and agree to submit a Consultant Acknowledgement Form if I/We are selected. Yes_____ No_____**

***Bidder is advised that effective August 1, 2003, the Town of Glastonbury cannot consider any bid or proposal where the Bidder has not agreed to the above statement.**

Respectfully submitted:

Type or Print Name of Individual	**Doing Business as (Trade Name)**
Signature of Individual	**Street Address**
Title	**City, State, Zip Code**
Date	**Telephone Number/Fax Number**
E-Mail Address	**SS# or TIN#**

(Seal – If bid is by a Corporation)

Attest

Project: Blackledge River Dam Removal

Minimum Rates and Classifications for Heavy/Highway Construction

ID#: **H** 24197

Connecticut Department of Labor
Wage and Workplace Standards Division

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: GL-2018-11

Project Town: Glastonbury

FAP Number:

State Number:

Project: Blackledge River Dam Removal

CLASSIFICATION	Hourly Rate	Benefits
01) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters. **See Laborers Group 5 and 7**		
1) Boilermaker	33.79	34% + 8.96
1a) Bricklayer, Cement Masons, Cement Finishers, Plasterers, Stone Masons	33.48	30.21
2) Carpenters, Piledrivermen	32.60	25.34

As of: Tuesday, December 12, 2017

Project: Blackledge River Dam Removal

2a) Diver Tenders	32.60	25.34
3) Divers	41.06	25.34
03a) Millwrights	33.14	25.74
4) Painters: (Bridge Construction) Brush, Roller, Blasting (Sand, Water, etc.), Spray	48.55	20.45
4a) Painters: Brush and Roller	32.72	20.45
4b) Painters: Spray Only	35.72	20.45
4c) Painters: Steel Only	34.72	20.45

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4d) Painters: Blast and Spray	35.72	20.45
4e) Painters: Tanks, Tower and Swing	34.72	20.45
5) Electrician (Trade License required: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	39.15	25.17+3% of gross wage
6) Ironworkers: Ornamental, Reinforcing, Structural, and Precast Concrete Erection	35.47	33.39 + a
7) Plumbers (Trade License required: (P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) and Pipefitters (Including HVAC Work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4 G-1, G-2, G-8, G-9)	41.62	30.36
----LABORERS---- -		
8) Group 1: Laborer (Unskilled), Common or General, acetylene burner, concrete specialist	29.25	19.50

9) Group 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators, powdermen	29.50	19.50
10) Group 3: Pipelayers	29.75	19.50
11) Group 4: Jackhammer/Pavement breaker (handheld); mason tenders (cement/concrete), catch basin builders, asphalt rakers, air track operators, block paver, curb setter and forklift operators	29.75	19.50
12) Group 5: Toxic waste removal (non-mechanical systems)	31.25	19.50
13) Group 6: Blasters	31.00	19.50
Group 7: Asbestos/lead removal, non-mechanical systems (does not include leaded joint pipe)	30.25	19.50
Group 8: Traffic control signalmen	16.00	19.50

Project: Blackledge River Dam Removal

Group 9: Hydraulic Drills	29.30	18.90
----LABORERS (TUNNEL CONSTRUCTION, FREE AIR). Shield Drive and Liner Plate Tunnels in Free Air.----		
13a) Miners, Motormen, Mucking Machine Operators, Nozzle Men, Grout Men, Shaft & Tunnel Steel & Rodmen, Shield & Erector, Arm Operator, Cable Tenders	32.22	19.50 + a
13b) Brakemen, Trackmen	31.28	19.50 + a
----CLEANING, CONCRETE AND CAULKING TUNNEL----		
14) Concrete Workers, Form Movers, and Strippers	31.28	19.50 + a
15) Form Erectors	31.60	19.50 + a

Project: Blackledge River Dam Removal

----ROCK SHAFT LINING, CONCRETE, LINING OF SAME AND TUNNEL IN FREE AIR:----		
16) Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers	31.28	19.50 + a
17) Laborers Topside, Cage Tenders, Bellman	31.17	19.50 + a
18) Miners	32.22	19.50 + a
----TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR: ----		
18a) Blaster	38.53	19.50 + a
19) Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders	38.34	19.50 + a

20) Change House Attendants, Powder Watchmen, Top on Iron Bolts	36.41	19.50 + a
21) Mucking Machine Operator	39.11	19.50 + a
----TRUCK DRIVERS----(*see note below)		
Two axle trucks	29.13	22.32 + a
Three axle trucks; two axle ready mix	29.23	22.32 + a
Three axle ready mix	29.28	22.32 + a
Four axle trucks, heavy duty trailer (up to 40 tons)	29.33	22.32 + a

Four axle ready-mix	29.38	22.32 + a
Heavy duty trailer (40 tons and over)	29.58	22.32 + a
Specialized earth moving equipment other than conventional type on-the road trucks and semi-trailer (including Euclids)	29.38	22.32 + a
----POWER EQUIPMENT OPERATORS----		
Group 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over), front end loader (7 cubic yards or over), Work Boat 26 ft. & Over, Tunnel Boring Machines. (Trade License Required)	39.30	24.05 + a
Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver ($3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	38.98	24.05 + a
Group 3: Excavator/Backhoe under 2 cubic yards; Cranes (under 100 ton rated capacity), Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar);Grader Operator; Bulldozer Fine Grade (slopes, shaping, laser or GPS, etc.). (Trade License Required)	38.24	24.05 + a

Project: Blackledge River Dam Removal

Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper)	37.85	24.05 + a
Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Spreader; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell)	37.26	24.05 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	37.26	24.05 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	36.95	24.05 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and Under Mandrel).	36.61	24.05 + a
Group 8: Mechanic, Grease Truck Operator, Hydroblaster, Barrier Mover, Power Stone Spreader; Welder; Work Boat under 26 ft.; Transfer Machine.	36.21	24.05 + a
Group 9: Front End Loader (under 3 cubic yards), Skid Steer Loader regardless of attachments (Bobcat or Similar); Fork Lift, Power Chipper; Landscape Equipment (including hydroseeder).	35.78	24.05 + a

Project: Blackledge River Dam Removal

Group 10: Vibratory Hammer, Ice Machine, Diesel and Air Hammer, etc.	33.74	24.05 + a
Group 11: Conveyor, Earth Roller; Power Pavement Breaker (whiphammer), Robot Demolition Equipment.	33.74	24.05 + a
Group 12: Wellpoint Operator.	33.68	24.05 + a
Group 13: Compressor Battery Operator.	33.10	24.05 + a
Group 14: Elevator Operator; Tow Motor Operator (Solid Tire No Rough Terrain).	31.96	24.05 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	31.55	24.05 + a
Group 16: Maintenance Engineer/Oiler	30.90	24.05 + a

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Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	35.21	24.05 + a
Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (minimum for any job requiring CDL license).	32.79	24.05 + a

**NOTE: SEE BELOW

----LINE CONSTRUCTION----(Railroad Construction and Maintenance)----

20) Lineman, Cable Splicer, Technician	47.14	6.5% + 20.98
21) Heavy Equipment Operator	42.43	6.5% + 18.84
22) Equipment Operator, Tractor Trailer Driver, Material Men	40.07	6.5% + 18.27

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23) Driver Groundmen	25.93	6.5% + 8.53
23a) Truck Driver	35.36	6.5% + 16.88
----LINE CONSTRUCTION----		
24) Driver Groundmen	30.92	6.5% + 9.70
25) Groundmen	22.67	6.5% + 6.20
26) Heavy Equipment Operators	37.10	6.5% + 10.70
27) Linemen, Cable Splicers, Dynamite Men	41.22	6.5% + 12.20

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28) Material Men, Tractor Trailer Drivers, Equipment Operators	35.04	6.5% + 10.45

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Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional $1.25 per hour for truck drivers.*

***Note: Hazardous waste premium $3.00 per hour over classified rate*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra $4.00 premium in addition to the hourly wage rate and benefit contributions:

1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)

2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson

3) Cranes (under 100 ton rated capacity)

Crane with 150 ft. boom (including jib) - $1.50 extra
Crane with 200 ft. boom (including jib) - $2.50 extra
Crane with 250 ft. boom (including jib) - $5.00 extra
Crane with 300 ft. boom (including jib) - $7.00 extra
Crane with 400 ft. boom (including jib) - $10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyperson instructing and supervising the work of each apprentice in a specific trade.

~~Connecticut General Statute Section 31-55a: Annual Adjustments to wage rates by contractors doing state work ~~

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page: www.ct.gov/dol.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

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Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: Tuesday, December 12, 2017

TECHNICAL SPECIFICATIONS – GL-2018-11

INTRODUCTION AND INDEX

The State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 817, Division II and III, as amended, will be the basis of Technical Specifications for this project and any exceptions, additions or deletions as indicated below. Where Division I of Form 817 is referenced, it is so noted in the applicable item in these specifications.

SECTION 01000

INTRODUCTION TO THE TECHNICAL SPECIFICATIONS

PART 1 – GENERAL

1.1 STANDARD SPECIFICATIONS

A. The Standard Specifications as defined below shall apply to the various items of work which constitute the construction contemplated under this Contract except as amended, supplemented or replaced by the Technical Specifications of this Contract and as described herein.

B. Within the Standard and Technical Specifications of this Contract, the definitions provided under item 1.3 Definitions shall apply.

1.2 DEFINITIONS

Standard Specifications
Shall mean the State of Connecticut Department of Transportation, Bureau of Highways, "Standard Specifications for Roads, Bridges and Incidental Construction," Form 817, January 2017, and supplements. Only Division II "Construction Details" and Division III "Materials Section" or those Sections of Division I "General Requirements and Covenants" that are specifically mentioned herein, of the Standard Specifications shall apply. Additionally Articles .04 and .05 – "Method of Measurement" and "Basis of Payment" of any Section shall not apply. Instead, the Contractor shall refer to the "Unit Prices" section contained herein for descriptions on all pay items. Within the referred to portions of the Standard Specifications, Form 817, wherein the following terms are used, they shall mean respectively:

State, Department, Commissioner
CT DEEP or its Engineer, Construction Manager, Inspector, or other authorized representative or agent of the Owner.

Contract Drawings
Design plans produced by the Milone & MacBroom, Inc. of Cheshire, Connecticut, dated October 31, 2017.

Bid Form
Official bid submitted by the Contractor to the Owner.

Lump Sum
Price bid as indicated in the Bid Proposal.

Work/Project
Activities related to the completion of the construction activities as described in these Technical Specifications and on the Contract Drawings.

Owner
The public body or authority, corporation, association, firm or person with whom the Contractor has entered into the Agreement and for whom the work is to be performed.

Property Owner
Person(s) possessing the deed to the property indicated on the Contract Drawings.

Inspector/Engineer/Wetland Scientist
Engineer, Construction Manager, Inspector, or other authorized representative or agent of the Owner to supervise and approve submittals and completed construction of items as indicated on the Contract Drawings and described in these technical specifications.

Contractor
Entity awarded the contract to perform the work described herein.

DEEP Representative
Staff member of the Connecticut State Department of Energy and Environmental Protection. The name and contact information of the DEEP Representative shall be determined prior to the commencement of construction activities.

Laboratory
Laboratory designated by Engineer.

Applicable Safety Code
Shall mean the latest edition including any and all amendments, revisions, and additions thereto of the Federal Department of Labor, Occupational Safety and Health Administration's "Occupational Safety and Health Standards" and "Safety and Health Regulations for Construction," the State of Connecticut Labor Department's "Construction Safety Code," State of Connecticut "Building Code," or applicable Town of Lyme codes, whichever is the more stringent for the applicable requirement.

Items
Referenced within the text of these Specifications to Items are Technical Specifications within this Contract. Sections or Articles referred to within the Technical Specification refer to the Standard Specifications defined above.

Local Regulatory Agency(ies)
Defined as the governing body or authority having jurisdiction over or responsibility for a particular activity within the scope of this Contract. They may be as specifically defined within the Special Conditions or Technical Specifications; otherwise, the Contractor shall be responsible to determine same in the local area of the Contract and should be cognizant of limits of jurisdiction within the project area.

These Specifications
Where used in the text of the Technical Specifications Items shall mean the Technical Specifications of this Contract.

A. Payment will only be made for items in the Bid Form. Other items may be included in the Standard or Technical Specifications but payment for those items not listed in the Bid Form will be included in the cost of other items of work.

B. In the case of any conflicts between the Technical Specifications, Plans, and Standard Specifications, the order of governance in order of descending authority shall be as follows: 1. Technical Specifications; 2. Plans; 3. Standard Specifications.

1.3 REFERENCES

A. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)

B. Occupational Safety and Health Administration, U.S. Department of Labor

C. Connecticut State Department of Transportation (ConnDOT)

D. Connecticut State Department of Energy and Environmental Protection (CTDEEP)

E. U.S. Department of Transportation, Federal Highway Administration

F. U.S. Environmental Protection Agency

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – METHOD OF PAYMENT (Not Used)

END OF SECTION 01000

SECTION 01100

SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and the Standard Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

i. Work covered by the Contract Drawings
ii. Type of the Contract
iii. Use of Premises
iv. Work Restrictions
v. Specification Formats and Conventions

1.3 WORK COVERED BY CONTRACT DRAWINGS

A. Project Identification:

Project: GL-2018-11 – Blackledge Dam Removal and River Restoration

B. Owner: Town of Glastonbury
2155 Main Street
PO Box 6523
Glastonbury, CT 06033
(860)-652-7710

C. Property Owner(s):

Town of Glastonbury
2155 Main Street
PO Box 6523
Glastonbury, CT 06033
(860)-652-7710

Connecticut State of DEP
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3000

D. Engineer: Milone & MacBroom, Inc.
99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

E. Contractor: To be determined.

F. The Work consists of the following:

1. Mobilization/demobilization
2. Installation, maintenance and removal of sediment and erosion controls
3. Removal and disposal of the existing stone masonry dam
4. Clearing and grubbing
5. Earthwork
6. Channel excavation, instream improvements, and bank slope treatments
7. Control of water
8. Topsoiling, seeding and plantings
9. Off-site removal of sediment
10. Restoration of project site and sediment disposal site

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 WORK PHASES

A. The Work shall be conducted in a three phases to maintain the control of the Blackledge River, and perform all work in fully dewatered conditions.

1.6 USE OF PREMISES

A. General: The Contractor shall have limited use of site for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during the hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise negotiated with Owner.

B. All unconfined instream work within the Blackledge River shall be restricted to the period July 1 to February 28. Refer to table below.

C. No in-water work will be permitted between March 1 to June 30 unless negotiated with Owner. Refer to the table below.

In-Water Work Allowed:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

2. Division 2: Sections in Division 2 govern the execution of the site construction and technical specifications of proposed work items.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

C. Form 817 – State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01110

UNIT PRICES

PART 1 – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Payment for work within these Contract Documents will only be made under the Bid Items listed on the Bid Form. The cost for other items of work included in the Contract Documents and/or on the Contract Drawings and not listed below in Part 3 shall be included in the cost of the various Items bid.

B. Unit prices include all necessary materials, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, by Owner's representative.

D. All work for this project shall be performed under the various Bid Items listed on the Bid Form. It is the intent of this provision that the value of all the Bid Items when added together shall equal the Total Bid Price.

E. All Unit Prices shall include the cost for all utility coordination, permits, materials, equipment, tools, labor and work incidental hereto.

F. The Owner reserves the right to increase or decrease the bid item quantities, and/or omit any work that he deems necessary to complete the work with 2 weeks written notice.

G. Should the Contractor have any question(s) regarding the scope of the work to be included within each Bid Item, said question(s) shall be directed to the Engineer and the

Owner in writing no later than five (5) business days prior to bid opening date in order to allow for a proper response.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 LIST OF UNIT PRICES – BASE BID

A. Unit Price No. 1 – Site Preparation – Lump Sum (L.S.)

This item includes but is not limited to mobilization, demobilization, construction staking, clearing, grubbing, stripping and stockpiling topsoil, installation and maintenance of stabilized construction entrances, installation and maintenance of temporary erosion control measures, installation and removal of temporary construction access roads, and providing, maintaining and removing all temporary facilities & controls.

There will be no measurement for this work. This work will be paid for at the contract lump sum bid price.

B. Unit Price No. 2 – Maintenance and Protection of Traffic – Lump Sum (LS)

This item includes, but is not limited to, maintenance and protection of traffic and pedestrian control on Hebron Avenue, Foote Lane, and adjacent streets if necessary, including installation, maintenance, and removal of all construction signage within construction limits.

