

CITY OF WORCESTER
Department of Public Works & Parks

149 WEST BOYLSTON DRIVE
IMPROVEMENTS

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PART II - TECHNICAL SPECIFICATIONS

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SECTION 02100
SITE PREPARTION AND DEMOLITION

PART 1 - GENERAL

1.01 GENERAL

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of the Project Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 SUMMARY

- A. Provide all labor, equipment, materials and perform all operations necessary to complete the work of this section as indicated within the drawings and specified herein which shall include but is not limited to the following:

1. Protection of existing site features to remain.
2. Protection of existing trees to remain.
3. Removal and disposal of trees and other vegetation.
4. Topsoil stripping and stockpiling.
5. Removal and disposal of site features within limit of work not required for finished work.
6. Removal and disposal of existing pavement, within limit of work not required for finished work.
7. Removal of trash/debris within the limit of the property.
8. Removal and delivery of materials to be salvaged to Parks Department Storage Facility.
9. Dust control.
10. Erosion and Sedimentation Control.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Division 2 Section "Earthwork" for extent of excavation and backfilling operations

1.04 SUBMITTALS

- A. Product Literature: Prior to ordering the below listed materials, submit product literature to Owners Representative for approval as follows. Do not order materials until Owners Representative approval has been obtained.

1. Sedimentation fence erosion control/ coir log.
2. Catch basin filters.
3. Tree protection fencing.
4. Temporary Construction fencing.

1.05 CONSTRUCTION AND FABRICATION OF SAMPLE PANELS.

- A. Contractor shall construct and/or fabricate samples for the following items in accordance with approved product literature.

1. Build sample panels of not less than twenty (20) linear feet for the following in the area designated by the Owners Representative:
 - i. Sedimentation fence erosion control/straw wattle filter sock.

- B. All items shall be complete in place. The quality of workmanship must be approved by Owners Representative before permanent construction is started. If the original sample is not approved, the Contractor shall provide additional samples as required, at no cost to the Owner, until an approved sample is obtained. The approved sample shall become the standard for the entire job. The samples can be constructed at a location that will become part of the work.
- C. Obtain Owners Representative written acceptance of the sample panels before proceeding with the final work.

1.06 CODES AND STANDARDS

- A. Perform demolition, clearing and improvements in accordance with the “Order of Conditions”, applicable rules, regulations, codes and ordinances of The City of Worcester, State and Federal Authorities, and in accordance with the requirements of Public Utility Corporations having jurisdiction over the work

1.07 PROJECT CONDITIONS

- A. Examination of Conditions
 - 1. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
 - 2. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing materials temporarily and/or rehandling items prior to final installation.
- B. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- C. The Contractors attention is directed to the fact that the work on this project is to be performed in areas, or adjacent to, that are utilized by pedestrians as well as park users. The Contractor shall be responsible for the installation of adequate precautions and other safety measures and controls deemed necessary by the authorities having jurisdiction, for the protection of the general public and for his own personnel.
 - 1. The Contractor shall without additional compensation be required to provide safe and convenient public access to the park during the prosecution of the work. Necessary areas for fire apparatus and other emergency vehicles shall be maintained at all times.

1.08 EXISTING SERVICES

- A. All locations of existing utilities shown on the plan have been developed from existing utility records and/or above ground inspection of the site. Completeness or accuracy of locations or depth of underground utilities or structures cannot be guaranteed. Contractor must verify the location and depth of all underground

utilities or structures prior to the start of work.

1. Contractor shall be responsible for all on-site coordination with utility companies and public agencies and for obtaining all required permits and paying all required fees. In accordance with M.G.L., Chapter 82, Section 40, including amendments; Contractor shall notify all utility companies and government agencies in writing prior to such excavation, (exclusive of Saturdays, Sundays and Holidays.) Contractor shall also call "Dig Safe" at 1-(888) 344-7233 no less than 72 hours prior to such excavation. Documentation of requests and numbers provided to Contractor prior to excavation work.
- B. Notify affected utility companies in advance and obtain written approval prior to commencing this Work.
- C. The contractor shall be responsible for the location, sealing, disconnection and/or protection of all existing utilities such as water, gas, sewers, electricity and telephone in accordance with the regulations of the utility concerned.
- D. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

1.09 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be stockpiled, relocated, salvaged, reinstalled, or otherwise indicated to remain on the Owners property, demolished materials shall become the Contractors property and shall be removed from the site and disposed of in a legal manner.
- B. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during site preparation, remain the Owners property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.

1.10 STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:
 1. The Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, supplementous latest edition.
 2. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
 3. ASTM: American Society of Testing and Materials, latest edition.
 4. ADA: Americans with Disabilities Act, latest edition.
 5. ABB: Architectural Barriers Board, Commonwealth of Massachusetts Regulation 521 CMR, latest edition.
 6. City of Worcester Standards for Public Works projects.

PART 2 - PRODUCTS

2.01 EROSION CONTROL

- A. Provide one hundred percent (100%) biodegradable straw wattle filter sock, Silt Fence, Silt Fence and Haybales, and Erosion Control Blanket as called for in the drawings or as required by the Owners representative.

2.02 CATCH BASIN/INLET FILTERS

- A. The contractor shall purchase, install and maintain catch basin/inlet filters at the locations indicated within the drawings for the provision of sediment control.
- B. Catch basin inlet filters shall be manufactured by either "Silt Sak" by Jennian, "Dandy Bag" by Dandy Products, "Drain Pac" or approved equivalent.
- C. The catch basin filters shall utilize materials and be assembled in a procedure acceptable to the City of Worcester Department of Public Works and Conservation Commission.

2.03 DUST CONTROL

- A. Acceptable materials for dust control use shall consist of the following or equivalent thereof:
 - 1. Potable water
 - 2. Calcium chloride
 - 3. Hydroseeding
 - 4. Motorized street sweeper
 - 5. Plastic covering.
- B. The Contractor shall not use oil or similar penetrants.

2.04 TREE PROTECTION FENCING

- A. If applicable, tree protection fencing shall be orange plastic construction fencing. Stakes shall be eight foot (8') steel posts driven a minimum of three feet (3') into ground. Posts shall be spaced ten feet (10') maximum on center.

PART 3 - EXECUTION

3.01 GENERAL

- A. Before commencing Site Preparation work, the contractor shall meet with the Owner in order to discuss the procedures to be utilized. The Contractor shall be held responsible for any damage to all vegetation designated to remain. Engineer will be the sole judge as to damage inflicted.
 - 1. The owner's representative shall make the final determination of action required regarding any and all items indicated for removals, stockpiling, disposal, adjustment and protection.
- B. The Contractor shall give the Owner adequate advance notice of his readiness to

start Site Preparation work in order that the Owner can review the Contractors plans for staging, parking and access to the construction site.

C. The work shall be conducted with prime consideration given to the following:

1. Compliance with governing laws and building codes.
2. Safety, protection, and convenience of the public and workmen.
3. Erosion control
4. Minimization of dirt and dust proliferation.
5. Neat and accurate cutting and trimming of elements to be partially removed subject to the Owners Representative approval.
6. Avoidance of any damage to existing vegetation to remain

3.02 ADD ALTERNATES or DELETE ALTERNATES

The Contractors attention is directed to the fact the final scope of work of this project will be determined based on the final acceptance of Add Alternates or Delete Alternates. Therefore, the final "Limit of Work" and location of erosion control may be adjusted to reflect the final construction scope.

3.03 EROSION CONTROL

- A. Install straw wattle filter sock, silt fencing, silt fencing with haybales, and/or erosion control blanket and other controls as indicated in the drawings prior to commencement of site preparation operations.
1. Tie the ends of adjacent straw wattle together with (6mm) 0.25 inch thick coir twines. Use extra loops of coir twine through the outer netting of adjacent coir rolls.
 2. Stakes shall be 24" x 4" x 2". Stakes shall be driven to a minimum of one (1) foot into the ground.
 3. Repair/replace straw wattle or fencing as requested by Engineer or the Owners Representative.
- B. The Contractor shall take effective action to control any erosion and run-off and shall prevent siltation of drainage systems and pollution of waterways. Provide additional temporary coir logs, temporary dams, sediment basins, mats, seeding or other effective control measures.
1. The Contractor shall regularly inspect and repair erosion control work to maintain effective control of erosion.

3.04 CATCH BASIN FILTERS

- A. The catch basin filters shall be installed prior to any demolition and/or construction commences on site. They shall be maintained by removing the trapped sediment loads as needed or a minimum of once per week in such a manner as not to cause sediments

and debris from entering the catch basin.

1. The contractor shall have on site at a minimum one (1) additional filter per catch basin for replacement purposes due to damage of the filter.
2. The contractor shall clean the existing catch basins/inlets of any debris, litter or sedimentation prior to the initial installation of any filter and shall be responsible in maintaining those catch basins/inlets clean for the duration of the contract or until directed otherwise by the Owner.

3.05 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

- A. Check erosion controls a minimum of twice monthly and always after each heavy rain. Remove silt build- up if greater than four (4) inches deep.
- B. Check the condition of other erosion control devices a minimum of twice each month, or more frequently if required due to heavy rainfall. Replace any damaged or deteriorated items. Keep erosion and sediment control devices securely anchored.
- C. Check the temporary sedimentation control basins and swales periodically for sedimentation build- up and remove sedimentation as necessary to maintain specified profiles and dimensions.
- D. Remove erosion and sediment control devices at completion of construction and as directed by the Engineer.