There will be no measurement for this work. This work will be paid for at the contract lump sum bid price.

C. Unit Price No. 3 – Water Control – Lump Sum (LS)

This item includes, but is not limited to the installation, maintenance, and removal of temporary cofferdams and dewatering pumping, as necessary to maintain fully dry and dewatered conditions for all active construction throughout the duration of the project. It is to include all control of water through the site during construction, inclusive of damages to the site that occur as a result of high waters, floods, or any types of failure of the water control plan.

There will be no measurement for this work. This work will be paid for at the contract lump sum bid price.

D. Unit Price No. 4 – Demolition and Removals – Lump Sum (L.S.)

This item consists of removal and disposal of existing stone masonry and earthen dam to the limits shown on the contract drawings. This shall also include the removal and/or

relocation of any rock underneath and in the immediate proximity of the existing dam as required to achieve proposed grades as shown on design plans.

There will be no measurement for this work. This work will be paid for at the contract lump sum bid price.

E. Unit Price No. 5 – Earthwork – Lump Sum (LS)

This item consists of channel and upland excavation as necessary to the limits shown on the Cross Section drawings plus or minus six inches (6") or to bedrock, whichever is higher, and the excavation and fill and sediment associated with changes in grading along the river channel and adjacent slopes. It shall include the stripping, stockpiling, and re-use of the existing channel armoring for completion of final channel. This item also includes removal of all debris within the project limits, separating and stockpiling appropriate materials for re-use in improvements as indicated on the contract drawings and off-site disposal of all materials not suitable or in excess amounts for re-use. Finally, it will include coordination with on-site archeologist (contracted with the Town of Glastonbury) for the excavation of up to 14 test pits up to three feet below the depth of sediment in the former dam impoundment.

There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion as determined by the Engineer.

F. Unit Price No. 6 – Bank Slope Treatment – Lump Sum (LS)

This item consists of installing all bank slope treatments features as specified in Section 02373 – Bank Slope Treatment, including but not limited to the following items;

- Boulder Slope Protection
- Boulder Revetment with Live Stakes
- Willow Brush Mattress with Log Toe
- Boulder and Log Toe Revetment

This item shall include the cost to reuse existing site materials, including all sands, gravels, cobbles, boulders, and woody debris meeting the requirements of these specifications for bank slope treatments.

There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion as determined by the Engineer.

G. Unit Price No. 7 – Instream Features – Lump Sum (LS)

This item consists of installing all instream features as specified in Section 02675 – Instream Features, including but not limited to the following items;

- Riffle Grade Control Structure
- Channel Bed Restoration
- Random Bed Armoring
- Random Boulder Clusters
- Stepping Stones
- Natural Stone-Lined Swale

This item shall include the cost to reuse existing site materials, including all sands, gravels, cobbles, boulders, meeting the requirements of these specifications for instream features.

There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion as determined by the Engineer.

H. Unit Price No. 8 - Site Restoration – Lump Sum (LS)

This item consists of spreading existing topsoil on site to the final grades, application of seed and mulch, furnishing and installation of all plants and trees, restoration of all construction entrance pads and access roads, and to pre-construction conditions or as otherwise indicated on the plans and details.

There will be no measurement for this work. This work will be paid for at the contract lump sum bid price.

END OF SECTION 01110

SECTION 01200

BEST MANAGEMENT PRACTICES FOR PROTECTION OF THE ENVIRONMENT

1. No construction shall proceed until proper sedimentation and erosion control methods have been installed as the sequence of construction necessitates.

2. No equipment, materials, or machinery shall be stored, cleaned, refueled, maintained, or repaired within 25 feet of any wetland or watercourse.

3. Any fuels, oils, greases, or other such contaminants resulting from construction activities that are spilled on the project site will be removed and disposed of from the site in a legal and environmentally responsible way. Dumping of oil or other deleterious materials on the ground is forbidden. The applicant shall provide a means of catching, retaining, and properly disposing of drained oil, removed oil filters, or other deleterious material. All oil spills shall be reported immediately to the DEEP/Hazardous Materials office at (860) 424-3338 or (860) 424-3023. Failure to do so may result in the imposition of a fine under Section 22a-450 of the Connecticut General Statutes.

4. The Contractor shall provide a spill containment kit containing 3 - 5" x 10' containment booms, 50 - 18"x18" absorbent pads, 8 - 4" x 4' containment socks, 6 - 11" x 20" absorbent pillows, 4 disposal bags, 4 nitrile gloves and 1 - 55 gallon yellow polyethylene drum as manufactured by A.H. Harris or an approved equal, on site throughout the duration of the project.

5. No construction shall proceed until a method to prevent construction debris or other materials from entering the wetland or watercourse has been implemented as the sequence of construction necessitates. These materials shall be collected and disposed of in an environmentally safe manner as determined by federal, state, and local laws at no additional cost to the Owner. The applicant shall monitor wind velocities and storm events during the conduct of such work and shall cause such activity to cease if storm or wind conditions threaten to cause deposits of materials in the waterway.

6. No objectionable materials resulting from any clearing activity shall be disposed of in any wetland or watercourse. This includes but is not limited to stumps, tree roots, matted roots, wood chips, and other debris.

7. No fill or material shall be deposited in surrounding wetlands or watercourses unless specified on the Contract Drawings.

8. A water control plan, including a contingency plan for flood events and an emergency operation plan shall be implemented as sequence of construction necessitates prior to commencement of any construction in the waterway

9. Where dewatering is necessary, dirty-water pumps shall not discharge directly into the wetland or watercourse. Proper methods and devices shall be utilized such as pumping the water into a temporary sedimentation settling basin, providing surge protection at the inlet and the outlet of

pumps, or floating the intake of the pump, or other methods to minimize and retain the suspended solids. If the pumping operation is causing turbidity problems, said operation shall cease until such time as feasible means of controlling turbidity are determined and implemented.

10. Whenever possible, work within and adjacent to watercourses shall be conducted during periods of low flow. The applicant shall remain aware of flow conditions during the conduct of such work and shall cause such activity to cease should flow conditions threaten to cause excessive erosion, siltation, or turbidity. During storms, every effort shall be taken to secure the work site.

11. All temporary fill, such as that used for permitted access roads and/or cofferdams, shall be properly stabilized during use to prevent erosion, and, when no longer needed, must be disposed of at an upland site and suitably contained to prevent turbid runoff from reentering a wetland or watercourse. All areas affected by temporary fills must be restored to their original contours and revegetated with suitable vegetation. The areal extent of temporary fill or excavation shall be minimized to that area necessary to perform the required work.

12. Every precaution shall be used while working in the vicinity of a waterway to prevent and minimize degradations of the existing water quality. All activities shall conform and be at all times consistent with applicable water quality standards, and management practices of the Federal Clean Water Act (1972), Connecticut's Water Quality Standards, and other applicable state laws, and as defined in Form 817, Section 1.10, entitled "Environmental Compliance."

13. All equipment being used in or around the water shall be free of leaks including but not limited to oil, hydraulic fluids, radiator fluids, grease, and fuel. All equipment to be used in the water shall be approved by the Owner's Representative. The Owner's Representative has the authority to order the contractor to remove any equipment from the water that the Owner's representative feels is detrimental to the environment.

14. Should any equipment break down in the water, the Contractor shall have a plan to immediately remove the equipment.

15. Work in general shall conform to the guidelines of Section 1.07.16, Unauthorized Use of Area(s) within the Project Site of Form 817.

16. The Engineer will review all equipment for leaks and damage prior to use. Use of questionable equipment as determined by the Engineer will not be permitted.

END OF SECTION 01200

SECTION 01410

EMERGENCY OPERATION PLAN DURING CONSTRUCTION

PART 1 – GENERAL

1.1 WORK INCLUDES

The items listed under Proposed Emergency Operation Plan are provided for general information only. The Emergency Operation Plan is to be created by the Contractor and approved by the Engineer. The Emergency Operation Plan provides the Contractor with guidelines for action during a flood or a threatening flood period in order to protect the surrounding community.

1.2 DESCRIPTION

A. The Contractor shall monitor the weather forecasts and plan construction accordingly.

B. If the National Weather Service (NWS) forecasts should indicate the possibility of a precipitation event where the equivalent of more than 3-inches of rain within 24 hours has a greater than a 50% chance of occurring, the Contractor shall plan for the possibility of high water levels at the site. Also, the Contractor shall notify the Owner and Engineer.

C. If a significant rainfall occurs, in excess of 3 inches of rainfall, the Contractor should maintain surveillance of the site and record water level readings every 2 hours during and immediately following the event.

D. If the water level behind the dam rises to a potentially unsafe level, the Contractor shall remove all equipment, construction materials (i.e., fuels, solvents, hydraulic fluids, explosives, etc.) and stockpiles from the floodplain and alert the following personnel of a potential emergency:

Owner's Representative:	Daniel Pennington	(860)-652-7736	daniel.pennington@glastonbury-ct.gov
DEEP Inland Fisheries:	Steve Gephard	(860) 434-6043	steve.gephard@ct.gov
Engineer:	Andie Greene	(203) 271-1773	agreene@mminc.com
Police Chief:	Marshall Porter	(860) 652-4201	marshall.porter@glastonbury-ct.gov
Fire Marshal:	Chris Siwy	(860) 652-7529	chris.siwy@glastonbury-ct.gov
Emergency:		911	

E. The Contractor shall maintain sufficient equipment and manpower at the sites in order to react to a flooding emergency.

F. Compensation: No additional compensation shall be made to the Contractor for damages resulting from high water or from time lost due to inclement conditions or river flows such that work within the project site is not feasible.

1.3 SUBMITTALS

The Contractor shall submit a detailed Emergency Operations and Flood Contingency Plan before any work commences. Said plan shall include a detailed narrative describing the various types of emergencies and corresponding actions to be taken in response. Identified on the plans shall be the location where all construction equipment, oils, fuels, lubricants, and other supplies will be stored. The Contractor shall certify that personnel are familiar with all provisions of his plan and are able to execute same. The Contractor shall submit a plan of action before any work commences, detailing actions to be taken during a flood emergency. The Contractor may use the above plan or prepare a plan of his own. In either case, **the Contractor shall submit to the Engineer an emergency operation plan for approval within 15 days of the contract signing**.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – METHOD OF PAYMENT

4.1 There is no separate method of payment for this item. This work is included under other Bid Items.

END OF SECTION 01410

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 WORK INCLUDED

All materials, equipment, and services necessary to furnish and deliver work of this Section as shown on the Drawings, as specified, and as required by job conditions including, but not limited to the following:

1. Installation and removal of all construction entrance pads and construction access roads across private property off of Hebron Avenue and Foote Lane, including grading, filter fabric, riprap, removal of riprap, and returning to original grade. Restoration shall be covered under Site Restoration, Section 02900.

2. Construction staking.

3. Protection of existing trees, vegetation, landscaping materials, stone walls, and site improvements not scheduled for clearing, which might be damaged by construction activities.

4. Clearing and grubbing of stumps, hedges, vegetation, debris, rubbish, designated trees, and site improvements.

5. Topsoil stripping and stockpiling.

6. Installation and maintenance of temporary erosion and sedimentation control measures and dust control.

7. Temporary protection of adjacent property, structures, benchmarks, and monuments.

8. Removal and legal disposal of cleared materials.

9. Temporary protection of existing utilities to remain.

10. Test pits, as necessary.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Earthwork:	Section 02300
Water Control:	Section 02245
Maintenance and Protection of Traffic:	Section 02150
Site Restoration:	Section 02900

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site. Cleared materials 6" or larger can be re-used as applicable.

1.5 QUALITY ASSURANCE

A. Codes and Standards: All materials and construction methods shall conform to Form 817 - State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified herein.

B. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

C. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties and on Owner's property. Restore damaged improvements to their original condition, as acceptable to property owner’s satisfaction.

D. Permits and Regulations: The Contractor shall handle all material in compliance with applicable requirements of OSHA and other governing authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

E. Coordinate with property owner's representative noted in Section 01100 for access to the site, staging areas, and sediment disposal site.

F. Protection of Existing Improvements:
1. Provide protections necessary to prevent damage to existing improvements

indicated to remain in place.

2. Protect improvements on adjoining properties and on Owner's property. Restore damaged improvements to their original improved condition, as acceptable to property owners.

G. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

H. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

I. Dust Control: The Contractor shall be responsible for controlling visible dust caused by Work operations and the moving of vehicles and equipment. Dust control shall be implemented when soils are exposed, before, during and after Work activity ceases. Dust control will also be required on the weekends.

PART 2 – PRODUCTS

A. Geotextile silt fence shall conform to Article M.08.01-19 of the Standard Specifications.

B. Erosion Control Blanket shall be 100% natural biodegradable material such as jute, sisal, coir, or excelsior. Netting constructed from photodegradable, ultraviolet degradable or oxo-(bio)degradable plastics are NOT considered "biodegradable." The erosion control blanket shall conform to Article M.13.09 of the Standard Specifications, meeting requirements specified in the ConnDOT Qualified Product List for Erosion Control Matting, Class 1: Slope Protection, Type B.

C. Temporary Vegetative Cover
1. Perennial Ryegrass 3 lbs/1,000 sq. ft. (*Ioluium Perenne*)
2. Temporary Mulching Straw or Hay 70-90 lbs/1,000 sq. ft.

D. Geotextile fabric for construction Entrance will be from an acceptable manufacturer that meets the requirements of Section M9.50.0 Type II Stabilization/Reinforcement Geotextile.

E. Crushed stone for construction entrance pad and access road caps shall conform to Section M.01.01 for No. 3 Stone.

F. Haybales and wood stakes shall conform to Article 2.18.02 of the Standard Specifications.

G. Modified riprap shall conform to Section M.12.02 of the Standard Specifications.

H. Where laser grade control is used for construction staking, a reference stake for verifying height of laser shall be required from the Contractor.

I. Tree Protection shall conform to the Drawings and Standard Specifications.

J. SOIL MATERIALS

1. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 02300 "Earthwork."
2. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

D. Maintenance: The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition at all times.

3.2 CONSTRUCTION STAKING

A. The Owner will furnish the Contractor such control points, bench marks, and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein.

B. The Contractor shall be responsible for the placement and preservation of adequate ties to all control points, whether established by him or found on the project, necessary for the accurate re-establishment of all base lines or center lines shown on the plans.

C. All stakes, references, and batter boards including original, additional or replacement, which may be required for the construction operations, signing and traffic control shall be furnished set and properly referenced by the Contractor. He shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions shall be called to the Engineer's attention by the Contractor for correction or interpretation prior to proceeding with the work.

D. Upon request of the Engineer, the Contractor shall furnish copies of all data used in setting and referencing all stakes and other layout markings used by the Contractor.

E. When requested by the Engineer, the Contractor shall provide safe facilities for convenient access to control points, batter boards, and references.

F. All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under the contract and who are acceptable to the Engineer. The personnel shall perform this staking under the direct supervision of a person, or persons, of engineering background experienced in the direction of such work and acceptable to the Engineer.

G. The Engineer may check the control of the work, as established by the Contractor, at any time as the work progresses. The Engineer will inform the Contractor of any deficiencies identified; however, said notification does not relieve the Contractor of any responsibility for the accuracy of the layout work. Further, the Contractor shall, at his expense, correct or replace as required any deficient layout and construction work which may be the result of inaccuracies in his staking operations or of his failure to report inaccuracies in his staking operations or of his failure to report inaccuracies found in work done by the Engineer or by others. If, as a result of these inaccuracies, the Engineer is required to make further studies, redesign, or both, all expenses incurred by the Owner due to such inaccuracies will be deducted from any monies due the Contractor.

H. The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of this work.

3.3 TEMPORARY PERVIOUS BARRIERS

A. Construct using bales of hay or sediment filter fabric, as detailed on the Construction Drawings.

B. Hay bales shall be installed in accordance with Article 2.18.03 of the Standard Specifications.
   1. Bales should be placed in a row with ends tightly abutting the adjacent bales.
   2. Each bale shall be embedded into the soil a minimum of 4 inches.
   3. Bales shall be securely anchored in place by wood stakes or reinforcement bars driven through the bales and into the ground. The first stake in each bale shall be angled toward the previously laid bale to force bales together

C. Sediment filter fence shall be installed in accordance with Article 2.19.03 of the Standard Specifications
   1. Filter fabric shall be securely anchored at the top of a 3 foot high fence and buried a minimum of six (6") inches to the soil. Seams between sections of filter fabric shall overlap a minimum of 2 (2') feet.

D. Erosion control blanket shall be installed in accordance with Article 9.50.03-7 of the Standard Specifications.

E. Riprap shall be installed in accordance with Article 7.03.03 of the Standard Specifications.

3.4 INSTALLATION AND MAINTENANCE

A. Baled hay erosion barriers, sediment filter fence, construction entrances, pumping settling basin and temporary seeding shall be installed at locations shown on the plans and as ordered by the Engineer.

B. All erosion checks shall be maintained until adjacent areas are stabilized.

C. Inspection shall be frequent (at minimum monthly and before and after heavy rain) and repair or replacement shall be made promptly as needed.

D. Erosion checks shall be removed when they have served their usefulness so as not to block or impede storm water flow or drainage.

E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removals.

3.5 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.

3.6 UTILITIES

A. Existing Utilities: Do no interrupt utilities serving facilities occupied by owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner/Engineer and Utility not less than 2 days (exclusive of Saturdays, Sundays and legal holidays) in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner/Engineer/Utility's written permission.

3. When necessary, the Contractor shall cooperate with representatives of public service companies in order to avoid damage to their structures by furnishing and erecting suitable supports, props, shoring or other means of protection. Fire hydrants adjacent to the work at all times shall be readily accessible to fire apparatus and no material or other obstructions shall be placed within a radius of 10 feet of a fire hydrant.

4. If the Contractor wishes to have any utilities temporarily relocated for his/her convenience other than contemplated by the Owner, the Contractor shall make

the necessary arrangement with the Owner and make reimbursement for the cost thereof at his/her own expense.

3.7 CLEARING AND GRUBBING

A. Clearing: The Contractor shall clear all items specified to the Contract limit lines shown on the Contract Drawings and shall remove cleared and grubbed materials from the site to an authorized disposal site.

1. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.

2. Comply with erosion, sediment control and storm management measures as specified on the contract drawings.

B. Grubbing: The Contractor shall clear and grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.

1. Stumps and root mats in these areas shall be removed to a depth of not less than 1 foot below the subgrade of sloped surfaces.

2. All depressions made by the removal of stumps or roots shall be filled with material suitable for backfill as specified in General Specification 02300 - Earthwork.

C. Tree and Shrub Removal: Remove trees, shrubs and stumps within the work area as necessary to perform the proposed site improvements.

1. Only those trees designated on the Contract Drawings for removal shall be removed.

2. Tree and shrub removal shall be conducted in a manner so as to avoid damage to those trees and shrubs which will remain.

3. Do not cut or damage trees or shrubs outside of the Contract limit lines. Damage outside the Contract limit lines caused by the Contractor's operations shall be corrected at the Contractor's expense.

4. All trees shall be calipered at 4 and one-half feet above existing grade prior to removal. All trees shall be "topped" and "limbed" previous to felling unless otherwise directed by the Engineer.

5. In areas of major construction, the stumps and roots of all trees designated for removal shall be grubbed and excavated to a depth of 3 feet below the ground surface except in areas of fill greater than 3 feet, where such trees may be cut flush with the ground surface.

6. Trees meeting the requirements of log toe under Section 02675 -Instream Features shall be cut and stockpiled for reuse.

D. Remove and dispose of all debris and trash in a legal manner off site. Burning of cleared and grubbed materials is not allowed within the property limits.

E. Cleared and grubbed items shall be removed from the site and satisfactorily disposed of in accordance with local regulations.

F. Air pollution caused by dust and dirt shall be controlled, complying with governing regulations.

G. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.8 TOPSOIL STRIPPING

A. Topsoil is defined as a friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, without weeds, roots, and other objectionable manner.

B. Remove sod and grass before stripping topsoil.

C. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other objectionable materials.

D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

E. Stockpile topsoil in storage piles in areas indicated or directed for reuse as part of Site Restoration (Section 02900). Construct storage piles to provide free drainage of surface water. Cover piles to prevent erosion and wind windblown dust, if required.

F. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

3.9 ESTABLISHMENT

A. Select appropriate species for the situation, note rates and seeding dates (see vegetative cover selection and mulching specifications).

B. Apply seed uniformly according to the rate indicated by broadcasting, drilling or hydraulic application (see vegetative cover selection and mulching specifications).

C. Unless hydroseeded, cover ryegrass seeds with not more than ¼ inch of soil with suitable equipment. Cover sudangrass and small grains with ½ inch soil.

D. Mulch immediately after seeding if required. (See vegetative cover selection and mulching spec.). Apply straw or hay mulch and anchor to slopes greater than 3% or where concentrated flow will occur.

3.10 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

3.11 CLEANING

A. Keep grounds clean of rubbish caused by work and of unused materials at all times.

B. Dispose of cleared materials and rubbish off-site in a legal manner.

C. Remove unused materials and equipment. Leave area clean.

D. Do not store hazardous or flammable materials or liquids on site, unless stored in approved containers, properly labeled and approved by the owner.

E. Trash receptacles and recycling containers shall be maintained on site at all times to prevent the accumulation of litter on the project site.

3.12 TEST PITS

A. Test Pits: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during test pit excavation. Test shall be performed, as needed. The Contractor may conduct other test pits to verify the location of subsurface utilities.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Do not interrupt existing utilities serving facilities except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

3.13 ACCESS ROADS

A. The location of the access road shall be staked in the field prior to starting construction for approval by the owner and engineer. Locations may be adjusted in order to minimize disturbance to existing trees.

B. Place 8" layer compacted broken stone and compact to elevation indicated on the plan. Cap access roads with 6-inch layer of granular material for driving surface.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 1 "Site Preparation," as determined by the Engineer.

END OF SECTION 02100

SECTION 02150

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications

1.2 Provide all labor, materials, tools and equipment, as and when required to perform the work specified herein or as shown on the plan, including but not limited to the following:

A. The work to be done under this Item shall conform to Form 817 Maintenance and Protection of Traffic and with any requirement specified by the local authority.

B. Contractor to install temporary traffic control signs in both directions from the work site to warn motorists of the construction site.

C. The Contractor shall restore any damage done during construction, upon completion of the work.

D. The Contractor will be responsible for removing all temporary traffic controls at the completion of the project.

1.3 QUALITY ASSURANCE

A. Codes and Standards: All materials and construction methods shall conform to Form 817 – State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified herein.

B. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

PART 2 – PRODUCTS

A. All construction signing shall conform to the standards in the Manual on Uniform Traffic Control Devices (MUTCD), the Standard Specifications and as detailed on the Contract Drawings.

B. The Contractor shall use certified flaggers as necessary to manage access and egress from the construction site.

C. The Contractor shall use police officers during any lane closure.

D. Traffic Cones shall be 42-inch retroflective traffic cones conforming to Article 9.81.02 of the Standard Specifications.

E. Traffic Drums shall conform to Article 9.78.02 of the Standard Specifications.

F. Construction Barricades shall conform to Article 9.79.02 of the Standard Specifications.

G. Temporary precast concrete barrier curb shall conform to Article 8.22.02 of the Standard Specifications.

PART 3 – EXECUTION

3.1 Maintain all lanes of traffic on all public and private streets throughout the area.

3.2 Provide flagmen and/or local police traffic person as required when construction equipment and trucks enter and exit the site.

3.3 Temporary signs and other temporary traffic protective devices shall remain in place throughout the full duration of the project.

3.4 Traffic signs shall be mounted on posts when feasible.

3.5 The Contractor shall notify the Owner at least 14 days in advance of proposed implementation of the Traffic Control Plan.

3.6 The Contractor shall implement the Maintenance and Protection of Traffic Plan before the start of construction.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 2 “Maintenance and Protection of Traffic,” as determined by the Engineer.

END SECTION 02150

SECTION 02245

WATER CONTROL

PART 1 -GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 Provide all labor, materials, tools and equipment, as and when required to perform the work specified herein or as shown on the plan, including but not limited to the following:

A. Temporary cofferdams, control of water, flow diversions, temporary bypass channels, and construction dewatering.

B. The Contractor shall furnish, install, operate and maintain dewatering equipment and systems as specified, shown on the Contract Drawings, or required during the construction of the project.

C. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.

D. The Contractor shall comply with all necessary permits from State and local agencies required for operation of the dewatering system, monitoring groundwater, and disposal of dewatering effluent.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Site Preparation: Section 02100

1.4 PERFORMANCE REQUIREMENTS

A. All water control provisions shall conform to Contract Drawings and approved water control plan.

B. Proposed revisions to water control plan for any reason must be submitted in writing, and approved by the Engineer.

C. Dewatering Performance: Design, furnish, install, test, operate, monitor and maintain dewatering system of sufficient scope, size, and capacity.

1. To control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

2. To control existing flow of water in Blackledge River in order to complete the dam removal, bank excavation and site improvements work in a reasonably dry condition and to minimize movement of sediment downstream. The channel shall be diverted around the active construction areas through the use of

temporary bypass channels, temporary cofferdams, and depending upon flow and elevation, bypass pumps may be required.

3. Work includes removing dewatering system when no longer needed and restoration of disturbed areas as a result of dewatering operations.

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

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

D. Pump Discharges: All pump discharges shall be routed to a designated discharge settling area to sufficiently settle out suspended sediments prior to water re-entering the watercourse, while also mitigating erosion or scour prior to encountering wetlands or watercourses.

E. Water diversion provisions shall be designed to safely divert a minimum base flow of the 50% duration flow for the period of construction. The flow shall be diverted entirely around all active work areas, without the release turbidity downstream, 24 hours a day, 7 days a week.

SEASONAL FLOWS (CFS)

	DEC. TO FEB.	MAR. TO APR.	MAY	JUN.	JUL. TO OCT.	NOV.
25% DURATION	17.5	28.4	17.8	10.5	4.07	14.3
50% DURATION	10.4	18.1	11.2	5.21	1.66	7.74
75% DURATION	6.24	11.8	7.45	2.83	0.75	3.8

1.5 SUBMITTALS

A. Temporary Cofferdam Plan: Shall be prepared and submitted a minimum of 2 weeks prior to construction. Plan shall include drawings and design calculations signed and sealed by a licensed Professional Engineer responsible for their preparation.

B. Water control plan: Shall be submitted a minimum of 2 weeks prior to construction. Show arrangement, locations, and details of wells and well points; pumps, discharge

lines, and means of discharge, control of sediment, and disposal of water, if applicable. If the submitted water control plan differs from the plan already provided by the Project Engineer, include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

C. Emergency operation and flood contingency plan: This emergency operation plan is designed to provide the Contractor with guidelines during a flood or a threatening flood period in order to protect the surrounding community.

1. The Contractor shall monitor the weather forecasts and plan construction accordingly.

2. If the weather forecasts should indicate the possibility of a major storm system within 24 to 48 hours, the Contractor shall plan for the possibility of high water levels at the site and shall remove all equipment, construction materials (i.e., fuels, solvents, hydraulic fluids, etc.) and stockpiles from the floodplain, and alert the Owner and Engineer of a potential emergency.

3. If the National Weather Service (NWS) forecasts should indicate the possibility of a precipitation event where the equivalent of more than 3-inches of rain within 24 hours has a greater than a 50% chance of occurring, the Contractor shall plan for the possibility of high water levels at the site. Also, the Contractor shall notify the Owner and Engineer.

4. If the water level within the channel rises to a potentially unsafe level, the Contractor shall remove all equipment, construction materials (i.e., fuels, solvents, hydraulic fluids, etc.) and stockpiles from the floodplain, and alert the Owner of a potential emergency.

5. The Contractor shall maintain sufficient equipment and manpower at the site in order to react to a flooding emergency.

C. Compensation: No additional compensation shall be made to the Contractor for damages resulting from high water or from time lost due to inclement conditions or river flows such that Work within the project site is not feasible.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing CT DEEP notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Pre-installation Conference: Conduct conference at Project site with Engineer, Owner's Representatives and/or DEEP Representative.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CONSTRUCTION METHODS

A. Description: The Contractor shall investigate and verify existing stream conditions, and evaluate the need for, and the type of protection and facilities required. Before commencing construction, the Contractor shall furnish the Engineer with details of the plan and methods he proposes to use for handling water and accomplishing the work. The Contractor may use sandbags, inflatable dams, cofferdams, or other types of protective facilities as approved by the Engineer. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibility for the safety of the work and for the successful completion of the project.

B. Any pumping from within the areas of construction shall be done in such a manner as to prevent the possibility of movement of sediment from within these areas. Any pumped water must be discharged to a temporary sediment basin and/or in accordance with the requirements of the Standard Specifications.

C. Unless otherwise provided or directed, all such temporary protective work shall be removed and disposed of in an approved manner when no longer required.

D. The Contractor shall be responsible for the scheduling of work described herein so as not to interfere with any sequence of operations developed for this project. Delays as a result of work required under this specification shall not constitute a claim for an extension of contract time.

3.2 INSTALLATION

A. Conform to Contract Drawings.

B. Provide temporary grading to facilitate pumping settling basin dewatering and control of surface water.

C. Monitor dewatering systems continuously.

D. Protect and maintain temporary erosion and sedimentation controls as shown on the plans and detailed in these specifications.

E. Before excavating below groundwater level, place system into operation to lower water to specified levels. Operate system continuously until foundations and excavations below ground water are complete or until dewatering is no longer required.

F. Provide an adequate system to lower and control water to permit excavation, construction of structures, and placement of fill materials on dry subgrades.

G. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

3.3 COFFERDAMS AND DIVERSIONS

A. The height of any flow diversions and or barriers shall be elected by the Contractor to provide reasonable protection from flooding. At a minimum, any barriers shall be constructed to the height necessary for the diversion flows described above in these specifications, or as otherwise indicated on the Contract Drawings. All such temporary structures or facilities shall be safely designed, extended to sufficient depth and be of such dimensions and water-tightness so as to assure construction of the permanent work to the limits shown on the plans. Movements or failures of the temporary protection facilities, or any portions thereof, which prevent proper completion of the permanent work, shall be corrected at the sole expense of the Contractor. Additionally, any cleanup associated with such movements or failures shall be completed at the sole expense of the Contractor.

B. Cofferdams will be constructed of clean, inert materials that will have a minimal impact on the stream system. Cofferdams constructed of soil or material from the stream will not be used unless specifically directed by the Owner.

C. Acceptable materials shall include water structures, concrete jersey barriers, plastic barriers, and other comparable items.

D. The Contractor is responsible to install all cofferdams/diversion structures in a safe and correct manner. Cofferdams must be installed so as to withstand the pressures exerted by the stream flow or ponded water against the cofferdam.

E. Commercial products used as cofferdams (i.e. water structures, temporary dams) shall be installed in accordance with the manufactures instructions.

F. The Contractor is permitted to make minor disturbances to the streambed or banks as may be required to properly install the cofferdam. All disturbances will be limited to only that disturbance necessary to install the cofferdam. Cofferdam installation must be done in the presence of the Owner.

G. If the Contract conditions call for the use of sand bags, or if the Contractor shall use sand bags to assist with de-watering, the Contractor shall fill the sand bags with clean, washed sand. Soils with fine particles are prohibited. When placed in the flowing water, the sand bags shall not produce visible turbidity.

H. The Contractor is responsible to install diversion piping to the line and grade shown on the drawings in order to naturally convey the flow of water by gravity. Cofferdams or inlet controls may also be required to direct the flow of water into the diversion piping.

I. The stream channel shall be diverted around the active construction area in a temporary bypass or diversion pipe.

3.4 DE-WATERING OF CHANNEL EXCAVATIONS

A. When in-stream construction requires deep excavation for the placement of footer rocks, the Contractor shall keep the excavation reasonably clear of water to allow observation of the footer rock placement. Excavation can be accomplished with a small diameter pump (2" or larger) with water pumped to the channel or to a filter area if excessive turbidity is produced in the channel.

3.5 DISCHARGE OUTFALL PROTECTION

A. The discharge of water from the pumping operations or bypass piping shall be done so as to prevent erosion of soils and the downstream introduction of sediment.

B. When discharges from the de-watering operation involve large volumes of water, the discharge area will require a concrete and/or stone structure to provide for dispersion of the discharge energy. The Contractor shall use geo-textiles as appropriate to provide erosion protection. Discharge structures must be capable of dispersing the energy of the expected discharge from the pumps.

C. All materials placed for the protection of discharge outfalls are temporary in nature, and shall be removed from the project area upon completion of the dewatering process.