3.06 PROTECTION OF EXISTING CONDITIONS

- A. Protection of Existing Conditions: Provide protections necessary to prevent damage to existing park features indicated to remain in place. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owners Representative at no additional cost to the Owner.
 1. Protect improvements on adjoining properties and on Owners property.

3.07 PROTECTION OF EXISTING VEGETATION

- A. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 1. Maintain protection fence throughout the project duration. Remove as directed by the Engineer.

2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
3. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible. Notify the Engineer immediately upon damage incurred during the course of construction.
4. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to the Engineer. Employ a licensed arborist to repair damage to trees and shrubs.
5. Existing trees to be saved within or outside the limit of work line which have, in the opinion of the Engineer, become damaged, shall be assessed at \$300 per caliper inch and deducted from the Contract amount. Existing shrubs, vines and groundcover to be saved which have, in the opinion of the Engineer, become damaged, shall be replaced with plants of equal size
 - a. All expenses of removal and replacement incurred shall be paid by the Contractor without additional cost to the Owner. These plants shall be removed, according to the Specification requirements for removals, the stumps grubbed out and removed, and the ground surface repaired.

3.08 DUST CONTROL

- A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere. Maintain dust control at all times throughout the construction period. Control measures will be required in all areas as well as for stockpiles, temporary traffic ways, and all other areas where dust may develop.
- B. Dust control procedures shall be monitored by the Owners Representative and shall be subject to on-site review by Authorities having jurisdiction.
- C. Site Preparation and earthwork may be halted as deemed necessary should dust control procedures prove inadequate.
- D. Clean all soil and debris from wheels of all construction vehicles and cover earth loads prior to leaving the construction site.
- E. The Contractor shall install the "Construction Entry" as detailed within the drawings at all entry/exit areas.
- F. All streets, driveways and sidewalks shall be swept daily or as required to prevent dust being a public nuisance.

3.09 CLEARING AND GRUBBING

- A. The Contractor shall accept the site as he finds it and shall remove and legally dispose off site all plants designated for removal and all debris, trash organic matter, and objectionable material which is not suitable for finished conditions at no additional cost to the Owner.

- B. Trees, shrubs, vines and all stumps to be removed under clearing and grubbing shall be as indicated on the drawings and as directed by the Engineer. No burning shall be allowed on site. Dispose of all material legally off site at no additional cost to the Owner.
 - 1. Before any tree, shrub, vine, or stump removal is initiated, the Contractor shall arrange a conference on the site with the Engineer to review procedures for protection of existing vegetation to remain, removal of existing vegetation and clearing and grubbing operations.
- C. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to remain.
 - 1. Completely remove all stumps and roots to the following minimum depths;
 - a. Eighteen (18) inches below existing ground level for shrubs,
 - b. Three (3) feet below existing ground level for trees.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 - 3. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 4. Unless further excavation is required, fill depressions caused by clearing and grubbing operations with Ordinary Borrow material.
 - a. Place borrow material in horizontal layers not exceeding six (6) inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

3.10 TOPSOIL STRIPPING AND STOCKPILING

- A. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than four (4) inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over one (1) inch in diameter, and without weeds, roots, and other objectionable material.
 - 1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Topsoil that is contaminated with subsoil shall not be used as loam borrow. Unless directed by Owner, remove heavy growths of grass from areas before stripping.
 - a. Topsoil excavation and stockpiling shall consist of discing and harrowing grassed areas at ninety (90) degrees to each prior operation, and removing topsoil from all areas of proposed work, screening it and storing in approved topsoil stockpiles to ensure organic matter decomposition.
 - b. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 - 2. Stockpile topsoil in storage piles in areas as directed by the Engineer or

the Owners representative. Construct storage piles to provide free drainage of surface water. Cover storage piles to prevent erosion; install coir logs around entire perimeter.

3. Remove Unsuitable or excessive topsoil and dispose of legally at no additional cost to the owner.

3.11 REMOVAL OF EXISTING PAVEMENT AND CURBS

- A. All existing pavement and curbs to be removed, stockpiled or designated for reuse shall include, but are not limited to those items as indicated on the Site Preparation Plan.
 1. The contractor shall be responsible for delivering all items designated for salvaging to a designated area at the Worcester Parks Department Headquarters at Greenhill Park and/or as directed by the owners representative.
- B. Remove existing bituminous concrete pavement, concrete pavement, concrete slabs and all other pavements as indicated on the drawings. All material shall be removed and disposed of legally off-site, at no additional cost to the Owner.
- C. Included in this item will be all saw cutting of pavement, in areas where existing pavement is to remain as indicated within the drawings. All sawed edges of pavement shall be protected from damage until new pavement is placed against it. Existing pavement that is damaged, disturbed or settled, shall be cut back by the same method and replaced as directed by the Engineer at no additional cost to the Owner.
- D. If, after the existing pavement and base materials are removed to the depth required, and the Engineer deems the underlying gravel satisfactory for pavement subbase, he shall direct the Contractor to leave the existing gravel in place and/or supplement it with additional material as required to bring the subbase to the proper grade. Existing material shall be compacted as specified under Section 02200 Earthworks, herein.

3.12 REMOVALS

- A. All items to be removed, stockpiled or for reuse shall include, but are not limited to those items as indicated on the Site Preparation Plan.
 1. The contractor shall be responsible for delivering all items designated to be salvaged to a designated area at the Parks Department Headquarters Facility at Greenhill Park and/or as directed by the owners representative.
 2. All other removed items that are not to be salvaged shall be the property of the Contractor and shall be disposed of in a legal manner.
 3. Chains removed from guardrail shall be returned to Owner.
- B. The Contractor shall demolish and remove all items necessary, in their entirety to complete the work as shown as indicated within the drawings. Use methods

required to complete work within limitations of governing regulations and as follows:

1. Dispose of demolished items and materials promptly off site in a legal manner.
 - a. Do not allow demolished materials to accumulate on-site.
 - b. Burning on Owners property is not permitted.
 - c. On-site storage or sale of removed items is prohibited.
2. The items to be removed shall include all associated footings, accessories and hardware when applicable.

3.13 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent infrastructure by selective demolition and site preparation operations.

3.14 GENERAL CLEAN-UP

- A. Remove from site all trash, litter and debris and leave site in a neat and orderly condition on a daily basis and to the satisfaction and approval of the Owners Representative.
- B. Provide street sweeping of entrance drive at completion of project as directed by the Owner.

END OF SECTION 02100

**SECTION 02140
DEWATERING AND DRAINAGE CONTROL**

PART 1 - GENERAL

1.01 GENERAL

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of the Project Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 SUMMARY

- A. This Section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems and the requirements for control of surface water within the site.
- B. The work includes:
1. Control of surface water runoff to prevent flooding of excavations, trenches and adjacent properties, and the loosening and saturation of soils.
 2. Removal and disposal of subsurface water from excavations and trenches as required to lower and control water levels during construction.
 3. Provision of equipment and facilities to remove sediment and control the rates and volumes of disposal of surface and subsurface waters removed from the work areas.

1.03 RELATED SECTIONS

- A. Sections which directly relate to the work of this Section include:
1. Section 02100—Site Preparation and Demolition
 2. Section 02200—Earthwork
 3. Section 02270—Erosion and Sedimentation Control

1.04 DEWATERING SYSTEM REQUIREMENTS

- A. The Contractor shall design the dewatering systems to:

1. Effectively reduce the hydrostatic pressure and lower the groundwater levels to a minimum of 2 feet below the bottom of excavations;
 2. Develop a substantially dry and stable subgrade for the proposed work;
 3. Prevent damage to adjacent properties, buildings, structures, utilities and other facilities;
 4. Ensure that, after 12 hours of initial pumping, no soil particles will be present in the discharge.
- B. Locate dewatering facilities where they will not interfere with utilities and construction work to be done by others.
- C. Modify dewatering equipment and procedures when operations threaten to cause damage to new or existing facilities.
- D. Disposal of discharge waters shall be in accordance with Owner direction.
- E. The Contractor shall be solely responsible for the proper design and execution methods for controlling surface and groundwater. Design review and/or field monitoring activities by the Owner or Engineer shall not relieve the Contractor of his responsibilities for the work specified herein.

1.05 SUBMITTALS

- A. Prior to installation of the dewatering system and at least two weeks prior to performing any excavation in areas that require dewatering, submit working drawings and design data for review by the Owners Representative with the following information:
1. The proposed types of dewatering system;
 2. Arrangement, location and depths of system components;
 3. Complete description of equipment and instrumentation to be used including installation, operation and maintenance procedures;
 4. Types and sizes of filters;
 5. Design calculations demonstrating adequacy of the proposed system and equipment; and
 6. Provisions and methods of sediment removal disposal of water.
 7. Submit records required in Article 3.02.
- B. It is anticipated that the initial dewatering plan will have to be modified to suit

the variable soil/water conditions encountered during construction. Modify the dewatering plan as often as necessary to meet the Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Furnish pumps, pipe, appliances, and equipment of capacity capable to keep the excavations free from water as necessary to compete the work as specified herein.