3.6 MAINTENANCE, REMOVAL AND RESTORATION

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

B. In the event that high flows damage or remove de-watering measures, the Contractor shall repair or replace the measures as soon as the water flows allow and prior to commencing work.

C. Upon completion of the work, and approval of the Contracting Officer, the Contractor shall remove all de-watering measures. The Contractor shall remove pumps and hoses from the site, as well as cofferdams from the stream channel.

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

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

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 3 “Water Control,” as determined by the Engineer.

END OF SECTION 02245

SECTION 02260

DEMOLITION AND REMOVALS

PART 1 – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.1 SUMMARY

A. The work under this Section includes all labor, supervision, materials and equipment necessary for the demolition, loosening, removal and disposing of existing masonry, concrete products, embedded metals and frames, structural steel, reinforcing steel, timber, earth and rubble fill as shown on the Contract Drawings and as directed by the Owner's Representative.

B. Work shall include, but not be limited to, the following:

1. The complete excavation and removal of any and all reinforced concrete, stone masonry, rock, wood, iron, steel, sheet piles, flashboards and miscellaneous material used to construct or support the existing dam, spillway, and apron, and its appurtenances to the limits and extents indicated in the Drawings.

2. Before removing any part of the existing structures, the contractor shall implement the approved water handling plan as outlined in Section 02245 Water Control.

3. The Contractor shall make a complete investigation of the existing structures, and of any special requirements that may be necessary to perform this work. No extra compensation will be made because of special requirements.

4. All materials not meeting the specifications for reuse in on-site restoration features shall be disposed of off-site as noted herein and in accordance with all local, State, and Federal regulations at the Contractor's expense. Stone from masonry dam meeting the requirements of Section 02373 – Bank Slope Treatment and 02675 – Instream Features shall be kept on site and reused in bank slope treatment.

5. Removal of stone retaining wall south of the dam to facilitate water control during construction.

1.2 MATERIAL DEFINITIONS

A. Concrete products shall include Portland Cement concrete and mortar used in the construction of the existing dam.

B. Reinforcing Steel shall include deformed steel bars and/or steel forming materials used in the construction of the dam. Such reinforcing may be encountered during the course of demolition.

C. Masonry shall include natural stone products used in the construction of the dam.

D. Rubble fill shall include a combination of brick, stone, earth, and other hard fill materials that may have been used in the construction of the dam.

E. Earth fill shall include soil and rock materials used in the construction of the dam and associated backfill adjacent to the dam.

F. Sediment shall include soils, debris, and other deposited materials within the impoundment or river channel.

1.3 RELATED WORK

Water Control:	Section 02245
Earthwork:	Section 02300
Bank Slope Treatment:	Section 02373
Instream Features:	Section 02675

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 REMOVAL METHODS

A. No blasting for the removal of the dam shall be allowed. Existing material to be removed by the Contractor shall be removed by such mechanical methods as he may propose, subject to the approval of the Engineer.

B. The concrete and stone masonry dam shall be removed to the limits shown on the plans. The exposed portions of the dam that are to remain shall be cut flush and free of jagged edges and/ or exposed rebar. The Contractor shall patch all exposed surfaces to remain as required.

C. The Engineer reserves the right to require the Contractor to change his demolition methods, sequence and/or equipment, if and when, in the opinion of the Engineer, the safety of the public, or the integrity of existing structures and or new construction is jeopardized.

D. The Contractor shall take all precautions and do such work as may be necessary to prevent damage to the completed portions of any new construction and existing structures to remain, due to his removal operations. Any damage to any existing structures to remain shall be repaired, prior to final payment, at the Contractor's expense.

E. Reinforcing steel, embedded steel items and timber may be encountered in portions of the structure to be removed. These items shall be removed and disposed of as part of the work, or may be salvaged by the Contractor as noted below.

E. Pneumatic hammers or any other method approved by the Engineer may be used to remove the concrete and/or stone masonry. Maximum 30 pound hammers shall be used for general removal. Pneumatic hammers shall not be placed in direct contact with the existing wall. The Contractor shall take all precautions and do such work as necessary to prevent damage to the structures to remain.

3.2 DISPOSAL OF DAM MATERIALS AND DEBRIS

A. Disposal: Remove and dispose of concrete and masonry not meeting specifications for on-site reuse. This material shall NOT be disposed of at the specified sediment stockpile location. Contractor to submit disposal site location and haul route to Owner and Engineer for approval prior to the start of construction.

B. Reuse: Large stones from any stone masonry to be removed from the structure may be reused for stone protection if it is free of cement, mortar, steel, and meets the requirements described in Section 02373 - Bank Slope Treatment, Section 02675 - Instream Features and/or Section 02900 - Site Restoration.

C. Sediment Disposal: Sediment removed from upstream impoundment shall be dewatered on-site and disposed of suitable sediment disposal location.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 4 “Demolition and Removals,” as determined by the Engineer.

END OF SECTION 02260

SECTION 02300

EARTHWORK

PART 1 – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 WORK INCLUDES

All materials, labor, equipment, and services necessary to perform the work of this section as shown on the Drawings, as specified, and as required by job conditions, including, but not limited to, the following:

A. General excavation and backfill for site improvements including new channel excavation

B. Excavation and fill for channel bed grading.

C. Preparing of subgrade for construction haul roads.

D. Rock excavation, mass, and trench.

E. Soil compaction control.

F. Site grading.

G. Fill from off-site sources, if required.

H. Trench excavation and backfill for utilities, conduits, and structures.

I. Removal of excess materials off-site, if required.

J. Removal and legal disposal of unsuitable materials off site, if required.

K. Topsoil from off-site sources, if required.

L. Topsoil spreading and fine grading.

M. Pond sediment excavation, stockpiling, dewatering, and transport.3

N. Coordination with on-site archeologist (contracted with the Town of Glastonbury) for the excavation of up to 14 test pits up to three feet below the depth of sediment in the former dam impoundment

1.3 DEFINITIONS

A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

In areas where rock is encountered, continuous and individual footing excavation shall consist of over-excavating a minimum of 8" below bottom of footings, and a minimum of 1'-0" horizontally around perimeter of footings.

B. Authorized Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.

C. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation shall be at the Contractor's expense.

Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Engineer.

In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

E. Structure: Buildings, foundations, slabs, fishway, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

F. Unsuitable Material: On-site materials which are of improper gradation to allow adequate compaction, are organically contaminated or have been identified as improper for the intended use by the Engineer.

G. Topsoil: Topsoil shall consist of natural loam, free from subsoil, obtained from an area which has never been stripped. Topsoil is friable clay loam surface soil found in a depth of not less than 4 inches, and is substantially free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material. Topsoil shall be as further defined under General Specification 02900 – Site Restoration. Topsoil meeting this definition and General Specification 02900 shall be considered suitable for use on-site.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork in compliance with applicable requirements of authorities having jurisdiction.
Form 817 - State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, as amended, shall be used for materials compliance and execution of the work in this section.

B. Compaction: Under structures, pavements, and walkways, 95 percent maximum density, ASTM D 1557. Under lawns or unpaved areas, 90 percent maximum density, ASTM D 1557.

1.5 PROJECT CONDITIONS

A. Notify Owner if unexpected subsurface conditions are encountered and discontinue work in area until Owner provides notification to resume work.

B. Examine the substrata of the areas and ascertain the conditions under which earthwork is to be performed/installed. Do not proceed until all unsatisfactory conditions, if any, have been corrected to the satisfaction of the owner.

C. Inform Call Before You Dig, Connecticut (1-800-922-4455 or 811) before beginning excavations. Do not proceed until clearance is received.

D. Existing Utilities: Locate existing utilities in areas of excavation work. Provide adequate means of support and protection during earthwork operations.

E. Should uncharted or incorrectly charted piping or other utilities be encountered, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

F. Do not interrupt existing utilities serving facilities occupied by Owner or others during occupied hours except when permitted and then only after acceptable temporary utility services have been provided.

G. Provide adequate notice to the Owner, and receive written notice to proceed before interrupting utility.

H. Protection of Persons and Property: Barricade open excavations occurring as part of this work.

I. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

J Protect benchmarks and existing structures, roads, sidewalks, paving, and curbs against

damage from equipment and vehicular or foot traffic.

K. Provide necessary safeguards to prevent accidents, to avoid all necessary hazards, and to protect the public, the work, and the property at all times, including Saturdays, Sundays, and holidays.

L. Contractor shall be responsible for any and all damages, which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life, and limb.

1.6 SUBMITTALS

A. Test Reports: Submit the following reports directly to the Owner, with copy to Engineer:
1. Gradation test reports on borrowed material.
2. Field reports; in-place soil density tests.
3. One optimum moisture-maximum density curve for each type of soil compacted.

B. The Contractor shall submit samples of all materials from off-site sources to the testing laboratory at least ten (10) calendar days prior to use in the work. The Contractor shall not deliver or use any materials for off-site sources until written approval is received from the Engineer based upon test results showing compliance with these specifications. On-site excavated material, including fill and topsoil, if available, may be submitted for testing.

PART 2 – PRODUCTS

A. General Fill: Select excavated material obtained from the construction site or imported, free from roots, wood, trash, broken rocks or stones in excess of 5" and other organic material, and approved suitable for use as general fill.

B. Granular Structural Fill: Select excavated gravel or stone materials free of organic material, loam, trash, snow, ice, frozen soil, and other objectionable material, conforming to the gradation requirements as follows:

Sieve Size	% Passing (by weight)
3½"	100%
3"	90-100%
1½"	55-95%
¼"	25-60%
No. 10	15-45%
No. 40	5-25%
No. 200	0-10%

C. Crushed Gravel: Broken stone or gravel conforming to the requirements of Section M.02.01 for Coarse Aggregate as described in the State of Connecticut DOT Form 817, with gradation as follows:

Sieve Size	% Passing (by weight)
5"	
3½"	90-100%
1½"	55-95%
1/4"	25-60%
10"	15-45%
40"	5-25%
100"	0-10%
200"	0-5%

D. Filter Fabric: Conform to State of Connecticut Form, 817, Section M.08.01, Paragraph 26.MIRAFI 140 Filter Fabric.

E. Borrow: Select excavated material obtained from the construction site or imported, free from roots, wood, trash, broken rocks or stones in excess of 5" and other organic material, and approved suitable for use as Borrow and meets the requirements of Form 817 Section 2.07 for Borrow.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstruction, and deleterious materials from ground surface as specified in Section 02100.

C. Protect and maintain erosion and sedimentation controls, which are specified in Section 02100.

3.2 EXCAVATION - GENERAL:

A. Earth Excavation: Excavation of all materials of any kind, except as classified as rock excavation, trench rock excavation, and trench earth excavation.

B. Trench Earth Excavation: Excavation of individual piers, footings, catch basins, pits, manholes, and including the excavation of all trench materials of any kind except as classified as trench rock excavation. No tunneling will be allowed.

C. Mass Rock Excavation: shall include the excavation of hard and solid ledge, boulders in excess of one cubic yard in volume and rock hard cementitious deposits, the removal of which requires the use of drilling, barring, wedging, and/or blasting.

D. Channel/ Sediment Excavation: Excavation of all materials of any kind to proposed grade

or subgrade as indicated on the Contract Drawings. Material excavated from the channel limits is to be re-used within the project limits to achieve proposed grade as indicated on the Project Plans prior to the importation of borrow material. This item includes the excavation of the channel and stockpiling, dewatering, placement, and compaction of the excavated material in those areas where fill is proposed to meet the finished grades shown on the design plans and to blend with the surrounding topography.

E. Trench and Rock Excavation: shall include the removal of solid rock, ledge, shale, or boulders in excess of one-half cubic yard in volume encountered in excavating trenches or pits which cannot be removed by power equipment without wedging, drilling, and/or blasting.

F. Rock Removal: Rock removal is not anticipated. The dam shall be removed to its lowest extents in accordance with proposed channel grading, down to existing bedrock.

G. Unsuitable Material: If unsuitable materials as defined by the Engineer are encountered at required subgrade elevations, carry excavations deeper and replace excavated material with other material as directed by the Engineer. Remove unsuitable materials from the site and legally dispose of them. Removal of unsuitable material and its replacement as directed, provided it is not due to fault or neglect of the Contractor, will be paid on a cubic yard basis of measured volumes. Where the removal of unsuitable soil material is due to the fault or negligence of the Contractor in his performance of earthwork and site grading operations, excavate the resulting unsuitable material and replace with compacted satisfactory material as required, at no additional cost to the Contract Sum.

H. Stability of Excavations: General - Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

1. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

2. Slope the sides of excavations over 5' deep to the angle of repose of the material excavated, but not steeper than 1½ horizontal to 1 vertical. Where sloping is not possible, either because of space restrictions or stability of material excavated, shore and brace in accordance with requirements of authorities having jurisdiction. In addition, provide 5' high snow fence around these areas as protection. Temporary slopes should be covered with plastic sheeting or other suitable cover where necessary to prevent the surface from drying or eroding.

3. Maintain sides and slopes of excavation in a safe condition until completion of backfilling, by scaling, benching, shelving, or bracing.

4. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations, and when sides or excavations are subject to vibrations from vehicular traffic or the operation of machinery, or from any other source.

5. Provide minimum requirements for trench shoring and bracing to comply with ANSI A10.1 "Safety for Building Construction", and with local codes and authorities having jurisdiction.

I. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavation limits to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

J Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35ºF. Protect bottom of excavations and soil around and beneath foundations from frost.

K. Backfill and Fill: General - place acceptable soil material in layers to required.
1. Under footings, pits, trenches, and other structures, use granular fill.
2. Under footings in rock excavations, use stone fill.
3. Behind wall structures, use stone fill with a 6" surface layer of topsoil.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removal of trash and debris from excavation.

L. Placing and Compaction: Ground surface preparation - remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than one vertical to 4horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified in this section for particular area classification, break up ground surface, pulverize, moisture condition as required to achieve optimum moisture content, and compact to required depth and percentage of density. For slab on grade, proof roll existing ground surface with a ten-ton roller.

Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to foundations or other structures to required elevations. Prevent wedging action of backfill against structures by carrying material uniformly around structures to approximately same elevation in each lift.

Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.

Percentage of maximum density requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557: compact top 12 inches of sub-grade and each layer of backfill or fill material to 95% maximum density.

In trenches and pits: Compact top 12" of subgrade and each layer of backfill or fill material to 95% of maximum density.

Behind wall or rock structures, compact each layer of backfill or fill material to a minimum of 95%, but not more than 98% of maximum density.

In landscaped areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90% of maximum density.

M. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

Grading: General - the Drawings indicate finished elevations. The grading to be performed consists of establishing finished grade elevations as shown on the Drawings. The Contractor shall import additional materials if on-site quantities are insufficient

and/or shall dispose of excess materials off-site as required at no additional cost to the Contract Sum unless otherwise specified.

Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are indicted, or between such points and existing grades.

N. Stockpile and Reuse of On-Site Stone: All material excavated from the site or dam shall be reused on site as backfill and fill material, when suitable. The material shall be segregated and stockpiled on site in accordance with the Plan. Any stones larger than twelve inches (12") shall be reused in the construction of instream features in accordance with Section 02675 "Instream Features." The remaining excavated channel material shall be used as general fill in accordance with the product requirements of this specification. Unsuitable material may be blended with suitable material and reused on-site when said material is covered by suitable material to a minimum depth of 24 inches. Reuse of unsuitable material on-site must be approved by the Owner/Engineer prior to placement.

O. Excavation Near Structures: Contractor shall not excavate near existing retaining walls and bridge abutments so as not to destabilize any existing structures.

3.3 SEDIMENT REMOVAL AND DISPOSAL

A. Follow all applicable regulations and provide all labor, tools and equipment as and when required to perform the work specified herein or as shown on the plans, including but not limited to the following:

1. This work shall consist of the handling, storage and transport of sediment accumulated during dewatering to permit construction activities. This includes the sediment excavated from the areas designated on the plans to the dewatering basin and transport vehicles. The dewatered sediment shall be stored only in those areas as noted on the Plans. Any alteration to this location shall require approval from the Engineer (Refer to Section 02140 – Temporary Sedimentation & Erosion Control for further information).

2. The excavated sediment shall remain in the dewatering basin until such time that the Engineer determines that the sediment has been sufficiently dewatered. Refer to the Plans for further details regarding the dewatering basin.

3. All sediment and subsequent water from the dewatering operations shall be handled, transported and disposed of in compliance with all federal, state, local, and other applicable regulations, laws and permits.

4. All sediment shall be disposed of only after the sediment has been dewatered. No sediment shall be reused within the project limits.

5. Sediment to be removed from the site shall be transported to the designated sediment disposal site as shown on the Project Plans. The Contractor shall stockpile the sediment in the designated location and the stockpile shall not exceed 8 feet total height.

3.4 ARCHEOLOGICAL TEST PITS

A. Contractor shall coordinate with on-site archeologist (contracted with the Town of Glastonbury) for the excavation of up to 14 test pits up to three feet below the depth of sediment in the former dam impoundment.

B. Contractor must take care to remove accumulated sediment without disturbing pre-dam ground surface prior to assessment by archeologist. Analysis of any artifacts may be necessary, during which period no further excavation or disturbance will be allowed.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 5 "Earthwork," as determined by the Engineer. The contractor is responsible to remove excess soil materials from the site as part of this lump sum pay item.

END OF SECTION 02300

SECTION 02373

BANK SLOPE TREATMENT

PART 1 - GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 SUMMARY

This item consists of installing all bank slope treatments features as specified in Section 02373 Bank Slope Treatment, including but not limited to the following items;

- Boulder Slope Protection
- Boulder Revetment with Live Stakes
- Willow Brush Mattress with Log Toe
- Boulder and Log Toe Revetment

This item shall include the cost to reuse existing site materials, including all sands, gravels, cobbles, boulders, and woody debris meeting the requirements of these specifications for bank slope treatments.

1.3 RELATED WORK

Site Preparation: Section 02100
Earthwork: Section 02300
Instream Features: Section 02375
Site Restoration: Section 02900

1.4 DEFINITIONS

A. Boulder Slope Protection: Shall consist of stone fitted and placed on banks in order to provide protection against erosion. Boulder slope protection shall be constructed my dry-placing stones, which shall stand by virtue of inter stone friction and gravity ONLY and there is no mortar or other similar nature cementitious material connecting the stones.

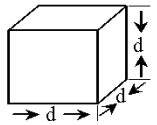
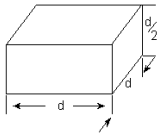
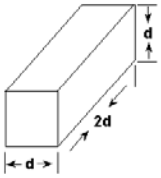
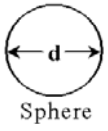
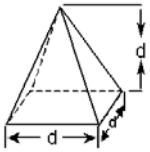
B. Boulder Revetment with Live Stakes: Shall consist of planting of live willow stakes and construction of boulder revetment.

C. Willow Brush Mattress with Log Toe: Shall consist of live willow stakes laid at opposing, interlocking but primarily vertical angles on the which is to be held down with stakes and jute twine for the purpose of bank stabilization and the promotion of permanent willow establishment. The toe of said slope will be protected by logs.

D. Boulder and Log Toe Revetment: Shall consist of construction of boulder revetment and use of logs to protect the toe of boulder revetment.

1.6 BOULDER WEIGHT MEASUREMENT

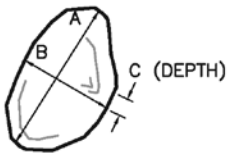
A. The weight of a single, irregularly shaped stone shall be approximated using the following table. Boulders that do not meet the specified weight, to within the specified tolerances when measured in this manner will not be approved for use.

STONE WEIGHTS AND DIMENSIONS					
Weights and Sizes	APPROXIMATE SHAPE				
					
600 lbs.	d = 18”	d = 23”	d = 15”	d = 23”	d = 27”
300 lbs.	d = 15”	d = 18”	d = 12”	d = 18”	d = 21”
150 lbs.	d = 12”	d = 15”	d = 9”	d = 15”	d = 17”
100 lbs.	d = 10”	d = 13”	d = 8”	d = 13”	d = 15”
d = 8”	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6”	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

1.5 BOULDER DIAMETER MEASUREMENT

A. The “Average Diameter” (Diameter) of a single, irregularly shaped stone shall be measured along its median axis, illustrated below as the “B” axis. Boulders that do not meet the specified diameter as measured along the “B” axis, to within the specified tolerances when measured in this manner will not be approved for use.

MEASUREMENT OF BOULDER AXES



NOTES:

A. LONGEST AXIS (LENGTH)
B. INTERMEDIATE AXIS (WIDTH)
C. SHORTEST AXIS (THICKNESS/DEPTH)

1.7 SUBMITTALS

B. Certified laboratory reports showing the following, as applicable:

1. Stone filling or rip-rap meets the criteria of the freeze thaw test and the magnesium sulfate soundness test requirements specified herein in the subsection headed "Quality Assurance."

2. Certification from the rock provider that the rock meets the requirements of the following parameters:

a. Bulk specific gravity (saturated dry surface basis) not less than 2.5. Bulk specific gravity to be determined by ASTM Method C127.

b. Absorption not more than two percent (2%).

c. Soundness - weight loss in five (5) cycles not more than ten percent (10%) when sodium sulfate is used or more than fifteen percent (15%) when magnesium sulfate is used.

d. Soundness shall be determined in accordance with ASTM C88 for coarse aggregate modified as follows:

1) The test sample shall not be separated into fractions. It shall consist of 500 grams (+300 grams), reasonably uniform in size and shape and weighing approximately 100 grams each, obtained by breaking the rock and selecting fragments of the required size.

2) After the sample has dried, following completion of the final test cycle and washing to remove the reactants, the loss of weight shall be determined by subtracting from the original weight of the sample, the final weight of all fragments which have not broken into three or more pieces. The report shall show the percentage loss of weight and the results of the qualitative examination.

e. Rock that fails to meet the requirements in subsections a, b, c and d above, may be accepted if the rock has been preapproved by CTDOT or if similar rock from the same source has been demonstrated to be sound after five (5) years or more of service or under similar conditions of weather, wetting, drying and erosive forces as those conditions anticipated at the site.

f. Any rock proposed for use from untested quarry sources must be tested by the Contractor and the test results provided to the Owner. All rock provided from off-site sources must be from a properly permitted quarry operation operating in good standing under all applicable local, state, and federal regulations.

1.8 QUALITY ASSURANCE

A. Provide at least one person who shall be present at all times during installation of the proposed structures and who shall be familiar with the types of materials being installed, recommended methods of installation and who shall direct all work performed under this section.

B. Accurately install all boulder revetments, walls, and instream boulder features to the lines and grades as indicated on the drawings.

C. The soundness of all material shall be approved on the basis of it satisfying the following criteria:

1. Freeze-Thaw Test: A maximum 10 percent loss, by weight, after 25 cycles of freezing and thawing.

2. Magnesium Sulfate Soundness Test: A maximum 10 percent loss, by weight, after 10 cycles of the magnesium sulfate soundness test. Test shall be performed in accordance with ASTM C88.

D. Codes and Standards: All materials and construction methods shall conform to Form 817 – State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified herein.

E. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.9 REFERENCES

A. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

B. Occupational Safety and Health Administration, U.S. Department of Labor

C. State of Connecticut Department of Transportation (CTDOT)

D. State of Connecticut Department of Energy and Environmental Protection (CTDEEP)

E. U.S. Department of Transportation, Federal Highway Administration

F. U.S. Environmental Protection Agency

PART 2 – PRODUCTS

2.1 MATERIALS

C. Type 2 – Semi-Rounded Sub-Angular Quarried Boulders: shall be angular, irregular, rectangular, flat or cubed rock obtained from a source that is approved by the Contracting Officer prior to execution of a contract for the project. Stone may be imported from off-site, or reused from on-site. Samples shall be submitted for approval.

D. Bank slope treatment materials shall be as specified on the plan and detail sheets. Blasted rock or concrete excavated from site is not approved for use under this specification. In no instance will concrete or other "debris" be allowed. Rock larger than 6 inches in diameter excavated from the site is approved for use under this specification.

E. The Contractor shall provide to the Engineer, for approval prior to installation, the source of all materials. The Engineer must approve the material before structure construction.

F. Materials shall include, but are not limited to revetment boulders, coir logs, wood stakes, erosion control blanket, large woody debris (rootwads and logs) as shown on the plan and detail sheets.

G. Consideration should be given to obtaining rock that is similar in color and texture to the native stone in the project area.

H. Individual stones shall be of sufficient hardness to resist weathering, dense, sound, and free from cracks, seams, and other defects which contribute to accelerated weathering. Limestone, sandstone, shales, and other porous or soft rocks will not be permitted for use.

I. Prior to execution of a contract, the Contractor shall identify all potential sources of rock.

J. Reuse: Large stones from any stone masonry to be removed from the structure may be reused for stone protection if it is free of cement, mortar, steel, and meets the requirements described in Section 02373 - Bank Slope Treatment, Section 02675 - Instream Features and/or Section 02900 - Site Restoration.

2.4 EROSION CONTROL BLANKET

A. Erosion control blanket shall be a biodegradable straw and coconut fiber erosion control blanket designed to provide all-natural erosion protection and assist with vegetation establishment on slopes of 2:1 or greater for 18 months. After the blankets degrade, soil erosion is controlled by the root, stem, and leaf structures of the mature vegetation. ECB shall be North American Green SC150BN, or approved equal.

2.6 BOULDER SLOPE PROTECTION

A. Stones shall be consistent with the requirements and specifications of material Semi-Rounded Sub-Angular Quarried Boulders, Type 2.

B. Stone shall consist of a mixture of generally sub-angular or rounded stone. Stone shall not be sandstone, shale, or other layered sedimentary rock, and shall conform to the hardness requirements described above.

C. Blasted, crushed, or angular riprap/shall not be approved for use.

D. Stones shall meet the gradation and diameter as specified on the detail sheet, and as measured on the B-axis (as described above).

E. Stones from excavation and dam removal may be used, if found to conform to the specifications, and shall be supplemented with stones as necessary.

2.7 BOULDER REVETMENT WITH LIVE STAKES

A. Stones shall be consistent with the requirements and specifications of material Semi-Rounded Sub-Angular Quarried Boulders, Type 2.

B. Stone shall consist of a mixture of generally sub-angular or rounded stone. Stone shall not be sandstone, shale, or other layered sedimentary rock, and shall conform to the hardness requirements described above.

C. Blasted, crushed, or angular riprap/shall not be approved for use.

D. Stones shall meet the gradation and diameter as specified on the detail sheet, and as measured on the B-axis (as described above).

E. Stones from excavation and dam removal may be used, if found to conform to the specifications, and shall be supplemented with stones as necessary.

F. Contractor is responsible for furnishing and installing live stakes.

G. Along the toe of the slope (first row), install 4' long live willow stakes (salix lucida or similar native willow species as approved by Owner/Engineer) spaced 3' on center. These are to be inserted into predrilled pilot holes slightly larger than the stake diameter and backfilled. Stakes should be inserted to 36" depth.

H. Higher on slope (above first row), install 4' long live stakes of elderberry (sambucus canadensis), arrowwood (viburnum dentantum) and gray dogwood (cornus racemosa) spaced 3' on center. These are to be inserted into preformed pilot holes larger than the stake diameter and backfilled with topsoil. Stakes should be inserted to 36" depth.

I. Plant materials shall be true to species. They shall be sound, healthy specimens and first-class representatives of their species. Plant materials that have serious injuries, insect pests, diseases or are shriveled, will be rejected. The plant materials shall be

from commercial sources or NRCS Plant Material Centers (PMC).

J. Final materials shall be subject to inspection and approval by the Owner prior to installation.

2.6 WILLOW BRUSH MATTRESS WITH LOG TOE

A. Live branches shall consist of live branch cuttings, see table below for material sizing, to the lengths given on the Contract Drawings. Live branches shall be cut from adventitiously sprouting native woody plants, such as willow and some species of shrub dogwood and alder. Non-native cultivars such as but not limited to Stremco and rusty willow are specifically prohibited. Branches shall be two to three year old flexible branches. Plant material shall be free from disease and harmful insects. Branches shall be cut and arranged no more than 48 hours before installation, and shall be kept moist and cold with refrigeration until installed. Live branches shall be approved by the Engineer prior to installation.

B. Live stakes shall consist of live branch cuttings from adventitiously sprouting native woody plant, such as willow and some species of shrub dogwood and alder, to the dimensions given on the Contract Drawings. Non-native cultivars such as but not limited to Stremco and rusty willow are specifically prohibited. Remove leaves and side branches from cuttings and do not use the first year growth. The basal ends should be cut at an angle and the top cut square. Cuttings must not be allowed to dry out, and must be kept covered and moist during transport and storage. Live stakes shall be approved by the Engineer prior to installation.

C. Logs shall be hardwood or other suitable species approved by the Engineer. Logs shall be a minimum of 8" in diameter and 12 feet to 20 feet long. Logs should have all branches removed and should be relatively straight and free of splits, rot, and insects. Trees shall be reused from on-site clearing when possible.

2.6 BOULDER AND LOG TOE REVETMENT

A. Stones shall be consistent with the requirements and specifications of material Semi-Rounded Sub-Angular Quarried Boulders, Type 2.

B. Stone shall consist of a mixture of generally sub-angular or rounded stone. Stone shall not be sandstone, shale, or other layered sedimentary rock, and shall conform to the hardness requirements described above.

C. Blasted, crushed, or angular riprap/shall not be approved for use.

D. Stones shall meet the gradation and diameter as specified on the detail sheet, and as measured on the B-axis (as described above).

E. Stones from excavation and dam removal may be used, if found to conform to the specifications, and shall be supplemented with stones as necessary.

F. Logs shall be hardwood or other suitable species approved by the Engineer. Logs shall be a minimum of 8" in diameter and 12 feet to 20 feet long. Logs should have all branches removed and should be relatively straight and free of splits, rot, and insects. Trees shall be reused from on-site clearing when possible.

2.9 WILLOW CUTTINGS/LIVE STAKES

A. Live cuttings for bioengineering practices shall conform to the following sizes

Practice	**Material Size**
Live Staking	½" – 1 ½" diameter, 30" – 42" length
Pole Planting	2" – 6" diameter, 4' – 8' length
Joint Planting	Same as live staking or pole planting
Live Fascine – Horizontal Fascines	¼" – 1 ½" diameter, 3' – 5' length
Live Fascine – Vertical Fascines	¼" – 1 ½" diameter, 3' – 5' length
Brush Mat	¼" – 1" diameter, 3' – 5' length
Clump Plantings	5 Stems, 1" – 4" diameter, 5' – 15' height
Live Stone Revetment	Same as live staking or pole planting
Brush Layered Revetment	¼" – 2" diameter, 3.5' – 6' length
Cluster Plantings	½" – 2 ½" diameter, 4.5' – 8' length

B. Unless otherwise noted all bioengineering practices requiring live cuttings shall use at least two of the following species. Additionally, no single species shall comprise more than 70% of the bioengineering practice:

Common Name	**Scientific Name**
Pussy willow	*Salix discolor*
Bebb's willow	*Salix bebbiana*
Silky willow	*Salix sericea*
Prairie willow	*Salix humilis var. humilis*
Black willow	*Salix nigra*
Autumn willow	*Salix serissima*
Shining willow	*Salix lucida*
Heart Leaved willow	*Salix eriocephala*
Silky dogwood	*Cornus amomum*
Gray dogwood	*Cornus racemosa*
Red Osier dogwood	*Cornus stolonifera*

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

Shall conform to the plan and detail sheets.

A. EROSION CONTROL BLANKET

1. Site Preparation - Proper site preparation is essential to ensure complete contact of the protection matting with the soil. Grade and shape the area of installation. Remove all rocks, roots, clods, vegetative, or other obstructions so that the installed blankets or mats will have direct contact with the soil. Prepare seedbed by loosening 2–3 inches of topsoil above final grade. Incorporate amendments, such as lime and fertilizer, into soil according to soil test and the seeding plan

2. Seeding - Seed the area before installing blanket for erosion control and revegetation. Seeding after mat installation is sometimes specified for turf reinforcement application—check the manufacturer's instructions. When seeding before blanket installation, reseed all check slots and other areas disturbed during installation. Where soil filling is specified for certain TRMs, seed the matting and the entire disturbed area after installation and before filling the mat with soil. Follow the manufacturer's instructions to ensure proper installation.

3. Anchoring - U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor ECBs and TRMs to the ground surface. Wire staples should be a minimum of 11 gauge. Metal stake pins should be 3/16 inch diameter steel with a 1.5 inch steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface.