PART 3 - EXECUTION

3.01 SURFACE WATER CONTROL

- A. Intercept and divert surface water runoff away from excavations through the use of dikes, curb walls, ditches, pipes, sumps or other approved means.
- B. Provide and maintain ditches of adequate size to collect and prevent surface and subsurface water seepage from entering the excavations. Divert the water to settling basins or other approved equipment required to reduce the amount of fine particles before discharge into drainage pipes and natural watercourses. If a drainage system or watercourse becomes blocked due to dewatering operation, the Contractor at no additional cost to the Owner shall clean it.

3.02 DEWATERING EXCAVATIONS

- A. Accomplish dewatering in accordance with the means and methods submitted as required in Article 1.04 and approved by the Engineer. Keep the Engineer advised of any changes required to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit the information required to show the installed system.
- B. Perform dewatering operations to lower the groundwater level in excavations as required to provide a stable, dry subgrade for the prosecution of the proposed work.
- C. Maintain dewatering operations in a manner that prevents buildup of excessive hydrostatic pressure and damage to structures, and the subgrade.
- D. Do not allow water to accumulate in excavations. The Contractor shall provide and maintain at all times ample means and devices to remove promptly, and to dispose of properly, all water entering excavations and to keep them dry until the proposed work is completed.

- E. If the Contractor's method of dewatering does not properly dewater the excavation as specified, then the Contractor shall install groundwater observation wells, as directed by the Engineer, and implement a revised dewatering plan that lowers the groundwater a minimum of 6 inches below the bottom of final excavation elevation, at no additional cost to the Owner.
- F. No pipe shall be laid in water. No masonry shall be laid in water, and no water shall be allowed to rise over concrete and brick masonry within 24 hours after being placed. Water shall not be allowed to rise over any concrete and masonry for four days. The Contractor shall constantly guard against the possibility of flotation of pipe or structures after installation. Backfill or other means shall be placed promptly to prevent this occurrence.
- G. Dewatering units used in the work shall be surrounded by suitable filter sand such that no fines shall be removed by pumping. Pumping shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.
- H. Dewatering flows shall be disposed of in an approved area. Sanitary sewer systems shall not be used to dispose of dewatering flows.

END OF SECTION 02140

SECTION 02200 EARTHWORK

Part 1 - GENERAL

1.01 GENERAL

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of Project Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. Prospective bidders are advised that significant quantities of topsoil are present at the property and presumably available for reuse if compatible with the requirements of this specification. The Contractor shall be responsible for amending topsoil, as required to comply with this specification.

1.02 SUMMARY

- A. Provide all labor, equipment, materials and perform all operations necessary to complete the work of this section as indicated within the drawings and specified herein which shall include but is not limited to the following:
 - 1. Excavation of all existing material for site improvements to the depth required in the plans and specifications to meet the required lines and grades.
 - 2. Excavating, screening stockpiling and rehandling all existing topsoil excavated within the construction site for reuse on-site.
 - 3. Perform all operations and provide such equipment as necessary to maintain excavated areas free from water from any source whatsoever and to avoid the disturbance of the subgrade.
 - 4. Rough and finish grading.
 - 5. Dust control.
 - 6. The Contractor shall legally dispose off-site all the excess excavated material originating from the construction of this site.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Division 2 Section 02100 "Site Preparation and Demolition" for site stripping, grubbing, topsoil removal, and tree protection.

1.04 DEFINITIONS

- A. Excavation consists of the removal of material encountered to sub-grade elevations and the reuse or disposal of materials excavated.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Owners Representative. Unauthorized excavation, as well as remedial work directed by the Owners Representative, shall be at Contractor's expense.
 - 1. Backfill and compact unauthorized excavations with structural fill as specified for authorized excavations, unless otherwise directed by the Owners Representative.

- C. Additional Excavation: Consists of the removal of material as directed by the Owners Representative beyond the required subgrade that is determined as unsuitable. The Contractor shall continue excavation until suitable bearing materials are encountered. The Contract Sum shall be adjusted by an appropriate Contract Modification. The following constitute unsuitable materials:
 - 1. All buried building materials encountered within 18 inches of finished grade, which may include but is not limited to the following:
 - a. Concrete rubble
 - b. Re-bars
 - c. Asphalt
 - d. Electrical materials and debris
 - e. Wood
 - f. Brick, block, tile (ceramic/quarry)
 - g. Pipe
 - h. Ashes
 - i. Metal pieces/parts
 - j. Insulation
 - k. Any other material remaining from previously demolished building
- D. Sub-grade: The undisturbed earth or the compacted soil layer immediately below granular sub- base.
- E. Structure: Foundations, footings, slabs, or other man-made stationary features occurring above or below ground surface.
- F. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.
- G. Free Water: Water with or without suspended material, which when sampled is pourable.

1.05 SUBMITTALS

- A. Product Literature: Prior to ordering the below listed materials, submit product literature to the Owners Representative for approval.
 - 1. Erosion Control
- C. Submit the following samples prior to ordering the below listed materials to the Owners Representative for approval.
 - 1. Not Applicable

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with all local and state regulations, laws and ordinances and with requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: The Contractor shall coordinate and submit all tests as specified herein.
 - 1. Owner's Responsibility: The Owner, at his option, shall employ a qualified geotechnical testing agency to verify that soils comply with specified requirements and

to perform required field and laboratory testing for the following:

- a. Not Applicable
2. Contractor's Responsibility: The Contractor shall employ a qualified geotechnical testing agency, and as approved by the Owner, to verify that soils comply with specified requirements and to perform required field and laboratory testing for the following:
 - a. Topsoil/ Ordinary Loam Borrow
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Special Conditions Section "Project Meetings".
 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Consultants, and other concerned entities. Review earthwork procedures and responsibilities including any testing and inspection procedures and requirements. Notify participants at least three (3) working days prior to convening conference. Contractor shall record discussions and agreements and furnish a copy to each participant.
- D. Experience: The Contractor or Sub-contractor shall have a minimum of five (5) years of experience of similar size and quality of this project.

1.07 PROJECT CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions both surface and sub-surface before submitting his bid, and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for additional compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed. The Owner shall not be responsible for interpretations or conclusions drawn from data or interpretations by the Contractor.
 1. Test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
 2. The Contractor may assume that topsoil material from on-site shall conform to the requirements specified as Ordinary Loam Borrow and be approved for on-site construction where indicated on the drawings or specified herein.
- B. Existing Utilities:
 1. All locations of existing utilities shown on the plan have been developed from existing utility records and/or above ground inspection of the site. Completeness or accuracy of locations or depth of underground utility or structures cannot be guaranteed. Contractor must verify the location and depth of all underground utilities or structures prior to the start of work.
 2. Locate all existing underground utilities in areas of excavation work. Disconnect, seal and/or protect, as required, all existing utilities, including but not limited to, water, gas, sewerage, storm, electrical and telephone in accordance with the regulations

concerned. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

- a. Contractor shall be responsible for all on-site coordination with utility companies and public agencies and for obtaining all required permits and paying all required fees. In accordance with M.G.L., Chapter 82, Section 40, including amendments; Contractor shall notify all utility companies and government agencies in writing prior to such excavation, (exclusive of Saturday, Sundays and Holidays) Contractor shall also call "Dig Safe" at 1(888) 344-7233 no less than 72 hours prior to such excavation. Documentation of requests and numbers provided to Contractor.
- b. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, 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.
- c. Do not interrupt existing utilities servicing facilities occupied by Owner or others, during occupied hours, except when permitted in writing by the Owners Representative and then only after acceptable temporary utility services have been provided.
- d. Provide minimum of forty-eight (48) hours notice to the Owners Representative, and receive written notice to proceed before interrupting any utility.
- e. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

D. Use of Explosives: Use of explosives is not permitted.

E. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
3. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

F. Adjoining Property: No construction work, temporary or permanent, shall take place on adjacent or adjoining property. The Owner does not have nor will obtain any legal easement for this purpose. The Contractor shall be fully responsible for monitoring and maintaining that no construction activities trespass onto the adjoining property for the duration of the contract.

1.08 BENCH MARKS, LINES AND GRADES

A. The Contractor shall engage a professional land surveyor, registered in the Commonwealth of Massachusetts and submit the name, address and registration number of such persons to the Owners Representative for approval to perform the following work:

1. Furnish all stakes, pins, grade markings and lay out all lines and grade work, required to implement the work, in accordance with Drawings.
 2. Establish permanent bench marks, maintain all established bounds and bench marks, and replace as directed any which are destroyed or disturbed.
 3. Establish all lines and vertical and horizontal alignment grades for the work and verify all locations, property lines, work lines, and other dimensioned points indicated on the Contract Drawings for the existing site.
 4. Submit to the Owners Representative, a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Contract Drawings. Such confirmation shall bear the Owners Representative's or Surveyor's registration stamp.
- B. The Contractor shall inform the Owners Representative when the general layout is completed and shall not begin excavation until the various alignments are approved. Any discrepancies encountered in field conditions shall be reported to the Owners Representative immediately.