4. All anchors should be 6–8 inches long and have sufficient ground penetration to resist pullout. Longer anchors might be required for loose soils. Use biodegradable composite or wooden stakes where dislodged metal staples or stakes might cause extreme hazards, such as near airport runways or areas where future mowing might cause risk

5. Installation on Slopes - Begin at the top of the slope and anchor the blanket in a 6 inch deep by 6 inch wide trench. Backfill trench and tamp earth firmly. Unroll blanket downslope in the direction of the water flow. The edges of adjacent parallel rolls must be overlapped at least 3 inches and be stapled through the overlapped area at least every 2 feet. When blankets must be spliced, place uphill blanket end over downhill blanket (shingle style) with 6-inch overlap. Staple through overlapped area, approximately 12 inches apart. Lay blankets and mats loosely and maintain direct contact with the soil—do not stretch. Ensure good, consistent, direct soil contact.

6. ECBs must be stapled sufficiently to anchor the blanket and maintain contact with the soil. Staples must be placed down the center and staggered with the staples placed along the edges. Steep slopes (1H:1V to 2H:1V) require at least 2 staples per square yard. Moderate slopes (2H:1V to 3H:1H) require 1-2 staples per square yard (1 staple 3 every feet on center). Gentle slopes require one staple per square yard.

7. Inspection and Maintenance - All blankets and mats should be inspected periodically following installation. Inspect installation after significant rainstorms to check for erosion and undermining. Any failure should be repaired immediately. If washout or breakage occurs, reinstall the material after repairing the damage to the slope.

A. BOULDER SLOPE PROTECTION

1. The ground surface on which bank protection is to be placed shall be free of brush, trees, stumps, and other objectionable material and shall be dressed to a smooth surface in accordance with General Specification 02100. All soft or spongy material shall be removed to the depth shown on the Contract Drawings or as directed by the Engineer and replaced with approved material. Excavation shall be in conformance with General Specification 02300. Filled areas shall be compacted in accordance with applicable provisions of General Specification 02300.

2. Install foundation stones at toe of slope.

2. Embed bank protection stone several inches into the stream bank to key into the bank, extending up the stream bank to the elevation indicated on the cross sections.

3. Finished elevation of the stones will be as indicated on the cross sections. Use heavy machinery/excavator to pack the revetment such that no loose stones remain after installation.

B. BOULDER AND LOG TOE REVETMENT

1. The ground surface on which bank protection is to be placed shall be free of brush, trees, stumps, and other objectionable material and shall be dressed to a smooth surface in accordance with General Specification 02100. All soft or spongy material shall be removed to the depth shown on the Contract Drawings or as directed by the Engineer and replaced with approved material. Excavation shall be in conformance with General Specification 02300. Filled areas shall be compacted in accordance with applicable provisions of General Specification 02300.

2. Install foundation logs at toe of slope.

2. Embed bank protection stone several inches into the stream bank to key into the bank, extending up the stream bank to the elevation indicated on the cross sections.

3. Finished elevation of the stones will be as indicated on the cross sections. Use heavy machinery/excavator to pack the revetment such that no loose stones remain after installation.

C. BOULDER REVETMENT WITH LIVE STAKES

1. Excavate bank sufficiently to place boulders without decreasing channel size.

2. Install boulder revetment per plan, and place one foot of topsoil as shown in detail.

3. Begin willow installation using the "stinger" or similar method to create voids in the rock.

4. Along the toe of the slope (first row), install 4' long live willow stakes (salix lucida or similar native willow species) spaced 3' on center. These are to be inserted into predrilled pilot holes slightly larger than the stake diameter and backfilled. Stakes should be inserted to 36" depth.

5. Higher on slope (above first row), install 4' long live stakes of elderberry (sambucus canadensis), arrowwood (viburnum dentantum) and gray dogwood (cornus racemosa) spaced 3' on center. These are to be inserted into predrilled pilot holes slightly larger than the stake diameter and backfilled. Stakes should be inserted to 36" depth.

6. Lightly tamp topsoil around each stake and saturate with water.

7. Seed bank with a mix consisting of native species that are at least moderately drought tolerant, do well on poor soils and develop substantial below-ground biomass. The slope should be hand raked to scarify the soil surface, then hand seeded, hydromulched or hand spread with a straw mulch, and raked lightly to ensure seed to soil contact. See seeding notes below for seed mix composition.

8. Plant materials should be planted the day they arrive on site. Plants and cuttings that cannot be planted the day they arrive shall be stored on site under a wet tarp to protect them from wind, direct sunlight, drying or other damage. Cuttings or unrooted stock that is not planted within two days after arrival on the site shall be discarded unless refrigerated at 40 to 50 degrees Fahrenheit. Rooted stock that is not planted within five days after arrival on site shall be discarded, unless stock is refrigerated at 40 to 50 degrees Fahrenheit. Discarded materials shall be replaced from commercial sources at the contractor's expense.

9. CLEAN-UP: The work area shall be kept clean and free of debris such as unusable plant materials. Final cleanup shall be the responsibility of the Contractor. Upon completion of the project, and prior to the issue of the final payment, the Contractor shall remove all debris and trash from the site and dispose of such materials off site.

10. SITE INSPECTION: Upon completion of the planting, the Contractor and Contracting Officer/Project Engineer will inspect all plantings. The Contractors shall correct all deficiencies within ten (10) calendar days of the inspection.

11. WARRANTY: The Contractors shall maintain a one (1) year repair and replacement warranty for the Willow Stakes. Plant survivability of 80% must be achieved.

D. WILLOW BRUSH MATTRESS WITH LOG TOE

1. A brush mattress is composed of live cuttings that are placed on the stream bank to form a densely packed layer of cuttings. The growth of the vegetation composing the mat structure may be improved by placing an initial lift of brush and covering it with soil and then placing a second lift of brush to the design surface. The mat is held in place by anchor stakes or poles and further secured to the slope by rope or binding products that are laced between the anchor poles. The base of the mat at the toe of the bank should be secured with rock or longitudinal bioengineered structures to prevent erosion or damage of the mat. The cuttings for the mat may be placed in small trenches cut into the face of the bank or pushed directly into the slope without the excavation of trenches.

2. Live cuttings shall be generally straight, supple, approximately ½ inch in diameter and no more than 2 inches in diameter, 5 feet long, and shall have lateral branches still attached. The cut ends of the cuttings shall be shaped to sharp tips for penetration into the stream bank. The cuttings shall be placed in rows parallel to the contours of the bank starting 0.75 feet below the bank crest. The rows shall be spaced every 2 feet thereafter down slope to the toe of the bank. All rows shall extend through the entire area delineated on the construction drawings.

3. The cut ends of the cuttings shall be pushed into the bank at the same contour elevation for each row with the growth tips toward the top of the bank. The cuttings shall be oriented normal to the bank toe. At least 15 cuttings shall be placed per liner foot in each row. A light roller and foot pressure shall be used to push the cuttings of subsequent rows against the bank over the cuttings of preceding rows to achieve a mat thickness of 4 inches. Up to 15 percent of the cuttings shall be placed parallel to the slope of the bank and interwoven with the cuttings that are placed with the growth tips toward the top of the bank. These parallel cuttings shall reinforce the brush mattress. The growth tips of the parallel cuttings shall be oriented downstream. The process of placing and compressing cuttings shall continue down slope until the toe of the bank is

reached. A row of cuttings shall be place along the toe of the bank regardless of spacing interval.

4. The toe of the bank shall be protected by large natural stones or as specified in the construction drawings. The protection should overlie the base of the cuttings of the row at the toe of the bank.

5. Live anchor stakes that are 2 inches in diameter shall be driven through the mat and 2 feet into the stream bank. The tops of these stakes shall not extend more than 1-foot above the top of the mat. The stakes shall be placed in rows parallel to the bank contours starting at the crest of the bank with the stakes spaced 3 feet apart. Subsequent down slope rows shall be spaced every 3 feet to the toe of the bank. A row of stakes shall be installed along the toe of the bank regardless of spacing interval to anchor the base of the mat. The top of each anchor stake shall be notched with a 1/2-inch deep triangular cut that is normal to the length of the stake and 25 mm 1 inch below the top of the mat when compressed by foot pressure adjacent to the stake.

6. The upstream and downstream ends of the mat shall be secured with anchor stakes that shall be placed with a spacing interval equal to one half the above specified spacing distances of stakes in the rows. The one half distance spacing of stakes shall extend for 3 feet towards the center of the structure from the upstream and downstream ends of the mat and shall extend from the base to the top of the mat at these locations.

7. The mat shall be secured to the slope using binding ropes. The ropes shall be laced across the mat in a diagonal. A single length of rope shall be secured to a stake in the row of stakes at the toe of the bank. The rope shall be secured to each stake that is oriented diagonally to this stake in a single direction from the toe of the bank to the crest of the bank. Ropes that cross between stakes shall be tied together. Ropes shall be secured parallel and normal to the slope along the rows of stakes and to the stakes that lie in a line from the crest to the toe of the bank. These ropes shall be tied together where they meet between stakes. All ropes shall be secured to the stakes with non-raveling knots. No more than 6 inches of rope shall remain at the ends of the rope lengths after they are installed.

8. Topsoil shall be brushed into the mat to within 2 inches of the top of the structure.

3.2 HARVESTING OF VEGETATION

A. Site harvesting shall require the cutting of existing vegetation for live and dead stakes, poles, or cuttings, collection of roots or tubers, or excavation of plants with root mats intact. The Contractor is responsible for obtaining the necessary approvals for harvesting and obtaining the permission of all landowners of the harvest sites. All harvesting should be performed in the dormant season. These plants are dormant when

buds are set in the fall after the first hard freeze until the time when the buds begin to swell in the early spring. If planting cannot be done during the dormant season then prior approval by the Owner/Engineer is required The harvest site must not be over harvested and must be restored as much as reasonably possible after harvest work is completed. The number and location of the vegetation that may be harvested shall be determined before construction by a qualified botanist or forest engineer.

B. Harvesting of Woody Plants

Woody plants consist of stem cuttings that quickly sprout roots and stems from the parent stem. These plants are typically willow and perhaps some species of dogwood and alder. Nursery stock with established roots may also be used. The length of the harvested vegetation will vary with site conditions and structure design. In general, stakes and poles should extend at least 1-foot above the top of structure. Cuttings should extend at least 1-foot beyond the edge of a structure or 2 feet above the ground surface. The actual lengths of the stakes or poles shall be based on the depth of soil from the surface to the mid-summer capillary zone or water table. For guidance, the minimum length is three feet. The diameters for the base of cuttings and stakes may range from 1/2 to 1.5 inches and should be of sufficient diameter to resist buckling when driven into the streambed or bank. Live poles may range from 4 to 6 inches. Live or dead logs should be at least 4 inches in diameter for gullies and 8 inches in diameter for use in streams or rivers. To improve survivability, live stakes and poles must be of sufficient length to penetrate the soil 2 feet below the bioengineered structure or to within the capillary zone of moisture in the soil. Stakes, poles, and cuttings shall be harvested from local sources of selected species. Species of plants foreign to the ecosystem environment at the work site shall not be imported. Unless otherwise stated below, cuttings and stakes shall be 0.5 to 1.5 inches in diameter and at least 3 feet in length. Stakes and Poles with a diameter of 1 to 3 inches and minimum length of 5 feet shall be used for insertion into armored stream bank structures. Stakes and cuttings and poles shall be cut from healthy plants and shall be as straight as possible. Plants for harvest shall be a minimum of one-year-old, preferable 2 to 5 years in age. Suckers or current year growth shall not be used. All cuts shall be clean and free of splits or excessive peeling of bark. At least two bud scars shall be visible on the cutting, stake, pole above the surface of the ground or structure when installed. Stakes and Poles with deviations or curvatures greater than 0.5 inch from vertical per 1-foot of length will not be accepted. All branches emanating from the stake pole shall be trimmed as close as possible to the surface of the stake without damage to the bark. The bottom end of the stake or pole shall be cut at an angle of 60 degrees to the horizontal. The top of the stake or pole shall be cut normal to its length. Live cuttings shall be harvested from branches and shall include the growth tips of the branch. The butt of the cutting shall be cut at an angle to the vertical to aid in placing into soil. If trunks of vegetation remain after cutting, these trucks shall have a sufficient number of healthy branches remaining to allow survival.

C. Sealing of Harvest Cuts

All harvest cuts on trunks or branches of the host vegetation shall be trimmed of loose wood or bark and sealed with an approved sealant to prevent desiccation and disease or infestation at the end of the workday without exception.

D. Harvest Site Restoration
The harvest site shall be restored to preexisting conditions as best as possible after harvesting is completed. Restoration shall include but shall not be limited to removal of aggregate or wood chip roads or access paths, access gates, and ruts or depression, or other items or features related to work activities.

3.3 TIME OF PLANTING

A. Woody plants, including cuttings, and nursery stock should be planted in the dormant season. These plants are dormant when buds are set in the fall after the first hard freeze until the time when the buds begin to swell in the early spring. If planting cannot be done during the dormant season then prior approval by the Owner/Engineer is required.

B. Herbaceous plants may be planted during the dormant or non-dormant seasons. If planted in the non-dormant season, these plants should be placed as early as possible in the spring to allow the greatest amount of time for root development and growth. Herbaceous plants should not be planted during hot or dry weather if at all avoidable.

3.4 TRANSPORTATION OF HARVESTED VEGETATION

A. All freshly harvested and prepared live woody vegetation shall be immediately submerged in clean uncontaminated water and shall not be allowed to dry out. Cut vegetation shall be transported to the work staging area submerged in water. If site conditions prohibit direct access to storage bins filled with water, then the freshly cut live vegetation shall be wrapped in cloth, which is thoroughly saturated with water, and shall be transported to a storage bin filled with water within no more than four hours from the time of cutting.

B. Prior to transportation to the work site vegetation shall be removed from the soaking tanks and wrapped in bundles that are completely covered with at least three layers of saturated highly absorbent cloth or saturated biodegradable paper product with high saturated strength. Upon reaching the work site vegetation shall be removed from the wrappings and immediately placed into containers containing clean uncontaminated water for soaking prior to planting.

C. Cut vegetation shall not be left uninstalled at the work site and exposed to air or heat or excessive cold for any reason. Dead cuttings stakes poles shall not be soaked unless the design requires this vegetation to be flexible. Cut live vegetation that is exposed to air for longer than 4 hours during harvesting, transportation, installation, or which were not collected or transported as specified above shall not be accepted. Damaged live vegetation shall not be accepted and shall be replaced at no expense to the Owner.

D. Herbaceous plants and nursery stock shall be transported to the work site in covered vehicles. Plants shall not be subjected to cold or excessive heat or drying during transport. The plants shall be carefully unloaded at the staging area and placed in a shaded area. Plants shall be watered and maintained in healthy condition until the time

of installation. The plants shall be transported to the work site by hand, push cart or vehicles and immediately installed at the site. Damaged, wilted, diseased or dead plants or nursery stock shall not be accepted and shall be immediately replaced at no expense to the Owner.

3.5 SOAKING AND PAINTING OF LIVE WOODY VEGETATION

A. All harvested live vegetation shall be soaked in clean water for 3 to 5 days before installation into the ground. The live vegetation shall be placed in clean, leak proof, large plastic storage containers or similar, which are at least 12 inches longer in length than the cut vegetation. Reused or new metal drums or drums used for the containment of hazardous wastes or chemicals shall not be used. The containers shall be placed in organized lines in a shaded location separated by a sufficient distance to allow access of a vehicle to the containers for the placement and removal of the vegetation.

B. The water levels in the containers shall be checked twice daily and water shall be added as needed to ensure the containers are filled with sufficient water to completely cover the contained vegetation with a minimum of 2 inches of water. Rust proof weights or clean cobbles or boulders may be used to weight down the vegetation and retain it under the water surface. These weights shall not crush or damage the vegetation. Water in the containers shall be completely replaced with fresh and clean water every 3 days without exception. Vegetation that remains in water that has not been replaced as required shall be deemed defective and shall not be accepted by the Owner. Water replacement schedule may be adjusted to compensate for weekends and holidays with the notification and approval of the Owner/Engineer.

1. Mixing of Live Vegetation
   Vegetation of a specific species shall not be commingled with another species during cutting, soaking, or transportation.

2. Painting of Stakes and Poles
   The top ends of the stakes and poles shall be painted with a latex paint diluted with water at a ratio of one part paint to one part water. The tops of the stakes and poles shall be dipped in the dilute paint mixture to a depth of 3 inches after soaking painted immediately after planting by brush or spray applicator. The color of the paint shall be caution yellow or safety orange. The top ends of dead stakes and poles shall not be painted.

C. Harvesting and soaking records
Daily logs shall be prepared documenting the activities of plant harvesting, transportation, and soaking. These records shall contain at a minimum: name, date, weather conditions, company, location of harvest area, location of soaking area, site rehabilitation, species harvested, number of cuttings harvested, number of cuttings placed in soaking tanks, damage to cuttings, problems, and solutions to problems encountered. Records shall clearly indicate the health of the primary vegetation from which the cuttings are obtained, diameter of cuttings and primary vegetation, length of cuttings, trimming procedures, time of cutting, time of placement in transportation bins, handling procedures, sealing of harvest cuts, time the live vegetation is delivered and transferred to soaking tanks. The records shall contain the duration of soaking of the vegetation, water quality and time and amounts of water added to the tank during soaking, time of removal

of the cuttings from the tanks, time of planting of the cuttings, and procedures used for removal, transportation, and planting of the vegetation at the construction site. The records shall be signed by the lead harvest person or person in charge of soaking and planting and shall be provided to the on-site Officer at the end of each day. Records shall be provided to the Owner/Engineer within 48 hours of completion.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 6 “Bank Slope Treatments,” as determined by the Engineer.

END OF SECTION 02373

SECTION 02675

INSTREAM FEATURES

PART 1 – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 SUMMARY

This item consists of installing all instream features as specified in Section 02675 –Instream Features, including but not limited to the following items;

- Riffle Grade Control Structure
- Channel Bed Restoration
- Random Bed Armoring
- Random Boulder Clusters
- Stepping Stones
- Natural Stone-Lined Swale

This item shall include the cost to reuse existing site materials, including all sands, gravels, cobbles, boulders, meeting the requirements of these specifications for instream features.

1.3 A. Related work specified elsewhere includes:

Site Preparation: Section 02100
Water Control: Section 02245
Earthwork: Section 02300
Bank Slope Treatment: Section 02375
Site Restoration: Section 02900

1.4 DEFINITIONS

A. Riffle Grade Control Structure: Shall consist of a mix of graded boulder, cobble or gravel sized stone and void filling sediment designed to mimic the relative high gradient rocky inflection points along a meandering stream. The riffle is constructed of Core Boulders, Footer Stones and Filler Stones.

B. Channel Bed Restoration: Shall consist of natural gravel/cobble/boulder bed material reused from on-site and supplemented with off-site material if necessary. Existing bed armoring shall be stripped and stockpiled for replacement on final channel bed in all areas of channel regrading. The final channel bed left in place shall be free of fines (sand and silt) and shall generally have the same stone size/placement, gradation, dimensions, and flow patterns of the channel upstream and downstream of the construction site.

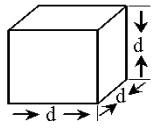
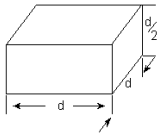
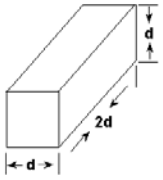
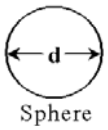
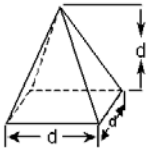
C. Random Boulder Clusters: Shall consist of header and footer boulders placed in groups of three to five, spaced throughout the channel to create roughness and areas of flow variability.

D. Stepping Stones: Shall consist of semi-angular to rounded stones to form a grade control, as well as to provide intermittent stones with flat tops situated above the low flow water surface elevation and located within stepping distance of pedestrians to allow for river crossing under certain low-flow circumstances.

E. Natural Stone-Lined Swale: Shall consist of a rounded, natural boulder-lined swale intended to provide a protected flow path of a tributary to Blackledge River through the soft sediments of the former impoundment.

1.6 BOULDER WEIGHT MEASUREMENT

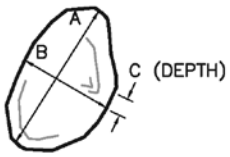
A. The weight of a single, irregularly shaped stone shall be approximated using the following table. Boulders that do not meet the specified weight, to within the specified tolerances when measured in this manner will not be approved for use.

STONE WEIGHTS AND DIMENSIONS					
Weights and Sizes	APPROXIMATE SHAPE				
				 Sphere	
600 lbs.	d = 18”	d = 23”	d = 15”	d = 23”	d = 27”
300 lbs.	d = 15”	d = 18”	d = 12”	d = 18”	d = 21”
150 lbs.	d = 12”	d = 15”	d = 9”	d = 15”	d = 17”
100 lbs.	d = 10”	d = 13”	d = 8”	d = 13”	d = 15”
d = 8”	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6”	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

1.5 BOULDER DIAMETER MEASUREMENT

A. The “Average Diameter” (Diameter) of a single, irregularly shaped stone shall be measured along its median axis, illustrated below as the “B” axis. Boulders that do not meet the specified diameter as measured along the “B” axis, to within the specified tolerances when measured in this manner will not be approved for use.

MEASUREMENT OF BOULDER AXES



NOTES:

A. LONGEST AXIS (LENGTH)
B. INTERMEDIATE AXIS (WIDTH)
C. SHORTEST AXIS (THICKNESS/DEPTH)

1.7 SUBMITTALS

A. Certified laboratory reports showing the following, as applicable:

1. Stone filling or rip-rap meets the criteria of the freeze thaw test and the magnesium sulfate soundness test requirements specified herein in the subsection headed "Quality Assurance."

2. Certification from the rock provider that the rock meets the requirements of the following parameters:

a. Bulk specific gravity (saturated dry surface basis) not less than 2.5. Bulk specific gravity to be determined by ASTM Method C127.

b. Absorption not more than two percent (2%).

c. Soundness - weight loss in five (5) cycles not more than ten percent (10%) when sodium sulfate is used or more than fifteen percent (15%) when magnesium sulfate is used.

d. Soundness shall be determined in accordance with ASTM C88 for coarse aggregate modified as follows:

1) The test sample shall not be separated into fractions. It shall consist of 500 grams (+300 grams), reasonably uniform in size and shape and weighing approximately 100 grams each, obtained by breaking the rock and selecting fragments of the required size.

3) After the sample has dried, following completion of the final test cycle and washing to remove the reactants, the loss of weight shall be determined by subtracting from the original weight of the sample, the final weight of all fragments which have not broken into three or more pieces. The report shall show the percentage loss of weight and the results of the qualitative examination.

e. Rock that fails to meet the requirements in subsections a, b, c and d above, may be accepted if the rock has been preapproved by CTDOT or if similar rock from the same source has been demonstrated to be sound after five (5) years or more of service or under similar conditions of weather, wetting, drying and erosive forces as those conditions anticipated at the site.

f. Any rock proposed for use from untested quarry sources must be tested by the Contractor and the test results provided to the Owner. All rock provided from off-site sources must be from a properly permitted quarry operation operating in good standing under all applicable local, state, and federal regulations.

1.8 QUALITY ASSURANCE

A. Provide at least one person who shall be present at all times during installation of the proposed structures and who shall be familiar with the types of materials being installed, recommended methods of installation and who shall direct all work performed under this section.

B. Accurately install all boulder revetments, walls, and instream boulder features to the lines and grades as indicated on the drawings.

B. The soundness of all material shall be approved on the basis of it satisfying the following criteria:

1. Freeze-Thaw Test: A maximum 10 percent loss, by weight, after 25 cycles of freezing and thawing.

2. Magnesium Sulfate Soundness Test: A maximum 10 percent loss, by weight, after 10 cycles of the magnesium sulfate soundness test. Test shall be performed in accordance with ASTM.

D. Codes and Standards: All materials and construction methods shall conform to Form 817 – State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified herein.

E. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

PART 2 – PRODUCTS

2.1 ROCK

A. Type 1 – Weathered Rounded Boulders: shall be generally spherical or oval in shape, with weathered and rounded corners, free of sharp angles or edges, and suitable for placement inside a stream channel such that they match the character, style, size, and color of existing stream bed material upstream and downstream of the site. Stone may be imported from off-site, or reused from on-site. Samples shall be submitted for approval.

B. Type 2 – Semi-Rounded Sub-angular Quarried Boulders: shall be semi-angular, irregular rock obtained from a source that is approved by the Contracting Officer prior to execution of a contract for the project. Stone may be imported from off-site, or reused from on-site. Samples shall be submitted for approval.

C. Gravel/Cobble: shall consist of weathered rounded river stones either harvested from the existing river bed or from elsewhere on-site, stockpiled for re-use, or imported from offsite. Samples of imported material shall be submitted for approval, to the size range as specified on the plans.

D. Instream feature materials shall be as specified on the plan and detail sheets. Blasted rock or concrete excavated from site is not approved for use under this specification. Rock materials used in the channel shall be generally spherical or elliptical in shape, with weathered and rounded corners, free of sharp angles or edges, and suitable for placement inside a stream channel such that they match the character, style, size, and color of existing stream bed material upstream and downstream of the site. Stone may be imported from off-site, or reused from on-site. Samples shall be submitted for approval.

E. Rock larger than 6 inches in diameter excavated from the site is approved for use under this specification.

F. The Contractor shall provide to the Engineer, for approval prior to installation, the source of all materials. The Engineer must approve the material before structure construction.

G. Rock that does not meet the specified size requirements shall not be accepted by the Owner and shall be removed from the site. No payment will be made on rock that does not meet the size requirements.

H. All rock shall be quarry or alluvial stone from an approved source. Prior to execution of a contract, the Contractor shall identify all potential sources of rock. The Contractor shall be responsible for obtaining from the rock provider and submitting appropriate samples to the Engineer and Owner for approval. All rock provided from off-site sources must be from a properly permitted quarry operation operating in good standing under all applicable local, state, and federal regulations.

I. Consideration should be given to obtaining rock that is similar in color and texture to the native stone in the project area.

K. Individual stones shall be of sufficient hardness to resist weathering, dense, sound, and free from cracks, seams, and other defects which contribute to accelerated weathering. Limestone, sandstone, shales, and other porous or soft rocks will not be permitted for use.

L. Reuse: Large stones from any stone masonry to be removed from the structure may be reused for stone protection if it is free of cement, mortar, steel, and meets the requirements described in Section 02373 - Bank Slope Treatment, Section 02675 - Instream Features and/or Section 02900 - Site Restoration.

2.2 RANDOM BOULDER CLUSTERS

A. Random Boulder Clusters shall consist of header and footer boulders placed within the channel to create local channel bed scour and deposition. Header and footer boulders shall be according to the size given on the Contract Drawings, both naturally occurring stone from an approved source. Riprap is not permitted.

B. The header boulder should be 18-inches to 24-inches in diameter, and the footer boulders shall be 18-inches to 24-inches in diameter.

C. Stones for random boulder clusters shall be consistent with the requirements and specifications of material Weathered Rounded Boulders, Type 1.

D. Naturally occurring blocky boulders should be used in place of round rock.

2.3 RIFFLE GRADE CONTROL STRUCTURE

A. Riffle material shall be composed rounded quarry or alluvial stone. Riffle shall be installed with a bedding of footer stones, and the overall gradation of rocks should be enhanced with filler cobble.

1. Stones for core boulders and footer boulders shall be consistent with the requirements and specifications of material Semi-Rounded Sub-Angular Quarried Boulders, Type 2.

2. Stones for filler cobble shall be consistent with the requirements and specifications of material Weathered Rounded Boulders, Type 1.

2.5 CHANNEL BED RESTORATION

A. Material for Channel Bed Restoration shall be obtained from on-site during channel bed excavation, and supplemented with off-site import as necessary.

B. Material shall conform to Gravel/Cobble River Bed Material.

C. If the pre-dam channel bed is not found upstream of the dam, supplemental material shall be imported to meet the gradation and dimension spec of Channel Bed Restoration as shown on the plans and details, and described herein. No extra payment will be made for such imported material. A sample of such material shall be submitted to the Owner for approval prior to installation in the proposed channel.

2.6 STEPPING STONES

A. Stones for random boulder clusters shall be consistent with the requirements and specifications of material Weathered Rounded Boulders, Type 1, with emphasis on stones with flat tops for the primary stepping rocks located at intermittent spacing in the channel.

2.7 NATURAL STONE-LINED SWALE

A. Stones for core boulders and footer boulders shall be consistent with the requirements and specifications of material Semi-Rounded Sub-Angular Quarried Boulders, Type 2.

PART 3 - EXECUTION

3.1 MATERIAL REUSE

A. Stones larger than 6 inches in diameter may be reused for instream features.

B. Large stones from any stone masonry to be removed from the structure may be reused for stone protection if it is free of cement, mortar, steel, and meets the requirements described in Section 02373 - Bank Slope Treatment, Section 02675 - Instream Features and/or Section 02900 - Site Restoration.

C. Material excavated outside of the channel (generally sand and silt) may be reused as general fill, as specified on the plans. Clay may not be reused on site unless approved by the Engineer.

D. Material reused from onsite sources shall be paid for under the appropriate bid item. Approximate size and quantity shall be determined by the engineer in the field.

3.2 CONSTRUCTION METHODS

A. Shall conform to the plan and detail sheets.

B. RANDOM BOULDER CLUSTERS

a. Complete the work during periods of low flow to ensure proper location within the stream channel and to facilitate the movement of heavy equipment.

b. Boulders shall be placed on top of footer rocks so that the boulder is offset in the upstream direction.

c. Place clusters arranged in an upstream or downstream “V” formation. Space multiple boulder clusters a minimum of 1/3 of a stream width apart.

d. Install all boulders at a low profile such that they are partially submerged during normal low flow. Finished elevation and location of the boulders will be determined in the field by the design engineer. The boulders should be buried a depth of 1/3 their diameter within the stream bed.

e. Boulders shall be placed in the middle third of the stream within the deepest portion of the channel.

f. The header boulder should be 12 inches to 24 inches in diameter, and the footer boulders shall be 12 inches to 24 inches in diameter.

g. Position boulders with their long axis parallel to the stream flow.

h. Install boulder clusters approximately in the locations shown on the plans or as directed in the field by Owner/Engineer with at least 3 structures per 100 linear feet of channel.

C. RIFFLE GRADE CONTROL STRUCTURE

a. Prior to the start of work, the Owner and Project Engineer shall designate representatives authorized to observe the Contractors construction of the riffles. The Contractor shall construct the riffles in the presence of an authorized Owner representative.

b. Excavation of the riffle base, below final grades, should be made in conformity with the specified design plans. This work includes the excavation and preparation of the trench for the footer stones and core boulders. The trench shall be a minimum of 3 feet in depth below the stream bed, and extend a minimum of 6 feet into the bank on either side of the watercourse. The subgrade cut should be inspected for bearing strength and if necessary machine compacted to a density approximating that of the surrounding undisturbed material.

c. Place footer stones and core boulders to fill the trench and to bring the riffle top to the required elevation. Filler rocks should be spread on top of and between the placed stone. Filler stones shall have a minimum depth of 2 feet and shall be embedded a minimum of one foot. Sand fraction of filler material shall be distributed over the surface of the placed filler stones, and washed down in to the voids of the stone.

d. Cobble/gravel riffle material should be systematically placed from the center of the channel to the outer edges. Larger rocks, as specified by the design gradation,

should be placed at the riffle surface as best as possible. Core boulders may and should extend above the nominal crest elevation of the riffle, provided that they are buried by 1/3 their depth at a minimum, and that they do not block more than 1/5 of the total cross-sectional width.

e. The rock should be placed with suitable equipment to produce a reasonably graded mass of stones. Rock should not be dropped from a height that causes damages to the footer rocks or causes impact segregation and sorting of rock sizes. Rock should be reasonably tamped in placed with suitable equipment.

f. The riffle feature should be keyed into the bank, and bank areas on either side of the riffle feature should be reconstructed to the design heights and form. Any excavation voids existing along the edges of the completed riffle should be backfilled and compacted to ensure all transitions are smooth. Bank areas on either side of the riffle should be reconstructed to the design heights and form.