1.09 WORK IN THE PUBLIC WAYS

- A. Notify the appropriate municipal officials at least seven (7) calendar days in advance of commencing any work in the public ways pay for and obtain all required permission and permits to perform this work. Perform all work in the public ways in a manner required by the municipal authorities.
- B. Should there be any conflict between requirements specified in the Contract Documents and those of the municipal authorities, the municipal requirements shall govern.
- C. Do not close or obstruct any streets or sidewalks unless and until they have been discontinued by the appropriate municipal authority or unless and until the Contractor shall have first secured all necessary or other permits therefor. No materials whatsoever shall be placed or stored in the streets. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks, or other facilities near enough to the work to be affected thereby.
- D. The Contractors attention is directed to the fact that the work on this project is to be performed in areas which are utilized by pedestrians as well as by vehicles. The Contractor shall be responsible for the installation of adequate precautions and other safety measures and controls deemed necessary by the authorities having jurisdiction, for the general public and for his own personnel.
 1. The Contractor shall without additional compensation be required to provide safe and convenient access during the execution of the work. Necessary areas for fire apparatus and other emergency vehicles shall be maintained at all times.

1.10 STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:
 1. Standard Specifications and Details: City of Worcester, Department of Public Works

and Parks, Parks Recreation and Cemetery Division.

2. Standard Specification: Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, supplemental specifications latest edition.
3. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
4. ASTM: American Society of Testing and Materials, latest edition.
5. ADA: Americans with Disabilities Act, latest edition.
6. ABB: Architectural Barriers Board, Commonwealth of Massachusetts Regulation Chapter 521 CMR, latest edition.

1.11 NOTIFICATION

- A. Not Applicable

1.12 SUBSURFACE SOIL DATA – **NOT REQUIRED**

- A. Review logs of borings, jar soil samples, records of explorations and other pertinent data for the site. After obtaining Owner's permission, take whatever additional subsurface explorations deemed necessary at no expense to the Owner.
- B. Boring logs are appended to these specifications. Jar soil samples may be examined upon written request to the Owner's Representative
- C. The above data are for general information and are accurate only at the particular locations and times the subsurface explorations were made. It is the Contractor's responsibility to make interpretations and to draw conclusions based on the character of materials to be encountered and the impact of his work based on his expert knowledge of the area and of earthwork techniques.
- D. The Drawings showing existing ground elevations are only for whatever use the Site Work Contractor may make of them with no responsibility on the part of the Surveyors, the Owner, or their Representatives for the accuracy and/or the reliability of the information given.

PART 2 - PRODUCTS

2.01 **NOT REQUIRED**

PART 3 - EXECUTION

3.01 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. Protect sub-grades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Provide tree protection as specified in Division 2 Section "Site Preparation and Demolition".

3.02 DUST CONTROL

- A. Refer to Section 02100 SITE PREPARATION for dust control requirements.

3.03 DEWATERING

- A. Upon entering the premises, assume responsibility for site and subsurface drainage and maintain such drainage during the life of this Contract in a manner acceptable to the Owners Representative, at all times protecting and maintaining the existing conditions in adjacent areas. Presence of ground water in the soil shall not constitute a condition for which any increase may be made in the Contract Price.
- B. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.
- C. Protect subgrades and foundation soils from softening and damage by rain or free water accumulation.
- D. Legally remove by pumping, draining or bailing all water which may accumulate or be found on the site within the Contract limits, where excavation and grading are to be done. Excavate and form all pump wells, sumps, dams, flumes or other necessary works to keep excavations entirely clear of water. Protect newly-placed concrete and newly-constructed masonry from damage resulting from dewatering work, by the use of canvas, tarpaulins, or by such other sufficient method as the Owners Representative may approve. Maintain at all times upon the work sufficient and satisfactory pumping machinery, including standby equipment. Provide pump wells or well points and under drains as may be required, where needed to properly handle the water. The final approved trimming excavation shall not be done until the Owners Representative has approved the manner of dewatering. Maintain excavations free from water until all backfilling operations and new construction has been completed. Provide portable generator if temporary power is not available.
- E. Dispose of water from excavations in such a manner as will not (a) cause injury to persons, (b) endanger public health, (c) cause damage to public or private property, (d) cause damage to the work completed or in progress, and (e) cause any interference with the use of any area beyond the Limit Lines of this Contract.

3.04 EROSION CONTROL

- A. Install and maintain erosion control measures as specified within the Division 2 Section "Site Preparation" and the following:

1. Schedule the delivery and placement of fill materials, obtained from off-site sources, in a manner which will minimize the length of time such fill materials would be stored on site and subject to erosion.
2. Limit new embankment slopes to three (3) horizontal to one (1) vertical, maximum unless indicated as steeper on plans.

3.05 **FROST PROTECTION- NOT APPLICABLE**

- A. Do not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be poured immediately after the excavation has been completed. Protect the excavation from frost if placing of the concrete is delayed. Should protection fail, remove frozen materials and replace with concrete or gravel fill, as directed, at no cost to the Owner. Once footings or slabs are placed, protect same from frost.
- B. Keep the operations under this Contract clear and free of accumulations of snow as required to carry out the work.

3.06 **SHEETING, SHORING AND BRACING AND PROTECTION – NOT APPLICABLE**

- A. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of the excavation and to prevent any movement of earth which could in any way diminish the width of the excavation below that necessary for proper construction, or otherwise injure or delay the work or endanger adjacent structure or personnel. If the Owners Representative is of the opinion that at any point sufficient or proper support has not been provided, he may order additional supports put in at the expense of the Contractor.
 1. Prior to installation of sheeting, the Contractor and the Owners Representative shall notify and consult with residents who may be affected by vibrations caused by equipment installing the sheeting.
- B. Whenever possible, sheeting shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled with sand and compacted.
- C. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing which the Owners Representative may direct him to leave in place at any time during the progress of the work, for the purpose for preventing injury to structure, personnel, utilities, or property at no additional cost. Timber or steel sheeting and bracing to be left in place shall be cut-off at least two feet below finish grade. This shall not constitute a waiver of the Contractor's responsibility to use his own judgment in where sheeting shall be left in place.
- D. All sheeting and bracing not to be left in place shall be carefully removed in such a manner as not to endanger the construction or other structures. All voids left or caused by withdrawal of sheeting shall be immediately backfilled with approved material and compacted by ramming with tools especially adapted to that purpose, by watering, or otherwise as may be directed.
- E. Comply with local safety regulations or in the absence thereof, with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.

1. Submit sheeting and shoring design for review to the Owners Representative. The sheeting and shoring design shall be prepared by a professional Owners Representative registered in the Commonwealth of Massachusetts and in the employ of the Contractor

3.07 EXCAVATION: GENERAL

- A. Classified Excavation: Excavation is classified and includes excavation to required sub-grade elevations indicated, regardless of character of materials and obstructions encountered. Excavation will be classified as earth excavation or rock excavation as follows:
 1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
 - a. Intermittent drilling or ripping to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
 - b. All excavation shall be done with a backhoe whose bucket is equipped with a wedge plate across the teeth to provide a smooth bottom profile or equivalent equipment approved by the Owners Representative.
 2. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No., 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000- pound breakout force (measured in accordance with SAE J732).
 3. Rock excavation for trenches includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power

excavator, equivalent to Caterpillar Model No. 215C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

- B. Material, encountered in the excavation, to qualify as rock, must be two (2) cubic yards or more in undisturbed size in open excavation and in trenches. To be considered for classification as rock, material shall be any one of the following:
 - 1. Rock, stone or shale (in original ledge) and all other material, including buried building foundations, which cannot be broken and removed by power excavation equipment and requires the use of drills.
 - 2. Boulders.
- C. When, during the progress of excavation, rock is encountered, uncover and expose the material, and notify the Owners Representative before proceeding further. Do not proceed with the excavation of material claimed as rock until the material has been classified by the Landscape Architect. Failure on the part of the Contractor to uncover such material or notify the Owners Representative, and take cross-sections, will forfeit the Contractors right-of-claim to any additional compensation or extension of time.
 - 1. Employ qualified personnel, acceptable to the Owners Representative, to take cross-sections of rock three (3) feet on center before removal of same; and to provide computations of cross-sections.

3.08 STABILITY OF EXCAVATIONS

- A. Excavation of slopes shall be constructed to comply with all OSHA regulations and with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Notify the Massachusetts Department of Labor and Industries of the start of excavation work.

3.09 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions as indicated within the drawings within a tolerance of plus or minus 0.10 foot. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended for bearing surface.

3.10 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades as indicated within the drawings.

3.11 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated slopes, lines, depths, and below invert elevations as indicated within the drawings.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to twelve (12) inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: Twelve (12) inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to receive bedding for pipes and conduit. Shape bedding to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
 - 1. Where rock is encountered excavate six (6") inches below required elevations and backfill with compacted gravel fill to required elevations.

3.12 APPROVAL OF SUBGRADE

- A. Maintain foundation excavations at least twelve (12) inches above design bearing level until final excavation immediately before footing construction, or placing fill. If footings will not be constructed within the same day as final excavation to subgrade level, a three (3) inch, thick lean concrete mud slab should be cast over the exposed bearing surface immediately after approval of the subgrade bearing surface by the geotechnical Owners Representative.
- B. Notify the Owners Representative when excavations have reached required subgrade for inspection of conditions and approval to proceed with construction.
- C. If the Owners Representative determines that unforeseen unsuitable material is present, he may direct the Contractor to continue excavation until suitable bearing materials are encountered.
- D. Re-construct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owners Representative, at no cost to the owner.
- E. Do not place fill material until the subgrade is approved by the Owners Representative.

3.13 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation with structural fill material as directed by the Owners

Representative. Flowable fill may be used to bring elevations to proper position when acceptable to the Owners Representative.

- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by Owners Representative at no additional cost to the owner.

3.14 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials approved as backfill materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent erosion and install siltation controls.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. Intermixed stockpiles as determined and directed by the Owners Representative shall be re- tested for compliance to specified requirements or removed from site immediately, at no additional cost to the owner.

3.15 PROOF COMPACTION

- A. Proof compact the bottom of excavations or existing subgrade, as applicable. Proof compaction shall consist of making ten (10) passes with a ten ton vibratory roller or by a minimum of three (3) coverages from the rear wheel assembly of a fully loaded ten-wheel dump truck or by a minimum of three (3) coverages from the treads of a tractor dozer weighing at least 30,000 pounds and observing the subgrade for any soft or weaving areas.
 - 1. If, in the judgement of the Owners Representative, compaction of receiving surfaces is not required, or will disturb the natural soil, the subgrade compaction requirements will be waived.
- B. Prior to placing fill in trench areas, thoroughly compact the trench bottoms and fill all depressions to a smooth uniform surface.

3.16 PLACEMENT AND COMPACTION OF FILLS

- A. General: Backfill excavations as promptly as work permits, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Coordinate installation of drainage systems.
 - 3. Surveying locations of underground utilities for record documents.
 - 4. Testing, inspecting, and approval of underground utilities.
 - 5. Concrete formwork removal.
 - 6. Removal of trash and debris from excavation.

7. Removal of temporary shoring and bracing, and sheeting.
 8. Remove vegetation, topsoil, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
 9. When sub-grade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.
- B. Notify the Owners Representative when areas to receive fill are ready for inspection. All subgrades to receive fill shall be compacted to a minimum ninety five (95) percent of maximum dry density beneath proposed foundations, slabs-on-grade and paved parking areas and walkways. Unless otherwise noted within the drawings or specified herein.
- C. Place approved fill materials in layers not exceeding six (6) inches compacted thickness and compact as specified below for various fill conditions.
- D. Before filling against walls, the permanent structures must be completed and sufficiently aged to attain strength required to resist fill pressures without damage. Temporary bracing of permanent structural wall will not be permitted. Correct all damages to the structure caused by the filling operations at no additional cost to the Owner.
1. Place no stones over four (4) inches in diameter closer than eighteen (18) inches to foundation or retaining walls.
- E. Placing Structural Fill
1. Place structural fill and compact to specified dry density as indicated within the drawings and beneath building structural elements, including footings foundations and slabs and as specified herein.
- F. Placing Compacted Gravel Fill
1. Place gravel fill and compact to specified densities as indicated within the drawings and all exterior site construction requiring filling and backfilling operations as a result of excavation operations and/or filling to required subgrades from existing grades.
- G. Placing Crushed Stone
1. Place crushed stone and compact to specified densities as indicated within the drawings and/or specified herein.
- H. Placing Sand Borrow
1. Place sand borrow and compact to specified densities as indicated within the drawings and specified herein.
- I. Placing Ordinary Borrow
1. Ordinary borrow may be utilized, if approved by the Owners Representative, as fill and backfill material beneath pavements, structures and lawn and planting areas not indicated within the drawings or specified herein as structural fill, gravel fill, crushed stone or sand borrow.
 2. Place ordinary borrow and compact to specified densities as indicated within the drawings and specified herein.

- J. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557 and in place density in accordance with ASTM D 1556.
 - 1. Under structures and pavements, compact the sub-grade and each layer of backfill or fill material at 95 percent maximum dry density.
 - 2. Under walkways, compact the subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
 - 3. Under planting areas or unpaved areas, compact the sub-grade and each layer of backfill or fill material at 90 percent maximum dry density.
- K. Placing Blast Rock Fill (Rip Rap) on the slope located on the high side of the Existing Retaining Wall on Providence Street shall be completed after the wall repair is 100% complete and the 6' chain link fence is installed. The blast rock shall be placed evenly along the slope in 6" lifts by individual bucket loads. Placement of rock on the slope by dumping from a truck is prohibited.

3.17 UTILITY TRENCH BACKFILL

- A. Place bedding course on bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits to spring line.
- B. Concrete backfill trenches that carry below or pass under footings and that are excavated within eighteen (18) inches of footings. Place concrete to level of bottom of footings.
- C. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of four (4) inches of concrete before backfilling or placing roadway sub-base.
- D. Place and compact backfill material to a minimum height of twelve (12) inches over the utility pipe or conduit and as indicated within the drawings.
 - 1. Carefully compact material and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- G. Place and compact final backfill of material to final sub-grade.
- H. Install warning tape directly above utilities, twelve (12) inches below finished grade, except six (6) inches below subgrade under pavements and slabs.

3.18 ROUGH AND FINE GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between existing adjacent grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Match/Maintain existing grade, plus or minus 0.10 foot.
 - 2. Walks: N/A
 - 3. Pavements: N/A

3.19 FIELD QUALITY CONTROL – **NOT APPLICABLE**

- A. Testing Agency Services: Allow testing agency to inspect and test each sub-grade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method).
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gauges according to ASTM D 3017.
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work, on each different type of material encountered, and at intervals as directed by the Owners Representative.
 - 2. Footing Sub-grade: At footing sub-grades, perform at least one (1) test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing sub- grades may be based on a visual comparison of each sub-grade with related tested strata when acceptable to the Owners Representative.
 - 3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one (1) field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.
 - 4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one (1) field in- place density test for each 100 feet or less of wall length, but no fewer than two (2) tests along a wall face.
 - 5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one (1) field in-place density test for each 100 feet or less of trench, but no fewer than two (2) tests.

- B. When testing agency reports that sub-grades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained, at no additional cost to the Owner.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace material to depth directed by the Owners Representative; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- D. All additional, repairing, removing and restoring work shall be completed at no additional cost to the owner.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove and legally dispose of surplus or excavated materials not required to complete construction, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 02200

SECTION 02270
EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.01 GENERAL

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of the Project Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 SUMMARY

- A. This Section specifies requirements for temporary erosion and sedimentation control provisions.
- B. The work includes:
1. Providing all temporary erosion control measures shown on the Drawings and required by the Owners Representative during the life of the Contract to control soil erosion and water pollution.
 2. The installation and maintenance of coir logs, erosion control barriers, berms, ditches, sedimentation basins, construction exits, fiber mats, erosion control blankets, catchbasin filters, siltation control fencing, straw, netting, gravel, trenches, mulches, grasses, slope drains and other approved erosion control devices or methods.

1.03 RELATED SECTIONS

- A. Sections which directly relate to the work of this Section include:
1. Section 02100—Site Preparation and Demolition
 2. Section 02200—Earthwork
 3. Section 02920—Loaming and Seeding, for installation of erosion control mat (jute netting).

1.04 SUBMITTALS

- A. Prior to the start of the construction, the Contractor shall submit to the Owners Representative for acceptance, schedules for the construction of required stormwater detention basins, temporary and permanent erosion and sediment controls, clearing and grubbing, grading, structures at watercourses,

construction, and paving. No work shall be started until control schedules and methods of operations have been accepted by the Owners Representative.

- B. Submit product data for siltation fencing and erosion control blanket.

1.05 REFERENCES

- A. Massachusetts Highway Department (MHD), Standard Specification for Highways and Bridges, latest edition, hereinafter referred to as MHDSSHB.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Straw wattle Filter Sock, see Section 02100.
- B. Quick growing grasses, such as wheat, rye or oats, shall be in accordance with MHDSSHB Section M6.03.1 Erosion Seed.
- C. Filter fabric at construction entrance shall be be a woven polypropylene geotextile used for soil separation and road grade stabilization and meeting the following criteria:

Grab Tensile Strength	ASTM D 4632	1.40
Grab Tensile Elongation	ASTM D 4632	15/10
Trapezoid Tear Strength	ASTM D 4533	0.53
Mullen Burst Strength	ASTM D 3786	4134
Puncture Strength	ASTM D 4833	0.53
UV Resistant after 500 hours	ASTM D 4355	70
Apparent Opening Size	ASTM D 4751	0.425
Permittivity	ASTM D 4491	0.05

- D. Catch Basin Filters – see Section 02100.
- E. Erosion Control Netting - Jute Mat - Use jute mat made of unbleached, undyed, and loosely-twisted yarn. The unit yarn weight shall be from 0.90 to 1.50 lb/yd² (488 to 814 g/m²). A 48 in (1.2 m) width shall show between 76 and 80 warpings, and a 36 in (900 mm) length shall show between 39 and 43 weftings. Furnish woven mesh strips of at least 45 in (1.1 m). Anchoring Staples shall be cold-drawn wire 14 gauge or wider in diameter, formed into a U shape from a wire 12 in or longer.

PART 3 - EXECUTION

3.01 EROSION CONTROL - GENERAL

- A. Erosion and sediment controls shall be in placed prior to any soil disturbing activities including, but not limited to, clearing and grubbing, earthwork, dewatering, and excavation work.