D. CHANNEL BED RESTORATION

a. Removal of existing bed armoring:
    i. Remove and stockpile all existing sand, gravel, cobble, and boulder to minimum 12" depth within existing bankfull channel downstream of existing dam and within area of proposed channel disturbance. Reuse material on top 12" of final channel bed.

b. Channel formation:
    i. Perform rough grading of channel.
    ii. Do not reuse fine-grained silts, clays, or organic material within the bankfull channel.
    iii. To establish new channel in fill situation: fill to within 12" of final grade with natural sand & gravel/cobble/boulder re-used from on-site excavation. Do not use silts, clays, or organics. Do not use stockpiled bed armoring as general fill to raise bed. Place final 12" of material from stockpiled material, and supplement with bed armoring as described below.
    iv. To establish new channel in cut situation, in suitable soil: place final 12" of material from stockpiled material, and supplement with bed armoring as described below.
    v. To establish new channel in cut situation, in unsuitable soil: remove material to 24" below final grade. Place 12" of suitable sand/gravel fill. Place final 12" of material from stockpiled material, and supplement with bed armoring as described below.
    vi. If sufficient material is not harvested from the site to form the proposed channel, material that meets the channel bed restoration specifications shall be imported from off-site. A sample of such material shall be submitted to the Owner for approval prior to installation in the proposed channel.

c. Low-flow channel:

i. Shall be a v-shaped channel with 5% slope from deepest point to banks, 14' wide and 0.5' deep.

d. Bankfull channel:
   i. Shall consist of a 60' wide flow area upland of the low-flow channel. It shall generally slope at 2% towards the low flow channel, and have 2.5' high banks at 3:1 slope (max) along the outer limits. See plan and detail.

e. Gravel/Cobble River Bed Material:
   i. Place 2"-12" Rounded Gravel/Cobble material to restore channel bed to preconstruction conditions (re-use from existing channel or import if necessary).

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 7 "Instream Features," as determined by the Engineer.

If the pre-dam channel bed is not found upstream of the dam, supplemental material shall be imported to meet the gradation and dimension spec of Channel Bed Restoration as shown on the plans and details, and described herein. No extra payment will be made for such imported material. A sample of such material shall be submitted to the Owner for approval prior to installation in the proposed channel.

END OF SECTION 02675

SECTION 02900

SITE RESTORATION

PART I – GENERAL

1.1 The General Conditions and Supplementary General Conditions apply to this section of the Specifications.

1.2 WORK INCLUDED

All materials, labor, equipment, and services necessary to perform the work of this section as shown on the Drawings, as specified, and as required by job conditions, including, but not limited to, the following:

A. Furnishing, grading, and treatment of topsoil to finish grade elevations, including mulching and seeding.

B. Providing an established stand of vegetation from native seed mixtures on all areas shown on the plans or where directed by the Engineer.

C. Furnishing and installation of exterior plants, including trees and shrubs.

D. Restoration of access road areas, staging and stockpile areas, including topsoiling and seeding as necessary to restore to original condition. Any damage or rutting lawns area shall be restored to its original condition. This item shall also include furnishing and importing to the site sufficient topsoil to provide 6 inches of depth over all disturbed areas and 12 inches of topsoil over the construction haul road as shown on the contract drawings.

E. Installation of anti-herbivory exclusion devices around installed trees and shrubs.

F. Rebuild access gate stone masonry wall if any portion was damaged or removed during construction.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Site Preparation:	Section 02100
Earthwork:	Section 02300

1.4 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

F. Backfill: The earth used to replace or the act of replacing earth in an excavation.

1.5 SUBMITTALS

A. Product data sheets, specifications, performance data, physical properties for the following:
   1. Seed mixture.

B. Manufacturer's Certificates or labels from containers certifying that the product meets the specified requirements for the following:
   1. Seed mixture, if pre-mixed, also show compliance with State and federal seed laws.
   2. Trees, planting materials, and shrubs.

C. Samples (and test report), in the following quantities:

   1. Topsoil, 5-gallon pail – provide representative testing to indicate percent organic content for both on-site and off-site source material. Only topsoil meeting organic content specification (6% min. – 20% max.) is acceptable.
   2. Submit sample and product literature and guarantees in accordance with requirements of the General Conditions for the following:
      a. Seed: - Submit native seed mixtures for approval prior to application of the seed and all empty seed bag labels after application of seed to the Engineer. Species types within Native Seed Mixtures listed below may vary dependent upon season and/ or availability of species' seed.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year.

1.6 QUALITY ASSURANCE

A. Codes and Standards: All materials and construction methods shall conform to Form 817 - State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2017 edition, and Supplemental Specifications thereto dated January 2015 unless otherwise specified herein.

B. The Owner reserves the right to test and reject for cause any material not meeting material specifications by tests in accordance with methods adopted by the Association of Official Agricultural Chemists. Costs for these tests shall be borne by the Contractor [subcontractor].

C. Acceptance of the restoration areas shall be established by the Engineer in writing, following the completion of all maintenance work requirements as specified herein, and following the correction of all punch list deficiencies by the Contractor.

D. Analysis and standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable.

E. Workmen: All workmen shall be thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

F. Do not make substitutions. If specified landscape material is not obtainable, submit proof of no availability to Owner, together with proposal for use of equivalent material.

G. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.
   1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

H Pre-installation Conference: Conduct conference with Owner/Engineer/Contractor/Local Authorities at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in new, sealed, containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging. Seed in damaged packaging is not acceptable.

B. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.8 JOB CONDITIONS

A. Seeding shall be performed when weather and soil conditions are suitable in accordance with locally accepted practice, as specified herein.

B. Seeding dates are as follows:
April 15 – June 30
September 15 - October 15

C. Do not install grass seed when wind velocity exceeds 5 mph.

D. Acceptance of the restoration areas shall be established by the Engineer in writing, following the completion of all maintenance work requirements as specified herein, and following the correction of all punch list deficiencies by the Contractor.

1.9 SPECIAL PRODUCT WARRANTY

A. The Contractor shall supply the Engineer with all warranties or certificates, or both, furnished with the seed mixture prior to use of the material, if so requested.

B. Installer's standard form in which Installer agrees to repair or replace plantings that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner, or incidents that are beyond Contractor's control.
   b. Structural failures including plantings falling or blowing over.

2. Warranty Periods from Date of Substantial Completion:
   a. Trees, Shrubs and Ground cover: One year.

PART 2 – PRODUCTS

2.1 SEEDING MATERIALS

A. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials. According to the methods of AOAC methods of testing, the acidity range shall be approximately 3.5 to 5.5 pH and a maximum moisture content of 30 percent. Organic matter content shall be not less than 90 percent, and ash content shall not be more than 10 percent, by weight on an oven-dry basis.

B. Accessories: Water - Clean, fresh and free of substances or matter which could inhibit vigorous growth of vegetation.

2.2 SEED

A. Seed may be mixed on-site by an approved method or pre-mixed by a dealer. If the seed is to be mixed on-site, seed shall be delivered to the site in separate containers for each variety of seed.

B. Seed mixes shall be supplied by New England Wetland Plants, Inc., 820 West Street, Amherst, MA 01002 (413) 548-8000 or approved equal and to the requirements below. Seed mix shall be free of invasive species.

New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites

SPECIES	PERCENT
Virginia Wild Rye *(Elymus virginicus)*	28
Creeping Red Fescue *(Festuca rubra)*	24
Little Bluestem *(Schizachyrium scoparium)*	15
Big Bluestem, Niagra *(Andropogon gerardii)*	8
Fox Sedge *(Carex vulpinoidea)*	8
Switch Grass *(Panicum virgatum)*	8
Upland Bentgrass *(Agrostis perennans)*	1
Creeping Bentgrass *(Agrostis stolonifera)*	1
New England Aster *(Aster novae-angliae)*	1
Boneset *(Eupatorium perfoliatum)*	1
Grass Leaved Goldenrod *(Euthamia graminifolia (Solidago G.)*	1
Sensitive Fern *(Onoclea sensibilis)*	1
Green Bulrush *(Scirpus atroviens)*	1
Blue Vervain *(Verbena hastata)*	1
Soft Rush *(Juncus effusus)*	0.5
Wool Grass *(Scirpus cyperinus)*	0.5
TOTAL	100

Application Rate: 35 LBS/ACRE (1250 SF/LB)

New England Erosion Control Seed Mix for Dry Sites

SPECIES
Creeping Red Fescue *(Festuca rubra)*
Canada Wild Rye (*Elymus canadensis*)
Annual Ryegrass (*Lolium multiflorum*)
Perennial Ryegrass (*Lolium perenne*)
Blue Grama (*Bouteloua gracilis*)
Little Bluestem *(Schizachyrium Scoparium)*
Indian Grass *(Sorghastrum nutans)*
Rough Bentgrass/Ticklegrass *(Agrostis scabra)*
Upland Bentgrass *(Agrostis perennans)*

Application Rate: 35 LBS/ACRE (1250 SF/LB)

New England Native Warm Season Grass Mix

(Sediment Disposal Site)

SPECIES
Little Bluestem *(Schizachyrium Scoparium)*

Big Bluestem (*Andropogon gerardii)*
Virginia Wild Rye (*Elymus virginicus*)
Indian Grass (*Sorghastrum nutans*)
Creeping Red Fescue (*Festuca rubra*)
Switch Grass *(Panicum virgatum)*
Application Rate: 23 LBS/ ACRE (1900 SQ. FT./ LB.)

C. Hydroseeding solution shall consist of the following components:

Grass seed	6 lbs / 1,000 sq. ft.
Cellulose mulch	32 lbs / 1,000 sq. ft.
Fertilizer	15 lbs / 1,000 sq. ft.
Superphosphate	20 lbs / 1,000 sq. ft.

D. Type of seed mix to be applied will be dictated by the Engineer.

2.3 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
   a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient.
   b. Additional loam, if required, shall be fertile, friable, agricultural soil, typical for locality, pH value compatible, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and free from other impurities, plants, weeds and roots.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m.

B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of vegetation.

2.6 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2.7 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

C. Provide containerized trees as specified on Contract Drawings.

D. Shrub sizes indicated on Drawings are sizes after pruning.

2.8 PLANT MATERIALS

A. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommend by ANSI Z60.1 for type and species required. Provide single stem trees except where special form are shown or listed.
   1. Provide balled and burlapped (B&B) deciduous trees.
   2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations for ANSI Z60.1 for container stock.

B. Deciduous Shrubs: Provide shrubs of height shown or listed and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.
   1. Provide balled and burlapped (B&B) deciduous shrubs.

2. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to specified limitations for container grown stock.

2.9 ANTI-HERBIVORY EXCLUSION DEVICE

A. Fencing shall consist of steel 1-inch mesh hexagonal 20-gauge galvanized wire with black PVC coating.

B. The fencing shall be secured using metal stakes, spaced appropriately.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base is properly rough graded and ready to receive the work of this Section.

B. Verify backfilling has been inspected.

C. Verify substrate base has been contoured and compacted.

D. Beginning of landscaping work means acceptance of existing soil base, and site conditions.

3.2 PREPARATION

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes in level areas.

B. Remove foreign materials and non-organic debris.

C. Scarify subgrade to depth of 4 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil. The contractor should plan to use track machines to minimize the use of rubber tire machines to reduce over compaction of the subsoil.

D. Saturate soil with water to test drainage.

E. Lay out individual tree, shrub, plant material locations and areas for multiple plantings with owner. Stake locations and outline areas and secure Owner's acceptance before start of planting work. Make minor adjustments as may be required.

3.3 PLACING AND TREATING TOPSOIL

A. Place both stockpiled topsoil and additional loam during dry weather; place to a minimum compacted depth of 6 inches on dry unfrozen subgrade. Treat additional

loam with ground limestone.

B. Fine grade topsoil, making changes in grade gradual, eliminating rough or low areas. Blend slopes into level areas. Manually spread topsoil close to trees, plants, and building to prevent damage. Roll, fill depressions to ensure positive drainage.

C. Remove roots, weeds, rocks and foreign material while spreading.

D. Remove surplus subsoil and topsoil from site. Leave stockpile areas and site clean and raked ready to receive grass.

E. Apply fertilizer in accordance with manufacturer's instructions, or testing agency recommendations (if tests are made), within 10 days of seeding, after smooth raking of topsoil and prior to roller compaction.

F. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

G. Mix thoroughly into upper 6 inches of topsoil.

H. Lightly water to aid the dissipation of fertilizer.

I. After incorporation of fertilizer and limestone into the soil, fine grade the seed bed to remove all ridges and depressions, and the surface cleared of all stones one inch or more in diameter and all other debris.

J. Smooth rake again and clear surface of all stones one inch or more in diameter and all other debris.

3.4 SEEDING

A. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

B. Apply seed evenly by mechanical spreader at a rate specified by the manufacturer (35 lbs/acre). Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

C. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

D. Seeding Season: In accordance with the supplier's recommendations.

These periods may be extended or reduced according to prevailing weather conditions at the time, upon approval by the Engineer.

If the Contractor seeds outside the seasonal periods, any additional material furnished and placed to establish growth shall be done at the Contractor's expense. The Contractor must also reseed, mulch and repair any areas seeded, whether out-of-season or not, that are damaged by fire, erosion, or any other cause, as directed by the Engineer at no expense to the Owner.

E. No seeding shall be permitted after a rain unless the surface of the ground is loosened or when the velocity of the wind exceeds a gentle breeze or about five (5) miles per hour. Extreme care shall be taken during seeding and raking so that no change in grading is made and so that the seed is not raked from one spot to another.

F. Maintenance: The Contractor shall be held responsible for the maintenance of all work and parts thereof prior to final acceptance.

Maintenance shall include watering of seeded areas, weeding, clean-up, edging, repairs of washouts and gullies, repairs to protecting fences and all other necessary work of maintenance.

The Contractor shall provide an adequate and acceptable growth of vegetation of the type specified. Adequately protect all seeded areas until the areas are acceptable to the Engineer.

After final acceptance by the Owner, the Contractor will not thereafter be required to do any of the above work, except that nothing contained herein shall release the Contractor from his obligations under the Contract.

H. Seed Schedule: All specified seed mixes shall be installed per the manufacturer's specific recommendations for seeding rates, seed bed preparation and seeding season/date requirements.

If feasibility of this seed schedule cannot be met, contact the engineer immediately for review.

I. Hydroseeding: The application of a combination of seed, fertilizer, and mulch in a slurry mixture. Seed mix applied by hydroseeding:

1. If fertilizer is applied at time of seeding, the application rate will not exceed 100 lbs/Ac Nitrogen, 200 lbs/Ac P and 200 lbs/Ac K.
2. When lime is to be applied by the hydro-seeder, the rate shall not exceed 3 tons/Ac. Burnt or hydrated lime shall not be used.
3. Hydro-seeding mixtures shall be prepared on site, and applied immediately. No seed/mulch mix that has been left in the seeder for more than 8 hours shall be used.

3.5 SATISFACTORY SEEDING

A. Satisfactory Seeding: After leaf-out in spring following construction 80% cover.

B. The Contractor shall be responsible for ensuring that seed mixture has successfully developed in to plant cover. The Contractor shall check seeded areas after leaf-out in the spring following construction.

3.6 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.7 TREES AND SHRUBS

A. Excavation of Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.
   1. Excavate approximately 3 times as wide as container diameter.
   2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

C. Stock with Root Balls: Set trees and shrubs plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.
   1. Balled and Potted and Container Grown: Carefully remove root ball from container without damaging root ball or plant.
   2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

D. Bare-Root Stock: Set and support bare-root trees and shrubs in center of pit or trench with trunk flare flush with adjacent finish grade. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots. Tamp final layer of backfill. Remove injured roots by cutting cleanly; do not break.

E. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

3.8 TREE AND SHRUB PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character.

3.9 SITE CLEANING AND REPAIR

A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition.

3.10 CLEANUP AND PROTECTION

A. During restoration work, keep pavements clean and work area in an orderly condition.

B. Protect restoration work and materials from damage due to operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged restoration work as directed.

C. Compaction: The Contractor shall keep all equipment, vehicular and pedestrian traffic off areas that have been seeded to prevent excessive compaction and damage to young plants. Where such compaction has occurred, the Contractor shall rework the soil to make a suitable seedbed; then re-seed and mulch such areas with the full amount of the specified materials, at no extra charge to the Owner.

D. This work will not be considered complete until all cleanup operations are complete. This shall include the removal of all debris resulting from the seeding operation. The Contractor shall be required to shape, grade, and establish vegetative cover in accordance with the specifications on all areas disturbed outside the normal limits of the construction.

3.11 INSPECTION AND ACCEPTANCE

A. When restoration work is completed, including maintenance, the Owner will, upon request, make an inspection to determine acceptability.

B When inspected restoration work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by the Owner and found to be acceptable.

PART 4 – MEASUREMENT AND PAYMENT

4.1 There will be no measurement for this work. This work will be paid for at the contract lump sum price bid as a percentage of completion of Bid Item No. 8 “Site Restoration,” as determined by the Engineer.

END OF SECTION 02900