- B. All disturbed soils shall be stabilized, either permanently or temporarily, within two (2) weeks of disturbance.
- C. At a minimum, the following shall apply:
 - 1. Brush and stumps shall not be removed until one (1) week prior to the start of seeding in that area or as directed by the Owners Representative.

The existing ground surface shall be disturbed as little as possible until no more than one (1) week prior to the start of s.
 - 2. Drainage leaving the site shall flow to water courses in such a manner as to prevent erosion.
 - 3. Loaming and seeding or mulching shall take place as soon after backfilling of laid pipe as practicable. This shall be considered part of the pipe work, and full payment for the pipe work need not be made until it has been completed.
- D. Measures for control of erosion must be adequate to assure that turbidity in the receiving water will not be increased more than ten (10) standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity must not exceed twenty-five (25) s.t.u. unless otherwise permitted.
- E. When excavating in wetlands or river floodplain, where no temporary diversion structure is required, the excavated material shall be placed within the limits of the construction easement shown on the construction drawings.
- F. Failure by the Contractor to control erosion, pollution, and siltation shall be cause for the Owner to employ outside assistance to provide the necessary corrective measures. The cost of such assistance, including review Engineer costs, will be charged to the Contractor and appropriate deductions made to the Contractor's monthly progress payment request.
- G. When it becomes necessary, the review Engineer engaged by the Owner will inform the Contractor of construction procedures and operations that jeopardize erosion control provisions. If these construction procedures and operations are not corrected promptly, the Engineer may suspend the performance of any or all construction until corrections have been made, and such suspension shall not be the basis of any claim by the Contractor for additional compensation from the Owner nor for an extension of time to complete the Work.
- H. The review Engineer has the authority to order immediate, additional, temporary control measures to prevent contamination of adjacent streams or other watercourses, or other areas of water impoundment and damage by erosion.
- I. The Contractor shall remove sediment from erosion control facilities as required, and as directed by the Engineer. The Contractor shall modify and improve

erosion control facilities and replace deteriorated hay bales and other devices as required, and as directed by the Engineer.

- J. The Contractor shall construct all permanent erosion and sediment control features at the earliest practical time as outlined in the accepted schedule. Temporary erosion and sediment control measures shall be used to correct conditions that develop during construction which were unforeseen, but are needed prior to installation of permanent control features, or that are needed temporarily to control erosion or sedimentation which develops during construction operations.
- K. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled and performed so that grading operations and permanent erosion and sediment control features can follow immediately thereafter, if conditions permit; otherwise, temporary control measures will be required between successive construction stages.
- L. Temporary and permanent erosion and sedimentation control measures are shown on the Drawings. The Contractor shall strictly adhere to the provisions. Additionally, temporary measures shall be constructed to accommodate field conditions that develop during construction.

3.02 MAINTENANCE AND CLEAN UP

- A. The Contractor shall inspect erosion control devices immediately after each storm event and at least daily during prolonged rainfall and maintain them in good operating condition for the life of the contract. Hay bales shall be replaced when deteriorated, and as directed by the Owners Representative.
- B. The Contractor shall inspect the condition of diversion dikes and ditches, filter berms, interceptor dikes, sediment basins and other erosion and sedimentation control devices after each rainstorm and during major storm events. Repairs shall be made as necessary and as directed by the Owners Representative.
- C. Accumulated sediment trapped by erosion and sedimentation control devices shall be removed as required, and as directed by the Owners Representative.
- D. During construction, temporary outlets of the drainage systems shall direct the flow to temporary or permanent sedimentation basins.
- E. Temporary soil erosion and sedimentation control devices shall be removed and adjacent areas outside the limits of grading restored upon completion of the work or when directed by the Owners Representative. Upon removal of the temporary controls, the site shall be restored to original condition in accordance with Section 02920 – Loaming and Seeding.

END OF SECTION 02270

SECTION 02920
LOAMING AND SEEDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The City of Worcester Bid Form, General Conditions, Supplementary Conditions and applicable parts of the Project Special Conditions form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.02 SUMMARY

- A. Provide all labor, materials, equipment, transportation and perform all services and operations necessary to complete the work of this section as indicated within the drawings and specified herein which shall include, but is not limited to, the following:
 - i. Processing and re-use of topsoil stripped from site and stockpiled
 - ii. Fine grading
 - iii. Providing and incorporating all fertilizers and additives as necessary
 - iv. Hydroseeding and Seeding
 - v. Erosion Control Matting
 - vi. Repairing lawn areas disturbed by Contractor's operations
 - vii. Maintenance including watering, mowing, and over-seeding until accepted by Owner.
- B. After approval of rough grading, loam shall be placed on all areas affected by the Contractor's operations, (unless shown in the drawings to be finished with other surface treatments such as pavement, stone dust, synthetic turf, etc.)

1.03 RELATED SECTIONS

- A. Section 02200 – Earthwork, for rough grading required to establish elevations indicated on drawings.
- B. Section 02270 – Erosion and Sedimentation Control
- C. Section 02811 – Landscape Irrigation

1.04 REFERENCE STANDARDS

- A. USDA Standards for determining soil characteristics
- B. Current Standards of the Association of Official Analytical Chemists, (AOAC International)

1.05 QUALITY ASSURANCE

- A. The Contractor must be a member in good standing of the Associated Landscape Contractors of America.

- B. The Contractor must show previous evidence of having successfully installed and maintained landscape projects of similar scope to the subject project with regard to quantities of loaming and seeding involved, complexity and a minimum of five (5) years experience on projects similar to this one. The Owner's Representative shall have the right to review the qualifications and references of the Contractor for approval to work on this project.
- C. Source Quality Control:
 - 1. Analysis and standards: For packaged products, provide with manufacturers certified product analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Analytical Chemists, wherever applicable.

1.06 SUBMITTALS

- A. SAMPLES/ TESTING: The Contractor shall furnish a Certified Laboratory Report documenting the soils USDA textural classification and nutrient analysis of representative samples of the existing loam to be used, including the extent of nutrient and pH adjustments required. Samples submitted for approval must be representative of the total volume to be furnished, taken in the presence of the Owners Representative, and delivered to a certified laboratory by the Contractor; all costs for such shall be borne by the Contractor.
 - 1. The Laboratory shall conduct tests for: standard fertility with extractable nutrient levels (N, P, K, Ca, Mg, Fe, Mn, Zn, Cu, B lead and aluminium), pH, organic matter concentration, soluble salts, and for traces of other heavy metals or hazardous materials.
 - 2. If the material does not conform to the requirements here-in it shall be rejected and additional sources shall be found. Sampling and testing shall be accomplished as specified until an approved material is found, all at the Contractor's expense.
 - 3. The Contractor shall seek confirmation with the Owners Representative that the screened existing loam to be used is acceptable, at least three weeks prior to the planned date for spreading loam. The Contractor shall submit to the Owner a one (1) cubic foot representative sample, address of the sources, and certified test results for loam materials.
- B. Based upon the Soil amendment and fertilizer recommendations from the Testing Laboratory, the Contractor shall provide two marked up prints to the Owners Representative indicating square footages for all lawn areas with quantities of all soil additives for each area, prior to beginning work.
- C. Seed Mixes: The Contractor shall submit manufacturers' seed mix composition as specified, to the Owners Representative for approval.

- D. Catalogue cuts of proposed Slope protection materials, erosion control blanket or matting, shall be submitted by Contractor for approval by the Owners Representative.
- E. Provide watering, fertilizing, mowing, and over-seeding schedule to Owners Representative for approval, following installation of seed.
- F. No additional loam material shall be ordered or delivered.

1.07 EXISTING TOPSOIL STRIPPED FROM THE SITE

- A. Existing Topsoil stockpiled on-site shall be used and screened to be made to comply with the specifications herein for screened loam. Two (2) test samples shall be taken and analyzed from each potential existing topsoil stockpile on site. Site of samples shall comply with testing lab requirements. Contractor shall deliver samples to testing laboratory, have testing report sent directly to the Owner's Representative and pay all costs. Report shall be submitted at least one (1) month before any loaming is to be done.
 - 1. Textural and chemical analysis shall be by a public extension service agency or a certified private testing laboratory in accordance with the current "Standards" of the Association of Official Analytical Chemists and acceptable to the Owners Representative.
 - 2. Soil test report shall include a mechanical sieve analysis with soil classification. Organic content shall be reported. Chemical analysis shall include pH (1:1 soil-water ratio), buffer pH, Soluble Salts (1:2 soil-water ratio), Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Manganese, Ferric Iron and Sulfate.
 - 3. Test report shall clearly recommend appropriate limestone and fertilizer requirements.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver all items to the site in their original containers with all labels intact and legible at time of Owner's inspection.
- B. Immediately remove from the site all seeding materials, which are not true to name, and all materials, which do not comply with the provisions of this Section of these Specifications.
- C. Use all means necessary to protect seeding materials before, during, and after installation and to protect the installed work and materials of all other trades.
- D. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

PART 2 - PRODUCTS

2.01 SCREENED LOAM

- A. Screened Loam shall be “coarse sandy loam” determined by mechanical analysis (ASTM D-422) and based on the “USDA” Classification System”. Screened Loam has the following mechanical analysis:

<u>Textural Class</u>	<u>Percentage of Total Weight Percentage</u>	<u>Average</u>
Sand (0.05 – 2.0mm dia. range)	45 – 75	60
Silt (0.002 – 0.05mm dia range)	15 – 35	25
Clay (Less than 0.002mm dia. range)	5 – 20	15

Coarse Sandy loam shall have: less than 30% fine /very fine sand, and 50% or more medium/coarse/very coarse sand.

- B. Screened Loam shall be a natural, fertile, friable product consisting primarily of natural topsoil, free from subsoil, and obtained from naturally well-drained areas which has never been stripped. It shall not be delivered when in a wet or frozen condition. Screened Loam shall have the following characteristics:
1. Screened Loam shall not contain less than 5 percent nor more than 15 percent organic matter as determined by the loss on ignition of oven-dried samples, at 100°C ± 5°C. To adjust organic matter content, the soil may be amended, prior to delivery or use, by the addition of composted organic matter or peat moss, well-blended into the soil mix.
 2. It shall be capable of sustaining vigorous plant growth.
 3. Screened Loam shall be without admixture of subsoil, and refuse, resulting in a homogeneous material free of stones greater than ½” in the longest dimension, be free of lumps, plants, glass, roots, sticks, excessive stone content, debris, and extraneous matter as determined by the Owners Representative.
 4. It shall fall within the pH range of 6.0 to 6.5 except as where noted on plans and planting details. If limestone is required to amend the screened loam to bring it within a pH range of 6.0 to 6.5, no more than 200 pounds of limestone per 1,000 cubic feet of loam, incorporated into the soil, or 50 pounds of limestone per 1,000 square feet of loam surface shall be applied within a single season.
 5. It shall be uncontaminated by salt water, foreign matter and substances harmful

to plant growth. The maximum soluble salt index shall be 100. Screened Loam shall not have levels of aluminum great than 200 parts per million and be free of heavy metals in concentrations hazardous to human health.

- C. Topsoil, which has been stockpiled on the site, shall be used to be made to comply with these Specifications herein for screened loam.
- D. To assure existing screened loam borrow/topsoil stockpiled fulfills specified requirements regarding textural analysis, organic matter content, and pH, the soil testing results shall be obtained by the Contractor and submitted to the Owner's Representative for review/approval.

2.02 SOIL ADDITIVES

- A. Fertilizer, compost, humus, peat or other soil additives shall be used to address soil deficiencies as recommended by the soil analysis and as directed by the Owner's Representative.
- B. Fertilizer: shall be commercial fertilizer, 10-8-4 U.F., and be a mixture containing at least fifty percent (50%) of organic nitrogen.
 - 1. Percentages of nitrogen, phosphorous and potash shall be based on laboratory test recommendations as approved by the Owners Representative. For purpose of bidding, assume ten percent (10%) nitrogen, twenty percent (20%) phosphorus and six percent (6%) potash by weight. At least fifty percent (50%) of the total nitrogen shall contain no less than three percent (3%) water- insoluble nitrogen.
 - 2. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Owners Representative. Store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be compromised.
 - 3. Fertilizer shall be applied in two (2) applications. The first application shall be prior to the time of seeding or sodding at the rate of thirty-five (35) pounds per thousand (1,000) square feet harrowed into the top two (2) inches of sod bed. The second application shall be done as a maintenance application.
- C. Humus: shall be natural humus, reed peat or sedge peat. It shall be free from excessive amounts of zinc, low in wood content, free from hard lumps and in a shredded or granular form. According to the methods of testing of A.O.A.C., latest edition, the acidity range shall be approximately 5.5 pH to 7.5 pH and the organic matter shall be not less than 85% as determined by loss on ignition. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- D. Manure: shall be well-rotted, unbleached stable manure not less than eight months and not more than two years old. It shall be free from sawdust, shavings or refuse of any kind and shall not contain over twenty-five (25) percent straw. The Contractor shall furnish information as to the kind of disinfectant or chemicals, if any, that may have been used in storage of the manure, upon request by the Owners Representative.

- E. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100- mesh sieve.
- F. Aluminum Sulfate: Commercial grade.
- G. Bonemeal: Commercial, raw, finely ground; 4% Nitrogen and 20% phosphoric acid. H.
Superphosphate: shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid. Superphosphate shall be applied with the fertilizer at the rate of twenty (20) pounds per thousand (1,000) square feet. At least 4 days shall lapse after the application of lime and fertilizer before sodding may begin.
- I. Water: The Contractor shall be responsible for furnishing his own supply of water to the site at no extra cost. If possible, the Owner will furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owners water supply is not available or not functioning, the Contractor will be held responsible to furnish water.
 - 1. Water shall be free of impurities injurious to vegetation.

2.03 SEED

- A. Seed mixtures shall be fresh, clean, new crop seed. Seed shall be of the previous years crop and in no case shall weed seed content exceed 1% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturers Certificate of Compliance. Seed that has become wet, moldy or otherwise damaged will not be acceptable
- B. Conservation/ Wildlife Seed Mix: shall be composed generally of the plant species listed below, installed in the area of the stormwater basin as indicated in the drawings, and sown in accordance with the manufacturer's guidelines.

New England Conservation/ Wildlife Mix, of Amherst, MA (413) 548-8000
www.newp.com , or approved equal mix, containing:

Virginia Wild Rye, Little Bluestem, Big Bluestem, Creeping Red Fescue, Switch Grass, Partridge Pea, Deer Tongue, Indian Grass, Common Milkweed, Ox Eye Sunflower, Purple Joe Pye Weed, Grass Leaved Goldenrod, Blue Vervain, Golden Alexanders, Flat Topped/ Umbrella Aster, and Early Goldenrod

- 1. Seed shall be mixed by manufacturer/ dealer.
- 2. Seed mixture to be applied at the following rate:
One pound per 1,750 square feet.

2.04 HYDRO MULCH FOR HYDROSEEDING MULCH FOR GRASS PROTECTION

- A. Hydro-mulch made from ground cellulose, paperboard, wood fibers and/or polyfiber, suitable for hydroseeding.
- B. To protect newly planted grass seed areas, the Contractor may use a mulch free of weed seeds.

2.05 SLOPE EROSION CONTROL MATTING OR BLANKET

- A. On loamed surfaces greater than 2.5 : 1 slope, the Contractor shall install Erosion Control Matting or blanket to stabilize the slope during the time needed for seed mixes to become securely rooted and densely established.
 - 1. Erosion control blanket shall be 100% degradable plastic mesh with 100% degradable straw or straw/ coconut fill, held together with degradable fastening, and applied to the slope with six inch wire staples in accordance with manufacturers guidelines.
 - 2. Erosion control blanket shall be made by:
 - North American Green, Evansville, IN,
 - U.S. Construction Fabrics, Windham, NH
 - Eastcoast Erosion Blankets, Bernville, PA,
 - or an approved equal.

PART 3 – EXECUTION

3.01 PROJECT CONDITIONS

- A. All areas to be loamed and seeded shall be inspected by the Contractor and the Owners Representative before starting work and any defects, such as incorrect grading, etc., shall corrected prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be loamed, finish graded and seeded, and he shall assume full responsibility for the work of this Section.
- B. Contractor shall coordinate loaming and seeding operations with shade and ornamental tree planting, so large plantings are installed prior to loaming and seeding.
 - A. Mix specified soil amendments and fertilizers with screened topsoil and/or loam borrow at rates specified by testing agency, and as specified under Section 02980 – Planting. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
 - 1. Loam, organic material and bonemeal for plant backfill for both planting beds and individual plants shall be thoroughly premixed in the proportions of one (1) part of organic material with seven (7) parts of loam together with ten (10) pounds of bonemeal per cubic yard of mixture.
 - 2. Maintain at all times during the planting operations one or more stockpiles of approved loam borrow or topsoil from stockpile.

3. Depth of planting soil in plant beds to be at least eight (8) inches deep.
4. Depth of tree and shrub pits and planting soil around trees and shrubs to be as indicated in the drawings.
5. Plant large plantings prior to or concurrently with finish grading.

3.03 FINE GRADING AND LOAMING

- A. After the areas to be loamed have been brought to rough grade, and immediately prior to and spreading the loam borrow or topsoil, the subgrade shall be loosened by disking or rototilling to a depth of at least three inches to permit bonding of the loam to the subsoil. Remove all stones greater than two (2) inch in diameter and all debris or rubbish. Such material shall be removed from the site, at no additional cost to the Owner.
- B. Provide an equal depth of screened existing loam in all areas indicated for seeding and all areas disturbed by excavation and construction operations.
- C. Screened loam borrow or screened topsoil from stockpile shall be placed and spread over approved areas to an equal depth sufficiently so that after natural settlement and light rolling, the completed work will conform to the existing lines, grades, and elevations indicated.
- D. Disturbed areas along the edges of full-depth loaming shall be finish graded with loam tapered to meet existing lawn areas to be retained.
- E. No subsoil or loam shall be handled in any way if it is in a wet or frozen condition.
- F. Sufficient grade stakes be set for checking the finished grades. Stakes must be set in the bottom of swales and at top of slopes. Grades shall be established which are accurate to one tenth of a foot either way. Connect contours and spot elevations with an even slope.
- G. After loam has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. All large stiff clods, lumps, brush, glass, roots, stumps, litter and other foreign matter, and stones over one inch in diameter shall be removed from the loam. Loam shall also be free of smaller stones in excessive quantities as determined by the Owner's Representative.
- H. The whole surface shall then be rolled with a hand roller weighing not more than 100 pounds per foot of width. During the rolling, all depressions caused by settlements or rolling shall be filled with additional loam and the surface shall be re-graded and rolled until it presents a smooth and even finish to the required grade.
- I. Contractor shall obtain Owner's Representatives written approval of fine grading and bed preparation before doing any seeding.

3.04 EROSION CONTROL MATTING, MESH, OR BLANKET

- A. After grassing, place erosion control matting or blanket in areas indicated in the

drawings or as directed by the Owners Representative.

- B. Roll the matting out in the direction of flow. Overlap adjacent strips by at least 6 inches. Overlap adjoining ends by at least 6 in. For all overlaps, place the upstream section on top. Use a Type 2 check slot at the downstream end of the mesh that does not connect to a structure.
- C. Apply mesh without stretching. Lay it evenly but loosely on the soil surface.
- D. To keep the area smooth, do not allow workers to walk directly on the seedbed before or after applying mesh.
- E. Bury the up-channel end of each installation in a narrow, 6 in deep trench and cover with at least 4 inches of loam.
- F. After burying the mesh, backfill, tamp, and staple the trench.
- G. Where one roll of mesh ends and a second begins, use a junction slot to make the connection.
- H. Stapling: Hold matting strips firmly in place with one row of staples as follows:
 - 1. Staple along each edge. Staple each row along the middle. Space staples no more than 3 ft apart in each row. Space the staples in the middle row alternately with those at the edges. For strips wider than 60 in., space staples no more than 3 ft apart. At the ends of the covered area and at overlapping joints, space staples no more than 18 in apart. Ensure that staples remain flush with the ground.
- I. Rolling: After placing and stapling the mesh, firmly embed it in the soil by tamping or rolling. Secure mesh that bridges over soil surface irregularities with extra staples to provide firm overall contact with the soil.

3.05 SEEDING

- A. All areas indicated in the drawings shall be loamed and seeded only after written approval of the Owner's Representative of bed preparation. All disturbed areas outside the limit of seeding shall also be seeded.
- B. Immediately before seeding, the ground shall be restored, as necessary, to the proper surface and to a loose friable condition by dicing, raking, or other approved method to a depth of not less than 1". The surface shall be cleared of all debris, weeds, and of all stones 1" or more in diameter.
- C. Seeding shall be done only during the period from April 1 to May 30 or August 15 to October 15. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. At his option, and on his responsibility, the Contractor may plant seed under unseasonable conditions at no increased cost to the Owner.
- D. If there is insufficient time in the planting season to complete the fertilizing and seeding, the permanent seeding may be left until the following planting season at the option of the Contractor or on the order of the Owner. In that event, a temporary

cover crop shall be sown by the Contractor, which shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the surface re-finish graded and fertilized, and the permanent seed crop shall be sown as specified.

- E. Seeding of lawns and other seeding mixes shall be done only by experienced workmen under the supervision of a qualified foreman.
- F. Soil additives shall be spread and thoroughly incorporated into the layer of loam by harrowing or other methods approved by the Owner's Representative. The following soil additives shall be incorporated, unless indicated otherwise by instructions from approved seed mix manufacturers:
 - 1. Spread ground limestone as required by soil analysis to achieve a pH of 6 to 6.5, but the maximum amount applied shall be one pound per square yard.
 - 2. Spread fertilizer at the rate of forty (40) pounds per one thousand (1,000) square feet or more as required by soil analysis.
 - 3. Spread Superphosphate at the rate of twenty (20) pounds per one thousand (1,000) square feet.
 - 4. Incorporate humus in the soil as required by soil analysis prior to delivery to site. Contractor shall have loam retested with organic matter incorporated and shall obtain approval prior to bringing any loam on the site.
- G. Seed only when the bed is in a friable condition, not muddy or hard.
- H. Apply the various seed mixes in a manner consistent with instructions from the manufacturer for each mix; and, complete soil amendments, watering, and maintenance in a manner appropriate to each mix.
- I. Seed all areas to be seeded with specified ground cover seed, sowing evenly with an approved mechanical seeder at the rate specified for each seed mix. Sow x pounds per 1,000 square feet in one direction and x pounds per 1,000 square feet at right angles to the first seeding. Spread seed when soil is moist. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible to cultipacker, the seeded ground shall be lightly raked and rolled in two directions with a water ballast roller. Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades and that the seed is not raked from one spot to another. Hydroseeding is an acceptable manner of seeding, providing the Contractor certifies in writing that the hydro-seed fertilizer mix is as herein specified and applied at the equivalent specified seeding rates per 1,000 square feet.
- J. If covering and rolling is not properly accomplished by the seeding machine, the seed shall be lightly raked into the ground, after which the ground shall be rolled with roller not weighing over 100 pounds per linear foot of tread; then thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least two (2) inches.
- K. Promptly after seeding, wet the seedbed thoroughly, keeping all areas moist throughout the germination period.
- L. Mulch shall be placed immediately after seeding. Straw or salt marsh hay that has

been thoroughly fluffed shall be spread evenly and uniformly at the rate of two to three tons per acre. Lumps and thick mulch materials shall be thinned. All mulch anchor stakes, strings and matting shall be removed before final acceptance of lawns. In addition, following mulching, all slopes of 2.5 : 1 or greater shall be covered with jute, biodegradable coconut netting, or approved equal, Securely stapled in place. Overlap all joints in netting a minimum of 6".

M. Hydroseed mix: All work shall be installed using an approved spraying machine specifically used for this purpose. Amounts of fertilizer used shall be as the testing agency recommendations prescribe and as directed by the Owner's Representative. The Contractor shall submit to the Owner's Representative for approval prior to the start of any seeding work, a certified statement as to the number of pounds and types of fertilizer, amounts and types of seed mix and processed fiber per one hundred (100) gallons of water.

1. Hydro-mulch shall be Terra-Sorb GB, or approved equal.
 - a. Add Terra-Sorb to the hydroseed tank at the rate of sixty (60) pounds per acre.

3.06 MAINTENANCE FOR SEEDED AREAS

A. Maintenance shall begin immediately after any area is seeded and shall continue until final acceptance, but in no case, less than the following period.

1. Sixty (60) days after substantial completion of seeding.
 - a. Maintenance may continue until the next growing season if in the opinion of the Owner's Representative the season enters a winter dormancy and no maintenance should continue.
 - b. Over-seeding the in next growing season shall be provided for each of the seeded areas, with application rates to be half of those initially applied.
 - c. General Acceptance by the Owners Representative will be granted for seeded lawn areas and ball fields when all areas have a close stand of grass which has received a minimum of two mowings, has no bare spots greater than two inches in diameter, and at least 90% of the grass established shall be permanent grass species. The Contractor shall maintain all seeded areas until final acceptance.

B. Maintenance shall include reseeding, mowing, watering, weeding and fertilizing.

C. Watering of Seeded Areas:

1. First Week: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn or ground cover. In the absence of an adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least two inches.
2. Second and Subsequent Weeks: The Contractor shall water the lawn and ground covers as required to maintain adequate moisture, in the upper two inches of soil, necessary for the promotion of deep root growth.
3. Watering shall be done in a manner, which will provide uniform coverage,

prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an eight (8) hour period.

D. Protection:

1. Seeded areas shall be protected by stakes and caution tape or snow fence as directed by the Owners Representative. Wire shall not be used.
2. Barriers must be installed immediately after seeding and shall be maintained until acceptance.

E. Reseeding: After the grass or ground covers in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Owner's Representative, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the expense of the Contractor.

F. Mowing:

1. At the time of the first cutting, there shall be a uniform stand between 3 and 3-1/2" high, and mower blades shall be set between 2-1/2" and 3" high.
2. Mowing shall include removal of clippings.

G. Fertilizing: A second application of fertilizer, as specified herein, shall be applied after one (1) season of growth of a minimum of two (2) months duration, but only during the months of April, May, August or September. Fertilizer shall be applied at the rate of thirty (30) pounds per one thousand (1,000) square feet in lawn areas.

H. Liming: If more than one initial application of limestone is required by the soils analysis to bring the pH of the stockpiled topsoil/loam borrow to a specified range, the Contractor shall be responsible for a second required lime application.

3.07 CLEANUP AND PROTECTION

- A. During seeding work, keep pavements clean and work area in an orderly condition.
- B. Protect seeding work and materials from damage due to landscape operations, operations by other contractors or trades, and trespassers.
 1. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.08 ACCEPTANCE

- A. The Owner shall inspect all work for Acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date of inspection. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Owner, he shall certify in writing to the Contractor as to the Acceptance of the work.

3.09 ACCEPTANCE IN PART

- A. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so and when approval is given to the Contractor in writing to complete the work in parts. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

3.10 CLEANUP

- A. After completion of all planting operations, dispose of all debris and excess material to the satisfaction of the Owner. All pavements shall be swept and hosed clean.

3.11 FINAL INSPECTION AND ACCEPTANCE

- A. At the end of the guarantee period, the Owner will inspect all guaranteed work for the Final Acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date for final inspection.
- B. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Owner at that time, he shall certify in writing to the Contractor as to the Final Acceptance of the project.

END OF SECTION 02920